

ANALYSIS OF WATER MANAGEMENT SITUATION WITHIN THE AMUDARYA AND SYRDARYA RIVER BASINS FOR THE NONVEGETATION PERIOD OF 2011/2012

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 5.53 km³ or 113.7% flow rate. To this water volume additional releases from the upstream reservoirs accumulated during vegetation period were 6.7 km³ that is 1.7 km³ less the planned one. Actual release from them for the nonvegetation period was 12.23 km³ that is 7.0% more the release of non-vegetation period of 2010-2011.

The total channel inflow to Naryn and Syrdarya up to the Shardara reservoir including releases to the Karadarya and Chirchik rivers amounted 8.88 km³; this gave possibility to increase the available regulated water resource of the basin up to 18.61 km³ (it was 20.0 km³ in the non-vegetation period of 2010-2011).

At the end of nonvegetation period 14.46 km³ of water was accumulated in the upstream reservoirs including 13.22 km³ or 86 % of the scheduled one in 2010-2011 - in the Toktogul reservoir.

For past five years (2007-2008...2011-2012) the mean annual inflow to the Toktogul reservoir amounted 13.84 km³ including 3.28 km³ for nonvegetation period. Inflow for nonvegetation period 2011-2012 was 3.4 km³ that is actually equal to the inflow for past five years.

For last 5 years the release from the Toktogul reservoir for nonvegetation period amounted 8.06 km³. Water volume released for nonvegetation period 2011-2012 (Table 1.4) amounted 8.0 km³ or 1.64 km³ less than the mean release for last 5 years. Therefore it was not possible to save water in the Toktogul reservoir needed to the beginning of vegetation period of 2012 at the same level as in the past year.

The total water withdrawal from Syrdarya river amounted 4.2 km³ or 135% of scheduled one in past year including for: Kyrgyz Republic - 0.03 km³, Republic of Tajikistan - 0.014 km³, Republic of Uzbekistan - 2.483 km³, Republic of Kazakhstan (through the Dustlik canal) - 0.158 km³. Moreover Uzbekistan allocated 1.505 km³ of water in its irrigation systems to decrease inflow to the Shardara reservoir. Uzbekistan also took 1.592 km³ of water for the Arnasay lake to decrease flow in the stem stream of the Syrdarya river.

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/). While a season water availability amounted 135%, a ten-day water availability in some ten-day periods for that season on some sites decreased to 1-3%.

Actual inflow to the Shardara reservoir for nonvegetation period 2011-2012 amounted 15.97 km³ or 1.83 km³ more in comparing with schedule of previous non-vegetation period.

Water consumption downstream the Shardara reservoir, including water withdrawal downstream the Shardara reservoir, Koksaray reservoir filling and water losses, all this amounted 7.73 km³ or 3.28 km³ more than in the non-vegetation period of 2010-2011!

The actual water delivery to the Aral Sea and Piaralie amounted 2.69 km³.

