ANALYSIS OF HYDROLOGICAL CONDITIONS IN THE SYRDARYA AND AMUDARYA BASINS OVER THE GROWING SEASON 2018

1 Syrdarya River Basin

The actual inflow to the upstream reservoirs (Toktogul, Andizhan, and Charvak reservoirs) in the Syrdarya basin was 17.0 km³ or 102 % of the forecast and 92% of the norm for the growing season. The total lateral inflow to the Naryn and Syrdarya Rivers (in the reaches up to the Shardara reservoir) was 9.9 km³.

By the beginning of the growing season, the upstream reservoirs (Toktogul, Andizhan, and Charvak) have accumulated 16.35 km³. By the end of the growing season, the total capacity in the upstream reservoirs was 21.93 km³ or 106% of the value scheduled by BWO Syrdarya. In the Toktogul reservoir, the total capacity was 14.46 km³ and the active capacity - 8.96 km^3. Water releases from the Toktogul reservoir were 5 km³ or 96 % of the BWO Syrdarya schedule. Analysis of operation of the Toktogul reservoir shows that water supply to the reservoir was 1.1 km³ more than the forecast and amounted to 102% of the norm during the growing season. Water releases from the reservoir were 0.21 km³ less than scheduled (planned) by BWO Syrdarya. An amount of 18.5 km³ was accumulated in the reservoir by the end of July, whereas by the end of September, the total capacity was 19.3 km³.

Water storage in the Bakhri Tochik reservoir was 3.41 km³ by the beginning of the growing season and 2.11 km³ by the end of the growing season. The inflow to the Bakhri Tochik reservoir and water releases to the river were 6.84 km³ and 7.32 km³, respectively. Analysis of operation of the Bakhri Tochik reservoir showed that water supply to the reservoir was 0.77 km³ more than planned by BWO Syrdarya, and water releases from the reservoir were 0.35 km³ more than scheduled by BWO Syrdarya. Consequently, higher inflow to the Bakhri Tochik reservoir allowed fulfilling the plan on water releases.

In the Shardara reservoir, water storage was 4.27 km³ by the beginning of the growing season and 0.95 km³ by the end of the growing season. The inflow to the Shardara reservoir was 3.54 km³; water releases from the reservoir were 5.48 km³, including 4.77 km³ into the river. According to BWO Syrdarya (KazHydroMet), water was not released into the Arnasay reservoir from the Shardara hydroscheme. Water losses were 1.37 km³ in the reservoir.

According to the Aralo-Syrdarya Basin Water Administration, the Koksarai reservoir accumulated water in the amount of 60 mcm only in April, while in other months, it discharged the earlier accumulated flow in the amount of 2,555mcm.

The total water withdrawal from the Naryn and Syrdarya Rivers was 10.7 km³ or 92% of the limit in the reaches up to the Shardara reservoir. Over the growing season 2018, water withdrawal was 0.95 km³ less than planned by BWO Syrdarya. Water shortage was 9 mcm in the Republic of Kazakhstan (along the Dustlik canal), 50 mcm in the Kyrgyz Republic, 299 mcm in the Republic of Tajikistan, and 505 mcm in the Republic of Uzbekistan. Water availability was uneven by state and river reach (Table 1.1). The highest relative water shortage (% of the limit) was observed in the middle reaches of the Bakhri Tochik reservoir-Shardara reservoir – 9%. The situation with water shortage was as follows by ten-day:

- In Kazakhstan, water shortage amounted to 49% and 14% in the first and third ten-day, respectively. From the beginning of June till the third ten-day of August, water shortage varied between 29% and 35%.
- Water shortage in Tajikistan varied between 9 and 24% in June-August;

- In Uzbekistan, water shortage varied between 10% and 44% in June, 21% and 25% in July, and 20% and 6% in the first and second ten-day of August, respectively.

