

Analysis of hydrological conditions in the Syr Darya and Amu Darya River Basins in the non-growing season 2022-2023

1. Syr Darya River Basin

In the non-growing season (October 2022 – March 2023), the actual inflow to the upstream reservoirs (Toktogul, Andizhan, Charvak) in the Syr Darya River Basin was 5.09 km^3 or 97% of the norm.

Inflow to the Toktogul reservoir amounted to 2.88 km^3 or 100% of forecast. Inflow to the Andizhan reservoir was 14% lower than expected, while inflow to the Charvak reservoir was 22% higher.

Total water releases from the reservoirs amounted to 11.63 km^3 or by 23% more than the forecast schedule of BWO Syr Darya.

Total lateral inflow amounted to 11.12 km^3 in the reach from the Toktogul reservoir to the Shardara reservoir, including discharge from the Karadarya and Chirchik rivers. This is 2.2. times more than the total inflow to upstream reservoirs but 4% lower than the total water releases from these reservoirs.

By the end of the non-growing season, the upstream reservoirs accumulated 9.49 km^3 of water, including: Toktogul reservoir – 7.94 km^3 or 80% of the plan; Andizhan reservoir – 0.9 km^3 (88% of the plan); Charvak reservoir – 0.65 km^3 (94 %). The Toktogul reservoir was drawnd down by 5.68 km^3 ; the Charvak reservoir, by 0.92 km^3 ; and, the Andizhan reservoir, by 0.02 km^3 .

Inflow to the “Bakhri Tojik” reservoir was 12.47 km^3 . This is by 2.63 km^3 more than in the forecast schedule accepted for reference at the 83rd ICWC meeting. 12.64 km^3 of water were discharged into the river. This is by 4.25 km^3 more than in BWO’s schedule. The reservoir accumulated 3.45 km^3 of water.

Total water withdrawal from the Naryn and Syr Darya Rivers made up 3.54 km^3 , of which: For the growing season 2022, the water withdrawal was less by 1.68 km^3 than planned according to established limits by ICWC. Суммарный водозабор из рек Нарын и Сырдарья составил km^3 , в том числе: 0.03 km^3 for the Kyrgyz Republic; 0.07 km^3 for the Republic of Tajikistan; 0.32 km^3 for the Republic of Kazakhstan (through Dustlik Canal); and, 3.11 km^3 for the Republic of Uzbekistan (Table 1.1).

Inflow to the Shardara reservoir amounted to 14.26 km^3 during the non-growing season 2022-2023. This is by 3.48 km^3 more than in the schedule of BWO Syr Darya. By the end of the season, the reservoir was filled with water to

5.0 km³ (97% of the plan), and 9.68 km³ (138%) were discharged from the reservoir.

Inflow to the Aral Sea was 1.54 km³ by the data of KazHydromet and 1.67 km³ (105% of expected amount) by the data of the Committee for Water Resources of Kazakhstan.

Table 1.2 shows the river water balance, while Table 1.3 gives the reservoir water balance.

Table 1.1

**Water use by riparian countries of the Syr Darya River Nasin
(in the reach up to Shardara reservoir), non-growing season 2022-2023**

#	Water user	Water quantity, km ³		Water availability, %
		Limit/ schedule	Actual	Season
1	Total water withdrawal	4.21	3.54	84
2	by country:			
	Kyrgyz Republic	0.047	0.03	66
	Republic of Uzbekistan	3.35	3.11	93
	Republic of Tajikistan	0.37	0.07	20
	Republic of Kazakhstan	0.45	0.32	71
3	by river reach			
3.1	Toktogul reservoir – Uchkurgan hydroscheme	1.38	1.28	93
	including:			
	Kyrgyz Republic	0.04	0.03	74
	Republic of Tajikistan	0.08	0.03	31
	Republic of Uzbekistan	1.25	1.22	98
3.2	Uchkurgan hydroscheme – Bakhri Tojik reservoir	0.25	0.20	80
	including:			
	Kyrgyz Republic	0.01	0.001	19
	Republic of Tajikistan	0.07	0.02	27
	Republic of Uzbekistan	0.17	0.18	103
3.3	Bakhri Tojik – Shardara reservoir	2.59	2.07	80
	including:			
	Republic of Kazakhstan	0.45	0.32	71

