Is Failure to Predict a Crime?

By Florin Diacu

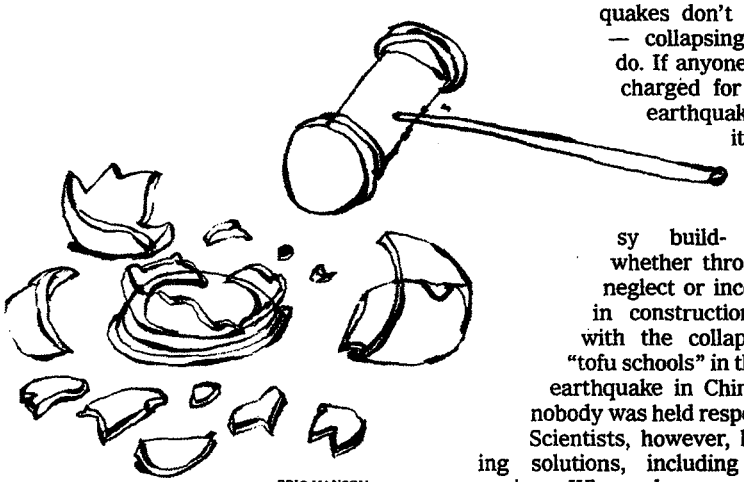
I LEARNED with disbelief on Monday about the decision of an Italian judge to convict seven scientific experts of manslaughter and to sentence them to six years in prison for failing to give warning before the April 2009 earthquake that killed 309 people, injured an additional 1,500 or so and left more than 65,000 people homeless in and around the city of L'Aquila in central Italy.

By this distorted logic, surgeons who warn a patient that there's a small chance of dying during surgery should be put in prison if the patient does, in fact, die. Imagine the consequences for the health system. The effect on other fields would be just as devastating. In response to the verdict, some Italian scientists have already resigned from key public safety positions. Unless this shortsighted verdict is overturned by wiser minds, it will be very harmful in the long run.

In L'Aquila, the scientists presented a risk assessment in late March 2009 after small seismic events made the public anxious. They found that a major quake was unlikely. Certainly, the timing of the scientists' statements played against them. On April 6, a 6.3-magnitude earthquake devastated the area, where earthquakes had been recorded since 1315. And L'Aquila is built on the bed of a dry lake, so the soil tends to amplify the motions of the ground. These facts, however, do not alter the truth of the scientists' claim that earthquakes are extremely rare there. One of the most important ones took place back in 1703.

In general, if the number of weak temblors is large, the probability of extreme events is small. But improbable does not mean impossible. Scientists generally cannot predict the time, location and magnitude of any major event, in spite of the fact that they did so — once. On Feb. 4, 1975, seismologists issued a warning to residents of Haicheng in northeastern China, prompting people to seek safety outdoors. A 7.3-magnitude earthquake struck that evening, killing more than 2,000 people and destroying more than 90 percent of the city. Without the warning, it might have resulted in close to 150,000 victims. But a 2005 report in the Bulletin of the Seismological Society of America qualified the Haicheng success as "a blend of confusion, empirical analysis, intuitive judgment and good luck."

Earthquake prediction is mostly based on probability. We know, for instance, that in the region of Cascadia, between Vancouver, British Columbia, and Sacramento, some 20 major events of a magnitude of 9 or higher took place in the past 10,000 years. The periods between those quakes have varied between two and eight centuries. The latest took place on Jan. 26, 1700. The next one could happen today or 10 generations from now.



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The ruling on the quake in Italy will be harmful in the long run.

Earthquakes are hard to predict because we know little about the configuration of the tectonic plates. The deepest hole drilled to learn more about the earth's crust was about 7.5 miles long, and it took more than 20 years to complete. But even if we could drill deeper and faster, it wouldn't help much in terms of quake prediction. It would be like trying to assess a fractured bone with a long needle. The only way we can now learn about the position of the plates is from how seismic waves propagate during earthquakes — in other words, after the disaster.

This doesn't mean that predictions can't be fine-tuned. In Cascadia, for instance, after researchers recently identified an increase in seismic activity — which now occurs every 14 months for two weeks — they concluded that large earthquakes are more probable during those periods. This is similar to knowing that car accidents are more likely during rush hour, which, of course, does not guarantee collisions then or safety at other times.

So what can we do with the information we do know? Officials should enforce tough building codes in seismic areas. After all, earthquakes don't kill people — collapsing buildings do. If anyone should be charged for deaths in earthquake zones, it's those who allow flimsy buildings to be built, whether through policy neglect or incompetence in construction. But as with the collapse of the "tofu schools" in the Sichuan earthquake in China in 2008, nobody was held responsible.

Scientists, however, keep seeking solutions, including real-time warnings. When a large earthquake is set off in the ground, it can take 10 or more seconds until it reaches a major city, enough time to receive automated signals that would give us time to duck and cover or even leave the building. Trains could be stopped to prevent derailments, and gas supplies could be cut to avoid fires. The University of California, Berkeley, will soon implement such a notification project in San Francisco at a cost of about $80 million, a small price to pay for the lives it might save.

We should not fear earthquakes, since most of us will never experience a major one. But we must prepare infrastructure to withstand disaster and learn how to react when disasters do hit. This is a serious policy issue. Safety messages can never be repeated enough. And we should all know that only friendly collaborations between science and public policy — not arrests and prosecutions — can lead to such achievements. □

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