**ANALYSIS OF THE WATER MANAGEMENT SITUATION IN THE SYRDARYA AND AMUDARYA RIVER BASINS OVER THE NON-GROWING SEASON 2015-2016**

## 1. Syrdarya River Basin

The actual inflow to the upstream reservoirs in the Syrdarya basin (Toktogul, Andizhan, and Charvak reservoirs) was 6.25 km³ or 121% of the forecast during the non-growing season. The actual water release was 10.81 km³ from the reservoirs.

The total lateral inflow in the reach from the Toktogul reservoir to the Shardara reservoir, including discharges along the Karadarya and Chirchik rivers, was 11.58 km³. This is 1.9 times more than the total inflow to the upstream reservoirs.

By the end of the non-growing season, 10.74 km³ were accumulated in the upstream reservoirs, including 8.93 km³ in the Toktogul reservoir or 97% of the BWO Syrdarya's scheduled amount.

The inflow to the Toktogul reservoir was 3.38 km³. Water in the amount of 7.44 km³, which is 0.89 km³ more than scheduled by the BWO Syrdarya, was released from the reservoir. From the third ten-day of October to the second ten-day of February, the actual water releases from the Toktogul reservoir exceeded the BWO Syrdarya's scheduled amount.

During the non-growing season 2015-2016, the inflow to the Bakhri Tochik reservoir amounted to 11.84 km³, which is 1 km³ more than scheduled by the BWO Syrdarya (during the non-growing season 2014-2015 the inflow was higher - 12.42 km³); the water releases were 9.8 km³ from the reservoir (in 2014-2015 – 9.75 km³). The accumulation of water in the reservoir amounted to 1.75 km³ to 3.38 km³ (as of April 1, 2015, it was 3.48 km³). The actual water releases from the reservoir exceeded the BWO Syrdarya's scheduled amount from the third ten-day of October to the second ten-day of January, as well as on the first and second ten-days of February and the third ten-day of March.

During the non-growing season, the total water diversion from the Naryn and Syrdarya rivers in the reach up to Shardarya reservoir was 3.62 km³, of which: for the Kyrgyz Republic – 0.03 km³, the Republic of Tajikistan – 0.02 km³, the Republic of Kazakhstan (along the Dustlik canal) – 0.49 km³, and for the Republic of Uzbekistan – 3.08 km³.

The water losses amounted to 1.95 km³ in the reach Toktogul-Shardara (estimated by using the balance method). In comparison, these losses amounted to 1.51 km³ in the same reach during the non-growing season 2014-2015.

Water supply was uneven for the states, the river reaches and unstable in time (Table 1.1).

The inflow to the Shardara reservoir during the non-growing season 2015-2016 was 11.03 km³, which is 1.39 km³ less than the BWO Syrdarya's scheduled amount. Thus, despite the excess of the actual water releases over the planned releases from the Bakhri Tochik reservoir, the actual inflow to the Shardara reservoir was less than scheduled (planned) one. The reason is the limited inflow (as compared to the forecast) along the Chrichik River and the return flow in the reach Bakhri Tochik-Shardara. The amount of 7.2 km³ was discharged into the river from the Shardara reservoir, the water diversion for the Kyzylkum canal was 0.21 km³. There was no release to Arnasay. The amount of 1.76 km³ was accumulated in the Koksaray.

In the reach of Shardara-Karateren, the water diversion to the lake systems was 2.11 km³, and flow losses were 0.91 km³. According to the data of UzHydromet, the actual water supply to the Aral Sea was 3.12 km³, whereas KazHydromet informed that it was 3.03 km³.

Table 1.2 provides the Syrdarya River channel water balance, and Table 1.3 gives the water balance of the reservoirs.

