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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

Twelfth meeting
Geneva, 2–4 May 2011
Item 5 (b) of the provisional agenda
Assessment of the status of transboundary waters in the UNECE[1] region: assessment of transboundary rivers, lakes and groundwaters in sub regions of Eastern and Northern Europe and Central Asia.

Assessment of transboundary waters discharging into the White Sea, Barents Sea and Kara Sea[2]

Note prepared by the secretariat*

Summary

This document was prepared pursuant to decisions taken by the Meeting of the Parties to the Convention on the Protection and Use of Transboundary Watercourses and International Lakes at its fifth session (Geneva, 10–12 November 2009) (ECE/MP.WAT/29, para. 81 (e)), and by the Working Group on Monitoring and Assessment at its eleventh meeting (Geneva, 6–7 July 2010), requesting the secretariat to finalize the sub regional assessment of Eastern and Northern Europe and Central Asia for the second Assessment of Transboundary Rivers, Lakes and Groundwaters in time for its submission to the Seventh "Environment for Europe" Ministerial Conference (Astana, 21–23 September 2011).

This document contains the draft assessments of the different transboundary rivers, lakes

[1] United Nations Economic Commission for Europe.
[2] This document was submitted for publication without formal editing.
* The present document has been submitted on the present date due to late receipt of inputs by concerned countries and resource constraints in the secretariat.

and groundwaters which discharge into the White Sea, Barents Sea and Kara Sea.

For background information and for the decisions that the Working Group on Monitoring and Assessment may wish to take, please refer to documents ECE/MP.WAT/WG.2/2011/4−ECE/MP.WAT/WG1/2011/4 and ECE/MP.WAT/WG.2/2011/6–ECE/MP.WAT/WG1/2011/6.

Contents

I. Introduction

1. The present document contains the assessments of the different transboundary rivers, lakes and groundwaters which are located in the Basins of the White Sea, the Barents Sea and the Kara Sea. The document has been prepared by the secretariat with the assistance of the International Water Assessment Centre (IWAC) on the basis of information provided by the countries in the Eastern and Northern Europe and the Central Asia sub-regions.

2. For descriptions of the transboundary aquifer types and related illustrations, Annex V of document ECE/MP.WAT/2009/8 should be referred to.

3. For background information and for the decisions that the Working Group on Monitoring and Assessment may wish to take, please refer to documents ECE/MP.WAT/WG.2/2011/4−ECE/MP.WAT/WG1/2011/4 and ECE/MP.WAT/WG.2/2011/6–ECE/MP.WAT/WG1/2011/6.

II. Oulanka River Basin[3]

4. The basin of the 135-km long river Oulanka (67 km is in the Russian Federation) is shared by Finland and the Russian Federation. The assessment covers the Oulanka River upstream of Lake Paanajärvi.

5. The Oulanka River originates in the municipality of Salla in Finland. Just across the border on the Russian side, in the Louhi region of Karelia, the Kuusinki River which is a transboundary tributary originating in Finland, joins it not far from Lake Paanajärvi.

Table 1
Area and population in the Oulanka basin

Country	*Area in the country (km^2)*	*Country's share %*	*Population*	*Population density (persons/km^2)*
Finland	4 915	88	5 800	1
Russian Federation	651	12		
Total[a]	**5 566**			

Sources: Finnish Environment Institute, Finnish Building and Dwelling Register
[a] The basin area is 5,566 km^2 to Lake Paanajärvi. The Oulanka is part of the Koutajoki water system with a total basin area of 18,800 km^2 draining to the White Sea.

Hydrology and hydrogeology

6. In the Finnish part of the basin, surface water resources are estimated at 744×10^6 m^3/year (average for the years 1991 to 2005) and groundwater resources at 20.3×10^6 m^3/year, adding up to a total of 764×10^6 m^3/year (or 132,000 m^3/capita/year).

7. The flow of the Oulanka is not regulated. Spring flooding is common.

[3] Based on information provided by Finland and the Russian Federation and the first Assessment of Transboundary Rivers, Lakes and Groundwaters.

Table 2
Land use/land cover in the Oulanka Basin (to Lake Paanajärvi)

Country	*Water bodies (%)*	*Forest (%)*	*Cropland (%)*	*Grassland (%)*	*Urban/industrial areas (%)*	*Surfaces with little or no vegetation (%)*	*Wetlands/ Peatlands (%)*	*Other forms of land use (%)*
Finland	11.9	73.0	1.6	0.4	1.3	0.2	11.7	-
Russian Federation	13	64	-	-	-	-	23	-

Note: Oulanka Natura 2000 site is located in the Finnish part of the basin

Pressures, status and response

8. The only pressure from human activities in the Finnish part is sewage discharges from the Oulanka Research Station, which has a rotating biological contactor process for wastewater treatment (population equivalent 66 in 2007, 5 in 2008 and 11 in 2009).

9. According to data from 2000 to 2007, the ecological state of Oulankajoki was evaluated high (fish, benthic fauna and diatoms represent high state). Also water quality factors (total nutrient content and pH) and hydromorphological factors were considered high. Chemical state (concentrations of harmful and hazardous substances) was classified as good. Water quantity and quality in the Oulanka are not monitored in the Russian Federation.

Trends

10. The status of the river at the border section is expected to remain high and good.

11. According to Finnish Meteorological Institute's report for climate strategy for Oulu Region the average annual temperature increase 2.1-2.4 ^{0}C and average precipitation increases 7% from 1971-2000 to 2020-2049. Number of snow covered days decrease 30% from 1961-1990 to 2071-2100. Possibility of heavy rain floods even in summer time increases, especially in small river systems. Groundwater level may increase on winter time and decline on summer time.

III. Tuloma River Basin[4]

12. The basin of the river Tuloma is shared by Finland and the Russian Federation. The Tuloma has two transboundary tributaries, the Lutto[5] and Notta/Girvas, which flow to Lake Notozero (or Upper Tuloma Reservoir) in the Russian Federation. The sub-basins of the Petcha and of Lower Tuloma are entirely in Russian territory. The Tuloma flows from Lake Notozero to the Barents Sea through the Kola Fjord.

[4] Based on information provided by Finland and the Russian Federation, and the first Assessment of Transboundary Rivers, Lakes and Groundwaters.

[5] The river is also referred to as Lotta. The Tuloma belongs to the Teno-Naatamo-Paatsjoki River Basin District.

Table 3
Area and population in the Tuloma Basin

Country	*Area in the country (km²)*	*Country's share %*	*Population*	*Population density (persons/km²)*
Finland	3 285	16	250	0.08
Russian Federation	17 855	84	19,500	1
Total	**21 140**			

Source: area — Finnish Environment Institute (SYKE), population — Finnish Building and Dwelling Register; Scheme of complex use and protection of water resources, river basin Tuloma; OAO Scientific Research Institute of Hydraulics B.E.Vedeneeva, 2001.

Hydrology and hydrogeology

13. In the Finnish part of the Tuloma basin, surface water resources are estimated to amount to 668.6 × 10^6 m^3/year and groundwater resources to 5.99 × 10^6 m^3/year, adding up to a total of 674.6 × 10^6 m^3/year (2.698 × 10^6 m^3/capita/year).

14. The Upper and Lower Tuloma reservoirs[6] are used for hydropower generation on the Russian part of the Tuloma basin, and reduce also impact from severe floods that occur frequently.

15. There are only small, insignificant aquifers (of type 3) in uninhabited wilderness areas in Finland's eastern and northwest border areas shared with the Russian Federation. Links to surface waters are weak in general.

Pressures, status and response

Table 4
Land use/land cover in the Tuloma Basin

Country	*Water bodies (%)*	*Forest (%)*	*Cropland (%)*	*Grassland (%)*	*Urban/industrial areas (%)*	*Surfaces with little or no vegetation (%)*	*Wetlands/ Peatlands (%)*	*Other forms of land use (%)*
Finland	1.2	90.2	0	0	0.1	2.8	5.7	-
Russian Federation	5	63.8	0.2[a]	N/A	0.2	N/A	18	N/A

Note: Protected areas make up 8.2 % of the surface area of the Finnish part of the basin. In the territory of the Russian Federation, the protected areas include Lapland State Biosphere Reserve (278 ha) and four natural reserves of the federal and regional importance (total area 195 ha). The forest cover in the basin ranges from mixed forest to tundra vegetation in the north. The area hosts many rare plant species.

[a] Only a half of the agricultural land is in use.

[6] The Upper Tuloma Reservoir was built 1963–1965, with an installed capacity of 50 MW and a total volume of 11.52 × 10^9 m^3 (effective volume 3.86 × 10^9 m^3). The Lower Tuloma Reservoir was built in 1936 with an installed capacity of 228 MW and a total volume of 390 × 10^6 m^3 (effective volume 37.2 × 10^6 m^3)

Table 5
Total withdrawal and withdrawals by sectors

Country	*Total withdrawal ×10^6 m^3/year*	*Agricultural %*	*Domestic %*	*Industry %*	*Energy %*	*Other %*
Finland	N/A	N/A	N/A	N/A	N/A	N/A
Russian Federation	21.7[a]	0.4	79.5	20.1	[b]	-

[a] Withdrawal for consumptive uses only (2009). The biggest water user is water supply company Murmanskvodokanal, which wakes up 78.4% of the withdrawal.

[b] Water withdrawal/diversion for electricity generation (non-comsumptive) is 15,137 × 10^6 m^3/year at Upper Tuloma hydropower station and 11,668 ×10^6 m^3/ year at Lower Tuloma hydropower station.

16. In the Finnish part of the Lutto and Notta/Girvas catchment areas, there are only some remote settlements and very little agricultural activity, making the human influence and transboundary impact negligible. Impact from the reservoirs as well as from flooding and erosion/sedimentation is assessed as local in Finland. In the Russian part, flooding affects road traffic between the border and the Kola Peninsula almost every year. In the Russian Federation, energy generation as pressure factor is assessed as widespread but moderate.

17. Five forestry districts, three agricultural enterprises and Nerpa shipyard operate in the Russian part of the basin. Animal husbandry, fur farms and greenhouses in the Tuloma village as well as reindeer herding are activities with only local impact. Industrial logging, which was primarily carried out in the sub-basins Vuva and Notta/Girvas, ceased in 1998. Extent of tourism is small but the area has high recreational use potential.

18. A copper-nickel ore deposit was exploited in Priretshnyi until recently, but currently the mine is closed. Pressure from industrial wastewater discharges is ranked as local but severe; permits were issued for discharges amounting to 7.32 × 10^6 m^3 for 2010 and discharges without permits are estimated to amount to 645,000 m^3.

19. Solid waste disposal in the Russian part of the basin is local, but severe pressure, posing a risk of surface and groundwater pollution. There is hardly any waste processing in the Murmansk region and waste is burned in an incinerator plant without pre-sorting. Village of Drovjanoe has a municipal landfill, but in other settlements both authorized and unauthorized dumps — commonly not meeting sanitary requirements — are used for disposal.

