

# III. Criteria for Evaluating the Implementation Plan

The purpose of the implementation plan is to provide the direction toward reduced earthquake risks.

## THE PURPOSE OF THIS PAPER

This paper proposes criteria against which that implementation plan may be evaluated, in order to put into the hands of the committees of Congress a document to assist them in their own assessment.

The strategy involves identifying the issues underlying the need for new measures in earthquake hazards reduction, since the fundamental concern of Congress is conflict resolution. From these issues and associated problems, criteria for evaluating the forthcoming plan emerge. These criteria do not serve as measures in any quantitative sense; rather, they constitute elements of a standard against which the implementation plan can be evaluated.

A number of the criteria take the form of questions about the contents of the plan.

The criteria, except in certain specified cases, do not apply specifically to any one of the fields involved—for example, physical science, social science, or engineering—to the exclusion of the others. Instead, the criteria are to be used to assess how well the plan deals with all the disciplines and all the parties-at-interest.

## WHAT IS A PUBLIC POLICY ISSUE?

A public policy issue may be defined as a fundamental enduring conflict, among or between objectives, goals, customs, plans, activities, or stakeholders, which is not likely to be resolved completely in favor of any polar position in that conflict. The necessarily temporary resolution of issues by a public policy is likely over long periods of time to move closer to favoring one pole over

another. Thus, the crucial task facing public policy at any given time is to strike a fresh, workable balance among conflicting forces.

It is important to distinguish issues from problems. A problem is solved by applying knowledge and choice in a definitive way. Problems can be solved, while issues cannot.

In the policy arena, especially in Congress are few problems. Consequently, there are few opportunities for solutions, and the search for them is usual 1}' sterile. For Congress the need is to identify alternatives and options and to specify their consequences, in order to facilitate the selection among them.

The fact that any significant public policy matter is an interlocking collection of subissues makes it difficult to come to grips with an issue.

The key issues are not obvious, since they usually have not been presented in a clear, cogent, or neutral way by any of the parties concerned. It is usually not in their interest to do so.

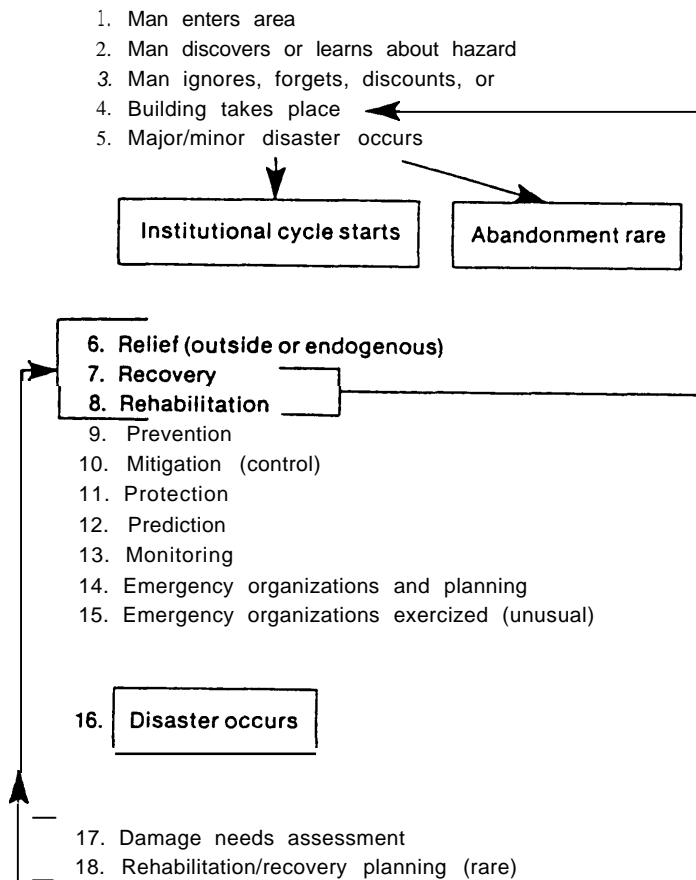
Issues are also value-laden. Since values are heterogeneous and overlapping among the parties-at-interest, it is difficult to identify and sort them into tidy bundles. An effective way to discern the values of each party in the conflict is required. That revelation is not likely to result from simple direct inquiry.

