well-developed dissemination and feedback system. The Committee's initial assessment of the present U.S.-based disaster-reporting system suggests that it is deficient in all these areas.

First, and perhaps most important, disaster reporting appears to serve several purposes, but these are not explicitly stated, nor has there been any discussion of possible contradictions in data collection requirements in meeting these purposes. For example, data on disaster impacts and responses (types and amounts) are entered into the AID/OFDA historical file, but their usefulness as planning and evaluation tools requires greater efforts in validating them. (This is particularly true for disaster-impact data.) On the other hand, final case reports appear to be used increasingly by AID for public relations reasons. This is evidenced by the post-1972 backlog of U.S. disaster responses for which no case reports have been published. The present practice seems to be to use case reports selectively to publicize only major U.S. disaster assistance programs. Data collected primarily for use in public relations need not be either continuous or rigorous.

Second, in addition to measurements of disaster impacts and data regarding types and amounts of various assistance programs, the report form that the AID/OFDA provides the AID Missions requires the following information: descriptions of the history of the disaster event, of U.S. government relief programs, and of the activities of U.S. voluntary agencies; and a multifaceted appraisal of the assistance provided by the United States, other bilateral donors, and international organizations. The Committee's analysis of the Mission disaster summary reports suggests that the AID Missions only have the resources to collect data on disaster impacts and on the types and amounts of within-country and external assistance programs. Third, the Missions are provided with few guidelines for collecting the data. The philosophy appears to have been one that requested all the data considered to be of potential interest and that hoped the Mission staff had the time, resources, and motivation to collect at least some of it. Fourth, the AID/OFDA has a dissemination list of over 400 entries for its various report categories. However, the Office has little knowledge of how the reports are used externally. It does not know what impressions about the disaster are created by the reports or if the individuals, groups, and organizations that receive these materials are aware of the incompleteness and unreliability of much of the data presented in them.

We believe the above situation can and should be improved and that the AID/OFDA should itself undertake a thorough evaluation of its reporting system. We offer the following guidelines for this effort. First, we believe that top priority should be given to two interrelated *internal* functions of disaster reporting: (1) to provide statistical documentation of disaster events and (2) to provide a basis for improving disaster response. The former requires collecting valid and reliable data on disaster impacts and on the types and

amounts of within-country and external assistance programs. The historical file in the AID/OFDA's computer system is programmed to store just such data. To provide data necessary for improving disaster response, on the other hand, requires documenting response-related problems, so that practitioners can collectively learn from past experience. The descriptive data necessary to perform this function is not regularly collected in sufficient detail to be of much use, and there is presently no system to organize such data.

Second, as indicated previously, our analysis suggests that the U.S. AID Missions provide *one* resource to document disaster events. In fact, the data required by the first internal function are the only ones the Missions are capable of regularly collecting for purposes of disaster reporting. We therefore suggest a simplified reporting form that relates directly to the data requirements of internal function 1 (the AID/OFDA computerized historical file). Since the AID Missions will then have more focused data requirements, we further suggest that they be strongly encouraged to cross-check various estimates of disaster impacts and to monitor changes in these estimates during the emergency period. We assume that the measurement of the types and amounts of within-country and external assistance programs presently suffers more from incompleteness than invalidity. This may require delaying the submission of a final report until government and donor accounting have been completed.

Third, the function of providing a basis for improving disaster response (internal function 2) is basic to Recommendation 5 discussed earlier. It will be recalled that Recommendation 5 states that site visits under the auspices of the AID/OFDA should be budgeted for any U.S. government response above a certain minimum. The twin purposes of the site visits are: (1) to facilitate the delivery of verified requests for U.S. assistance and (2) to provide a reasonable accounting of the use of the services provided, describing any logistical problems in their delivery. If a descriptively more detailed accounting of response problems is desired, the AID/OFDA will have to undertake the effort on its own resources. Assuming Recommendation 5 is implemented, a system for storing and using these data needs to be developed. We envision detailed after-action reports that precisely document response problems relating to U.S. government activities. These reports would become an information resource for the operations and planning divisions of the AID/OFDA.

