DOI: 10.46991/JISEES.2025.SI1.172

Assessing the Ecosystem Services of Water Reservoirs: A Case Study from the Hrazdan River Basin

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ABSTRACT

Armenia is a mountain country with medium to high baseline water stress. Water reservoirs established mostly in the Soviet era either have hydropower or irrigation purposes but were never designed for multipurpose use. River Hrazdan was regulated by three single-purpose reservoirs covering a range of altitudes and landscapes. The aim of the present study is to conduct a non-monetary assessment of the ecosystem services of reservoirs and to analyze their potential. We hypothesize that current water resource management practices in Armenia do not adequately account for the flow of ecosystem services. We used macrophytes, microorganisms, phytoplankton, and hydrochemical parameters both for the evaluation of ecosystem services and for the assessment of ecosystem structure and functions. Since reservoirs are primarily used for energy generation, water supply, and flood protection, these services were not considered in the present study. Instead, we assessed ten benefits provided by the reservoirs. The results of investigation showed that three reservoirs exhibit considerable ecological and socio-economic value through multiple ecosystem services. While most water quality parameters fall within permissible limits for irrigation, certain elements exceed recommended thresholds, highlighting the need for monitoring and management to prevent potential soil and plant health impacts. Phytoplankton and macrophyte communities are contributing to oxygen production, nutrient cycling, and habitat provision for aquatic fauna. Plants also significantly contribute in nutrient uptake, pollutant removal, and sediment stabilization. Ornamental macrophytes further provide cultural ecosystem services, supporting recreational, aesthetic, and educational functions, while also performing ecological roles such as phytoremediation and carbon sequestration.

Keywords: ecosystem services, reservoir, macrophytes, microbiology, phytoplankton

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