Water availability was 94% for the Republic of Uzbekistan and 87% for the Republic of Kazakhstan. The lowest water availability was in the Kyrgyz Republic – 80%. Water availability in the Republic of Tajikistan was higher than in the Kyrgyz Republic but very uneven by river reach: 1) Toktogul-Uchkurgan – 53%; 2) Uchkurgan-Bakhri Tochik – 116%; 3) Bakhri Tochik-Shardara – 79% (Tables 1.4 and 1.5).

Analysis of water balance in basin's reservoirs (Table 1.3) has revealed unrecorded inflow of 0.27 km³ to the Charvak reservoir, losses in other reservoirs in the total amount of 2.06 km^3, including 1.37 km^3 in the Shardara reservoir and 0.66 km³ in the Bakhri Tochik reservoir.

Water losses in open river channel in the Toktogul-Shardara reach were 1.3 km³ or 8% of regulated runoff in the growing season. Water losses were not predicted for this reach.

In the lower reaches, runoff utilization was 6.22 km³ (including water withdrawal, losses, minus lateral inflow).

Water supply to the Aral Sea and Prearalie (Karateren GS) was 0.81 km³ in the growing season by KazHydroMet's data and 1.15 km³ according to the Kazakh Committee for Water Resources.

Table 1.1

Water availability for the Syrdarya River basin countries over the growing season 2018

Water user	Water volume, km^3		Water availability %	Deficit (-), surplus (+) km^3
	BWO schedule/ limit	Actual	Season	Season
1 Total water withdrawal up to Shardara reservoir	11.66	10.71	92	-0.946
2 By state:				
– *Kyrgyz Republic*	0.25	0.20	80	-0.050
– *Uzbekistan*	8.80	8.30	94	-0.505
– *Tajikistan*	1.91	1.61	84	-0.299
– *Kazakhstan*	0.71	0.61	87	-0.09
3 By river reach				
3.1 Toktogul reservoir – Uchkurgan hydroscheme	3.95	3.58	91	-0.37
including:				
– *Kyrgyz Republic*	0.16	0.13	80	-0.03
– *Tajikistan*	0.24	0.13	53	-0.11
– *Uzbekistan*	3.55	3.33	94	-0.22
3.2 Uchkugran hydroscheme – Bakhri Tochik reservoir	1.08	1.12	104	0.04
including:				
– *Kyrgyz Republic*	0.08	0.07	79	-0.02
– *Tajikistan*	0.45	0.52	116	0.07
– *Uzbekistan*	0.54	0.53	98	-0.01
3.3 Bakhri Tochik reservoir – Shardara reservoir	6.63	6.01	91	-0.62
including:				
– *Kazakhstan*	0.71	0.61	87	-0.09
– *Tajikistan*	1.22	0.96	79	-0.26
– *Uzbekistan*	4.71	4.44	94	-0.27
4 Additionally:				
– Inflow to Shardara reservoir	5.09	3.54	70	-1.55
– Discharge into Arnasay	0.00	0.00		0.00
– Water supply to the Aral Sea and Prearalie	1.36	0.81	60	-0.55

Table 1.2

Syrdarya River channel water balance for the growing season 2018

Balance item	Water volume, km^3		Deviation (actual-plan)
	Forecast/plan	Actual	
1 Inflow to the Toktogul reservoir	8.75	9.85	1.10
2 Lateral inflow in the river reach of Toktogul reservoir – Shardara reservoir (+)	9.56	9.88	0.32
including:			
– *Discharge from the Karadarya river*	1.60	1.72	0.12
– *Discharge from the Chirchik river*	0.96	0.29	-0.67
– *Lateral inflow from CDF and small rivers*	7.00	7.88	0.88
3 Flow regulation in the reservoirs: inflow (+) or withdrawal (-)	-2.46	-4.21	-1.75
including:			
– *Toktogul reservoir*	-3.54	-4.84	-1.31
– *Bakhri Tochik reservoir*	1.08	0.63	-0.44
4 Regulated flow (1+2+3)	15.86	15.53	-0.33
5 Water withdrawal in the Toktogul – Shardara reach (-)	-11.66	-10.71	0.95
6 Water losses (-) or unrecorded inflow to the river channel (+) in the Toктogul-Shardara reach	0.89	-1.28	-2.17
Including % of regulated flow	6	8	
7 Inflow to the Shardara reservoir	5.09	3.54	-1.55
8 Flow regulation in the Shardara reservoir: inflow (+) or withdrawal (-)	3.40	1.95	-1.45
9 Water releases from the Shardara reservoir	8.48	5.48	-3.00
10 Including water releases into the river	7.28	4.77	
11 Flow regulation in the Koksaray reservoir: inflow (+) or withdrawal (-)	1.68	2.27	0.58
12 Runoff utilization (water withdrawal-lateral inflow+losses)	7.60	6.22	-1.37
13 Water supply to the Aral Sea and Prearalie	1.36	0.81	-0.55