Finally, the public relations and other external uses of the AID/OFDA disaster-reporting system should be viewed as secondary or as spin-off benefits rather than primary functions. However, in restructuring its disaster-reporting system, the Office should inform the over 400 persons and agencies currently on the distribution list of the kinds of data to be collected, the manner in which they will be collected, and the internal uses to which they will be put.

8. *The computerized data bank at the AID/OFDA cannot perform all of the multiple functions for which it was originally developed. The system should therefore be critically reevaluated in terms of its capability to perform the following information management functions: (a) modeling disaster impacts using integrated hazard and vulnerability analysis, (b) documenting disaster events for management purposes, (c) providing adequate baseline country profiles, and (d) improving operational performance.*

The general function of the AID/OFDA computerized data system is to meet the information requirements of the Office's disaster relief and preparedness programs. The four functions itemized in this recommendation are specific subdivisions of this more general function. The Committee's conceptual framework provides a useful mechanism to evaluate the potential of this system to meet these functions. We offer the following suggestions, based on our initial assessment of the data bank.[12]

a. *Modeling Disaster Impacts Using Integrated Hazard and Vulnerability Analysis* The present contents of the historical file are not configured to fulfill this function. The file is inadequate for hazard analysis, because it only records those events that have actually coincided with vulnerable settlement patterns. Moreover, for events of long recurrence cycles, such as earthquakes and volcanoes, the file has insufficient historical coverage on which to anticipate future patterns of occurrence. Nor does the system have much potential for assessing the vulnerability of particular human settlements to particular disaster agents. This requires systematic collection of impact data from previous disasters. For the vast majority of the 900 events in the historical file, there is no record of the precise location of the impact area, no record of the level of intensity, and no record of the total population and physical structures exposed. Thus there are insufficient data even for very crude estimates of vulnerability. Although the file is programmed to store more detailed descriptions of impact, this is only a very preliminary step for disaster modeling, and it remains to be seen whether the data will actually be collected. Moreover, the country profiles do not contain basic research data on vulnerability of structures because such research has thus far been carried out predominantly on modern and sophisticated building structures in developed societies. There has been little effort to support vulnerability analysis in developing countries. Although disaster modeling has some potential for certain disaster agents, the data requirements are large and costly. The present system is insufficient for this purpose, and the Committee believes that the long-range costs needed to obtain the pertinent data and perform the neces-

[12]The comments here are based on the Committee's more detailed evaluation of this system presented in the Appendix.

sary rigorous analyses exceed the benefits the AID/OFDA will derive from the effort.[13]

b. *Documenting Disaster Events for Management Purposes* The historical file has genuine value for management purposes. It is a reasonably accurate expression of the work performed under the aegis of the United States and other international disaster assistance programs, particularly since 1965. Much more can be done in a descriptive fashion to analyze recent expenditure patterns. With improvements in the data on assessments of agent impact and victim needs, the AID/OFDA will have a better basis for isolating relationships between disaster-induced needs and disaster response. Combined with readily available measurements of development, improved estimates of the long-term developmental effects of disasters will become possible. These are worthy and manageable objectives for the historical file, which should, in the long run, prove to be cost-effective. We therefore believe that the costs of maintaining and updating the historical file are justified.

c. *Providing Adequate Baseline Country Profiles* As outlined in Chapter 4, a predisaster baseline profile logically includes information on hazard analysis, vulnerability analysis, and disaster-relevant resource analysis. We have already suggested that the potential for using this system to conduct integrated hazard analysis and vulnerability analysis is very limited. However, the system does have potential usefulness for conducting disaster-relevant resource analyses in terms of level of disaster preparedness and the general resource profile of countries subject to disasters. The present country profiles provide several types of information: descriptive data on the social and political structure, data on transportation and communications logistics, information on health conditions and the structure of health services, and limited data on disaster planning and preparedness. Thus it is clear that most of the currently available data relates to what we have referred to as the general resource profile of these societies rather than disaster preparedness. We offer several comments on the country profiles and their possible uses.