20. Even though there is some pressure on water resources from urban wastewater discharges, the degree of connectedness to water supply and sewerage collection in many settlements in the Russian part is reported to be high: 95% in Murmashi, 87 in Upper Tuloma, 96 in Priretshnyi and 87 in Tuloma. The greatest amount of wastewater and pollutants (share of the total load in parenthesis) are discharged through Murmanskvodokanal: 59.2 tons of organic matter measured as BOD (66%), 5.19 tons of phosphorus (77%), and 47.9 tons of suspended solids (74%), among others. This also reported to be the source of all the synthetic surfactants and ammonium.

Status and response

21. The Russian Federation reports the main pollutants to be metals (iron and copper) and organic matter. Average concentrations of phenols are typical of the Tuloma Basin, ranging from 0.003 to 0.006 mg/l in “clean” rivers up to 0.011 mg/liter in “polluted”.

Table 6
Concentrations of specific pollutants/elements in the Upper Tuloma Reservoir at the boundary of Upper Tuloma village, measured during the period from 1986 to 2009.

Determinand (unit)	*Number of measurements*	*Average concentration*	*Lowest concentration measures*	*Highest concentration measured*
COD (mg/l)	750	14.0	1.7	27.5
BOD_5 (mg/l)	753	0.54	0.03	2.15
Suspended solids (mg/l)	751	1.976	0	21
Ammonium-nitrogen (mg/l)	750	0.01	0	0.3
Nitrite-nitrogen (mg/l)	750	0	0	0.041
Phosphate (mg/l)	751	0.002	0	0.065
Total iron (mg/l)	751	0.15	0	1.67
Copper (µg/l)	736	4.0	0	29
Zinc (µg/l)	331	8	0	59
Nickel (µg/l)	466	3	0	48
Lead (µg/l)	31	0.5	0	5
Mercury (µg/l)	434	0.017	0	0.7

Figure 1
Ammonium-nitrogen and phosphate concentrations in the Upper Tuloma Reservoir at the boundary of the village of Upper Tuloma measured during the period from 1986 to 2009.

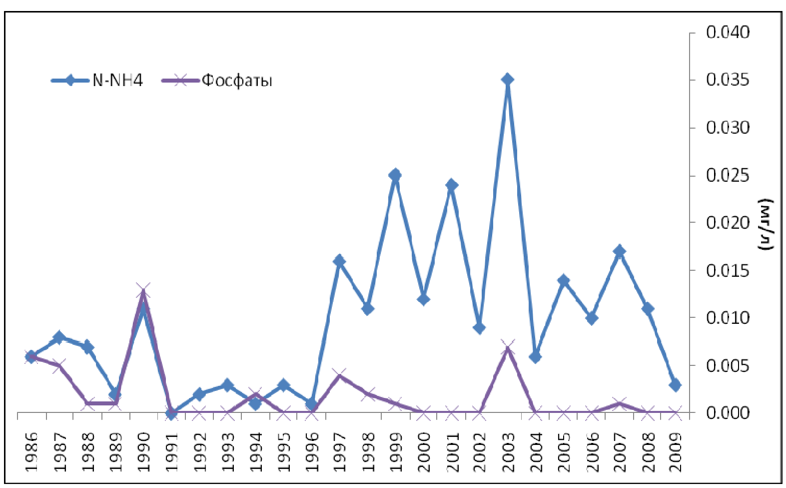
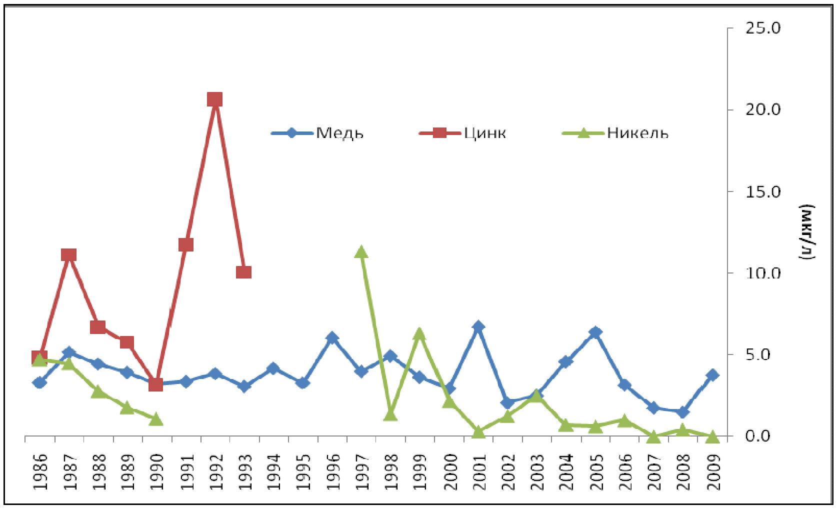


Figure 2

Copper, zinc and nickel concentrations in the Upper Tuloma Reservoir at the boundary of the village of Upper Tuloma measured during the period from 1986 to 2009.



22. In terms of the environment, the Tuloma is one of the cleanest rivers in north-western Russia. According to long-term monitoring and the Russian water quality classification, the Upper Tuloma Reservoir and the rivers Notta and Lutto can be described as slightly polluted.

23. The main shortcomings in monitoring transboundary water resources are reported to be the low frequency observations (in the Russian Federation currently made during main hydrological phases — 4 to 6 times a year for physical and chemical parameters), a lack of biological (hydrobiological, toxicology) observations and a lack of observations of pollutant concentrations in bottom sediments.

24. The present fish fauna has been monitored in a project exploring the possibility of restoring the salmon stocks which were historically excellent in the Tuloma river system but the construction of the two power stations stopped the migration.

25. The river is covered by the agreement of 1964 between the riparian countries concerning “frontier watercourses” and by the Joint Commission operating on that basis (see Annex II of document ECE/MP.WAT/WG.2/2011/6–ECE/MP.WAT/WG1/2011/6).

Trends

26. The rivers at the border section are expected to remain in high and good status.

27. Predicted climate change impacts on the hydrology are described in the assessment of the Teno.

IV. Jakobselv River Basin[7]

28. The basin of the 45-km long river Jakobselv[8] is shared by Norway and the Russian Federation. The river flows between steep hills and has many rapids. It discharges into the Varanger flord in the Barents Sea The river is known to be good for recreational fishing, of salmon in particular.

Table 7
Area and population in the Jakobselv Basin

Country	*Area in the country (km^2)*	*Country's share %*	*Population*	*Population density (persons/km^2)*
Norway	174	67	0	2.8[a]
Russian Federation	86	23		
Total	**237**			

Source: Norwegian Water Resources and Energy Directorate, Ministry of Agriculture of the Russian Federation
[a] In the municipality of Sør-Varanger (Norway), according to the Statistics Norway

Hydrology and hydrogeology

29. Surface water resources generated in Norwegian part of the Jakobselv Basin are estimated at 130.73 m^3/year .

30. The maximum discharge with three% exceedence probability is 140 m^3/s, determined in the Russian Federation

31. Most of the time, groundwater feeds the river, but during spring flooding the river feeds the adjacent aquifers.

[7] Based on information provided by Norway and the Russian Federation, and the first Assessment of Transboundary Rivers, Lakes and Groundwaters.
[8] The river is also known as the Grense Jakob River and Vorema River.

Table 8
Grense Jakobselv aquifer: Type 3. Late Quaternary sand and gravel aquifer. Links with surface water are reported to be strong.

	Norway	*Russian Federation*
Border length (km)		
Area (km^2)	5	
Thickness in m (mean, max)	N/A	
Groundwater uses and functions	Groundwater maintains baseflow and springs, and supports ecosystems during frost season	
Other information	National groundwater body code is NO324700428	

Sources: Norwegian Water Resources and Energy Directorate; The Geological Survey of Norway

Pressures, status and transboundary impact

32. There is very high sulphur deposition in the basin due to the smelters in Nikel, Russian Federation. The trend has been decreasing, though: The SO2-emissions have been reduced by 75 percent between 1979 and 2006, and the sulphate concentrations have been reduced by 37 percent between 1986 and 2008. Alkalinity and acid neutralizing capacity (ANC) have increased.[9] A national lake survey in 2004-2006 in Norway showed the highest concentrations of nickel (Ni) in surface sediments in the lakes in eastern Finnmark on the Sør-Varanger Peninsula. Changes in concentrations revealed a severe increase in the concentrations of nickel in surface sediments compared with subsurface sediment, indicating influence of the smelters. The same pattern of increasing nickel was observed in water chemistry and in air pollutants.[10]

33. In the Russian part of the basin, the only reported concern — albeit moderate and local in extent — is breaking and hydromorphological change of the right bank of the river. This is addressed by reinforcing the bank: in 2007 some 5 km of bank was strengthened by rock rubble.

V. Paatsjoki River Basin[11]

34. Finland, Norway and the Russian Federation share the basin of the Paatsjoki River[12]. The 143-km long Paatsjoki River is the outlet from Lake Inari in Finland (see assessment below) to the Barents Sea. The river empties into the Varangerfjord, not far from Kirkenes.

[9] *Source*: Overvåking av langtransportert forurenset luft og nedbør. Årsrapport - Effekter 2008 (TA-2546/2009). Norwegian Institute for Air Research.
[10] Source: National lae survey 2004 – 2006. Part III: AMAP. (TA-2363/2008). Norwegian Institute for Water Research
[11] Based on information provides by Finland, Norway and the Russian Federation, as well as the first Assessment. The Paatsjoki is a part of the Teno-Naatamo-Paatsjoki River Basin District.
[12] The River is known as the Pasvikelva in Norway.

Vaggatem, Fjørvatnet and Hestefossdammen are transboundary lakes within the basin. Fossevatn, Klistervatnet, Bjørnevatnet, Svanevatn, Langvatnet and Hasetjørna are other lakes in the basin Lake Inari is a large (1,084 km^2) subarctic, oligotrophic lake with clear water. The catchment area of Lake Inari forms the Finnish part of the Paatsjoki water system. Lake Inari has been regulated since 1942 by power plants situated in Russia and Norway.

Table 9
Area and population in the Paatsjoki Basin

Country	*Area in the country (km^2)*	*Country's share %*	*Population*	*Population density (persons/km^2)*
Norway	1 109	6	3 100	2.8
Finland	14 512	79	6 100	0.42
Russian Federation	2 7 82	15	17 200	6,2
Total	**18 403**			

Source: Lapland regional environment centre, Finland; Finnish Building and Dwelling Register, Statistics Norway, 2008

35. The basin is in taiga and tundra zones. Bogs of various types are common. Arable land in the Russian part of the basin is insignificant, limited to garden plots. Pasture area has decreased in the Russian part due to increased groundwater levels. The Pasvik National Park is transboundary, with 14,700 ha of its total surface area of 16,610 ha in the Russian Federation (Pechenga district) and the rest in Norway (Øvre Pasvik, also a Ramsar site).

Table 10
Land use/land cover in the Paatsjoki sub basin

Country	*Water bodies (%)*	*Forest (%)*	*Cropland (%)*	*Grassland (%)*	*Urban/industrial areas (%)*	*Surfaces with little or no vegetation (%)*	*Wetlands/ Peatlands (%)*	*Other forms of land use (%)*
Norway								
Finland[a]	13.0	74.1	0.04	0	0.33	0.88	11.7	-
Russian Federation								

[a] Some 43.2% of the basin area in Finland is protected.