#	Water user	Water quantity, km ³		Water availability, %
		Limit/ schedule	Actual	Season
	Republic of Tajikistan	0.212	0.030	14
	Republic of Uzbekistan	1.92	1.72	89

Table 1.2

Water balance of the Syr Darya River for the non-growing season 2022-2023

#	Balance item	Water quantity, km ³		
		Forecast/ plan	Actual	Deviation (actual – plan)
1	Inflow to Toktogul reservoir	2.88	2.88	0.00
2	Lateral inflow in the Toktogul reservoir – Shardara reservoir reach (+)	9.24	11.12	1.88
	including:			
2.1	<i>Discharge from the Karadarya River</i>	1.22	2.07	0.85
2.2	<i>Discharge from the Chirchik River</i>	1.03	1.32	0.29
2.3	<i>Lateral inflow from CDN and small rivers</i>	6.99	7.74	0.75
3	Flow regulation by reservoirs: recharge (+) or diversion of flow (-)	2.03	5.84	3.81
	including:			
3.1	<i>Toktogul reservoir</i>	3.76	5.68	1.92
3.2	<i>Bakhri Tojik reservoir</i>	-1.72	0.17	1.89
4	Regulated flow (1+2+3)	14.16	19.85	5.69
5	Water diversion in the Toktogul– Shardara reach (-)	-4.21	-3.54	0.67
6	Inflow to Shardara reservoir	10.78	14.26	3.48
7	Flow regulation by Shardara reservoir: recharge (+) or diversion of flow (-)	-5.45	-7.22	-1.77
8	Inflow to the Aral Sea (Karateren g/s)*	1.59	1.67	0.09

*Based on the data of the Committee for Water Resources of the Republic of Kazakhstan

Table 1.3

**Reservoir water balance in the Syr Darya River basin
for the non-growing season 2022-2023**

#	Balance item	Water quantity, km ³		Deviation (actual – plan)
		Forecast/ plan	Actual	
1	Toktogul reservoir			
1.1	Inflow to the reservoir	2.88	2.88	0.00
1.2	Water volume in reservoir:			
	– beginning of the season (1 October 2022)	13.62	13.62	0.00
	– end of the season (1 April 2023)	9.86	7.939	-1.92
1.3	Water releases from the reservoir	6.64	8.56	1.92
1.4	Flow regulation: recharge (+) or diversion of flow (-)	3.76	5.68	1.92
2	Andizhan reservoir			
2.1	Inflow to the reservoir	0.78	0.68	-0.11
2.2	Water volume in the reservoir:			
	– beginning of the season (1 October 2022)	0.91	0.91	0.00
	– end of the season (1 April 2023)	1.01	0.90	-0.12
2.3	Water releases from the reservoir	0.68	0.68	-0.01
2.4	Flow regulation: recharge (+) or diversion of flow (-)	-0.10	0.00	0.10
3	Charvak reservoir			
3.1	Inflow to the reservoir	1.26	1.54	0.27
3.2	Water volume in reservoir:			
	– beginning of the season (1 October 2022)	1.57	1.57	0.00
	– end of the season (1 April 2023)	0.69	0.65	-0.04
3.3	Water releases from the reservoir	2.10	2.39	0.29
3.4	Flow regulation: recharge (+) or diversion of flow (-)	0.84	0.86	0.02
4	Bakhri Tojik reservoir			
4.1	Inflow to the reservoir	9.84	12.47	2.63
4.2	Water volume in reservoir:	0.380	0.224	-0.16
4.3	– beginning of the season (1 October 2022)			
	– end of the season (1 April 2023)	1.71	1.71	0.00
	Water releases from the reservoir	3.49	3.45	-0.04
4.4	Inflow to the reservoir	8.50	12.68	4.19