**Table 1.1**

**Water availability in the Syrdarya River basin countries for the non-growing season 2015-2016**

| № | Water user | Water volume, $km^3$ | | Water availability, % | Deficit (-), surplus (+), $km^3$ |
|---|---|---|---|---|---|
| | | Quota/ schedule | Actual | Season | Season |
| 1 | Total water diversion | 3.30 | 3.62 | 110 | 0.32 |
| 2 | Water diversion by state: | | | | |
| | Kyrgyz Republic | 0.04 | 0.03 | 72 | -0.01 |
| | Republic of Uzbekistan | 2.48 | 3.08 | 124 | 0.60 |
| | Republic of Tajikistan | 0.37 | 0.02 | 4 | -0.35 |
| | Republic of Kazakhstan | 0.41 | 0.49 | 120 | 0.08 |
| 3 | By river reach | | | | |
| 3.1 | Toktogul reservoir – Uchkurgan hydroscheme | 1.37 | 1.49 | 109 | 0.12 |
| | of which: | | | | |
| | Kyrgyz Republic | 0.030 | 0.024 | 79 | -0.006 |
| | Republic of Tajikistan | 0.085 | 0.003 | 4 | -0.082 |
| | Republic of Uzbekistan | 1.252 | 1.459 | 116 | 0.207 |
| 3.2 | Uchkugran hydroscheme – Bakhri Tochik hydroscheme | 0.25 | 0.23 | 93 | -0.018 |
| | of which: | | | | |
| | Kyrgyz Republic | 0.007 | 0.003 | 41 | -0.004 |
| | Republic of Tajikistan | 0.069 | 0.002 | 3 | -0.067 |
| | Republic of Uzbekistan | 0.171 | 0.224 | 131 | 0.053 |
| 3.3 | Bakhri Tochik hydroscheme – Shardara reservoir | 1.68 | 1.90 | 113 | 0.22 |
| | of which: | | | | |
| | Kyrgyz Republic | 0.410 | 0.492 | 120 | 0.08 |
| | Republic of Tajikistan | 0.214 | 0.011 | 5 | -0.20 |
| | Republic of Uzbekistan | 1.060 | 1.400 | 132 | 0.34 |
| 4 | Inflow to the Shardara reservoir | 12.42 | 11.03 | 89 | -1.39 |
| | Discharge into Arnasay | 0.00 | 0.00 | | 0.00 |
| 5 | Water supply to the Aral Sea (Karateren gauging station) | 1.99 | 3.12 | 157 | 1.13 |

**Table 1.2**

## Syrdarya River channel water balance for the non-growing season 2015-2016

| № | Balance item | Water volume, $km^3$ | | Deviation (actual - plan) |
|---|---|---|---|---|
| | | Forecast/plan | Actual | |
| 1 | Inflow to the Toktogul reservoir | 2.80 | 3.38 | 0.58 |
| 2 | Lateral inflow at the river reach of Toktogul reservoir – Shardara reservoir (+) | 10.75 | 11.58 | 0.83 |
| | of which: | | | |
| 2.1 | *Water releases to the Karadarya river* | 1.71 | 1.74 | 0.03 |
| 2.2 | *Water releases to the Chirchik river* | 2.07 | 1.52 | -0.54 |
| 2.3 | Lateral inflow from CDF and small rivers | 6.97 | 8.31 | 1.35 |
| 3 | Flow regulation in the reservoirs: inflow (+) or diversion (-) | 2.00 | 1.63 | -0.37 |
| | of which: | | | |
| 3.1 | *Toktogul reservoir* | 3.75 | 4.06 | 0.31 |
| 3.2 | *Bakhri Tochik reservoir* | -1.75 | -2.43 | -0.68 |
| 4 | Regulated flow (1+2+3) | 15.55 | 16.59 | 1.04 |
| 5 | Water diversion at the reach Toktogul – Shardara (-) | -3.30 | -3.62 | -0.32 |
| 6 | Water losses (-) or unrecorded inflow to the channel (+) at the reach of Toктogul-Shardara | 0.17 | -1.95 | -2.12 |
| 6.1 | Including % of the regulated flow | 1 | 12 | |
| 7 | Inflow to the Shardara reservoir | 12.42 | 11.03 | -1.39 |
| 8 | Flow regulation in the Shardara reservoir: inflow (+) or diversion (-) | -4.18 | -3.62 | 0.56 |
| 9 | Water releases from the Shardara reservoir | 8.16 | 7.20 | -0.96 |
| 10 | Water releases to the Kzylkum canal (-) | -0.08 | -0.21 | -0.13 |
| 11 | Discharge into Arnasay (-) | 0.00 | 0.00 | 0.00 |
| 12 | Water diversion for the Koksaray reservoir | - | 1.76 | |
| 13 | Water releases from the Koksaray reservoir | - | 0.00 | |
| 14 | Discharge into the Arys river | - | 0.70 | |
| 15 | Water diversion, including lake systems (-) | - | -2.11 | |
| 16 | Water losses (-), lateral inflow (+) | - | -0.91 | |
| | *Including % of the water releases from the Shardara reservoir+ the Arys river* | | 12 | |
| 17 | Water supply to the Aral Sea (Karateren GS) | 1.99 | 3.12 | 1.13 |

