FACULTY OF ENGINEERING

DEPARTMENT OF WATER RESOURCES ENGINEERING

FINAL YEAR PROJECT REPORT

ASSESSING THE IMPACTS OF WASTEWATER DISCHARGE ON RIVER ATURUKUKU WATER QUALITY (TORORO)

BY

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A final year project report submitted to the Department of Water Resources Engineering in partial fulfillment for the award of the Bachelor of Science in Water Resources Engineering of Busitema University.

November

ABSTRACT.

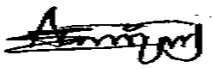
The discharge of untreated high-strength wastewater into water bodies results in water quality deterioration of the receiving waters. This study aimed to assess the impacts of wastewater discharge on the water quality of river Aturukuku, Tororo. Water samples were collected from river Aturukuku at six points: three points upstream of the stabilization ponds, the fourth point at the discharge point for the stabilization pond, and the other two downstream of the ponds. Physicochemical parameters that were considered include dissolved oxygen, biological oxygen demand, temperature, pH, turbidity, conductivity, nitrates, and phosphates. Some data was collected in the field while the other was collected after laboratory analysis of the samples collected during the wet season. Using the results obtained, water quality indices were calculated to evaluate water quality at each sampling point, and based on these indices, water was categorized as fit for different uses. Points 1, and 5 were categorized as poor for drinking but could be used for irrigation, points 2, 3, and 6 were categorized as very poor for drinking and were restricted to irrigation purposes. Point 4 was categorized as unfit and this was restricted from any use unless proper treatment is done. The results showed that most of the concentrations of the parameters were within the standard limits (WHO, and NEMA). Based on the results above, it can be concluded that water quality in the region sampled is below quality standards set by WHO and NEMA, and at the WSP discharge point, in particular, the quality of water declines substantially as compared to the rest of the sampled points.

Keywords: wastewater, water quality, impact, physicochemical parameters, stabilization ponds, and water quality index.

DECLARATION

I, AMPIIRE COLLINE hereby certify and confirm that the information I have written in the project is a result of my effort, and research and has not been submitted before to any university or institution of higher learning for any academic award.

AMPIIRE COLLINE

Signature…  Date 12th January,2023

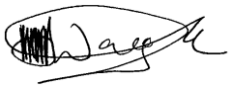
APPROVAL

This is to certify that this final year project report was written under the guidance of my supervisors on the topic "**assessing the impacts of wastewater discharge on River Aturukuku water quality, Tororo**" has been under the supervision of

Dr. Joseph Ddumba Lwanyaga

Signature ……. date……

Mr. Godfrey Wangi

Signature  date 12th January,2023

ACKNOWLEDGMENT

I thank the almighty God for the far that he has brought me, the gift of life, knowledge, hope, protection, and his provision during and throughout the writing of this project report.

I extend deep sincere gratitude to my academic supervisors for the encouragement and the guidance they have accorded me in the writing of this project report.

Special thanks to my family for the unconditional prayers, love, and encouragement in the writing of this project report.

It would be a great injustice if I omit the role played by my dear friends in directing me, and their tremendous tireless encouragement, support, and guidance is given to me during the writing of this project report.

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LIST OF ACRONYMS

WSPs-Wastewater stabilization ponds

WHO-World health organization

BOD5 – Five-day Biological Oxygen demand

DO- Dissolved Oxygen

pH- the potential of hydrogen

NEMA-National Environment Management Authority

CHAPTER ONE: INTRODUCTION

1.1 Background

Water is one of the necessities and is facing increasing demand due to population growth, industrialization, and urbanization (Xagoraraki & Kuo, 2017). The quality of the available water is getting depleted day by day due to, the discharge of urban and industrial sewage, and agricultural runoff. Water bodies serve different purposes to both human societies and aquatic life. Just as organisms on earth require oxygen to survive, aquatic life must access sufficient quantities of dissolved oxygen from their freshwater ecosystems (Mitra et al., 2016). A healthy water body that can support life and as well prove to be safe for human consumption must contain 6.5 – 8.5 mg/L of dissolved oxygen (DO) (WHO, 2011). However, different factors may reduce this standard DO requirement leading to the suffocation of aquatic life and as well reduction of surface water quality for human consumption. The factors that may lead to this include; the presence of decaying organic matter, an increase in water temperature, weather changes, and contamination with wastewater, (Jachimowski, 2017). A big amount of agricultural, municipal, industrial, highway, and waste stabilization ponds wastewater discharges to water bodies around the world.

According to the above-mentioned problems of wastewater discharges, it is important to manage the water quality of hydrological sources and predict the impact of contaminants on them. Rivers and streams are one of the main sources that suffer a big amount of pollutant loads and wastewater around the world (Nakhae & Griffith, 2010). Disposal of municipal, agricultural and industrial wastewater into the rivers with little or no treatment before discharge is a common practice in many developing countries. This has caused a serious concern over the deterioration of river water quality (Viswanathan & Schirmer, 2015). Many small rivers and streams in Uganda such as River Aturukuku and its tributaries are under threat due to the influx of pollutants without prior treatment. Therefore, it is important and timely that a rigorous approach to the water quality modeling of such water courses be undertaken (Matsiko et al., 2011).

During the flows of River Aturukuku through the different agricultural, municipal drainage, and industrial areas, it receives untreated industrial, municipal, and agricultural waste discharges such as effluent from factories and drainage areas in the catchment area and the neighboring small settlements situated on the bank of the stream and also the stream receives partially treated waste from waste stabilization ponds of Tororo along Mbale road (Matsiko et al., 2011). This stream is the main source of fresh water for domestic use to the villages along

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