

## Project Summary

Given their topographical and climatological conditions, the Caribbean Islands are highly susceptible to natural disasters (i.e., hurricanes, floods, landslides, and earthquakes). Over the past century, these Islands have experienced a variety of natural disasters which has resulted in a dramatic loss of life and property. The Island of Puerto Rico has not been an exception. The geographical location of Puerto Rico, its diverse topography, climatological conditions, high population density, and its multicultural characteristics, provide the ideal conditions to study natural disasters within the Caribbean context.

Much of the land in Puerto Rico is characterized by coastal or riverline flood areas and steep mountains. Therefore, it is no surprise that a significant proportion of the population resides in areas which are extremely hazardous due to the high probability of flooding and landslides. The Mameyes landslide (1985) in which 127 persons died, Hurricane Hugo (1989) with a death toll of nine persons, and the Three Kings Day Flood (1992) in which 20 persons were killed, are just three recent examples of natural disasters in Puerto Rico. Despite the aforementioned facts, the literature focusing on the social aspects of disasters in Puerto Rico is scarce to non-existent. This proposal is aimed at filling this void.

One of our primary objectives is to examine, analyze, and evaluate the disaster preparedness plans of a variety of organizations which are directly involved in disaster recovery

activities. Further, we will obtain information regarding knowledge, attitudes, and behavioral patterns of the Puerto Rican population related disaster awareness and preparedness. It is expected that this information will lead to a further understanding of the impact of cultural and cross-cultural factors in disaster situations in Puerto Rico and the Caribbean.

We also propose to develop an **Applied Social Science Research Laboratory for Natural Disasters** which will emphasize research on the social aspects of natural disasters in Puerto Rico and the Caribbean. An innovative, and much needed, component of this laboratory will be a **Rapid Mobilization Interdisciplinary Research Team** which will mobilize immediately to a disaster area to obtain empirical and scientifically reliable information on the disaster agent and the social, psychological, and economic effects prior to, during, and immediately after the occurrence of the disaster.

The proposed research plan will focus on the entire range of the "disaster cycle" which includes mitigation, preparedness, response, and recovery. The results obtained from this project will allow us to obtain a better understanding of the factors which have a significant impact on individual behavior and attitudes toward natural disasters, as well as the adequacy of disaster mitigation and preparedness plans of key organizations and institutions in our society. This information will be used to present policy recommendations regarding the development and implementation of programs aimed at disaster mitigation and preparedness in Puerto Rico.

## **Introduction**

Given their topographical and climatological conditions, the Caribbean Islands are highly susceptible to natural disasters (i.e., hurricanes, floods, landslides, and earthquakes). Over the past century, these Islands have experienced a variety of natural disasters which has resulted in a dramatic loss of life and property. The Island of Puerto Rico has not been an exception. The geographical location of Puerto Rico, its diverse topography, climatological conditions, high population density, and its multicultural characteristics, provide the ideal conditions to study natural disasters within the Caribbean context.

Much of the land in Puerto Rico is characterized by coastal or riverline flood areas and steep mountains. Therefore, it is no surprise that a significant proportion of the population resides in areas which are extremely hazardous due to the high probability of flooding and landslides. Indeed, the Federal Emergency Management Agency (FEMA) (1985) estimates that 47% of the Puerto Rican population resides in flood hazard areas. This represents a potentially catastrophic hazard threat to life and property.

Hurricanes San Ciriaco (1899), San Felipe (1928), San Nicolás (1931), San Ciprián (1932), Santa Clara (1956), and Federico (1979) remind us of the vulnerability of Puerto Rico to this type of natural disaster. The most recent hurricane, Hugo (1989), had devastating social and economic effects on the Island of Puerto Rico (Aguirre and Bush, 1991). Thousands of people lost their homes, two persons drowned, seven persons died of other causes

after the storm had passed, thirty-five municipalities were left without electricity, and the San Juan area had no water service for about nine days. It is estimated that the total economic losses in Puerto Rico were over two billion dollars (Aguirre and Bush, 1991). What is even more alarming is that, according to William Gray, we can expect a period of more intense hurricanes similar to Hugo for the next 20 years (cited in González and Chaparro, 1990).

Flood disasters have also been very common in Puerto Rico. Since 1970, the president of the United States has made ten major disaster declarations in Puerto Rico (see Appendix A). One of the most dramatic of these events occurred during the period of October 4-7, 1985, when a tropical wave swept through the Island resulting in 22 inches of rain within a 24-hour period. The consequences were devastating; 180 people died. In the squatter settlement of Mameyes in the municipality of Ponce, the "most lethal landslide in U.S. history" (FEMA, 1985) occurred leaving a death toll of 127. As a result of an overflow of the Coamo River Dam, a span of the Las Américas Expressway collapsed and another 29 people died. In the squatter settlement of Las Batatas in El Tuque, Ponce, another 17 lives were lost due to flash floods and the lack of evacuation warnings (FEMA, 1985).