Issues call for resolution by compromise rather than a clear victory for any party in the conflict. It is through consideration of the above that issue identification becomes the central theme in determining the criteria for the evaluation of the implementation plan.

## THE LIFECYCLE OF AN EARTHQUAKE HAZARD

Figure 2 presents a general picture of the lifecycle followed by all hazards, including earthquakes, as

**Figure 2.— Lifecycle of a Hazard**



SOURCE: Office of Technology Assessment

they evolve from the natural environmental circumstances into risks from the involvement of that environment with man's works, on through disaster and disaster recovery. This lifecycle conception complements the issues analysis strategy by presenting an overall framework which permits the identification of points of strength and weakness in current public policy.

As it stands now, the relative strong point with regard to earthquake hazards is Item 14, the emergency organization and planning for dealing with the immediate postdisaster situation. Substantially weaker, is Item 15, the practice exercise of the emergency response capability. Item 17, the damage assessment following a disaster, is probably at a mediocre state of development with regard to a major earthquake, although in good shape with regard to a minor quake.

Seriously lacking, however, from every sector subject to earthquake and characteristic of most

major disasters, is the rehabilitation--recovery planning that must be done well before a major disaster. This calls for elaborate and comprehensive plans facilitating relief, recovery, and rehabilitation, and rebuilding in ways that avoid repeating past errors. Building adequate structures on suitable sites provides effective long-term hazards reduction. Effective mitigation can only be pre-empted on this rehabilitation-recovery planning.

As it stands now prevention and protection measures (Items 9 and 10), through adequate construction, suitable construction codes, and retrofitting existing structures, involve major policy issues, as is discussed below.

With the development of prediction and warning capabilities in the earthquake area (Item 12), a host of social, economic, and most importantly, political problems arise as new developments in the public policy picture. Relief, recovery, and rehabilitation measures (Items 6-8) are in relatively good shape for short-term disaster relief and small disasters (less than a billion dollars damage). However, as noted above, recovery and rehabilitation planning is wholly inadequate in every earthquake disaster area in the United States today.

As it presently stands the most likely circumstance is that San Francisco, Calif., St. Louis, Mo., Salt Lake City, Utah, Los Angeles, Calif., Boston, Mass., or Charleston, S.C. would be rebuilt essentially along their present lines after a major disaster.

Therefore, the single most important public policy question with regard to earthquakes is long-term land use planning for recovery. The major short-term policy should be orchestrating public policy tools simultaneously to minimize life and property loss during a quake while sustaining orderly community growth and development.

## IMAGES OF THE FUTURE

Present public policy actions are unlikely to have major short-term consequences for the quality of life or the public well-being. Their major effects, both planned and unplanned, will occur in the future. Consequently, this question arises:

What are the explicit, extrapolative, and normative assumptions about the future with regard to earthquake hazard regions, technologies, public policy, population, and other variables that have entered into this plan?

Trends within the structural elements of society will basically determine the future context in which present policy is implemented. Making explicit those trends and so making explicit the potential for changes, shifts, and discontinuities in those trends could be important to defining and selecting among alternative policies. Trends related to earthquakes are shown in table 1. Table

2 is a list of more general trends in relation to natural hazards.

The 49 trends in table 2 fall into six groups.

- . General
- Management
- . Governmental
- . Scientific and Technical
- Social
- Economic

These trends were developed from OTA staff work on the preliminary analysis of natural hazards mentioned in the preface.

