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# RSIS COMMENTARIES

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## **After Japan: Waiting for Asia's Next Big One**

By Yang Razali Kassim

### **Synopsis**

*Japan's recent mega quake and tsunami have once again raised the question of whether this double calamity will recur, and where. While predicting earthquakes is virtually impossible, an awareness of the increasing risk of earthquakes is critical.*

### **Commentary**

THE MEGA earthquake and tsunami that shook northeast Japan on 11 March 2011 were the worst double calamity to hit the Pacific island country in recent memory. As if this was not enough, the tsunami damaged a nuclear power plant, triggering a nuclear and environmental crisis that has put Japan on a knife's edge. It is causing global concern because of its potential radioactive fallout around the world.

The Tohoku earthquake, at magnitude 9 (M9) according to the US Geological Survey (USGS), was Japan's largest instrumentally recorded, and the ensuing tsunami the largest "in a thousand years". Recovery will take years, if not decades. So far, at least 28,000 people are reported to have died or disappeared – with the figure expected to rise as more bodies are accounted for.

### **Will it Happen Again?**

The Tohoku earthquake should be seen in terms of the broader trend in natural disasters in recent times. Just two weeks after it struck, a M6.8 earthquake shook eastern Myanmar, which killed at least 105 people. The Japan quake and tsunami came seven years after a similar double calamity shook the Indian Ocean off northern Sumatra, whose M9.3 was even larger than Tohoku's. That giant Asian tsunami in 2004 swept away a total of 230,000 lives in no less than 12 countries across the Indian Ocean. In between the 2004 and 2011 earthquakes/tsunamis, there has been a series of other major convulsions of the earth – in Haiti, New Zealand and China, for instance. With the exception of the M8.8 earthquake in Chile on 27 February 2010, these intervening events have not been accompanied by terrifying tsunamis.

Is there a connection between these earthquakes around the globe? Are they all on the same tectonic plates that slide and clash, incrementally but often violently nonetheless, at the bottom of the oceans? Experts say 'no'. But moving forward, the obvious question to ask is: "Will such twin tragedies – mega quakes followed by tsunamis -- happen again?"

## Long Term Forecasting

There is some debate within the small community of experts in the field -- geologists and seismologists. To be sure, predicting earthquakes is virtually impossible. The experts prefer the term 'forecasting'. Though growing, the field of seismology is still young, having been invented only about 100 years ago – a very short time in the context of the thousands, possibly millions of years that earthquakes have been happening repeatedly on our "living" planet.

In fact, if long-term forecasting based on thousands of years is taken, a mega earthquake and tsunami of the size of that in Japan or off the Indonesian island of Sumatra could come again anytime in certain spots, according to Prof Paul Tapponnier of the Earth Observatory of Singapore (EOS). "Forecasting mega quakes has to be done not just in terms of hundreds but of thousands of years," he says. The Tohoku earthquake was the result of stresses building up since the 9th century AD on the boundary between the North American and Pacific plates. "The continuation of this boundary well south of Tokyo is now very strongly stressed. It has not had a very large earthquake in a very long time. We must ask, 'Could it occur in the next few years or decades?' We cannot answer yet, but certainly we should watch with great attention," Tapponnier told RSIS Commentaries.

Seismologists rely on mathematical models to calculate probabilities, the nearest thing to a prediction – "earthquake risks". This is based on the fundamental assumption that earthquakes are a recurring phenomenon. Given the many recent examples around the world, this is not in doubt. But what are the facts that models can be fed with? This is the key question, Tapponnier asserts.

## Moving Plates

The earth comprises tectonic plates that move very slowly over time – from two to 10 centimetres a year. Some plates collide in what is called a subduction, when one plate goes under the other. In the case of the recent Japan quake, the huge magnitude was due to the massive stress accumulated over many centuries. If we take the long view, Tapponnier argues, mega earthquakes similar to Tohoku's may be due to occur in several spots – one south of Japan, others along the Sumatra or Java trenches, if we keep our eyes on Southeast Asia. It is the potential of the Sumatra or Java trenches shaking that should be of concern to Indonesia and Singapore.

There might first be a big earthquake in the Mentawai Islands off the west coast of Sumatra --- a site which already had a magnitude 7.7 shock in October 2010 and a place monitored closely by EOS. "In the case of a giant event along part of the Java trench, Yogyakarta and Jakarta would be shaken strongly," says Tapponnier. The impact would easily be felt directly along the Java coast to Bali, Timor Leste and Sumbawa. On 4 April 2011, an earthquake of M 7.1 shook the coastal city of Cilacap in Central Java.

## Implications for Singapore

While Sumatra and Java are big islands that buffer Singapore, there could be significant shaking in Singapore should the Java or Sumatra trenches convulse, says Tapponnier. But is Singapore earthquake-free? "I don't think Singapore will be at risk of a large continental earthquake, as that in Myanmar a couple weeks ago. But there are aspects of the geology of Singapore that should be studied," he says. "If someone were to ask me of the possibility of a magnitude 4 earthquake somewhere in Singapore, I wouldn't be secure to say there won't be. It requires more thinking, more work," Tapponnier notes.

He says local seismological data have been accumulated over the past 15 years. "But they have not been used to locate small tremors within Singapore. Perhaps, it would be good to start. Singapore is not on the Ring of Fire. But it is not far from it," he adds.

"The shaking in Sumatra or Java would be felt more strongly where there is reclaimed land. But if buildings are constructed properly on the right type of ground, there should not be much damage," Tapponnier says. "We can't predict earthquakes, but we must be conscious of the fact that there are a few places that can produce big earthquakes."

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