Table 1.1

**Indicators of state's water availability in the Syrdarya river basin
for the nonvegetation period 2011-2012**

Water user	Water volume, km3		Water availability, %		Water deficit, km3	
	Limit/schedule *)	Actual	Season	Min ten-day period **)	Season	Sum, ten-day period ***)
1. Total withdrawal	3,107	4,206	135,4	52,5	1,10	-0,12
2. By states:						
Kyrgyz Republic	0,037	0,030	81,8	13,9	-0,01	-0,02
Republic of Uzbekistan	2,484	4,003	161,2	49,9	1,52	-0,06
Republic of Tajikistan	0,180	0,014	7,8	0,4	-0,17	-0,17
Republic of Kazakhstan	0,407	0,158	39	0,9	-0,25	-0,36
3. By sections:						
Toktogul reservoir - Uchkurgan waterworks facility	1,329	1,676	126,1	73,5	0,35	-0,09
<i>Including:</i>						
<i>Kyrgyz Republic</i>	0,030	0,028	94,9	13,9	-0,002	-0,012
<i>Republic of Tajikistan</i>	0,047	0,011	22,9	2,0	-0,036	-0,041
<i>Republic of Uzbekistan</i>	1,252	1,637	130,7	77,5	0,385	-0,048
Uchkurgan waterworks facility – Kairakkum waterworks facility	0,222	0,471	212,4	95,9	0,249	-0,001
<i>Including:</i>						
<i>Kyrgyz Republic</i>	0,007	0,002	29,4	21,4	-0,005	-0,005
<i>Republic of Tajikistan</i>	0,043	0,000	0,3	1,4	-0,043	-0,043
<i>Republic of Uzbekistan</i>	0,171	0,469	274,0	168,3	0,298	-0,000
Kairakkum waterworks facility – Shardara reservoir	1,556	2,059	132,3	2,6	0,50	-0,25
<i>Including:</i>						
<i>Republic of Kazakhstan</i>	0,407	0,158	39	0,9	-0,25	-0,36
<i>Republic of Tajikistan</i>	0,089	0,003	3,5	18,6	-0,09	-0,09
<i>Republic of Uzbekistan</i>	1,060	1,898	179,0	2,7	0,84	-0,15
4. Inflow to the Shardara reservoir	17,120	15,842	92,5			
Release to Arnasay	1,1	1,59	144,8		0,5	
Water delivery to the Aral Sea and Priaralie	5,18	2,69	51,9			

*) according to actual data of non-vegetation period of 2010-2011

**) minimal registered water availability for ten-day period

***) Sum of registered water deficits for ten-day periods

Table 1.2

Syrdarya river channel balance for nonvegetation period 2011-2012

Item	Water volume, km3		Deviation (actual-plan)
	expected/ plan*	actual	
1 Inflow to the Toktogul reservoir	3,90	3,41	-0,490
2 Lateral inflow at the Toktogul reservoir – Shardara reservoir section (+)	11,90	8,88	-3,02
<i>Including:</i>			
<i>Release along the Karadarya river</i>	2,04	2,25	0,21
<i>Release along the Chirchil river</i>	1,44	1,69	-0,25
<i>Lateral inflow from CDF¹ and small rivers</i>	8,42	4,94	-3,48
3 Streamflow regulation by reservoirs: adding to runoff (+) or removal from runoff (-)	4,18	6,32	2,14
<i>Including:</i>			
<i>Toktogul reservoir</i>	4,10	6,32	2,22
<i>Kayrakkum reservoir</i>	0,08	0,0	-0,08
4 Regulated runoff (1+2+3)	19,98	18,61	-1,37
5 Water withdrawal at the Toktogul – Shardara section (-)	4,82	4,21	-0,61
6 Runoff losses (-) or unaccounted inflow to the channel (+) at the Toktogul – Shardara section	1,01	1,57	0,56
<i>Including % of regulated runoff</i>	5,08	10,0	
7 Inflow to the Shardara reservoir	14,14	15,97	1,83
8 Runoff regulation by the Shardara reservoir addition to runoff (+) or withdrawal (-)	-4,980	-3,431	1,549
9 Water release from the Shardara reservoir	9,64	10,39	0,75
10. Water release to the Kzylkum canal (-)	0,28	0,56	0,28
11 Release to Arnasay (-)	0,20	1,59	1,39
12 Amount of water used in the lower reaches: algebraic sum of withdrawal (-), lateral inflow (+), water losses (-)	-4,45	-7,73	-3,28
13 Water delivery to the Aral Sea and Priaralie	5,18	2,69	-2,49

*) According actual data for non-vegetation period of 2010-2011

¹ CDF-collector-drainage flow

Table 1.3

Water balance of reservoirs in the Syrdarya river basin for nonvegetation period 2011-2012

