GEO-INFORMATION TECHNOLOGY IN DISASTER MANAGEMENT: A CASE STUDY IN AKKARAIPATTU MUNICIPAL AREA

by

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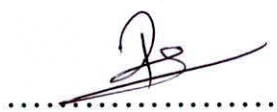
Declaration

The work described in this thesis was carried out by me under the supervision of Dr. Ranjith Premasiri, Senior Lecturer, Department of Earth Resources Engineering, University of Moratuwa 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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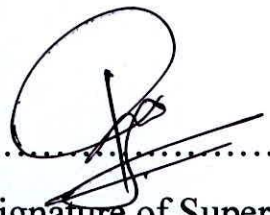
Certification

I 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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Signature of Supervisor Date

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ABSTRACT

Sri Lanka, the pearl drop of Indian Ocean is one of the countries located in the disaster prone belt of the Asian Region. The natural hazards occur in Sri Lanka are costing a strong impact on the country's socio-economic environment. Coastal zone of Akkaraipattu is one of the most devastated areas by the disasters. The livelihood of the people and the physical environment are highly disrupted which led to major changes in the land use patterns. The research focuses mainly on Disaster Management in the light of Geo-information technology in Akkaraipattu municipal council area.

To delineate a spatial applications program for sustainable development and a strategy for its implementation at the national and regional levels, it may be useful to review briefly the major problems confronting to consider how these could be addressed through spatial applications. The fast growing trends in computer technology, information systems and virtual world to obtain data about the physical and cultural worlds, and to use these data to do research or to solve practical problems are the prime concern in the research.

To identify the draw backs of traditional disaster management and the potentials of Geographic Information System in disaster management and to prepare the disaster risk map for Akkaraipattu Municipality area are the prime objectives of the research.

The past available events of hazards of the research area were incorporated with Geo-spatial Information System, to create hazard maps for flood, cyclone, tsunami, drought and diseases. In order to get Multi-hazard risk map, all the risk map layers; tsunami, diseases, flood and cyclone were integrated. The resulted map has been intersected with the house layer of Akkaraipattu Municipal Council Area to find the families falling under different multi-hazard risk zones. A comprehensive analysis of the basic data related to multi-hazards in GIS environment, resulted the disaster locations, affected community (male, female, children, families and total populations) within Akkaraipattu Municipal Council area which is the basis for relief aids and rehabilitation activities of disaster management process.

In combining all disasters to produce multi-hazard zone for Akkaraipattu Municipal Council Area shows that 4.9 % of houses and 5.4 % of population are falling under very high risk zone, 16.8 % of houses and 18.1 % of population are falling under high risk zone, 34.4 % of houses and 34.5 % of population are falling under moderate risk zone and 43.9 % of houses and 42.1 % of population are falling under low risk zone. A fully fledged GIS environment has to be facilitated at Divisional Secretariat to set up GIS Database. If a disaster occurs the system will prepare all necessary map layers and provide the detail regarding the affected people in no time that will be used for relief activities.

CHAPTER 1

INTRODUCTION

1.1 Statement of the Problem

Sri Lanka, The pearl drop of Indian Ocean is one of the countries located in the disaster prone belt of the Asian Region. Figure 1.1 shows that the Asia is world's most disaster affected region in the world. In Asia every year 46,000 people killed, 180 million people affected and USD 35 billion of damage caused by disasters (World Disaster Report 1997). Most natural disasters experienced by the eastern coastal region of Sri Lanka are water-related either through excess water or a lack of it; cyclone, flooding, storm surges, tsunami, drought and diseases.