Table 1.3

Water balance of the Syrdarya River basin reservoirs for the growing season 2018

Balance item	Water volume, km^3		Deviation (actual-plan)
	Forecast/plan	Actual	
1.Toktogul reservoir			
1.1 Inflow to the reservoir	8.75	9.853	1.10
1.2 Water volume in the reservoir:			
– beginning of the season (1 April 2018)	14.46	14.456	0.00
– end of the season (1 October 2018)	17.94	19.298	1.36
1.3 Water releases from the reservoir	5.22	5.011	-0.21
1.4 Unrecorded inflow (+) or losses (-)	-0.0537	-0.001	0.05
% of inflow to the reservoir	1	0	1
1.5 Unrecorded inflow (+) or losses (-)	-3.54	-4.84	-1.31
2.Andizhan reservoir			
2.1 Inflow to the reservoir	2.59	2.49	-0.10
2.2 Water volume in the reservoir:			
– beginning of the season (1 April 2018)	1.22	1.22	0.00
– end of the season (1 October 2018)	1.11	0.88	-0.23
2.3 Water releases from the reservoir	2.69	2.80	0.11
2.4 Unrecorded inflow (+) or losses (-)	-0.01	-0.03	-0.02
% of inflow to the reservoir	0	1	1
2.5 Flow regulation: inflow (+) or withdrawal (-)	0.09	0.31	0.21
3.Charvak reservoir			
3.1 Inflow to the reservoir	5.34	4.67	-0.66
3.2 Water volume in the reservoir:			
– beginning of the season (1 April 2018)	0.68	0.68	0.00
– end of the season (1 October 2018)	1.59	1.75	0.16
3.3 Water releases from the reservoir	4.40	3.87	-0.54
3.4 Unrecorded inflow (+) or losses (-)	-0.02	0.27	0.29
% of inflow to the reservoir	0	6	5
3.5 Flow regulation: inflow (+) or withdrawal (-)	-0.93	-0.81	0.13
4 Bakhri Tochik reservoir			
4.1 Inflow to the reservoir	6.07	6.84	0.77
4.2 Lateral inflow	0.30	0.21	-0.09
4.3 Water volume in the reservoir:			
– beginning of the season (1 April 2018)	3.41	3.41	0.00
– end of the season (1 October 2018)	1.78	2.11	0.33
4.4 Water releases from the reservoir	7.45	7.68	0.23
including:			
– *Water releases into river*	6.97	7.32	0.35
– *Water withdrawal from reservoir*	0.48	0.36	-0.12
4.5 Unrecorded inflow (+) or losses (-)	-0.55	-0.66	-0.11
% of inflow to the reservoir	9	10	1

