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A PATH FOR HORIZING YOUR INNOVATIVE WORK

RESILIENCE OF TSUNAMI IN COASTAL REGIONS BY USE OF MANGROVE BELT

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Abstract: This review assesses the degree of resilience of mangrove forests to large, infrequent disturbance (tsunamis) and their role in coastal protection, and to chronic disturbance events (climate change) and the future of mangroves in the face of global change[Daniel. M. Alongi], 3rd October, 2007. The trees of Mangroves have shown very successful results among the sea and ocean shore evolution with respect to time. In many extreme conditions Mangroves trees has limited foundries of protection over tsunamis. These limitations mainly depend on the denseness and cover of the trees, their expansions of roots and thickness, topographical factors around, the angel of incidence of the incoming waves, and the stage at which it enters the cover. The protection afforded by this shoreline of dense trees appears substantial, not only for storm-generated waves (Massel et al., 1999), winds, typhoons, surges, but also for tsunamis.

Keywords: Tsunami, Mangrove belt, Coastal regions, Tsunami resistance, Mangrove forest Density.

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INTRODUCTION

Objective

The main objective of Mangroves has been reported to be able to help buffer against tsunamis, reduce the tsunami wave effect in coastal area [3]. Mangroves fulfil an important role in the coastal ecosystem and are also important for coastal Protection and also to provide an overview of how mangroves can be used as coastal protection and also consider mangroves forest desity width and height to help the reduce the tsunami wave effect in coastal area.

What is tsunami?

TSUNAMI is a series of water waves caused by the displacement of a large volume of a body of water, generally an ocean or a large lake. Earthquakes, volcanic eruptions and other underwater explosions (including detonations of underwater nuclear devices), landslides, glacier callings, meteorite impacts and other disturbances above or below water all have the potential to generate a tsunami.

What is Mangroves:

Mangroves are a group of trees and shrubs that are capable of growing in marine, estuarine and, to a limited degree, fresh water. They occupy the fringe of intertidal shallows between the land and the sea.

The term 'mangrove' is used to describe individual trees or shrubs and also the general habitat, although the habitat is often called a 'mangrove forest' or 'mangal'.

Mangroves are various types of trees up to medium height and shrubs that grow in saline coastal sediment habitats in the tropics and subtropics . Mangroves are a salt-tolerant group of tropical plants that occupy the inter-tidal zones of the sheltered coasts such as estuaries and lagoons. They are variously adapted to cope with the

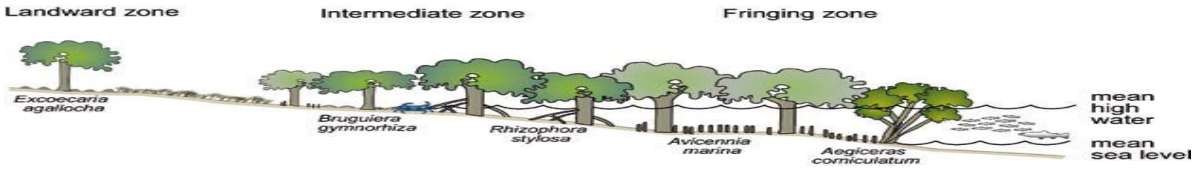

FIGURE. 1 Zones where mangroves grow and its tyoes . (Source: image produced and supplied by N Duke and D Kleine, University of Qld 2007)[8]

unfavourable environmental conditions for growth and reproduction resultant by inundation with salt water, unstable soils due to tidal flow and lack of freshwater

Mangrove vs. Tsunami:

Distinctive characters of the existing environment in the coastal mangrove forests suggest very important roles e.g. physically mangrove forests protect the coast from the waves of the sea and coastal erosion(Halidah. 2007). Mangrove trees have always been regarded as a means of wave attenuation, reducing wave energy as the wave propagates through the dense trees by obstructing the waves with their network of roots and trunks(fang yen teo). The protection afforded by this shoreline of dense trees appears substantial Many of the tsunamis are tamed by the coral reefs before hitting the coast, where they were absorbed by a dense layer of red mangrove trees. These flexible trees, with long branches growing right down into the sand below the surface of the sea, absorb the shock of tsunamis. Behind the red mangrove trees there is a second layer of black mangrove trees, which are taller and slow down the waves. [2010 - EcoWorld Media LLC.] Tsunamis are long waves in deep water. Mangrove forests are the most important coastal tree vegetation in the area and are one of the world_s most threatened tropical ecosystems and resist tsunami[I. Valiela, J. L. Bowen, J. K. York, Bioscience 51, 807 (2001).][12]. Mangroves give an extra resistance to the flow, which might decreases the flow speed somewhat, but significantly. On the other hand, Kerr et al. (2006) found no relationship between human mortality and the extent of forests fronting hamlets for coastal protection during tsunamis