**Table 1.—Some Trends Related to Earthquakes**

<ol style="list-style-type: none"> <li>1. Population and investments are increasing in areas of high seismic risk.</li> <li>2. There is a trend, particularly on the west coast, toward rehabilitation of structures in contrast to new construction. The extent to which this facilitates retrofitting for hazards reduction, the extent to which it inhibits more effective land use planning, and its general interaction with hazards mitigation merit close attention.</li> <li>3. Concern over earthquakes has become intertwined with concern over powerplant, liquid natural gas facility, and other major civil and industrial works siting.</li> <li>4. A functional earthquake prediction capability is increasingly likely, although it is not clear that such a capability is in any way imminent. A prediction capability will create new problems and new opportunities. The new problems principally deal with institutionalization of the techniques and the identification of an appropriate management scheme to minimize the undesirable side effects of credible predictions.</li> <li>5. There is continuing resistance to recognizing risk of major earthquakes in those areas that have not experienced quakes for many decades.</li> <li>6. Knowledge related to controlling or moderating earthquakes is increasing. While earthquake controls are not likely to be practical in the near future, major institutional</li> </ol>	<p>and side effects will result from achieving and using such capabilities.</p> <ol style="list-style-type: none"> <li>7. Several trends characteristic of hazards in general are listed here with regard to earthquakes: <ul style="list-style-type: none"> <li>• We have been and still are building toward huge catastrophes. These latent catastrophes could take thousands of lives and cause tens of billions of dollars in property damage.</li> <li>• Public policy continues to promote the potential for catastrophic life and property loss by permitting— if not actually encouraging— inappropriate development on hazardous terrain.</li> <li>• Progress is being made in dealing with earthquake hazards in a variety of legal modes. For example, the earthquake code for Long Beach, Calif, seems to be a successful application of legal measures. Its degree of success in influencing actual structures is unclear.</li> <li>• Land use planning integrating technical, economic, and administrative measures is on the increase, both as an aspiration and as a government function.</li> <li>• Earthquake hazards management is moving from the current high priority on relief to mitigation, prevention, and loss reduction.</li> </ul> </li> </ol>
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SOURCE: Office of Technology Assessment

**Table 2.—Trends in Relation to Natural Hazards in the United States**

<p><i>General</i></p> <ol style="list-style-type: none"> <li>1. The loss of life has remained fairly stable over several decades. It is not clear to what extent this stability can be attributed to better planning, preparedness, fewer severe events, social factors, or disaster-reduction efforts. The detailed patterns in individual hazards may be different: for example, there is a weak long-term trend toward an increase in flood deaths.</li> <li>2. Property loss has increased. It is not clear to what degree this reflects true increases, and to what degree</li> </ol>	<p>the trend results from other factors, such as inflation, better reporting, and insurance availability.</p> <ol style="list-style-type: none"> <li>3. We have been and still are building toward huge catastrophes (for instance, in coastal zones). These latent catastrophes could take thousands of lives and cause tens of billions of dollars in property damage.</li> <li>4. Public policy continues to promote the potential for catastrophic life and property loss by permitting — if not actually encouraging— development on fragile, dangerous, or risky terrain. This is particularly so in flood and earthquake-prone areas.</li> </ol>
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**Table 2.—Trends in Relation to Natural Hazards in the United States—cont.**

*Management of Natural Hazards*

5. There has been a long-term trend toward the use of physical and technological solutions rather than institutional or social-technological solutions to hazards. One generally finds flood control, rather than land use management, as the historically preferred measure. Physical measures seem to be politically more acceptable since they may bring financial benefits and have a minor impact on short-term investments. As pointed out in the four following trends, this situation is changing.
6. There is an overall Federal shift in emphasis from structural to nonstructural prevention and protection measures.
7. There is a trend in hazards management from the current high priority on relief to mitigation, prevention, and loss reduction.
8. "Acts of God" are a decreasingly important aspect of natural hazards. The combination of prediction, control, and loss mitigation measures reduces the unanticipated, unplanned-for elements in the "act of God."
9. Progress is being made in dealing with natural hazards in a variety of legal modes. The earthquake code for Long Beach, Calif., and the management of the floodplain in cities, such as Hilo and Valdez, seem to be examples of successful applications of legal measures.
10. Land use planning is on the increase, both as an aspiration and as a governmental function. It is a reflection of a larger trend towards increasing awareness of the need for planning for future management. It is not clear, however, to what extent planning is being effectively reduced to management. There is a generally recognized lag between planning and its implementation and effective application.
11. The growth of future studies, forecasting, and the institutionalization of long-range planning is a trend across all sectors of society.
12. The trend is toward greater reliance on the Federal Government for long-term planning at the national level and for stimulating planning at the State and local level.

