

ANALYSIS OF WATER MANAGEMENT SITUATION WITHIN THE AMUDARYA AND SYRDARYA RIVER BASINS FOR THE NONVEGETATION PERIOD OF 2010/2011

1 Syrdarya River Basin

The actual inflow to the upstream reservoirs of the Syrdarya River Basin (Toktogul, Andijan and Charvak without Ugam River) for the nonvegetation period was 6.44 km³ or 101% predicted inflow. To this water volume additional releases from the upstream reservoirs accumulated during vegetation period were 5.0 km³ that is 0.28 km³ less the predicted one. Actual release from them for the nonvegetation period was 11.41 km³ that is 1.8% less the predicted one.

The total channel inflow to Naryn and Syrdarya up to the Shardara reservoir including releases to the Karadarya and Chirchik rivers amounted 11.9 km³; this gave possibility to increase the available regulated water resource of the basin up to 20 km³.

At the end of nonvegetation period 17.57 km³ of water was accumulated in the upstream reservoirs including 15.4 km³ or 107.5% of the predicted one - in the Toktogul reservoir.

For past five years mean annual inflow to the Toktogul reservoir amounted 13.41 km³ including 3.22 km³ for nonvegetation period. Inflow for nonvegetation period 2010-2011 was 3.9 km³ or more than mean annual one for 5 years by 0.67 km³.

For last 5 years the mean annual release from the Toktogul reservoir for nonvegetation period amounted 8.02 km³. The same 8.0 km³ of water was released for nonvegetation period 2010-2011 (Table 1.4).

The total water withdrawal from Syrdarya river amounted 4.82 km³ or 155% of planned one including for: Kyrgyz Republic - 0.026 km³, Republic of Tajikistan - 0.069 km³, Republic of Uzbekistan - 4.33 km³, Republic of Kazakhstan (through the Dustlik canal) - 0.400 km³.

Water supplying was unequal for the states and river sites and was not stable during the time (see Table 1.1, and also data on the website: www.cawater-info.net/analysis/).

Obligations on water delivery to the Shardara reservoir was implemented on 82.6%; actual inflow to the reservoir for nonvegetation period 2010-2011 amounted 14.14 km³ but the planned inflow had to be 17.12 km³.

Water release to the Arnasay amounted 0.197 km³. The planned water delivery to the Aral Sea and Piaralie was implemented on 199%; actual water delivery amounted 5.18 km³ (data of Uzhydromet) as to 2.60 km³ of the planned one.

Water consumption downstream the Shardara reservoir amounted 4.5 km³.

Actual channel losses calculated by the balance method at the Toktogul-Shardara section, amounted 1.0 km³, or 5% of the regulated flow of the Syrdarya River (Table 1.2).

Analysis of reservoirs' water balances in the Syrdarya basin (Table 1.3) has revealed the nonregistered inflow to the Andijan and Kairakkum reservoirs within the total volume of 0.04 km³. In the Toktogul, Charvak and Shardara reservoirs the total water losses were 0.36 km³.

