

**Use of GIS in Flood Risk Analysis of
Pattiyawala Grama Niladhari Division in
Wattala Divisional Secretariat**

By

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Use of GIS in Flood Risk Analysis of Pattiyawala Grama

Niladhari Division in Wattala Divisional Secretariat

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On

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DECLARATION OF CANDIDATE

The work described in this thesis was carried out by me under the supervision of Dr. M.A. Shantha Wijesinghe and Dr. H.M. Ranjith Premasiri, and a report on this has not been submitted in whole or in part to any university or any other institution for another Degree / Diploma.


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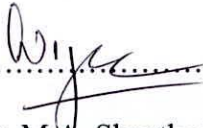
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DECLARATION OF SUPERVISORS

We certify that the above statement made by the candidate is true and that this thesis is suitable for submission to the University for the purpose of evaluation.

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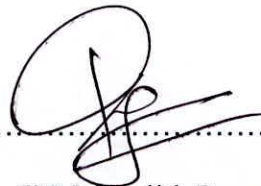
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LIST OF ABBREVIATIONS

GDP	Gross Domestic Product
SDA	Southern Development Authority
NDRSC	National Disaster Relief Services Center
GN	Grama Niladhari
GND	Grama Niladhari Division
DSD	Divisional Secretariat Division
GIS	Geographic Information System
GPS	Geographical Position System
IDW	Inverse Distance Weighting
MDG	Millennium Development Goals
UTM	Universal Transverse Mercator
DRM	Disaster Relief Management
WGS	World Geographic System
TIN	Triangular Irregular Networks
MSL	Mean Sea Level
JAXA	Japan Aerospace Exploration Agency
FID	Field Identifier
DEM	Digital Elevation Model
DTM	Digital Terrain Model

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ABSTRACT

Flood is the major natural disaster in Sri Lanka. Effective and efficient forecasting will help to mitigate risk of the people involved and for the better organizing of relief aid without mistaken. Government spends large amounts of money annually for flooding. Still no reliable measurements have been taken to prevent and mitigate. This research is an attempt to assist the GIS and GPS technologies to rank flood in the Wattala divisional secretariat. These can be successfully used to identify high risk divisions in flood. Identification of critical areas helped organizing relief aids to real affected families. The assessment of flood risk in terms of the vulnerability and level of hazard would emphasize the severity of the disaster. It is required to forecast, proper early warnings and conducting awareness programs among the flood affected people in mitigating flood risk.

Keywords: GIS, GPS, Flood, Vulnerability, Hazard, Risk

Chapter One

INTRODUCTION

1.1. Introduction

Disaster is a sudden, disturbing event bringing great damage, loss and destruction and devastation to life and property (Srivastava, 2010). A disaster is a sudden, calamitous event that seriously disrupts the functioning of a community or society and causes human, material, and economic or environmental losses that exceed the community's or society's ability to cope using its own resources. Though often caused by nature, disasters can have human origins (<http://www.ifrc.org/en>). The damage caused by disasters is immeasurable and varies with the geographical location, climate and the type of the earth surface, degree of vulnerability. This will suffer the mental, socio-economic, political and cultural state of the affected area. It is an unexpected event.

Humans rely on their environment around and utilize ecosystems to sustain life and livelihoods. Most of people often more depend directly on ecosystem services. A disaster diminishes an ecosystem's capacity to provide resources critical to human life and livelihoods.

Disasters fall into two major categories. These include man-made and natural disasters. Natural disasters can be occurring due to a change in natural phenomenon. Human life is filled with various unexpected happenings. Natural disasters are most unpredictable things man ever faces. It can happen at anywhere at any time. Frequency and intensity of natural disasters increase with the environmental degradation and exacerbates the impacts of such disasters. Nevertheless man cannot escape from these disasters.

Sri Lanka's geographic and climatic diversity exposes the country to a number of natural disasters; in particular floods, droughts, landslides and cyclones. Man-made disasters are influenced by human beings and they are often caused as a result of negligence and human mistakes. These can be divided into different categories and they include technological hazards, sociological hazards and transportation hazards. Weather patterns have changed significantly over the past few years. Countries across the world have experienced unusual weather patterns, and Sri Lanka has been no exception. There

has been heavy rainfall over the past few years and flooding in many areas of the country. Time to time, Sri Lanka experienced serious situations created by floods. As an example nearly 328,000 people were affected in 10 out of 25 districts in Sri Lanka in the provinces of Sabaragamuwa, North, East, West, Uva, Central, South, North Central and East in year 2013 (<http://www.ft.lk/>).

Today most of the world's population lives in areas; which are affected at least once by earthquake, cyclones, flood or drought. Due to increased population, economic development and innovations in science and new technology; human beings are highly vulnerable to natural and man-made disasters. Natural disaster risk is closely connected to processes of human development. Disasters put development at risk. Therefore, disaster management has become most significant and timely important with the ongoing development activities.

Apart from Tsunami, the major natural disasters affecting Sri Lanka are floods, droughts cyclones, landslides and coastal erosions; which frequently occur and are driven by weather and climate. Among these natural disasters, flood caused immense damage to people, economic activities and to the infrastructure (Table1.1).

As an example Paddy is the main crop in Sri Lanka, generally cultivated twice a year (<https://www.statistics.gov.lk/agriculture/Paddy>). Other major cash crops are tea, rubber, coconut and spices. This agrarian economy is highly susceptible to floods and droughts.

Table.1.1. Damages to person from major natural disasters 2007 – 2012

Year	Flood	Drought	Cyclone	Landslide
2007	211,318	93,316	6,647	10,902
2008	1,018,080	106,912	356,790	2,068
2009	217,935	226,835	15,736	508
2010	533,713	131,168	9,422	140
2011	1,514,666	69,507	2,345	1,430
2012	558,063	920,684	2,387	277

Source : National Disaster Relief Service Center,2013

Then government has to allocate majority part of its budgetary provisions for the expenses of relief and rehabilitation assistance. Inadequate early warning, lack of data and information on victims of previous disasters and lack of skills and knowledge of relief officials related to response and recovery measurements hindered the disaster preparedness capacity hence the country's development.

Table.1.2 government expenditure natural disaster management 2006 -2012 (Rupees)

Year	Flood	Drought	Cyclone	Landslide
2007	159,111,089	19,921,772	17,662,054	22,586,775
2008	210,339,335	15,286,758	11,675,820	20,502,716
2009	202,680,398	31,139,254	43,879,536	4,928,667
2010	244,091,220	16,308,306	8,678,239	3,252,698
2011	589,835,798	12,863,596	20,997,295	34,397,743
2012	113,941,901	58,562,510	3,844,743	672,445

Source: National Disaster Relief Service Center, 2013

Public awareness and people perception regarding the disasters is very important. Existing relief assistance at a disaster should be reconsidered. Systematic approach of recovery in a disaster circumstance is a constant challenge. The government has a national strategy of achieving sustainable development by mitigating disasters and going towards a safer Sri Lanka.

The National Disaster Management Act, No. 13 May, 2005; provide the legal framework of the country's contribution to prevent or mitigate the impact of disasters. Preparing and implementing risk management program to country is a timely need. Increasing the awareness among children, general public and officials, disaster related research and publication is essential.

Sri Lanka being a small island in the Indian Ocean in the path of two monsoons is mostly affected by weather related hazards. In Sri Lanka, floods, landslides, cyclones, droughts, wind storms, coastal erosion, tsunami, sea surge, and sea level rise are the main natural hazards that generate disasters. These natural disasters have caused loss of life, and enormous damage and destruction to property. Sri Lanka faced the most crucial