In tsunami affected mangrove stands *Acanthus ilicifolius* (in 50% of study plots), *Achrosticum aureum* (40%) and *Lumnitzera racemosa* (17%) were the dominant species establishing in open muddy substrates, while *Clerodendrum inerme* (57%), *Lumnitzera racemosa* and *Excoecaria agallocha* (29% each) were regenerating in sand deposited in the mangrove patches.

Ipomoea pes-caprae (85%), *Scaevola taccada* and *Calotropis gigantea* (23% each) were observed as the dominant species re-establishing in the gentle seashore vegetation, while *Spinifex littoreus* shows a slow rate of regeneration. Most of the destroyed *Pandanus odoratissimus* bushes facing the beach are not regenerating. Instead a new row of *Pandanus* was observed regenerating immediately backing the original stands. Prominent species regenerating in coastal scrublands are *Croton bonplandianus* and *Gymnema sylvestre* (37% each), *Clerodendrum inerme* (16%), *Calotropis gigantea* (10%) and *Crateva adansonii* (10%) and saplings of *Azadirachta indica* and *Limonia acidissima*.

Invasive alien plants, mainly *Opuntia dillennii* have established well and spreading vigorously in affected coastal scrublands (58%), some study plots of gentle seashore vegetation (31%) as well as on sand depositions in the affected mangroves (15%). This species was observed replacing the spaces occupied by destroyed *Pandanus odoratissimus* bushes and *Spinifex littoreus* beds. Invasive alien plants such as *Prosopis juliflora* and *Lantana camara* were also spreading in tsunami disturbed coastal scrublands.

096

Assessment of tsunami damage on the coastal vegetation in five selected districts in the coastal zone of Sri Lanka, after one and half years of tsunami

D M S H K Ranasinghe and W M P S B Wahala
Department of Forestry and Environmental Science, University of Sri Jayewardenepura, Sri Lanka

Tsunami, the killer wave swept nearly two thirds of the coast of Sri Lanka on 26th of December, 2004. About 40,000 people died and around 500,000 people were displaced, more than 119,000 houses damaged either fully or partially. About 13 coastal districts were directly affected, the north and east suffered the brunt of the blow accounting for about 2/3 of deaths and 60% of displacements. In terms of ecological aspects, with the exception of few species, most of the vegetation suffered total or partial death, lagoons, estuaries, coral reefs, sea grass beds, salt marshes and mangroves experienced the damage at varying levels. This study was conducted with the patronage of the Food and Agricultural Organisation of the UN to scientifically assess the response of the coastal ecosystems with special reference to coastal forests to the Tsunami, almost one and half years of the incident.

The study focused on 5 tsunami affected districts namely, Kalutara, Galle, Matara, Hambantota and Ampara. In each district, approximately 6 sampling locations selected based on the topography maps and ground information. In each sampling location, a transect which was 10m wide and upto 250m inland was taken. The transect was divided into 50m blocks, the first one laid at the start of vegetation line of the beach. In each 50m section of the transect, all the plant species were enumerated. For the ground vegetation, percentage ground cover was taken. Using an index, the level of damage was evaluated for each plant. Composite soil samples were taken at each 50m segment and analysed for Electrical Conductivity, Soil Organic Carbon and major nutrients. Water samples were taken from existing wells located close by.

Although most of the vegetation, except for few exceptions, suffered badly at the time of Tsunami, there was extensive regeneration on the coast at the time of our study. The species which suffered the tsunami damage most were Palmyrah palm (*Borassus flabellifer)*, Del (*Artocarpus nobilis*), Araliya (*Borassus* flabellifer), Puwak (*Areca catechu*), Banana (*Musa spp*), Kitul (*Caryota* urens), Guava (*Psidium guajava*), Avacardo pears (*Persea gratissima*), trees of Citrus family ie Oranges, Lemon, Lime (*Citrus spp.*) Alstonia, Teak (*Tectona* grandis) etc. Of these, most of the species had regenerated to varying degrees, the most difficult ones being Araliya, Palmyrah, plants of citrus family, Kitul, Guava.