**Table 1.3**

**Water balance of the Syrdarya River basin reservoirs for the non-growing season 2015-2016**

| № | Balance item | Water volume, km³ | | Deviation (actual-plan) |
|---|---|---|---|---|
| | | Forecast/Plan | Actual | |
| **1** | **Toktogul reservoir** | | | |
| 1.1 | Inflow to the reservoir | 2.80 | 3.38 | 0.58 |
| 1.2 | Water volume in the reservoir: | | | |
| | - beginning of the season (October 1, 2015) | 13.01 | 13.01 | 0.00 |
| | - end of the season (April 1, 2016) | 9.24 | 8.93 | -0.31 |
| 1.3 | Water releases from the reservoir | 6.55 | 7.44 | 0.89 |
| 1.4 | Unrecorded inflow (+) or losses (-) | -0,01 | -0,01 | -0,002 |
| | Including % of inflow to the reservoir | 0 | 0 | 0 |
| 1.5 | Flow regulation: inflow (+) or diversion (-) | 3.75 | 4.06 | 0.31 |
| **2** | **Andizhan reservoir** | | | |
| 2.1 | Inflow to the reservoir | 0.95 | 0.91 | -0.04 |
| 2.2 | Water volume in the reservoir: | | | |
| | - beginning of the season (October 1, 2015) | 0.79 | 0.79 | 0.00 |
| | - end of the season (April 1, 2016) | 1.22 | 1,01 | -0.21 |
| 2.3 | Water releases from the reservoir | 0.52 | 0.67 | 0.15 |
| 2.4 | Unrecorded inflow (+) or losses (-) | 0.00 | -0.02 | -0.02 |
| | Including % of inflow to the reservoir | 0 | 2 | 2 |
| 2.5 | Flow regulation: inflow (+) or diversion(-) | -0.43 | -0.24 | 0.19 |
| **3** | **Charvak reservoir** | | | |
| 3.1 | Inflow to the reservoir | 1.43 | 1.96 | 0.53 |
| 3.2 | Water volume in the reservoir: | | | |
| | - beginning of the season (October 1, 2015) | 1.59 | 1.59 | 0.00 |
| | - end of the season (April 1, 2016) | 0.88 | 0.79 | -0.08 |
| 3.3 | Water releases from the reservoir | 2.13 | 2.70 | 0.57 |
| | Unrecorded inflow (+) or losses (-) | -0.01 | -0.06 | -0.05 |
| | Including % of inflow to the reservoir | 1 | 3 | 2 |
| 3.5 | Flow regulation: inflow (+) or diversion(-) | 0.71 | 0.74 | 0.03 |
| **4** | **Bakhri Tochik reservoir** | | | |
| 4.1 | Water inflow to the reservoir from the river | 10.85 | 11.84 | 1.00 |
| 4.2 | Lateral inflow | 0.300 | 0.39 | 0.09 |
| 4.3 | Water volume in the reservoir: | | | |
| | - beginning of the season (October 1, 2015) | 1.75 | 1.75 | 0.00 |
| | - end of the season (April 1, 2016) | 3.42 | 3.38 | -0.04 |
| 4.4 | Water releases from the reservoir | 9.40 | 9.80 | 0.41 |
| | of which: | | | |
| | - releases to the river | 9.33 | 9.80 | 0.47 |
| | - diversion from the reservoir | 0.07 | 0.00 | -0.07 |
| 4.5 | Unrecorded inflow (+) or losses (-) | -0.08 | -0.80 | -0.72 |
| | Including % of inflow to the reservoir | 1 | 7 | 6 |