#	Balance item	Water quantity, km ³		Deviation (actual – plan)
		Forecast/ plan	Actual	
	of which:			
	– discharge into the river	8.39	12.64	4.25
	– water diversion from reservoir	0.11	0.046	-0.06
4.5	Flow regulation: recharge (+) or diversion of flow (-)	-1.72	0.17	1.89
5	Shardara reservoir			
5.1	Inflow to the reservoir	10.78	14.26	3.48
5.2	Water volume in reservoir:	0.0	0.0	0.00
5.3	– beginning of the season (1 October 2022)			
	– end of the season (1 April 2023)	1.34	1.34	0.00
	Water releases from the reservoir	5.16	4.99	-0.17
5.4	Inflow to the reservoir	7.00	9.68	2.68
	of which:			
	– discharge into Arnasay	0.00	0.50	0.500
	– discharge into the river	6.92	8.71	1.79
	– water diversion from reservoir	0.08	0.47	0.39
5.5	Flow regulation: recharge (+) or diversion of flow (-)	-3.78	-5.55	-1.77
	TOTAL flow regulation by reservoirs: recharge (+) or diversion of flow (-)	-0.93	1.15	2.08

2. Amu Darya River Basin

Actual water availability in the Amu Darya River at nominal Kerki g/s (upstream of water intake to Garagumdarya) was 11.82 km^3 (83% of the norm at 14.16 km^3) which is 118% more than forecast (Table 2.1).

Inflow to the Nurek reservoir amounted to 4.56 km^3 (125% of forecast), while water releases from the reservoir were 8.13 km^3 (108% of BWO Amu Darya's schedule). Recharge of river flow through drawdown of the Nurek reservoir amounted to 3.57 km^3 . By the end of the season, the reservoir was drawn down to 6.32 km^3 .

The plan of water accumulation in the reservoirs of Tuyamuyun hydroscheme (TMHS) was fulfilled during the non-growing season. By April 1, the actual water quantity was 0.11 km^3 more than planned quantity and amounted to 2.7 km^3 due to higher than expected inflow to the instream reservoir – the flow at Darganata point was 7.53 km^3 (123% of forecast). Consequently, water releases from TMHS were higher than BWO's schedule – 6.12 km^3 (119%).

The established limit on water withdrawal in the Amu Darya Basin was used by 91%. Total water withdrawal was 14.32 km^3 , including 11.53 km^3 - downstream of Kerki g/s (starting from the water intake to Garagumdarya). Available water supply varied by states from 87% (Tajikistan) to 93% (Turkmenistan) (Table 2.1). Water availability was 87% in the upper reaches (up to intake to Garagumdarya), 92% in the middle reaches (from nominal Kerki g/s to TMHS) and 92% in the lower reaches (97% in Turkmenistan and 90% in Uzbekistan).

The established limit of sanitary and environmental flow for canals in the lower reaches of the Amu Darya was used by 93%, and 0.75 km^3 of water were delivered. According to UzHydromet's data, inflow to the Aral Sea and the Aral Sea region amounted to 1.35 km^3 or 64% of the plan.

Tables 2.2 and 2.3 show the data on river water balance and reservoir water balance, respectively.

