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**Pollution of Inland Waters:  
A Case Study of Sisa River,  
Kumasi, Ghana, West Africa**

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**Master Thesis**

by

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## ABSTRACT

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*Pollution of Inland Waters: A Case Study of Sisa River,*

*Kumasi, Ghana, West Africa*

Sisa River is one of the major rivers in one of the sub-catchments in Kumasi, Ghana. It is located in the Asokwa Sub-Metro in the eastern part of Kumasi. Water resources in the peri-urban area around Kumasi including Sisa are losing their values due to pollution. Since the particular pollution situation at specific areas of Sisa River had not yet been documented, this project had two main **OBJECTIVES**, which were:

1. to identify specific existing or emerging water quality problems as a result of the presence of different potential pollution sources and their particular waste-water management along the banks of Sisa River,
2. to gather information to design specific pollution prevention or remediation programs

The **STUDY METHODS** used to collect data for this project included Personal Observations and Surveys, Water Sampling and Analyses, Desk Study and Interviews. Water quality parameters measured included pH, Temperature, Conductivity, Total Dissolve Solids, Dissolved Oxygen, Biological Oxygen Demand, Nitrites, Nitrates and Coliform bacteria. Institutions involved in the interviews were Environmental Protection Agency, Institute of Renewable Natural Resources, Environmental Health Office, Waste and Sewerage Department, Ghana Water Company Limited, Town and Country Planning and Ghana Statistical Service – all based in the Kumasi Metropolis.

The **RESULTS** revealed that there is a clear deterioration of water quality of Sisa River from the more rural (upstream of Kumasi) to the more urban-affected (within and downstream of Kumasi) subcatchments. The following obtained on Sisa River supported this.

- ❖ The taste and odour of the water were offensive and objectionable to the people

- ❖ There were low levels of Dissolved Oxygen which makes it difficult for many species of fishes to thrive well in the water
- ❖ Conductivity levels were far higher than EU recommended levels
- ❖ Nitrites level exceeded EU recommendations
- ❖ There was widespread coliform contamination

Most of the **POLLUTANTS** originated from refuse, sewage, industrial waste, human as well as animal faeces and the effects of urban runoffs. Although agriculture has affected the shoreline vegetation of Sisa River, there is less evidence of agriculture having a significant effect on water quality, as high levels of nitrates would have indicated its effects.

Problems of pollution can be attributed to:

### **1. Poor Domestic Waste Disposal**

- lack of demarcated sites for refuse disposal
- relatively inaccessible refuse dump sites
- lack of awareness of the health implication of insanitary practices
- indifference to the presence of waste
- lack of the requisite equipment for disposal
- poor siting of refuse disposal sites (e.g. along river banks and marshy areas, near water sources)
- lack of the technical know-how to add value to waste (e.g. composting)

### **2. Poor Human Waste Disposal**

- absence of private toilet facilities in most homes
- absence of public toilet facilities in certain communities
- inaccessible public toilet facilities, in terms of distance in some communities
- ignorance of health implications of indiscriminate defecating
- indifference to consideration of hygiene
- poor maintenance of public toilets
- littering, especially polythene products

The residents of Kumasi are already paying for sanitation services but do not enjoy a good standard of service. People are paying more than \$1 million per

year to have only 10 percent of their waste removed from their immediate environment. About 38 percent of Kumasi's population use public latrines, which charge per visit; another 20 percent of the population use the unhygienic bucket latrine system, which is emptied every other day for a fee; 30 percent use household water closet facilities; 1 percent rely on sewerage (Asafo, 4BN, central hospital and the university); while pit latrines (KVIP/traditional; 7 percent) and the bush (4 percent) provide for the rest of the population.

The current system of **human waste and sanitation management** in Kumasi are inadequate; waste removed from the public and bucket latrines end up in nearby streams and in vacant lots within the city limits creating an unhealthy environment. Many government offices, schools and private institutions require improved sanitation facilities. Industrial effluent from the breweries, leachate from sawmills and waste oil spillage from the vehicle repair complex at Suame are also discharged into receiving waters without treatment. The storm water drainage system is essentially an open sewer, which discharges into the Subin (major tributary of Sisa River), Aboabo (major tributary of Sisa River) and Sisa rivers, and as a result the beneficial uses of these rivers (domestic water supply, irrigation, livestock watering and recreational activities) are adversely affected for a number of miles downstream.

Whilst **infrastructural initiatives** to deal with bulk pollution will be required, for example improved sewage treatment systems, **actions** at the individual and community levels are also desirable.

This research together with its **suggestions** may serve as the basis for further water quality monitoring. Furthermore, the **data on pollution** can be used in **formulating management system** and **policies** to prevent further pollution and to **derive plans for remediation** measures for the polluted Sisa River.