United Nations

ECE/MP.WAT/WG.2/2010/6

Economic and Social Council

Distr.: General
28 June 2010

English only

Economic Commission for Europe

Meeting of the Parties to the Convention on the Protection and Use of Transboundary Watercourses and International Lakes

Working Group on Monitoring and Assessment

Eleventh meeting
Geneva, 6–7 July 2010
Item 7 B of the provisional agenda
Assessment of the status of transboundary waters in the United Nations Economic Commission for Europe (UNECE) region

Assessment of transboundary rivers, lakes and groundwaters in the Caucasus discharging into the Black Sea

Note prepared by the secretariat[1]

I. Introduction

1. The present document contains the assessments of the transboundary rivers, lakes and groundwaters in the Caucasus which are located within the Black Sea drainage basin, namely the Psou and Chorokhi/Coruh Rivers. The document has been prepared by the secretariat on the basis of information provided by Georgia, the Russian Federation and Turkey.

2. It should be noted that maps of the basins and maps showing locations of the transboundary aquifers are not referred to here but will be developed for the final assessment, consulting the riparian countries when necessary. For descriptions of the transboundary aquifer types and related illustrations, see Annex V of document ECE/MP.WAT/2009/8.

[1] The present document has been submitted after the official documentation deadline due to late receipt of input and resource constraints.

II. Psou River Basin[2]

3. The basin of the river Psou is shared by the Russian Federation and Georgia. The river has its source on the Mountain Aigba at a height of 2,517 m and discharges into the Black Sea.

4. The basin has in its upper part a mountainous character with its tributaries forming steep-sided rugged valleys. The lower part of the basin, along the last 15 km, is hilly terrain. The average elevation is about 1,110 m a.s.l.

Table 1
Area and population in the Psou Basin

Country	*Area in the country (km^2)*	*Country's share %*	*Population*	*Population density (persons/km^2)*
Georgia	232	55.1		
Russian Federation	189	44.9	11 050	58
Total	421			

Hydrology

5. The river is fed by snow, rainwater and groundwater. The river is characterized by spring floods, with a peak in May. There is a low flow period in the summer (August–October) and in the winter (November–March).

6. In the part of the Psou Basin that is in Georgia's territory, surface water resources are estimated at 0.545 km^3/year (based on data from 1913 to 1955). Surface water resources in the territory of the Russian Federation are estimated to be approximately 0.593 km^3/year and groundwater resources are 0.0219 km^3/year, for a total of 0.6149 km^3/year in the Russian Federation, or 53,700 m^3/year/capita.

Table 2
Mean monthly discharge characteristics of the Psou at the Leselidze gauging station in Georgia (1.5 km upstream of the river mouth, elevation: 1,140 m a.s.l) based on observations from 1913 to 1955

Mean monthly discharges		
October: 14.8 m^3/s	November: 14.9 m^3/s	December: 12.4 m^3/s
January: 10.5 m^3/s	February: 13.3 m^3/s	March: 24.7 m^3/s
April: 30.8 m^3/s	May: 35.1 m^3/s	June: 24.7 m^3/s
July: 14.1 m^3/s	August: 9.52 m^3/s	September: 10.9 m^3/s
Mean discharge	17.3 m^3/s	

[2] This section is based on information from Georgia and the First Assessment of Transboundary Rivers, Lakes and Groundwaters

Table 3
Discharge characteristics of the Psou at the Veselyi gauging station in the Russian Federation (1.5 km upstream from the river mouth)

Discharge characteristics	*Discharge (m^3/s)*	*Period of time or date*
Q_{av}	19.2	1929–1937
Q_{max}	935	
Q_{min}	1.96	

Table 4
Transboundary aquifer No. 59[3,4]

No. 59	*Georgia*	*Russian Federation*

Type 3, 1) Alluvial aquifer consisting of boulder-gravels of the river valley alluvium, which is 100 per cent hydraulically connected to surface water. Palaeogene and Quaternary (Holocene) in age. Groundwater flow direction from Georgia and the Russian Federation to the Psou River. 2) Sandstone aquifer. Cretaceous in age. Groundwater flow direction from Georgia to the Russian Federation. The aquifers discharge partly to the Black Sea. Both aquifers are strongly linked with surface water.

