The Water Quality of Birim River in South-East Ghana

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Abstract

A limno-chemical characterization and water quality assessment of Birim River Catchment identified mining and domestic activities as the main pollution sources. The concentrations of a range of elements and ions in the river waters were measured over a of 12-month period. The river waters were well oxygenated due to their turbulence with resultant diffusion action, and 72.2% of the waters had dissolved oxygen (DO) above the natural background level range of 5.0 - 7.0 mg L^{-1}. Evidence of high nutrient loads recorded in the basin was as a result of influences from domestic, agricultural and industrial activities, as well as biogeo-chemical reactions in the soil. The seasonal variations of the nutrients were higher in the rainy season than in the dry season. The waters of the Birim basin showed an overall ionic dominance pattern of Ca > Mg and HCO_3 > Cl > SO_4, typical of freshwater systems, due to the dominance of Ca and HCO_3. Calcium and magnesium showed a strong linear correlation $r = 0.95$ significant at $P < 0.001$, an indication of strong weathering pattern in the Birim catchment. Variations of chlorides and suspended solids were high in the rainy season. BOD loads were high in the lower reaches, an indication of industrial, domestic and commercial discharges. 84.2% of the measured Mn values exceeded the background level of 0.1 mg L^{-1} as a result of mining activities and other anthropogenic point sources.

Key words: Birim River, Ghana, limno-chemical, nutrient load, seasonality, water quality assessment

Introduction

The development of water resources has often been used as a yardstick for socio-economic and health status of many nations worldwide. However, pollution of waters often negates the benefits obtained from the development of these water resources.

For many people in Ghana, water supply, sanitation and safe disposal of wastes remain the most important of all environmental problems. Control and sustainable management of river catchment are major issues in Ghana because of a variety of pressures placed upon land and water resources. These include nutrient enrichment of surface waters from urban sources and by agricultural chemicals, sediment loading caused by deforestation, eutrophication, improper land management, and abstraction of water for human consumption and irrigation, the requirements for rural and urban development and poverty alleviation (Ansa-Asare, 1995).

In Ghana, not much work has been done on the pollution loads of some freshwater systems and how they affect their inherent resources. Available information on some river quality systems in Ghana are: Ansa-Asare & Asante (1998); Ampofo (1997); Ansa-Asare (1995); Ansa-Asare (1992); Biney (1987); Odei (1975); Amuzu (1975) and Ayibotele (1974). The Birim basin, for example, has not been studied as an entity, although some portions of it relating to mining ativities around Akwatia and Kwabeng have had preliminary documentation on their hydrobiology (Odei, M.A., personal communication).

The Birim, which is an important source of water supply for the people in its catchment area, is being subjected to waste discharges in places like Oda, Akwatia and Kwabeng from mining activities. Deforesta-