Quake Predictions: A Plan for 'What if?'

Earthquake prediction has been a goal of numerous researchers for so long that it has seemed reasonable to consider it an end in itself. But now that broadening research experience suggests that forecasting major tremors may actually be possible in the foreseeable future, it is becoming belatedly clear that prediction alone may be barely half of a larger—and potentially ominous—issue: what to do with the prediction.

If a scientist or group of scientists predicts a coming quake in a given area, who should be told? There is the chance of panic. In the case of a tremor foreseen months or years in the future, economic consequences of a prediction might be potentially worse than the quake damage itself, as residents move, property values plummet, insurance rates soar and businesses suffer. And what measures can be taken anyway? Would a few years' lead time encourage construction of quake-resistant structures, or would it bring all construction to a grinding halt, with a mass exodus to boot? Even on short notice, few advance plans exist. Given an "assured" quake three days hence, says one noted seismologist, "I can't think of anything but getting the ambulances and fire trucks out in the street, so they won't be trapped when their buildings collapse."

Last week, for the first time, a specific Federal plan was proposed concerning whom to tell, when to tell them, what to tell them and what to do about it. In San Francisco, where such questions have drawn more than passing concern, Vincent E. McKelvey, director of the U.S. Geological Survey, offered a tentative set of guidelines on how to proceed in the event of scientific indications of a forthcoming quake. "Although developing a plan to issue predictions may appear to be premature when the capability is not really operational," he told a conference on earthquake warning and response, "the impact that a prediction can have requires that even the most fragmentary data be processed in a careful and responsible manner." Only data from scientists employed or funded by USGS are considered in the initial plan, but McKelvey expects that others "would be willing to enter the system."

The starting point of the plan is with scientists of the USGS Office of Earthquake Studies, who receive and interpret data from field instruments. Given sufficient lead time, the interpretations will be reported at scientific meetings and through publications. "Care will be taken, however, to distinguish between an individual scientist's interpretation of data, and the interpretation of his data and other relevant data by his peers that might result in a USGS prediction." At stake, of course, is the real thing—advance warning—not just academic discussion of techniques. So official review would be provided by the USGS Earthquake Prediction Council, composed of 5 to 10 USGS scientists and any needed "outsiders."

1971 San Fernando, Calif., earthquake.

The council's report (which, says McKelvey, need not be a consensus nor even necessarily agree with the conclusion of the scientist presenting the data) would go to USGS headquarters, where the decision would be made whether to issue an official prediction.

The next step—who gets a prediction once it is made—has long been the biggest question in past discussions of the matter. Seismologists presumably know as little about disaster warning procedures as disaster officials know about predicting earthquakes. In McKelvey's proposal, therefore, the USGS headquarters statement would go first to the governor of the threatened state and to applicable Federal agencies.

And *then* to the public. "It may be judged," says McKelvey carefully, "that the negative impact of a prediction could be lessened if responsible state and Federal officials received prior notice." But, he says, "any delay should be short." Also, he suggests, the public notice of the prediction should probably be accompanied by a list of recommended precautions to be taken—lowering water levels in reservoirs, etc.—so that the public will not feel (or be) stranded during what could be a traumatic period.

Beyond this point, the authority of the USGS to implement plans and procedures runs out. "We anticipate," says McKelvey, however, "that the governor's office would refer the prediction to the state office concerned with disaster response, and the governor may choose to call together his own group of experts to evaluate the evidence for the prediction. . . . The governor's decision about the prediction would be transmitted to local officials and a warning issued. The prediction going to the headquarters of other Federal agencies would be transmitted to their regional offices, where coordination would be effected with state personnel."

Yet there remain numerous unanswered questions. Some of what seem like obvious communications channels have in fact hardly been used at all. In April, the University of Colorado's Eugene Haas, who has been studying the social aspects of natural hazards for more than a decade, told a Senate committee that a just-completed major study on the subject was motivated precisely because of such factors as poor exchange of information. "The numerous city managers, relief directors, design engineers and others responsible for emergency or corrective measures," he said, "communicated only in a very limited way with scientists carrying out research on the basic problems." In fact, he added, "the all-important social, economic and political 'people' factors involved in hazards reduction have been largely ignored."

Many of these factors are subtle, yet significant, perhaps more so on both counts than even the effects of a predicted earthquake that doesn't happen on schedule. "The very existence of an earthquake prediction and warning system," he told the legislators, "may to some extent generate a false sense of security and a tendency on the part of the public to infer that no warning means that no damaging earthquakes will occur."

Haas also urged that attention be given to gathering data on the different kinds of quake responses and resultant damage—vibration, landslides, flooding—to which different regions are susceptible, with the goal of what amounts to seismic zoning. Last week, just such a research program was announced by the USGS for the San Francisco Bay region, growing out of a five-year cooperative study with the Department of Housing and Urban Development. Researchers are studying potential damage by evaluating results of a hypothetical earthquake of magnitude 6.5 on the San Andreas Fault south of the city and extending across the bay. "Prediction research," says one, "is going ahead. It's the next step that we have to get moving." □