Area (km^2)	
Border length (km)	1) 57; 2) 47 (aquifer lengths)
Thickness in m (mean, max)	1) 22, 60 2) 35, 50
Groundwater resources (m^3/day)	60,000
Groundwater management measures	
Groundwater uses and functions	Current abstraction: 3,800 m^3/day

Pressures

7. According to the Russian Federation, the main problems in the Psou Basin are breaking/erosion of the right bank upon flooding and contamination of groundwater due to increased anthropogenic loading from expansion of settlements in the Adler district of Sochi. Flooding is reported to have a widespread but moderate influence. Erosion and suspended sediments are assessed as serious, but spatially limited in impact.

8. The Russian Federation reports that due to geochemical anomalies in the basin some elements such as iron, copper, zinc and magnesium occur in elevated concentrations. The influence is local but may be serious. To a limited extent, hydrotechnical constructions and tourism also affect water resources in the basin.

[3] See Annex V of document ECE/MP.WAT/2009/8 for descriptions of the transboundary aquifer types.
[4] This is a new aquifer number because the aquifer did not appear in the First Assessment of Transboundary Rivers, Lakes and Groundwaters.

Table 5
Land use/land cover in the Psou Basin

Country	*Water bodies*	*Forest*	*Cropland*	*Grassland*	*Urban/industrial areas*	*Surfaces with little or no vegetation*	*Wetlands/ peatlands*	*Protected areas*	*Other forms of land use*
Georgia									
Russian Federation		80	1 [a]	0.2	10	5	0	[b]	4

[a] Of the cropland area, 0.1 per cent is irrigated.

[b] Most of the Russian part of the basin is located in a protected area, Sochi National Park (98 per cent), and a small part (2 per cent) is more strictly protected as the Caucasian State Biosphere Reserve.

Table 6
Water use by sector in the Psou Basin

Country	*Total withdrawal ×10^6 m^3/year*	*Agricultural*	*Domestic*	*Industry*	*Energy*	*Other*
Georgia						
Russian Federation	1.544[a]	13	87	–	–	–

[a] 2008 figures.

Status and transboundary impact

9. According to the classification applied in the Russian Federation, the river is clean (class 2).

Table 7
The average concentrations of monitored chemical determinands in the Psou River for the period 2006–2009

	Total dissolved solids *mg/l*	*Sus-pended solids* *mg/l*	*BOD* *mg/l*	*NO_3^-* *mg/l*	*NH_4^+* *mg/l*	*Cl^-* *mg/l*	*SO_4^{2-}* *mg/l*	*Fe* *mg/l*	*Cu* *mg/l*	*Zn^{2+}* *mg/l*	*Mn^{2+}* *mg/l*	*Pb* *mg/l*	*Total P* *mg/l*	*phos-phates* *mg/l*
MAC[a]	1 000	20	2	40	0.5	300	100	0.1	0.001	0.01	0.01	0.006	0.5	0.2
River mouth	226	30	0.82	0.48	0.53	1.21	9.81	0.22	0.007	0.01	0.09	0.004	0.09	0.05
Upstream	173	30	1.16	0.67	0.10	1.66	7.20	0.25	0.007	0.01	0.02	0.003	0.03	0.05
Middle part	200	30	0.99	0.81	0.39	1.43	8.51	0.23	0.007	0.01	0.06	0.003	0.06	0.05

Source: Russian Federation.
[a] Maximum allowable concentration.

Management response

10. The Russian Federation reports that draft schemes for integrated use and protection of water bodies in the Black Sea Basin — including the Psou Basin — are being developed and they are due in 2010.

Future trends

11. No serious impact of climate change on rainfall and the river run-off is predicted in the basin by the Russian Federation. The predicted impacts include reduction of peak flow by decreasing snow cover in the mountainous part of the basin, increasing the frequency of rain floods in the summer/autumn period.

12. No changes are expected in water use because of climate change, because of the low level of economic development of the territory in the Russian part of the basin. Nevertheless, by 2020, total water use is expected to increase to *30.08 × 10 m^3/year*.

III. Chorokhi/Coruh River Basin[5]

13. The basin of the river Chorokhi/Coruh[6] is shared by Turkey and Georgia. The more than 430 km[7]-long river has its source in Turkey, at the height of approximately 2,700 m a.s.l., and discharges to the Black Sea. Machakhelisckali/Macahale River is a transboundary tributary.

14. The basin has a pronounced high and hilly mountainous character with an average elevation of about 1,132 m a.s.l. The Coruh River leaves the mountainous topography and enters into meandering floodplain in Georgia before it flows to the Black Sea.