First, we believe that information on disaster preparedness and planning within a country is useful and should be regularly updated, because that information identifies existing societal preparedness measures that outside donors should be aware of in organizing their own responses. It should also be

[13]The data requirements and research costs of disaster modeling should never be understated. Disaster modeling techniques have little potential usefulness without adequate data, many of the necessary historical data are not available, and the costs of collecting current data are prohibitively expensive. There is a temptation by practitioners to use these techniques simply because they exist, and there are crude data available. The Committee rejects such unreflective uses for purposes of decision making. The techniques themselves, their ultimate uses, and the costs attached to these uses should be subjected to continuing scientific and public scrutiny and debate.

noted that disaster experience and its historical timing also potentially relate to preparedness. Since those data are available from the historical file, they should be integrated with any continuing assessment of societal preparedness.

Second, information related to the country's languages, ethnic groups, political organizations, and political relations represents useful supplemental briefing material for people making site visits. However, these data need not have been computerized to serve this purpose. We also believe that the more important practical information involves close and continuing contact with relevant organizations and officials of the disaster-stricken societies and an assessment of the current political, social, economic, and cultural realities of dealing with the government and its citizens. That kind of detailed, informal knowledge is, in large measure, possessed by the AID Mission personnel, and it cannot adequately be computerized.

Third, information related to the general level of societal development has little direct operational use, and the AID/OFDA is not well equipped to utilize the data for purposes of examining the effects of disaster on societal development. We recommend that the data on development variables not be updated and that information on disaster impacts and responses (from the historical file) be made available to development research experts who, in turn, can undertake the required analyses.

Fourth, those portions of the country profiles pertaining to topography, climatology, transportation systems, communications systems, and power sources are important for anticipating logistical problems of disaster response. These data should be maintained as a basic planning and management tool.

Fifth, information pertaining to basic health conditions and the structure of health services should be maintained and updated. The former provides useful data for both general and specific epidemiological surveillance purposes. However, one should recognize that the validity and reliability of epidemiological data vary from country to country. The latter illustrates quite well the point made in Chapter 4 about the need to gather data on disaster-relevant organizations. However, such data as the number of hospitals, number of beds, and number of health personnel as a proportion of total population is of insufficient specificity for direct operational use. Instead, much more detailed knowledge is needed on their *location* and *distribution* in relation to the disaster site.

d. *Improving Operational Performance* The two remaining AID/OFDA subsystems—i.e., the procurement file and the crisis management file—highlight the operational and planning potential of this system most explicitly. The Office has given little attention to these systems thus far, and the files are virtually devoid of data.

The purpose of the procurement file is to provide data on the commodities that can be furnished by various suppliers, together with data on avail-

ability, cost, and packaging. We believe that the very effort to make explicit the kinds of services the United States is capable of providing will lead to a far more organized U.S. response. Disaster-stricken societies need to know what is available. A procurement file can potentially provide that kind of information quickly. We therefore recommend a feasibility study of the procurement file—one that selectively examines commodities that have previously been donated in large amounts.

The basic data inputs to the crisis management file are to be obtained from the continuous monitoring of any disaster in terms of requests or offers of assistance and their disposition. On the basis of these inputs, the Office would then be able to program a continuous process of transactions. Thus the system would presumably expedite the development of a rational line between available resources and disaster-generated needs. The idea is conceptually elegant, but the Committee believes that it is practically untenable as an operational guide. The postdisaster context is far too complex to be simply programmed. However, the crisis management concept provides an additional postdisaster reporting methodology and a basic planning tool to improve future responses. Both of these functions require a reasonably accurate accounting of what happened during the emergency period.