*Government/*

13. There is an increase throughout Government in Federal interaction and intervention with what had previously been nongovernmental or State and local concerns. This long-term societal trend is manifested in virtually every aspect of hazards, and is a partial reflection of the following three trends:
14. Cultural homogenization—the growth of a national society.
15. There is a trend toward new institutions and new institutional mechanisms for dealing with what were in the past personal, private, or nongovernmental responsibilities.
16. Bureaucratization of public and private institutions.
17. The growth of big Government continues, and continues to engender hostility at the State and local government level and with the general public.
18. State activism, in terms of better integration at the State level of various complex functions, growing concern about risks and hazards, and increasing animosity toward Federal Intervention are a cluster of closely related trends.

19. The trend is toward increasing layers of regulatory complexity at the State and local level, with public backlash to this trend.
20. The long-term trend toward broader public participation in governmental and private planning and decision making cuts both ways. Giving special interest groups a louder voice often has the effect of paralyzing effective longer term actions. It also tends to be litigious in its effects, thereby making definitive action difficult to take. On the other hand, participation creates the demand for more effectively engaging people in decisions.
21. There is an increasing Federal role in disaster assistance and indemnification for hazards losses, in part because of the limited resources available at individual State and local levels.
22. There is a trend toward the partial transfer of risk burden for disaster from the Federal Government to lower level jurisdictions and individuals through insurance programs and mandated land use planning.

*Scientific and technical*

23. Development of new prediction techniques, particularly dealing with earthquakes and weather-related phenomena such as hurricanes and tornadoes, are creating both new problems and new opportunities. The problems principally have to do with institutionalization of the techniques and the identification of an appropriate management scheme for the undesirable side effects of prediction capabilities.
24. Attempts to control natural hazards are increasing and may be expected to continue. e.g., earthquake control, hurricane modification, hail suppression, and fog dispersal. There seem to be no clear limits to the technical ability to influence weather.  
Again, there are major questions about institutions and side effects that society has only begun to examine.
25. Inadvertent and uncertain modification of weather and inadvertent modification of climate are continuing trends in the United States and throughout the world. Similar trends exist for terrain both in terms of modifications of soil characteristics and of land use and water run-off patterns.
26. There is some agreement among climatologists that the climate is shifting. The direction of that shift—warmer or colder—and its relation to longer term climate shifts is unclear.
27. Nonatmospheric changes are also occurring, such as a rise in sea level.
28. Man's actions are an increasingly significant component of geophysical and environmental phenomena in the world. In some regions the generation of CO<sub>2</sub> exceeds the local capabilities for assimilation. Man is creating heat islands: man is affecting the albedo through deforestation.
29. There is an increasing amount of research on natural disasters and natural hazards, reflecting the generally increasing role of research and development in the overall socioeconomy.

Although research is increasing, there is no comprehensive or adequately coordinated hazards disaster program. The transitory interests of funding agencies is spotted and fragmented. Acute attention to particular disasters creates disjointed research programs. Fur-

Table 2.—Trends in Relation to Natural Hazards in the United States—cont.

thermore, the total volume of research on natural hazards from the point of view of the lifecycle of hazards continues to be very poorly funded.

- 30 Practical utilization of both well-established and new knowledge continues to be underplayed. The mechanisms at the Federal level for organizing, packaging, successfully delivering, and assuring utilization of knowledge at the Federal, State, and local levels continues to be fractionated, inept, and underfunded.
- 31 Remote sensing as a technological tool in relation to some natural hazards is now well developed. Application and utilization of remote sensing remain to be more effectively institutionalized.
32. The mapping and the collection of hazards-related data are increasing through the country.

