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EDITORIAL

Earthquakes and Collective Action

A big earthquake, while a major catastrophe, brings out some of the best in people and science, but also some potential misunderstandings. The recent magnitude 6.6 earthquake north of Los Angeles evoked the headline, "Killer Quake in Los Angeles Kills 24." A quake with a similar magnitude (6.8) in Iran last year resulted in similar headlines, but the deaths were 55,000. A major part of the difference related to the quality of the buildings constructed in a country that was able to take advantage of scientific and engineering expertise. In California, where earthquakes are common, awareness of the hazards is present both in the design of buildings and the response of communities to earthquakes. Information gathered in many previous earthquakes has allowed governments to take cost-effective precautions, and this recent earthquake will yield much information. Many buildings have been equipped with motion sensors to provide information toward future construction. Monitors in soils and bedrock provide records of local seismic wave propagation and complement detailed mapping of the local and regional geology. Scientists are now able to analyze rapidly the mechanism and origin of an earthquake, and using data about the pattern of aftershocks, to provide some assessment of the threat of more severe earthquakes, both soon after the quake and in more detail later. This response was possible even for this earthquake, which like two other recent major quakes in southern California, apparently occurred on a previously unknown or poorly mapped fault. Most of the lives in this quake were lost in the collapse of a few buildings. Thousands of other buildings, while shaken badly, stood. Although damage to the infrastructure was severe and may yield much of the long-term economic cost of the earthquake, dams held and most roadways remained intact. The community and city, state, and federal governments responded rapidly. The orderliness of the response attests to fine behavior of citizens, crisis management, and much prior planning coordinating scientists, engineers, government, and civil response teams on local, state, and national levels. In consideration of the devastation, the government and citizens deserve praise for orderly handling of the crisis.

Good citizenship requires that we make wise use of scientific judgments. Large earthquakes are so destructive that no reasonable precautions can eliminate all risk. At present and for the foreseeable future we can only guess at the likelihood and severity of future earthquakes. Accurate prediction, if it is ever achieved, may only provide short-term warning before an earthquake starts. Engineering, scientific study, and coordinated community response can mitigate but never eliminate damage. As illustrated by the vastly different levels of destruction for earthquakes in different countries, however, the effect of some mitigation can amount to many lives and billions of dollars saved. Already, engineers and civil leaders are evaluating what did and did not work. The Los Angeles metropolitan area can expect to experience both large but rare earthquakes and also frequent (10 to 20 years), magnitude 6 to 7 earthquakes. Many other areas of this and other countries are not immune and could also experience magnitude 6 or larger earthquakes and should heed the lessons, too. The Latur earthquake in India in 1993, for example, which killed more than 11,000 people, occurred in a region considered to be of low seismic risk.

In the past 5 years, many areas of the United States have been hit by major natural disasters, including two destructive earthquakes, three major hurricanes, and a 100-year flood, in addition to severe droughts in the west and southeast. With regard to natural disasters, even areas that are careful in their preparation, as in Los Angeles, and areas that are considered unlikely to have a disaster will experience devastation. The cost of the devastation should be shared as much as possible by all of us. Actuarial calculations make insurance costs so high that individuals, corporations, and governments are usually self-insured. To some extent, we as citizens must insure collectively against all low-probability, high-consequence events. Sensible, cost-effective collective insurance must involve planning for response by communities and individuals, a national commitment to share in the costs and relief, and, as illustrated by all of these disasters, scientific study and engineering. In such a policy we are deciding that those in the affected zone bear the most risk, but we are also saying that those who are fortunate enough to be in unaffected zones bear some obligation to help prepare for disaster and to aid the victims of distress, not only in generosity of spirit, but also as part of a mutual support network.

Daniel E. Koshland Jr. and Brooks Hanson