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PRELIMINARY ASSESSMENT OF TRANSBOUNDARY RIVERS IN THE ARAL SEA BASIN AND THEIR MAJOR TRANSBOUNDARY TRIBUTARIES*

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

Addendum

1. This preliminary assessment is an intermediate product and deals with the Amu Darya and Syr Darya, which flow into the Aral Sea, and other transboundary rivers in the Aral Sea basin that discharge either into one of these rivers (or their tributaries) or a desert sink.

2. Given the countries' response to the datasheets[1] and data availability from other sources, many of these watercourses have been dealt with as shown in the following table. The other watercourses will be included in the updated version to be submitted to the sixth Ministerial Conference "Environment for Europe" (to be held in Belgrade in October 2007) as explained in document ECE/MP.WAT/2006/16.

* This document was submitted on the above date because of processing delays.

[1] The cut-off date was 1 September 2006.

Transboundary rivers in the Aral Sea basin and their major transboundary tributaries						
Basin/sub-basins	**Riparian countries**	**Recipient**	**Status of assessment**			
			Hydrology	***Pressure***	***Impact***	***Trends***
Amu Darya	AF, KG, TJ, UZ, TM	Aral Sea	x	x	x	x
- Surkhan Darya	TJ, UZ	Amu Darya	…	…	…	…
- Kafirnigan	TJ, UZ	Amu Darya	x	…	…	…
- Pyanj	AF, TJ	Amu Darya	x	x	x	x
-- Bartang	AF, TJ	Pyanj	…	…	…	…
-- Pamir	AF, TJ	Pyanj	…	…	…	…
- Vakhsh	KG, TJ	Amu Darya	x	x	x	x
Zeravshan	TJ, UZ	Desert sink	x	x	x	x
Syr Darya	KZ, KG, TJ, UZ	Aral Sea	x	x	x	x
- Naryn	KG, UZ	Syr Darya	x	x	x	x
- Kara Darya	KG, UZ	Syr Darya	x	x	x	x
- Chirchik	KZ, KG, UZ	Syr Darya	x	x	x	x
--Chatkal	KG, UZ	Chirchik	x	(x)	(x)	(x)

The following abbreviations for country names are used: Afghanistan (AF), Iran (IR), Kyrgyzstan (KG), Tajikistan (TJ), Uzbekistan (UZ) and Turkmenistan (TM). The following abbreviations for the status of the assessment are used: x – draft assessment made; (x) –draft assessment partially made. Three dots (…) indicate that no data were submitted.

I. ASSESSMENT OF THE STATUS OF TRANSBOUNDARY RIVERS IN THE AMU DARYA BASIN

A. Amu Darya River

3. Afghanistan, Kyrgyzstan, Tajikistan, Uzbekistan and Turkmenistan share the basin of the Amu Darya River. While some literature sources quote a basin area of up to 534,700 km^2, the water divide can only be correctly established in the mountainous part of the basin; therefore many hydrologists refrain from giving figures for the total basin area.

Hydrology

4. The confluence of the two transboundary rivers, the Pyanj and the Vakhsh (see the separate assessment below), is taken as the beginning of the Amu Darya.

5. Of these two, only the Vakhsh is regulated (Nurek reservoir, 10.5 billion m^3); therefore, floods often occur downstream of the rivers' confluence and the Tyuyamuyunsk reservoir on the Amu Darya (7,270 million m^3). Downstream of this reservoir, the Amu Darya is fully regulated.

Discharge characteristics of the Amu Darya River at the gauging station upstream of the Karakum Canal		
Q_{av}	1,970 m^3/s	Average for: …
Mean monthly values:		
October – 1,740 m^3/s	November – 957 m^3/s	December – 898 m^3/s
January – 816 m^3/s	February – 820 m^3/s	March – 979 m^3/s
April – 1,670 m^3/s	May – 2,670 m^3/s	June – 3,800 m^3/s
July – 4,500 m^3/s	August – 3,470 m^3/s	September – 1,950m^3/s
Source: Hydrometeorological Service of Uzbekistan.		

