

**LANDUSE IMPACTS ON WATER RESOURCES MANAGEMENT IN A
DATA-SCARCE WATERSHED OF THE EQUATORIAL NILE: CASE
STUDY OF THE SEMLIKI.**

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ABSTRACT

Data availability in developing countries for water management, planning and design constitutes a challenge for comprehensive spatial and temporal studies. Prediction in Ungauged Basin (PUB) is an on-going area of research of modern hydrology.

The Nile is the world's longest stream which, depending on the time of the year, water travels for about 20 days in the Blue Nile tributary and more than 45 days for in White Nile tributary. Intermediate and long term flow prediction for the Nile is crucial for the management and operation of the existing water control infrastructures from the Central and Eastern parts of Africa up to Egypt via the middle reaches (Sudan). An effective and appropriate way to study the vast Nile is to work at subbasin level and this study aims at providing a rational approach for flow prediction in the Semliki watershed- one of the waterheads of the White Nile.

This thesis deals with the assessment of landscape interactions with water resources in the data scarce Semliki watershed of the Equatorial Nile. Using a combination of limited ground information, remotely sensed acquired datasets, GIS and statistical techniques, conceptual deterministic, mesoscale hydrologic models for the catchment were developed.

One of the outputs from this work is the development of a new equation for the correction of the FEWS-NOAA satellite generated rainfall for the Semliki watershed. It takes into account the spatial and temporal dynamics of rainfall for the catchment. This is valuable for planners and managers of the water resources of the watershed who hitherto had relied only on one rainfall gauging station at Beni.

The identification and grouping of similar subcatchments of the Semliki watershed from landscape attributes using ordination techniques and clustering analysis was performed. The

ordination technique, namely the Principal Component Analysis, was further used in identifying data structure and redundant variables (landscape attributes) and subsequently guided the development of optimal model dimensions.

Using regression-based techniques, monthly linear and non-linear deterministic prediction models were developed to predict flows within Semliki subcatchments from the physiographic attributes.

Step-wise temporal and spatial sensitive analysis of the monthly flow on the variation of physiographic attributes was carried out for both the linear and non linear predictive models. The stream length of catchment was found to be generally most sensitive.

While providing water managers and planners with useful tools in a data-poor watershed, this study calls for urgent steps to be taken in acquiring Hydro meteorological data that can support further investigations into physically based modelling approaches that explicitly account for the interaction between landscape attributes and water resources in the Semliki watershed of the equatorial Nile region.