Table 2.1

Indicators of available water supply of the riparian countries in the Amu Darya River Basin, non-growing season 2022-2023

#	Water user	Water quantity, km ³		Water availability, %
		Limit/ Schedule	Actual	Season
1	Total water withdrawal	15.71	14.32	91
2	Breakdown by states:			
	<i>Kyrgyz Republic</i>	-	-	-
	<i>Republic of Tajikistan</i>	2.86	2.49	87
	<i>Turkmenistan</i>	6.50	6.02	93
	<i>Republic of Uzbekistan</i>	6.35	5.81	91
3	Downstream of nominal Kerki g/s	12.48	11.53	92
	<i>including:</i>			
	<i>Turkmenistan</i>	6.50	6.02	93
	<i>Republic of Uzbekistan</i>	5.98	5.51	92
4	By river reach			
4.1	Upper reaches	3.23	2.79	87
	<i>Including:</i>			
	<i>Kyrgyz Republic</i>	-	-	-
	<i>Republic of Tajikistan</i>	2.86	2.49	87
	<i>Syrkhandarya, Republic of Uzbekistan</i>	0.37	0.30	81
4.2	Middle reaches	8.35	7.71	92
	<i>Including:</i>			
	<i>Turkmenistan</i>	5.10	4.66	91
	<i>Republic of Uzbekistan</i>	3.25	3.05	94
4.3	Lower reaches	4.13	3.82	92
	<i>Including:</i>			
	<i>Turkmenistan</i>	1.40	1.36	97
	<i>Republic of Uzbekistan</i>	2.73	2.46	90
5	Sanitary-environmental flow to canals in the lower reaches	0.80	0.75	93
	<i>Including:</i>			
	<i>Turkmenistan</i>	0.15	0.15	100
	<i>Republic of Uzbekistan</i>	0.65	0.60	92

#	Water user	Water quantity, km ³		Water availability, %
		Limit/ Schedule	Actual	Season
6	Water supply to the Aral Sea region and the Aral Sea	2.1	1.35	64

Table 2.2

**Water balance of the Amu Darya River,
non-growing season 2022-2023**

Balance item	Water quantity, km ³		Deviation (actual – plan)
	Forecast/ plan	Actual	
1. Water content in the Amu Darya River – unregulated flow at nominal Kerki section*	9.96	11.82	1.854
2. Flow regulation by the Nurek reservoir: recharge (+) or diversion of flow (-)	3.86	3.57	-0.29
3. Water withdrawal in the middle reaches (-)	-8.35	-7.71	0.64
4. Return flow in the middle reaches (+)	1.16	0.97	-0.20
5. River flow at Darganata g/s	6.12	7.53	1.40
6. Water releases from TMHS (including water diversion from the reservoir)	5.15	6.12	0.96
7. Water withdrawal in the lower reaches, including diversion from TMHS (-)	-4.13	-3.82	0.32
8. Sanitary-environmental flow to canals (-)	-0.80	-0.75	0.05
9. Flow of the Amu Darya River at Samanbai g/s	0.45	0.66	0.20

* excluding water withdrawal in the upper reaches (Tajikistan, Uzbekistan (Surkhandarya province))

Table 2.3

**Reservoir water balance, Amu Darya River basin,
non-growing season 2022-2023**

Balance item	Water quantity, km ³		Deviation (actual – plan)
	Forecast/ plan	Actual	
1 Nurek reservoir			
2.1 Inflow to the reservoir	3.66	4.56	0.91
2.2 Water quantity in the reservoir:			
– beginning of the season (1 October 2022)	10.57	10.57	0.00
– end of the season (1 April 2023)	6.34	6.38	0.04
2.3 Water releases from the reservoir	7.52	8.13	0.62
2.4 Flow regulation: recharge (+) or diversion of flow (-)	3.86	3.57	-0.29
2 TMHS reservoirs			
2.1 River flow at Darganata g/s	6.12	7.53	1.40
2.2 Water quantity in the reservoirs:			
– beginning of the season (1 October 2022)	2.32	2.32	0.00
– end of the season (1 April 2023)	2.59	2.70	0.11
2.3 Water releases from hydroscheme	5.15	6.12	0.96
including:			
– water releases into the river	3.68	4.47	0.79
– water diversion	1.48	1.65	0.17
2.4 Flow regulation: recharge (+) or diversion of flow (-)	-0.97	-3.06	-2.08