6. Like other rivers in Central Asia, the Amu Darya is subject to strong hydraulic processes (e.g. deformation of the river bed, meandering, bank erosion).

7. In addition to the Pyanj and the Vakhsh, a number of other transboundary waters are located in the Amu Darya basin, including the Pamir, Kafirnigan, Surkhan Darya and Zeravshan rivers (assessed separately below).

Pressure factors, transboundary impact and trends

8. The pressures, transboundary impact and trends for the transboundary rivers in the Amu Darya River basin are described in the following sections. In general, the joint sustainable use and protection of water resources of these transboundary rivers is a particular challenge for the Central Asian countries and Afghanistan.

B. Pyanj River

9. Afghanistan and Tajikistan share the catchment area of the Pyanj River, located in the Amu Darya River basin, as shown in the following table. Of the Pyanj's total catchment area, 107,000 km^2 are in the mountains and the rest (6,500 km^2) in the lowland part of the catchment area.

Sub-basin of the Pyanj River			
Area	Countries	Countries' share	
113,500 km^2	Afghanistan	47,670 km^2	42%
	Tajikistan	65,830 km^2	58%
Source: Hydrometeorological Service of Uzbekistan.			

Hydrology

10. The Pyanj and Pamir rivers form the border between Afghanistan and Tajikistan.

11. Usually the confluence of the rivers Vachan-Darya (Afghanistan) and Pamir (forming the border between Afghanistan and Tajikistan) is considered as the beginning of the River Pyanj. However, hydrologists consider the source of the Vachan-Darya in Afghanistan as the beginning of the River Pyanj, as the Vachan-Darya is the "natural prolongation" of the Pyanj towards the east.

12. The total length of the Vachan-Darya/Pyanj is 1,137 km; from the confluence of the Vachan-Darya and Pamir, the river is 921 km long.

13. Knowledge concerning the hydrological regime of the Pyanj is very limited. Moreover, due to the closure of the Nishny Pyanj measuring station in 1992, there are no water level or discharge measurements by Tajikistan on the Pyanj River. With the exception of Lake Sarez (on the Bartang-Murgab-Oqsu tributary, having its source in Afghanistan, too) and a reservoir on the Gunt River, the flow of the Pyanj is not regulated, which results in severe flooding. June, July and August are the months with peak flow (on average 2,000 m^3/s).

14. The lake percentage is 0.42%, based on data for 1987.

Discharge characteristics of the Pyanj River at Nishny Pyanj (Tajikistan), 35 km upstream of the confluence with the Vakhsh River		
Q_{av}	1,012 m^3/s	Average for 1965–1992
Mean monthly values:		
October – 643 m^3/s	November – 516 m^3/s	December – 445 m^3/s
January – 389 m^3/s	February – 406 m^3/s	March – 503 m^3/s
April – 828 m^3/s	May – 1,290 m^3/s	June – 2,000 m^3/s
July – 2,300 m^3/s	August – 1,960 m^3/s	September – 1,050 m^3/s
Source: Hydrometeorological Service of Uzbekistan.		

15. Downstream of the confluence of the Vachan-Darya and the Pamir, a number of tributaries join the Pyanj, such as the Gunt, the Bartang, the Jasgulem, the Vanj and the Kyzylsu (right-hand-side tributaries), and the Koktsha (a left-hand-side tributary which flows exclusively through Afghanistan).

Pressure factors

16. Besides the general pressure factors in the Amu Darya and Syr Darya basins, the Pyanj catchment area has the following relevant specific features: The Sarez Lake (16.1 km^3), formed by an earthquake in the upper part of the Bartang River, is a potential threat to the population (some 5 million people) living near the middle and lower Amu Darya. In Tajikistan, water use for irrigational agriculture in the Pyanj catchment area is relatively small and mostly limited to the Kyzylsu catchment area.

