Suspended Sediment Sources Fingerprinting in Ashebeka River Catchment, Assela, Central Ethiopia

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Abstract : Ashebeka River is the main source of drinking water supply for Assela City and its surrounding inhabitants. Apart from seasonal water reliability disruption, the cost of treating water downstream of the river has been increasing over time due to increased pollutants and suspended sediments. Therefore, this research aimed to identify geo-location and prioritize suspended sediment sources in the Ashebeka River catchment using sediment fingerprinting. We collected 58 composite soil samples and a river water sample for suspended sediment samples from the outlet, which were then filtered using Whatman filter paper. The samples were quantified for geochemical tracers with multi-element capability, and inductively coupled plasma-optical emission spectrometry (ICP-OES). Tracers with significant p-value and that passed the Kruskal-Wallis (KW) test were analyzed for stepwise discriminant function analysis (DFA). The DFA results revealed tracers with good discrimination were subsequently used for the mixed model analysis. The relative significant sediment source contributions from sub-catchments (km2): 3, 4, 1, and 2 were estimated as 49.31% (8), 26.71% (5), 23.65% (5.6), and 0.33% (28.4) respectively. The findings of this study will help the water utilities to prioritize areas of intervention, and the approach used could be followed for catchment prioritization in water safety plan development. Moreover, the findings of this research shed light on the integration of sediment fingerprinting into water safety plans to ensure the reliability of drinking water supplies.

Keywords : disruption of drinking water reliability, ashebeka river catchment, sediment fingerprinting, sediment source contribution, mixed model
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