

Analysis of water management situation on the Amudarya and Syrdarya river basins for the period of vegetation and mean vegetation of 2008

(as of 11. 21. 08)

Water management situation for vegetation and mean periods on the Syrdarya and Amudarya rivers has been analyzed in line with the following indices:

- Water content – by tributaries to upper water reservoirs (Toktogul, Andidjan, Charvak, Nurek) and channel inflow to the rivers, with forecasted and actual data correlation;
- Water reservoirs regimes – by timetables of reservoirs filling, tributaries and releases from them through planned and actual data correlation;
- Timetables of water distribution – deficit periods, water availability and steadiness of water delivery through planned (allocated water amount quotas) and actual data correlation.

1. Vegetation period

1.1. The Syrdarya river basin

Water content in rivers of the basin, made up as the aggregate of tributaries inflow to the upper water reservoirs and channel inflow, had been forecasted at the level of 74 % of the norm. Actual water content turned out to be 67 %, being below the forecasted value by 2.0 km^3 (7 %).

Actual tributary inflow to the Toktogul water reservoir came to 7.42 km^3 - or 73 % of the average amount of inflow for the last 10 years (1999-2008).

Inflow to the Charvak water reservoir turned out to be below the forecasted one (by 15%) - 3.7 km^3 ; as to the inflow to the Andidjan water reservoir, it went beyond the forecasted value (by 6%) - 1.6 km^3 , partially compensating insufficient inflow to the Toktogul water reservoir.

The aggregate of tributaries inflow to water bodies along the sections: - Toktogul – Uchkurgan, Andidjan – Uchtepe and Uchkurgan, Uchtepe – Kairakkum, (water discharge to the Naryn, Karadarya, Syrdarya rivers along small rivers and return flow) was close to the forecasted amount of 5.2 km^3 as well as water content within the basin section down to the Kairakkum water reservoir (14.2 km^3), the deviation - 2 %.

Within the section of Kairakkum – Shardaara the tributary inflow (0.9 km^3) constituted about 30 % of the norm and was below the forecasted value by 60 %; in the section Gazalkent – Chinaz – Chirchik it was below the forecasted value by 7 %, resulting in decline of water content in the river down stream in the Kairakkum water reservoir outlet.

Actual releases from the Toktogul (4.4 km^3) water reservoir exceeded the releases schedule set by the “Kyrgyzenergo” (3.2 km^3) by 37 %, in April – May (to meet own demands), and beginning from the second decade of July owing to purchase of energy from Kazakhstan. Actual releases from the Charvak water reservoir (3.0 km^3) were below the planned schedule by approximately 20 %. Releases from the Andidjan water reservoir (2.0 km^3) exceeded the BWO planned releases, designed for feeding GFC zones which are in very short water supply, by 1.7 km^3 or 17 %.

By the end of the season the Toktogul reservoir was filled to 9.6 km^3 or up to 88 % of the expected volume (as compared to the volume on the same date in 2007 – by 70 %), the Andidjan reservoir by 0.36 km^3 (76 %), the Charvak reservoir by 0.93 km^3 (80 %).

Regimes of water reservoirs were characterized by irregularity within the season.

Releases from the Kairakkum water reservoir (5.2 km^3) turned out to be below the schedule by 9%, however, by the end of the season management failed to maintain the planned volume of water in the reservoir – 0.82 km^3 (81% of the plan).

The planned releases from the Kairakkum water reservoir in June – July had been set as $400\text{-}500 \text{ m}^3/\text{s}$; actually the values changed within the range of $280 \text{ m}^3/\text{s}$ - $440 \text{ m}^3/\text{s}$.

Inflow to the Shardara water reservoir was about 1.3 km³, releases – 6.4 km³ that is beyond the planned schedule by approximately 6 %. At that, though by the end of the season the planned amount of water was achieved, but this volume was marked as one of the most minimal that had been observed whenever (0.93 km³).

Analysis of water delivery has been conducted with regard to balance sections, countries-water users in comparison with actual water abstraction and quotas for water abstraction based on average values for the period of last 10 years (1999 - 2008) and for 2008. Evaluation has been made by indices of water availability and delivery consistency.

Analysis as applied to the section covering waterway up the Shardara reservoir revealed the following:

- Water abstraction quota for 2008 in whole of the basin constituted 101 % of the average quota for the last 10 years, including: Kyrgyzstan (88 %), Uzbekistan (101 %), Tajikistan (103 %), and Kazakhstan (107 %);
- Actual water abstraction as of 2008 in whole of the basin constituted about 74 % of 2008 quota, including: Kyrgyzstan 66 %, Uzbekistan 75 %, Tajikistan 66 %, and Kazakhstan 84 %;
- Actual water delivery is distributed by countries as follows: Kyrgyzstan – 1.5 %, Uzbekistan – 76.2 %, Tajikistan – 14.6 %, and Kazakhstan - 7.7 %, being close to the planned water allocation quotas.