More recently, the "Three Kings Day Flood" (January 5-6, 1992) took disaster mitigation authorities and the Puerto Rican population by surprise. As a result of heavy rainfalls some areas in Puerto Rico received up to 20 inches of rain during a 24-hour period which resulted in one of the Island's worst floods. The

death toll reached 20 persons. It was estimated that over 6,000 families totally or partially lost their homes or their personal belongings. About 17 shelters were opened and approximately 600 persons took up temporary residence in them. On January 15th, 1992, the governor of Puerto Rico requested that the president of the United States declare Puerto Rico a major disaster area, requesting approximately 80 million dollars in federal funds.

The above evidence most definitely shows the vulnerability of the Island of Puerto Rico to natural disasters such as hurricanes, floods, and landslides. Furthermore, because Puerto Rico is situated almost right on top of where the Caribbean and North America tectonic plates meet, it is also highly susceptible to earthquakes. The last major earthquake occurred in 1918 and affected the west coastal area of Puerto Rico. Seismologists in Puerto Rico indicate that another major earthquake can occur at any moment, given the historical earthquake trends in this region.

Because of the frequency of natural disasters and the high probability that more damaging disasters will occur in the Caribbean, FEMA recently opened its first office outside the continental United States in Puerto Rico to "help the region plan, prepare, respond to, and recover from disasters" (San Juan Star, June 16, 1992:14).

It is noteworthy that further natural disasters in Puerto Rico, as in other parts of the world, will be more damaging than in the past (Curson, 1989; Quarentelli, 1985). Population growth, population concentration, the tendency of individuals to reside in

hazard-prone areas (i.e., coastal or riverline flood zones and steep mountainous areas), and modern high rise infrastructure all contribute to the higher vulnerability of the population when a disaster occurs.

### **Social Aspects of Disasters**

A natural disaster, such as a hurricane, is a phenomena which "involves a disruption of the social context in which the individual functions" (Killian, 1954, p. 67). A natural disaster can result in injuries, death, lost or damaged property, disruptions in health care, transportation, and communication systems, loss of electrical services and water supplies. These dramatic changes in the "normal functioning" of a society have a significant and detrimental impact on the social, economic, and psychological well-being of the persons involved in such an event.

Moreover, vulnerability to disasters depends on the type of disaster (i.e., hurricanes, flash floods, landslides, earthquakes, etc.), the physical characteristics of the area affected, and the social, cultural, psychological (Britton, 1987), demographic, and economic characteristics of the population. The management of disaster-related crises by government and organizational officials can either alleviate or exacerbate the consequences of such an event. In essence, then, a disaster is a social phenomena and has to be studied in social terms. Dynes (1985) argues that we need to view a disaster in terms of social disruption and this is "only partially and incidentally related to physical damage" (p. 2). Why

a disaster is a social phenomena or event is clearly summarized by Quarentelli (1989):

...all disasters are always primarily the results of human actions. A disaster is not a physical happening, it is a social event...Allowing high density population concentrations in flood plains, having poor or unenforced earthquake building codes for structures, delaying evacuation from volcanic slopes, providing inadequate information or warnings about tsunamis, for example, are far more important than the disaster agent itself in creating the casualties, property and economic losses, psychological stresses, and disruptions of everyday routines that are the essence of disasters. In one sense, there never is [a] natural disaster; at most, there is a conjuncture of certain physical happenings and certain social happenings... We should think of all disasters, natural agent-based or otherwise, as social events (p. 2).

This was certainly true for Puerto Rico in its most recent and devastating hurricanes and landslides. FEMA (1985) points out that many landslides in Puerto Rico are a result of or are exacerbated by the daily activities of the population and the government. The construction of houses on unstable hillsides, the lack of enforcement of building codes, and the lack of maintenance to channel and flood control structures, among others, most definitely create a disaster situation or magnify its consequences. Aguirre and Bush (1991) argue that many of the problems confronted by the Puerto Rican population and society during and after Hurricane Hugo "were the result of inefficient policies and response by many agencies and bureaucracies within the Puerto Rican government" (p. 2).

