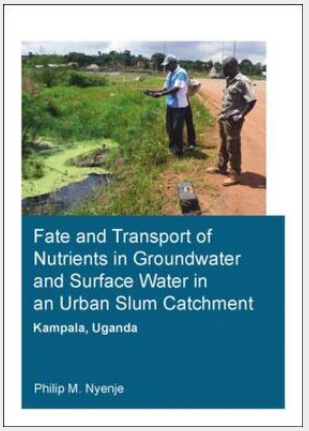
Nyenje

Fate and Transport of Nutrients in Groundwater and Surface Water in an Urban Slum Catchment, Kampala, Uganda



Urban informal settlements or slums are growing rapidly in cities in sub-Saharan Africa. Most often, a sewer system is not present and the commonly-used low-cost onsite wastewater handling practices, typically pit latrines, are frequently unplanned, uncontrolled and inefficient. Consequently, most households dispose of their untreated or partially treated wastewater on-site, generating high loads of nutrients to groundwater and streams draining these areas. However, the fate of nutrients in urban slums is generally unknown. In excess, these nutrients can cause eutrophication in downstream water bodies. This book provides an understanding of the hydro-geochemical processes affecting the generation, fate and transport of nutrients (nitrogen and phosphorus) in a typical urban slum area in Kampala, Uganda. The approach used combined experimental and modeling techniques, using a large set of hydrochemical and geochemical data collected from shallow groundwater, drainage channels and precipitation. The results show that both nitrogen-containing acid precipitation and domestic wastewater from slum areas are important sources of nutrients in urban slum catchments. For nutrients leaching to groundwater, pit latrines retained over 80% of the nutrient mass input while the underlying alluvial sandy aquifer was also an effective sink of nutrients where nitrogen was removed by denitrification and anaerobic oxidation and phosphorus by adsorption to calcite. In surface water, nutrient attenuation processes are limited. This study argues that groundwater may not be important as regards to eutrophication implying that management interventions in slum areas should primarily focus on nutrients released into drainage channels. This research is of broad interest as urbanization is an ongoing trend and many developing countries lack proper sanitation systems.

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