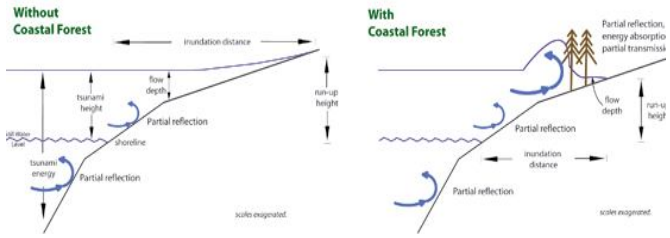

FIGURE 2 : Tsunami wave run-up with and without coastal forest barrier. Source: Keith Forbes[5]

Background and methodology

A. Definitions of tsunami Mangroves Forest density

mangroves forest width, mangroves forest height:

A Tsunami is a naturally occurring series of ocean waves resulting from a rapid, large-scale disturbance in a body of water, caused by earthquakes, landslides, volcanic eruptions, and meteorite impacts.

Mangroves Forest density

A coastal mangroves forest provides a permeable barrier. Spacing of trees (horizontal density) and vertical configuration of above-ground roots, branches and foliage (vertical density) define the overall density (also called vegetation thickness) or the permeability of a barrier(keith forbes and jereny broadhead). Though mangroves forest density may have a less pronounced mitigation effect relative to width, density directly relates to the forest's ability to reflect a tsunami, as well as absorb its energy. A wave encountering a permeable barrier of stems, branches and foliage (and aboveground roots with some species), is partially reflected and partially transmitted into the forest where its energy gradually adsorbed. Moderate densities are the most effective in tsunami mitigation. Mangroves forest density is high than more tsunami wave are resist.

Mangroves Forest width

Forest width is one of the most important factors in mitigation. Over the width of the forest, energy is progressively dissipated by drag and other forces created by tree trunks, branches and foliage, as well as the undergrowth, as the tsunami passes through the forest. Width effect remains intact under a broad range of conditions. Simulations show a coastal forest of 200 meters width reduced the hydraulic force of a three meter tsunami by at least 80 percent, and flow velocity by 70 percent for all scenarios examined. (keith forbes and jereny broadhead).

Mangroves Forest Height forest height

Height of the mangroves trees in a coastal forest has a direct bearing on the forest's frontal area projected towards a tsunami. The taller the forest the greater the reflective area of the barrier 'wall' and the lower the potential it will be overtopped by a tsunami. (keith forbes and jereny broadhead). Height of mangroves trees is a function of tree age, tree species and growing conditions

B. Objective of research

The trees of Mangroves have many merits from environmental point of view, and also other advantages of resisting tsunami which are explained here. the fishery industry gets benefits from this system. On the contrary people avoid to live near the Mangrove forests, hence there is no danger to their lives. The following research gives overall idea about setup and benefits of Mangrove forests. Design graphs are presented to determine the required mangrove belt as a function of deep water wave action and mangrove density (h.j verhagen 20-24feb 2012) . Thus by providing Mangroves the altitude of the waves can be considerably reduced. Because of this a coastal protection structure behind a mangrove Belt can be lower.

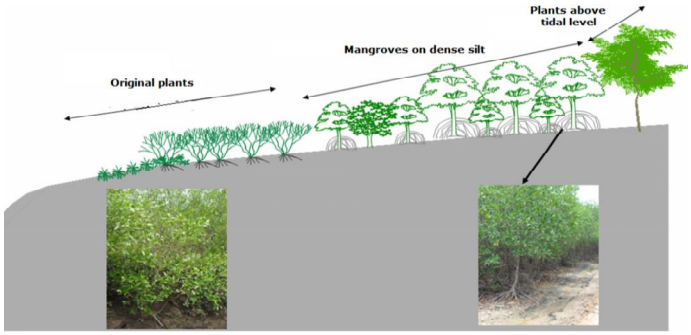

FIGURE 3 : Natural ecological succession of mangroves[3]

Another effect of a mangrove belt is that it stimulates siltation. Because currents reduce in the forest, more sediment will settle. On long term this will have the advantage that a higher foreland will even reduce tsunami wave action much more, and consequently there will be less load on the dike. However, because specific mangrove species require a very specific average waterlevel and tidal range, the consequence is that the species in the forest will change. This natural succession process can be enhanced artificially, but should certainly not be counteracted. See also figure:3

life in coastal areas(Bengen, D.G. 2001).In many cases Mangroves may reduce soil erosion because it is known that in forest the tress hold the soil and abrasion is less. Coastal vegetation, such as mangroves, can provide coastal communities with many valuable goods and services, and the protection of these ecosystems is an endeavor we wholeheartedly support, however, expecting these ecosystems to provide protection from large tsunamis. K. Kathiresan and N. Rajendran)[11]

CONCLUSION

Here we conclude that by providing mangrove belt in coastal areas we can diminish the intensity of Tsunami waves upto certain extent, prevent soil erosion on coastal regions. If sufficient height, width and density of mangrove belt is provided then the mangrove belt can act as a barrier to tsunami and also can reduce height of Tsunami waves .

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