Hydrology and hydrogeology

36. High flows result from substantial amounts of water retained in snow cover over long winters released upon melting. The river flow is regulated and there are seven hydroelectric power plants, five of which are Russian. The related reservoirs are Kaitakoski , Jäniskoski, Rajakoski, Hevoskoski and Borisoglebsk . Skogfoss (maximum capacity 46,5 MW) and Melkefoss (22 MW) hydropower stations are located in the Norwegian part.

37. Surface water resources generated in Norway's part of Paatsjoki Basin are estimated at 5,344 m^3/year (1961 to 1990)[13]. Surface water resources generated in

[13] *Source*: Norwegian Water Resources and Energy Directorate

Finland's part of Paatsjoki Basin are estimated at 5,140 $\times 10^6$ m^3/year, ground water resources are 36.8 $\times 10^6$ m^3/year, in total 5,177 $\times 10^6$ m^3/year .

38. Based on measurements made at gauging station Paatsjoki at the Kaitakoski hydropower station in the Russian Federation from 2005 to 2009, the average discharge is 167.2 m^3/s.

Table 11
Total withdrawal and withdrawals by sectors (per cent)

Country	*Total withdrawal* $\times 10^6$ m^3*/year*	*Agricultural %*	*Domestic %*	*Industry %*	*Energy %*	*Other %*
Norway			[b]			
Finland	0.55[14]					
Russian Federation	11.90[a]	0	*32*	*48*		0

[a] Of the total amount withdrawn, 78.3% was surface water and 21.7% groundwater according to the state statistic reports on water use. The total water use (including non-consumptive) for hydropower generation is some 37 $\times 10^9$ m^3/year.

[b] Skogfoss Waterworks abstracts some 19,000 m^3/year destined to domestic use.

Table 12
Aquifer Pasvikeskeren: Type 3, Late Quaternary, sand and gravel, strong link with surface water

	Norway	*Russian Federation*
Area (km^2)	53.7	
Renewable groundwater resource (m^3/d)		
Thickness in m (mean, max)	12,,12	
Number of inhabitants		
Population density		
Groundwater uses and functions	Supports ecosystems as well as maintains baseflow and springs	
Other information	Groundwater body code: NO324600775	

39. In the Finnish part aquifers that continue to the neighbouring countries' territory are small, insignificant for water use and consist of sands and gravels with a mean thickness of some 15 m and maximum thickness of 100 m.

Pressures

40. On Russian territory, the Pechenganickel industrial complex smelters emit dust which results in deposition of metals the Paatsjoki watercourse, exerting severe pressure on the downstream river system. Copper, nickel and mercury concentrations in water are

[14] Withdrawal from the rivers Teno, Näätämö and Paatsjoki in total in 2007.

elevated. The level of sulphate deposition is high, but alkalinity of water buffers its effect to a degree. The river basin lies in an area of very high sulphate deposition and also there is a marked decrease of alkalinity in the spring. The remaining alkalinity is still sufficient to avoid acid water.

41. Water quality at the confluence of Kolosjoki (Borysoglibs'ka hydropower station) is affected negatively by inadequately treated discharges of waters from mines and slag dumps of smelters to the tributary. The illegal discharges of domestic wastewaters in the villages of Borisoglebskiy and Rajakoski in the Russian Federation have a negative impact on river water quality.

42. The impact of water regulations by the power plants in Norway and the Russian Federation is ranked as widespread but moderate. The impact of industrial activities is assessed to be local but severe.

43. Agriculture and forestry has some impact on water quality and fauna, but in the Russian part, these factors are considered insignificant and Finland also ranks their influence as minor. Groundwater level increase and weeds affect forestry negatively in the Russian part. Only Hevoskoski Reservoir is used for recreation purposes.

Table 13
Estimated loads of nutrients from different sources in the Finnish part of the Paatsjoki Basin (based on VEPS model, Hertta database of the Finnish Environment Administration)

Activity	*Nitrogen load (tons/a)*	*Phosphorus load (tons/a)*
Natural/ background	2 093	73
Wastewater, municipalities	21.9	0.1
Wastewater, scattered settlements	6.6	1.2
Agriculture	0	0.6
Forestry	68	6
Fisheries	2.2	0.2

44. The population density in the drainage basin of Lake Inari is very low (0.5 persons/km^2), and the human impact in general low. Only purified wastewaters of Ivalo village (4,000 inhabitants) and Saariselkä tourist centre are discharged to the Ivalojoki River which flows to Lake Inari.

45. According the regulation permit of Lake Inari, the annual water-level fluctuation could be 2.36 m. However, in practice water-level fluctuation has been on average 1.47 m during the period of 1980-2008. The regulation has some undesirable effects on Lake Inari’s biota. Increased winter draw-down affects negatively on littoral species and habitats. Moreover, regulated water-levels are higher in autumn than naturally and increase bank erosion.

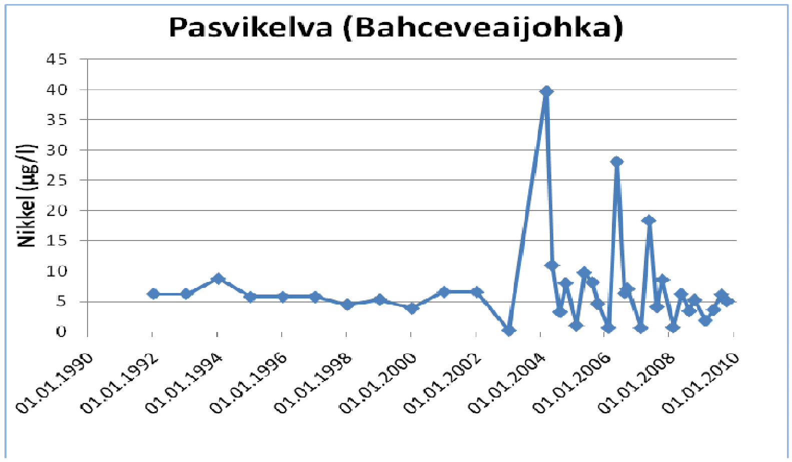
Status and transboundary impacts

46. In 2009, based on water quality monitored[15] in five locations, an increase in concentrations of sulphate and heavy metals could be observed in the Russian part of the basin. No significant changes were observed, compared with the previous year. Given the

[15] The monitoring was carried out by the Murmansk unit on Hydrometeorology and Environmental Monitoring of Roshydromet

large water volume of the Paatsjoki, the observed high metal concentrations (e.g. copper) indicate continued pollution and accumulation of these elements.

Figure 3
Measured nickel concentrations in the Pasvik River, near Svanvik, Norway.



Source: Comprehensive study on Riverine Inputs and Direct Discharges (OSPAR)

47. Above the Kaitakoski HPS, water is classified as “clean” and downstream at Borysoglibs'ka HPS as “moderately polluted”, that is, class 2 and 3 in the Russian quality classification system, respectively.

48. According to the ecological classification employed in Finland — based on EU Water Framework Directive — the ecological quality of the Paatsjoki was excellent in 2009. According to the same classification, the ecological status of Lake Inari was good in 2009. The status was revised from excellent because of the impacts of flow regulation.

49. Effects of climate change in some hydrological variables have been observed in Lake Inari. Duration of ice cover has become shorter and the ice thickness seems to have become thinner although that change is not statistically significant. Also, the heat summation of surface water during ice-free period and mean temperature of water mass during the period from May to September has increased. These changes seem to be more pronounced during the 2000s. The oxygen saturation has decreased near bottom in the deepest point of Lake Inari (maximum depth about 95 m) during spring (March-April). At the same time the water temperature has increased, having most likely decreased oxygen content (accelerated decomposition).[16]

Response measures and transboundary cooperation

50. Finnish-Russian and Finnish-Norwegian Commissions on transboundary waters operate on the basis of bilateral agreements. There is a trilateral agreement about the

[16] Puro-Tahvanainen A. & Salonen, E. 2010: Effects of climate change into hydrology, water quality and fishes in Lake Inari. In Simola, H.(ed)2010: Symposium on Large Lakes 2010 – Climate change – changing freshwater ecosystems and society. .Publications of the University of Eastern Finland, Reports and and Studies in Forestry and Natural Sciences 4.

regulation of Lake Inari. (see Annex II of document ECE/MP.WAT/WG.2/2011/6–ECE/MP.WAT/WG1/2011/6)

51. The Finnish-Norwegian Commission has prepared a multiple-use plan for the Paatsjoki River in 1997 and the Russian authorities were included in the relevant process.

52. The Norwegian water regulation adopted in December 2006 incorporates the Water Framework Directive (WFD) into Norwegian law. As part of its implementation, a River Basin Management Plan for the Finnmark District was prepared including the Tana, Neiden and Pasvik basins (adopted in 2009). In Finland, the River Basin Management Plan covers the catchment areas of the rivers Teno, Näätämö, Uutuanjoki and Paatsjoki, which form a single River Basin District.

53. To reduce emissions of pollutants with mine water discharges from Pechenganickel, recycling of water for production needs was started in the Severniy mine. Treatment facilities have been constructed for waters of the mines Severniy, Severniy-Glubokiy and Kaula-Kotselvaara in the Russian Federation. The smelter area was cleaned of heavy and non-ferrous metals, and new technology was introduced for processing copper-nickel concentrate. Several discharge points of industrial wastewaters will be eliminated as a result to closure of mining and metallurgical production and their transfer to Monchegorsk.

54. Exchange of water quality data on the Paatsjoki between Russia, Norway and Finland is not made at present time. However, project "Development of a joint environmental monitoring program in the Norwegian, Finnish and Russian border area"[17], with the objective of ensuring reliable and comparable monitoring data, was implemented from 2003 to 2006. Water quality assessment in Norway and Finland with Russia is not unambiguous. For a consistent assessment of water quality in the Paatsjoki, the Russian Federation suggests that a special monitoring program coordinated between the three countries should be devised.

55. Recommendations concerning regulation practices, management of fish stock and fishing, mitigation of erosion, monitoring of the state of Lake Inari and communication were made by the Lake Inari Monitoring Group in 2008.

Future trends

56. At the Finnish-Russian border, the river is in a good status. Improvements in water-quality in the Russian Federation require huge investments in cleaner production and clean-up of sites, but measures in that direction are being reported by the Russian Federation.

57. In the Russian part, water use for industry was expected to increase by 15 to% in 2010 and 2011, and domestic use was expected to decrease.

58. According to Finland, a set of climate change scenarios suggests an increase of 1.5–4.0 ºC in annual mean temperature and 4–12% increase in annual precipitation in forthcoming 50 years. The frequency of spring floods may increase. Groundwater level may increase on winter time and decline on summer time. Reduced groundwater recharge may cause oxygen depletion in small groundwater bodies and consequently increased metal concentrations in groundwater (e.g. iron, manganese).