With a view to find out the species which are more robust in the regeneration, percentage ground cover (in ground vegetation) and relative abundance (in tree/shrub vegetation) were taken in each

50m segment of a plot. The districts did not vary significantly in the biodiversity. However, the species abundance showed a significant variation especially between the districts of the western coast (Kalutara, Galle, Matara) with that of south and eastern coasts (Hambantota and Ampara). While Mudu bim thamburu (*Ipomea pescaprae*) was the most prominent ground cover in the western districts, Maha ravana ravul (*Spinifex* spp.) was more prominent in both south and eastern districts. With regard to the abundance of trees/shrubs, Wetakeiyya (*Pandanus sp*), Coconuts (*Cocos nucifera*), Gam suriya (*Thespesia spp.*), Mudilla (*Barringtonia spp.*), Domba were most abundant. In the South and Eastern districts, Maliththan (*Woodfordia fruitocosa*), Andara (*Prosopis juliflora*), Palmyrah palm, Cashw nut (*Anacardium occidentale*) and Neem (*Azadirachta indica*), Indi, (*Phoenix spp*) Korakaha/ Kayan (*Memecylon angustifolium*) were prominent. In the South and South-eastern districts, Aththana (*Datura metel*), Wal kochchi had spread into invasive levels while the regeneration of Ranawara (*Cassia auriculata*) also had increased.

With regard to the physical parameters, soil carbon content showed a decrease with the increase in distance from the beach. The Electrical Conductivity (EC) also showed a decreasing trend with the increasing distance from the beach in all the districts studied. In general, all the nutrients (Total N, Available P, Available K, Ca, Mg and Na) showed an increase upto about 50m compared to that of non tsunami levels and then decreased. The pH of the water samples taken in all the districts were between 7-8 indicating a neutral level while the EC values were higher than the standard of 4 mil semens.

With regard to the establishment of Green Belt, the coastal area could be broadly categorised into natural, rural and urban landscapes. For the natural landscapes like mangroves, sand dunes and coastal forests, facilitation/restoration of the natural vegetation is recommended. Selection of species should be in line with the naturally occurring ones in the ecosystem. In total locations, planting a strip of natural littoral woodland and strand plants seaward of agricultural crops is suitable. For urban locations, patches of natural vegetation could be integrated as far as possible with the most suitable concept for the area. There could be open grassed/sandy/paved parks or playgrounds or sports grounds of various sizes, provided there is a substantial belt of trees on the seaward side, and in cyclone prone areas, wind shelter belts on all sides. In cyclone prone areas, wind shelter belts should be planted around crops and settlements: the trees and shrubs used could be introduced species as well as indigenous/ native (found naturally in Sri Lanka) and endemic (found naturally only in Sri Lanka) species.

The design of the Green belt should include both ground vegetation, shrubs and then trees. Based on the study results, composition of the vegetation for both ground vegetation, shrub layer and the tree layer has been proposed for all the 5 districts. In the tree layer, there were two distinctions, one for the bioshield which is located at close proximity to the sea and then the trees outside the bioshield comprising of more multipurpose ones serving both protection and production purposes. Further, general designs were recommended for the west coast and southeast and eastern coasts. Guidelines were also proposed for rehabilitation of the mangrove areas and sand dunes.

097

Hydrogeological condition and groundwater quality distribution in the tsunami affected Southern coastal area of Sri Lanka

R U K Piyadasa[1], K D N Weerasinghe[2], D S E Kumara[2], H K C S Lakmal[2]
J A Liyanage[3]
[1] Department of Geography, University of Colombo, Sri Lanka
[2] Department of Agricultural Engineering, , University of Ruhuna, Sri Lanka
[3] Dept of Chemistry, University of Kelaniya, Sri Lanka

Groundwater monitoring in the tsunami affected southern coastal Weligama bay area was conducted during May 2005 to July 2006 to determine the hydrogeological conditions and groundwater quality by selecting 90 dug wells where water level, electrical conductivity (EC), total dissolved solids (TDS) and pH was measured in monthly interval. The Weligama bay area is located in latitudes and longitudes of 80°22', 5°97'. The dug wells are sunk into the permeable quaternary sand deposits in the coastal margin at Weligama Bay area is very permeable and hydro-geological conditions are very favorable for saltwater intrusion.