Water availability has been irregular - with regard to both by countries (sections) and periods (within the season).

Water delivery in Kyrgyzstan (by availability rates) within the section Toktogul - Uchkurgan turned out to be higher than that in the Uchkurgan – Kairakkum section. A reverse situation is in Tajikistan: water availability is smallest within the Uchkurgan – Kairakkum section, whereas it is the greatest at the Toktogul – Uchkurgan section. The least water availability has been observed in Uzbekistan within the section downstream of the Kairakkum hydro scheme, whereas maximum has been fixed at the Toktogul – Uchkurgan section.

Water availability had been changing in June-July at the Toktogul - Kairakkum section within the range of 57 % up to 84 %, including Kyrgyzstan - from 53 % up to 62 %, Tajikistan – from 68 % up to 80 %, Uzbekistan – from 54 % up to 87 %. Within the section of Kairakkum - Shardara water availability for Kazakhstan during this period had been changing within the range of 31 % - 112 %, for Tajikistan - from 58 % up to 78 %, Uzbekistan - from 46 % up to 60 %.

The lowest water availability by the basin in whole was marked in the first decade of July showing - 57 %, in Kyrgyzstan, in the third decade of June – 53 %, in Uzbekistan in the second decade of July – 58 %, in Tajikistan, in the second decade of April - 43 %, in Kazakhstan in the first decade of July – 31 %.

As to indices of water delivery steadiness, while applied to canals at all irrigation system sections there were most critical periods in April, as well as from May till the end of June. Extremely irregular was water delivery provided during some periods in Kazakhstan (May, June, September), in Tajikistan (April, the early May), more steadily – in Uzbekistan and Kyrgyzstan.

Actual water delivery to Priaralye constituted 1.3 km³, whereas the planned volume was 1.8 km³.

Thus, due to natural shortage of water and because of the virtually empty Toktogul water reservoir, an extremely critical situation occurred by the beginning of the vegetation period regarding water resources use – to tackle this problem water managers tried to reduce quotas for water withdrawal and additional releases exceeding energy demands of Kyrgyzstan in the amount of 600 million m³ (due to purchase by Kyrgyzstan electric energy from Kazakhstan). However, this was not sufficient. Actual overall water deficit in the Syrdarya river basin constituted about 3.2 m³, value of water availability – approximately 74% (during some months reduced down to 45 -50 %), with expected damage, for Uzbekistan only, of 180-200 million USA dollars (according to preliminary evaluation by SIC ICWC).

Calculations show that to prevent damages caused by releases from the Toktogul the amount of 600 million m³ obviously is not enough; it is necessary to increase the volume by somewhat 1.5-2 km³. This will not eliminate water deficit completely but bring it up to an acceptable value – thus ensuring actual elimination of damages. At that, expenses of Kyrgyzstan on purchase of summer electric power will not exceed 100 million USA dollars (even at the price 0.05 \$ for kilowatt) – this being less than expected damages.

It is necessary to underline that the Toktogul reservoir failed to act as a multi-year regulator and therefore had not retained necessary volume of water by the beginning of the 2008 vegetation, that could have secured (on the agreement between the countries) coverage of the expected water deficit caused by natural low water level.

While managing multi-year regulation it is necessary to maintain average volumes of releases (average for the period of 5-10 years) equal to inflow norms – that is average multi-year inflow for the period of 1911-2007 (11.8 km³). This has not occurred and releases from the Toktogul for the last 5 years have been upon the average exceeding the inflow norm (11.8 km³) by 3.0 km³/year; see Tables 1.1 – 1.3. In other words, the additional resource accumulated for the last 5 high water level years (surplus of inflow over the norm) has been used for the sake of the energy sector's commercial interests, but not for building-up guaranteed reserve of water in the reservoir against water scarcity. .

This situation could have been avoided if the “Kyrgyzenergo” would not exceeded annual aggregate releases at the amount of 12.2 km³ - as it had been suggested in the Draft Agreement on the Syrdarya river. This suggestion was flatly rejected in the process of the discussion by representatives of the Kyrgyz energy sector, who are now “reaping the fruits of their own labor”.

