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MEETING OF THE PARTIES TO THE CONVENTION ON THE PROTECTION AND USE OF TRANSBOUNDARY WATERCOURSES AND INTERNATIONAL LAKES

Working Group on Monitoring and Assessment

Eighth meeting
Helsinki, Finland, 25–27 June 2007
Item 4 of the provisional agenda

ASSESSMENT OF THE STATUS OF TRANSBOUNDARY WATERS IN THE UNECE REGION[1]

PRELIMINARY ASSESSMENT OF TRANSBOUNDARY RIVERS DISCHARGING TO THE BALTIC SEA AND THEIR MAJOR TRANSBOUNDARY TRIBUTARIES
Pregel, Vistula and Oder

Submitted by the Chairperson of the Working Group on
Monitoring and Assessment

[1] At their fourth meeting (Bonn, Germany, 20–22 November 2006), the Parties to the Convention mandated its Working Group on Monitoring and Assessment with the assessment of transboundary rivers, lakes and groundwaters in the UNECE region. For details, please refer to documents ECE/MP.WAT/WG.2/2007/1 and 3.

I. ASSESSMENT OF THE STATUS OF TRANSBOUNDARY RIVERS IN THE PREGEL BASIN[2]

1. Lithuania (see also assessment of the Nemunas River in document ECE/MP.WAT/WG.2/2007/7), Poland and the Russian Federation (Kaliningrad Oblast) share the basin of the Pregel River, also known as the Prieglius or Pregola.

Basin of the Pregel River

Area	Countries	Countries' share	
15,500 km^2 *	Lithuania *	65 km^2	0.4%
	Poland **	7,520 km^2	48.5%
	Russian Federation	7,915 km^2	51.1%

Sources: * Environmental Protection Agency, Lithuania.
** National Water Management Authority, Poland.

Hydrology

2. The Pregel River has two transboundary tributaries: the Lava River (also known as the Lyna River) and the Wegorapa (or Angerapp) River. The confluence of the Wegorapa and Pisa rivers in Kaliningrad Oblast (Russian Federation) is usually considered as the beginning of the Pregel River. The Pregel's main tributaries (the Wegorapa and Lava) have their sources in Poland. Poland also shares a very small part of the Pisa with the Russian Federation.

3. On Polish territory, there are 133 lakes in the Pregel basin with a total area of 301.2 km^2. There are also six NATURA 2000 sites, including the Lake of Seven Islands, a combined NATURA 2000 and Ramsar site of 10 km^2 situated very close to the Polish-Russian border.

Hydrology of the transboundary tributaries to the Pregel

4. The Lava (Lyna) River has a length of 263.7 km, of which 194 km are in Poland. From the sub-basin's total area (7,126 km^2), altogether 5,719 km^2 are in Poland. On Polish territory, there are 97 lakes with a total surface of 154,6 km^2. The main left tributaries include the Polish Marozka, Kwiela, Kortowka and Elma rivers. The Wadag, Krisna, Symsarna, North Pisa and Guber rivers are the main right tributaries in Poland.

5. The Wegorapa River has its source in Lake Mamry (Poland), at an altitude of 116 m above sea level. From its total length (139.9 km), 43.9 km are in Poland. Of the sub-basin's total area (3,535 km^2), 1,511.8 km^2 are in Poland. On Polish territory, there are also 28 lakes with a total surface of 140.1 km^2. The Wegorapa River's main tributaries are the Goldapa and Wicianka rivers and the Brozajcki Canal.

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[2] Based on information provided by the National Water Management Authority, Poland.

Discharge characteristics of the Lava (Lyna) and Wegorapa rivers in Poland		
Lava (Lyna) River at Bukwald upstream of the border with the Russian Federation		
Discharge characteristics	Discharge, m^3/s	Period of time or date
Q_{av}	155	1951–1985
Q_{max}	34.9	1951–1985
Q_{min}	10.4	1951–1985
Wegorapa River at Mieduniszki (Poland) upstream of the border with the Russian Federation		
Discharge characteristics	Discharge, m^3/s	Period of time or date
Q_{av}	51.4	1991–1995
Q_{max}	11.9	1991–1995
Q_{min}	3.3	1991–1995
Source: National Water Management Authority, Poland.		

Pressure factors

6. In Poland, agriculture (54%) and forests (29%) are the main form of land use in the Pregel basin.

7. In the sub-basin of the Lava River, sewage discharge mainly originates from the municipal wastewater treatment plant at Olsztyn with an amount of 36,000 m^3/d. Other, smaller municipal discharges originate at Bartoszyce (3,400 m^3/d), Lidzbark Warminski (3,400 m^3/d), Dobre Miasto (1,200 m^3/d), Stawigud (250 m^3/d), Sepopol (200 m^3/d) and Tolek (90 m^3/d). Industrial wastewaters are discharged from the dairy production plant at Lidzbark Warminski (1,100 m^3/d).