*Social trends*

- 33 There is a growing awareness of misfires from man's actions and intervention. Hence there is a growing awareness in and out of Government of the need to attend more closely to the interaction and effects of people's activities on the environment.
34. There is a growing awareness of the interconnectedness of things. The first law of ecology "Everything is related to everything else"—is increasingly accepted both as a fact and as an ideological position.
35. There are rising expectations in the United States of safety, security, high quality of environment, and the preservation of the highly valued assets of man and nature.
36. The growth of tourism, vacationing, travel, increased affluence, and leisure time are contributing to the development of fragile and hazardous areas.
37. An awareness of hazards is increasing at the governmental level and, to some extent, at the popular level, partially in response to recent media coverage.

This trend toward a diffuse awareness of hazards contrasts with the relative lack of awareness of the hazards, vulnerabilities, and risks in a particular locality on the part of public officials, realtors, architects, designers, and owners of property.

38. The growing demand for accountability in the expenditure of public resources, a beneficial trend in itself, may emphasize program objectives for convenience in accountability to the detriment of effective program implementation. This trend may promote increased demands for immediate and effective program implementation. It may also promote increased demands for immediate and effective response to new programs for which effective short-term responses are unrealistic.
39. There is a general increase in liability suits against architects, engineers, and other professionals involved with the design, construction, and evaluation of structures. While this increased liability on the part of architects, for example, is creating major concerns for the profession, in the long run, it should, if properly orchestrated and supported by reliable information, be one key to improving hazards-resistant design and siting.
40. Urbanization, metropolitanization, and suburbanization continue as long-term trends, with consequent stresses on land use and strong pressures to build and overbuild on hazardous ground. Continuing demographic shifts

are creating special stresses on areas in the coastal zone, riverine floodplains, and other places subject to disasters. To *some extent* the continuing mobility of the population brings a constant stream of migrants who are unfamiliar with the major hazards of a particular area. Since major disasters tend to occur on decades-long cycles, they are not common topics of conversation.

41. Demographic shifts, such as the move into the sunbelt, may be creating special stresses on relatively fragile environments.
42. Such factors as: declining birth rate, shifts in rates of family formation, marriage, divorce, and women's entry into the work force affect population mobility, housing styles, and urbanization patterns. Close attention to demography should be a significant part of hazards planning at all levels of government.

*Economic*

43. The integration of the national economy or more properly, the national society, is interactive with many of the previously noted trends, such as mobility, cultural homogeneity, and the institutionalization of problems. The same trend works toward recognizing that what were previously seen as localized problems are actually national problems. This trend underlies the tension between the need for Federal attention to national problems and the constitutional and customary State and local responsibilities.
44. The integration of the national economy leads to interesting demographic *trends in* the corporate sector. The change from large numbers of self-owned proprietorships to nationwide corporations promotes its own mobility, not only among workers, but in corporate flexibility in regard to structures, purchases, and land use patterns. This flexibility and national perspective of corporations could be a factor in either worsening or reducing the risks from natural hazards.

The corporate trend, while important, is balanced by the fact that small business makes up 47 percent of the business portion of the gross national product and 55 percent of the nongovernmental, nonagricultural employment.

45. Subsidiary to this trend is the trend within corporations toward the leasing of land, equipment, and other elements of corporate life, which tends to reduce the equity at, and hence the affiliation to, a specific locale.
46. Inflation is affecting long-range planning by making calculations based on discount rates less certain than they were in the past.
- 47 Economic decisions in the United States will be increasingly driven by, and must take cognizance of, water policies. The availability of water is a limiting factor in various enterprises in many locations.
48. The structural increase in the price of energy, that is, the fundamental rise in the cost of energy, is a new basic factor in the economy. It will permeate all of the society. It may, for example, lead to an acceleration of the depreciation of structures and hence promote turnover. It will almost certainly increase the trend toward retrofitting

Table 2.—Trends in Relation to Natural Hazards in the United States—cont.

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and modification for energy conservation. The opportunity to exploit this for hazards reduction merits consideration. A potential long-term decrease in the use of automobiles may effect long-term land use patterns, planning for which should take cognizance of natural hazards.

49. A trend reversal toward labor-intensive production associated with increases in costs of energy and materials might promote durability in structures and, again, be a facilitating factor in hazards control and mitigation.

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SOURCE: Office of Technology Assessment.