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Pursuing Excellence

**FACULTY OF ENGINEERING
DEPARTMENT OF MINING & WATER RESOURCES ENGINEERING
B.SC. WATER RESOURCES ENGINEERING FINAL YEAR PROJECT
REPORT**

**Application of GIS in Modeling Groundwater Vulnerability to Contamination
Case Study; Namanve in Kira-Goma sub county**

Submitted by: Odoch Jimmy Raymond

BU/UP/2012/643

Email; jimmyraymond57@gmail.com Mobile; +256774757269/+256703409424

Supervisor: Mr. Oketcho Yoronimo

Co-supervisor: Mr. Wangi Mario



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ABSTRACT

Ground water is the safest source of water and most relied on water source in most rural settings of Uganda. The potential for ground water contamination to occur is affected by the physical characteristics of the area, the chemical nature of the pollutant, the rate frequency and the method of application.

This Report presents a standardized system which incorporates physical characteristics of any area into a methodology which can be used to evaluate the ground water pollution potential of any hydrogeologic setting.

The system has been designed to use existing information which is available from a variety of sources. Information on the parameters including the depth to water in an area, net recharge, aquifer media, soil media, general topography or slope, vadose zone media, and hydraulic conductivity of the aquifer is necessary to evaluate the ground water pollution potential of any area.

This report entails the way in which a multi-criteria approach of weighting factors was applied and Rating and Ranking which were used to come up with the Groundwater Vulnerability map of Kira and Goma sub counties where Namanve lies. Final outcome discussed in this report is the vulnerability map of Kira-Goma sub counties

DECLARATION

I **ODOCH JIMMY RAYMOND** hereby declare that all the information in this report is from my tireless work.

Signature

Jim

Date

30th / MAY / 2017

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ACRONYMS

NRC	National Research Council
NEMA	National Environmental Management Authority
DRWM	Directorate of Water Resources Management
UNMA	Uganda National Meteorological Authority
UIA	Uganda Investment Authority
DGSM	Directorate of Geological surveys and Mines
NEAP	National Environmental Action Plan
MCE	Multiple-Criteria Evaluation
DEM	Digital Elevation Model
UTM	Universal Transverse Mercator
SWL	Static Water Level
S/C	Sub-County
DTB	Depth to Bedrock
DWD	Directorate of Water Development
WHO	World Health Organisation
NGWDB	National Groundwater Database
ET_o	Evapotranspiration
Eff.	Effective

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Chapter 1

INTRODUCTION

This chapter contains the background of the problem, the problem statement, objectives, scope and justification of the research proposal.

1.1 BACKGROUND

About 1.1 billion people throughout the world lack access to clean drinking water. Serious health conditions can be the result from consumption of contaminated water. By the year 2015, one of the UN MDGs is to half the proportion of people without sustainable access to sanitation and safe drinking water (Moulodi and Thorsell, 2013)

Groundwater being most readily available water in terms of its distribution and the safest drinking water source due to natural purification mode would be the source of this clean drinking water. But this would be portable water source is under threat of contamination due to due to the rapid developments, heavy industrialization, use of Pesticides and fertilizers in agriculture in many parts of the world.

Groundwater pollution is mainly due to the process of industrialization and urbanization that has progressively developed over time without any regard for environmental consequences(Akinbile, Yusoff and Area, 2011)

The main sources of contamination are traffic, industrial wastewater disposal, effluent and unsorted wastes that have been dumped on the soil and this leaches into soils and is expected to eventually enter the shallow groundwater aquifers. The polluted soil would be another source of contamination, but a longer term problem since it takes more time for the pollutants to be transported to the groundwater (Larsson & Ljung, 2002)

In the past two or three decades, rapid urbanization across Africa has led to the growth of large areas of unplanned sub-standard housing in most cities. Residents of such areas usually resort to groundwater as a source of inexpensive, high-quality domestic water supply. However, the uncontrolled expansion of this kind of housing, together with increasing sewage and effluent leakage, indiscriminate waste disposal, and uncontrolled industrial and

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