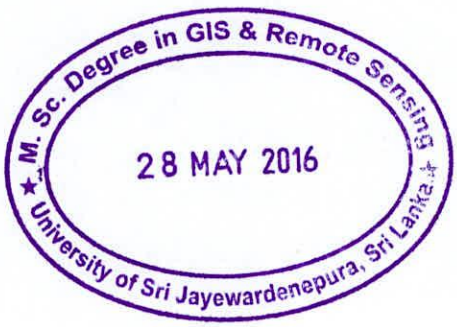
Feasibility Analysis of Relocation of Vulnerable Landslide Settlements in Badulla District

By

P. P. D. S. S. Pathirage



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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 Dr. Rev. Pinnawala Sangasumana and Mr. Prabath Malavige, 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.

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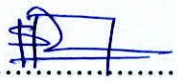
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CHAPTER STRUCTURE

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LIST OF ABBREVIATIONS

AD	-	Archaeology department
ADB	-	Asian Development Bank
C&SD	-	Department of Census & Statistics
CEA	-	Central Environmental Authority
DMC	-	Disaster Management Centre
ERDAS	-	Earth Resources Data Analysis System
FD	-	Department of Forest
GIS	-	Geographic Information System
GoSL	-	Government of Sri Lanka
GPS	-	Global Positioning System
IBRD	-	International Bank for Reconstruction and Development
IDA	-	International Development Association

IFRC Societies	-	International Federation of Red Cross and Red Crescent
IUCN	-	International Union for Conservation of Nature
JICA	-	Japan International Cooperation Agency
LAA	-	Land Acquisition Act
LUPPD	-	Land Use Policy Planning Department
MCUDP	-	Metro Colombo Urban Development Project
NBRO	-	National Building Research Organization
NBRO	-	National Building Research Organisation
NIR	-	National Involuntary Resettlement Policy
NPPD	-	National physical Planning Department
NWS&DB	-	National Water Supply and Drainage Board
R&R	-	Resettlement and Rehabilitation
RAP	-	Resettlement Action Plan
RDA	-	Road Development Authority
RTK GPS	-	Real Time Kinematic Geographical Positioning System
SD	-	Survey Department
SMF	-	Social Management Framework
UDA	-	Urban Development Authority
UNDP	-	United Nations Development Programme
UN-HABITAT	-	United Nations Human Settlements Programme
UNISDR Reduction	-	United Nations International Strategy for Disaster
UPC	-	Uva Provincial Council
WLD	-	Department of Wildlife Conservation

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ABSTRACT

Disasters can take away much of the development gains and impact the quality of lives. As part of the disaster risk reduction, the resettlement processes can be strengthened using spatial tools such as GIS to minimize risks. The main objective of this research was to develop a GIS modelling approach to identify the most suitable areas for resettlements processes for people living in landslide prone areas.

The study focus on identifying disaster prone areas for relocations in the Badulla district and also identify potential resettlement areas with minimum environment and disaster concerns to ensure that the resettlement process is sustainable and resilient. Landslide hazard in the Badulla district was used as the case study in this study. The weighted overlay techniques were applied to arrive at the final environmental suitability mapping. The physical and socio-economic factors used for evaluation of environmental and disaster free suitability of the resettlement site are land use/land cover, topography, proximity, and infrastructural facility. The majority of the area has been identified as sensitive areas with 813 km^2 area out of 1892 km^2 can be used for any development activities. Suitability analysis of among areas indicates that only 105 km^2 of the area has a "high" suitability condition and 34 km^2 areas are "moderately" suitable for resettlement. The remaining 332km^2 is "low" suitable and 2398 km^2 is not suitable for human resettlement.

The GIS platform helped to integrate spatially complex and different ecological factors for performing land suitability analysis. With adequate data the identification of vulnerable areas and facilitating of the resettlement process to be sustainable and resilient can be done effectively with the support of a GIS approach.

Key words: Resettlement, Vulnerable areas, Sensitive areas, Multi Criteria Evaluation, Weighted Overlay Analysis.