[17] www.pasvikmonitoring.org

VI. Pasvik Nature Reserve (Norway, Finland, Russian Federation)[18]

General description of the wetland

59. The Ramsar site has a size of 1910 ha of which approx. 450 ha is covered by waterbodies. The reserve includes the most intact section of the Paatsjoki/Pasvik river system, characterized by many bays, islets, shallow waters and extensive mires. In the central part of Pasvik valley and in the south of the nature reserve the river still follows its original course. The river is surrounded by Scots pine forests (Pinus sylvestris) which which are characterized by few species of lichen and ericaceous species on dry ground. Typical features are the extensive tracts of mires, which are dominated by stands of sedge species (Carex spp.). Of particular interest are well developed structures of permafrost called palsa mires, i.e. permanently frozen parts of the mire. Dense thickets of willow species (Salix spp.) can be found along the river. In those sections of the river which are characterized by shallow and protected bays the aquatic flora is particularly well developed. In the river, rich stands of pondweed Potamogeton spp. dominate, while in more shallow parts species like bur-reed Sparganium spp. and Common Water-Crowfoot Ranunculus peltatus dominate.

Main wetland ecosystem services

60. As the degradation of the wetlands in the northern regions is low, there are hardly any flooding problems despite the flooding in spring. The significant transport of sediments and the continuous shifting of the estuary as a consequence of this process are important in maintaining a natural estuary ecosystem. Leisure activities within the reserve include fishing, bird watching and boating. The latter is strictly restricted due to specific border regulations. In the surrounding area of the reserve there is reindeer husbandry (on the Norwegian and Finnish sides), forestry, hunting, fishing and other leisure activities. However, the area is sparsely populated and the impact from tourism is low.

Cultural values of the wetland area

61. The site is of archaeological interest as it has been shown that the first human settlements in the area occurred over 8,000 years ago. Saami people dominated the area prior to the settlement by Norwegians. As the valley of the Pasvik River is located at the border of Russia, Finland and Norway its historical background is influenced by different cultures. Furthermore, the farm of famous Norwegian naturalist Hans Tho. L. Schaanning on Varlam Island, Russia, and at Noatun, Norway, (within the Russian-Norwegian Reserve Pasvik) is currently protected as a national historical monument.

Biodiversity values of the wetland area

62. The area is an important breeding and staging area for a large number of species, among them many redlisted species. Of the 78 redlisted bird species on the Norwegian Red List (2006) as many as 55 are found in the Paatsjoki Pasvik valley (70 %), 33 of these species are observed breeding (42 %). Eight of these species such as Garganey Anas querquedula (EN), Smew Mergellus albellus (EN), Bean goose Anser fabalis (VU), Northern Shoveler Anas clypeata (VU) and Greater Scaup Aythya marila (VU) are listed as critically endangered (CE), endangered (EN) or vulnerable (VU). The area is also important for a series of boreal species with limited distribution in Europe; for instance the Northern Hawk Owl Surnia ulula (LC) and Great Grey Owl Strix nebulosa (LC). In addition to common species typical of the climate zone, the area hosts a stable breeding population of

[18] *Sources*: Ramsar Information Sheet 2009, Norwegian-Finnish Commission on Transboundary Waters,
Website of the trilateral park Pasvik-Inari: http://www.pasvik-inari.net/neu/eng/main.html

Brown bear Ursus arctos (EN) and Eurasian Otter Lutra lutra (VU). In terms of flora, the area hosts a number of Eastern species like Arrowhead Sagittaria natans sagittifolia and Lapland sedge Carex lapponica. The rich and varied aquatic vegetation found in this river is a rare example for rivers draining into the Barents Sea.

Pressure factors and transboundary impacts

63. The regulation of Pasvik River by hydro-electric power plants which are located outside the Ramsar area has some influence on the fluctuation of the water level. While large tracts of forests have been logged in the surrounding area on both sides of the border, there are still great areas of virgin taiga remaining within and outside of the protected area and the neighbouring national park. Prospecting for minerals has been undertaken in the catchment area, while the extraction of major deposits was rejected with the establishment of the reserve. A plan for the construction of a new highway between Norway and Finland along the river still exists but is strongly opposed due to the unspoilt character of the area.

Transboundary wetland management

64. The Ramsar site was established first as a National Nature Reserve in 1993 and received the status as a Ramsar Site in 1996. All kind of human activity within the conservation area is regulated. The area is part of the Pasvik-Inari Trilateral Park which consists of five connected and cooperating protected areas in Norway, Finland and Russia (total area 188,940 ha). The Russian strict nature reserve Pasvik Zapovednik (14687 ha) is also part of this trilateral park and plans for designation of this area as a Ramsar Site currently exist. Moreover, the Ramsar Site is part of the Øvre Pasvik Important Bird Area (20,000 ha). Within the Trilateral Park the harmonization of management, research methodology as well as ecotourism across borders is one of the main objectives. With the aim to develop a long term monitoring strategy, a number of species surveys have been undertaken as part of the Pasvik programme in all three countries.. Further, a new addition to the Pasvik Programme deals with climate change and airborne pollutants as well as the mitigation of their harmful effects.

65. Since 1980 the Norwegian-Finnish Commission on Transboundary Water acts as an advisory body to the governments of both countries. Russia has been taking the role of observer and expert respectively in this process of transboundary cooperation since 1991.

VII. Näätämö River Basin[19]

66. The basin of the river Näätämö[20] is shared by Finland and the Norway. The river flows from Lake Iijärvi (Finland) to Norwegian territory and discharges into the Barents Sea. On Finnish territory, it flows about 40 km through wilderness; there are many rapids in the river. Geaågesuolojavri is a transboundary lake in the basin.

Table 14
Area and population in the Näätämö River Basin

Country	*Area in the country (km²)*	*Country's share %*	*Population*	*Population density (persons/km²)*
Finland	2 354	81	200[a]	0.09[a]
Norway	553	19	230	2.8[b]
Total	**2 907**			

Sources: Finnish Environment Institute (SYKE), River Basin Management Plan for the Finnmark Water Region, Finnish Building and Dwelling Register, Statistics Norway

67. The surface water resources in Finland are estimated at 265.2×10^6 m^3/year (average for the years 1991 to 2005) and groundwater resources at 11.9×10^6 m^3/year. Total water resources are approximately 277.2×10^6 m^3/year and total water resources per capita in the Finnish part of the basin is: 1.385×10^6 m^3/year/capita.

68. Surface water resources in the Norwegian part of the basin are estimated at 925.44 m^3/year (average for the years 1961 to 1990)[21].

Hydrology and hydrogeology

69. Most of the time, groundwater feeds the river. During spring flooding the river feeds the adjacent aquifers.

Table 15
Neiden aquifer: Type 3. Late Quaternary sand and gravel aquifer. Dominant groundwater flow is from Finland to Norway. Links with surface water are reported to be strong.[22]

	Norway	*Finland*
Border length (km)		
Area (km²)	15	5
Thickness in m (mean, max)	10, 15	9,14
Number of inhabitants		
Population density (persons/km²)		
Groundwater uses and	Groundwater maintains	Groundwater flow is

[19] Based on information provided by Finland and the first Assessment of Transboundary, Rivers, Lakes and Groundwaters

[20] The river is known as Neiden in Norway. It is part of the Teno-Näätämö-Paatsjoki River Basin District

[21] *Source*: Norwegian Water Resources and Energy Directorate

[22] *Sources*: Norwegian Water Resources and Energy Directorate; The Geological Survey of Norway

functions	baseflow and springs, and supports ecosystems during frost season	maintaining baseflow and supports ecosystems.
Other information	National groundwater body code is NO324400934	National code for groundwater area is FI12 148 196

Pressures, status and transboundary impact

70. The anthropogenic pollution in the river basin is very low, there is no significant transboundary impact on Norwegian territory. Neiden Waterworks (Norway) withdraws some 21,000 m^3/year for domestic use. In the Finnish part, the ecological status of the river is classified as excellent. The river is an important watercourse for the reproduction of Atlantic salmon, and there is long-term monitoring of salmon stocks.

71. The water quality status of the river at the border section is expected to remain good.

Response measures

72. The Norway and Finland have signed bilateral agreements on water transfer (1951) and fishing (1977) in the Näätämö River. In 1980, an agreement for signed on a Finnish-Norwegian Commission on boundary water courses (see Annex II of document ECE/MP.WAT/WG.2/2011/6–ECE/MP.WAT/WG1/2011/6).

73. As the Norwegian water regulation adopted in 2006 incorporates the Water Framework Directive (WFD), a River Basin Management Plan has been prepared accordingly for the river, which was adopted by the Finnmark County Authority in 2009, and a Programme of Measures has also been defined specifically for Näätämö as part of the Programme for the whole River Basin District. In Finland, the River Basin Management Plan has been prepared covering the catchment areas of the rivers Teno, Näätämö, Uutuanjoki and Paatsjoki which form a single River Basin District..

74. The Finnish-Norwegian Commission has prepared multiple-use plan for the River Näätämöjoki in 1987. Needs for updating the plan has been discussed in the Commission.

VIII. Teno River Basin[23]

75. Finland and Norway share the basin of the Teno River[24], which discharges into the Barents Sea and is important for salmon reproduction. With its headwaters — the Inarijoki River and Kaarasjoki which are mostly in Norway — the Teno River forms 283 km of the Finnish-Norwegian border.

[23] Based on information provided by Finland, and Norway as well as the first Assessment

[24] The river is also known as the Tana River.

Table 16
Area and population in the Teno Basin

Country	*Area in the country (km^2)*	*Country's share %*	*Population*	*Population density (persons/km^2)*
Norway	11 314	69		2.8
Finland	5 133	31	1 300	0.25
Total	**16 386**			

Sources: Lapland regional environment centre, Finland, Finnish Building and Dwelling Register, Statistics Norway, 2008

76. Surface water resources generated in Norwegian part of the Teno Basin are estimated at 6,226 $\times 10^6$ m^3/year (based on observations from 1961 to 1990)[25]. Surface water resources generated in the Finnish part are estimated at 5,645 $\times 10^6$ m^3/year and groundwater resources at 26.89 $\times 10^6$ m^3/year, making up a total of 5,672 $\times 10^6 m^3$/year (4.36 $\times 10^6$ m^3/year per capita).

Hydrology and hydrogeology

77. Most of the time in the Norwegian part, groundwater feeds the river but during spring flooding the river feeds the adjacent aquifers. Finland assesses the transboundary aquifers in the eastern and northwestern borders shared with Norway as small and insignificant, situated in uninhabited wilderness areas. Groundwaters are generally discharging to rivers, lakes and swamps in the Finnish part of the basin. Groundwater occurs in sand and gravel aquifers some 15 m thick (not exceeding 100 m).

