agenda.

This study will focus on how the attitudes, knowledge, and behavioral patterns associated with disaster situations vary according to the demographic and socioeconomic characteristics of the population surveyed. Variables such as age, gender, education, income, previous experience with disaster situations, physiological and psychological symptoms, among others, will be used as independent predictors of disaster preparedness, attitudes, response, resiliency (Flach, 1988), and recovery during disaster situations. Further, stereotypes regarding the behavior of individuals in disaster situations will be identified and evaluated.

It is noteworthy that individual response or behavior during a crisis situation does not occur in isolation; rather, it is a collective process in which available information, previous experience and learning, peer pressure, and persuasive communication may strongly influence the person's decision-making process. A disaster situation can be conceptualized as a "collective stress situation" (Britton, 1987), as manifestations of the vulnerabilities of the social system (Quarentelli, 1987). It is how individuals and organizations perceive and respond to these stress situations that we propose to analyze.

Data and Methodology

Previous research directed at understanding the impact of individual and socio-cultural variables in a disaster situation

have provided contradictory results. This outcome has been attributed to a variety of factors including: limited standardization of research methodology (Green, 1982); predominance of popular and official information over scientific and ethnographic reporting (Dynes, 1985); methodological constraints imposed by the disaster itself (McFarlane, 1986); and profound conceptual disagreement within the disaster research community (Quarentelli, 1987).

In an attempt to overcome some of the aforementioned limitations, and in order to obtain the information which will allow the research team to create a database on knowledge, attitudes, disaster mitigation, and preparedness for individuals and organizations in Puerto Rico, we will use both qualitative and quantitative methods. The combination of these two procedures permits a better perspective on disasters within a social framework.

The basic data for this research project will be obtained from three separate samples: an Islandwide random sample of individuals, and a sample of organizations and individuals in areas which are highly susceptible or have experienced disasters in the recent past. The first random sample of individuals will be selected from the Puerto Rican population on the Island using a multi-stage cluster probability proportionate to size design. The data obtained from this sample will provide baseline information on attitudes, knowledge, behavioral patterns, and preparedness concerning natural disasters among Island residents. This information will be compared

to the results obtained from a sample of individuals who reside in areas which have experienced and/or are highly susceptible to disasters.

In coordination with the College of Engineering and the Geology Department at the University of Puerto Rico-Mayagüez and with information provided by the Federal Emergency Management Agency (FEMA), a census of the areas which have experienced and/or are hazard prone will be conducted. The Department of Civil Engineering at the University of Puerto Rico-Mayagüez has already provided us with the sites where they have placed instruments to measure seismic activity in Puerto Rico. These areas are important because of the significant damages that may result as a consequence of an earthquake. The research team proposes to study a sample of organizations and individuals located in these areas. Further, the Department of Natural Resources has identified over 60 flood-prone areas in Puerto Rico. Again, it is important to select samples from these areas for the proposed analysis.

A census will be conducted of organizations which have been or will be directly or indirectly involved in disaster situations in the selected areas. Organizations such as hospitals, clinics, police and fire departments, Civil Defense agencies, the National Guard, the American Red Cross, the Department of Social Services, the Department of Natural Resources, other lifeline agencies such as "La Autoridad de Energía Eléctrica" (agency in charge of electrical services in Puerto Rico) and "La Autoridad de Acueductos y Alcantarillados," (agency in charge of the supply of water

services on the Island), the educational system, and religious and other community organizations play a pivotal role in disaster situations. A sample of these organizations will be selected using judgmental or purposive sampling techniques.

The selection of organizations for our sample cannot be probabilistic or random since we would run the risk of excluding the most important organizations in disaster mitigation, preparedness, response, and assistance. "It makes no sense, for example, to randomly select organizations in the community to study disaster response; to do so would exclude the organizations most central to responding to the disaster" (Mileti, 1987, p. 67).

The information obtained from the sample of organizations will set the stage to select the third sample which will be composed of individuals from the selected areas which are highly vulnerable to disasters. This sample will consist of individuals which have experienced, first hand, disasters or reside in hazard-prone areas or who belong to a "disaster subculture" (Gillipsie and Streeter, 1987). This will allow the research team to determine if and how the attitudes, knowledge, and preparedness of individuals who reside in hazard-prone areas distinguishes them from the general Puerto Rican population. The research team will not only examine individual knowledge and attitudes concerning disasters but will also focus on how individuals actually responded to disaster situations such as Hurricane Hugo and the Three Kings Day Flood.

The techniques to be used to gather the necessary data include: document observation (unobtrusive research), field observation and

survey methods. In the following pages we describe how each of these techniques will be used in the proposed research project.

