MODEL DEVELOPMENT USING GEOGRAPHIC INFORMATION SYSTEMS FOR RIVER BASIN PLANNING A CASE STUDY OF ATTANAGALU OYA

MASTER OF PHILOSOPHY

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DEPARTMENT OF CIVIL ENGINEERING
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A CASE STUDY OF ATTANAGALU OYA

THESIS SUBMITTED TO THE DEPARTMENT OF CIVIL ENGINEERING IN FULFILMENT OF THE REQUIREMENT FOR THE DEGREE OF

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January 2010

DECLARATION

I hereby declare that the work included in the thesis has not been submitted in part or whole for any other academic institution for the qualification of a higher degree.

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ABSTRACT

Increasing population and rapid economic and technical developments is threatening water resources all over the world. Need for careful management of water resources has become a major concern for watershed managers to protect water resources for sustainable future. As streamflow is one of the key considerations in water resources management, this study focuses on streamflow determination as a function of land use, soil, slope and rainfall from developed GIS model. This study further attempts to identify the potential of the model application in ungauged downstream of the case study basin.

Estimating runoff from rainfall records in the absence of stream gauge records is an important step in Sri Lanka, because most of the watersheds are ungauged. It was assumed that runoff depends on land use, soil type and slope (catchment characteristics) in addition to the rainfall. A simple conceptual model was used to compute runoff from each land parcel. The model assumes a linear function incorporating land use, slope and soil as major catchment parameters contributing to convert rainfall into surface runoff.

Attanagalu Oya was selected as the case study basin. Since Attanagalu Oya is ungauged at the downstream, an alternative methodology to find stream flow data was required to assess the streamflow variation. A GIS model was developed, calibrated and verified for sub-basin of Attanagalu Oya at Karasnagala and optimised runoff coefficients were obtained. As downstream of Attanagalu Oya basin (at Kotugoda) has more soil types other than Karasnagala, Kelani Ganga sub-basin at Glencourse and Kalu Ganga sub-basin at Putupaulla were selected as supportive study areas.

Runoff coefficient matrix suitable for wet zone catchments of Sri Lanka was developed. The developed matrix was utilised to calculate the runoff from rainfall records and used to calculate nodal network model input and analysis of water resources in the Attanagalu Oya basin.

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LIST OF ABBREVIATIONS

GIS:	Geographic Information Systems
GPS:	Global Positioning System
DHI:	Danish Hydraulic Institute
ID:	Irrigation Department
MRAE:	Mean Ratio of Absolute Error
NWS & DB:	National Water Supply and Drainage Board
RO:	Runoff
RYP:	Red Yellow Podzolic
SD:	Survey Department

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