Balance item	Water volume, km^3		Deviation (actual-plan)
	Forecast/plan	Actual	
4.6 Flow regulation: inflow (+) or withdrawal (-)	1.08	0.63	-0.44
5 Shardara reservoir			
5.1 Inflow to the reservoir	5.09	3.54	-1.55
5.2 Lateral inflow	0.00	0.00	0.00
5.3 Water volume in the reservoir:			
– beginning of the season (1 April 2018)	4.27	4.27	0.00
– end of the season (1 October 2018)	1.15	0.95	-0.19
5.4 Water releases from the reservoir	8.48	5.48	-3.00
including:			
– *Discharge into Arnasay*	0.00	0.00	0.00
– *Water releases into river*	7.28	4.77	-2.51
– *Water withdrawal from reservoir*	1.21	0.71	-0.49
5.5 Unrecorded inflow (+) or losses (-)	0.28	-1.37	-1.65
% of inflow to the reservoir	5	39	33
5.6 Flow regulation: inflow (+) or withdrawal (-)	3.40	1.95	-1.45
TOTAL Flow regulation by reservoirs: inflow (+) or withdrawal (-)	0.10	-2.76	-2.86
TOTAL losses (-), unrecorded inflow (+)	-0.36	-1.79	-1.43

Tabe 1.4

Country water availability in the Toktogul-Uchkurgan reach, growing season 2018

Balance item		April			May			June			July			August			September			mcm growing season
		I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	
Total for the reach	Limit, m^3/s	164	193	216	244	235	237	263	283	300	332	347	343	321	277	242	191	152	148	**3,946**
	Actual, m^3/s	196	204	216	238	223	218	244	259	281	272	288	284	256	235	225	173	132	129	**3,581**
	Water availability, %	**120**	**106**	**100**	**98**	**95**	**92**	**93**	**91**	**94**	**82**	**83**	**83**	**80**	**85**	**93**	**91**	**87**	**87**	**91**
Kyrgyz Republic	Limit, m^3/s	4	4	4	6	8	10	13	13	14	15	15	15	15	13	13	9	7	6	**162**
	Actual, m^3/s	2	2	3	5	5	5	10	9	11	12	13	14	13	12	12	10	5	4	**130**
	Water availability, %	**50**	**36**	**72**	**75**	**63**	**49**	**74**	**74**	**80**	**84**	**91**	**90**	**88**	**94**	**96**	**105**	**69**	**76**	**80**
Tajikistan	Limit, m^3/s	11	13	14	15	16	16	17	17	17	17	17	17	17	17	15	13	11	9	**237**
	Actual, m^3/s	6	9	8	8	8	9	7	12	11	8	8	9	8	9	6	5	6	5	**126**
	Water availability, %	**52**	**69**	**61**	**53**	**47**	**56**	**42**	**72**	**62**	**48**	**50**	**52**	**48**	**51**	**42**	**38**	**55**	**61**	**53**
Uzbekistan	Limit, m^3/s	149	175	198	222	211	211	233	253	269	300	315	311	289	247	215	169	133	133	**3,548**
	Actual, m^3/s	188	193	204	225	211	204	227	237	259	251	267	261	235	214	207	159	121	119	**3,326**
	Water availability, %	**126**	**110**	**103**	**101**	**100**	**97**	**98**	**94**	**96**	**84**	**85**	**84**	**81**	**87**	**96**	**94**	**91**	**90**	**94**

Table 1.5

Water releases from the Bakhri Tochik reservoir and country water availability in the Bakhri Tochik reservoir – Shardara reservoir reach, growing season 2018