Table 8
Basin of the Chorokhi/Coruh

Country	*Country's share km ^{2}*	*Country's share%*	*Number of inhabitants*	*Population density*
Turkey	19 872	91.3	322 904[a]	16
Georgia	1 900[b]	8.7	135 100	71
Total	21 772			

[a] *Source*: Turkish Statistical Institute, 2008
[b] *Source*: Resource of Surface Water. National Agency Of Environment, Department of Hydrology, 1974

[5] Based on information from Georgia, Turkey and the First Assessment of Transboundary Rivers, Lakes and Groundwaters
[6] The river is known as Chorokhi in Georgia and as Coruh in Turkey.
[7] According to Turkey, the length of the river is approximately 410 km (DHI), and according to Georgia approximately 438 km (Source: Resource of Surface Water. National Agency Of Environment, Department of Hydrology, 1974). Georgia reports about 26 km of the river length to be in Georgia.

Hydrology and hydrogeology

15. In the Turkish part, the flow regimes are irregular with a large variation in run-off parameters. This part of the river basin is also prone to floods. Fluctuations in seasonal river flows are high.

16. Surface water resources in the territory of Turkey are estimated to be approximately 6.3 km^3/year and groundwater resources 0.045 km^3/year, making up a total of 6.345 km^3/year or 19,650 m^3/year/capita. In the part of the basin that is in Georgia's territory, based on observations from 1951 to 1992, the surface water resources are estimated to be approximately 8.711 km^3/year or 64,475 m^3/year/capita.

Table 9

Discharge characteristics of the Chorokhi/Coruh at the Karsikoy gauging station in Turkey (downstream of Muratli dam)

Discharge characteristic	*Discharge (m^3/s)*	*Period of time or date*
Q_{av}	200	long-term
Q_{max}	2 231	N/A
Q_{min}	38	N/A

Table 10

Discharge characteristics of the Chorokhi/Coruh at the Erge gauging station in Georgia (located at about 15 km upstream from the river's mouth; latitude 41° 33´ N; longitude 41°42´ E)

Discharge characteristic	*Discharge (m^3/s)*	*Period of time or date*
Q_{av}	276	1951–1992
Q_{max}	409	1951–1992
Q_{min}	159	1951–1992

Table 11

Mean monthly discharges of the Chorokhi/Coruh at the Erge gauging station in Georgia

Mean monthly discharges		
October: 193 m^3/s	November: 198 m^3/s	December: 178 m^3/s
January: 139 m^3/s	February: 176 m^3/s	March: 270 m^3/s
April: 560 m^3/s	May: 678 m^3/s	June: 447 m^3/s
July: 219 m^3/s	August: 130 m^3/s	September: 133 m^3/s

Pressures

Table 12

Land cover/use in Chorokhi/Coruh basin (per cent of the part of the basin extending in each country)

Country	*Water bodies*	*Forest*	*Cropland*	*Grassland*	*Urban/ industrial areas*	*Protected areas*	*Other forms of land use*
Turkey	0.24	32.5	16.4[a]	43.5	N/A	1.2	6.16[b]
Georgia	N/A	N/A	4.2	20.5	N/A	N/A	N/A

[a] About 5 percent of the cropland area is irrigated;

[b] Including urban/industrial areas and surfaces with little or no vegetation.

Table 13

Mean annual water withdrawal by sector in Chorokhi/Coruh basin

Country	*Total withdrawal ×10⁶ m³/year*	*Agricultural*	*Domestic*	*Industry*	*Energy*	*Other*
Georgia	724					
Turkey	81[a]	56	44	N/A	–	N/A

[a] This figure only includes the estimated agricultural (45×10^6 m^{3}/year) and domestic use (36×10^6 m^3/year), which are the main recorded consumptive uses. No consumptive use for energy purposes is reported.

17. Groundwater and spring water is used in both the Turkish and Georgian part of the basin for domestic water supply in the settlements of the river basin.

18. In the Turkish part of the basin, two hydropower stations are operational at present time: Muratli dam 100 m upstream from the border since 2005 and Borçka dam since 2007, with an installed capacities of 115 MW and 300 MW, respectively. In the Coruh River Development Plan (DSI, 1982), 10 hydropower projects along the main river in a cascade style are planned on the upper, middle and lower main course in the Turkish part of the Coruh River. The Lower Coruh projects are either in operation (Muratli and Borcka) or under construction (Deriner) The Middle Coruh projects (Yusufeli and Artvin) are under final design or getting investment arranged for, and the Upper Coruh projects (Laleli, Ispir, Gullubag, Aksu and Arpun) are either in the early planning or the planning stage. Together. they will have an installed capacity of 2,536 MW and will be utilized for generation of 8,320 GWh/year, when all the proposed projects are operational. In this development plan, three large reservoirs are to be constructed at Laleli, Yusufeli, and Deriner sites, located at the uppermost, middle and lower parts of the Coruh, respectively, to regulate the river flow. This regulation will mitigate the effects of floods in downstream of the river. Existing and planned hydropower stations will result in some changes in natural river flow regime, river dynamics and morphology.

