TSUNAMI IMPACT MITIGATION BY COASTAL VEGETATION

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for the Degree in Master of Science

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Abstract

The Indian Ocean Tsunami in 2004 caused widespread damage in the coastal regions of Sri Lanka. The extent of inundation and the associated damage varied significantly with the local near shore wave height, topography and the resistance offered to the overland flow. This study is concerned with the resistance offered by coastal vegetation in reducing the extent of tsunami inundation. Various types of coastal vegetation that survived tsunami inundation were identified by a field survey and literature. Also in the field surveys tree geometries such as stem diameter, height of trees, spacing, number of aerial roots, diameter of aerial roots and arrangement of trees were measured. Average values of these parameters were used to develop model trees in the testing scenarios. As part of the research, physical modeling facility was developed to simulate tsunamis in the laboratory by using dam break phenomena. Concept was, to retain water in between two gates of the flume and sudden release of one gate to simulate tsunami overland flow in the flume. Small scale physical tests were carried out to asses their effectiveness as a tsunami impact mitigation measure and results on the effect of location, extent, spacing and pattern of coastal vegetation in reducing the inundation distance were presented. For the selected spacing and pattern, test were carried out to asses their contribution to effectiveness as component wise such as stem only, stem with branches, stem with high dense branches, stem with aerial roots and with all components (stem, aerial roots and branches). Inundation distance was measured and analyzed to identify the effectiveness. Large scale testing was done by generating solitary wave in the 2D flume of the Lanka Hydraulic Institute. There wave heights were measured and studied the effect of ·stem only and stem with branches (by using actual small scale plants). The results evaluate effectiveness of the vegetation in order to reduce damages from the tsunamis and identify the important considerations in designing vegetation as tsunami mitigation measure.

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R.P.S.S. Bandara

Declaration

This thesis is a report of research carried out in the Department of Civil Engineering, University of Moratuwa, between November 2006 and March 2008. 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 113 pages.

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