Table 1.1

**Indicators of state's water availability in the Syrdarya river basin
for the nonvegetation period 2010-2011**

Water user	Water volume, km ³		Water availability, %		Water deficit, km ³	
	Limit/schedule	Actual	Season		Limit/schedule	Actual
1. Total withdrawal	3,100	4,824	155,6	66,3	1,72	-0,10
2. By states:						
Kyrgyz Republic	0,037	0,026	69,4	0,0	-0,01	-0,02
Republic of Uzbekistan	2,484	4,330	174,3	74,1	1,85	-0,09
Republic of Tajikistan	0,179	0,069	38,4	14,7	-0,11	-0,12
Republic of Kazakhstan	0,400	0,400	100	0,0	0,00	-0,09
3. By sections:						
Toktogul reservoir - Uchkurgan waterworks facility	1,329	1,750	131,7	66,7	0,42	-0,08
<i>Including:</i>						
<i>Kyrgyz Republic</i>	0,030	0,024	79,4	0,0	-0,006	-0,014
<i>Republic of Tajikistan</i>	0,047	0,064	136,6	41,1	0,017	-0,015
<i>Republic of Uzbekistan</i>	1,252	1,662	132,8	68,2	0,410	-0,060
Uchkurgan waterworks facility – Kairakkum waterworks facility	0,222	0,257	115,9	18,4	0,035	-0,040
<i>Including:</i>						
<i>Kyrgyz Republic</i>	0,007	0,002	27,9	0,0	-0,005	-0,006
<i>Republic of Tajikistan</i>	0,043	0,000	0,0	0,0	-0,043	-0,043
<i>Republic of Uzbekistan</i>	0,171	0,255	149,0	22,4	0,084	-0,019
Kairakkum waterworks facility – Shardara reservoir	1,550	2,817	181,8	9,8	1,27	-0,08
<i>Including:</i>						
<i>Republic of Kazakhstan</i>	0,400	0,400	100	0,0	0,00	-0,09
<i>Republic of Tajikistan</i>	0,089	0,005	5,4	0,0	-0,08	-0,08
<i>Republic of Uzbekistan</i>	1,061	2,413	227,5	12,8	1,35	-0,06
4. Additionally:						
Inflow to the Shardara reservoir	17,120	14,142	82,6	55,6	-2,98	-3,37
Release to Arnasay	0,000	0,197				
Water delivery to the Aral Sea and Priaralie	2,603	5,18	199,1			

*) minimal registered water availability for ten-days period

**) Sum of minimal registered water deficits for ten-days periods; partially or fully covered by water surplus within the season up to "deficit for the season"

Table 1.2

Syrdarya river channel balance for nonvegetation period 2010-2011

Item	Water volume, km ³		Deviation (actual- plan)
	expected/plan	actual	
1 Inflow to the Toktogul reservoir	3,75	3,90	0,14
2 Lateral inflow at the Toktogul reservoir – Shardara reservoir section (+)	11,90	11,90	0,00
<i>Including:</i>			
<i>Release along the Karadarya river</i>	1,93	2,04	0,11
<i>Release along the Chirchil river</i>	1,91	1,44	-0,47
<i>Lateral inflow from CDF¹ and small rivers</i>	8,06	8,42	0,36
streamflow regulation by reservoirs: adding to runoff (+) or removal from runoff (-)	5,05	4,18	-0,86
<i>Including:</i>			
<i>Toktogul reservoir</i>	5,17	4,10	-1,06
<i>Kayrakkum reservoir</i>	-0,12	0,08	0,20
4 Regulated runoff (1+2+3)	20,70	19,98	-0,72
5 Water withdrawal at the Toktogul – Shardara section (-)	3,10	4,82	1,72
6 Runoff losses (-) or unaccounted inflow to the channel (+) at the Toktogul – Shardara section	0,48	1,01	0,53
<i>Including % of regulated runoff</i>	2,33	5,08	
7 Inflow to the Shardara reservoir	17,12	14,14	-2,98
8 Runoff regulation by the Shardara reservoir addition to runoff (+) or withdrawal (-)	-6,183	-4,980	1,20
9 Water release from the Shardara reservoir	11,02	9,64	-1,38
10. Water release to the Kzylkum canal (-)	0,08	0,28	0,19
11 Release to Arnasay (-)	0,00	0,20	0,20
12 Amount of water used in the lower reaches: algebraic sum of withdrawal (-), lateral inflow (+), water losses (-)	-8,42	-4,45	3,96
13 Water delivery to the Aral Sea and Priaralie	2,60	5,18	2,58

