ESTABLISHMENT OF DRY WEATHER FLOW IN KALU GANGA UNDER CLIMATE CHANGE SCENARIOS

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Degree of Master of Science

Department of Civil Engineering

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Thesis submitted in partial fulfillment of the requirements for the degree Master of Science in Environmental Engineering and Management

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DECLARATION

I declare that this is my own work and this thesis does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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The above candidate has carried out research for the Masters under my supervision.

Signature of the supervisor: Date:

ACKNOWELDGEMENT

Accomplishment of this study was possible due to numerous supports which I received during my study. I feel highly indebted to those who supported for my thesis study in numerous ways.

My deepest gratitude is offered to my advisor Dr. Nimal Wijerathne for his guidance, valuable suggestion and encouragements provided throughout the research work.

My deepest gratitude and gratefulness also extended to Dr. Manathunga and Dr. Mahesh Jayaweera for their supports, guidance and kind assistance throughout the research work as well as during the course work.

My special thanks and gratitude is conveyed to Dr. K. Raveenthiran , Dr. Prasanthi Ranasinghe and other staff members from Lanka Hydraulic Institute for their support during thesis work as well as course work period.

I would like to thank the academic and non academic staff in Department of Civil Engineering, University of Moratuwa for their support during the study period.

Furthermore, I would like to express my sincere thanks to all who helped me to discuss the difficulties during the thesis study.

Finally, I would like to my heartfelt thank to my parents, husband, other family members and friends for their continuous encouragements, motivations and supports throughout my study.

ABSTRACT

Establishment of Dry Weather Flow in Kalu Ganga under Climate Change Scenarios

Kalu Ganga basin is one of the most important river basins in Sri Lanka which covers a major portion of the wet zone and carries the highest discharge volume into the sea annually. Therefore it has been identified that, Kalu Ganga is the main source of water for potable water supply schemes especially for the Greater Colombo area.

It is the dry weather flow which determines its potential as a source of water for potable water supply schemes with no major 'at the source storage'. This study is focused on the analysis of low flow due to climate change. The objective of the study is to establish low flow conditions in the Kalu Ganga basin under different climate change scenarios.

Effect of the predicted climate change scenarios on the low flows can be taken into account by using Statistical downscaling with emission scenario consideration.

Statistical Downscaling Model (SDSM) is used for the downscaling of GCM data. Downscaling of GCM data using SDSM Global Circulation Model data of Hardley Center Coupled Model 3 (HadCM3) is used under both A2 and B2 emission scenario as the raw data. A variation of future rainfall is analyzed with observed data. Catchment runoff is predicted using a MIKE11 NAM based hydrological model for 50 years. Frequency analysis is conducted for measured and predicted flow data to establish low flow values due to climate change impacts.

Reduction of low flow in Ellagawa station about 6% and Millakanda Station about 4% in 50 year return periods. It is about 1% for other return periods in both stations. Impact of climatic change is high for the events with high recurrence interval. Hence it is not recommended to extract water during dry period. Therefore, having an appropriate storage system to cater the required demand during dry season is needed.

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LIST OF ABBREVIATIONS

CCCma	Canadian Centre for Climate Modeling and Analysis
CSIRO	Commonwealth Scientific and Industrial Research Organization
DHI	Danish Hydraulic Institute
GC	Greater Colombo
GCM	General Circulation Model
GHG	Green House Gas
HadCM3	Hardley Center Coupled Model 3
IPCC	Intergovernmental Panel on Climate Change
MCM	Million Cubic Meters
NAM	Nedbør-Afstrømnings-Model
NCEP	National Center for Environmental Physics
NEM	North East Monsoon
NWSDB	National Water Supply and Drainage Board
RCM	Regional Climate Model
SDSM	Statistical Downscaling Model
SRES	Special Report on Emission Scenarios
SWM	South West Monsoon
WMO	World Meteorological Organization