Transboundary impact

17. According to the 1946 agreement between the Soviet Union and Afghanistan, Afghanistan is entitled to use up to 9 km^3 a year from the River Pyanj. Afghanistan currently uses about 2 km^3 yearly.

Trends

18. Full use of Afghanistan's quota for water use from the Pyanj (9 km^3/a), fixed by the 1946 agreement, could radically change the water flow along the Pyanj and would have a significant impact on the downstream flow regime of the Amu Darya.

C. Bartang River

19. Only a small part of the river's catchment area is in Afghanistan (river name downstream of the border: Oqsu; further downstream in Tajikistan: Murgab; and finally Bartang).

20. An assessment will be made at a later stage, given the river's importance for the hydrological and ecological regime of the Pyanj.

D. Pamir River

21. Based on recent information by Tajikistan, there are no gauging stations on the Pamir River. The first station further downstream is on the Pyanj River at Nishny Pyanj (see the description above).

22. The assessment will be made at a later stage.

E. Vakhsh River

23. Kyrgyzstan (upstream of the river, which in Kyrgyzstan is called the Kysyl Suu) and Tajikistan (downstream) share the catchment area of the Vakhsh River. Of the total area of 39,100 km^2, 34,010 km^2 are located in the mountainous part.

Sub-basin of the Vakhsh River			
Area	Countries	Countries' share	
39,100 km^2	Kyrgyzstan	7,900 km^2	20.2%
	Tajikistan	31,200 km^2	79.8%
Source: Hydrometeorological Service of Uzbekistan.			

Hydrology

24. The flow regime of the Vakhsh is regulated, mainly due to the Nurek reservoir. Since the Nurek reservoir became operational, the "natural" flow rate of the river has been measured upstream at the station Darband (former Komsomoladad), which was opened in 1976. This value is also taken as the inflow value for the reservoir. The catchment area above the gauging station is 29,190 km^2.

Discharge characteristics of the Vakhsh River at Darband (Tajikistan)		
Q_{av}	1,012 m^3/s	Average for 1965–1992
Mean monthly values:		
October – 334 m^3/s	November – 245 m^3/s	December – 205 m^3/s
January –177 m^3/s	February – 172 m^3/s	March – 213 m^3/s
April – 447 m^3/s	May – 795 m^3/s	June – 1,220 m^3/s
July – 1,600 m^3/s	August – 1,350 m^3/s	September – 697 m^3/s
Source: Hydrometeorological Service of Uzbekistan.		

Pressure factors, transboundary impact and trends

25. The planned extension of the mining and aluminium processing plant in Tursunzade (Tajikistan) may cause significant transboundary impact.

26. The Government of Tajikistan is also planning to resume the construction of a big reservoir at Rogun (total volume 12,400 million km^3, exploitable volume 8,700 million km^3). The future hydro-energy production at this reservoir will be used mainly to satisfy the higher energy demand of the mining and aluminium processing plant in Tursunzade.

F. Kafirnigan River[2]

27. Given the short common border between Tajikistan and Uzbekistan of some 30 km, formed by the Kafirnigan River, most of the Kafirnigan's catchment area of 11,590 km^2 belongs to Tajikistan.

Hydrology

28. The average discharge is on the order of 170 m^3/s). As a rule, the maximum discharge occurs in May (gauging station Tarzi, located some 50 km upstream of the river mouth, upstream catchment area some 9,780 km^2).

[2] Source: UNECE Environmental Performance Review for Tajikistan.

Discharge characteristics of the Kafirnigan at Tartki (Tajikistan)		
Q_{av}	169 m^3/s	Average for 1929–2005
Mean monthly values:		
October – 60.0 m^3/s	November – 62.9 m^3/s	December – 63.1 m^3/s
January – 59.6 m^3/s	February – 62.2 m^3/s	March –187 m^3/s
April – 295 m^3/s	May – 405 m^3/s	June – 389 m^3/s
July – 270 m^3/s	August – 129 m^3/s	September – 70.1 m^3/s
Source: Hydrometeorological Service of Uzbekistan.		

