

**ASSESSMENT OF TSUNAMI AND STORM SURGE  
IMPACT MITIGATION BY COASTAL VEGETATION**

**By**

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A thesis submitted to University of Moratuwa  
for the Degree in Master of Science



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## ABSTRACT

The devastation caused by the Indian Ocean tsunami in 2004 and subsequent tsunami alerts in 2005 and 2007 as well as the historical records of possible tsunamis in the past have highlighted the vulnerability of the country to such major hazards. More than two third of the 1600 km long coastline in the Northern, Eastern, Southern as well as part of relatively sheltered Western regions suffered with a widespread damage in the event. The damage caused by the tsunami varied significantly with the local near shore wave height, topography and the resistance offered to the overland flow. In addition to the ground surface resistance the resistance offered by the various features in the coastal zone is among the factors contributing to such hydraulic resistance. These features include coastal infrastructure such as buildings as well as natural features such as coastal green belts. The study on the effect of such contributory features is important in identifying and planning possible tsunami impact mitigation measures. In this study, attention is focused on the resistance offered by coastal green belts to overland flow and their effectiveness as a possible tsunami impact mitigation measure. Such a measure would also have the dual advantages of being environmentally friendly and cost effective, which could be a more suitable method for developing countries like Sri Lanka.

In this study investigation conducted to assess the influence of coastal vegetation in resisting the overland flow. The resistance would depend on characteristics of individual plant structure and the vegetation as a whole, as well as the ability of plants to resist the flow without being damaged or destroyed. The factors affecting the drag force were related to the characteristics describing a vegetation, namely, plant type, size, extent, spacing & pattern. Experimental & numerical studies were conducted to assess the influence of these characteristics on energy dissipation of the flow under steady condition and reduction in inundation distance under unsteady flow. Small scale physical model tests were carried out in a hydraulic flume (length 10 m, width 30 cm and depth 30 cm). Coastal vegetation was represented by geometrically similar small scale models and energy dissipation characteristics were observed under different discharge conditions. Experiment results indicate up to about 48% of energy loss through the vegetation and it highlight the contribution of different patterns and densities of vegetation in effective impact mitigation.

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*R.B.C.D. Manawasekara*

## DECLARATION

This thesis is a report of research carried out in the Department of Civil Engineering, University of Moratuwa, between July 2008 and August 2010. Except where references are made to other work, the contents of this thesis are original and have been carried out by the undersigned. The work has not been submitted in part or whole to any other university. This thesis contains 62 pages.

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## CONTENTS

Abstract .....	i
Acknowledgement .....	ii
Declaration .....	iii
Contents .....	iv
List of Figures .....	vii
List of Tables .....	ix

### Chapter 1 : Introduction

1.1 General.. .....	1
1.2 Tsunami Impact Mitigation Measures .....	2
1.3 Tsunami Impact Mitigation by Coastal Vegetation .....	4
1.4 Coastal Vegetation in Sri Lanka .....	5
1.5 Objectives of the Study .....	6

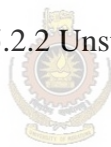
### Chapter 2 : Overview of the Previous Investigations

2.1 Role of Coastal Vegetation Belts in Previous Tsunamis .....	7
2.2 Theoretical Studies.....	8

### Chapter 3 : Mechanism of Impact Mitigation

3.1 Generation and Propagation of Tsunami .....	10
3.1.1 Generation of Tsunami .....	10
3.1.2 Deep Water Propagation of Tsunami Wave .....	12
3.1.3 Shallow Water Transformation .....	13
3.2 Run-up and Inundation .....	13
3.3 Methods Impact Mitigation .....	15
3.4 Major Resisting Forces Acting on Fluid.....	16

3.4.1 Drag Force .....	16
3.4.2 Influence of Vegetation Characteristics on Drag Force .....	17
<b>Chapter 4 : Field Investigations</b>	
4.1 Study Area .....	18
4.2 Field Observations .....	20
4.2.1 Tsunami Vegetation .....	21
4.2.2 Other Important Species .....	22
4.3 Classification of Vegetation for Physical Modelling .....	23
<b>Chapter 5 : Experimental Study</b>	
5.1 Vegetation Modelling .....	24
5.2 Development of Physical Model .....	25
5.2.1 Steady Flow Set-up .....	26
5.2.2 Unsteady Flow Set-up .....	29
<b>Chapter 6 : Numerical Study</b>	
6.1 Governing Equations .....	31
6.2 Programme Inputs and Output .....	33
<b>Chapter 7 : Results and Discussion</b>	
7.1 Steady Flow Tests .....	34
7.1.1 Steady Flow Tests: Set 1.....	34
7.1.2 Steady Flow Tests: Set 2.....	37
7.2 Steady Flow Numerical Modelling .....	40
7.3 Unsteady Flow Tests .....	43
<b>Chapter 8 : Conclusion</b>	46
<b>References</b>	48