19. A "washing away" problem is experienced in the coastal zone near the river mouth because of reduced sediment load. The maintenance of the sediment transport to sustain sandy beaches at the Black Sea coast is vital for tourism, which is of prime importance to Georgia's earnings. The problem of erosion, manifested by a high load of sediments in the river water (estimated at 5.8 million m^3 annually), is assessed by Turkey as widespread but moderate.

20. Agriculture is a pressure factor both in Georgia and Turkey. In terms of impact, it is reported to be only local in both countries but severe in the Georgian part and moderate in the Turkish part of the basin. The nutrient loads from agriculture in the Turkish part of the basin were estimated in 2005 to be 1,528 tons/year of nitrogen and 153 tons/year of total phosphorus.[8]

21. Because of a lack of wastewater treatment plants in urban settlements, wastewater discharges exert a pressure on water quality. Considered local and moderate in impact, the loads from municipal wastewater in the Turkish part of the basin were estimated in 2005 to be as follows: BOD 1,135 tons/year; COD 2,579 tons/year; nitrogen 213 tons/year; and total phosphorus 43 tons/year. Organic loads from industrial wastewater were estimated to be 858 tons/year as BOD and/or 1,850 tons/year as COD[9].There are no sanitary landfills in municipalities on the Turkish side yet, and controlled dumpsites are reported to exert pressure on water quality, human health, and landscape.

22. The region of the Coruh River Basin has a considerable potential for nature and eco-tourism which at the present is relatively little developed.

Response

23. Water resources development projects in the Turkish part of the Coruh River Basin have been carried out according to the developed master plans which generally include economic development of the basin’s water resources for hydropower, irrigation and domestic uses. These master plans also include some other issues such as flood protection and water quality aspects of the river basin. Integrated River Basin Management (IRBM) is not practised and presently and there is no existing comprehensive IWRM plan for the whole Chorokhi/Coruh River Basin, but Turkey plans to prepare a Coruh River Basin Management Plan within a 3–10 year time frame as part of an envisaged national adaptation strategy to climate change. According to the project on the strategic orientations of activity of the Ministry of the Environment and Natural Resources of Georgia (2009), development of a river basin management plan for the part of the Chorokhi Basin that is in the territory of Georgia is scheduled for the period from 2011–2013.

24. Preliminary works for the installation of a wastewater collecting and treatment plant for Artvin and Bayburt cities located in Turkish part of the Coruh Basin have been carried out. Wastewater treatment for cities and urban areas is required in Turkey, and Turkey reported that treatment facilities would be installed in the near future. Installation of industrial wastewater treatment plants is also required for new and existing industrial facilities in Turkey. Wastewater from villages is generally disposed of via seepage pits.

25. To address the erosion problem, general erosion control within the Coruh River Basin has been carried out by Turkish General Directorate of Aforestation and Erosion Control and the General Directorate of State Hydraulic Works (DSI) since 2001. Aforestation activities and campaigns in some areas of the Turkish part of the catchment are ongoing. The Turkish Soil Pollution Control Regulation dating from 2005 contributes to soil quality protection.

[8] TUBITAK-MAM-MRC, 2005, “National Action Plan for Land Based Sources for Turkey”, the Scientific and Technological Research Council of Turkey (TÜBİTAK), Marmara Research Centre (MRC), Chemistry and Environment Institute (CEI), Kocaeli, Turkey.

[9] TUBITAK-MAM-MRC, 2005, “National Action Plan for Land Based Sources for Turkey”, the Scientific and Technological Research Council of Turkey (TÜBİTAK), Marmara Research Centre (MRC), Chemistry and Environment Institute (CEI), Kocaeli, Turkey.

26. Problems related to flooding, which in the Turkish part of the basin are assessed to be widespread and severe, are addressed through construction of multi-purpose dams and reservoirs on the main river course, as well as construction of flood control structures in tributary streams and rivers threatened by flooding.

