OPINION: What worked and what did not: views from the field

By Rajib Shaw
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Recently I took a survey in the affected areas of Iwate and Miyagi prefectures as a part of the need assessment team of a nonprofit organization named SEEDS Asia.

This survey was an effort by the consortium of nongovernmental organizations called Japan Platform which has been active mobilizing resources in the hardest-hit areas. I visited several affected towns and cities including Taro, Miyako, Yamada, Kamaishi, Ofunato, Rikuzentakata, Kesennuma, Minamisanriku, Ishinomaki, Sendai, Iwanuma, Watari and Yamamoto-cho in four days. The devastation is huge, and beyond any description. After the 2004 Indian Ocean Tsunami, I surveyed Indonesia, Sri Lanka and India, but did not see this level of destruction.

First, let us look at the magnitude of the earthquake, which is a once-in-1,000-years event. The affected area is known for its past active seismicity, and repeated tsunami, like June 15 of 1896, March 3 of 1933, and on May 22 of 1960. The last one was due to the Chile earthquake. Paleo-seismicity tells that in 869 AD, there was a major event, named Jogan Earthquake, where three fault sources broke simultaneously. The current earthquake is also of the same nature. Therefore, the energy released was much higher compared to other recent earthquakes, causing one of the strongest tsunami Japan has experienced in the last 100 years.

Apart from the magnitude of the earthquake and resultant tsunami, one of the key reasons for devastation is Japan's land character. Almost 70 percent of the country's land is covered by mountains, which leaves a very narrow coastal belt. The devastation of tsunami was found to be the largest in two types of land areas. The first is areas with a narrow opening to the sea, like that of Taro in Miyako town. The other is areas of vast, flat lands, like Rikuzentakata (in Iwate prefecture) or Watari, Yamamoto-cho (in Miyagi prefecture).

Taro is famous for its tsunami prevention measures. The town was affected by the 1896 tsunami (known as the Meiji Sanriku earthquake and tsunami), which killed more than 22,000 people. The town lost most of its population in that disaster. In 1933, the town was again hit by another devastating tsunami, following a decision by the town leader to construct a mega dyke to protect its people. The dyke was built in several phases, becoming a 10 meter-by-2.5 kilometer long structure. The latest tsunami wave overflowed this dyke and damaged some areas, but would have been more devastating without the dyke. The importance of infrastructure-based disaster prevention can be highlighted here.

In Kamaishi, Iwate prefecture, an eight-story tsunami evacuation building stood undamaged very close to the shoreline. On the hazard map, distributed by the city government, this building was designated and marked as an evacuation building with clear instruction that people need to evacuate higher than the fourth floor. What is more interesting is that, on March 3 (also the day of the 1933 Showa Sanriku earthquake and tsunami) an evacuation drill was performed with local residents and school children. Therefore, tsunami awareness was rather fresh in their minds and people took shelter in evacuation buildings and on a nearby evacuation road (a pre-designated road on the nearby mountain with access stairs), immediately when they felt the earthquake. This shows the importance of evacuation drills and disaster education.

In contrast, in Rikuzentakata, where there was rather vast land in the coastal area, the tsunami wave entered as far as 4 km inland, caused extensive damage to the local government building, and made it

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non-operational in the immediate rescue relief phase. A distinct difference in the post-disaster operation can be observed in the cities where the local government office was not affected due to its location on higher ground. In Ofunato in Iwate Prefecture, or in Iwanuma, Yamamoto-cho, in Miyagi Prefecture, the local governments already started their preparations for the short- and medium-term recovery phase, including construction of temporary shelter. In contrast, in Minamisanriku, where the three-story disaster management office was also destroyed, the relief phase has been prolonged.

For early warning systems to be effective, a proper risk communication mechanism, which links both information provider and receiver, is needed. In the March 11 disaster, the tsunami warning and tsunami advisory were issued within three minutes after the event.

The warning was broadcast though the Japan Meteorological Agency webpage, television, radio, social networking media, and also through announcements from the town and city offices. However, in several places, initially, people underestimated the height and severity of tsunami, and started evacuating after the first wave had arrived. What makes people take immediate action for evacuation? An easy-to-understand early warning (with information on potential tsunami height), evacuation orders and repeated evacuation drills make a difference. In some cases, people had a "feel safe" misperception, where neighbors' and children's roles became important.

What is an ideal tsunami prevention measure? There is possibly not a single formula applicable to every place. It needs to be customized based on local geographic and topographic conditions. A combination of early warning systems, infrastructure measures like coastal dykes, tsunami evacuation centers, and awareness and education campaigns including evacuation drills and disaster education is required.

Finally, I would like to emphasize that through the 400 km long survey along the coast, I have not seen major earthquake damage. While liquefaction effects were reported in Chiba and Ibaraki prefectures due to soft soil and reclaimed land, most of the buildings on higher ground in the worst-affected areas remain undamaged. The only visible impact was the damage of roof tiles in some areas like Natori, Watari and Yamamoto-cho in Miyagi prefectures.

The epicenter and the fault zone were located under the sea, and therefore it may not be comparable to the Hanshin-Awaji Great Earthquake, which was an inland earthquake, with the fault line passing below the devastated city. But with a magnitude 9 earthquake, and with an intensity of 7 on the Japanese scale (the maximum possible intensity), a real appreciation needs to be given to the earthquake risk reduction measures Japan has practiced over years. In all the coastal towns, a sharp demarcation of affected and non-affected areas can be made through the tsunami inundation, which varies from 3 to 5 km. If there was additional damage due to earthquakes, the situation would have been worse.

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