Pressure factors, transboundary impact and trends

29. An assessment will be made at a later stage.

30. As a consequence of heavy rainfall, mudflow has a considerable impact on the ecological regime and the safe operation of hydrotechnical installations.

G. Surkhan Darya River[3]

31. The Surkhan Darya is a transboundary tributary to the Amu Darya and has its source in Tajikistan. The catchment area is 13,500 km^2; the major part of this area is located in Uzbekistan.

Hydrology

32. The natural flow of the river is heavily disturbed by water management activities in the catchment area. Whereas some 120 m^3/s are estimated to originate in the mountain part, the inflow into the Jushnosurkhandsk reservoir (Uzbekistan) is only 74.2 m^3/s (see the following table).

[3] Source: UNECE Environmental Performance Review for Tajikistan.

Discharge characteristics of the Surkhan Darya (Uzbekistan) (inflow into the reservoir; summary values for the Shurchi gauging station on the Surkhan Darya and the Ustje gauging station on the Khalkadshar)		
Q_{av}	74.2 m^3/s	Average for 1970–2005
Mean monthly values:		
October – 25.3 m^3/s	November – 34.4 m^3/s	December – 42.01 m^3/s
January – 45.3 m^3/s	February – 47.6 m^3/s	March – 72.8 m^3/s
April – 157 m^3/s	May – 196 m^3/s	June – 166 m^3/s
July – 72.3 m^3/s	August – 17.2 m^3/s	September – 15.3 m^3/s
Source: Hydrometeorological Service of Uzbekistan.		

Pressure factors, transboundary impact and trends

33. An assessment of the Surkhan Darya River will be made at a later stage.

II. ASSESSMENT OF THE STATUS OF TRANSBOUNDARY RIVERS IN THE ZERAVSHAN RIVER BASIN

34. Tajikistan (upstream) and Uzbekistan (downstream) are riparian countries to the Zeravshan River. Due the sheer impossibility of determining the size of the catchment area, many hydrologists simply give a figure of 12,200 km^2 for the mountain part of the catchment area. Currently, the most upstream weir of the irrigation system for the Karakul Oasis is considered the "mouth" of the Zeravshan River.

Hydrology

35. The Zeravshan River was formerly a tributary to the Amu Darya but lost this function with the development of irrigation in the lowland parts of the catchment area. Some hydrologists therefore consider the Zeravshan an independent river; others still attribute it to the Amu Darya basin.

Discharge characteristics of the Zeravshan River at the gauging station downstream of the confluence of the Magian Darya River		
Q_{av}	161 m^3/s	Average for: …
Mean monthly values:		
October – 91.3 m^3/s	November – 63.4 m^3/s	December – 49.3 m^3/s
January – 42.4 m^3/s	February – 39.7 m^3/s	March – 38.6 m^3/s
April – 57.1 m^3/s	May – 150 m^3/s	June – 362 m^3/s
July – 477 m^3/s	August – 370 m^3/s	September – 193 m^3/s
Source: Hydrometeorological Service of Uzbekistan.		

Pressure factors

36. Currently some 96% of the water resources are used for irrigation, mainly in Uzbekistan.

Transboundary impact

37. Based on information supplied by Uzbekistan, Tajikistan is planning to construct a reservoir and hydropower station in the upper reaches of the Zeravshan River.

Trends

38. Given the planned construction of a reservoir in Tajikistan, Uzbekistan has voiced the need for an agreement on the joint use of the Zeravshan River responding to the various forms of water use: hydropower generation in Tajikistan and irrigation in Uzbekistan.

III. ASSESSMENT OF THE STATUS OF TRANSBOUNDARY RIVERS IN THE SYR DARYA BASIN

A. Syr Darya River

39. Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan share the basin. Some literature sources quote a basin area of up to 782,600 km^2 (of which 218,400 km^2 is in Kazakhstan). As with the Amu Darya, the water divide can only be correctly established in the mountainous part of the basin. Thus, many hydrologists do not give a figure for the total basin area but state that 142,200 km^2 of the basin area is upstream of the point where the river leaves the Fergana Valley.