Document Observation (Unobtrusive Research)

Early in the research, a literature review focused on Puerto Rico's hazards and related organizations will be conducted at libraries and government agencies. Extended search will also be done using electronic access to databases and libraries in the continental United States. Computer programs will be used in order to store the collected sources and start an annotated bibliography on natural disasters, and related topics, for Puerto Rico and the Caribbean.

Within document observation we include the analysis of existing statistics. Examples of this type of data are official government statistics (i.e. census data) that focus on the social, economic, and demographic characteristics of the Puerto Rican population and the Federal Emergency Management Agency (FEMA), which has published a variety of reports with valuable information identifying geographical areas in Puerto Rico which are highly susceptible to disasters such as floods and landslides. These sources will provide demographic and socioeconomic data on areas which are vulnerable to disasters in Puerto Rico. The data will be analyzed in the context of disaster prevention and management.

Systematic collection of clippings from newspapers in order to determine how the media reflect and influence public opinion and organizations on disaster-related issues will be carried out during

the research period. This information will assist Island officials and public planners in designing rational policies for disaster management and education. Using written media clippings and field observations, we also expect to detect the functions performed by organizations directly or indirectly involved in the warning, during, and in the immediate post-impact phases of response in disaster situations.

Field observation

In order to understand the full complexity of organizational and human components of disasters, a comprehensive field observation phase is being proposed. On-site interviews and field observations will be conducted in selected areas which have experienced or are highly susceptible to disasters. Appropriate recording equipment, questionnaires, and other research instruments will be used. This will provide the opportunity to record the personal experiences of those affected by natural disasters. This personal involvement provides the opportunity to record the experiences of those affected and to empathize with them by adopting their perspectives and sharing their everyday experiences.

In the field observation stage, we will visit organizations to identify key organizational officials who will provide information on disaster mitigation and preparedness plans, organizational facilities, budget, personnel, supporting documents, and other resources.

The field observation approach gives qualitative data and

provides an opportunity for reasoned explanation of results. This technique will also help in the design, elaboration, and pre-test of the formal instrument for the survey phase of the project, and also help us design sampling strategies and identify behavior exhibited by disaster victims, attendants, and managers. To add validity to the field observations, at least two independent observers will be used. The field observation phase will be accompanied by a set of open-ended guiding questions to be administered to key informants and representatives of organizations involved in disaster prevention and management.

Rapid Mobilization Interdisciplinary Research Team

Following the model set by the Disaster Research Center at the University of Delaware, a **Rapid Mobilization Interdisciplinary Research Team** will be created to respond to emerging disaster situations. This team will provide the opportunity to systematically collect first-hand data on the disaster situation, the community's social response patterns, and the victims' affective, cognitive, and behavioral reactions immediately after the disaster. Individuals and organizations which provide assistance to disaster victims will also be observed.

The Rapid Mobilization Interdisciplinary Research Team will vary in size and membership according to available resources and the type of disaster to be observed. The team will be composed of at least two of the primary researchers and several students with the necessary training and experience in Social Science research.

The primary researchers, through university release time, will be available to respond immediately to disaster situations throughout the fall and spring semesters and during the summer months.

The activities of the Rapid Mobilization Team will be coordinated with other researchers of the MRCE such as geologists, engineers, and others, as needed. Locally identified on-site informants and guides will provide the Team with the necessary information to work in close proximity with key organizational and community leaders.

The team will have available audio and video recording equipment, interview instruments, observation sheets, and other standardized observational resources to gather extensive field notes. Follow-up research activities will be conducted to assess post-disaster individual and community recovery. The relative effectiveness of formal and informal relief efforts will also be assessed.

In addition to providing first-hand information on specific disaster situations, should they occur, the information gathered by the Rapid Mobilization Team will be analyzed and compared to the population's attitudinal and cognitive data available from previous survey activities conducted as part of this proposal. Pre-impact data will serve as baseline to assess levels of agreement and differences in beliefs, emotions, and behavior with observed reactions during an actual disaster situation. The team will also be able to monitor the response time of local and federal organizations, such as FEMA, to assist the victims confronting a

disaster situation. Further, we will observe how response patterns and recovery vary from area to area according to the demographic and economic characteristics of the individuals affected.

Survey methods

It is vital for the survey research that enough time be devoted to questionnaire construction and testing. The phase of document observation gives the researchers the opportunity to construct valid instruments since it places them in contact with the literature related to disasters. In order to get reliable data, time will also be devoted to adequately train interviewers, who will be advanced Social Science university students as well as the primary researchers. Survey data will be obtained through face-to-face interviews which, according to our research experience, has much higher response rates and provides greater flexibility than telephone and mail surveys.

