

Assessment of the impact of the Dniester Hydropower Complex on hydrological state of the Dniester River

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Abstract: Operation of the Dniester Hydropower Complex (DHC), build on the middle course of the Dniester River in the middle of the '80s of the last century and extended during last decades, on one hand, produces low-cost energy and contributes to local and regional economical development, but on the other hand, leads to modification of river flow and ecosystems in the downstream, creating a series of dilemmas that are difficult to manage and solve by bazinal countries, Ukraine and the Republic of Moldova. This research aims to assess the changes in flow, phases of the hydrological regime, water temperature and sediments' regime due to the DHC operation. Main utilized approach was comparative analysis of hydrological time series recorded at the stations situated upstream and downstream of the DHC, for two representative time periods: before and after construction of this hydropower complex. As a result, it was estimated that the mean annual flow downstream the DHC decreased by 9.2%. Seasonal flow changed mainly by significant decrease in February-April (February - 18%, March - 40%, April - 27%), and increase in the autumn months, by 10-14%. Minimum flows upstream of the DHC, increased by 52%, and downstream have doubled, reaching 107 m³/s (compared to 51 m³/s, before the DHC construction). Maximum annual flow, in the upstream part, in the second period, has slightly increased, while towards the downstream part, there is a reduction of this parameter by about 30%. One of the direct impacts of the DHC operation is hydropeaking effect. Intraday level amplitude downstream of the DHC amounts to 52 cm and the length of the sector that is influenced by this effect is over 100 km. Also, a long river sector is subject to water thermal modifications: when upstream the average annual water temperature has risen by 0.8°C, in the downstream it has diminished by 0.44°C. On a monthly scale, there is a decrease in the water temperature in the spring-summer period, and an increase in the autumn-winter period downstream of the DHC. Sediment transport process was also altered significantly. Due to the DHC operation, suspended sediments decreased by 92-98% downstream of it. The significant decrease in sediment volumes is specific to all months of the year. The reduction of sediment transport has increased the transparency of water, which, as a result, influences the development of the aquatic ecosystems.

Keywords: Forest Dniester Hydropower Complex, the Dniester River, flow regime, hydrological alteration, reservoirs.

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