



FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF WATER RESOURCES

FINAL YEAR PROJECT

**FEASIBILITY ASSESSMENT OF POTENTIAL SITE FOR
HYDROPOWER PRODUCTION**

CASESTUDY: RIVER CHEPTUI WATERSHED

BY

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**A final year project report submitted to the Department of Water Resources Engineering in
partial fulfilment of the requirement for the award of the Bachelor of Science in water
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ABSTRACT.

This study investigates the feasibility of a potential site for hydropower production within the River Cheptui watershed, located in the eastern region of Uganda. With Uganda relying heavily on hydropower for electricity generation, and only a small portion of its potential capacity utilized, the research focuses on identifying viable small hydropower sites to enhance rural electrification and sustainable energy development. The study assessed the topographic characteristics of the watershed to estimate the gross head, evaluated the hydrological potential through rainfall-runoff modeling using HEC-HMS, and developed a hydropower energy model using RETScreen to estimate the annual energy output.

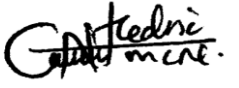
Topographic analysis revealed a gross head of 115 meters, making the site suitable for run-of-river hydropower generation. Hydrological simulations based on 18 years of CHIRPS rainfall data estimated an average river flow of 5.1 m³/s, with a selected design flow of 3.1 m³/s. Energy modeling indicated an average annual energy production of 14.04 GWh, with variability due to seasonal rainfall patterns. The plant exhibited a capacity factor of 61.6%, with full capacity operation achieved over 45% of the year.

The findings confirm the technical and hydrological viability of the site for small-scale hydropower development. The study recommends further environmental assessments, integration of hybrid renewable systems, and stakeholder engagement to ensure sustainable implementation. This research contributes to Uganda's national energy goals and the achievement of Sustainable Development Goal 7 by promoting access to clean, affordable, and reliable energy.

Keywords: Hydropower feasibility, River Cheptui, Run-of-river, Gross head, HEC-HMS, RETScreen, Small-scale hydropower, Rural electrification, Hydrological modeling, and Energy generation.

DECLARATION

I MWAMBU CEDRIC NAMUDOTO with Registration number BU/UP/2021/0309, hereby declare that all the work material portrayed in this project is my original work except where explicit citation has been made and it has not been presented to any Institution of higher learning for any academic reward.

SIGN: -----

DATE: 10th May 2025

APPROVAL.

This is to certify that the project under the title “**Feasibility assessment of potential site for Hydropower Production**” has been done under the best of my effort and is now ready for examination.

Mr. Mugisha Moses

Department of Water Resources Engineering.

SIGN: 

DATE: 10th May 2025

DEDICATION

This report is dedicated to all who are committed to the protection and preservation of our water resources, to the scientists and researchers whose work deepens our understanding of the environment and Hydropower, and to the activists who tirelessly promote and implement sustainable practices.

Special appreciation goes to my family and friends for their steadfast support and encouragement throughout this academic journey. Your unwavering belief in me has been a continual source of motivation and strength.

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I thank GOD for the life He has given me and for this far He has brought me in my academic journey.

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LIST OF ACRONYMS

AMS	Annual Maxima Series
ANNs	Artificial Neural Networks
CHIRPS	Climate Hazards Group InfraRed Precipitation with Station data
DEM	Digital Elevation Model
DWRM	Directorate of Water Resources Management
EIA	Environmental Impact Assessment
ERA	Electrical Regulatory Authority
FDC	Flow Duration Curve
GE	Google Earth
GWh	Giga Watt hour
GIS	Geographical Information System
GPS	Global Positioning System
HEC-HMS	Hydrological Simulation Models
MWE	Ministry of Water and Environment
SDG	Sustainable Development Goal
SCS-UH	Soil Conservation Service Unit Hydrograph
SHP	Small Hydropower Plant

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