Water quality of the Lava (Lyna) River at the border profile at Stopki (Poland) for the period 18 January to 13 December 2006

Determinands	**Average**	**Observed maximum**	**Observed minimum**
Total suspended solids in mg/l	10.79	29.00	5.7
$N\text{-}NH_4$ in mg/l	0.22	0.32	0.14
Total nitrogen in mg/l	2.72	5.00	1.42
Total phosphorus in mg/l	0.20	0.32	0.14
COD_{Cr} in mg O_2/l	28.48	33.80	23.60
COD_{Mn} in mg O_2/l	9.31	13.20	3.45
BOD_5 in mg O_2/l	1.61	2.50	0.90

8. In the sub-basin of the Wegorapa River, major wastewater discharges stem from the municipal wastewater treatment plant at Wegorzewo, which discharges 1,400 m^3/d.

Water quality of the Wegorapa River at the border profile at Mieduniszki (Poland) for the period 9 January to 4 December 2006			
Determinands	**Average**	**Observed maximum**	**Observed minimum**
Total suspended solids in mg/l	8.71	35.10	…
$N\text{-}NH_4$ in mg/l	0.17	0.49	0.03
Total nitrogen in mg/l	2.59	5.90	1.55
Total phosphorus in mg/l	0.13	0.19	0.08
COD_{Cr} in mg O_2/l	33.82	50.80	15.90
COD_{Mn} in mg O_2/l	9.59	12.70	6.30
BOD_5 in mg O_2/l	2.51	6.20	0.40

Transboundary impact and trends

9. The Lava (Lyna) used to be one of the most polluted rivers flowing out of Polish territory; its status is improving.

10. The overall status of the Wegorapa River is still poor, because of the high pollution levels in its tributaries (Goldapa River and Brozajcki Canal).

11. The envisaged further improvement of wastewater treatment, the implementation of the planned non-structural measures in agriculture and water management as well as better policy integration among various economic sectors will significantly reduce transboundary impact and improve water quality.

II. ASSESSMENT OF THE STATUS OF TRANSBOUNDARY RIVERS IN THE VISTULA BASIN[3]

12. Belarus, Poland, Slovakia and Ukraine share the Vistula basin with a total area of 194,424 km^2 (199,813 km^2 including the delta).

13. The most important transboundary river in the Vistula basin is the Bug River, shared by Belarus, Poland and Ukraine. The Poprad and Dunajec rivers, whose sub-basins are shared by Poland and Slovakia, are smaller transboundary tributaries to the Vistula.

A. Bug River[4]

14. Belarus, Poland and Ukraine share the Bug River basin. The river's sub-basin is around 19% of the entire Vistula basin.

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[3] Based on information provided by the National Water Management Authority (Poland), the Institute of Meteorology and Water Management (Poland), the Slovak Hydrometeorological Institute, and the State Committee of Ukraine for Water Management.

[4] Based on information provided by the National Water Management Authority (Poland) and the State Committee of Ukraine for Water Management.

Sub-basin of the Bug River			
Area	Countries	Countries' share	
39,400 km^2	Belarus	9,200 km^2	23.35%
	Poland	19,400 km^2	49.24%
	Ukraine	10,800 km^2	27.41%
Source: National Water Management Authority, Poland.			

Hydrology

15. The Bug River, sometimes called the Western Bug to distinguish it from the Southern Bug in Ukraine, has its source in the northern edge of the Podolia uplands in the L'viv region (Ukraine) at an altitude of 310 m. The river forms part of the border between Ukraine and Poland, passes along the Polish-Belarusian border, flows within Poland, and empties into the Narew River near Serock (actually the man-made Lake Zegrzynskie, a reservoir built as Warsaw's main source of drinking water).

16. The River Bug is 772 km long, of which 587 km are in Poland. Except in its upper stretch in Ukraine (Dobrotvirsk and Sokalsk dams), the main watercourse of the Bug River is not regulated, but its tributaries are heavily regulated, in particular in Ukraine (more than 218 dams) and Poland (more than 400 dams). The reservoirs are mainly used for irrigation. The Bug is connected through the Dnieper-Bug canal with the Pripyat (Ukraine).

17. The Bug's long-term average discharge is 157 m^3/s (5.0 km^3/a), measured upstream of Lake Zegrzynskie (Wyszkow station, Poland).