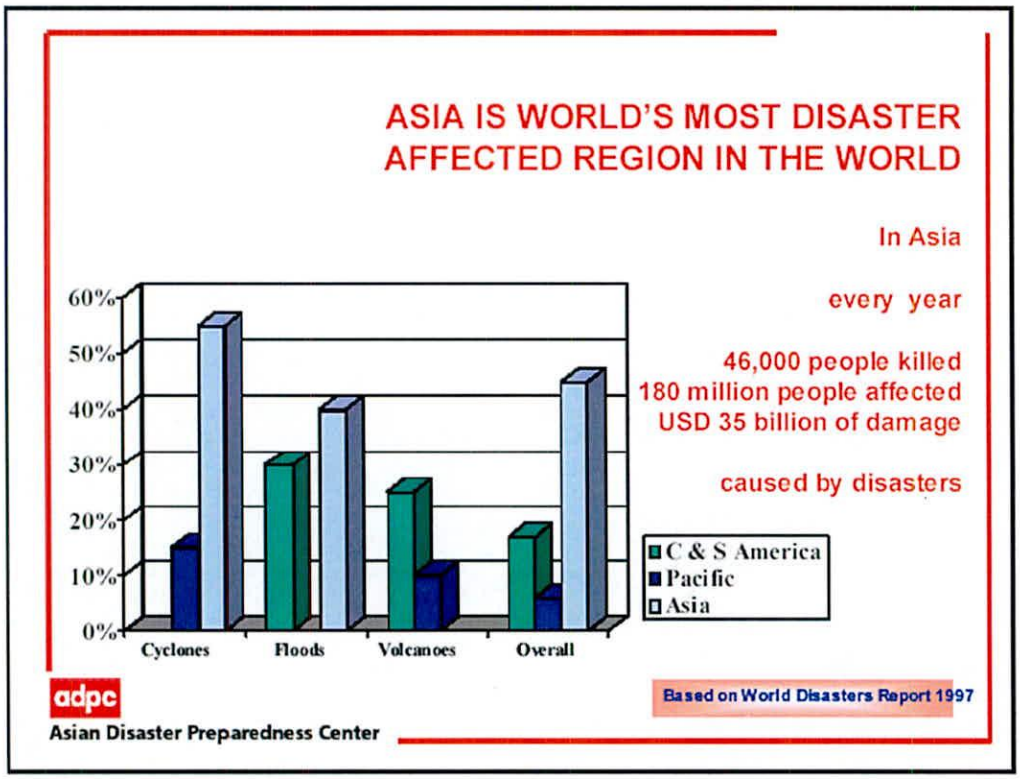

Figure 1.1. Overview of Disasters in Asia (World Disaster Report 1997)

The region of Asia supports some 57 per cent of the population of the world on a land mass comprising about 23 per cent of the earth's total land mass. A large proportion of

this population is concentrated in urban centers and is close to coastlines which, in certain countries, are frequently exposed to hurricanes, cyclones and tsunamis. Rising sea levels associated with global climate change are a direct threat to coastal cities. Disasters like earthquakes, landslides, droughts and floods also occur relatively frequently. The telecommunication infrastructure to serve the rural population, which may constitute as much as 60-70 per cent of the total population in highly populated countries, is totally inadequate. Owing to lack of amenities and employment opportunities in the rural areas, there is a large-scale influx of rural population into urban centers, thus aggravating the existing imbalance in the population distribution and placing a heavy burden on the civic services of the mega-cities (Ministerial Conference on Space Applications for Development in Asia and the Pacific, 19-24 September 1994, Beijing).

Natural hazards are extreme natural phenomena occurring within the environment. Among the natural hazards that occur in Sri Lanka are floods, droughts, landslides, cyclones, sea erosion, lightning are costing a strong impact on the country's socio – economic environment (Table 1.1). The government spends large amount of money annually to provide relief to families affects by natural hazards. In 1996 the government had spent 453 million rupees in providing relief to families placed in distress by natural hazards, (Department of Social Services, Colombo 1997). Compared with the other districts, the Ampara district is severely subjected to natural hazards like floods, droughts, cyclones and sea erosion.

Table 1.1. Disasters in Sri Lanka (2000-2007)

No	Disaster	Year	Area	Dead	Affected
1	Flood	2000	Galle, Matara	02	100,000
2	Flood	2000	Ampara, Batticaloa, Polonnaruwa	03	300,000
3	Cyclone	2000	Ampara, Anuradapura, Batticaloa, Mannar, Trincomalee, Polonnaruwa	05	375,000
4	Flood	2001	Matale		375,000

5	Flood	2002	Ampara, Anuradapura, Batticaloa, Mannar, Trincomalee, Polonnaruwa, puttalam, Kilinochchi	02	500,000
6	Flood	2003	Galle, Matara, Hambanthota, Nuwara Eliya, Kalutura	296	695,000
7	Flood	2004	Ampara, Anuradapura, Batticaloa, Mannar, Trincomalee, Polonnaruwa, Vavuniya, Jaffna, Matara	06	200,000
8	Tsunami	2004	Jaffna, Mullaitivu, Kilinochchi, Ampara, Galle, Matara, Hambantota, Batticaloa	35399	23176
9	Flood	2005	Colombo, Rathmalana, Gampaha, Trincomalee, Jaffna, Kilinochchi, Mullaitivu	06	145,000
10	Flood	2006	Colombo, Rathmalana, Gampaha, Puttalam, Matara, Badulla, Ratnapura	25	333,000
11	Flood	2007	Walappana, Meepai	18	68281

(Source: EM-DAT, the OFDA/CRED International Disaster Database - July 15, 2007)

Further the natural and human disasters affected physical, social and economic development of our country during ethnic conflict destructed the infrastructure of North and Eastern region.

Akkaraipattu Municipal Council area has been facing these disasters since many years. The Study Area, situated absolutely between north latitude 7° 13' 0" - 7°.45' and East longitude 81° 51' - 81°.52' is bounded in the North by the Addalaichenai Divisional Secretariat Division in the West by Irakkamam Divisional Secretariat Division in the South by Alayadiwembu Divisional Secretariat Divisions and in the east by the shore line.