Balance item		April			May			June			July			August			September			mcm growing season
		I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	
Water releases from the reservoir	Plan, m^3/s	520	520	520	390	390	390	500	500	500	550	550	550	432	432	432	250	250	250	**6,967**
	Actual, m^3/s	661	640	569	447	395	429	350	678	541	512	539	550	496	471	447	270	187	145	**7,318**
	Deviat.from limit, %	**27**	**23**	**9**	**15**	**1**	**10**	**-30**	**36**	**8**	**-7**	**-2**	**0**	**15**	**9**	**3**	**8**	**-25**	**27**	**5**
Kazakhstan	Limit, m^3/s	15	10	10	10	15	20	45	55	70	90	90	100	100	90	65	13	0	0	**705**
	Actual, $м^3/с$	20	18	12	20	24	35	23	57	60	64	64	67	65	60	71	31	3	0	**613**
	Deviat.from limit, %	**33**	**83**	**23**	**95**	**63**	**75**	**-49**	**3**	**-14**	**-29**	**-29**	**-33**	**-35**	**-34**	**9**	**138**		**33**	**-13**
Tajikistan	Limit, m^3/s	10	60	81	82	82	89	92	96	96	96	96	96	96	96	82	60	40	35	**1,220**
	Actual, m^3/s	4	25	38	63	60	74	71	73	78	80	80	86	82	84	75	62	40	16	**961**
	Deviat.from limit, %	**-56**	**-59**	**-53**	**-24**	**-27**	**-17**	**-23**	**-24**	**-19**	**-17**	**-17**	**-10**	**-15**	**-12**	**-9**	**3**	**0**	**-56**	**-21**
Uzbekistan	Limit, m^3/s	225	244	255	265	269	293	388	439	447	455	456	455	384	295	208	131	88	60	**4,708**
	Actual, m^3/s	325	371	368	342	279	286	219	395	377	340	360	359	309	276	215	113	71	44	**4,435**
	Deviat.from limit, %	**45**	**52**	**44**	**29**	**4**	**-2**	**-44**	**-10**	**-16**	**-25**	**-21**	**-21**	**-20**	**-6**	**3**	**-13**	**-19**	**45**	**-6**

2 Amudarya River Basin

The actual water content in the Amudarya River at the nominal Atamyrat gauging station (upstream of intake to Garagumdarya) was 37.2 km³ or 2.2 km³ less than expected by the BWO Amudarya (Table 2.2). The inflow to the Nurek HEPS amounted to 16.24 km³ and turned to be lower of the forecast by 1.86 km³. Water releases from the reservoir were 12.35 km³ or 1.89 km³ less than scheduled by BWO Amudarya. Water withdrawal from the river through accumulation in the Nurek reservoir amounted to 3.89 km³ (Table 2.3).

According to measurements at the Bir-Ata gauging station, the inflow to the Tuyamuyun hydroscheme (TMHS) was 15.26 km³ or 3.04 km³ less than expected. This did not allow accumulating planned volume (2.24 km³). Water volume in the TMHS reservoirs was only 2.2 km³ by the end of the growing season. Water releases from TMHS were 2.96 km³ less than planned and amounted to 13.6 km³. The total water intake by the Nurek reservoir and TMHS reservoirs from the Vakhsh and Amudarya Rivers amounted to 5.6 km³.

Given such hydrological conditions, the established limit of water withdrawal into canals in the Amudarya River basin was 83% provided (Table 2.1). The total water withdrawal amounted to 31.9 km³, including 24.6 km³ downstream of the Atamyrat gauging station (starting from intake to Garagumdarya). During the growing season, the average water availability was 92% for the Republic of Tajikistan, 87% for Turkmenistan and 76% for the Republic of Uzbekistan; in the lower reaches water availability was 66% for Turkmenistan, 63% for the Republic of Uzbekistan, and 89% for the Surkhandarya province (Table 2.1).

The highest relative shortage (% of the limit) was observed in the lower reaches of Tuyamuyun-Samanbay – 36%. Situation with water shortage by ten-day (Table 2.4) is as follows:

- In Turkmenistan, minimal shortage was 12% in the second ten-day of September, and maximum shortage was 63% in the second ten-day of May; it varied between 18% and 38% in June-August.
- In Uzbekistan, maximal shortage was 43-63% at the beginning of the growing season (April-May). In June-August, it varied from 32% to 54%.

Water losses in open channel of the Amudarya River between the nominal Atamyrat g/s and Bir-Ata g/s were calculated using the balance method and resulted in 4.23 km^3 or about 10 % of runoff at the nominal Atamyrat g/s. Water losses in the lower reaches (in the reach Tuyamuyun GS –Samanbay GS) were 3.8 km³ or 40% of runoff at the Tuyamuyun GS. Water losses along the Amudarya River (nominal Atamyrat GS-Samanbay GS) were approximately 8 km^3 or 22% of water content in the river.

