FACULTY OF ENGINEERING

DEPARTMENT OF MINING & WATER RESOURCES ENGINEERING

A FINAL YEAR PROJECT REPORT

USE OF AN OPTIMAL WATER RESOURCES ALLOCATION MODEL ON R. RWIZI CATCHMENT

SUBMITTED BY

KIMERA ISMAIL

REG: BU/UG/2014/2001

Tel: 0780227595 / 0703347443

Email: ***kimeraismail2@gmail.com***

MAIN SUPERVISOR: Mr. DAVID KIMERA

CO-SUPERVISOR: **Mr. MASERUKA BENDICTO**

A final year project report submitted to the Department of water resources and mining engineering in partial fulfilment for the award of the Bachelor of Science in Water Resources Engineering degree of Busitema University

MAY 2018

DECLARATION

I KIMERA ISMAIL declare that the work presented in this project report is as a result of my own research and has never been submitted to any institution of higher learning for any award whatsoever.

Signature.....

Date…...……/……/…….

APPROVAL

This research project was conducted under my supervision and has been submitted with my approval for examination and award of B.Sc. Water Resources Engineering at Busitema University.

MAIN SUPERVISOR

MR. KIMERA DAVID

SIGNATURE 

DATE: 10th June 2018

CO-SUPERVISOR

MR. MASERUKA BENDICTO

SIGNATURE ……..…….

DATE…….

ABSTRACT

Mbarara municipality has a rapidly growing population with R.Rwizi as the only fresh water source.

Water scarcity and unregulated utilization of R.Rwizi catchment have become a threat to the sustainable development of both the ecosystem, human beings and livestock .In order optimize water resources in the area, this report attempts to propose a new perspective for the optimization of water resources allocation in a typical river catchment. In order to conduct an accurate and feasible program for water resources allocation, an optimal water resources allocation programming model was used which was solely decided by water resources demand in different water use sectors and the available volume in the catchment. The program includes two parts, namely water demand forecast among different water use sectors and optimal allocation among domestic, industrial, agricultural and ecological uses within the study area. The results demonstrate that the optimal program can well predicate the future water demand of the different water sectors and appropriately allocate the resources without constraining the ecological sector the actual situation of water allocation in the future. To ensure regional sustainable development, it is vital that reasonable water-saving measures in each water use sector and ecological protection policies be taken.

ACKNOWLEDGEMENT

It gives me great pleasure on the successful completion of my project report. Praise be to the Almighty God who led me through the course of the work by providing me His blessings and guidance.

I extend my sincere gratitude to my academic supervisors, **Mr. Kimera David and Mr. Maseruka Bendicto** for being inspirational, immensely supportive, and courageous and selflessly helpful throughout this project. I would like to as well thank the entire staff of the department of Mining and Water Resources Engineering Busitema University for providing all kinds of assistances throughout this project.

I express my sincere appreciation as to my friend Iyega Hamimu for the enormous contribution towards the completion my research.

Lastly, I extend my heartfelt thanks to my dear family for the inexplicable support to me from the beginning of my career up to date. I really owe you a lot.

May the Almighty God reward you all!

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACRONYMS

UBOS	Uganda National Bureau Statistics
MWE	Ministry of water and Environment
Ve	Effective volume
NWSC	National Water and Sewerage Corporation
R	River

CHAPTER ONE

1. Background of the Study

Water is a complex resource, with distinctive features as an economic good and often with a unique legal status. Access to the resource is often subject to usage rights (or "water entitlements"), rather than outright ownership, with the exception of groundwater resources in certain countries(Bird, Arriens and Custodio, 2008).

A well-designed allocation system should have two key characteristics: it should be robust by performing well under both average and extreme conditions and have the capacity to adjust to changing conditions at least cost over time(Bird, Arriens and Custodio, 2008).

Water allocation is the process in which an available water resource is distributed (or redistributed) to legitimate claimants, and the resulting authorization for use is granted, transferred, reviewed, and adapted as a water use right. Priorities for allocating water may be defined in law or through strategy development or planning processes(Bird, Arriens and Custodio, 2008).

Burchi and D'Andrea (2003) define water allocation as the "function of assigning water from a given source to a given user or number of users for abstracting it and applying it to a given use."

In a 2007 paper on water rights and water allocation, the World Wide Fund for Nature, better known as WWF, defines water allocation as a process "whereby an available water resource is distributed to legitimate claimants and the resulting water rights are granted, transferred, reviewed, and adapted. Hence, water allocation processes generate a series of water rights governing the use of water within a catchment(Bird, Arriens and Custodio, 2008).

The basic principles for the optimal allocation of water resources are efficiency, equity, and sustainability, with the aims of pursuing the maximum benefit for society, the environment and the economy, whilst maintaining fair allocation among various areas and people(Water, 2017).

Although Uganda is usually considered as being well endowed with water resources the country is at an increasing rate, confronted with the following concerns: The seasonal and spatial variability of the water resources, increasing water demand, variation between distinct

References

Bird, J., Arriens, W. L. and Custodio, D. Von (2008) ‘Water Rights and Water Allocation’, (February).

Brown, T. C., Service, U. S. F. and Collins, F. (2002) ‘Proceedings of 2’, pp. 1–11.

Dinar, A. et al. (1997) ‘Water Allocation Mechanisms- Principles and Examples’.

Global, T. et al. (2015) Intergrated Water Resources Management .

Jefferson, T. (1950) ‘Trend Extrapolation Methods’, (1984), pp. 161–183.

Malekian, A. et al. (2012) ‘Optimal Planning for Water Resources Allocation (Case study : Hableh Roud Basin , Iran)’, 17, pp. 1–8.

Mijares, J. A. et al. (2008) ‘Water resources assessment: integral water balances in basins’, p. 82.

Rolda, Â. et al. (2001) ‘Optimisation model for water allocation in de ® cit irrigation systems I . Description of the model’, 48, pp. 103–116.

Wang, J. F. et al. (2007) ‘Optimal Water Resource Allocation in Arid and Semi-Arid Areas’. doi: 10.1007/s11269-007-9155-2.

Wang, Z. et al. (2015) ‘Optimal Water Resources Allocation under the Constraint of Land Use in the Heihe River Basin of China’, pp. 1558–1575. doi: 10.3390/su7021558.

Water, M. O. F. (2017) ‘REPUBLIC OF UGANDA’, (APRIL 2014).