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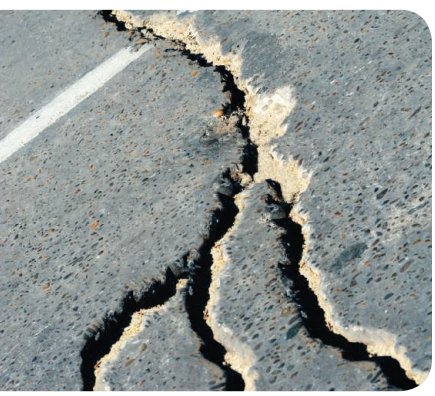
Science and Law: Rattled by Quakes

WHEN GOOD RISK ASSESSMENTS IMPROVE FINANCIAL, ENVIRONMENTAL, OR HEALTH DECISIONS, society often does not recognize the combined efforts of stakeholders who brought good management to bear. But when disaster strikes, the interface between science and public policy can come into question. A recent example is the 6.3-magnitude earthquake that struck the Italian city of L'Aquila in early April 2009, destroying 20,000 buildings, displacing 65,000 people, injuring more than 1500, and killing more than 300. This region suffered earlier severe earthquakes and experienced swarms of tremors beginning in 2008. A National Commission for Prediction and Prevention of Major Risks met briefly in late March 2009 to evaluate and communicate the risks in L'Aquila. In September 2011, the six scientists and one bureaucrat comprising this commission were put on trial in Italy. The charges are not simple, and the trial is expected to last months or years. The indictment raised outcries from many geoscientists and some scientific organizations, who pointed out that no scientific method reliably predicts the occurrence of an earthquake. The controversy also raised questions about how well scientific information is conveyed to the public and how well policymakers and lawyers understand the nature of science.



In 1989, a report of the U.S. National Research Council (NRC), *Improving Risk Communication*, recommended replacing one-way communication from experts to nonexperts with an "interactive process of exchange of information and opinion," because risk communication is "successful to the extent that it raises the level of understanding of relevant issues or actions for those involved and satisfies them that they are adequately informed within the limits of available knowledge." Twenty years later, information exchange remains a problem.

The largest issue that springs from L'Aquila is how societies can ready themselves for hazards where science is necessary but not sufficient to prepare and respond. Federal scientific agencies such as the U.S. Geological Survey and the National Oceanic and Atmospheric Administration have engaged with other parts of federal and local governments to improve risk assessments and responses. As science and technologies evolve, risk assessments and two-way conversations between scientists and governments must change. Both sides must continually determine whether laws provide scientists and administrators with clear standards for their analyses and public communications. Natural scientists must also be educated to work with engineers, social scientists (economists, demographers, and psychologists of risk perception and decision-making under uncertainty), and public administrators to determine and communicate the consequences of applying or ignoring scientific findings. Lawmakers and judges need to understand what natural sciences, social sciences, engineering, and public administration can and cannot offer.

This year, the NRC and Federal Judicial Center issued the third edition of the *Reference Manual on Scientific Evidence*. It is meant to assist judges in understanding science from which legal evidence is derived and to inform discussion with experts and attorneys. Although such volumes are valuable references, they are not enough. Courses on understanding science and engineering in their social applications should become part of the initial and continuing education of those in law, public administration, and policy professions. Science education should better prepare scientists to understand the interactions among science, technology, public administration, and law, especially when high risks are involved.

The NRC Committee on Science, Technology, and Law will convene scientific, engineering, and legal participants in 2012 to discuss whether and how a course on science and engineering in their social applications could be designed and made a part of the core training of legal and policy professionals. It is a valuable and timely effort. The other half of the problem, educating scientists and engineers to interact effectively with lawyers and administrators, deserves equally innovative attention.

– Joel E. Cohen

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