| № | Balance item | Water volume, km³ | | Deviation (actual-plan) |
|---|---|---|---|---|
| | | Forecast/Plan | Actual | |
| 4.6 | Flow regulation: inflow (+) or diversion (-) | -1.75 | -2.43 | -0.68 |
| **5** | **Shardara reservoir** | | | |
| 5.1 | Inflow to the reservoir | 12.42 | 11.03 | -1.39 |
| 5.2 | Lateral inflow | 0.0 | 0.0 | 0.00 |
| 5.3 | Water volume in the reservoir: | | | |
| | - beginning of the season (October 1, 2015) | 1.22 | 1.22 | 0.00 |
| | - end of the season (April 1, 2016) | 5.311 | 4.850 | -0.46 |
| 5.4 | Water releases from the reservoir | 8.07 | 6.98 | -1.09 |
| | of which: | | | |
| | - Discharge to Arnasay | 0.00 | 0.00 | 0.000 |
| | - Releases to the river | 8.16 | 7.20 | -0.96 |
| | - water diversion from the reservoir | -0.08 | -0.21 | -0.13 |
| 5.5 | Unrecorded inflow (+) or losses (-) | -0.26 | -0.42 | -0.16 |
| | Including % of inflow to the reservoir | 2 | 4 | 2 |
| 5.6 | Flow regulation: inflow (+) or diversion(-) | -4.35 | -4.05 | 0.30 |
| **6** | **Koksaray reservoir** | | | |
| 6.1 | Water inflow to the reservoir | - | 1.76 | |
| 6.2 | Water volume in the reservoir: | | | |
| | - beginning of the season (October 1, 2015) | - | 0.00 | |
| | - end of the season (April 1, 2016) | - | 1.64 | |
| 6.3 | Water releases from the reservoir | - | 0.00 | |
| 6.4 | Unrecorded inflow (+) or losses (-) | | -0.12 | |
| | Including % of inflow to the reservoir | - | 7 | |
| 6.5 | Flow regulation: inflow (+) or diversion(-) | | -1.76 | |
| 7 | **Total** flow regulation by reservoirs: inflow (+) or diversion (-) | -2.07 | -3.68 | -1.61 |
| 8 | **Total** unrecorded inflow (-), or losses (+) | -0.36 | -1.43 | -1.07 |

## 2 Amudarya River Basin

The actual water availability in the Amudarya River at the Atamyrat gauging station (upstream of the intake to Garagumdarya), excluding the water diversion to Syrdarya province, was 12.63 km³, which is 1% less than expected by the BWO Amudarya's scheduled amount.

The established quota of water diversion in the Amudarya River basin was 96% used; the water diversion amounted to 15.17 km³, including 12.31 km³ downstream of the Atamyrat gauging station (starting from the intake to Garagumdarya).

The water availability was unequal for the states and river reaches (Table 2.1). The total water deficit was 4%, of which: the Republic of Tajikistan – 13%, the Republic of Uzbekistan – 0.1%, and Turkmenistan – 4%.

By the end of the season, 6.74 km³ of water was managed to be kept in the Nurek reservoir, and 3.33 km³, in the TMHS reservoirs. The inflow to the Nurek reservoir was 3.86 km³, the water releases were 7.64 km³. The surplus to the river flow due to the drawdown of the Nurek reservoir was 3.78 km³. The actual water releases from the Nurek reservoir differed from the releases scheduled by the BWO Amudarya: from October to January they were less than scheduled releases, and from February to March they exceeded the planned ones. Thus, the actual water releases (the total ones for the non-growing season) from the Nurek reservoir exceeded the scheduled ones by 0.86 km³. Despite this, due to the higher inflow (as compared to the schedule) to the reservoir, by the 1st of April the actual water volume in the reservoir exceeded the scheduled one by 0.5 km³.