Water balance item	Water volume, km ³		Deviation (actual-plan)
	expected/plan *	Actual	
1. Toktogul reservoir			
1.1 Inflow to the reservoir	3,896	3,408	0,49
1.2 Water volume in the reservoir:			
- at the beginning of season (1 October 2010)	19,509	19,541	0,03
- at the end of season (1 April 2011)	15,398	13,219	-2,18
1.3 Water release from the reservoir	8,000	9,730	1,73
1.4 Unaccounted inflow (+) or water losses (-)	-0,01	0,000	-0,01
<i>Including % of inflow to the reservoir</i>	-0,2	0,0	-0,2
1.5 Streamflow regulation: adding to runoff (+) or removal from runoff (-)	4,104	6,322	2,22
2. Andijan reservoir			
2.1 Inflow to the reservoir	1,143	0,913	-0,23
2.2 Water volume in the reservoir:			
- at the beginning of season (1 October 2010)	1,419	0,672	-0,75
- at the end of season (1 April 2011)	1,427	0,743	-0,68
2.3 Water release from the reservoir	1,144	0,830	-0,31
2.4 Unaccounted inflow (+) or water losses (-)	0,01	-0,012	-0,02
<i>Including % of inflow to the reservoir</i>	0,8	-1,3	-0,5
2.5 Streamflow regulation: adding to runoff (+) or removal from runoff (-)	0,001	-0,083	-0,08
3. Charvak reservoir			
3.1 Inflow to the reservoir	1,401	1,208	-0,19
3.2 Water volume in the reservoir:			
- at the beginning of season (1 October 2009)	1,858	1,182	-0,68
- at the end of season (31 March 2010)	0,747	0,496	-0,25
3.3 Water release from the reservoir	2,262	1,67	-0,59
3.4 Unaccounted inflow (+) or water losses (-)	-0,25	-0,22	0,03
<i>Including % of inflow to the reservoir</i>	-17,86	19,0	1,14
3.5 Streamflow regulation: adding to runoff (+) or removal from runoff (-)	0,861	0,462	-0,4
4. Kairakkum reservoir			
4.1 Inflow to the reservoir	13,369	14,84	1,47
4.2 Lateral inflow	0,255	0,271	0,02
4.3 Water volume in the reservoir:			
- at the beginning of season (1 October 2010)	3,379	1,53	-1,85
- at the end of season (1 April 2011)	3,331	3,39	0,06
4.4 Water release from the reservoir	13,703	14,84	1,14
<i>Including:</i>			
- release to the river	13,65	14,79	1,14
- water withdrawal from the reservoir	0,05	0,05	-0,03
4.5 Unaccounted inflow (+) or water losses (-)	0,03	1,86	1,83
<i>Including % of inflow to the reservoir</i>	0,2	12,5	
4.6 Streamflow regulation: adding to runoff (+) or removal from runoff (-)	0,078	0,0	-0,078
5. Shardara reservoir			
5.1 Inflow to the reservoir	14,142	15,971	1,83
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	1,118	0,08
- at the end of season (31 March 2010)	4,973	5,132	0,16
5.4 Water release from the reservoir	10,11	12,54	2,43

Water balance item	Water volume, km ³		Deviation (actual-plan)
	expected/plan *	Actual	
<i>Including:</i>			
- release to Arnasay	0,197	1,592	1,40
- release to the river	9,64	10,39	0,75
- water withdrawal from the reservoir	0,276	0,556	0,28
5.5 Unaccounted inflow (+) or water losses (-)	-0,10	0,583	0,68
<i>Including % of inflow to the reservoir</i>	-0,7	3,7	3,0
5.6 Streamflow regulation: adding to runoff (+) or removal from runoff (-)	4,033	-3,431	0,6
TOTAL: Streamflow regulation: adding to runoff (+) or removal from runoff (-)	9,08	3,27	-5,81
TOTAL: Unaccounted inflow (+) or water losses (-)	-0,32	2,20	2,52

*) According actual data for non-vegetation period of 2010-2011

Table 1.4

Inflow to and release from the Toktogul reservoir for 2007-2012

n	Hydrologic year	Inflow, million m3			Release, million m3		
		Nonvegetation period	Vegetation period	Year	Nonvegetation period	Vegetation period	Year
1	2007-2008	2505	7371	9876	9726	4408	14134
2	2008-2009	2672	9876	12548	5884	5748	11632
3	2009-2010	3898	15244	19142	6965	5445	12410
4	2010-2011	3896	9888	13784	8000	5714	13714
5	2011-2012	3408			9730		
	Average for 5 years	3276	10595	13837	8061	5329	12973

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 13.33 km³ that is 10 % less than the expected (planned) one of the BWO "Amudarya".