Although we may not be able to prevent natural disasters (i.e., earthquake, tornado, hurricane, or a landslide) we can prevent or mitigate the impact or consequences of such events through adequate

disaster preparedness. Further, the knowledge, perceptions, and attitudes that organizational administrators, government officials, and the general population have pertaining to disasters most definitely have an impact on the efforts, or the lack of efforts, to prepare the economy and society for a disaster situation.

Curson (1989) indicates that "disasters are about human populations, how their lives and activities are imperiled or changed, how they react to crises, the attitudes they hold, the adjustments they make and how they confront the everyday problems of risks and vulnerability" (p. 3). Therefore, it is not only important to look at the physical aspects of disasters and their potential structural effects (e.g. upon buildings, communication and transportation systems and other lifeline protection agencies), but to look as well at the impact of disaster agents on the social structure. In Puerto Rico, the vast majority of scientific research on natural disasters has focused on the technical and environmental aspects such as strong winds, geological factors, floodmaps, hydrologic studies, and construction and other structural concerns. However, disaster research from a sociological and/or psychological context has been scarce to nonexistent.

The lack of attention on the social impact of disasters in Puerto Rico is, in part, due to the absence of a formalized approach to hazard mitigation from a sociological and/or psychological perspective. There is clearly a growing need to identify, study, and explain disasters in terms of these perspectives. The issues of disaster preparedness, attitudes, and



knowledge, in the case of Puerto Rico, therefore, merit thorough and extensive research from a social framework.

The knowledge base on the social aspects of disasters, which has been developed in the continental United States in the past 40 years, will provide the research team with extensive information on disaster mitigation, preparedness, response, and recovery. Some of the most significant theoretical and methodological generalizations that have been developed regarding disasters, particularly those concerning the minority population in the United States, will be tested in the Puerto Rican context.

### Objectives

The proposed research will have a duration of five years. This will allow the research team to focus on a variety of aspects involving natural hazard mitigation, preparedness, response, and recovery in Puerto Rico. The primary objectives of this research are as follow:

- 1) To examine, analyze, and evaluate the disaster preparedness plans of a variety of organizations which have been or will be directly involved in disaster activities when they occur. This will allow the research team to examine the scope and extent of the available disaster plans and to determine how effective and efficient organizational response will be in a disaster situation. The response, or lack thereof, of organizations such as hospitals, fire and police departments, the National Guard, and social services agencies, among others, will most definitely make a

difference in an emergency or disaster situation.

2) To obtain information regarding knowledge, attitudes, and behavioral patterns of the Puerto Rican people concerning disaster awareness and preparedness. By examining the knowledge and attitudes of people regarding disasters, we will be able to provide policy recommendations to prevent and/or alleviate the consequences of such disasters. Britton (1987, p. 34) indicates that the knowledge of individuals in a high-stress situation such as a disaster can be used or mobilized to offset the effects of a disaster agent.

3) To work on the creation and development of the Applied Social Science Research Laboratory for Natural Disasters which will emphasize innovative research on the social aspects of natural disasters in Puerto Rico with plans for extending this research to other areas in Tropical Latin America and the Caribbean. This laboratory will house a group of interdisciplinary researchers to develop projects of excellence that build on the strongest scientific resources available in Puerto Rico and the Caribbean Islands. This group will help increase the representation of minorities in the diverse social science fields in which they can make contributions to the knowledge base on disaster mitigation as well as develop methodologies which will have an impact on individual, family, and community well-being.

The group of researchers will consist of scholars in the social sciences (i.e., sociology, demography, psychology, and health, among others). Undergraduate students will also form part of this

research group. The proposed Laboratory for Natural Disasters will be housed in the Center for Applied Social Science Research, in the Department of Social Sciences. The investigators will use the Disaster Research Center at the University of Delaware as a model in developing the laboratory at the University of Puerto Rico-Mayagüez.

4) To create and develop a Rapid Mobilization Interdisciplinary Research Team. One of the most important and innovative components of the **Applied Social Science Research Laboratory for Natural Disasters** will be an interdisciplinary emergency response team. This team will mobilize immediately to a disaster area to obtain empirical and scientifically reliable information on the disaster agent and the social, psychological, and economic effects during and immediately after the occurrence of the disaster.

Most of the available information regarding disasters on the Island and organizational and individual responses to such events is mainly based on accounts presented by the mass media. However, the evidence suggests that the mass media have conveyed inaccurate, biased, and exaggerated information, focusing on human loss and physical destruction (Wenger, et. al., 1980; Nigg, 1987; Quarentelli, 1987). The media may be maintaining and spreading myths and stereotypes regarding disasters and individual behavior. Other official accounts of disaster agents, such as local and federal reports, have focused on their physical impact on life and property without really focusing on the sociological and psychological causes and consequences of disasters and on the

factors that accounted for the response or lack of response of individuals to the warnings issued. The proposed emergency response team will seek to obtain accurate and reliable information regarding individual and organizational response to disaster situations and the factors affecting their behavior prior to, during, and after the occurrence of a natural disaster.