Broader Research Needs Related to International Disaster Assistance

9. *High priority should be given to research that will develop more valid and reliable measurements of disaster impacts and of societal and international responses to these impacts.*

The AID/OFDA and the Committee have conducted some preliminary statistical analyses of the AID/OFDA's historical file to assess possible relationships between measures of disaster impact and the response of the United States. There are essentially two types of data amenable to analysis in this file: several measurements that reflect disaster impacts and other measurements that reflect the aggregate level of international disaster assistance from various sources. Since the data are in quantitative form, much could be done in the way of "number crunching." However, we question both the wisdom and the utility of more complex multivariate statistical analyses of the full data deck, because most of the data inputs are of dubious reliability and validity. The bulk of the more than 900 entries provide at best the date of disaster, name of country impacted, disaster agent, and crude estimates of number killed, number of victims (which is never defined), and dollar damage. The file appears to be reasonably complete for the period 1965-1975 and also includes fairly detailed data on the contributions of the U.S. government

and other international donors. The period of the 1950's to early 1960's appears far less complete, and the period 1900–1950 has both very serious gaps and some highly questionable numbers. The early years of the historical file are dependent on information collected from general sources, the accuracy of which cannot be known. That same problem characterizes, perhaps to a considerably less degree, the formal reporting mechanisms established since 1965. Specifically, the data file on disaster impacts is far more complete but not necessarily more valid for the period 1965–1975. We assume that information concerning U.S. government expenditures during this latter period is fairly accurate.

The data may only have meaning in the aggregate and, even in that form, one should be cautious in interpreting it. Restricting ourselves to data that document the activities of the AID/OFDA (1965-1975), we have looked at the following types of statistical aggregations: (1) aggregate measurements of disaster impact and response (e.g., total world damage and average annual loss, total deaths and average annual death rates, total victims and average annual victim rates, and total and average U.S. expenditure by type of disaster); (2) ranking of disaster agents in terms of their fatality rates, victim rates, and reported damage; (3) ranking of countries suffering disasters in terms of average annual fatalities, victims, property damage per capita, and property damage as a proportion of the gross national product; and (4) year-by-year comparisons of aggregate level of U.S. expenditures in terms of disaster types. We have chosen not to summarize these analyses in tabular form because that would give the appearance of more precision in the number of findings than they generally deserve. At this point, we feel it appropriate only to offer some general observations.

Even without examining the data, one could surmise that a simple relationship does not exist between the magnitude of need generated by disasters and the quantity and quality of extralocal response. Some readily identifiable reasons would account, in part, for this discrepancy: the disaster-relevant resources and capabilities within a particular country vary, as does the desire both to give and receive assistance; the quality of information about victim needs is often poorest when the outside response is being generated; and the resources of donors vary over time. Without a reasonable understanding of these dynamics, one would have difficulty interpreting a statistical relationship between a crude measurement of disaster impacts and a measurement reflecting the extent of external assistance.

This historical data file unfortunately does not allow for a reasonable test of the relationship between disaster-generated needs that cannot be met at the local level and the amount of U.S. or broader international disaster relief. Additional data would be required, and the data presently on file concerning disaster impacts are of questionable accuracy. For example, the term "disaster victim" is not defined. The numbers killed, injured, homeless, evacu-

ated, or cared for by mass feeding all reflect the idea of a victimized population, but these types of measurements are not necessarily comparable for different natural and man-made disasters. At the broadest level, it appears that the number of people affected is the measurement that the AID/OFDA finds most useful, but there is no standardized meaning given the term. In an earthquake, that measurement may reflect a gross estimate of the homeless; in a flood it may refer to the population of a geographic area; and so on. Furthermore, the short- and long-term economic costs of disasters are extremely difficult to measure. Property damage is only one of several possible measurements and, as measured, has severe validity problems. Even if there were agreed-upon and valid measurements of impact that could be assumed to imply disaster-generated needs, we would still require a far better understanding of conditions and actions within the recipient country before residual needs could be determined.

In light of the complex problems of defining and measuring the needs of victim populations, one is far more likely to find little statistical relationship between measurements of impact and measurements of external aid. Not surprisingly, the level of U.S. expenditures for the U.S. disaster assistance program from 1965 to 1975 is not simply related to either weighted or unweighted measurements of impact. The data also reinforce the ideas that, in this context, it is unreasonable to talk about disasters in the generic sense and that comparisons across types of disasters are most difficult. At this stage in our level of knowledge, it is more fruitful to look for patterns within, rather than between, disaster types.

