

Dniester River Reservoir Model

Background: The Alliance for Global Water Adaptation (AGWA) is supporting the United Nations Economic Commission for Europe (UNECE) and the Organization for Security and Co-operation in Europe (OSCE) on their project “Climate Change and Security in the Dniester River Basin.” The AGWA team is developing a model of the Dniester River reservoirs. The results of the model will support a framework for risk-based decision making for climate adaptation and reservoir management.

Reservoirs are one of the key climate adaptations mechanisms in the Dniester River basin. Water management needs to balance multiple objectives. Open reservoir storage space for potential future flood waters must be balanced with reservoir storage for water supply and hydropower. As climate changes, flood storage or water supply storage requirements may change. Seasonal climate patterns may change, such as earlier snow melt, which may change the seasonal requirements for flood storage. In addition, society also changes and reservoir management may need to change to meet society’s new preferences.

Description of Model: The model will simulate reservoir management for the reservoirs on the Dniester River. The reservoirs will include the Dniestrovsky Reservoir, the Buffer Reservoir and the Pumped Storage Reservoir in Ukraine and Dubasari Reservoir in Moldova. The model will begin upstream at the Zalischyky flow monitoring station and will end downstream at the estuary. The U.S. Army Corps of Engineers Hydrologic Engineering Center Reservoir Simulation software (HEC ResSim 3.1) is being used for the simulation. This software is available for free download (<http://www.hec.usace.army.mil/software/hecrsim/downloads.aspx>), so the model can be used by other participants. HEC ResSim is widely used in the United States and throughout the world for reservoir management.

The model will be able to simulate operations for multiple management objectives including flood management, hydroelectric generation, agricultural, municipal and industrial water supply, and water requirements for environmental needs. UNECE and OSCE identified three sectors of primary concern: flood risk management, environment, and agricultural water supply. The AGWA team intends to simulate how the reservoirs are currently operated and evaluate how well these three sectors perform under different climate and hydrologic conditions. The model will first be run for the observed flow record. Current reservoir management and alternative management plans would then be tested for more extreme flood and drought conditions and for possible future climates. Observed flow data is critical to running the model simulations and developing realistic hydrologic conditions.

The model will be used to evaluate alternative management strategies. These strategies could include different flood risk management alternatives that modify seasonal flood storage space. Other alternative strategies would provide flows for downstream aquatic and riparian ecosystems. The modeling team will work with basin decision makers and stakeholders to develop and evaluate different management alternatives. One goal is to find management strategies that perform well for each sector for a range of plausible future climates.

Another goal is to develop an integrated model of the Dniester River reservoirs that is shared by basin stakeholders and decision makers and can be used to manage the river as a system to provide greater economic and environmental benefits to both Ukraine and Moldova.