91.5% of defined water withdrawal limit in the Amu Darya River Basin was implemented, and total water withdrawal amounted to 14.4 km³, including 12.15 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 8.5%, including within the Republic of Tajikistan - 31%, the Republic of Uzbekistan - 4%, Turkmenistan - 3%. But in some ten-day periods downstream water availability was reduced to 12-16% (November, February) in Turkmenistan, and in Uzbekistan - up to 2-6% (1st and 2d ten-day period of February). It was planned to deliver 80-360 m³/sec of water in February to wash soils in the lower reaches in Uzbekistan but this measure was stopped because of strong frost.

At the end of season 6.0 km³ of water was stored in the Nurek reservoir as was planned by the BWO "Amudarya", and in the TMHS reservoirs 3.28 km³ of water was accumulated (see Table 2.3).

The additional water volume to the river flow due to Nurek reservoir's drawdown amounted 4.47 km³. There is no water losses and unaccounted inflow to the Nurek reservoir.

The water losses in the TMHS reservoirs amounted 1.49 km³ (14.9% of water inflow) and in the Tuyamuyun-Samanbay river section - 1.56 km³ or 27% of water flow at the Tuyamuyun hydropost. Water losses in the river section upstream the TMHS amounted 1.23 km³.

Thereby, the total actual water losses from river channel and reservoirs amounted 4.27 km³ or about 24% of river flow at the Atamyrat G/S (see table 2.4).

The defined limit of sanitary-environmental water releases into the Amudarya downstream canals was implemented by 96%; water delivery amounted 0.77 km³. Water delivery to the Aral Sea and Priaralie amounted 1.05 km³ or 50% of planned flow (see Table 2.2).

Table 2.1

**Indicators of state's water availability in the Amudarya river basin
for nonvegetation period 2011-2012.**

Water user	Water volume, km ³		Water availability, %		Deficit, km ³	
	limit/ schedule	actual	Season	Min ten-day period)	Season	Sum, ten-day period)
1. Total withdrawal	15.70	14.36	91.5	52.2	-1.34	-1.86
2. By countries:						
Republic of Kyrgyzstan	-	-	-	-	-	-
Republic of Tajikistan	2.85	1.97	69.3	43.4	-0.88	-0.88
Turkmenistan	6.50	6.17	96.9	68.2	-0.20	-0.61
Republic of Uzbekistan	6.35	6.30	95.9	34.5	-0.26	-1.03
3. down the Atamyrat GS ***)	12.48	12.15	97.4	52.4	-0.33	-1.11
<i>Including:</i>						
<i>Turkmenistan</i>	6.50	6.30	96.9	68.2	-0.20	-0.61
<i>Republic of Uzbekistan</i>	5.98	5.85	97.9	36.4	-0.13	-0.91
4. By sections:						
Upstream	3.22	2.21	68.6	44.6	-1.01	-1.01
<i>Including:</i>						
<i>Republic of Kyrgyzstan</i>	-	-	-	-	-	-
<i>Republic of Tajikistan</i>	2.85	1.97	69.3	43.4	-0.88	-0.88
<i>Surkhandarya, Uzbekistan</i>	0.37	0.23	63.3	50.0	-0.14	-0.15
Middle course	8.35	7.96	95.4	76.8	-0.38	-0.65
<i>Including:</i>						
<i>Turkmenistan</i>	5.10	4.78	93.6	72.9	-0.32	-0.37
<i>Republic of Uzbekistan</i>	3.25	3.19	98.2	73.4	-0.06	-0.35
Downstream	4.14	4.19	101.4	12.7	0.06	-0.85
<i>Including:</i>						
<i>Turkmenistan</i>	1.40	1.52	108.9	37.8	0.12	-0.43
<i>Republic of Uzbekistan</i>	2.73	2.67	97.5	2.1	-0.07	-0.73
5. Additionally:						
Sanitary-environmental water releases into downstream canals	0.80	0.77	96.0	-	-0.03	-
<i>Including:</i>						
<i>Turkmenistan</i>	0.15	0.15	100	-	0.0	-
<i>Republic of Uzbekistan</i>	0.65	0.62	95.6	-	-0.03	-
Water delivery to the Aral Sea and Priaralie	2.10	1.05	49.9	-	-1.05	-