Hydrology

40. The confluence of the transboundary rivers Naryn and Kara Darya (see separate assessments below) in the eastern part of the Fergana Valley is considered the beginning of the Syr Darya. Its total length is 2,137 km.

41. The river flow is strongly regulated. Major reservoirs include the Kajrakkum reservoir (design capacity 3,400 million m^3) and the Farkhad hydropower station in Tajikistan, and the Chardarin reservoir in Kazakhstan (design capacity 5,200 million m^3).

42. The long-term average river discharge is a calculated value of discharges into the Naryn-Syr Darya Cascade of reservoirs as follows:

Discharge characteristics of the Syr Darya, based on discharges into the Naryn-Syr Darya Cascade of reservoirs

Q_{av}	34.1 km^3/a	Average for: …
Mean monthly values:		
October – 2.25 km^3	November – 2.08 km^3	December – 2.03 km^3
January – 2.10 km^3	February – 2.04 km^3	March – 2.43 km^3
April – 3.03 km^3	May – 4.27 km^3	June – 4.47 km^3
July – 3.97 km^3	August – 3.21 km^3	September –2.53 km^3

Source: Hydrometeorological Service of Uzbekistan.

43. In the downstream parts of the Syr Darya, frequent flooding of human settlements, including the town of Kyzylord, occurs in winter. This is caused by the operation of the Kajrakkum reservoir in Tajikistan for maximum hydropower production.

Pressure factors, transboundary impact and trends

44. As to specific pressures on the river, Uzbekistan and Tajikistan report water pollution by industrial wastewaters and/or agriculture (return water from irrigational agriculture flowing into the river through a system of channels). At the Kokbulak monitoring station (in Kazakhstan, on the border with Uzbekistan), the Syr Darya has elevated concentrations of nitrates, manganese, sulphates, iron (2+) and copper. Pollution peaks are observed in autumn.

45. In Kazakhstan itself, the pollution load of the Syr Darya (and its non-transboundary tributaries, Arys and Keles rivers) is increased by industrial wastewater discharges, emissions from agriculture (discharges from drainage channels) and livestock breeding.

Water pollution characteristics of the Syr Darya River in Kazakhstan (measuring station …)

Year	Water pollution index	Determinands	Average concentration in mg/l	Factor by which the MPC is exceeded	Water quality
2001	1.26	Manganese Sulphate Iron (2+) Copper	78.120 662.41 0.018 0.0028	1.95 6.63 3.6 2.8	Class 3 (moderately polluted)
2002	1.36	Manganese Sulphate Iron (2+) Copper	58.628 555.661 0.037 0.0039	1.47 5.56 7.45 3.9	Class 3 (moderately polluted)
2003	2.13	Manganese Sulphate Iron (2+) Copper	59.956 486.012 0.036 0.0042	1.5 4.86 7.19 4.19	Class 3 (moderately polluted)
2004	1.92	Manganese Sulphate Iron (2+) Copper	63.768 515.402 0.046 0.0034	1.59 5.15 9.2 3.38	Class 3 (moderately polluted)

Source: Ministry of Environment Protection of Kazakhstan.

46. The following sections describe the pressure factors, transboundary impact and trends for the transboundary rivers of the Syr Darya River basin. The joint sustainable use and protection of the water resources of these transboundary rivers is a particular challenge for the Central Asian countries.

B. Naryn River

47. Kyrgyzstan (upstream) and Uzbekistan (downstream) are riparian countries to the Naryn River. The literature gives various figures for the size of the catchment area, from 58,370 km^2 to 59,900 km^2.

Hydrology

48. The River Naryn originates in the Tien Shan Mountains in Kyrgyzstan and flows through the Fergana Valley into Uzbekistan. Here it confluences with the Kara Darya River (assessed below) to form the Syr-Darya (assessed above).