Discharge characteristics at selected sites in the sub-basin of the Bug River

River km	Station	Area in 1,000 km^2	Period	Water discharge in m^3/s *					
				HQ	MHQ	MQ	MNQ	NQ	Irr
602.0	Lythovetz (UA)	…	1980–1998	216	…	30.3	…	8.2	26.3
536.6	Strzyzow (UA-PL border)	8.945	1961–1990	692	230	40.9	11.5	3.20	216
378.3	Wlodawa (PL)	14.410	1951–1990	769	271	54.4	16.8	8.01	96
163.2	Frankopol (below BY-PL border)	31.336	1951–1990	1,480	487	119.0	38.9	12.40	119
33.8	Wyszkow (PL)	39.119	1951–1990	2,400	678	157.0	50.5	19.80	121

Notes:

* Over the last 50 years

HQ: Maximum water discharge; MHQ: Average maximum water discharge; MQ: Average water discharge; MNQ: Average minimum water discharge; NQ: Minimum water discharge

Irr.: Irregularity of water discharge (Q_{max}/Q_{min})

18. There are 13 tributaries with a length of more than 50 km, including five in Ukraine, two in Belarus and six in Poland. Four of them are transboundary rivers: the Solokiia and Rata between Poland and Ukraine and the Pulva and Lesnaya between Poland and Belarus.

19. Floods are frequent in the upper and middle parts of the river's catchment area (Ukraine) and at the border between Poland and Belarus. Significant variations in the flow regime due to melting snow in spring and low discharges in autumn greatly affect the quality of water.

Pressure factors

20. The whole sub-basin of the Bug River is a region with poorly developed water-supply networks and an even less developed sewage systems, especially in the rural areas. In some regions, villages and small towns do not have sewage systems at all. The sewage collected from water users is discharged to wastewater treatment plants (total number 304). Many of them are located in Poland (224, of which 165 municipal), 45 in Belarus (including 42 municipal) and 35 in the Ukraine (including 18 municipal). There are 94 municipal wastewater treatment plants with a capacity greater than 150 m^3/day. Of these, 64 are in Poland, 14 in Belarus, and 16 in Ukraine.

21. Thus, the water quality of the Bug is mainly affected by municipal wastewater discharges. Pollution from agriculture and the food-processing industry is an additional pressure factor.

Municipal wastewater treatment plants (MWWTP) in the sub-basin of the Bug River and treatment technology used

Item	**Ukraine**	**Belarus**	**Poland**
Number of MWWTP	18	42	165
Technology of treatment:			
Mechanical			29
Mechanical-biological	16	9	127
Mechanical-biological-chemical			4
With advanced biogenic removal			5
Others:			
Cesspool	1		
Filter field	1	31	
Biological ponds		1	
Oxidation ditch		1	

Transboundary impact

22. A high percentage of the population not connected to sewage system (especially in the rural areas and small towns), the dominating agricultural character of the sub-basin and the dominating food industry producing organic loads, together with the bad technical conditions of existing sewage treatment plants, are main reasons of organic pollution.

23. The consequences of high organic pollution load are reflected in low dissolved oxygen concentration, which adversely affect the river's self-purification capacity and the ecosystem of the river. In the last few years, there is a downward tendency of organic pollution in the border stretch of the Bug River. However, in the lower part of the Bug River and in its tributaries, high concentrations of BOD5 and CODCr are measured, which exceed the concentrations given in the Council Directive of 16 June 1975 concerning the quality required of surface water intended for the abstraction of drinking water in the Member States (75/440/EEC).

24. The share of diffuse sources in the total estimated load of organic pollution (BOD5) is very high (>80%). The greatest part (about 90%) originates from the Polish territory due to the size of the area, the high percentage of the population unconnected to sewerage systems, the cattle density and the greater use of fertilizers.

25. The sources of bacteriological pollution are sewage discharge from municipal treatment plants as well as rainwater from built-up areas and raw sewage discharged from households that are not connected to sewage systems. The waters of the whole border stretch of the Bug River have been highly polluted by faecal coliforms, which caused disqualification of these waters for recreation, prevented cyprinid and salmonid fish living, and in some places prevented their use for drinking water preparation. Particularly in the vicinity of L'viv (Ukraine) and Krzyczew and Popow (Poland), significant faecal contamination of water has been found. Bad sanitary conditions have also been observed in the tributaries of the Bug River, according to Ukrainian, Belarusian and Polish data.

26. Eutrophication processes are the result of the long-lasting presence of high concentrations of biogenic compounds in the waters, which mainly influence the ecological functions as well as water use for drinking purposes and recreation.

27. Existing data show that water quality in some places has deteriorated due to the presence of heavy metals (Pb, Cu, Ni, Cd, Cr) as well as phenols, detergents and oil compounds.

Trends

28. As a result of the activities to regulate sewage management in the basin and the widespread regression in agriculture, a decrease in the concentrations of nitrogen compounds is observed, especially in the lower part of the Bug. The concentrations of phosphorus have hardly decreased yet, in spite of the investments in the water sector and regression of the economy in the whole basin.

