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IMPACTS OF ANTHROPOGENIC FACTORS ON ECOSYSTEMS IN THE CHIBEFWE RIVER CATCHMENT, MKUSHI DISTRICT ZAMBIA

N. Namafe[1], K. Mbata[2] & F. Kleinschroth[3]
Integrated Water Resources Management Centre, Department of Geology, School of Mines, University of Zambia[1]
Department of Biological Sciences, School of Natural Sciences, University of Zambia[2]
ETH Zurich, Department of Environmental Systems Science, 16 8092 Zurich Switzerland[3]

Abstract

The Chibefwe River Catchment in Zambia constitutes areas of high population densities owing to its favourable conditions to support agriculture, water supply and transport among others. However, despite human dependence on the catchments' river systems, anthropogenic activities such as those associated with rapid population growth, urbanisation and industrialization have resulted in the severe degradation of water quality, ecosystem health and river channel integrity. Due to mushrooming small scale farming, the catchment is notably characterized by activities such as uncontrolled abstractions and diversions, stream bank cultivation, spraying of uncertified pesticides and herbicides, open defecation and unsustainable solid waste disposal. Studies have shown that most catchments are subject to an array of ecologically unsustainable land use and developing activities, which constantly threaten their ecological integrity of river systems and ultimately compromises the services derived from them. There is some evidence that freshwater ecosystems are vulnerable and are constantly under threat. However, in the face of these human activities, presently little is known about the catchments' river ecological integrity. This study analysed impacts of land use activities on water quality using aquatic macroinvertebrates as indicators of water quality in the Chibefwe River Catchment. Three sites were selected on the Chibefwe River namely: 1. near the source of the Chibefwe River, (2) around the built-up area of Mkushi town and (3) before the confluence with the Lunsemfwa River. At each site physicochemical parameters were recorded and sampling of aquatic macroinvertebrates was done using a 1mm kick-sized net. Collected specimens were identified to family level on-site using the Zambia Invertebrate Scoring System (ZISS) photographic identification manual. Specimens that could not be identified in the field were preserved in 70% ethanol and taken to the lab for further analysis. Data collected was analysed by computing the ZISS score, Average Score per Taxon (ASPT) and the macroinvertebrate species diversity. Water chemistry results revealed that all physicochemical measurements at the sites conformed to the World Health Organization standards for drinking water except for pH and dissolved oxygen requirements. Sites one, two and three recorded pH values of 3.15, 4.05 and 4.74 respectively and a value of 5.33 *mg/l* of dissolved oxygen was recorded at site one compared to the recommended (>6mg/l). Furthermore, results showed that sites one and three had moderate water quality conditions (ASPT 6.66 and 7.75). In contrast, an ASPT value of 4.5 was recorded for site two suggesting an impaired environmental quality of river water at the site. Sites one and three had macroinvertebrate species diversities of 1.12 and 1.34, respectively, suggesting moderate modifications to the environment. A species diversity value of 0.84 determined for site two indicates that the Chibefwe River inside Mkushi town was highly degraded with high levels of pollution. The study concludes that there are changes in water quality and ecosystem conditions across the Chibefwe along a gradient of human disturbance. Deterioration of habitats near the township are due to settlements and croplands which have resulted in the depletion of vegetation cover. The study recommends that existing vegetation be conserved while reducing disposal of untreated wastes in the river.