ASSESSMENT OF ENVIRONMENTAL IMPACTS OF POOR WASTE DISPOSAL ON WATER QUALITY.

A Case study; River Rwizi, Mbarara Municipality, Western Uganda

BY

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DECLARATION

I hereby declare that the work in this dissertation is my own original work arrived at through literature review and fieldwork under the guidance of my supervisor and the help of the water quality technicians of National Water & Sewerage Corporation-Mbarara. To the best of my knowledge, it has never been submitted for any academic award in any other university or higher institution of learning. In all cases where other people's ideas were used, they have been duly acknowledged by complete references.

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APPROVAL

This work has been thoroughly supervised and approved to have fulfilled the requirement leading to the award of a bachelor of science in Natural Resource Economics of Busitema University. Therefore, this dissertation has been submitted for examination with the approval of the supervisor.

Signature

.....

M/s Gimbo Rebecca

Date.....

DEDICATION

I dedicate this dissertation to my parents Mr. Mugizi Robert and Mrs. Edridah Mugizi
May God bless you

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It was not my capability or aptitude neither was it my prospective to carry out the research successfully, nor my knowledge to prepare this dissertation systematically but the total will and mercy of the Divine Creator who granted me life, wisdom and knowledge. I wish to express my heartfelt appreciation to my Supervisor, M/s Gimbo Rebecca for the patience, guidance and encouragement in shaping this research study up to the last minute. I am also grateful to staff members at the Department of Natural Resources Economics, Namasagali campus, Busitema University. I am deeply indebted to management and staff of the National Water and Sewerage Corporation (NWSC) analytical laboratory-Mbarara area for the kind of assistance offered to me at various stages during the research. I am greatly indebted to my parents and relatives and with sincere gratitude, I acknowledge especially my parents for the moral, material, financial and spiritual support they rendered me before, during and after the course, my sister and brothers who have always stood by side to support and encourage me.. Also in special way, I thank my classmates and the entire Christian union of Namasagali campus Busitema University. Thank you for the moral support and a shoulder to lean on.

TO ALL, I SAY; MAY YOU BE BLESSED!

Table of Contents

List of figures

List of tables

List of plates

List of abbreviations

AOAC: Association of Official Analytical Chemists

BOD: Biological Oxygen Demand

CFU: Colony Forming Unit

COD: Chemical Oxygen Demand

EPA: Environment Protection Agency

FTU: Formazin Turbidity Unit

LVEMP: Lake Victoria Environmental Management Project

mg/l: milligrams per litre

ml: millilitres

MST : Microbial Source Tracking

NEMA: National Environment Management Authority

NTU: Nephelometric Turbidity Unit

NWSC: National Water & Sewerage Corporation

SWAP: Source Water Assessment Programs

TDS: Total Dissolved Solids

TDS: Total Dissolved Solids

WHO: World Health Organization

ABSTRACT

The environmental impacts of poor waste disposal on quality of water of river Rwizi were assessed so that preventive measures may be taken. The increasing human activities such as deforestation, industrialization have led to the degradation of the environment thus increasing the degree of the disposal of wastes into river Rwizi. Sampling sites were selected based on areas with active human activities, the wastes deposited and physical characteristics of the areas. Samples for water chemistry analysis were collected in duplicate in the morning for a period of four months (December 2013, January 2014, February2014 and March2014) . An automated sampler was used to get the values of parameters such as conductivity, pH and temperature collected in four months and analyzed. In this study the statistical package used for analysis was SPSS and MS excel.

pH (ranged from 5.55 to 10.75), conductivity (ranged from 79.95µScm-1to 88.95µScm-1), turbidity (ranged from 53.025NTUto 71.425 NTU), color (ranged from 414PTUto 533PTU), bacteriological analysis (ranged from 106.5CFU/100ml to 141.5CFU/100ml), total alkalinity (ranged from 35.75mg/l to 79.3mg/l), total acidity(ranged from 43mg/l to 66.5mg/l), total hardness(ranged from 43mg/l to 81.25mg/l), oxygen concentration (ranged from 5.4mg/l to 8.075mg/l), nitrates (ranged from 10.875µm to18.925µm), nitrites (ranged from 14.85µm to 24.725µm), phosphorus (ranged from 4.595µm to 14.97µm), temperature (ranged from17.225°C to 25.2°C). These values were comparable to those identified by NEMA for water contaminated by wastes for all water resources. Phosphorus was below the detection limits at site 1.

It was found that there is a high degree of waste disposal into river Rwizi and recommendations on reduction of wastes disposed in the river Rwizi and conserving the environment around river Rwizi were made. Sources of wastes disposed in the river Rwizi include the human and economic activities taking place around river Rwizi such as sand mining, brick making, water treatment production plants, agricultural activities, Construction, motor vehicle garage, sewage treatment plants.

Keywords: *Environmental impact, Waste disposal, Water quality.*

Chapter one: General Introduction

1.1 Background of the study

River Rwizi intersects almost five districts located in south western Uganda including Mbarara, Bushenyi, Ntungamo, and Buhweju among others. river Rwizi originates from the Buhweju hills with some tributaries from other parts of Ankole region and pours its waters into lake Victoria via the kooki lakes (Mburo, Kachera, Naively, Kijanebarola,) System. It is the major inflow intoLake Mburo and other lakes in the system. This river Rwizi is the major source of the main economic activities in the districts and most of these activities take place within the river Rwizi itself and others take place within the catchment. Such activities include water abstraction, sewage treatment, cattle rearing, brick making, basket making, agriculture and agro-forestry and many other practices. These activities are all done without notification of downstream users and as a result river Rwizi has deteriorated both in quantity and quality including drying up of wetlands around, fringing river Rwizi. The total quantity of nutrients discharged into surface waters in river Rwizi basin is normally larger than the nutrient load at the river Rwizi mouth and such discrepancy is explained by the process of nutrient retention which is a collective expression for a large number of biogeochemical and hydrological processes that temporarily decrease, decay, degrade, transform or permanently retard and remove the substances from the river Rwizi channel. Urban Rivers, streams and wetlands are susceptible to pollution and so, river Rwizi in western Uganda faces a similar problem. This river Rwizi is a source of water for domestic, industrial and Agricultural activities for Mbarara municipality but due to poor waste disposal, proliferation of motor garages, washing bays, hotels, hospitals, schools and industrial setups, its water quality could have got compromised. The proposed study at five sampling sites (including entry and exit from the municipality) seeks to assess the water quality of this section of the river Rwizi using biological Agents like faecalcoli forms which acted as an indicator for water quality. The changes of the mentioned biological variables will be assessed considering the seasonal variations. The information generated from this study will be used by relevant stakeholders in water management to design measures aimed at reducing water pollution and make it safe for human and animal consumption.

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