29. Without strong pollution control measures, the water quality of the Bug River will slowly but systematically decrease.

30. Fortunately, many actions are being taken to improve water management (including monitoring and assessment), and with the financial support of the EU many wastewater treatment plants are being built.

B. Dunajec and Poprad Rivers[5]

31. The sub-basins of the Dunajec and Poprad are both shared by Slovakia (upstream country) and Poland (downstream country). The Poprad is a transboundary tributary to the Dunajec, which is also transboundary, and which ends up in the Vistula River.

Sub-basin of the Dunajec River (without the Poprad sub-basin)

Area	Countries	Countries' share	
4726.7 km^2	Poland	4368.8 km^2	92.4%
	Slovakia	357.9 km^2	7.6%

Source: Institute of Meteorology and Water Management (Poland)

[5] Based on communications by the Slovak Hydrometeorological Institute as well as the National Water Management Authority and the Institute of Meteorology and Water Management (Poland).

Sub-basin of the Poprad River			
Area	Countries	Countries' share	
2,077 km^2	Poland	483 km^2	23.3%
	Slovakia	1,594 km^2	76.7%

Sources: Institute of Meteorology and Water Management (Poland) and Slovak Hydrometeorological Institute.

1. Dunajec River

32. The transboundary impact from Slovakia on Polish territory is estimated as "insignificant" as the headwaters of the Dunajec River in Slovakia (mostly small creeks) are located in a mountain region with small settlements. However, monitoring was not yet carried out on these small watercourses in Slovakia.

2. Poprad River

Hydrology

33. The Poprad River, a right-hand side tributary of the Dunajec, has its source in the Tatra Mountains in Slovakia and ends up in Poland in the Dunajec River. The river's length is 169.8 km (62.6 km in Poland and 107.2 km in Slovakia); for 38 km the river forms the border between Poland and Slovakia. The average riverbed slope is 9.6 %.

34. The sub-basin has a pronounced mountain character with an average elevation of about 826 m above sea level. It is classified as "High Mountain River", with low flow rates in winter (January, February) and high flows in summer (May, June). The average discharge of the Poprad River at the boundary section at Piwniczna is 22.3 m^3/s.

Discharge characteristics of the Poprad River at the Chmel'nica monitoring station in Slovakia		
Discharge characteristics	Discharge, m^3/s	Period of time or date
Q_{av}	14.766	1962–2000
Q_{max}	917.0	1931–2005
Q_{min}	2.240	1931–2005

Source: Slovak Hydrometeorological Institute.

35. There are only small glacier lakes in the sub-basin. The Tatras National Park is a NATURA 2000 site in Slovakia. Six NATURA 2000 sites are located in the Polish area of the Poprad sub-basin.

36. One small hydropower station is in operation on the Poprad River.

Pressure factors and transboundary impact

37. The population density is 92 persons/km^2 in Poland and 135 persons/km^2 in Slovakia.

38. In Slovakia, forests (42%), grassland (28%) and cropland (25%) are the main forms of land use. Water use by industry is around 47% and 53% is used for drinking water supply and other domestic purposes. Crop and animal production is limited to small farms with potato and cereals growing and cattle and sheep husbandry. Manufacturing is also limited to mechanical engineering (refrigerators and washing machines), small chemical and textile companies and several other small manufactures. Large settlements and towns discharge treated wastewaters. Presently, solid wastes are delivered to controlled dumpsites; however, there are several small old uncontrolled dumpsites from the past.

Water quality in the Poprad River in Slovakia in 2000–2005

Determinands	Water-quality class*
Oxygen regime	II–III
Basic physical-chemical parameters	II–III
Nutrients	III–IV
Biological parameters	II–III
Microbiological parameters	IV–V
Micro-pollutants (heavy metals)	III

* In accordance with Slovak national technical standards, the water-classification system is made up of five classes, ranging from class I (very clean water) to class V (very polluted water).

Source: Slovak Hydrometeorological Institute.

39. In Poland, the town of Muszyna causes the biggest pressure on water resources. The town is equipped with a municipal wastewater treatment plant, which discharges 2,727 m^3/d. Agriculture terrains are usually covered with grass or herbage and suitable for grazing by livestock (19% of land use) or destined for tillage (14% of land use). In general, the whole agricultural production stems from small farms.

40. Water quality is measured at two boundary profiles (Czercz and Piwniczna, Poland). The following table shows the results for the Czercz station.