Several instruments or questionnaires will be developed to be administered to the three samples selected (i.e., Islandwide random sample of individuals, and a sample of organizations and individuals in areas which have experienced or are highly susceptible to disasters). The questionnaire to be administered to key organizational leaders is currently in the phase of revision and was pre-tested during the summer of 1992 and the 1992-1993 academic year in the community of Mayagüez, Puerto Rico.

The survey design is a cross-sectional one, focused on describing general characteristics of the samples and their

disaster-related attitudes, knowledge, behavioral patterns, mitigation and preparedness plans, response and recovery regarding disasters. The emphasis placed on the design of a valid and reliable instrument will permit the replication of the study. The data collected by the Rapid Mobilization Team at different points in time will allow longitudinal studies on disaster related situations in Puerto Rico.

Descriptive and multivariate statistical techniques, where appropriate, will be used to analyze the data collected using unobtrusive techniques, field observation, and person-to-person interviews.

Through the proposed research we will develop a database on natural disasters in Puerto Rico which will provide researchers from many different disciplines abundant information on disasters using individuals and organizations as the unit of analysis. This data will be used to examine attitudes, knowledge, mitigation, preparedness, response and recovery. The database will include extensive information on the respondents demographic, social, and economic characteristics. We expect that many interdisciplinary projects and articles will result as a consequence of the proposed research. The information obtained through this research is important for policy makers, campaign educators, and social planners who will obtain reliable, up-to-date, empirical data to be used for governmental and organizational decision making on disaster mitigation, preparedness, response, and recovery.

FIVE YEAR BUDGET SUMMARY

NATIONAL SCIENCE FOUNDATION

A. SENIOR PERSONNEL:	$137,754.00
B. OTHER PERSONNEL:	$112,800.00
C. PERMANENT EQUIPMENT (See Appendix C):	$ 36,993.00
D. MAINTENANCE CONTRACTS FOR COMPUTER AND ELECTRONIC EQUIPMENT (Equivalent to 10% of total value of computer and electronic equipment).	$ 6,147.00
E. TRAVEL:	$ 75,400.00
F. OTHER DIRECT COSTS (Materials and supplies, computer disks, communications, film, tapes, publications, workshops, etc.):	$ 17,000.00
SUB-TOTAL	$386,094.00
Total indirect costs[2]:	$ 85,200.00
TOTAL FIVE YEAR BUDGET, NATIONAL SCIENCE FOUNDATION:	$471,294.00

UNIVERSITY OF PUERTO RICO

A. SENIOR PERSONNEL: University release of three credits per semester or one-fourth of school year: (in-kind payment)	$144,471.00
B. OTHER PERSONNEL	$ 91,200.00

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[2] The indirect costs were based on two different rates. It was estimated that 50% of the senior personnels time will be used in off-campus research. The off-campus indirect cost rate of 25% was, therefore, applied to this portion of the researchers salary and fringe benefits. To the remaining 50% of the senior personnels salary, the in-campus indirect cost rate of 41.7% was applied. The funds requested for travel were also applied the off-campus rate of 25%. The in-campus indirect cost rate of 41.7% was applied to funds requested for other direct costs, part-time secretary, and the maintenance contracts. The indirect costs do not apply to the funds requested for permanent equipment and stipends for undergraduate students.

C. MAINTENANCE CONTRACTS FOR COMPUTER AND ELECTRONIC EQUIPMENT (Equivalent to 10% of total value of computer and electronic equipment).	**$ 7,904.00**
D. REMODELING OF CISA FACILITIES	**$ 5,200.00**
TOTAL FIVE YEAR BUDGET, UNIVERSITY OF PUERTO RICO ($144,471.00 in-kind payment):	**$248,775.00**

Conclusions

One of the primary goals of this research project is to focus on the knowledge, attitudes, preparedness, and behavioral patterns of the Puerto Rican people regarding natural disasters and how these vary according to demographic and socioeconomic characteristics. The available evidence clearly shows that Puerto Rico is highly susceptible to natural disasters. However, there is a lack of research concerning individual attitudes and behavioral patterns as well as organizational response and emergency assistance during disaster situations on the Island. By obtaining accurate and reliable information regarding individuals' knowledge and attitudes toward disasters, we expect to develop models that will allow the research team to estimate individual behavior during disaster situations.

Government officials and organizational leaders expect individuals to receive the disaster warning signal, give it a "correct" interpretation, and then respond in an effective and efficient manner. However, the conditions influencing the way individuals respond or do not respond in a disaster are rarely

taken into account. To be effective in getting warnings across, in having individuals respond accordingly, and in saving lives and property, disaster mitigation and preparedness programs must take into account the factors which affect and interact with people's decision-making and behavioral responses during disaster situations. People need to have access to knowledge and research on hazard mitigation and opportunities to develop a better understanding of disaster events so as to enable them to cope during a disaster situation.