¹ CDF-collector-drainage flow

Table 1.3

**Water balance of reservoirs in the Syrdarya river basin
for nonvegetation period 2010-2011**

Water balance item	Water volume, km ³		Deviation (actual-plan)
	expected/ plan	actual	
1. Toktogul reservoir			
1.1 Inflow to the reservoir	3,755	3,896	0,14
1.2 Water volume in the reservoir:			
- at the beginning of season (1 October 2009)	19,509	19,509	0,00
- at the end of season (31 March 2010)	14,329	15,398	1,07
1.3 Water release from the reservoir	8,922	8,000	-0,92
1.4 Unaccounted inflow (+) or water losses (-)	-0,01	-0,01	0,006
<i>Including % of inflow to the reservoir</i>	-0,3	-0,2	0,16
Streamflow regulation: adding to runoff (+) or removal from runoff (-)	5,167	4,104	-1,06
2. Andijan reservoir			
2.1 Inflow to the reservoir	1,176	1,143	-0,03
2.2 Water volume in the reservoir:			
- at the beginning of season (1 October 2009)	1,419	1,419	0,00
- at the end of season (31 March 2010)	1,734	1,427	-0,31
2.3 Water release from the reservoir	0,859	1,144	0,29
2.4 Unaccounted inflow (+) or water losses (-)	0,00	0,01	0,01
<i>Including % of inflow to the reservoir</i>	-0,2	0,8	0,95
2.5 Streamflow regulation: adding to runoff (+) or removal from runoff (-)	-0,317	0,001	0,32
3. Charvak reservoir			
3.1 Inflow to the reservoir	1,443	1,401	-0,04
3.2 Water volume in the reservoir:			
- at the beginning of season (1 October 2009)	1,858	1,858	0,00
- at the end of season (31 March 2010)	1,456	0,747	-0,71
3.3 Water release from the reservoir	1,84	2,262	0,43
3.4 Unaccounted inflow (+) or water losses (-)	-0,01	-0,25	-0,24
<i>Including % of inflow to the reservoir</i>	-0,66	-17,86	-17,20
3.5 Streamflow regulation: adding to runoff (+) or removal from runoff (-)	0,392	0,861	0,47
4. Kairakkum reservoir			
4.1 Inflow to the reservoir	13,412	13,369	-0,04
4.2 Lateral inflow	0,437	0,255	-0,18
4.3 Water volume in the reservoir:			
- at the beginning of season (1 October 2009)	3,38	3,379	0,00
- at the end of season (31 March 2010)	3,42	3,331	-0,09
4.4 Water release from the reservoir	13,73	13,703	-0,03
<i>Including:</i>			
- release to the river	13,64	13,65	0,01
- water withdrawal from the reservoir	0,09	0,05	-0,03
4.5 Unaccounted inflow (+) or water losses (-)	-0,08	0,03	0,11
<i>Including % of inflow to the reservoir</i>	-0,6	0,2	0,83
4.6 Streamflow regulation: adding to runoff (+) or removal from runoff (-)	-0,120	0,078	0,20

Water balance item	Water volume, km ³		Deviation (actual-plan)
	expected/ plan	actual	
5. Shardara reservoir			
5.1 Inflow to the reservoir	17,120	14,142	-2,98
5.2 Lateral inflow	0,0	0,0	0,00
5.3 Water volume in the reservoir:			
- at the beginning of season (1 October 2009)	1,043	1,043	0,00
- at the end of season (31 March 2010)	5,281	4,973	-0,31
5.4 Water release from the reservoir	11,10	10,11	-0,99
<i>Including:</i>			
- release to Arnasay	0,000	0,197	0,197
- release to the river	11,02	9,64	-1,38
- water withdrawal from the reservoir	0,083	0,276	0,19
5.5 Unaccounted inflow (+) or water losses (-)	-1,78	-0,10	1,67
<i>Including % of inflow to the reservoir</i>	-10,4	-0,7	9,66
5.6 Streamflow regulation:			
adding to runoff (+) or removal from runoff (-)	6,016	4,033	-1,98
TOTAL: Streamflow regulation:			
adding to runoff (+) or removal from runoff (-)	11,14	9,08	-2,06
TOTAL: Unaccounted inflow (+) or water losses (-)	-1,88	-0,32	1,56

Table 1.4

Inflow to and release from the Toktogul reservoir for 2006-2011

n	Hydrologic year	Inflow, million m3			Release, million m3		
	Hydrologic year	Nonvege- tation period	Vegeta- tion period			Nonveg etation period	Vegetati on period
1	2006-2007	3157	8911	12068	9538	5857	15395
2	2007-2008	2505	7371	9876	9726	4408	14134
3	2008-2009	2672	9876	12548	5884	5748	11632
4	2009-2010	3898	15244	19142	6965	5445	12410
5	2010-2011	3896			8000		
	Average for 5 years	3226	10350	13408	8023	5365	13393

2 Amudarya River Basin

The actual water content of the Amudarya river at the Atamyrat gauging station (GS) conditional (upstream to the water intake into Garagumdarya) amounted 11.19 km³ that is 19.7% less than the expected (planned) one of the BWO "Amudarya".