Water quality of the Proprad River in 2005 at the transboundary profile Czercz (Poland)		
Determinands	**Unit**	**Value**
Temperature	°C	16.3
pH	pH	7.9–8.4
Dissolved oxygen	mg/l	8.2
Oxygen saturation	%	72
Dissolved substances	mg/l	281
Total suspended solids	mg/l	56
N-NH_4	mg/l	0.85
N-NO_2	mg/l	0.071
N-NO_3	mg/l	2.66
Total nitrogen	mg/l	3.86
Phosphates [PO_4]	mg/l	0.27
Total phosphorus	mg/l	0.23
COD_{Cr}	mgO_2/l	28.9
BOD_5	mgO_2/l	3.6
Organic nitrogen [N_{org}]	mg/l	0.73
Mercury	mg/l	< 0.00005
Cadmium	mg/l	< 0.0003
Chlorophyll a	mg/l	2.8
Fecal coliform	Most probable number (MPN)	8,084
Total coliform	Most probable number (MPN)	42,486

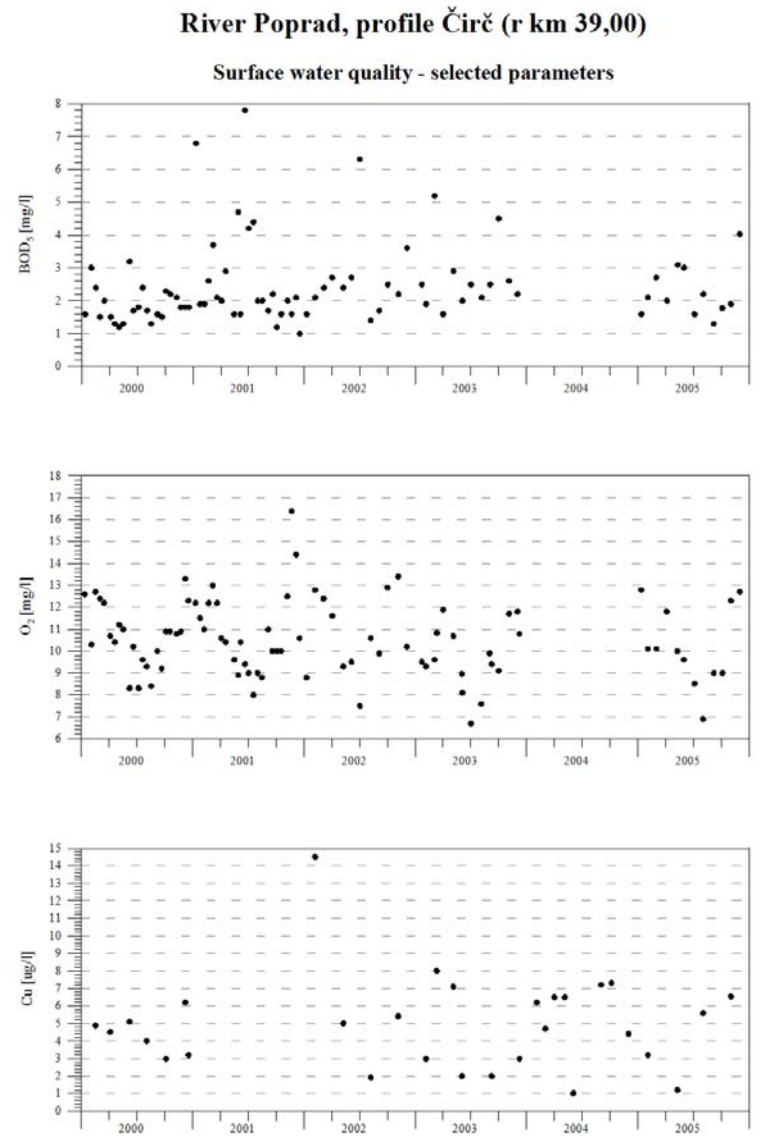
41. The waters of the Poprad River are currently not at risk of eutrophication.

Trends

42. In the 1980s and the beginning of the 1990s, the Poprad River was among the most polluted small watercourses.

43. Achieving the current level of water quality in the Poprad River, which mostly ranks between classes II and III, was possible as a result of investments made in the basin. In the period 1990–2001, the most important measures included:

- Building mechanical-biological wastewater treatment plants in Muszyna and three other tows in Poland;
- Building mechanical-biological wastewater treatment plants in 17 towns and major settlements Slovakia;
- Building wastewater pipelines from not canalized settlements to wastewater treatment plants; and
- Closing the factories TESLA S.A. and SKRUTKAREN.



Transboundary impact

44. In Slovakia, organic matter from wastewater discharges, pathogens in wastewater discharges, nitrogen species and heavy metals are of particular concern as they cause transboundary impact

45. In 2005, an industrial accident occurred near the town of Kežmarok (Slovakia) that polluted the river with mineral oil.