CHAPTER ONE

INTRODUCTION

1.1 Background

Natural disasters are common occurrence in the world. It may come in various forms such as earthquakes, flooding, volcanic eruption, landslide, hurricanes etc. Sri Lanka is experiencing multiple natural disasters with severe impacts over the past years affecting human lives, disturbing human settlements and damaging properties.

Among the natural hazards, landslides are attracting more and more attention due to its increasing effect on economic and human losses.

In the context of Sri Lankan case, many of the natural hill slopes that stood safe for centuries are now frequented by landslides. This is mainly due to human intervention into vulnerable hill slopes. Hence landslides associated with intense rain during monsoon and inter-monsoon seasons have became the most frequent and pressing natural disaster within the central highland of the country.

Nearly 13,000 km^2 (20% area of the country) covering ten administrative districts such as Badulla, Nuwara Eliya, Matale, Kandy, Kegale, Rathnapura, Kalutara, Galle, Matara and Hambanthota are considered to be highly prone to landslides and some have been identified as being unsuitable for human habitation. During the last three decades damages to life, property and human displacements resulting from landslides are reported at an increasing frequency, due to increased number of human settlements in such fragile lands. Unplanned housing schemes, resettlement programs construction and land development activities without proper planning and technical guidelines lead to increase the risk level.

Selecting the Sites for resettle the affected peoples is a complex process involving not only technical requirement, but also physical, economic, social, Environmental and political requirements that may result in conflicting objectives. Such complexities necessitate the simultaneous use of several decision support tools such as Geographical Information System.

In this research a model was developed to identify the suitable areas for settlement development for people living in landslide vulnerable areas in Badulla District. The central theme of this research is to explain the process of developing geospatial model to provide a system for supporting location decisions with respect to the implementation of urban master plans. GIS was used based on a set of criteria derived from the spatial aspects, environment, policies and national and local physical.

1.2 Research problem

Government faces difficulties in finding proper safe lands for resettlements. As a result of population growth and rapid urbanization, land has become a scare resource. With the increasing trend of landslide risk in Sri Lanka, requirement for lands for resettlements is also increasing. Fulfilling the demand with limited resources has become a challenge.

Developing acquired lands with basic infrastructure facilities such as shelter, road access and water, requires funds. Access to Health services, schools, public transport, markets and other services might be limited in acquired lands.

Resettling inhabitants in a safer place may give rise to number of social, economic and cultural issues. Livelihoods of these communities depend on their living area. Majority of these communities are engaged in agriculture, agriculture related labour or small scale industries for which raw materials are collected from the surrounding. In addition to that school education for children, social cohesion and emotional attraction with their original living place make them reluctant to shift to a new location.

As a result of above conditions certain vulnerable communities reject to be resettled and want to remain in disaster prone area. In addition to that returning of resettled communities to their original places leaving their lives at risk is recognized as an issue in many resettlement sites. Unplanned housing schemes, resettlement programs construction and land development activities without proper planning and technical guidelines lead to increase the risk level.

In this context, as a solution it is very important to find a scientific method to identification of most suitable areas for resettlements development to overcome above issues.

1.3 Objectives

1.3.1 General objective

- To introduce a feasibility study for relocation of vulnerable settlements in landslide prone areas in Badulla District.

1.3.2 Specific objectives

- To identify the landslide vulnerable settlement and their characteristics of Badulla District.
- To examine the environmental sensitive areas in Badulla dstrict.
- To examine the disaster vulnerable areas in Badulla District
- To identify the opportunity areas for any development activities.
- To apply GIS and Remote sensing technologies for selection of most suitable lands for relocation of vulnerable settlement due to landslide.

1.4 Significance of the study

Remote Sensing and GIS are recently developed technological advancements vital to objectively integrate various environmental factors that affect the ecological suitability of human resettlement. Furthermore the most suitable areas that fulfill all the set parameters can also be indicated using this technology. It is expected that the final outcome of this research will help governmental and non-governmental organizations as well as policy and decision makers that work on resettlement issues to revise their action in an informed manner. It will have a special contribution in identifying the most important environmental factors and Disaster free areas that dictate the suitability of human settlement in the study area.