

BOOK REVIEW

Robert Ayre, *Earthquake and Tsunami Hazards*, 150 pages;

Earl Baker and Joe McPhee, *Land Use Management and Regulation in Hazardous Areas*, 124 pages;

Don G. Freidman, *Computer Simulation in Natural Hazard Assessment*, 192 pages;

Gilbert F. White, *Flood Hazard in the United States*, 141 pages;

Boulder, Colorado: Institute of Behavioral Science, University of Colorado, 1975.

The results of a National Science Foundation sponsored multi-year study of Natural Hazards in the United States conducted at the University of Colorado's Institute of Behavioral Science is in the process of being presented in a series of 20 monographs. The remarks below pertain to the four monographs indicated above. These four are treated here collectively since they are homogeneous and complementary as regards methodologies and the reporting of results.

FLOOD HAZARDS

Gilbert White, in his monograph on flood hazards, provides the keynote and pattern for presentations of results in all the monographs. In the summary statement he writes that "the U.S. as a whole is doing a competent job of dealing with some aspects of its natural hazards and a very ragged job of handling other aspects." He draws attention to management pitfalls common to all programs of hazard amelioration when decision making (usually by federal agencies with limited goals and terms of reference) is based exclusively upon evaluations of technologies without considering the dynamic relationships between the technologies and the social

responses to them. The central message or theme which emerges from the analyses is that the policy of government in dealing with natural hazards, namely to place emphasis almost solely upon (1) relief and rehabilitation and (2) the application of technology *is succeeding only in increasing the disaster potential and the economic risks, while lowering the social benefits!* The reason given is that as more dollars are spent on preventive works and on forecast and warning facilities and, as the government rushes in to provide attractive offsets for economic losses, the individual reaction is to downplay the risks, invest more capital in and expand the occupancy of hazardous areas. The study finds that losses due to floods will increase at least 10% per decade if the present policies and levels of support continue.

Six types of adjustments to natural hazards are identified, all funded mainly by the federal government: (1) protective works, (2) prediction and warning, (3) hazard resistant construction, (4) land management, (5) insurance, and (6) relief and rehabilitation. The study lists the costs and potential contributions of each, individually, then employs a model for examining the interaction between these adjustments, and how each adjustment may be modified in terms of these interactions

to maximize the economic and social benefits. The amount of additional research support for each adjustment needed to accomplish the desired changes is estimated.

The results are unique, attractive and stimulating because for the first time the potential benefits from each type of adjustment are considered, not only individually, but in combination with others, together with the obstacles that may emerge from the social environment and the expected social responses.

This volume is replete with poignant facts and useful figures concerning the flood hazard and its impact on the nation, the costs of the adjustments, and the benefits (if any) that have accrued. For example, on the nations flood plains an average of \$100 million has been spent annually on levees, dams and protective works, and projects costing more than \$6.1 *billion* are now underway; yet over a recent 50-year period, due to underdesign, 33% of all the flood losses have come from failure of these protective works. Conversely, due to overdesign in other cases the projects have been exorbitantly and unnecessarily expensive. In another area the analyses point out that greater emphasis has been placed by the National Weather Service on improvement of forecasts for lesser weather events than on the anticipation, detection and warning of catastrophic events. And still less emphasis has been placed on the means of expediting delivery and on gaining the acceptance of warnings by the public whose interests are at stake.

The model results point to the need for specific augmentations of research support for programs of short term warnings, flood proofing of construction, land management measures, insurance, and disaster relief; but concludes that the largest single program benefits would come from the improvement of warning systems and their effective dissemination. The total cost of the added research effort covering a 5 to 10 year period would be approximately \$54 million and would require the professional services of more than 100 additional researchers.

Results of the flood hazard study are presented in a credible manner and provide the decision maker with a comprehensive overview of the interacting problems and adjustment factors which must be faced collectively if a viable program to protect the public interests on the flood plain is to evolve.

The concerned reader in trying to assimilate all the information presented, however, may gain the impression that the decision maker, armed with this information, may conclude that his principal advantage is in knowing more about what *not* to do than precisely what to do. Many readers will also recall, sadly, that experience demonstrates that political expediency, a factor not treated in these analyses or model results, will doubtless be weighted more heavily than the results of these analyses when it comes to gaining acceptance of a program with a \$54 million price tag funded mainly by the federal government.

Overall the monograph series by the Institute of Behavioral Sciences on natural hazards should have a significant impact on planning and administering programs to minimize economic and social losses if for no other reason than that it assembles a massive amount of factual information on the physical character of these hazards, and on the interaction to be expected between the various adjustments most of which are presently supported individually and independently by various government agencies.

Whether the recommendations made will effectively impact federal research policies will very likely depend more on the political expediency with which they are viewed by the incumbent and following administrations than upon the urgency with which the National Science Foundation supports the recommendations of the study it has sponsored. Experience has shown that this in turn is likely to depend upon whether one or more natural disasters of sufficient political importance to the nation occur before obsolescence overtakes these important publications.

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