

УДК 504.05/06

DETERMINATION OF HYDROCHEMICAL SELF-PURIFICATION CAPACITY
OF SHORT AND FAST-FLOWING MOUNTAIN RIVERS

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Rivers are characterized with a natural self-purification capacity, defined as the ability of aquatic ecosystems to neutralize pollutants through interconnected physical, chemical, and biochemical processes. The persistence of pollutants within a natural water body results from the combined influence of these processes, which collectively determine the self-purification potential of the aquatic environment. However, this capacity is dynamic rather than static, varying across seasons, river stretches, and levels of anthropogenic pressure. When pollutant concentrations exceed critical thresholds, the self-purification capacity may collapse, leading to eutrophication and broader ecosystem degradation. Despite its increasing relevance for integrated water resources management, quantitative approaches for assessing self-purification capacity remain limited, and largely not designed for mountainous river typologies. Such rivers are characterized by rapid flow velocity, low water temperature, high dissolved oxygen concentrations, and pronounced seasonal variability associated with snowmelt and precipitation regimes. Compared with hydromorphological and hydrobiological components, the hydrochemical component of self-purification capacity can be more readily quantified and effectively assessed across different river sections and seasonal conditions. In this study, a new method for quantifying the hydrochemical self-purification capacity of mountain rivers is proposed. The methodology is based on seasonal hydrochemical parameters' monitoring data combined with river water flow data. The hydrochemical indicators required for the assessment are classified into two categories: mandatory key parameters and supporting parameters. Validation of the proposed method was carried out using Armenian case studies and demonstrated a high level of representativeness and applicability. The proposed approach contributes to evidence-based water governance, supports climate change adaptation planning, and provides an early warning indicator for the eutrophication, which is of growing importance under conditions of increasing global freshwater scarcity.

<https://doi.org/10.46991/PYSUC.2026.SI1.034>

Keywords: water quality, hydrochemical, self-purification capacity, river.
Acknowledgment/ *This work is supported by the Science Committee of the RA within the framework*
Funding: *of scientific project No 25RG-1E072.*
References: Margaryan L.A., Arakelyan A.A., et al. Assessment of a Self-Purification Capacity of Voghji River under the Environmental Risk. *J. Environ. Protection and Ecol.* 25 (2) (2024), 374–381.
<https://doi.org/10.18411/doi-code-2024.296>

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