In the Tuyamuyun hydroscheme reservoirs (TMHS reservoirs), the water accumulation plan has not been achieved – by the 1st of April the actual water volume was less than the scheduled one by 0.81 km³. The water releases schedule from the TMHS was fully observed. The failure to implement the water accumulation plan is explained by the limited inflow to the in-stream reservoir as expected (lower by 0.43 km³) and the excessive actual water diversion than scheduled (more by 0.11 km³).

The water losses in the reach of Atamyrat-Birata amounted to 3.11 km³ or 19% of the regulated flow at the Atamyrat GS. The water losses in the river reach from the Tyuyamuyun gauging station up to the Samanbay gauging station were 0.38 $km^3$ or 6 % of the river flow in the section of the Tyuyamuyun gauging station.

The established quotas for environmental water releases to the Amudarya downstream canals were 94% used; the water supply was 0.75 km³. An amount of 3.3 km³ or 157% of the scheduled one were supplied to the Priaralie and the Aral.

Table 2.2 provides data on the river channel balance, and Table 2.2 gives the water balance of the reservoirs.

**Table 2.1**

## Water availability in the Amudarya River Basin countries for the non-growing season 2015-2016

| № | Water user | Water volume, km³ | | Water availability, % | Deficit (-), surplus (+) km³ |
|---|---|---|---|---|---|
| | | Quota/ Schedule | Actual | Season | Season |
| 1 | Total water diversion | 15.73 | 15.17 | 96 | -0.56 |
| 2 | Diversion by state: | | | | |
| | *Kyrgyz Republic* | - | - | - | - |
| | *Republic of Tajikistan* | 2.88 | 2.49 | 87 | -0.38 |
| | *Turkmenistan* | 6.5 | 6.32 | 97 | -0.17 |
| | *Republic of Uzbekistan* | 6.35 | 6.36 | 100 | 0.01 |
| 3 | Downstream of Atamyrat GS | 12.48 | 12.31 | 99 | -0.17 |
| | *of which:* | | | | |
| | *Turkmenistan* | 6.5 | 6.32 | 97 | -0.18 |
| | *Republic of Uzbekistan* | 5.98 | 5.99 | 100 | 0.01 |
| 4 | By river reache: | | | | |
| | Upstream | 3.25 | 2.86 | 88 | -0.39 |
| | *of which:* | | | | |
| | *Kyrgyz Republic* | - | - | - | - |
| | *Republic of Tajikistan* | 2.88 | 2.49 | 87 | -0.38 |
| | *Republic of Uzbekistan, Surkhandarya province* | 0.37 | 0.37 | 99 | 0.00 |
| | Midstream | 8.34 | 8.18 | 98 | -0.16 |
| | *of which:* | | | | |
| | *Turkmenistan* | 5.10 | 4.88 | 96 | -0.22 |
| | *Republic of Uzbekistan* | 3.24 | 3.30 | 102 | 0.05 |
| | Downstream | 4.14 | 4.12 | 100 | -0.02 |
| | *of which:* | | | | |
| | *Turkmenistan* | 1.4 | 1.43 | 102 | -0.03 |
| | *Republic of Uzbekistan* | 2.74 | 2.69 | 98 | -0.05 |
| 5 | Environmental water releases to canals in the river lower reaches | 0.80 | 0.75 | 94 | -0.05 |
| | *of which:* | | | | |
| | *Turkmenistan* | 0.15 | 0.14 | 94 | -0.01 |
| | *Republic of Uzbekistan* | 0.65 | 0.61 | 94 | -0.04 |
| 6 | Water supply to the Aral Sea and the Priaralie | 2.1 | 3.30 | 157 | 1.20 |