Since the next period (starting from 2008) is expected to be low water, then inflow to the Toktogul will be lower than the norm, and the Toktogul water reservoir will be able to operate mainly in the seasonal regime.

Comparison of vegetation inflow and releases from the Toktogul water reservoir for the last 5 years shows (Tables 1.1-1.2) that during the most intensive period – June-July – releases in 2008 were less than average values by 0.7 km³. Releases from the water reservoir in June-July 2008 (1.5 km³) were less than natural inflow (3.1 km³) by more than 2 times, at that, natural inflow in June-July 2008 was less average figures for the last 5 years by 2.3 km³.

Table 1.1 Releases from the Toktogul water reservoir, million m³

№	Years	April	May	June	July	August	September	Total
1	2003	1054	587	300	644	1165	1143	4894
2	2004	893	725	1134	1163	1240	1070	6226
3	2005	936	560	2367	984	1045	937	6829
4	2006	1008	604	760	1027	1064	954	5418
5	2007	802	670	1056	1355	1208	766	5857
6	Average 5 years	938	629	1123	1035	1145	974	5845
7	2008	775	588	601	894	967	584	4408
8	№6 - №7	164	41	523	141	178	390	1436

Table1.2 Inflow to the Toktogul water reservoir, million m³

№	Years	April	May	June	July	August	September	Total
1	2003	823	2131	3603	2821	1638	1164	12179
2	2004	811	2024	3585	2897	1619	1109	12045
3	2005	1095	2113	2825	2357	1524	778	10692
4	2006	894	1951	3142	1943	1429	1003	10362
5	2007	1204	1819	1913	1806	1332	837	8911
6	Average 5 years	965	2008	3014	2365	1508	978	10838
7	2008	681	1658	1817	1308	1212	695	7371
8	№6 - №7	284	350	1197	1056	296	283	3467

Таблица 1.3 Inflow and release with regard to the Toktogul water reservoir, million m³

№	hydrological year	Inflow			Release		
		low stage	vegetation	year *	low stage	vegetation	year
1	2002-2003	3697	12179	15876	8503	4894	13397
2	2003-2004	3654	12045	15699	8478	6226	14704
3	2004-2005	3767	10692	14459	9045	6829	15874
4	2005-2006	3496	10362	13858	9082	5418	14500
5	2006-2007	3157	8911	12068	9538	5857	15395
6	Average for 2002-2007гг	3554	10838	14392	8929	5845	14774
7	2007-2008	2505	7371	9876	9726	4408	14134
8	№6 - №7	1049	3467	4516	-797	1436	640

* average multi-year (1911 - 2007) 11.8 km³

1.2 The Amudarya river basin

Actual water content of the Amudarya River at the "Atamurat" section line (upstream of water intake to the Karakum canal) constituted 22.6 km³ or 57 % of the norm.

Compared to the estimated values of BWO "Amudarya", the actual water content turned out to be 29.1 km³ that is lower than the calculated figures by 6.5 km³.

Actual inflow to the Nurek ware reservoir constituted 15.3 km³, being close to the upper threshold of the forecast (13-16 km³). Releases from the Nurek water reservoir constituted 11.8 km³ being close to the planned values (11.7 km³). By the end of the vegetation 9.6 km³ of water had been accumulated in reservoir (at the planned amount – of 10 km³).

The actual inflow to the TMHS constituted 8.6 km³ (at the estimated amount of 14.9 km³), releases - 9.2 km³ (estimated - 12.7 km³). The actual impoundment by the end of vegetation reached the level of 2.1 km³, being less than the planned by 1.1 km³.

Water losses at the "Bir-Ata – hp/Tuyamuyun" section according to balance calculations (see the Table 1.4) are equal to zero. Null of losses may be explained by the fact that the in-channel basin was in operation at lower level marks (April – 119 m, May – 117 m, June – 1120 m, July – 121 m, August – 117 m, September – 120 m).

Table 1.4: Water balance in the Tuyamuyun water reservoir for vegetation

№	Balance item	Water volume, km ³
1	Inflow to the TMHS (hp/"Bir-Ata")	8.6
2	Water volume in the reservoir at the beginning of vegetation	2.73
3	Water volume in the reservoir by the end of vegetation	2.12
4	Drawdown of the reservoir (2-3)	0.61
5	Total resource use (1+4)	9.21
6	Releases from the reservoir (ware abstraction and discharge to the river)	9.21
7	Losses (5-6)	0.0

Water losses at the "Tuyamuyun - Samanbay" section constitutes about 2.7 km³. (Table 1.5)

Table 1.5: Water balance of the Amudarya River at the "Tuyamuyun - Samanbay" section during vegetation of 2008.

