ISSN:2372-0743 print
ISSN:2373-2989 on line
International Journal of Ground Sediment & Water
Vol. 20
2024

◆ Research paper

DOI: 10.5281/zenodo.14025336

Analysis of Hydrological Drought Patterns in the Aras River Basin within the Framework of Transboundary Water Management

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Abstract: This study analyzes drought trends and their effects on water management in the transboundary Aras River Basin, a crucial component of Turkey's annual water resources. Climate change has resulted in diverse water management strategies among the basin-sharing nations—Turkey, Azerbaijan, Iran, and Armenia—each seeking to safeguard its interests. The utilization of the Aras River for agricultural irrigation and energy generation has led to tensions among the nations regarding its shared management. This study utilized monthly average flow data from six streamflow observation stations operated by the Turkish State Hydraulic Works, gathered from 1970 to 2015, to compute standardized streamflow drought indices for 3, 6, 9, and 12-month intervals. The indices were subsequently examined utilizing the Mann-Kendall Trend and Mann-Kendall Regional Trend tests. The results demonstrate a declining trend in drought indices at stations D24029 and D24058 over 3, 6, 9, and 12-month intervals, and at stations D24019 and D24049 over 9 and 12-month intervals, whereas station D24060 showed an increasing trend over the 9 and 12-month indices. The regional trend analysis for the entire basin revealed a consistent decline in the 6, 9, and 12-month indices. These findings underscore the imperative for coordinated and sustainable annual water production and distribution among Turkey, Azerbaijan, Iran, and Armenia to alleviate the risks of prolonged hydrological drought in the Aras River Basin. Determining the annual potential water budget is essential for ecosystem preservation, transparent

governance, and attaining sustainable water allocation via an integrated, collaborative water management approach.

Keywords: Aras River, Standardized drought index, Transboundary water, Mann Kendall Trend test, Hydrological drought

This paper DOI: 10.5281/zenodo.14025336
Journal New Website web1: https://ijgsw.eu.org/
web2: https://ijgsw.net/
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