Table 17
Aquifer Anarjokka: Type 3, Late Quaternary, sand and gravel, strong link with surface water

	Norway	*Finland*
Area (km^2)	16.2	
Renewable groundwater resource (m^3/d)		
Thickness in m (mean, max)		
Groundwater uses and functions	Groundwater supports ecosystems during the frost season and maintains baseflow and springs	
Other information	National groundwater body code: NO323400442	

[25] *Source*: Norwegian Water Resources and Energy Directorate

Table 18
Levajok-Valjok aquifer : Type 3, Late Quaternary, sand and gravel, strong links with surface water

	Norway	*Finland*
Area (km^2)	26.7	
Renewable groundwater resource (m^3/d)		
Thickness in m (mean, max)	17.1,19.5	
Groundwater uses and functions		
Other information	National groundwater body code: NO323400963	

Table 19
Karasjok aquifer: Type 3, Late Quaternary, sand and gravel, strong links with surface water

	Norway	*Finland*
Area (km^2)	91	
Renewable groundwater resource (m^3/d)		
Thickness in m (mean, max)	12.8, 50	
Groundwater uses and functions		
Other information	National groundwater body code: NO323400964	

Table 20
Tana Nord: Late Quaternary, sand and gravel, Type 3, strong link with surface water

	Norway	*Finland*
Area (km^2)	218.9	
Renewable groundwater resource (m^3/d)		
Thickness in m (mean, max)	17.4,36	
Groundwater uses and functions		
Other information	National groundwater body code: NO323400656	

Pressures

78. The anthropogenic pollution in the river is very low, there is no significant transboundary impact on Norwegian territory.

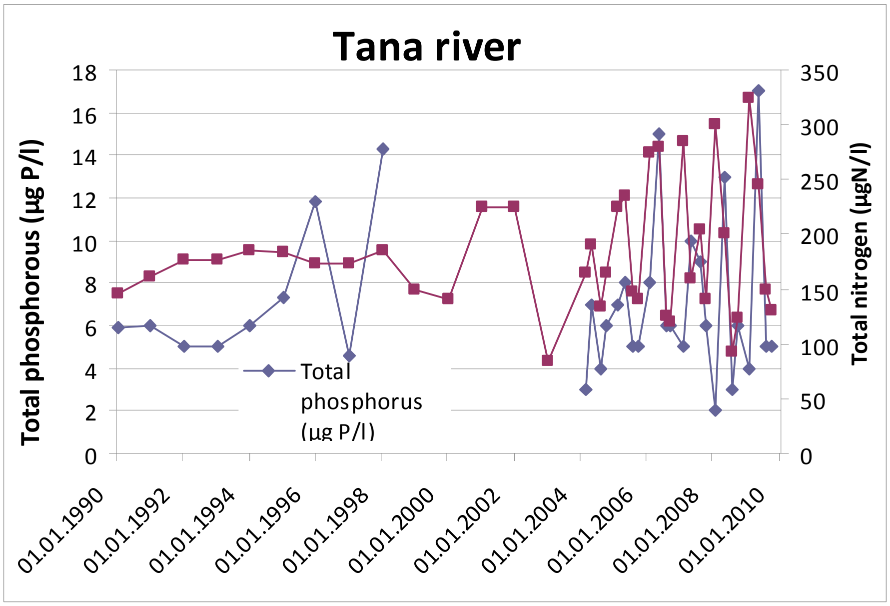
79. Surface water is withdrawn for domestic purposes in the small village of Båteng in Norway, at the border. The total withdrawal of surface water for the Teno, Näätämö and Paatsjoki was 0.55 $\times 10^6$ m^3/year in 2007.

80. Urban wastewater at Karasjok, Tana Bro and Seida in Norway and at Karigasniemi and at Nuorgam in Finland undergoes biological and chemical treatment. The urban wastewater at Utsjoki in Finland is treated chemically. The impact of wastewater discharges is assessed at local and moderate. In the Finnish part, the nutrient load from municipalities and scattered settlements is estimated at 0.9 tons-year of phosphorus and 8.1 tons/year of nitrogen. Agriculture and forestry are other relatively small sources of nutrient loading.

Status and transboundary impacts

81. The Teno has has moderate concentrations of organic matter, mainly due to leakage from soil and bogs. The load of organic matter from villages does not measurably affect water quality in the main river. The reported parameters monitored by Norway for the past 20 years — suspended solids, total organic carbon (TOC), total phosphorus and total nitrogen (see Figure 4) —do not show any particular trend. The natural fluctuations in concentrations throughout the year are pronounced which in the lower part of the river are influenced by particles from erosion during heavy rainfall and snowmelt. Generally, there are very few anthropogenic pressures on water quality in the whole river basin. The Teno is stably in a high status.

Figure 4.
Total phosphorus and total nitrogen concentrations in the Teno, measured in Seida, Norway[26] (approximately 30 km from the river's mouth; latitude 70º 14', longitude: 28º 10').



[26] *Source*: Comprehensive Study on Riverine Inputs and Direct Discharges (OSPAR), Norwegian Institute for Water Research.

Response measures

82. Agreement on a Finnish-Norwegian Commission on boundary watercourses (1980) provides the framework for transboundary cooperation on regulating, hydraulic development, water supply and protection of water resources.

83. The Finnish-Norwegian Commission has prepared multiple-use plan for the Teno which was last updated in 2006.

84. A River Basin Management Plan for the Finnmark District was prepared including the Teno, Neiden and Pasvik basins (adopted in 2009 by the Finnmark County Authority in Norway). In Finland, the respective plan covers the catchment areas of the rivers Teno, Näätämö, Uutuanjoki and Paatsjoki which form a single River Basin District.

Future trends

85. According to a set of climate change scenarios developed/worked on in Finland suggest an increase of 1.5–4.0 ºC in annual mean temperature and 4–12% increase in annual precipitation in forthcoming 50 years. The frequency of spring floods may increase.

86. Groundwater level may increase on winter time and decline in summer time, with the lowest late summer/autumn levels possibly decreasing below the current lows.

IX. Yenisey River Basin and the Selenga sub-basin[27]

87. The 3,487-km long Yenisey River flows only on Russian territory, but the upper part of the basin is transboundary, including parts of the transboundary Selenga River (total length 1,024 km; 615 km in Mongolia)[28] shared by Mongolia and the Russian Federation.

88. The recharge area of the Yenisey basin is consists — in addition to the Yenisey itself — of the Selenga River, Lake Baikal (31,500 km^2) and the Angara River. The Selenga has its source in Mongolia (Shishhid Gol River) and ends up in Lake Baikal. The Yenisey discharges to the Kara Sea.

89. The Selenga River Basin is covered mainly by forest and mountain-steppe, and has an average elevation of about 1850 m a.s.l. In the Yenisey Basin the average elevation is 247 m a.s.l.

[27] Based on information provided by Mongolia and Russian Federation and the first Assessment of Transboundary Rivers, Lakes and Groundwaters.

[28] G.Davaa," Surface water resources of Selenge aimag", Darkhan, 1990

Table 21
Area and population in the Yenisey Basin and the Selenga sub-basin

Country	*Area in the country (km²)*	*Country's share %*	*Population*	*Population density (persons/km²)*
Mongolia	282 050	63.3	1 173 657	4
Russian Federation	163 195	36.7		
Selenga sub-basin sub-total	445 245			
Mongolia	282.050	11.1	1 173 657	4[a]
Russian Federation	2 261 700	88.9		
Total	**2 543 750**			

Source: Integrated Management and Protection of Water Resources of the Yenisey and Angara rivers, Krasnojarsk Regional Branch of the International Academy of Ecology and Nature, Krasnojarsk, 2006; Surface water resources of the USSR, Gidrometizdat, Leningrad, 1973, For Selenga river basin: National Statistical Department, Yearbook, Ulaanbaatar, 2008,

[a] The calculated density. According to the National Atlas of Mongolia (Mongolian Academy of Sciences, 2007) the density ranges from 5 to 10.

Hydrology and hydrogeology

90. Surface water resources generated in Mongolian part of Selenga river basin are estimated at 18×10^9 m³/year and groundwater resources at 6.6×10^6 m³/year, adding up to a total of 24.6×10^9 m³/year[29] (26 m³/year/capita) .

91. The average discharge of the Selenga is 290 m³/s in the border section. The total discharge of the Yenisey at the mouth is 18,730 m³/s (Kara Sea).

Table 22
Aquifers: Type 2, 1) Quaternary alluvial deposits; 2) Cambrian limestones, sandstones, siltstones and conglomerates; 3) Fissure-pore water in tectonic faults in Precambrian granites; dominant groundwater flow towards the Russian Federation, Medium links with surface water (groundwater recharges from surface water)

	Mongolia	*Russian Federation*
Area (km²)		
Renewable groundwater resource (m³/d)		
Thickness in m (mean, max)	10–15 (Quaternary alluvial aquifer); 25	
Number of inhabitants		
Population density		
Groundwater uses and functions	Groundwater makes up 60–80% of the total water use. It also supports ecosystems and agriculture, prevents	

[29] *Sources*: Regional scheme of use and protection of water resources in Selenge river basin, Ulaanbaatar, 1986 and for groundwater resources: D.Sc.N.Jadambaa, Geo-ecology Institute of Mongolia, Ulaanbaatar

	land subsidence and serves as seasonal heat storage
Other information	Interaction between surface water and groundwater in the basin play important role in the functioning of riparian ecosystem

Pressures

Table 23
Water use in different sectors (per cent)

Country	*Total withdrawal* $\times 10^6$ *m*^{3}*/year*	*Agricultural %*	*Domestic %*	*Industry %*	*Energy %*	*Other %*
Mongolia	539.8[a]	36	13	22	0	28
Russian Federation	2 961.6[b]					

Note: Rural people in Mongolia use water from rivers, streams and snow water as drinking water.
[a] 2009, Water Authority of Mongolia
[b] Withdrawal in 2009 in the Selenga River Basin

92. Among widespread and severe pressure factors in the Mongolian part of the Selenga Basin are floods caused by heavy rain, gold mining (52 companies operating), forest fires and insects affecting forests (beetles *Coleoptera sp.*). Also widespread but more moderate in impact are wool processing, tanneries and beverage factory as well as overgrazing. The cattle grazing in the territory Selenga River Basin. Hydromorphological change of the river channel is a local but potentially severe pressure. Thermal power stations in Ulaanbaatar city and discharge of urban wastewater are assessed to be of comparable importance.

Status and transboundary impacts

93. Average mineralization of groundwater in Selenga river basin is 450 mg/l. Based on data from four monitoring stations, the pH is 7.8.

Response measures

94. Planned measures in the Yenisey Basin in the Russian Federation include: changes of the operational regime of reservoirs and Lake Baikal; protection of human settlements against floods and rising groundwater levels; further cleaning up of riverbeds; improvement of collection systems for wastewater and stormwater overflows and wastewater treatment plants; control illegal waste disposal, especially in water protection zones; limit erosion by using vegetation; and further development of monitoring and assessment of the status of watercourses.

95. Renovation of technology and facilities of the following wastewater treatment plants is foreseen during the period 2010-2021: Tolgoit in Ulaanbaatar, Moron city of Khovsgol aimag and Darkhan city. These works are a part of the implementation of the National programme on Water in Mongolia. The Mongolian water legislation requires mining companies and factories to take measures to protect water resources. Accordingly, in Orkhon aimag, Erdenet copper mine is reusing its wastewater.