An amount of 0.46 km³ (Amudarya runoff at Samanbay g/s plus collector-drainage flow) was supplied to Prearalie and the Aral Sea during the growing season.

Analysis of hydrological conditions in the Amudarya basin over 2018 growing season revealed that low water availability largely resulted from substantial open channel water losses, which exceeded forecasts by 1.3 km³ in the middle reaches and 2.9 km³ in the lower reaches.

To improve hydrological conditions and increase water availability, it is necessary to improve control over water withdrawal in the middle and lower reaches.

Table 2.1

Water availability in the Amudarya River basin countries over the growing season 2018

Water user	Water volume, km³		Water availability %	Deficit (-), surplus (+) km³
	Limit/ schedule	Actual	Season	Season
1. Total water withdrawal	**38.5**	**31.87**	**83**	**-6.7**
2. By state:				
Kyrgyz Republic	-	-	-	-
Republic of Tajikistan	6.8	6.2	92	-0.6
Turkmenistan	15.0	13.0	87	-2.0
Republic of Uzbekistan	16.8	12.7	76	-4.1
3. Downstream of Atamyrat g/s *)	**30.6**	**24.6**	**81**	**-6.0**
of which:				
Turkmenistan	15.0	13.0	87	-2.0
Republic of Uzbekistan	15.6	11.6	75	-4.0
4. By river reach:				
Upper reaches	**7.92**	**7.22**	**91**	**-0.7**
of which:				
Kyrgyz Republic	-	-	-	-
Republic of Tajikistan	6.75	6.19	92	-0.6
Surkhandarya province, Uzbekistan	1.17	1.03	89	-0.1
Middle reaches	**15.70**	**15.04**	**96**	**-0.7**
of which:				
Turkmenistan	10.13	9.77	96	-0.4
Republic of Uzbekistan	5.57	5.27	95	-0.3
Lower reaches	**14.91**	**9.61**	**64**	**-5.3**
of which:				
Turkmenistan	4.87	3.24	66	-1.6
Republic of Uzbekistan	10.04	6.37	63	-3.7
5. **Additionally:**				
Emergency and environmental water releases to canals in lower reaches	0	0		
of which:				
Turkmenistan	0	0		
Republic of Uzbekistan	0	0		
Supply to the Aral Sea and Prearalie **	2.10	0.46	22	-1.6

***)** Atamyrat g/s nominal – section of the Amudarya River upstream of water intake to Garagumdarya

**) including the discharged collector-drainage water

Table 2.2

Amudarya River channel water balance for the growing season 2018

Balance item	Water volume, km^3		Deviation (actual-plan)
	Forecast/Plan	Actual	
1. Water content in the Amudarya River - non-regulated flow at Atamyrat g/s nominal	39.37	37.19	-2.18
2. Flow regulation in the Nurek reservoir: accumulation (+) or withdrawal (-)	-3.87	-3.89	-0.03
3. Water withdrawal in the middle reaches (-)	-15.70	-15.04	0.66
4. Return flow (collector-drainage) in middle reaches (+)	1.46	1.23	-0.23
5. Water losses (-) or unrecorded inflow to the channel (+)	-2.97	-4.23	-1.26
% of flow at Atamyrat g/s nominal	7	10	3
6. River flow at Bir-Atal g/s	18.30	15.26	-3.04
7. Flow regulation in Tuyamuyun hydroscheme: accumulation (+) or withdrawal (-)	-1.77	-1.70	0.08
8. Releases from Tuyamuyun hydroscheme (including withdrawal from reservoir)	16.52	13.57	-2.96
9. Withdrawal in lower reaches, including withdrawal from Tuyamuyun hydroscheme (-)	-14.91	-9.61	5.31
10. Return flow (collector-drainage) in lower reaches (+)	0.00	0.00	0.00
11. Emergency and environmental water releases to canals (-)	0.00	0.00	0.00
12. Flow losses (-) or unrecorded inflow to the channel (+)	-0.94	-3.83	-2.89
% of flow at Tuyamuyun g/s	8	40	31.17
13. Supply to Prearalie and the Aral Sea (Samanbay g/s)	0.67	0.13	-0.54
TOTAL losses:	-3.91	-8.06	-4.15
% of river water content	10	22	11.73