**Table 2.2**

## The Amudarya River channel water balance for the non-growing season 2015-216

| № | Balance item | Water volume, $km^3$ | | Deviation (actual-plan) |
|---|---|---|---|---|
| | | Forecast/ Plan | Forecast/Plan | |
| 1 | Water content of the Amudarya river - non-regulated flow at the Atamyrat GS * | 12.77 | 12.63 | -0.14 |
| 2 | Flow regulation in the Nurek reservoir: accumulation (+) or diversion (-) | 4.31 | 3.78 | -0.53 |
| 3 | Water diversion in the midstream (-) | -8.34 | -8.18 | 0.16 |
| 4 | Midstream return CDF (+) | 1.22 | 1.36 | 0.14 |
| 5 | Water losses (-) or unrecorded inflow to the channel (+) | -3.08 | -3.14 | -0.07 |
| | *% of the regulated flow* | 18 | 19 | 1 |
| 6 | Inflow to the TMHS (Bir-Ata GS) | 6.88 | 6.45 | -0.43 |
| 7 | Flow regulation in the TMHS reservoirs: accumulation (+) or diversion (-) | 1.56 | 2.10 | 0.55 |
| 8 | Releases from TMHS (including water diversion from the reservoir) | 8.44 | 8.55 | 0.11 |
| 9 | Downstream water diversion, including diversion from TMHS (-) | -4.29 | -4.12 | 0.16 |
| 10 | Downstream return CDF (+) | 0.00 | 0.00 | 0.00 |
| 11 | Emergency and environmental water releases to canals (-) | -0.80 | -0.75 | 0.05 |
| 12 | Runoff losses (-) or unrecorded inflow to the channel (+) | -1.25 | -0.38 | 0.87 |
| | *% of the flow at the section of the Tuyamuyun gauging station* | 20 | 6 | -14 |
| 13 | Water supply to the Priaralie and the Aral Sea | 2.10 | 3.30 | 1.20 |
| 14 | **TOTAL** losses: | -4.33 | -3.52 | 0.81 |
| | *% of the regulated flow* | 25 | 21 | -3.89 |

* Minus upstream water diversions (Tajikistan and Surkhandarya province)

**Table 2.3**

## Water balance of the Amudarya River basin's reservoirs for the non-growing season 2015-2016

| № | Balance item | Water volume, km3 | | Deviation (actual-plan) |
|---|---|---|---|---|
| | | Forecast / plan | Actual | |
| **1** | **Nurek reservoir** | | | |
| 1.1 | Inflow to the reservoir | 3.58 | 3.86 | 0.27 |
| 1.2 | Water volume in the reservoir: | | | |
| | - beginning of the season (October 1, 2015) | 10.52 | 10.50 | -0.02 |
| | - end of the season (April 1, 2016) | 6.24 | 6.74 | 0.50 |
| 1.3 | Water releases from the reservoir | 7.90 | 7.64 | -0.25 |
| 1.4 | Lateral inflow (+) or water losses (-) | 0.03 | 0.03 | 0.00 |
| | *Including % of the inflow to the reservoir* | 1 | 1 | 0 |
| 1.5 | Flow regulation: accumulation (+) or diversion (-) | 4.31 | 3.78 | -0.53 |
| **2.0** | **TMHS reservoirs** | | | |
| 2.1 | Inflow to the TMHS | 6.88 | 6.45 | -0.43 |
| 2.2 | Water volume in the reservoirs: | | | |
| | - beginning of the season (October 1, 2015) | 5.52 | 5.43 | -0.09 |
| | - end of the season (April 1, 2016) | 4.14 | 3.33 | -0.81 |
| 2.3 | Water releases from the TMHS | 8.44 | 8.55 | 0.11 |
| | of which: | | | |
| | - releases to the river | 6.38 | 6.38 | 0.00 |
| | - water diversion | 2.06 | 2.17 | 0.11 |
| 2.,4 | Unrecorded inflow (+) or water losses (-) | 0.18 | 0.00 | -0.18 |
| | *Including % of the inflow to the reservoir* | -3 | 0 | 3 |
| 2.5 | Flow regulation: accumulation (+) or diversion (-) | 1.56 | 2.10 | 0.55 |
| | **Total** flow regulation by the reservoirs: accumulation (+) or diversion (-) | 5.87 | 5.89 | 0.02 |
| | **Total** losses (-), unrecorded inflow (+) | 0.21 | 0.03 | -0.18 |