96. The Joint Commission of Transboundary Waters between Mongolia and Russia operating on the basis of the intergovernmental Agreement on "Protection and use of transboundary waters" (1995) meets regularly. The provisions of the Agreement include exchange of information on transboundary waters. Transboundary monitoring of surface water quality is carried out at Sukhbaatar, Khiagt, Zelter and Shished monitoring points. Information on discharge, regime, quality monitoring results and flood and emergency situation is exchanged in the joint Mongolian and Russian Working Group established by order of minister of Nature and Environment of Mongolia and the Russian counterpart.

97. Currently there are 19 surface water monitoring stations observing daily in the Selenga Basin in Mongolia. In the framework of "Strengthening Integrated Water Resources Management in Mongolia" project, 17 groundwater monitoring wells will be set up within the Selenga river basin area.

98. The Eroo River Basin Council was established in 2007 and the Tuul River Basin Council in 2010 in Mongolia. The first Meeting of River Basin Councils of Mongolia was held in Ulaanbaatar in June 2010. The Water Agency of Mongolia develops in a project Integrated Water Resources Management (IWRM) Plans for the Orkhon and Tuul River Basins. A vulnerability assessment of these two basins was carried out by UNEP in collaboration with Peking Univerisity and the Water Institute from 2005 to 2007. Mongolia is interested in conducting joint research and studies on developing an IWRM plan of Selenga River Basin. In recent years riparian countries have carried out together some surveys as Selenga River water regime, fishery survey and inventory of pollution sources in the upper Selenga basin.

Future trends

99. Mining companies' activities in the proximity of water bodies will be limited with enforcement of the Mongolian Law on "Prohibition of the prospecting and exploitation of the mineral resources within the forest and water reservoir areas, 2009". A campaign (Atar III) aimed at increasing crop and vegetable production will continue.

100. The introduction of the Boguchany hydropower station (fourth dam in the Angara cascade) into service in Krasnoyarsk will increase human impact on the Angara River in the Russian Federation and will bring changes in the modes of operation of reservoirs of the Angara-Yenisey cascade and Lake Baikal.

101. Mongolia is very sensitive to climate change due to its geographic location, sensitive ecosystems and socioeconomic condition. Land surface water resource tends to be enhanced during the first stage of climate change, however, but there is no sign of enhancement yet whatsoever in these years. In the last 60 years, the average yearly temperature has warmed by 1.9 ºC, while the annual precipitation has fallen down by about 10%. Depending on the location, dynamics of temperature and precipitation changes differ. Melting of permafrost area caused by global warming will have effects on bridge and road constructions as well as buildings. For adaptation to climate change in the water sector, Mongolia prioritizes the formulation and stabilization of water resources management policy. Water saving and protection activities are also promoted. [30]

[30] *Source*: Climate change report MARCC 2009, Ministry of Environment, Nature and Tourism, Mongolia

X. Ob River Basin[31]

102. The basin of the Ob River is shared by China, Kazakhstan, Mongolia and the Russian Federation.

103. The Irtysh is the main (first order) tributary of the Ob. The Tobol and the Ishim are other transboundary tributaries.

Table 24
Area and population in the Ob Basin

Country	*Area in the country[a] (km^2)*	*Country's share %*	*Population*	*Population density (persons/km^2)*
Russian Federation	2 192 700	73.77		
Kazakhstan	734 543	24.71		
China	45 050	1.51		
Mongolia	200	0.01		
Total	**2 972 493**			

104. In the Russian part of the Ob Basin, surface water resources are estimated at 408.3 km^3/year and groundwater resources at 0.47 km^3.

Pressure, status and response

Table 25
Total withdrawal and withdrawals by sectors

Country	*Year*	*Total withdrawal $\times 10^6$ m^3/year*	*Agricultural %*	*Domestic %*	*Industry %*	*Energy %*	*Other %*
Russian Federation	2003	923.4[a]					
Kazakhstan	2003, 2004	3 530.6[b]	30.4	8.4	50.8	-	10.4
China							

[a] The amount withdrawn by the Russian Federation 70.3% surface water 29.7% groundwater. The figure is the total withdrawal from all water bodies of the Ob Basin.
[b] The figure for Kazakhstan consists of withdrawals from tributaries of the Ob, the Irtysh, Tobol and Ishim.

105. Exploitation of oil and gas in the middle and lower Ob in the Russian Federation exerts pressure on the water resources in the middle and lower Ob. See the separate assessments of the Irtysh, Tobol and Ishim for detailed information on these sub-basins.

[31] Based on information provided by the Russian Federation and the first Assessment of Transboundary Rivers, Lakes and Groundwaters.

XI. Irtysh sub-basin[32]

106. The basin of the 4,248-km long river Irtysh is shared by China, Kazakhstan, Mongolia and the Russian Federation. The river has its source in the Altai Mountains in Mongolia (at an altitude of 2,500 m) and discharges to the Ob. The average elevation of the basin in the Russian Federation is in the order of 250–285 m.a.s.l. With the elevation ranging from 80 m.a.s.l. to some 2,000 m.a.s.l., the character of the basin varies from plain to high-mountain.

107. The Tobol, Ishim, Bukhtarma, Ulba, Uba are major transboundary tributaries.

Table 26
Area and population in the Irtysh sub-basin

Country	*Area in the country (km^2)*	*Country's share %*	*Population*	*Population density (persons/km^2)*
Russian Federation	726 000	67	10 930 000[a]	15
Kazakhstan	316 472	29	2 000 000	6
China and Mongolia	45 250	4		
Total	**1 087 722**			

Sources: Scheme of complex use and protection of water resources in the Irtysh basin, volume 1, general characteristics of the Irtysh Basin, ZAO PO "Sovintervod", Moscow, 2009; Scheme of complex use and protection of water resources in the basin of the Irtysh River. Consolidated Note 2005; Statistics Agency of Kazakhstan

[a] Figure from 2007.

Hydrology and hydrogeology

108. Surface water resources in Kazakhstan's part of the Irtysh Basin are estimated at 33.66 km3/year (out of which 7.8 km^3/year is incoming water from outside the territory of Kazakhstan). Explored exploitable groundwater resources in Kazakhstan's part of the basin are estimated at 2.967 km^3/year.

109. In Kazakhstan, a cascade of large hydroelectric power stations (Bukhtarminskaya, Shulbinskaya, Ust-Kamenogorskaya and others) is used to regulate the flow.

Table 27
Preirtysh aquifer: None of the illustrated transboundary aquifer types, see the sketch (figure 5) , intergranular/multilayered aquifer, Paleogene and Cretaceous sands Groundwater flow direction from Kazakhstan (South) to the Russian Federation (North). Links with surface waters

	Kazakhstan	*Russian Federation*
Border length (km)	1 055	1 055
Area (km^2):	98 900	
Renewable groundwater resource (m^3/d)	965×10^6	
Thickness in m (mean, max)	14, 280	

[32] Based on information provided by Kazakhstan and the Russian Federation, and the first Assessment of Transboundary Rivers, Lakes and Groundwaters

Groundwater uses and functions	Groundwater abstraction is some 32.5 × 10^6 m^3/year, with 49% for agriculture, 48% for household water and 2% for industry.
Pressure factors	Groundwater abstraction from the confined aquifer layers, development of a regional cone of depression as a consequence of decreasing groundwater level.
Management measures	Kazakhstani-Russian joint modelling to evaluate exploitable groundwater resources and their allocation would be informative.
Other information	Stratigraphic units: P_3nk; K_2; K_{1-2}

Figure 5.
Sketch of the Preirtysh aquifer (provided by Kazakhstan)

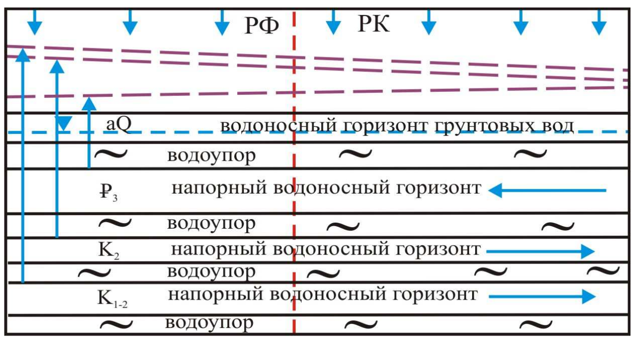
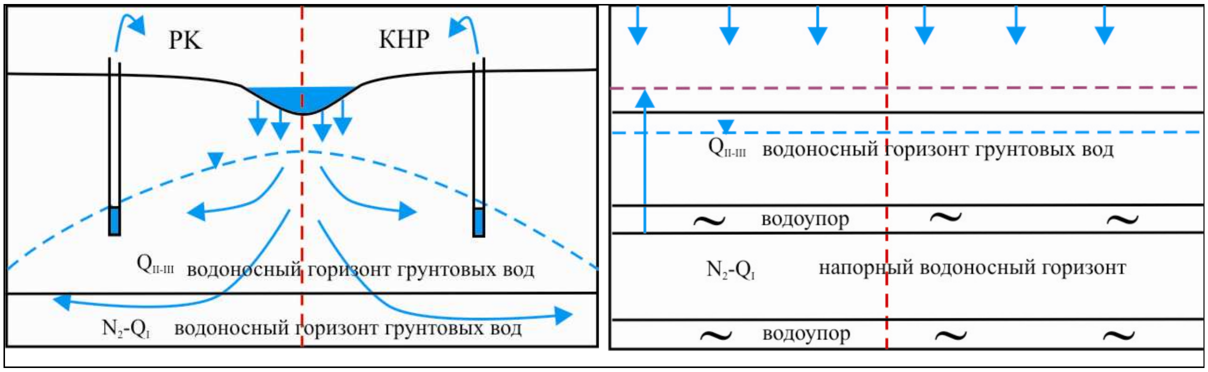


Table 28
Zaisk aquifer: sand and gravel and pebbles; Groundwater flow direction along the border from South to North. Links with surface waters vary, being either strong or weak

	Kazakhstan	*China*
Border length (km)	115	
Area (km^2):	30 150	
Renewable groundwater resource (m^3/d)	1 126 × 10^6	
Thickness in m (mean, max)	14, 280	
Groundwater uses and functions	Groundwater abstraction is some 1.32 × 10^6 m^3/year, 100% for household water	
Pressure factors	The abstraction of is significantly less than the estimated exploitable groundwater resources. No actual problems.	
Groundwater management measures	Early warning and surveillance monitoring (needed?)	
Other information	Stratigraphic units: Q_{II-III},N_2-Q_I	

Figure 6.
Sketch of the Zaisk aquifer (provided by Kazakhstan)



Pressures

Table 29
Total withdrawal and withdrawals by sectors

Country	*Year*	*Total withdrawal ×10⁶ m³/year*	*Agricultural %*	*Domestic %*	*Industry %*	*Energy %*	*Other %*
Russian Federation	2007	2 785[a]					
Kazakhstan	2003	3 166	31.5	5	52.9	-	10.6
	2010[b]	4 100	34.2	5	45.2	-	15.6

[a] Of this total amount, some 77.7% (2,600 × 10^6 m^3/year) was surface water and 22.3% (620 × 10^6 m^3/year) was groundwater.
[b] The figures are predictions for 2010.

