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DISASTER VULNERABILITY OF RATNAPURA DISTRICT: APPLICATION OF GEOGRAPHICAL INFORMATION SYSTEMS FOR DISASTER MANAGEMENT

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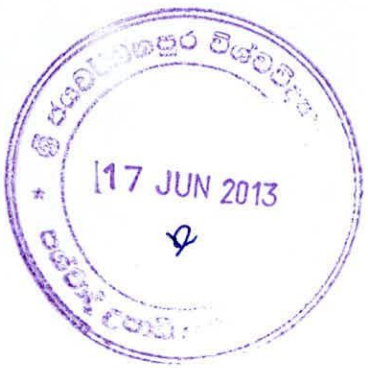

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DECLARATION

The work described in this thesis was carried out by me under the supervision of Prof CKM Deheragoda and a report on this has not been submitted in whole or in part to any university or any other institution for another Degree.

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DECLARATION OF SUPERVISOR

We certify that the candidate has incorporated all corrections, amendments and additions recommended by the examiners of the viva examination.

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CONTENT

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS

ADPC: Asian Disaster Preparedness Center

DEM: Digital Elevation Model

DMC: Disaster Management Centre

DSD: Divisional Secretariat Division

DTM: Digital Terrain Model

GIS: Geographical Information Systems

GND: Grama Niladari Division

GOSL: Government of Sri Lanka

GPS: Global Position System

ILWIS: Integrated Land and Water Information System

LHMP: Landslide Hazard Mapping Project

MC : Municipal Council

MSL: Mean Sea Level

NBRO: National Building Research Organization

NPPD: National Physical Planning Development

RMC: Ratnapura Municipal Council

SINMAP: Stability Index Mapping

SPSS: Software Package for the Social Sciences

UDA: Urban Development Authority

UNDRO: United Nations Disaster Relief Office

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Disaster Vulnerability of the Ratnapura District:

Application of Geographical Information Systems for Disaster Management

K.V.D. Edirisooriya Menike

ABSTRACT

Sri Lanka has 65,000 sq.km of land area with many areas prone to manmade and natural disasters. The last few decades has witnessed the occurrence of an increased number of natural disasters in Sri Lanka. Flash floods and landslides are the most common natural disaster in Sri Lanka and it contributes to 50 percent of the total disaster occurrences in the country that devastates lives and property year after year. The Ratnapura District is highly prone to natural disasters such as landslides, floods and strong winds. The vulnerability for landslides and floods is particularly very high in the areas such as Rathnapura Municipality, Elapatha, Palawela, Nivithigala, Kalawana, and Pelmadulla of the Ratnapura District.

The main objectives of the Study are to identify the disaster prone areas by their severity and to discover the real causes of disasters in the study area, with a view to developing a disaster management plan for the study area using Geographical Information Systems (GIS) technology. The Ratnapura District is 3,275 square kilometers in land extent. Thus this study has been restricted to two areas namely; the Ratnapura Municipality and the Elapatha Divisional Secretariat Division. These areas are heavily populated and highly vulnerable to floods and landslides when compared with the other areas of the District.

The Study is based on the data collected from both primary and secondary sources. Data was collected from published information sources, particularly on flood and landslide generation factors such as rainfall. The flood gauge levels required for the Study were

obtained from gauges used by the Survey Department, Meteorological Department and the Irrigation Department of Sri Lanka. Other secondary sources consist of relevant literature and digital maps (1:10000) of the Surveyor General's Department of Sri Lanka.

Primary data was collected through field surveys and interviews. Field observations were carried out to identify the drainage pattern of the Kalu Ganga, flood prone areas, land use patterns, and impacts of the disasters. Questionnaire survey was administered to ascertain the impact of floods such as; loss of lives, damage to property and houses, number of days of inundation and water levels etc. Random sampling method was used for selection of the sample for questionnaire survey and 10 percent units out of the flood and landslide affected populations were selected. ArcGIS 9.3, SINMAP, ILWIS technique and the statistical analysis software (SPSS 13.0) were used for digitizing, modeling, data analysis and interpretation. Hazard areas and risk areas were identified and classified in to high, medium and low hazard zones. Areas with a high risk of flood hazard are located towards the center of the Ratnapura Municipality. The Randola and Hangamuwa areas of the Elapatha DSD also had to face similar impacts from the floods. According to the findings of the SINMAP analysis, almost 13 percent of the land area of the Elapatha DSD is unstable and prone to landslide disasters.

It is envisioned that the hazard and stability index maps produced through this research will help planners and decision makers to take rational decisions on mitigation of negative impacts of floods and landslides in the Ratnapura Municipality and the Elapatha DSD.

Key Words: Vulnerability, GIS, SINMAP, Disaster, Floods, Landslides