

## Tsunami deaths

An attempt is made in this letter to discuss possible reasons for the huge loss of human life due to the 26 December 2004 tsunami and to provide some preventive measures that can be considered during the resettlement plan.

As it turns out, it is known now that tsunamis are often found in the Pacific, but not so in the Indian Ocean. The latter area is blacked out on awareness and prevention. Despite the knowledge on fragile ecosystem of the coasts, governments of all the affected countries give constructional permissions to promote tourism, allow fishermen to settle down near the coasts and ignore the destruction of natural barriers. Coasts are being indiscriminately utilized by man in the name of recreation and expansion of civilization.

In probing the reasons for the heavy loss to human life and property, it appears that landforms and geology of the coastal zones seem to have relation with the devastation. Take the case of Tamil Nadu coasts, where the death toll reached 8000. It took almost 2 h for the tsunami to strike Chennai and it took another 3 h to hit the entire coast of Tamil Nadu because of its configuration. However, the zone between Point Calimer and Manakkad, being behind the west of Sri Lanka, a shadow zone for tsunamis, escaped from the ravage. Waves of about 10 m amplitude came in three to four pulses and the sea receded between two pulses. While the first wave was of surging type, the following ones were the most devastating in most places. Huge quantity of water ingressed into the land, inundating vast coastal areas. Among the affected coastal districts, devastation was of serious nature in Chennai, Cuddalore, Nagapattinam and Kanyakumari districts. In Nagapattinam alone, over 5000 people were killed.

Lack of awareness is undoubtedly the first reason behind the huge loss of life.

Throughout the entire coastal zone the sea suddenly receded up to 300 m just before the first wave hit the coast. The sea in Mahabalipuram receded exposing some mound-like structures on the floor. A fast-receding sea is the forewarning for an advancing tsunami.

In Chennai, it was observed that though the water level rose from 1.75 to 2 m water advanced about 500 m in north, flooding the entire width of Marina Beach, while in the south, being at a higher elevation, water ingressed 150 m only. Foreshore Estate area, where fishermen have made their settlements, lies in a shallow valley and on the northern bank of Adyar river. The waves from the east and the overflowing river from the south inundated the entire settlement, killing hundreds of people. Along the coast there may develop three to four sets of beach parallel ridges, among which the first beachfront ridge is topped by sand dunes. It is observed that the dwellings on these ridges and adjoining valleys have been destroyed. However, some concrete constructions on the ridges without dunes may have escaped destruction, while the contiguous valleys have been deluged.

In some areas, the beach is flat where water transgressed freely inundating the entire coastal habitation. Huge quantities of water entered through the mouths of many rivers and creeks, and overflowed causing much damage. Many blocked river mouths got opened as the water receded with a high velocity. In Nagapattinam and elsewhere, water gushed with high force into the creeks and rivers and forced open or cut through the network of abandoned channels, flooding a largely populated settlement hinterland area and leaving thousands of people dead.

For prevention, in the future, the first and foremost step is to sensitize people at

large and create awareness through different media and school textbooks on various natural hazards, including the tsunami and the preventive measures to be adopted. The entire coastal zone is to be studied in terms of geological and geomorphological points of view, to develop inundation vulnerability maps. Flood-prone areas like low-level lands, creeks and river flood plains, palaeochannels, sand dunes, and valleys are to be marked as vulnerable. No habitation should be allowed on such flood-prone areas and also up to the third beachfront ridge. No constructional structure for recreational purpose should be permitted on the beachfront. Construction of a sea front wall and its maintenance is a costly affair that may be avoided if other preventive measures are taken. Some scientific planning will save many lives in future. Coastal Regulation Zones should be observed strictly without surrendering to the pressure of politicians and businessmen. The coral reefs, mangroves and beach sands are being destroyed indiscriminately, exposing the public more to natural devastation. These may not obstruct the tsunami, but may act as a buffer zone to minimize the effect. Tsunami warning systems are being introduced in the Indian Ocean, as also a high-resolution satellite monitoring system.

Both awareness and preventive steps are needed to prevent such huge loss of human life in future.

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