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Deforestation-driven changes to hydrological dynamics in West Africa: A systematic review

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Abstract

West Africa is experiencing one of the fastest rates of forest loss globally, with major implications for hydrological processes and sediment dynamics. Understanding these impacts is critical for evidence-based land-use planning and sustainable water resource management. This systematic review following PRISMA methodology (n=32) synthesizes and evaluates current evidence on deforestation in West Africa, specifically its effects on hydrological processes and sediment dynamics. The review shows that research has predominantly focused on hydrological and sediment transport processes at broader landscape levels with mayor study publish at the watershed level. It find that the average deforestation rate in West Africa (1.27 % yr^{-1}) substantially exceeds recent global averages reported by the FAO (0.2–0.3 % yr^{-1}) and the continental African average (0.6–0.7 % yr^{-1}), with rates ranging from 0.1 to 4 % yr^{-1} depending on forest type and period. Forest loss and subsequent conversion, particularly to cropland and built-up areas, consistently drive changes in hydrology, including increased surface runoff, higher peak discharges, increased sediment export, and concurrent reductions in baseflow and groundwater recharge. The review further indicates that increasing forest cover may enhance overall water availability without necessarily amplifying surface runoff, however overall hydrological responses are highly context-dependent and vary with forest type, post-conversion land use, and climatic conditions. The review also identifies three key research gaps: limited empirical evidence from West Africa, insufficient isolation of deforestation as a distinct driver, and a strong reliance on modelling approaches. Addressing these gaps is essential for strengthening the evidence base underpinning water resource management and Forest Landscape Restoration (FLR) initiatives in the region.

Keywords: Deforestation, forest landscape restoration, governance, hydrological dynamics, land-use change, West Africa

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