110. Pressure factors in China include industry and water withdrawal for irrigated agriculture (e.g. through the more than 300-km long canal from the Black Irtysh[33] to Karamay). In the mid-1990s, the Irtysh in Kazakhstan was heavily affected pollution from the metal-processing industry, discharge of untreated water from mines, ore enrichment and leakages from tailing dams and well as wastewater discharges from Ust-Kamenogorsk.

111. The conflict between hydropower production and shipping has been increasing due to limited water resources availability and due to e.g. retaining water in the reservoir of Shul'binsk in the summer.

112. The main natural factors resulting in adverse impacts from water on the population and economic infrastructure in the Russian part of the Irtysh Basin are floods, ice dams, rise of water levels in lakes, water erosion and reduction of river channel capacity.

[33] The upstream part of the Irtysh flowing to Lake Zaysan is called Black Irtysh.

113. Wastewater discharges to the Irtysh in the Russian part of the basin were estimated at some 2,167 × 10^6 m^3 in 2007. From 2002 to 2009, the volume of sewage discharge in total and of untreated sewage in the Omsk region in the Russian Federation has been fairly constantly decreasing.[34]

Status and transboundary impact

114. At the monitoring station Buran, water entering the territory of Kazakhstan from China was classified as “clean” (class 2) in 2009. The observed oxygen level (10.9 mgO_2/l) met the requirements. The concentration of total dissolved solids was 140 mg/l on average and pH 8.0.

115. At the border with the Russian Federation, the water flowing from Kazakhstan is classified as “moderately polluted” (water quality class 3) in 2009. The observed oxygen level (11.4 mgO_2/l) met the requirements. The total dissolved solids was 185 mg/l and the pH 7.8.

116. The water pollution index values and observed exceedences of the Maximum Allowable Concentration for these locations are shown in the table below.

Table 30
Water quality classification

Location of observation on the Irtysh	*Water pollution index[a] – water quality classification*		*Parameters exceeding MAC*	*Multiplier of MAC exceedence*
	2008	2009		
Buran village, at the border with China	0.47; class 2, “clean”	0.70; class 2, “clean”	copper (2+)	1.39
Preirtysh, at the border with the Russian Federation	0.75; class 2, “clean”	1.07; class 3, “moderately polluted”	copper (2+)	1.8
			total iron	1.75

Source: Kazhydromet, Ministry of Environmental Protection of Kazakhstan
[a] The water pollution index is defined on the basis of the ratios of measured values and the maximum allowable concentration of the water-quality determinands.

117. In the Russian part, the overall water quality was ranked as “dirty” (class 4A) in 2007 according to the Russian classification. At the Tatarka monitoring station (17 km downstream from the border with Kazakhstan), water quality was classified as “very polluted” (class 3b) in the same year.[35] From 2006 to 2009, a general decrease has been observed in the concentrations of metals (copper, iron, magnesium and zinc). Phenol and oil (hydrocarbon?) concentrations also decreased in the same period. Downstream from Omsk, the concentrations of these metals, phenols and oil as well as biochemical oxygen demand (BOD_5) and chemical oxygen demand (COD) have been observed to increase towards the border of Omsk and Tyumen oblasts in the Russian Federation[36].

[34] Annual Nature Protection Reports of Omsk Regional Government
[35] Scheme of complex use and protection of water resources in the Irtysh River Basin. Book 2. Assessing the environmental status and key issues of water bodies of the Irtysh Basin. ZAO PO "Sovintervod, Moscow, 2009.
[36] Annual Nature Protection Reports of Omsk Regional Government (2006-2009)

Trends

118. Water quality in the Irtysh had a tendency to improve in the late 1990s and in the 2000s.

119. The (monetary) value of both industrial and agricultural production has increased in the basin in the 2000s, and this trend is predicted to continue.

XII. Tobol sub-basin[37]

120. The basin of the 1 591-km long river Tobol is shared by the Russian Federation and Kazakhstan. The river has its source between the southern Ural and Turgay Plateau in Kostanai Oblast in northern Kazakhstan and discharges to the Irtysh River in the Tyumen Oblast (Russian Federation). The major transboundary tributaries are the Ubagan, Uy, Ayat, Sintashta[38] and Toguzyak.

121. The basin area has a lowland character, with an average elevation of 100 to 200 m a.s.l.

Table 31
Area and population in the Tobol sub-basin

Country	*Area in the country (km^2)*	*Country's share %*	*Population*	*Population density (persons/km^2)*
Russian Federation	305 000	74.4		
Kazakhstan	105 110	25.6	910 400	
Total	**410 110**			

Sources: Scheme of complex use and protection of water resources in the basin of the Irtysh River, volume 1, general characteristics of the Irtysh Basin, ZAO PO "Sovintervod", Moscow, 2009; Integrated River Basin Management Plan, Kazakhstan, 2006; population — Statistics Agency of Kazakhstan, 2004

[a] Figure from 2007.

Hydrology and hydrogeology

122. In the part of the basin that is Kazakhstan's territory, surface water resources are estimated at 777×10^6 m^3/year (average for the years from 1938 to 2004) and groundwater resources at 286×10^6 m^3/year.

123. The mean annual flow of the Tobol is 0.48 km^3/year (15.2 m^3/s).

124. There are 624 reservoirs in the basin, providing drinking water and serving flow regulation.

37 Based on information provided by Kazakhstan and the Russian Federation, and the first Assessment of Transboundary Rivers, Lakes and Groundwaters

38 The river is also known as the Dshelkuar.

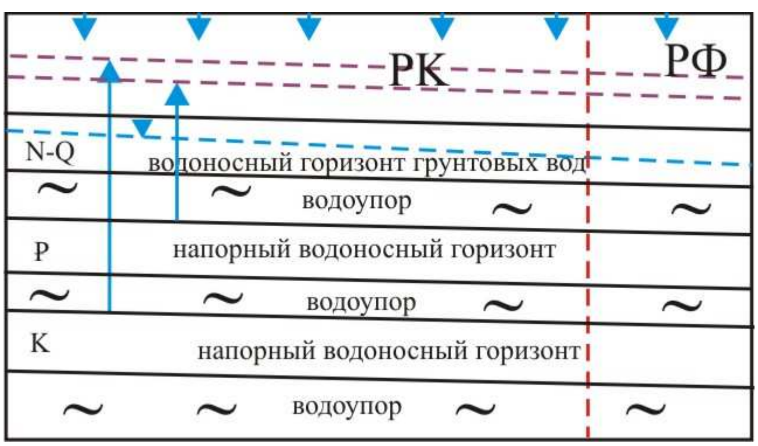
Table 32

North-Kazakhstan aquifer: Does not correspond with the described aquifer types (see figure 7) Intergranular/multilayered aquifer (confined), sand and gravel Groundwater flow direction from Kazakhstan (South) to the Russian Federation (North). Links with surface waters. The aquifer extends to the basins of both Tobol and Ishim (in Kazakhstan the aquifer is within the Tobol Basin).

	Kazakhstan	*Russian Federation*
Border length (km)	1 840	
Area (km^2):	147 600	
Renewable groundwater resource (m^3/d)		
Thickness in m (mean, max)		
Number of inhabitants		
Population density		
Groundwater uses and functions	Groundwater abstraction about 47.3 ×106 m^3/year (2008). Some 80% of it was for domestic use and 20% for industry.	
Pressure factors		
Problems		
Groundwater management measures		
Other information	Stratigraphic horizons K, Ᵽ, N-Q	

Figure 7.

Sketch of the North Kazakhstan aquifer (provided by Kazakhstan)



Pressures

125. Parts of the Tobol basin, for example in the Ural region and in the area of natural salt lakes in the Ubagan sub-basin cause elevated concentrations of certain metals and other elements.

126. Industrial and agricultural are developed in the sub-basin. Water management infrastructure and works, including withdrawals, inter-basin water transfer, operation of dams and reservoirs (Karatomarsk in particular) as well as melioration agricultural and forested land, also impact on the flow and water availability.

127. In Kazakhstan, the main anthropogenic pollution sources are municipal and industrial (mining and ore processing) wastewaters, residual pollution from closed-down chemical plants in Kostanai, accidental water pollution with mercury from gold mining in the Toguzyak sub-basin, and heavy metals from other tributaries to the Tobol. Diffuse pollution from fertilizers in agriculture has been decreasing, but remains a problem. Spring floods result in polluted surface runoff.

Table 33
Total withdrawal and withdrawals by sectors

Country	*Year*	*Total withdrawal ×10^6 m^3/year*	*Agricultural %*	*Domestic %*	*Industry %*	*Energy %*	*Other %*
Russian Federation	2009	2 090.87[a]					
Kazakhstan	2004	151.62	17	31.65	50.92	-	0.43
	2010[A]	182.12	28.65	26.9	44.2	-	0.25

[a] The figures of Kazakhstan for 2010 are a forecast. Withdrawals in 2015 are expected to be more than 20% higher than in 2010. Withdrawals for household water and for industrial purposes are predicted to decrease and agricultural withdrawals are expected to increase.

128. In the Russian part, the main sources of pollution of surface waters are wastewater discharges from towns and villages where the wastewater treatment does not meet the regulatory requirements. Nutrient and organic substance pollution from municipal wastewater as well as hazardous substances from urban waste dumps, power stations' ash deposits and the fat-processing industry from the Russian Federation through the transboundary tributaries (notably the Uy) .

129. Erosion by water is intensified during periods of flooding, causing for example destruction of river banks in the Kurgan and Chelyabinsk regions in the Russian Federation.

Status

130. In 2008 and 2009, water quality in the Tobol (at Milyutinko station) as well as in the Ayat and Toruzyak tributaries was classified as "moderately polluted". The oxygen content in 2009 (?) met the requirements, at 8.6 mgO_2/l in the Tobol, 11.3 mgO_2/l in the Ayat and 9.65 mgO_2/l in the Toruzyak. The pH varied from 7.60 to 7.80, and total concentration of dissolved solids from 7.53 to 9.62 mg/l.

Table 34
Water quality classification in the Tobol sub-basin

Location of observation in the Tobol Basin	*Water pollution index[a] – water quality classification*		*Parameters exceeding MAC*	*Multiplier of MAC exceedence*
	2008	2009		
Tobol, Milyutinko station	1.38; “moderately polluted” (class 3)	1.56; “moderately polluted” (class 3)	copper (2+)	3.58
			sulphates	2.50
			ammonium nitrogen	1.04
			total sodium & potassium content	1.10
Ayat tributary, Varvarinka station (downstream from the Russian border)	1.47, “moderately polluted” (class 3)	1.84, “moderately polluted” (class 3)	copper (2+)	5.3
			sulphates	2.24
			ammonium nitrogen	1.27
			magnesium	1.26
Toruzyak tributary, Toruzyak station	1.40, “moderately polluted” (class 3)	1.74, “moderately polluted” (class 3)	sulphates	3.04
			copper (2+)	2.30
			nitrite nitrogen	1.86
			magnesium	1.65

Source: Kazhydromet, Ministry of Environmental Protection of Kazakhstan
[a] The water pollution index is defined on the basis of the ratios of measured values and the maximum allowable concentration of the water-quality determinands.