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## **Annexes**

<b>Annex 1 : Structure of the field observation sheet</b>	49
<b>Annex 2 : Summary of field observations</b>	50
<b>Annex 3 : Observation sheet for steady flow test</b>	52
<b>Annex 4 : Calibrated curve for v-notch</b>	54
<b>Annex 5 : Steady flow test results</b>	55
<b>Annex 6 : Numerical Modelling results</b>	59



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## LIST OF FIGURES

Figure	Description	Page
Figure 1.1	Various earthquakes from 1900 and their magnitudes for Sunda trench	2
Figure 3.1	Generation of tsunami due to submarine earthquake caused by two moving plates	10
Figure 3.2	Shoaling effect takes place when wave reaches the near shore	13
Figure 3.3	Spatial Distribution of (a) inundation (b) tsunami height for the East coast of Sri Lanka	14
Figure 3.4	Steady flow through a vegetation belt	10
Figure 3.5	Characteristics of vegetation on drag force	17
Figure 4.1	Major climatic zones of Sri Lanka	18
Figure 4.2	Tsunami affected DS divisions in 2004	19
Figure 4.3	<i>Cocos nucifera</i> belt at Wadduwa	16
Figure 4.4	<i>Terminalia catappa</i> at Galle	20
Figure 4.5	Mangroves with complex root structure at Madu Ganga	21
Figure 4.6	Mangrove nursery at Puttalam lagoon	21
Figure 4.7	<i>Pandanus odoratissimus</i> belt at Kalutara	22
Figure 4.8	Section of a branch	22
Figure 4.9	<i>Casuarina equisetifolia</i> plantation at Hambantota	23
Figure 4.10	Tree classification	23
Figure 5.1	Different plant categories according to their natural structure	24
Figure 5.2	Preparation of vegetation panels for the experiment	25
Figure 5.3	Arrangement for steady flow setup	26
Figure 5.4	Configuration for steady flow test set 1	26
Figure 5.5	Configuration for steady flow test set 2	27
Figure 5.6	Steady flow passes through vegetation models	27
Figure 5.7	Flow profile was traced on to the transparent sheets	28



Figure 5.8	V-notch apparatus	28
Figure 5.9	Experimental set-up for the unsteady flow tests	29
Figure 5.10	Opening mechanism for the gate	29
Figure 5.11	Gate and tank arrangement for unsteady flow tests	30
Figure 6.1	Structure for the computer programme	33
Figure 7.1	Assess effect of parameters in energy loss for a constant discharge	36
Figure 7.2	Energy loss for 24 m extent	36
Figure 7.3	Avg. % of energy loss for different vegetation patterns for steady flow	37
Figure 7.4	$\Delta H/H_1$ % Vs S/D for different extents in staggered arrangement	38
Figure 7.5	$\Delta H/H_1$ % Vs S/D for different extents in uniform arrangement	38
Figure 7.6	$\Delta H/H_1$ % Vs E/D for different tree diameters under 2 cm spacing, staggered pattern	39
Figure 7.7	$\Delta H/H_1$ % Vs E/D for different tree spacing in staggered pattern	40
Figure 7.8	Calibration curve to find 'n'	40
Figure 7.9	Trial & error procedure to find the bulk drag coefficient using numerical model	41
Figure 7.10	Comparison of numerical modelling results with physical modelling results to find the drag coefficient	42
Figure 7.11	Variation of $C_d$ with $R_e$	42
Figure 7.12	Inundation Distance	43
Figure 7.13	Effect of veg. extent in inundation reduction	43
Figure 7.14	Effect of veg. density in inundation reduction	44
Figure 7.15	Effect of tree diameter in inundation reduction	44
Figure 7.16	Variation of dR% against S/D ratio (1:7.5 slope)	45

## LIST OF TABLES

<b>Table</b>	<b>Description</b>	<b>Page</b>
Table 3.1	Causes of Tusnami in the Pacific Ocean Region	12
Table 7.1	Average % of energy reduction for steady flow test set 1	35



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