49. The river is 807 km long and contains many multipurpose reservoirs, which are particularly important for hydropower generation. The largest one, the Toktogul reservoir,

contains some 19.9 km^3 water, which is used for hydropower generation in Kyrgyzstan and for irrigational water supply and protection against floods in Uzbekistan.

50. Downstream of the Toktogul reservoir, the flow of the river is totally regulated. Therefore, the river discharge figures refer to the inflow into the reservoir as the sum of the discharge of the Naryn at the Utshterek gauging station and the discharge of three smaller rivers directly communicating with the reservoir.

Discharge characteristics of the Naryn River		
Q_{av}	381 m^3/s	Total inflow into reservoir (Naryn plus three smaller rivers). Average for: …
Q_{av}	342 m^3/s	Discharge of the Naryn at the Utshterek gauging station only. Average for: …
Mean monthly values (total inflow into the reservoir):		
October – 229 m^3/s	November – 198 m^3/s	December – 164 m^3/s
January – 152 m^3/s	February – 147 m^3/s	March – 159 m^3/s
April – 283 m^3/s	May – 606 m^3/s	June – 942 m^3/s
July – 844 m^3/s	August – 577 m^3/s	September – 324 m^3/s
Source: Hydrometeorological Service of Uzbekistan.		

51. Unfortunately, of the former 15 gauging stations, only three are currently operational in the Kyrgyzstan part of the catchment area; this greatly reduces the accuracy of flood forecasts.

Pressure factors

52. The main pressure factors include untreated and insufficiently treated wastewater from municipal/domestic sources, discharges from industry and livestock breeding, wastes from ore mining and uncontrolled disposal of domestic waste from nearby human settlements.

53. Pollution hot spots are found in the populated lower section of the river, where high concentrations of nitrates (above 3 mg/l), nitrites (0.7 mg/l), oil and grease (0.5 mg/l), phenols (above 0.001 mg/l) and pesticides are still detected.

54. In the upper stretches, the water quality is assessed as “very good” and “good”, respectively.

Transboundary impact

55. The transboundary impact will be assessed at a later stage.

Trends

56. In addition to direct human impact on water quality and quantity, which will not significantly decrease, there is the growing potential of an adverse impact (mostly on water quantity) from the melting of glaciers due to rising air temperature and pollution of the glaciers.

C. Kara Darya River

57. Kyrgyzstan and Uzbekistan share the Kara Darya River catchment area of 28,630 km^2. Upstream of the Andishan reservoir, the catchment area is 12,360 km^2.

Hydrology

58. The river is heavily regulated. In 1978, the Andishan reservoir became operational, which had a significant impact on the river's flow regime (see the following table). Downstream of this reservoir, the much smaller Teshiktash and Kujganya reservoirs also became operational.

Discharge characteristics of the River Kara Darya		
Q_{av}	122 m^3/s	Inflow into the Andishan reservoir for 1978–2005
Q_{av}	136 m^3/s	Discharge at the Uchtepe gauging station at the river mouth for 1978–2005
Mean monthly values (total inflow into the reservoir):		
October – 62.2 m^3/s	November – 67.1 m^3/s	December – 58.9 m^3/s
January – 50.8 m^3/s	February – 49.4 m^3/s	March – 63.1 m^3/s
April – 170 m^3/s	May – 290 m^3/s	June – 324 m^3/s
July – 324 m^3/s	August – 101 m^3/s	September – 61.9 m^3/s
Mean monthly values (river mouth):		
October – 122 m^3/s	November – 147 m^3/s	December – 133 m^3/s
January – 108 m^3/s	February – 102 m^3/s	March – 117 m^3/s
April – 175 m^3/s	May – 210 m^3/s	June – 199 m^3/s
July – 199 m^3/s	August – 124 m^3/s	September – 87.1 m^3/s
Source: Hydrometeorological Service of Uzbekistan.		