*) 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 2011-2012

Item	Water volume, km ³		Deviation (actual-plan)
	expected/plan	actual	
1 Water content of the Amudarya river at the g/s Atamyrat conditional *	12,09	13,33	1,24
2 Runoff regulation by the Nurek reservoir: addition to runoff (+) or withdrawal (-)	4,57	4,47	-0,1
3 Water withdrawal of middle course (-)	8,35	7,96	-0,38
4 Return CDF in the middle course (+)	0,64	1,37	0,72
5 Runoff losses (-) or unaccounted inflow to the channel (+)	-0,23	-1,23	-1,00
<i>% of runoff in the section of g/s Atamyrat conditional</i>	1,91	9,58	7,67
6 Inflow to the Tuyamuyun hydroscheme (TMHS)	8,73	9,98	1,25
7 Runoff regulation by TMHS reservoirs: addition to runoff (+) or withdrawal (-)	-1,94	-2,41	-0,47
8. Water losses in TMHS (-), lateral inflow (+)	-1,4	-1,49	-0,09
<i>% of inflow</i>	-16,0	-14,9	-1,1
9. Release from TMHS (including water withdrawal from reservoir)	6,79	7,67	0,78
10 Downstream water withdrawal, including withdrawal from the TMHS (-)	4,14	4,19	0,05
11 Return CDF in the downstream (+)	0,00	0,00	0,00
12 Sanitary-environmental water releases into downstream canals (-)	0,80	0,77	-0,03
13 Runoff losses (-) or unaccounted inflow to the channel (+)	0,25	-1,56	-1,31
<i>% of runoff in the section of g/s Tuyamuyun</i>	6,0	27,0	
14 Water delivery to the Aral Sea and Priaralie	2,10	1,05	-1,05

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

** G/S Darganata

Table 2.3

**Water balance of reservoirs in the Amudarya river basin
for nonvegetation period 2011-2012**

Item	Water volume, km ³		Deviation (actual-plan)
	expected/plan	expected/plan	
1. Nurek reservoir			
1.1 Inflow to the reservoir	3.78	3.57	0.22
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	6.06	0.06
1.3 Release from the reservoir	8.35	8.04	-0.31
1.4 unaccounted inflow (+) or water losses (-)	0.03	0.01	-0.02
<i>% of inflow to the reservoir</i>	<i>0.78</i>	<i>0.00</i>	<i>-0.78</i>
1.5 Runoff regulation: addition to runoff (+) or withdrawal (-)	4.57	4.47	-0.1
2. TMHS reservoirs			
2.1 Inflow to TMHS	8.73	9.98	1.25
2.2 Water volume in the reservoirs:			
- at the beginning of the season (1 October 2010)	2.36	2.36	0.0
- at the end of the season (31 March 2011)	2.90	3.28	0.38
2.3 Release from waterworks facility	6.79	7.57	0.78
Including:			
- release to the river	4.48	5.69	1.21
- water withdrawal	2.31	1.88	-0.43
2.4 unaccounted inflow (+) or water losses (-)	-1.40	-1.49	-0.09
<i>Including: % of inflow to the reservoir</i>	<i>-16.0</i>	<i>-14.9</i>	<i>-1.1</i>
2.5 Runoff regulation: addition to runoff (+) or withdrawal (-)	-1.94	-2.41	-0.47
TOTAL runoff regulation by reservoirs: addition to runoff (+) or withdrawal (-)	2.63	2.06	-0.57

Table 2.4

Water losses (-) of the Amudarya river for non-vegetation period 2011-2012

River site	Plan, km3	Actual, km3
Nurek reservoir	0,03	0,01
middle course	-0,23	-1,23
Tyuyamuyun reservoir	-1,40	-1,49
lower course	0,25	-1,56
Total:	-1,35	-4,27
% of regulated runoff	8,1	24,0