Status

27. According to water quality measurements, water quality of the Coruh River generally falls into Class I and Class II (Unpolluted and Less polluted water body) according to Turkish Inland Water Quality Standards (derived from Water Pollution Control Regulation).

28. According to the Ministry of the Environment and Natural Resources of Georgia, based on data from 2007 to 2009, the chemical and ecological status of the river system is good.

Transboundary cooperation

29. There are no joint bodies on transboundary waters in the Chorokhi/Coruh River Basin at the present time. Only some bilateral agreements and protocols exist on water-related issues in the basin between Georgia and Turkey, based on which bilateral technical cooperation and technical meetings have been held since 1994 and a working group for joint monitoring exists since 1998. This cooperation is regular. Based on the agreement between the Turkish and Georgian Governments, three flow-gauging stations were established by the Turkish Government at three locations in Georgia: on the Acara tributary, the Machakhelisckali/Macahale tributary and on the main river channel at Erge. Since 1999, 20 sets of joint measurements have been carried out and the results have been communicated to Georgia through diplomatic channels.

30. In order to identify, monitor and evaluate changes which may occur after implementation of the planned dam projects, including the situation of sediment trapping in reservoirs, Turkey and Georgia have agreed on and implemented since 1996 survey and monitoring work on the Chorokhi/Coruh River, including the Georgian river section, the river mouth, and the Black Sea coastline up to Batumi. An Environmental Impact Assessment for Yusufeli dam was prepared in 2006.

31. Communication and meetings have been reported between Georgian and Turkish delegations concerning establishment of early warning systems on the Chorokhi/Coruh River.

Trends

32. In the part of the basin that is part of Turkey's territory, based on global and long national scenarios and predictions of climate change modelling, by 2100, an increase of 10 to 20 per cent in precipitation in the northern latitude and increased variability in precipitation is predicted seasonally. An increase is expected in run-off, in variability of precipitation and run-off, and in flood risk. Groundwater levels are also predicted to rise as a result of increased precipitation, and the overall impact of climate change on groundwater quality is expected to be positive. Non-consumptive use of water for hydropower generation is expected to increase. Pressure on water quality from municipal and industrial wastewater is expected to decrease as a result of installation of wastewater treatment plants. Flooding risk will also be better controlled as a result of river flow regulation upon completion of the dam projects on the main course of the river.

IV. Machakhelisckali/Macahale sub-basin

33. The 37-km-long Machakhelisckali/Macahale River has its source in Turkey at a height of 2,285 m and flows from the Southern side of Mereti Mountain, discharging into the Chorokhi/Coruh River in Georgia.

Table 14
Sub-basin of the Machakhelisckali/Macahale River

Country	*Country's share km ^{2}*	*Country's share %*	*Number of inhabitants*	*Population density*
Georgia	188	50.9	3269	173
Turkey	181	49.1	1 112[a]	6
Total	369			

[a] *Source:* Turkish Statistical Institute, 2008.

Table 15
Discharge characteristics of the Machakhelisckali/Macahale at the gauging station in the village of Sindieti in Georgia (located at about 2.2 km upstream from the mouth of Chorokhi)

Discharge characteristic	*Discharge (m^3/s)*	*Period of time or date*
Q_{av}	20.6	1940–1992[a]
Q_{max}	30.4	1951–1992
Q_{min}	9.12	1951–1992

[a] Operation period of the monitoring station.

Table 16
Mean monthly discharges of the Machakhelisckali/Macahale at gauging station in the village of Sindieti in Georgia

Mean monthly discharges		
October: 21.5 m^3/s	November: 19.5 m^3/s	December: 17.5 m^3/s
January: 13.1 m^3/s	February: 15.9 m^3/s	March: 21.3 m^3/s
April: 34.3 m^3/s	May: 35.1 m^3/s	June: 23.7 m^3/s
July: 16.5 m^3/s	August: 14.5 m^3/s	September: 15.8 m^3/s

34. Surface water resources in the Georgian part of the basin are estimated at approximately 0.027 km^3/year (based on observations from 1951 to 1992), which is about 8,280 m^3/capita/year.

35. Approximately 8 per cent of the land in the Georgian part of the basin is cropland. Non-point source pollution from the use of fertilizers in agriculture is reported by Georgia, but the impact is assessed to be only local and moderate.

36. In 2008, the only reported water use in the Georgian part of the basin was energy: 177,283,000 m^3/year for (non-consumptive) hydropower generation on the Adjaristskali tributary. The water use is expected to remain unchanged in the Georgian part until 2015.