Pressure factors, transboundary impact and trends

59. The hydrological regime of the river in the Fergana Valley can be characterized as follows: the river water is used for irrigation purposes (abstraction), and there is considerable water inflow from groundwaters and return waters from irrigational areas (input). Therefore, the

main problems are the correct calculation of water abstraction and compliance with the "abstraction norms".

D. Chirchik River

60. Kazakhstan, Kyrgyzstan and Uzbekistan are riparian countries to the Chirchik River. The total catchment area of the Chirchik River is 14,240 km^2, of which 9,690 km^2 are in the mountains (upstream of the Charvads reservoir).

Hydrology

61. The Chirchik originates in Kyrgyzstan, at the confluence of two rivers, the Chatkal (shared by Kyrgyzstan and Uzbekistan) and the Pskem. Currently both rivers supply the Charvads reservoir.

62. Downstream of the Charvads reservoir, the Charchik river is fully regulated. There are two relatively big tributaries, the Ugam on the right and the Aksakata on the left. Further downstream, in the lowland part, the Chirchik is used intensively for irrigational water supply through a comprehensive system of canals. The biggest include the Zakh, Bozsu and Northern Tashkent canals, which, although artificial, look like real rivers.

Discharge characteristics of the Chirchik River at the Chinaz gauging station		
Q_{av}	104 m^3/s	Average for: …
Mean monthly values (inflow into the reservoir):		
October – 98.1 m^3/s	November – 86.0 m^3/s	December – 72.4 m^3/s
January – 64.2 m^3/s	February – 61.8 m^3/s	March – 82.7 m^3/s
April – 218 m^3/s	May – 417 m^3/s	June – 550 m^3/s
July – 414 m^3/s	August – 232 m^3/s	September – 135 m^3/s
Source: Hydrometeorological Service of Uzbekistan.		

Pressure factors

63. The river is used mainly for irrigation and hydropower generation. From time to time, there is inter-basin water transfer into the catchments of the Keles and Achangaran rivers.

64. Major industrial enterprises in the Chirchik basin include the Khodjikent asphalt and concrete plant, the manufacturing firm Electrochimprom and the Uzbek industrial complex for metal manufacturing. According to recent data, wastewater discharged from Electrochimprom still exceeds MPC values as follows: suspended matters 24 times, ammonia nitrogen up to 10 times, nitrates up to 7 times and oil products 3 times. One can expect a similar picture for the other industrial sites in the Chirchik basin.

65. In the upper stretches of the lowland part, the Chirchik carries a high sediment load (above 1 t/m^3). To protect the Chirchik-Bozsu Cascade of hydropower stations from this mudflow, a great number of facilities for mud removal and/or its "harmless" passing through the cascade have been built.

Transboundary impact

66. The transboundary impact will be assessed at a later stage.

Trends

67. With the ongoing economic development and population growth in the Tashkent Oasis, there is an ever-growing deficit of water for irrigation and hydropower generation.

E. Chatkal River

68. Kyrgyzstan and Uzbekistan share the catchment area of the Chatkal River (7,110 km^3).

Hydrology

69. The river has a length of 217 km. There are 106 tributaries to the Chatkal River with a total length of 1434.5 km. None of the three former gauging stations is currently operational.

Discharge characteristics of the Chatkal River		
Gauging stations at the mouth of the Ters River		
Q_{av}	66.2 m^3/s	1941–1990
Q_{max}	102.6 m^3/s	1978–1979
Q_{min}	40.7 m^3/s	1981–1982
$Q_{absolute\ max}$	450.0 m^3/s	24 June 1979
$Q_{absolute\ min}$	9.2 m^3/s	9 January 1974
Source: Ministry of Environment of Kyrgyzstan.		

Pressure factors, transboundary impact and trends

70. There are only eight villages in the basin, two of them with central water supply and only one of them with a wastewater treatment plant (Kanysh-Kiya).

71. The transboundary impact seems to be limited to organic pollution from the human settlements.