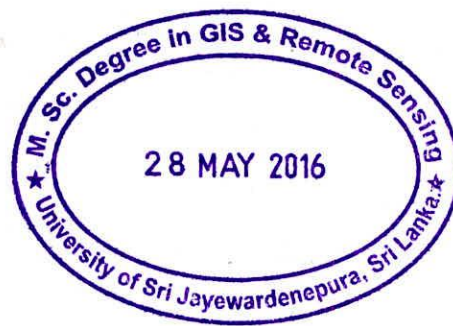


A Hydrological Analysis on Gurugoda Oya River Basin Using GIS
Technology

By

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DECLARATION OF THE CANDIDATE

I do hereby declare that work described in this thesis was carried out by me under the supervision of Prof.G.M.Bandaranayake and Prof.R.M.K.Ratnayake and report on this thesis has not been submitted in whole or in part to any University or any other institution for another Degree/Diploma.

Date: 20 March 2016



M.R.N.S.Bogahavita
"Meth Sisila",
Kiniwita,
Mahapallega.

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ABSTRACT

The world is facing a rapid growing demand on high quality water for increasing population and industries. As a third world country, Sri Lanka is also facing the chronic water scarcity in dry seasons. There for water resources assessment is a national wide important fact. It is evident that Gurugoda oya has a huge amount of water discharge all the month of the year. Due to lack of unavailability of real hydrological data of the river, this study proposed a GIS based analyze for making better understanding of the real situation as the main objective, Finding the possibility of making hydro power and taking water for drinking and sanitation are the secondary objectives of the study.

Both site observation and GIS based hydrological analyses are done in this study for getting to prove the result logically. Combining both data of informal discussions of the people who are living around the river and field observation, as well as GIS based hydrological data have been use in this study.

According to this study the upper catchment area is much suitable for getting water for drinking and sanitation purposes due to location of less dumping sites than the down catchment area where dumping sites are mostly functioned. Also the middle catchment area is suitable for making hydro power due to its hydrological and geographical characteristics which fund in this study.

Keywords: Gurugoda oya, GIS, Hydrology, Hydrologic analyze, River basin

Chapter One

INTRODUCTION

1.1 Introduction

The future of the whole world highly depends on the sound management of natural resources such as water, soil and forest. The world is facing a rapidly growing demand for high quality water due to demand on increasing population and industries .More than the quarter of the world's population or a two third of the population in developing countries will lives in regions that experience serve water scarcity by the next century. At the same time over exploration of usable water resources already has threatened to the sustainability of fresh water availability. As like most of the developing countries, Sri Lanka is also facing chronic water scarcity in the dry season, with the population growth and increase of industrial and agricultural activities. Hence the water resources assessment is an important exercise to establish accountability of water to meet present and future demands. (Anoja.2007)

Sri Lanka's has a radial pattern network of rivers, which start from the central highlands. The all 103 distinct river basins cover 59,217 square kilometers. Most identifiable stream basins are less than 100 square kilometers and many carry water only during the rainy season.

Large-scale development of water resources for irrigation and hydro-power generation have been implement during the last fifty years. Today, largely because of dams on the Mahaweli, hydro-power provides 90 percent of Sri Lanka's electric energy. The large reservoirs irrigate over 500,000 hectares of land, and have an aggregate installed capacity of 938 Megawatts (1988). But opportunities for projects of large-scale water resource development, with a few limited exceptions, have been exhausted with the Mahaweli Development Programme. Now attention must be focused largely on opportunities for small hydro-generation and more efficient use of water.

In our ancient history water was the most precious resources. That the hydrologic civilization was totally built up always with river basins. The great king Maha Parakramabahu who was civilized the Polonnaruwa kingdom by making lot of tanks and

streams once stated, *“Every drop of rainfall will not allow to flow to sea without getting useful for living being”*.

Therefore the understanding of the real hydrological situation of a basin is more important when planning any water resource development project. As a tool, GIS is very powerful for addressing different water resources issues such as water quality, surface water movement, surface water contamination, river restoration, flood prediction and management, and etc. at local, regional, national or even global scale (Esri, 2012). GIS with their advantages of spatial, spectral and temporal availability and manipulation of data covering large and inaccessible area within a short time has become a very useful tool in accessing, monitoring and conserving water resources (Sener, 2004)

1.2 Study Problem

It is evident that Gurugoda oya has huge amount of water discharge without being used for human developments. It is also evident that there is a possibility of using this river for many purposes such as hydro power generation in middle catchment and supply of water for drinking and sanitation etc. In such strategies it is essential to understand the hydrological characteristics of the river for better benefits. At present such data are not available.

1.3 Significance of the study

Hydrological characteristics of a river can be studied by 3 ways,

1. Field Observations
2. Map Interpretation
3. GIS

Former two are old methods comparably high accuracy. The latter is a modern method that represent data, with organization and with good presentation based on maps. GIS is also important to deeply analysis the water situation in the aspect of spatial pattern.in some river basin studies only former methods are used, while some studies both former and GIS methods combine used.

In the Sri Lanka context many rivers have hydrological data but, most of them have been not taken by the use of GIS. This study uses both GIS and field observations for better up the accuracy. Also GIS provides very powerful visualization facilities for display and manipulation, giving immediate intuitive evaluation capabilities to which a wide range of non-technical users and decision makers can relate to.

This study provides a good insight into the field of hydrological analysis of river basins as such, studies are very rare. This study will be given information on how a river behavior is important to understand its potential utility.

1.4 Objectives

According to the study problem the main objective of this study is to investigate possibility of using GIS to analyze the hydrological characteristic of the Gurugoda oya.

And the specific objectives are as follows;

Find a suitable location for hydro power generation.

Find the feasibility of getting water from the river for drinking purpose and sanitation.

Chapter Two

LITREATURE REVIEW

2.1 Hydrology and Hydrologic Studies

While settling every ancient human civilization along the banks of rivers and lakes, proper management of fresh water was the conspicuous event of their day to day activities. Majorly it happened along the Indus in Pakistan, the Euphrates and Tigris in Mesopotamia (presently Iraq and Syria), the Hwang Ho in China, and the Nile in Egypt that the pioneer engineers of hydrology created dams, canals, subsurface water conduits, and wells as early as 5000-6000 years ago. Hydrologic information became vital to these early civilizations. The flow rates and yields of rivers were monitored by the Egyptians as early as 3800 years ago, and rainfall measuring instruments were first utilized approximately 2400 years ago by Kautilya of India.

The philosophy of a global hydrologic cycle dates back at least 3000 years when early Greek philosophers, including Thales, Anaxagoras, Herodotus, Hippocrates, Plato, and Aristotle conceptualized the basic ideas governing the process. Many initial ideas established by the Greeks about the hydrologic cycle were reasonable. However, many of the initial mechanisms concerning the routes by which water returned from the sea and entered rivers were devoid of as much logic. Despite the apparent gaps in hydrologic mechanisms, the Romans developed aqueduct systems reflecting an extensive practical understanding of hydrology and hydraulics, and did so utilizing the basic hydrologic ideas established and passed along by the Greeks. During the Renaissance, Leonardo da Vinci (1500) in France proclaimed on the basis of field observations that the waters in rivers come from precipitation. It was during that time that any unrealistic mechanisms proclaimed by the Greek philosophers concerning the hydrologic cycle were either refuted or modified. In the seventeenth century, the modern scientific approach to studying the hydrologic cycle was initiated by the Frenchmen Pierre Perault and Edme Marriotte. By