Trends

46. Currently, the status of the Poprad River is assessed as "moderate".

47. The programme of measures to be developed by 2009 and implemented by 2015 is based on the requirements of the Water Framework Directive in both countries (Slovakia and Poland).

III. ASSESSMENT OF THE STATUS OF TRANSBOUNDARY RIVERS IN THE ODER BASIN[6]

48. The Czech Republic, Germany and Poland share the basin of the Oder River.

Basin of the Oder River

Area	Countries	Countries' share	
118,861 km²	Czech Republic	6,453 km²	5.4%
	Germany	5,587 km²	4.7%
	Poland	106,821 km²	89%

Source: International Commission for the Protection of the Oder River against Pollution (www.mkoo.pl).

49. The Oder River Basin District[7] differs from the hydrological basin of the Oder as follows:

Oder River Basin District*

Area	Countries	Countries' share	
122,512 km²	Czech Republic	7,246 km²	5.9%
	Germany	7.987 km²	6.5%
	Poland	107.279 km²	87.6%

* The total area of the Oder River Basin District includes the area of the Szczecinski Lagoon (3,622 km² with its tributaries, from which 2,400 km² are in Germany (Kleines Haff and the Uecker, Randow and Zarow rivers) and 1,222 km² in Poland (Zalew Wielki/Grosses Haff and the catchment areas of the Gowienica and Świna rivers and the other subordinate coastal waters).

Source: Report for International Basin District Odra on the implementation of the Article 3 (2004) and Article 15 (2005) of the Water Framework Directive (www.mkoo.pl).

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[6] Information provided by the Voivodeship Inspectorate of Environmental Protection, Szczecin, in consultation with the International Commission for the Protection of the Oder River against Pollution.

[7] Following the Water Framework Directive (Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for European Community action in the field of water policy), a "River Basin District" means the area of land and sea, made up of one or more neighbouring 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.

Hydrology

50. The Oder River with a total length of 855 km has its source at an altitude of 632 m in Góry Odrzańskie (Czech Republic), the south-eastern part of the Central Sudety mountain range. In the recorded period 1921 – 2003 (without 1945), the annual mean discharge at the Hohensaaten-Finow station (Germany, upstream basin area 109,564 km^2) has varied between 234 m^3/s and 1,395 m^3/s. The mean average discharge was 527 m^3/s with an absolute maximum of 2,580 m^3/s (in 1930) and an absolute minimum of 111 m^3/s (in 1921).

51. The Oder is navigable over a large part of its total length, as far upstream as to the town of Koźle, where the river connects to the Gliwicki Canal. The upstream part of the river is canalised and permits larger barges (up to CEMT Class IV) to navigate between the industrial sites around the Wrocław area. Further downstream, the river is free flowing, passing the German towns of Frankfurt/Oder and Eisenhüttenstadt (where a canal connects the river to the Spree River in Berlin). Downstream of Frankfurt/Oder, the Warta River forms a navigable connection with Poznań and Bydgoszcz for smaller vessels. At the German town of Hohensaaten, the Oder-Havel-Waterway connects the Oder again with the Berlin's watercourses. The river finally reaches the Baltic Sea through the Szczecinski Lagoon and the river mouth at Świnoujście.

52. Transboundary tributaries to the Oder are the Olse River (right tributary, sub-basin shared by the Czech Republic and Poland) and the Neisse River (left tributary, sub-basin shared by the Czech Republic, Germany and Poland). The biggest tributary, entirely located in Poland, is the Warta River that occupies almost half of the entire Oder basin area. With a mean annual discharge of 224 m^3/s, the Warta provides for some 40% of the mean annual discharge of the Oder River.

53. In the entire basin, there are 462 lakes, each with an area over 50 hectares. There are 48 dams and reservoirs, mostly in Poland, used for water supply and flood protection (useable volume: 1 million m^3). The inventory of significant ecological barriers shows that in the Czech part of the basin 1,254 such barriers exist (Czech criterion > 30 cm drop), in the Polish part 705 barriers (Polish criterion >100 cm drop), and in the German part 307 barriers (German criterion >70 cm drop).

54. Different types of floods occur: Floods caused by precipitation and ice melting are characteristic for the Upper and Middle Oder; winter floods are characteristic for the Lower Oder; and floods caused by storms, for the Oder delta.

55. The biggest flood caused by ice melting was recorded in 1946; the biggest flood event caused by heavy rainfall was recorded in summer 1997. A characteristic feature of big floods in the Upper and Middle Oder is a long-lasting state of alert. During the summer flood in 1997, it took 19 days for the peak flood wave to proceed from the Czech border to Slubice (upstream of Szczecin). In the Lower Oder region, the basic flood threat is caused by ice and ice-jams.

Pressure factors

56. The Oder River basin belongs to the most densely populated and industrialized areas (85 million people) in the Baltic Sea basin.