131. In 2007, the general water quality in the Tobol in the Russian Federation was classified as “dirty” (class 4b, water pollution index 5.6), according to the Russian quality classification system[39].

Response

132. Hydrochemical and hydrological monitoring of transboundary waters is being carried out with the 1992 Intergovernmental Agreement on the joint use and protection of transboundary water bodies between Russia and Kazakhstan as the basis for joint activities.

[39] Scheme of complex use and protection of water resources in the basin of the Irtysh River. Book 2. Assessing the environmental status and key issues of water bodies of the Irtysh Basin. ZAO PO "Sovintervod, Moscow, 2009.

Future trends

133. Pollution in the Tobol in Kazakhstan has been decreasing since 2001[40], and water quality has been upgraded from class 5 (very polluted) to class 3 (moderately polluted). Pollution still continues to have an adverse impact, especially on the drinking-water supply.

XIII. Ishim sub-basin[41]

134. The sub-basin of the Ishim is shared by Kazakhstan and the Russian Federation. The river originates in the Niaz mountains in Kazakhstan and flows into the Irtysh River.

135. The major transboundary tributaries include Koluton, Shabai, Tersakkan, Akkanburluk and Imanburluk which have their source in Kazakhstan.

Table 35
Area and population in the Ishim sub-basin

Country	*Area in the country (km^2)*	*Country's share %*	*Population*	*Population density (persons/km^2)*
Russian Federation	34 000	18		
Kazakhstan	155 000	82	1 918 700[a]	12
Total	**189 000**			

Sources: Scheme of complex use and protection of water resources in the basin of the Irtysh River, volume 1, general characteristics of the Irtysh Basin, ZAO PO "Sovintervod", Moscow, 2009; Integrated River Basin Management Plan; population — Statistics Agency of Kazakhstan, 2004
[a] Figure from 2007.

Hydrology and hydrogeology

136. The surface water resources in the part of the basin that is Kazakhstan's territory are estimated at 2.59 km^3/year and groundwater resources at 0.165 km^3/year.

137. In the Russian part, surface water resources are estimated at 2630 m^3/year and groundwater resources at 48.329 m^3/year. Divided by population, the total water resources in the Russian part make up 5.9 m^3/year/capita.[42]

138. There are 16 reservoirs with a volume exceeding 1 million m^3 on the Ishim River; all of them in Kazakhstan. The guaranteed minimum flow at the border section (2.4 m^3/s) is reflected in the operational rules for the joint management of two reservoirs (Segrejevsk and Petropavlovsk reservoirs). A specific working group under the auspices of the joint Russian-Kazakhstan Commission deals with water-quantity issues, including such flow regulation issues.

[40] Indicated by the water pollution index, as reported in the first Assessment of Transboundary Rivers, Lakes and Groundwaters.

[41] Based on information provide by Kazakhstan and the Russian Federation, as well as the second Assessment of Transboundary Rivers, Lakes and Groundwaters

[42] Scheme of complex use and protection of water resources of the Ishim. Volumes 1 (Summary of the explanatory note, 2004), 3 (water resources and their current status, 2004) and 6 (water management and protection activities, 2005), ZAO PO "Sovintervod, Moscow

Pressures

Table 36
Total withdrawal and withdrawals by sectors

Country	*Year*	*Total withdrawal ×10⁶ m³/year*	*Agricultural %*	*Domestic %*	*Industry %*	*Energy %*	*Other %*
Russian Federation	2009	12.26					
Kazakhstan	2004	212.97	22	42.4	20.3	-	15.3
	2010[a]	33.05	23.3	34.7	23.1	-	18.9

[a] The figures of Kazakhstan for 2010 are a forecast.

139. Current level of water supply and sanitation in the settlements in the Ishim Basin does not meet the contemporary requirements for water supply sources and treatment of municipal and industrial sewage according to the Russian Federation.

Status

140. Water quality in the Ishim at the Dolmatovo station in Kazakhstan was classified as "moderately polluted" (Water Pollution Index 1.70). Concentration exceeding the Maximum Allowable Concentration was observed for copper (5.02 times MAC, zinc 1.08 MAC, sulphate 1.30 MAC and total iron 1.43 MAC). Oxygen content (10.9 mgO_2/l) met the requirements. The total concentration of dissolved solids (TDS) was 6.82 mg/l, and pH 7.80.

141. From the mid-1990s onwards, the water quality has been described as "clean" (class 2) or "moderately polluted" (class 3).

142. Overall assessment of water quality of the Ishim in the Russian Federation was classified in 2007 as "dirty" (class 4B) according to the Russian classification system (water pollution index 4.9)[43].

XIV. Tobol-Ishim Forest-steppe (Russian Federation, Kazakhstan)[44]

General description of the wetland

143. The site has a size of 217 000 ha and is located in the Ishim province of the forest-steppe zone (birch and aspen forests interspersed with meadows and steppe) on the Western Siberian Plain (average elevation 138 m a.s.l), 190-250 km south of the city of Tumen and 7 km to the south of the town of Ishim. Characteristic features of the landscape include

[43] Scheme of complex use and protection of water resources in the basin of the Irtysh River. Book 2. Assessing the environmental status and key issues of water bodies basin. Irtysh. ZAO PO "Sovintervod, Moscow, 2009.

[44] *Source of information*: Ramsar Information Sheet (http://www.wetlands.org/rsis/)

enclosed lakes, linear formations such as gently sloping ridges, dry river-beds, depressions and wide shallow river valleys (the Ishim and Emets). The wetlands are presented mainly by lakes (which cover an area of 95,000 ha) and small rivers with marshy catchments, but also by forested peatlands, salt inland marshes and wet meadows. The lakes vary in salinity from 1 g/l (freshwater) dominating in the northwest to more than 25 g/l in a southeasterly direction as climatic conditions become more arid and continental. The hydrological regime of the lakes is characterized by dramatic long term (20-50 years) and less pronounced short term (5 years) cyclical changes in inundation which are determined by variations in climate with evaporation as a key factor. This results in marked changes in water level, hydrochemical composition, size, shape and even the disappearance of lakes for several decades. The lakes are fed by surface runoff, groundwater and precipitation (450–475 mm annually).

Main wetland ecosystem services

144. The rivers and lakes as well as other water bodies are very important reserves of fresh water. The storage of floodwaters helps to regulate the flow of water in the rivers and is used for hydropower production. A specific micro-climate has formed in the area under the influence of extensive water surfaces and wetland vegetation which helps to reduce the effects of droughts and dry winds. Agriculture, including the production of cereal, fodder crops and vegetables, is well-developed. Hay production and cattle grazing takes place in areas adjacent to human settlements. The harvesting of berries and mushrooms plays a significant role. Fishing is carried out in most lakes in the region throughout the year. Waterfowl hunting is permitted during specific periods. There is some outdoor recreation by local people, mainly on river banks and lake shores.

Biodiversity values of the wetland area

145. Tobol-Ishim forest-steppe supports a great number of migrating and breeding populations of wildfowl and colonial shore birds, including several rare migrating species such as the Lesser White-fronted Goose (*Anser erythropus*), The Red-breasted Goose (*Branta ruficollis*), Bewick's Swan (*Cegnus bewickii*) and Taiga Bean Goose (*Anser fabalis*) as well as regular migrating species such as the Common Crane (*Grus grus).* In the Ramsar Site within the protected area “Byelozersky zakaznuk” a project on Siberian Crane (*Grus leucogeranus)* reintroduction is under implementation. Further, the site lies at the northern edge of the breeding area of a number of species such as the Dalmatian pelican *Pelecanus crispus*, the black-winged stilt *Himantopus himantopus* and the avocet *Recurvirostra avosetta.* Mammal species include 50 species such as: elk *Alces alus*, , lynx *Felis lynx* and wolf *Canis lupus*. Fishes include indigenous species such as *Carassius carassius* and introduced species such as *Cyprinus carpio* Other species of interest are the Siberian salamander *Salamandrella* and the sand lizard *Lacerta agilis.*; . Many lakes and marshes are overgrown with emergent, floating and submerged aquatic plants (*Phragmites, Typha, Carex, Scirpus, etc.*). Species listed in the Red Data Book of the Russian Federation include e.g. *Cypripedium calceolus, C. macranthons, Epipodium aphyllum, Liparius loeselii and Neottianthe euculata.* Moreover, the Ramsar Site is refuge for species which are on the edge of becoming endangered due to the disappearance of steppe landscapes such as *Allium nutans, Pulsatilla flavescens and Iris sibirica.*

Pressure factors and transboundary impacts

146. There is a high natural background pollution with heavy metals due to the occurrence of mineral-rich bedrock. Additionally, natural salt lakes cause elevated mineralization which deteriorates the quality of drinking water. Anthropogenic pollution sources are municipal and ore mining wastewaters as well as residual pollution from closed-down chemical plants in Kostanai. Moreover, water resources are being overused for irrigational purposes which causes variation in water level. Poaching has a significant impact and has become a large-scale activity during the past decades. Grazing and hay production have a negative effect on waterbirds during the breeding period, especially

during hot and dry climatic conditions. The permanent presence of people causes a higher likelihood of fires.

147. The introduction of plankton-eating species (mostly *Coregonus*) and carps *Cyprinus carpio* into some of the water bodies have caused a great reduction in the biomass of zooplankton and benthos, which are the main food resources for many species of waterbirds. The population of *Carassius carassius* (an indigenous species) has decreased, as juveniles are caught along with the carp. Fishing is also a major cause of disturbance of birds and other animals. Despite strict limitations, waterfowl shooting (especially in spring) has a considerable negative effect upon local and migrating populations of waterfowl.

Transboundary wetland management

148. There are 10 protected areas of different status within the Ramsar Site such as the Federal Byelozersky Zakaznik (since 1986, 17,850 ha of core and 2,168 ha of buffer zone) and regional protected areas – Okunevsky (1930 ha), Pyesochny (930 ha), Kaqbansky (22400 ha), Tavolzhan (2,720 ha). The Federal Byelozersky Zakaznik was a model area for the international GEF/UNEP project on Siberian Crane in which 6 countries have been cooperating in terms of population management. The Russian Federation and Kazakhstan cooperate on transboundary waters through a joint commission established on the basis of the 1992 bilateral Agreement (renewed in 2010; see the annex II in document ECE/MP.WAT/WG.2/2011/4–ECE/MP.WAT/WG1/2011/4). However, disagreements exist in terms of water use for irrigation and maintenance of infrastructure on the Kazakhstani side. A number of measures aimed at limiting economic activities have been proposed including, restrictions on grazing, fishing of Carassius carassius during the spawning period and fishing during the breeding season of waterbirds as well as the use of fishing nets which are fixed on river banks. There is a need to establish protected belts around all the lakes and to carry out measures for the restoration of trees and shrubs in these zones. There is also a need to prohibit the shooting of waterfowl in spring.