

# Seasonal and Longitudinal Variations of Water Quality in an Urban Stream: Case Study of Sosiani River Uasin Gishu County, Kenya

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## Abstract

The study sought to analyse longitudinal and seasonal variations in physico-chemical properties of water quality in Sosiani River in Eldoret town, Kenya. An experimental design was used to collect water samples upstream midstream and downstream of Eldoret town for a period of one year during the dry and wet seasons. Samples were collected from effluent discharge points in accordance with APHA, 2012 water sampling procedures. Sosiani River exhibited significant variation in physico-chemical water parameters along the river and during rainy seasons. TSS varied significantly across the river at  $F= 185.52$   $P < 0.001$  and during the wet season ( $P < 0.045$ ). TDS varied significantly along the river ( $F= 59.0129$  at  $p < 0.001$ ) with a significant positive correlation at  $P < 0.001$  during wet season. Turbidity varied significantly along the sampling points  $F= 32.41$   $P < 0,001$  and varied significantly  $p < 0.028$  during the rainy season. BOD varied significantly along the river ( $F= 78.95$  &  $P < 0.001$ ) with a significant positive correlation  $P < 0.038$  during the rainy season. COD varied significantly along the river ( $F=77.64$  &  $P < 0.001$ ) and during wet season. Water temperature varied significantly along the river ( $F=185.52$ ,  $p < 0.001$ ) and with the onset of the rainy season ( $P < 0.013$ ). Water pH varied significantly along the sampling points ( $F= 159.85$  &  $P < 0.001$ ). However, pH did not vary significantly during the wet season ( $P < 0.616$ ). This river is polluted, turbid with low dissolved oxygen and high BOD hence not suitable for aquatic life. However the water quality improves downstream perhaps due to self cleansing ability of the river. Hence the water is not suitable for human consumption and or recreation purposes. The water should be treated and municipal effluent channelled into effluent treatment works for pre-treatment.

**Keywords:** Sosiani River, physicochemical water quality, seasonal and longitudinal variations

## 1. Introduction

Rivers and streams are vital sources of fresh water for both domestic and industrial use. They provide livelihood, fresh water resources, water for irrigation and recreation purposes. Besides, they also play a key role in assimilation of municipal and industrial effluent through a complex process of influx of surface and ground water, hydrolysis, biological or chemical processes such as sedimentation, coagulation, volatilization, precipitation of colloids and biological uptake (Edward, 2000; McKinney & Schoch, 2003;). However, they have become susceptible to pollution since water bodies are perceived to be limitless dumping grounds for wastes. As a result rivers are used as sinks for urban effluent hence a pathway for heavy metal translocation worldwide (David, 2008). Apparently, owing to the large quantity of effluent discharged to the receiving waters, the natural processes of pathogen reduction are inadequate to protect public health. Hence some rivers are unable to self purify as waters flow downstream (Alavi *et al.*, 2007; Maina *et al.*, 2010). By and large water pollution has become a major global problem as effluent management deteriorates. This is as a result of increasing populations, urbanization, industrialization and increased use of chemicals (Burton & Robert, 2001; Hogan, 2010).

Haphazard effluent discharge alters the physico- chemical and bacteriological properties of water which affects water use, ecosystem functions and human health. In light of this, water pollution can be defined as the change in physical, chemical and biological properties of water quality that has harmful effect on living things (WHO, 2003). It is a critical resource that supports life and makes up to 50-97 per cent of plant and animal weight and 70 per cent of human body (Goel, 2006; Hogan, 2010; WHO, 2011). Most water resources are polluted by non point source pollution where pollutants gradually diffuse or leach into rivers unlike point source pollution where pollutants are directly discharged from a single discrete source (Goel, 2006; Hogan, 2010). Ultimately water pollution exacerbates water scarcity as it limits the use by, and or imposes a higher cost for treatment on downstream users. Hence deteriorating water quality has become one of the most critical issues affecting both the developed and developing countries alike (WHO, 2007).

## 2. Materials and methods

This study was conducted along Sosiani River which traverses Eldoret town in Uasin Gishu County of Kenya. This river originates from two river dam in Kaptagat a confluent of two streams Elengerini and Endoroto whose source is Kaptagat forest (Figure 1). Sosiani River discharges into Kipkaren River in Turbo which subsequently