57. The basin area is characterised by diverse level of land development and urbanization; thus a diversity of human impact occurs along the river.

58. In its upper course, the Oder flows through the most industrialized and urbanized areas of Poland. This area is rich in mineral resources, such as coal and metal ores. Accordingly, heavy industry like steelworks, mining and energy production dominate.

59. The area of the Middle Oder basin is, on the one hand a strongly urbanized and industrialized (copper industry) region, and on the other, a typical agricultural and forest area. The Polish side of the border region with the German Federal State of Brandenburg is covered by forest, and weakly industrialized and urbanized. The German side, however, is an industrial region, with the cities of Frankfurt/Oder and Eisenhüttenstadt.

60. The lower part of the Oder basin includes the agglomeration of Szczecin (Poland) with harbours and shipyards industry, chemical and paper industry and energy production. Fishery and tourism also represents an important part of the economy in this part of the basin, especially in the Szczecinski Lagoon and the Pomeranian Bay.

Water-quality determinands for the period 1992–2005 at the Krajnik station (Poland, river kilometre 690)

Determinands	Unit	n	Minimum	Maximum	Average
Total suspension	mg/l	26	6.9	9.5	8.6
pH	pH	26	3.0	84.0	35.2
Oxygen	mgO_2/l	26	3.3	18.4	12.2
BOD_5	mgO_2/l	26	1.0	17.2	7.2
COD_{Mn}	mgO_2/l	26	4.6	16.0	10.5
COD_{Cr}	mgO_2/l	26	7.8	93.0	45.3
Total nitrogen	mgN/l	26	1.1	9.0	4.8
Total phosphorus	mgP/l	26	0.0	1.0	0.4
Number of faecal coli bacteria	ml/bact.	26	0.0	4.0	0.9

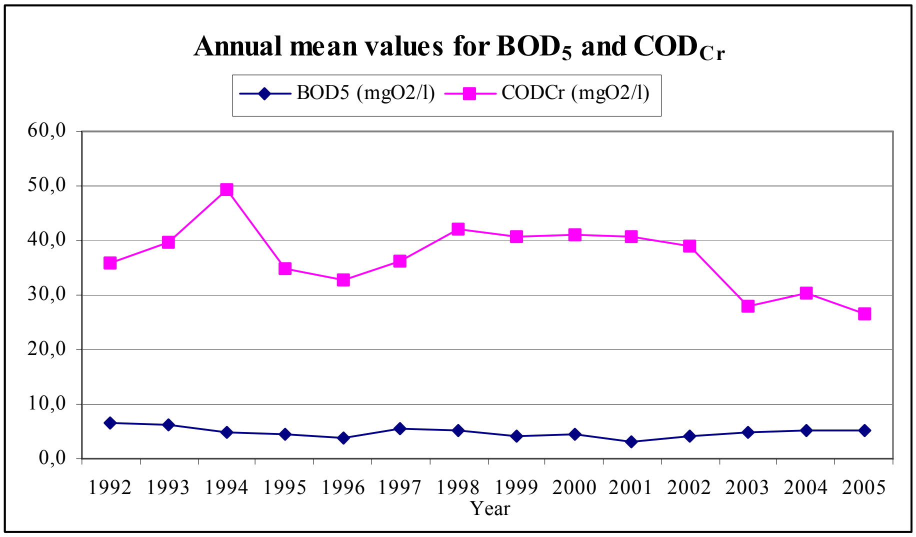
61. In the Oder River Basin District, 741 significant municipal point sources of pollution (over 2,000 p.e.[8]) have been identified, among them 56 in the Czech Republic, 635 in Poland, and 50 in Germany. In 2002, the pollution load was as follows: BOD_5 = 11.2 tO_2/year, COD_{Cr} = 37.9 tO_2/year, nitrogen 12.1 t/year and phosphorus 1.3 t/year. The total amount of wastewater was 606,739,000 m^3/year.

62. Diffuse pollution sources in the German and Polish part of the basin release 78,520 t/year (Polish share 74,482 t/year) nitrogen and 5,229 t/year (Polish share 4,912 t/year) phosphorus. It

