Mind, machine and the tsunami

One feels that in the recent earthquake-triggered tsunami destruction, many lives could have been saved, as on hindsight failure of the mind of scientists appears to be one of the main lapses. It is well known that there is an active subduction arc along the eastern margin of the Indian lithospheric plate, which includes Andaman and Nicobar islands, Sumatra and Indonesia, and also that these subduction corridors are well-known seats of large earthquakes.

Thus, as earth scientists (especially seismologists), we ought to have thought of the possibility of large earthquakes ($M > 7$) in this region, since accumulated stress had not been released in the Sumatra–Nicobar sector of the subduction arc. There is this failure of mind or thinking, rather than absence of machinery alone. We have also not thought well enough that large earthquakes ($M > 7$) would cause tsunamis in this part of the Indian Ocean, as under optimal conditions earthquakes and tsunami have simple cause and effect relation. Both as oceanographers and seismologists, we should have been aware and alert. Even more, top seismologists have headed the ocean development department and despite this, our long-term plans and vision have apparently not paid enough attention to the expected coupling between earthquakes (at subduction zone) and tsunamis. Otherwise with requisite alertness, smart thinking and earthquake information dissemination system in place, this could have saved a significant percentage of lives lost, as has been done after the earthquake (M 8.2) of 29 March 2005.

It is particularly painful because for the past ten years we have been promising (the country) after each catastrophic earthquake, like those at Uttarkashi, Latur (Killari), Jabalpur and Bhuj, that a very efficient hazard-monitoring and information-dissemination system would be in place 'soon'. While technology certainly needs to be continuously reinforced, at the same time our thinking (or mind) is at least, equally as if not more, important in time of such catastrophes. Our inaction for nearly three hours, that is the time interval between recording of the earthquake (at ~0630 h) and arrival of the tsunami (at ~0930 h) along the east coast of peninsular India, remains largely unexplained and it emphasizes failure of mind of scientists especially the geophysicists. In this context one of the essential steps that could be taken is establishment of separate institutes for study of earthquakes and study of monsoons, while strengthening their coordination and immediate data exchange facilities. Further, earthquake information dissemination has to work on the level of war footing – immediate and rapid – so that what happened on 26 December 2004, does not happen again.

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Tsunami engineering study in India

There are only a few institutions in the world studying tsunamis. The Pacific Marine Environmental Laboratory at NOAA, USA has the tsunami-research program (http://www.pmel.noaa.gov/tsunami/). The tsunami research group is part of the Civil Engineering Department at the University of Southern California where undergraduate and graduate academic programs in water resources and coastal engineering, are offered. In June 1990, Japan established the Tsunami Engineering Division; it is the only one of its kind in the world which studies the phenomenon from the engineering point of view. The Tsunami Engineering Laboratory at the graduate School of Engineering, Tohoku University (http://www.tsunami.civil.tohoku.ac.jp/hokusai2/main/eng/index.html) offers research programmes on tsunami. The University of Roorkee, now renamed as IIT Roorkee is the oldest Indian institution to provide a degree in Earthquake Engineering.

Looking into the magnitude of massive damages that could take place due to a tsunami or earthquake, it may be the right time that India establishes a proper early warning system. Since tsunami is related to dynamics of a huge water body, premier institutions like IITs at Kharagpur and Chennai where full-fledged ocean engineering curriculum exists, may establish tsunami engineering study centres. We need to carry out research in the fields like: (a) developing early warning system to alert coastal residents based on numerical forecasting, (b) implementing and maintaining an awareness on the warnings of tsunami danger through field investigations, databases, computer graphics, etc. and (c) ultimately producing and updating the tsunami hazard maps to identify areas vulnerable to flooding and inundation; this is very much similar to earthquake hazard zones being classified. To carry out these, we need research groups to study historical tsunamis, numerical modelling, such field survey, physical experiments, evacuation models, etc. and they may be located in various research institutions/organizations/universities.

As most of the islands in Andaman and Nicobar, Lakshdweep and some coastal regions have low-land areas, in addition to warning and awareness systems, we should construct many tsunami shelters, which are similar to cyclone shelters already existing in the east coast of India.

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