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Adaptation costs of "Water facility" sector under adverse climate change impacts

The most part (more 80%) of the territory of Turkmenistan is located in the desert zone. The climate over the all territory is hot and semi-arid. At the same time, there are insignificant amounts of surface water in the country. The main available surface water sources are trans-boundary. The river Amu Darya that is the major waterway in the Central Asia plays the most important role in water balance of the country.

Scenarios of regional climate change, developed by national and international centers, show increase in average temperature and decrease in flows of the trans-boundary rivers for the future. It will have a profound effect on the agriculture and food safety in Turkmenistan. Therefore, sustainable development of the national economy greatly depends on the state of "Water Facility" sector.

Upon analysis made under the Second national communication on climate change, national experts concluded that till 2030 due to climate change:

- The Amu Darya river flow will decrease by 7-12%, for the other rivers: Murghab, Tejehen and Atrek - by 5-8%. Under 5-15% declining in annual river flows, the Amu Darya flow is assumed to be decreased by 30% at the time of vegetative period, Tedzhen - by 30%, Atrek - by 50%. The total decrease in the river flows will account for 2400 mln.m^3;
- Evaporation from surfaces of water basins will increase. Growth in evaporation will account for 150 mln.m^3 compared with the current evaporation;
- The irrigating norms for the main agricultural crops will increase by 13% till 2030. It implies 3000 mln.m^3 additional water demand to irrigate farming crops.

In general, owing to climate change impacts the need for additional water resources will account for about 5,5 bln.m^3. The main criteria of developing baseline and adaptation scenarios are reduction in this evaluated water supply deficit.

As more 90% of total available water resources are in use by the irrigated agriculture, scope of the sector for assessing water adaptation costs includes water resources intended for land irrigation. Irrigated agriculture means irrigated farming including construction and operation of irrigating and collector-drainage networks, hydraulic engineering constructions, water basins, water-distributing systems, land reclamation. The adaptation costs were estimated till 2030. The historical period is represented by 2000-2008 data.

Baseline scenario – "Water Facility" sector develops according to its development program till 2030. The measures planned in the program for the irrigated agriculture are aimed mainly at water savings, and consequently at declining in water supply deficit. For some reasons indicative investment and financial parameters of the program are often specified. The most important program measures are annually selected and financed by the government. However, development of the sector is always kept at an average level. Therefore, the methodological approach to the baseline scenario is based on average indicators of the water sector development. In other words, growth rates of investment and financial flows till 2030 will keep on the tendency of 2000-2008 historical period.

Adaptation scenario – It takes into account increase of population in Turkmenistan as well as the fact, that climate change will have effect on increasing in water supply deficit. As in Turkmenistan there are not additional surface water sources, the possible water supply deficit was estimated under climate change impacts as well as adaptation measures for reducing the deficit are proposed. Under the adaptation scenario investment and financial flows were assessed as minimum costs required for supplying the economy of Turkmenistan with sufficient amounts of water resources in view of climate change. This scenario assumes that development of the water sector will be speeded up to be adapted to climate change.

Though the measures of the baseline and adaptation scenarios are similar, they differ in scales and rates of their fulfillment.

The analysis of results showed, that fulfillment of the baseline scenario will reduce in water supply deficit by less 50% till 2030. Lack of water resources for irrigation will have effect on declining in irrigating rates, decrease in productivity of agricultural crops and efficiency of agricultural production. Therefore, import of main foods is supposed to be increased.

Realization of the adaptation scenario will eliminate almost 100% water supply deficit. Additionally, the irrigated area is assumed to be extended due to increase of population and food demand. It should be noted that the adaptation scenario takes into account the most adverse climate change effect.

The major outcome of the cost assessment is evaluated amounts of additional investment and financial flows for the adaptation scenario compared with the baseline scenario. The total amount of water savings cost, including other operating costs, under the baseline scenario accounts for 10,482 bln. USD for the period 2009-2030, under the adaptation scenario - 16,098 bln. USD. In that way the additional costs of water supply adaptation will account for 5,616 bln. USD. In view of 10% discounting rate the discounted adaptation costs will be 1,629 bln. USD.