The Coastal Vegetation Role in Protecting the Thailand Coast Against the 26th December 2004 Tsunami

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Abstract

At 0100 GMT on 26th December 2004 a 9.3 magnitude earthquake occurred on the sea floor near Simeulue Island, Indonesia, generating a powerful wave resulting in the largest tsunami the world has known in over forty years. This tsunami destructively attacked Thailand with 5,395 fatalities, 8,457 injured, 2,932 missing victims, more than 1,200 orphans and tremendous economic lost. The tsunami's death toll could have been drastically reduced, if the warning was disseminated quickly and effectively to the costal dwellers along the Indian Ocean rim. With a warning system in the Indian Ocean, it would have been possible to warn, evacuate and save countless lives.

The best tribute we can pay to all who perished or suffered in this disaster is to heed its powerful lessons. We need to address the long-term issues of better disaster preparedness, functional early warning systems and realistic arrangements to cope with not just tsunamis, but a multitude of other hazards. To reduce the lost of the future tsunami, we have to prepare and build the systematic capacities in countries around Indian Ocean.

The content of this presentation is the impacts of tsunami on 26th December 2004 on coastal forests; study on greenbelt and tsunami, criteria damage by tsunami flow velocity and height; role of coastal vegetation to protect the coast from tsunami disaster; coastline rehabilitation and protection; with conclusions and recommendations.

The Indian Ocean tsunami had some impacts on coastal ecosystems such as mangrove and beach forests. The main impacts of tsunami on coastal wetlands include loss or degradation of mangrove and sea-grass beds, silting on coastal ecosystem, major changes on coastal features and productivity of land. The mangroves are extremely important in forming an effective barrier against any type of wave. It filters the energy out of the wave, so it can protect the infrastructure behind it more or less. Damages from the tsunami could have been reduced if more coastal areas had maintained their protective shields of mangrove swamps, beach forest and coral reefs.

The assessment of mangrove damages has been made by using the aerial photos, satellite data, coastal topography and field surveys on Thailand coasts. The NDVI (Normalised Difference Vegetation Index) were used to assess the degrees of the damage on some areas of the 6 coastal provinces of the Andaman seacoast of Thailand from the tsunami. The environmental data such as offshore bathymetry, coastal topography, coastline configuration, coastal type, land-use data, runup data, seven tide gauge data, behaviours of run-up and rundown variations from MOST model were combined to investigate the degree of damage. The site examples revealed the effective protection of dense mangrove, beach forests and coral reef against the powerful force of the tsunami wave. The characteristics of erosion and sedimentation from the tsunami

run-up and rundown were analysed for coastal rehabilitation processes. Owing to the characteristics of long wave, tsunami will cause some damages on the mangrove at the unprotected coast. The degree of damage was lesser at mangrove coast than the sandy beach at Prathong Island. The resonance, refraction, diffraction and reflection effects of tsunami long wave at the harbour, islands and complex topography were revealed from the result of MOST model. The impacts of natural forests, sand dune and human constructions were compared at some coastal areas. The comparison of the erosion and sediment transport from tsunami wave and wind wave were shown at the Ban Thao Bay, Phuket. The rehabilitations for coastal protection were recommended.

The criteria of damage by tsunami flow velocity and height was proposed by Dr. Tetsuya Miraishi (Port and Airport Research Institute (PARI), Japan) with the analysis in some places in Thailand. The studies on effect of greenbelt to reduce the tsunami force were conducted at PARI wave basin in 2001. The results are used to design the greenbelt characteristics. Effect of greenbelt varies according to coastal topography.

Several functions and effects of coastal forest to protect the coast from tsunami disaster were shown. Roles of mangrove to prevent natural disaster are shock absorbers, with dense mangrove, the damage is less. In some areas, the mangrove can prevent people or properties to be washed out to the sea by powerful tsunami wave. They form a protective buffer, stabilize sediments, reduce shoreline and riverbank erosion, regulate flooding and recycle nutrients. Therefore, the productivity of mangrove is highest among other coastal ecosystems.

The coastline rehabilitation and protection by hard and soft measures are exemplified, mostly in Japan, where the offshore breakwater, sea-wall and greenbelt were combined to protect the coastal communities from tsunami. Education is an important means to reduce the risk of tsunami. The managements of mangrove plantation and recovery were studied in many places.

We can conclude that the coastal forests provided significant protection where there was a sufficient width of intact forest. The degraded forest or widely spaced trees provided little protection. The situation varies significantly between sites influenced by different factors. Strong justification is for protection of remaining coastal forests, for immediate support for rehabilitation. The sufficient experience must be available in the region for rehabilitation techniques – but information is scattered and not available to many affected communities.