In the existing water management situation, 93.9% of defined water withdrawal limit in the Amu Darya River Basin was implemented, and total water withdrawal amounted to 14.74 km³, including 12.13 km³ down the Atamyrat GS (starting from the water intake into Garagumdarya).

Water supplying was unequal for the states, river sites (see Table 2.1, and also data on the website: www.cawater-info.net/analysis/). The total water deficit amounted 6% only, including within the Republic of Tajikistan - 20%, the Republic of Uzbekistan - 1%, Turkmenistan - 5%.

At the end of season only 6.0 km³ of water was stored in the Nurek reservoir as was planned by the BWO "Amudarya", and in the TMHS reservoirs - 3.16 km³ or less than the planned one by 1.3 km³ (see Table 2.3). The total additional water volume to the river flow due to Nurek and Tuyamuyun reservoirs drawdown amounted 4.84 km³.

There is no water losses and unaccounted inflow to the Nurek reservoir.

The water losses in the TMHS reservoirs amounted 2.2 km³ (28.4% of water inflow) and in the Tuyamuyun-Samanbay section - 0.57 km³ or 9.7% of water flow at the Tuyamuyun hydropost. Water losses in the river section upstream the TMHS amounted 1.4 km³.

Total actual water losses from river channel and reservoirs amounted 4.14 km³ or about 26% of river flow at the Atamyrat G/S what is near the calculated (planned) ones.

The defined limit of sanitary-environmental water releases into the Amudarya downstream canals was implemented by 99%; water delivery amounted 0.79 km³. Water delivery to the Aral Sea and Priaralie amounted 1.48 km³ or 118.2% of planned flow (see Table 2.2).

Table 2.1

**Indicators of state's water availability in the Amudarya river basin
for nonvegetation period 2010-2011**

Water user	Water volume, km ³		Water availability, %		Deficit, km ³	
	limit/ schedule	actual	season		limit/ schedule	actual
1. Total withdrawal	15.70	14.74	93.9	63.8	-0.96	-1.94
2. By countries:						
Republic of Kyrgyzstan	-	-	-	-	-	-
Republic of Tajikistan	2.85	2.28	80.1	41.8	-0.57	-0.67
Turkmenistan	6.50	6.17	95.0	72.0	-0.33	-0.61
Republic of Uzbekistan	6.35	6.28	98.9	56.0	-0.07	-1.01
3. down the Atamyrat GS ***)	12.48	12.13	97.2	66.4	-0.35	-1.38
<i>Including:</i>						
<i>Turkmenistan</i>	6.50	6.17	95.0	72.0	-0.33	-0.61
<i>Republic of Uzbekistan</i>	5.98	5.96	99.7	60.1	-0.02	-0.91
4. By sections:						
Upstream	3.22	2.60	80.9	41.9	-0.62	-0.70
<i>Including:</i>						
<i>Republic of Kyrgyzstan</i>	-	-	-	-	-	-
<i>Republic of Tajikistan</i>	2.85	2.28	80.1	41.8	-0.57	-0.67
<i>Surkhandarya, Uzbekistan</i>	0.37	0.32	86.9	0.0	-0.05	-0.10
Middle course	8.35	8.05	96.5	72.8	-0.30	-0.64
<i>Including:</i>						
<i>Turkmenistan</i>	5.10	4.70	92.2	60.7	-0.40	-0.64
<i>Republic of Uzbekistan</i>	3.24	3.35	103.1	74.0	0.10	-0.21
Downstream	4.13	4.09	98.8	33.8	-0.05	-0.81
<i>Including:</i>						
<i>Turkmenistan</i>	1.40	1.47	105.0	81.4	0.07	-0.07
<i>Republic of Uzbekistan</i>	2.74	2.62	95.6	10.3	-0.12	-0.81
5. Additionally:						
Sanitary-environmental water releases into downstream canals	0.80	0.79	99.0	-	-0.01	-
<i>Including:</i>						
<i>Turkmenistan</i>	0.15	0.15	100	-	0.0	-
<i>Republic of Uzbekistan</i>	0.65	0.64	98.4	-	-0.01	-
Water delivery to the Aral Sea and Priaralie	2.10	2.48	118.2	-	0.38	-

