**Lessons from post 2004 Indian Ocean tsunami research for the 2011 Pacific Ocean tsunami**

A Great Earthquake, one of the most powerful in recorded history, occurred off the coast of Honshu, North East Japan, on the 11th of March 2011. The previous Great Earthquake in Asia occurred off the coast of Sumatra, North West Indonesia, on the 26th of December 2004. Both were followed by local tsunamis and teletsunamis (tsunamis that travel large distances across the ocean). The scope and scale of the destruction of lives, livelihoods and property by the 2004 Indian Ocean tsunami generated a massive wave of humanitarian assistance, some of which was also used for research on how to respond to and prepare for such hazards in the future. Now, in the aftermath of the Pacific event, it is reasonable to ask what was learned from the Indian Ocean event.

LIRNE*asia*, together with several partner organizations around the Bay of Bengal, engaged in a number of disaster risk-reduction research projects since 2005, some that were self- and locally-funded, but the major project that started in 2006 was financed generously by International Development Research Centre of Canada. It focused on the “last mile” of the warning chain, that constituted by the communities where the actions necessary to save lives, livelihoods and property has to be taken. This note summarizes the findings that are likely to be of relevance in the present circumstances.

LIRNE*asia*’s work focuses on disaster-risk reduction, not on disaster relief and recovery, the aspects of the greatest relevance at this moment, after the disaster has occurred.

Hazards may be classified as follows in terms of amenability to early-warning interventions:

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| --- | --- | --- | --- |
|  | **Warning time less than 60 mts** | **Warning time more than 60 mts but less than 4 days** | **Warning time more than 4 days** |
| **Large geographical scope** | E.g., earthquake | E.g., cyclone/storm, tsunami, breach of an upriver dam in a large cascaded system | E.g., drought |
| **Local geographical scope** | E.g., local tsunami, landslide triggered by floods, single small dam failure | E.g., volcanic eruption, certain forms of floods | E.g., some forms of landslides |

Hazards with large geographical scope that can be detected in ways that allow around 60 minutes of forewarning are the one most amenable to information and communication technology based early warning interventions. There is not much benefit in using speedy electronic communication to warn people of hazards that can be predicted well in advance. Localized hazards do not require the distance-spanning abilities of ICTs. When warning time is too short, governments cannot issue warnings and people cannot wait to respond to government warning, the best example being a local tsunami generated by a near-coast earthquake. As they say in Hawai’i, your feet are your signal: if you feel tremors from an earthquake while on a beach, head for high ground without waiting for official warning.

The 8.9 magnitude earthquake that occurred on March 11th was only 130 km from the city of Sendai. It generated a local tsunami that would have seen water hit the shore minutes after the tremors stopped. ICTs and the best possible national official warning systems are of little value in such cases. Earthquake and tsunami resilient building codes, land-use planning and people’s knowledge and preparedness are the only methods of reducing risks to lives, livelihoods and property. While the tally of damage is yet to be done, first reports suggest that it will be extensive though not as total as in Banda Aceh during the 2004 Indian Ocean event.

In the case of the teletsunami that was triggered by the 8.9 earthquake, ICT-based warning could, and did, play a role, as was seen in video from Hawai’i and the coastal areas of the western United States. Hawai’i was an exemplar of good practices in tsunami risk-reduction practices when we designed our project. The principles of hazard risk reduction do not differ from country to country. Yet their application varies widely, because the ground circumstances in different localities greatly differ. For example, telephone books in Hawai’i contain maps of areas vulnerable to tsunamis and evacuation plans. This works in Hawai’i. In countries where homes cannot be securely locked and people do not trust the police, evacuations will not work in the same way. The 2006-08 HazInfo study sought to identify the practices that would be most appropriate for coastal communities in Sri Lanka and the ICTs that would work best.

Different technologies were tested in field conditions, some coming straight from development labs, designed for purpose. Addressable, remotely activable satellite radio was found to be highly effective across multiple evaluation criteria. However, the service can no longer be used in the Asian region because the only company offering satellite radio services over the Indian Ocean has since gone out of business. The HazInfo project along with related research revealed the different useful roles that can be played by communication over mobile platforms. SMS, an application familiar to millions, is not a good public warning technology due to congestion but can play useful roles in alerting first responders ahead of information being broadly disseminated. It can also assist coordination in the relief and recovery phases. An SMS module was designed and incorporated into the Sahana disaster management suite that was developed by the Lanka Software Foundation.

The best available technology for public warning is cell broadcasting, a functionality of GSM and some CDMA wireless networks. Cell broadcasting is a point-to-multipoint mode of communication that is not vulnerable to the congestion effects that are unavoidable when too many users come on-stream at the same time in point-to-point networks. It is also capable of issuing different message to different localities and can also communicate with roaming customers, if certain preconditions have been satisfied. It is therefore the most appropriate for reaching tourists. Sri Lanka’s mobile networks are now fully capable of issuing localized warnings through cell broadcasting. More needs to be done to improve government procedures including the setting in place of protocols to ensure fast, focused and unambiguous instructions to media, including mobile operators.

Understanding that ICTs play a complementary role, the HazInfo project focused on community preparedness. The research addressed the best ways communities could prepare themselves to receive government evacuation orders and take the most appropriate actions. Ideas such as conducting periodic hazard assessments, developing and updating contingency plans and conducting table-top exercises for community first-responders were generated through the project and are now incorporated into the practices of Sarvodaya, Sri Lanka’s largest community-based organization. Efforts are being made to include these ideas into the procedures of tourist hotels.

The findings of the HazInfo research were disseminated to the disaster risk-reduction expert communities in Bangladesh, India, Indonesia and the Maldives as well as the larger worldwide expert community.

Japan is a country that knows how to deal with earthquakes. Its buildings are constructed to code; its people are trained on how to respond from when they are in school. It is also a wealthy developed country and one that has a high population density. Therefore, the original hypothesis was that loss of life will be much less than in the case of the 2004 Indian Ocean tsunami while property losses will be much larger. First reports indicate that the early warning systems worked and the years of training citizens to respond appropriately yielded results. Yet the losses of life in Sendai, the city most affected by the local tsunami, indicate that more can be done in early warning and in disaster-resilient land-use planning and building construction.

In relation to the teletsunami that threatened the littoral countries of the Pacific Ocean, the risk-reduction measures appear to have worked, at least in the developed economies. Loss of life has been avoided in Hawai’i and locations covered by international media. The microstates of the Pacific islands have significant similarities with the Sri Lankan coastal communities that were studied as part of the HazInfo project. Whether or not the early warnings went through effectively to the last mile in those countries and whether those communities were prepared to respond appropriately remains to be seen.

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