№	Balance item	Water volume, km ³
1	Release from the TMHS to the river	6.74
2	Channel inflow	0.2
3	Total resources (1+2)	6.94
4	Water abstraction from the river at the "Tuyamuyun - Samanbay" section	4.11
5	Runoff at the Samanbay section line	0.4
6	Total runoff discharge (4+5)	4.51
7	Losses (3-6)	2.43

Actual water abstraction within the basin constitutes 26.1 km³, at the allocation quota of 35.6 km³, availability – 73%, including Tajikistan – 94%, Uzbekistan – 64%, Turkmenistan – 74%. The least of water availability level was observed in the lower reaches – 46%; in Uzbekistan - 45%, in Turkmenistan - 48%.

As to consistency of water delivery to the canals, there were most serious problems in Uzbekistan in the lower reaches in May (74%), and in Turkmenistan (55%).

Due to acute water deficit, water delivery to Priaralye constituted only 393 million m³, that being evidently insufficient fraught with abrupt decline in bio-productivity of the Amudarya delta.

2. Low-flow period

2.1. The Syrdarya river basin

Actual water content (by inflow to the upstream water reservoirs - Toktogul, Andidjan, Charvak) constituted for this period 1.5 km³, that is 97% of the forecasted volume or 77 % of the norm (1.95 km³).

Channel inflow (without the section along the Chirchik river) is estimated as 2.0 km³, that being close to the forecasted value and constitutes 62 % of the norm (3.22 km³).

Actual inflow to the Toktogul ware reservoir constitutes for this period 0.88 km³ or 104% of the expected value, and actual releases from the water reservoir was - 1.35 km³, and constituted 136 % of the plan. Consequently, by the end of the period 9.1 km³ had been accumulated in the water reservoir that being less than the planned volume by 0.6 km³. It should be noted that the Toktogul reservoir drawdown has been carried out at a more rapid pace than it had been stipulated by the Protocol between the states.

Thus, it is expected that by the beginning of vegetation the Toktogul water reservoir (considering adjustment to its actual regime) will be drawdown to the inactive storage capacity (5.5 km³).

In the Andidjan water reservoir 0.32 km³ (0.44 km³ - planned) were accumulated, in the Charvak - 0.9 km³ (0.82 km³ - planned). Total actual inflow to these water reservoirs constituted 0.62 km³, and release – 0.66 km³.

Total actual release from the upstream water reservoirs constituted 2 km³ or 122 % of the planned value. Consequently, by the end of the period 10.3 km³ were accumulated in these reservoirs that being by 0.63 km³ less than the planned volume. Total volume of water could have been even less if only the Charvak was not filled with more water than it had been planned.

In the Kairakkum water reservoir 1.4 km³ (1.2 km³ - planned) had been accumulated by the end of the period; at that, actual release was 1.7 km³ and exceeded the planned level by 0.2 km³.

Inflow to the Chardara water reservoir constituted for the period about 1.4 km³ that being less than the planned volume by 0.73 km³, at the same time the release (including water intake into the Kyzyl-Kum canal) constituted – 0.52 km³, that being less than the planned by nearly 0.7 km³. Owing to this 2 km³ of water had been accumulated in the reservoir – more than the planned by 0.2 km³.

Actual water delivery to Priaralye constituted about 0.08 km³, while the plan was 0.3 km³.

2.2 The Amudarya river basin

Actual water content of the river for this period (at the Atamurat post) constituted 2.3 km³ (0.42%).

Inflow to the Nurek water reservoir constituted 1.2 km³ (the forecast was 1.1 km³), and the release was 2.1 km³ (the plan was 2.0 km³), consequently, the planned volume of 8.7 km³ was accumulated by the end of the period.

Inflow to the TMHS was about 0.92 km³ (the plan was 0.84 km³), the release - 0.88 km³ (the plan - 0.89 km³), 2.17 km³ were accumulated (the plan was 2.06 km³).

Calculated losses at the “Bir-Ata – hp/Tuyamuyun” section are equal to zero.

About 0.02 km³ of water were delivered to Priaralye.

Due to low water content quotas for water withdrawal are not adhered. On the whole through the basin water availability constituted 73%, including the section upstream of the TMHS - 75%, lower reaches from the TMHS - 64%.

Irregularity of water delivery has been noted: water availability in Turkmenistan in middle reaches constituted 63%, in lower reaches - 135%; as to Uzbekistan the situation is reverse, in middle reaches it was – 76%, in lower reaches - 52%.