The proposed research plan focuses on the entire range of the disaster cycle which includes mitigation, preparedness, response, and recovery. Therefore, we will study individual and organizational attitudes, knowledge, mitigation, and preparedness. Furthermore, we will document how individuals and organizations actually respond to disaster situations. The information obtained through this research can be used to recommend and implement governmental policies regarding disaster mitigation and preparedness which directly take into account individual attitudes and behavioral patterns.

If the information collected indicates a lack of knowledge concerning disasters, then educational plans aimed at increasing public knowledge and awareness can be implemented. The primary goal of all agencies involved in disaster situations is to minimize the loss of lives, injuries, and loss of property. This can be effectively done by taking people into account in disaster plans. This research project is aimed at obtaining and providing to local

and national leaders the necessary information so that the Puerto Rican population can be educated, trained, and taken into account in disaster mitigation and preparedness.

We will also focus on disaster mitigation and preparedness among key organizations (i.e., fire and police departments, hospitals and clinics, the National Guard, the Department of Natural Resources, the Federal Emergency Management Agency, the American Red Cross, local companies which supply water and electricity, as well as other local and national organizations) which have been or will be directly or indirectly involved in disaster situations. The mitigation and preparedness plans, as well as the response of these organizations during a crisis situation, can make a significant difference between an emergency or a disaster situation. It is, therefore, important that we carefully analyze the disaster mitigation and preparedness plans of these organizations.

Another issue that will also be addressed is whether the available disaster information can be generalized between disasters and across cultures. The availability of baseline information from the general population and field-based data from disaster situations will provide the opportunity to validate existing theoretical disaster preparedness and intervention models developed by researchers in the United States and elsewhere. New theories and models in disaster research could also be generated.

Puerto Rico is located in a region which is multicultural and multilingual, and differentiates itself economically and

politically from other countries in this region. It is important, therefore, to examine disaster mitigation, preparedness, response, and recovery in Puerto Rico in relation to its Caribbean neighbors. The proposed research will set the stage so that cross-cultural disaster research can be undertaken by scholars in this area. It is expected that this information will lead to a further understanding of the impact of cultural and cross-cultural factors in disaster situations.

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Appendix A

PRESIDENTIAL DISASTER DECLARATIONS FOR FLOODING IN THE COMMONWEALTH OF PUERTO RICO

DECLARATION	DATE	COST TO FEMA
296-DR	October, 1970	$14,573,834*
455-DR	November, 1974	12,056,237*
483-DR	September, 1975	44,749,088*
597-DR	September, 1979	102,047,551*
736-DR	May, 1985	25,221,000 (PROJECTED)*
746-DR	October, 1985	65,000,000 (PROJECTED)*
768-DR	May, 1986	-
805-DR	December, 1989	-
842-DR	September, 1989	-
-	January, 1992	-
TOTAL COST TO FEMA		**$269,647,710***

* Total costs to FEMA only include the amounts with an asterisk.

Source: Federal Emergency Management Agency (1985). "Federal Interagency Flood Hazard Mitigation Team Report for Puerto Rico. In Response to the Oct. 10, 1985 Disaster Declaration (FEMA-746-DR-PR)"; Estado Libre Asociado de Puerto Rico (1991). Plan de Mitigación de Riesgos Naturales del Estado Libre Asociado de Puerto Rico.

Appendix B

NATURAL DISASTERS IN PUERTO RICO

TYPE OF DISASTER	DATE	DEATHS	ECONOMIC COSTS ($) (MILL.)
Hurricane San Roque	August 16, 1893	-	-
Hurricane San Ciriaco	August 8, 1899	3,369	$35
Earthquake	October 18, 1918	-	-
Hurricane San Felipe	September 13, 1928	312	$50
Hurricane San Nicolás	September 10, 1931	-	-
Hurricane San Ciprián	September 26, 1932	-	-
Hurricane Santa Clara	August 12, 1956	-	-
Hurricane Donna	September 6, 1960	107	$7.5
Tropical Depression	October 5-10, 1970	18	$68
Hurricane Elisa	September 16, 1975	34	$125
Hurricane Federico	September 1979	-	-
Stationary Front	May 17-18 1985	1	$37
Tropical Wave	October 6-7, 1985	170	$125
Stationary Front	November 20, 1987	5	$10
Cold Front	December 6-7, 1987	1	$5
Hurricane Hugo	September 17-18, 1989	9	$2 bill.
Cold Front/Stationary Front	January 5-6, 1992	20	$50+

Sources: Estado Libre Asociado de Puerto Rico (1991). Plan de Mitigación de Riesgos Naturales del Estado Libre Asociado de Puerto Rico; FEMA (1992). Inundaciones Repentinas (Video).