Table 2.3

Water balance of the Amudarya River basin reservoirs for the growing season 2018

Balance item	Water volume, km^3		Deviation (actual-plan)
	Forecast / plan	Actual	
1 Nurek reservoir			
2.1 Inflow to the reservoir	18.11	16.24	-1.86
2.2 Water volume in the reservoir:			
– beginning of the season (1 April 2018)	6.64	6.64	0.00
– end of the season (1 October 2018)	10.53	10.55	0.02
2.3 Water releases from the reservoir	14.24	12.35	-1.89
2.4 Lateral inflow (+) or water losses (-)	0.02	0.02	0.00
% of inflow to the reservoir	0	0	0.00
2.5 Flow regulation: accumulation (+) or withdrawal (-)	-3.87	-3.89	-0.03
2 TMHS reservoirs			
2.1 Runoff at Bir-Ata g/s	18.30	15.26	-3.04
2.2 Water volume in the reservoirs:			
– beginning of the season (1 April 2018)	2.78	2.78	0.00
– end of the season (1 October 2018)	2.24	2.20	-0.04
2.3 Water releases from the hydroscheme	16.52	13.57	-2.96
of which:			
– releases into the river	11.27	9.69	-1.57
– withdrawal	5.26	3.87	-1.39
2.4 Unrecorded inflow (+) or water losses (-)	-2.32	-2.28	0.04
Including % of inflow to the reservoir	13	15	2
2.5 Flow regulation: accumulation (+) or withdrawal (-)	-1.77	-1.70	0.08
TOTAL flow regulation by the reservoirs: accumulation (+) or withdrawal (-)	-5.64	-5.59	0.05
TOTAL losses (-),unrecorded inflow (+)	-2.29	-2.26	0.04

Table 2.4

Country water availability in the Tuyamuyun-Samanbay reach, growing season 2018

Balance item		April			May			June			July			August			September			mcm growing season
		I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	
Total for reach	Limit, m^3/s	**461**	**521**	**572**	**592**	**673**	**776**	**845**	**1,000**	**1,096**	**1,123**	**1,145**	**1,259**	**1,075**	**972**	**1,058**	**745**	**582**	**419**	**14,914**
	Actual, m^3/s	**253**	**245**	**236**	**262**	**272**	**613**	**433**	**587**	**667**	**747**	**759**	**851**	**685**	**598**	**695**	**648**	**651**	**403**	**9,606**
	Water availability, %	**55**	**47**	**41**	**44**	**40**	**79**	**51**	**59**	**61**	**67**	**66**	**68**	**64**	**62**	**66**	**87**	**112**	**96**	**64**
Turkmenistan	Limit, m^3/s	228	233	237	242	246	237	232	266	275	285	290	323	297	307	382	321	262	207	**4,870**
	Actual, m^3/s	120	116	112	100	91	187	148	178	193	218	228	264	221	201	237	229	230	163	**3,236**
	Water availability, %	**53**	**50**	**47**	**41**	**37**	**79**	**64**	**67**	**70**	**76**	**79**	**82**	**74**	**66**	**62**	**71**	**88**	**79**	**66**
Uzbekistan	Limit, m^3/s	233	288	334	350	428	539	613	734	821	838	855	936	778	665	676	423	320	212	**10,044**
	Actual, m^3/s	132	129	125	163	182	426	285	410	474	529	531	587	463	397	458	419	421	240	**6,370**
	Water availability, %	**57**	**45**	**37**	**47**	**42**	**79**	**46**	**56**	**58**	**63**	**62**	**63**	**60**	**60**	**68**	**99**	**132**	**113**	**63**