

Solution to the Mountain Reservoir Silting Problem in Georgia

Giorgi Metreveli and Lia Matchavariani

Ivane Javakhishvili Tbilisi State University, Tbilisi, Georgia

Georgia, as a sea state with mountain rivers, faces three opposing issues: 1. Hydropower development, 2. Coastal protection, and 3. Riparian settlements and infrastructure protection from floods in distributaries mouth. Climate change and global warming intensify beach erosion and further impact these issues as well as silting of mountain reservoirs because of increasing drifts in river deposits. This tendency is supported in the report published by the National Communications of Georgia at the UNFCCC. According to the comparison, the trends in the mean annual air temperature, precipitation and the moistening regime between periods 1955-1970, 1990-2005 and 1986-2010, increment of temperature and precipitation in West Georgia appeared to vary in the range of 0.2-0.4°C and 8-13%, respectively, while in East Georgia the relative values were found to be 0.6°C and 6.0%.

However, by creating quarries systems in the reservoirs, excavating deposits using them and strengthening beaches with it can simultaneously solve these problems. Removed deposits can be transported using conveyor (car, railway, barge) to the eroded beaches and other consumers. This will permanently increase volume of the useful water in the reservoir, significantly reduce consumption of the inert material from other rivers and save nearby settlements from overflowed tributaries. Implementation of the proposed method solves several issues at once: it protects the eroded seashores and extends reservoir's lifespan with a minimal environmental impact and a significant economical profit.

The basis of the method is to know the sedimentation prism dynamic, which is determined by morphometry, hydrology and type of reservoir's regulation. The quarries need to be located along the reservoir's length. These phases are stronger than other factors influencing the distribution of deposits and reservoir dimensions (length and depth of the reservoir). Therefore, in different reservoirs the fractional structure and genesis of deposits essentially will differ from each other both on the length of a reservoir, and on its depth. Hence, the quarries and transportation should be viewed under these assumptions. Ignoring these irregularities can cause significant financial damage, disappointment in the efficiency of a method and delay in works to prevent catastrophic erosion of the beaches as it might happen to Georgia's (Gonio-Batumi) coastline. Currently, this is the most critical area in Georgia that requires immediate action because on the river Chorokhi Turkey has already built and is planning to build even more hydropower stations. Due to that in the next 500 years the river itself will deliver only limited amount of beach forming sediment, which will not be enough to save the seashore from erosion.

To avoid this this proposal will be practically implemented on Georgia's Gumati reservoir. It currently has almost 80.0 million m³ sediment accumulated in it, out of which 35-40 million m³ is beach forming one. Suggested method of "quarried extractions of sediment from a reservoir" has also other important advantages: more sediment is removed from the reservoir the more water will accumulate for hydropower. The proposed method will allow: periodic renewal of beaches with

deposits, restoration of reservoir's volume and accumulation of new beach forming deposits. These materials can be transferred from Gumati to seashore via railway and then by barges.

The advantage of the proposed method is that it will solve all three issues - hydropower development, coast protection and ecology all at once, and will also provide significant economic profit to the country. How widespread the application of this method will be depend on the necessity to reconstruct eroded beaches and the construction industry's need for inert material because the river deposit is the best construction material so far. Having said that, the need to solve these three opposing issues remains unchanged and since our method offers the most cost efficient, ecologically safe and profitable solution we remain hopeful that it will find its way to practical implementation sooner rather than later.

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