*) minimal registered water availability for ten-days period

**) Sum of minimal registered water deficits for ten-days periods; partially or fully covered by water surplus within the season up to "deficit for the season"

***) Atamyrat hydropost conditional (upstream to the water intake into Garagumdarya)

Table 2.2

Amudarya river's channel balance for nonvegetation period 2010-2011

Item	Water volume, km ³		Deviation (actual- plan)
	expected/ plan	actual	
1 Water content of the Amudarya river at the g/s Atamyrat conditional *	13,94	11,19	-2,75
2 Runoff regulation by the Nurek reservoir: addition to runoff (+) or withdrawal (-)	4,54	4,54	0,00
3 Water withdrawal of middle course (-)	8,35	8,05	-0,30
4 Return CDF in the middle course (+)	0,60	1,34	0,74
5 Runoff losses (-) or unaccounted inflow to the channel (+)	-0,37	-1,40	-1,03
<i>% of runoff in the section of g/s Atamyrat conditional</i>	2,6	12,4	9,8
6 Inflow to the Tuyamuyun hydroscheme (TMHS)	10,36	7,62	-2,74
7 Runoff regulation by TMHS reservoirs: addition to runoff (+) or withdrawal (-)	-0,08	0,31	0,38
8. Water losses in TMHS (-), lateral inflow (+)	-1,24	-2,17	-0,93
<i>% of inflow</i>	-12,0	-28,4	-16,4
9. Release from TMHS (including water withdrawal from reservoir)	10,29	7,93	-2,36
10 Downstream water withdrawal, including withdrawal from the TMHS (-)	4,13	4,09	-0,05
11 Return CDF in the downstream (+)	0,00	0,00	0,00
12 Sanitary-environmental water releases into downstream canals (-)	0,80	0,79	-0,01
13 Runoff losses (-) or unaccounted inflow to the channel (+)	-3,26	-0,57	
<i>% of runoff in the section of g/s Tuyamuyun</i>	-39,5	-9,7	
14 Water delivery to the Aral Sea and Priaralie	2,10	2,48	0,38
15 TOTAL: runoff losses (-) or unaccounted inflow to the channel (+)	-4,87	-4,14	
<i>16 % of regulated runoff</i>	-26,4	-26,3	

* after deduction of water withdrawal of upstream (Tajikistan, Surkhandarya region)

Table 2.3

**Water balance of reservoirs in the Amudarya river basin
for nonvegetation period 2010-2011**

Items	Water volume, km ³		Deviation (actual-plan)
	expected/ plan	actual	
1. Nurek reservoir			
1.1 Inflow to the reservoir	3.48	3.82	0.35
1.2 Water volume in the reservoir:			
- at the beginning of the season (1 October 2010)	10.54	10.54	0.0
- at the end of the season (31 March 2011)	6.0	6.0	0.0
1.3 Release from the reservoir	8.02	8.36	0.35
1.4 unaccounted inflow (+) or water losses (-)	0.0	0.0	0.0
<i>% of inflow to the reservoir</i>	<i>0.0</i>	<i>-0.03</i>	<i>-0.03</i>
1.5 Runoff regulation: addition to runoff (+) or withdrawal (-)	4.54	4.54	0.0
2. TMHS reservoirs			
2.1 Inflow to TMHS	10.36	7.62	-2.74
2.2 Water volume in the reservoirs:			
- at the beginning of the season (1 October 2010)	5.63	5.63	0.0
- at the end of the season (31 March 2011)	4.46	3.16	-1.30
2.3 Release from waterworks facility	10.29	7.93	-2.36
Including:			
- release to the river	8.24	5.85	-2.40
- water withdrawal	2.05	2.08	0.03
2.4 unaccounted inflow (+) or water losses (-)	- 1.24	- 2.17	-0.92
<i>Including: % of inflow to the reservoir</i>	<i>-12.0</i>	<i>-28.4</i>	<i>-16.43</i>
2.5 Runoff regulation: addition to runoff (+) or withdrawal (-)	-0.08	0.31	+0.38
TOTAL runoff regulation by reservoirs: addition to runoff (+) or withdrawal (-)	4.46	4.84	+0.38