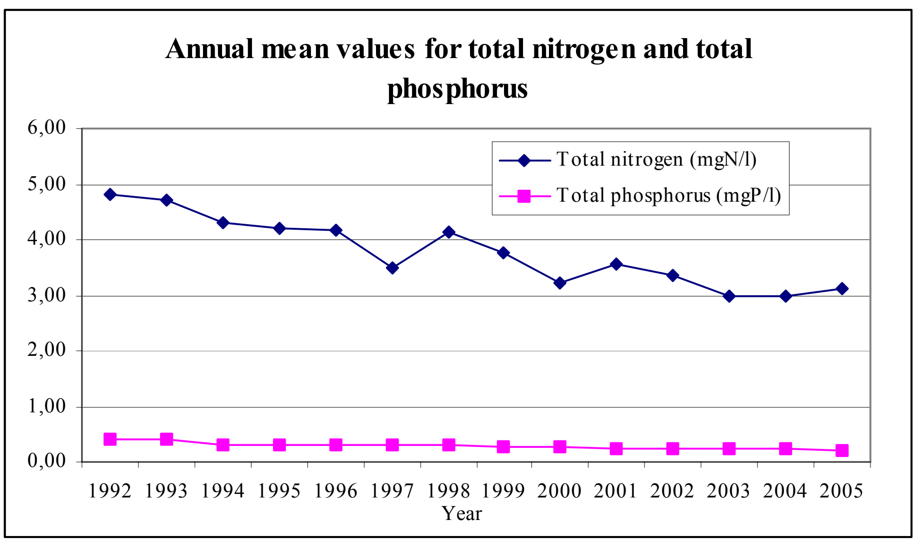
[8] Population equivalent.

is estimated that 3,213 tons nitrogen and 45 tons phosphorus are discharges every year from Czech sources.

63. Due to a lack of Polish data, the total discharge of toxic substances into the Oder River Basin District is unknown.



Annual mean values for BOD_5 and COD_{Cr} at the Krajnik station (Poland)



Annual mean values for total nitrogen and total phosphorus at the Krajnik station (Poland)

Transboundary impact by heavy metals and other hazardous substances

64. Given the location of the metal-processing industry, the metal concentrations in water and sediment samples vary along the river. In water, they usually do not exceed the values of Polish and German standards for drinking water. In sediments, however, high and relatively high concentration of heavy metals occur in the upper and middle part of the basin as a consequence of the wastewater discharges from mines and steelworks (also from metal industry, engineering industry, electronic and chemical industry). An important share of the heavy metal load stems from the Oder tributaries, which carry polluted sediments. Untreated wastewater from the Szczecin agglomeration is another source of heavy metal loads.

65. Polycyclic aromatic hydrocarbons (PAHs), Polychlorinated biphenyls (PCBs) and chlorinated pesticides are present in the sediments in the upper and middle part of the basin. Pollution by PAH occurs in discharges from the large industries, which process rocks, rich in organic substances, at high temperature. Chlorinated pesticides are also present in the sediments of the Warta River, resulting from intensive agriculture as an important economic sector in the Warta River's sub-basin. High concentrations of PCBs in sediments were also discovered in this sub-basin. Investigations of pesticides in the water phase showed concentrations below 50 ng/l; concentrations exceeding this value were found in the lower Oder River at Mescherin and in the Szczecin region.

66. Additionally, the harbour and shipbuilding industries located in the Oder mouth have contributed to the accumulation of pollutants in the sediments, not only of heavy metals, but also PAH and PCB compounds. Maintaining the traffic of ships from the Swinoujscie harbour to the Szczecin harbour requires continuous dredging of the fairway, which results in a release and transport of these pollutants.

67. The results of examinations indicated the presence of tin compounds in the sediments of the Szczecinski Lagoon is a concern.

Impact on the marine environment

68. The marine ecosystem of the Baltic Sea is very sensitive, partly due to the natural conditions and partly due to pressure from human activities in the basin.

69. The Oder River releases significant pollution loads through the Szczecinski Lagoon into the Baltic Sea. Eutrophication is recognized as the most alarming issue. The nutrient pollution stimulates excessive algae growth and threatens to deplete the bottom waters of oxygen. Unfavourable changes in the species composition of game fish are a result of the progressive eutrophication in the Szczecinski Lagoon and the Pomeranian Bay waters. The long periods of algae blooming discourage tourists from recreation.

70. Chemical pollution and spills have moderate impact on the Baltic Sea environment.

Trends

71. Under the *Short Term Programme for the Protection of the Oder River against Pollution* (1997–2002), prepared under the auspices of the International Commission for the Protection of

the Oder River against Pollution, 41 municipal and 20 industrial wastewater treatment plants were constructed in 1997–1999. Thanks to these investments, the targets for pollution reduction were already partly achieved as follows: 17% for BOD_5, 50% for nitrogen, 20% for phosphorus and 44% for COD. Structural changes in industry and agriculture, although gradual and slow, will contribute to improving water quality.

72. Although sanitary conditions have improved over the last decade in the whole river basin, the excessive concentration of faecal bacteria remains a major problem.

73. Regarding eutrophication, the concentration of nutrients is decreasing. This decrease is especially noticeable for phosphorous compounds. The concentration of nitrogen compounds is also decreasing, but more slowly.