In any event, there is a need for systematic research that will lead to (1) valid and reliable measures of impact and (2) precise documentation of response activities at several levels. With regard to the former, for example, efforts should be made to develop new ground-survey data-collection methods for rapid damage and needs assessment. The techniques should be designed in such a way that a minimum amount of data can clarify need boundaries. Provision should also be made for the gradual upgrading of information as time passes. More broadly, research should be directed to determining the appropriate mixes of ground-survey, aerial-assessment, and satellite-monitoring technologies for damage and needs assessment in various types of disasters. Finally, the methodologies for analyzing the economic, social, and environmental impacts of natural disasters should be thoroughly reviewed and critiqued. With regard to the latter, for example, efforts should be made to identify the research requirements for sustained monitoring of the flow and use of commodities and services provided by international donors. Research should also be directed to a thorough analytical treatment and empirical documentation of the types of social networks that exist among international donors in various types of disasters. Finally, research should be directed to the identification of the forms of disaster assistance that have important

developmental consequences, e.g., housing and other forms of reconstruction, land-use planning, food production and distribution, and public health measures.

10. *The establishment of organizational mechanisms for the exchange of policy-related research information on disaster prevention, mitigation, and response should be given careful consideration at the international level.*

A number of attempts are now being made to organize knowledge in such areas as hazard vulnerability and impact, monitoring and warning systems, individual and organizational response patterns, technologically feasible emergency housing designs, food delivery systems, basic nutritional data relating to food priorities for mass hunger conditions, causal relations between nutritional deficiencies and communicable diseases, and many other scientific and technical areas. In the fields of administration and management, there are also some efforts to achieve a better organization of the collective memory of the experiences of disaster practitioners so that future international disaster assistance operations can be made more effective and efficient.

The above kinds of efforts are discontinuous, and perhaps unavoidably so. One underlying issue to consider concerns the relationships between priorities for research and priorities for providing available types of services. The gap between the two must be bridged if specific successful efforts to apply scientific and technical knowledge are to be made. One possible solution may be first to identify the high-priority problems from a service delivery standpoint, then to direct research attention to scientific and technical capabilities that can be immediately applied to these problems. For example, if one can assume that pre- and postdisaster problems have been throughly documented in terms of the research suggested in Recommendation 9, one might envision disaster-relevant technology profiles directed to those problems. These profiles would include information on design criteria, performance evaluation, and adaptability to various contexts. In any event, an effort must be made to achieve a balance between short-term needs based on immediate administrative operational problems and long-term research and application needs.

Perhaps the most basic problem in this area concerns the appropriate auspices through which scientific and technical knowledge should be organized and disseminated. Such knowledge might be better integrated through the use of existing national and international scientific organizations. Information on the effective means of administering or managing international disaster assistance operations is currently scattered and unorganized. A methodology and organizational framework to collate, systematize, and disseminate the lessons learned from previous experience is needed.

The difficult problem of effectively linking the relevant bodies of scientific and administrative-operational knowledge needs to be given considerable

attention. Some form of international clearinghouse for information exchange appears to be essential. Such a clearinghouse could serve both operational and research functions. It would seek to translate existing scientific and technical knowledge into operationally useful information for many different user groups in the international community of hazard reduction and disaster preparedness personnel. It would also serve to alert and inform disaster research specialists of new or additional problems that require further research efforts.[14] The establishment and operation of this type of international clearinghouse on disaster-related information falls within the general coordination mandate of the UNDRO, whose capabilities to handle this function effectively should be the subject of further study. In particular, attention should be directed to the question of whether this clearinghouse function should be centralized exclusively within UNDRO, or whether UNDRO should be the focal point for referring users of disaster-related information to other national and international sources of scientific, technical, and operational knowledge.

[14] For further information on the functions and organizations of such a clearinghouse, see C. E. Fritz, *Some Guidelines for Developing an Office of Emergency Preparedness Clearinghouse for Emergency-Related Research* (Arlington, Virginia Institute for Defense Analyses, Paper P-824, 1971). This report may be obtained from the National Technical Information Service, Springfield, Virginia 22151, as document No. PB 206278.