5) To develop and elaborate disaster-related educational and training programs directed at organizations and the public at large. Results obtained in the first and second objectives will be summarized and presented through seminars, workshops, and other outreach activities to key members and organizational leaders in the community and organizations. These leaders will, in turn, present this information to the larger community.

In order to expand the dissemination of information in Puerto Rico, the United States and elsewhere, the proposed research team will work in close contact with the Minority Research Center of Excellence (MRCE) Outreach Component. This component offers educational seminars and workshops to teachers, professors, and researchers as well as summer research apprenticeships for undergraduate students. One of the main goals of the Outreach Component is the diffusion and communication of information obtained through the MRCE projects.

The dissemination of information and educational and training programs or seminars will help increase the awareness and knowledge among organizational leaders and the population at large concerning disasters and their social impact. The information obtained through

the proposed objectives, and the dissemination of the same, will clearly contribute to improving mitigation, preparedness, response, and recovery measures on an organizational and individual level.

6) To recruit and train minority undergraduate students in disaster research. Students will be a major and very important component during this five-year process. They will receive professional training in the theoretical and methodological aspects of disaster research. This will prepare them to actively participate in the research process which will include literature review, interviewing, coding, data entry, statistical analysis, and the preparation of progress reports as well as the final report. The proposed Research Laboratory, the Rapid Mobilization Team, and the other proposed objectives will provide the much needed opportunity to train minority undergraduate students in Puerto Rico.

7) To work on the elaboration of a proposal which will focus on the creation of an interdisciplinary graduate program on natural disasters, mitigation, and preparedness and resource management. As a long range goal, and as a consequence of the research developed in the area of disasters at the University of Puerto-Rico Mayagüez, the proposed research team, in conjunction with the Department of Social Sciences, expects to work toward the development of a graduate program focusing on disasters and resource management. This will be an interdisciplinary program with active participation from the departments of Agriculture, Geology, Marine Sciences, and Social Sciences, among others. The department of Social Sciences

will develop courses on collective behavior and natural disasters; social, psychological, and economic aspects of natural disasters; population and disasters; and research methods and statistical analysis in disaster research, among others. The courses taught, combined with the active participation of graduate and undergraduate students in disaster-related research projects, will result in an excellent academic program in the area of disasters. A program of this magnitude, to our knowledge, does not exist in Puerto Rico or other areas of the Caribbean, Latin America, or the United States.

### **Organizations and Disaster Preparedness**

Natural disasters can result in mass casualty and evacuations and, therefore, disrupt the day-to-day functions of hospitals and clinics (Blanshan, 1978, p. 174), police and fire departments, Civil Defense agencies, the National Guard, the Department of Social Services, the Department of Natural Resources, the educational system, and other lifeline agencies. These organizations play a pivotal role in disaster situations. Therefore, their preparedness and capacity to respond to a disaster situation will be of primary concern in this analysis.

The proposed research team will identify all or the most important organizations that will be directly or indirectly involved in providing services to the community in disaster situations. Once we obtain this information, we will focus on the

history and current status of mitigation and disaster planning among these organizations in a variety of communities.

We want to determine if the organizations have a written disaster plan; whether it is an agent-specific or a generic disaster plan; how much time, effort and income have been assigned to the development of the plan; what problems the plan focuses on; how well the plan will work in response to different types of disasters; how and when the plan will be activated; how the activation of the plan will affect the day-to-day functions of the organization; is there a particular person or group in charge of the plan; whether the plan involves interaction, communication, and coordination with other public or private organizations; when the plan was last revised; whether the plan has been recently executed or rehearsed; and whether the organization has regular meetings in connection with the disaster plan. These are only a small sample of questions that can provide some insight into the degree, importance, and adequacy of disaster mitigation and preparedness in these organizational structures. Clearly, disaster preparedness is much more than a written disaster plan.

Preparedness "denotes a readiness to respond and suggests purposive or anticipatory action. It implies knowledge of appropriate behavior, and conveys the need for training and practice" (Gillipsie, et. al., 1987, p. 157). According to Quarentelli (1985), disaster preparedness involves "all those activities, practices, interactions, relationships, etc., whether short- or long-term, intended to improve the response pattern at

times of disaster impact" (p. 6).

Disaster preparedness involves communication within and between organizations. The available information must be communicated to the public. There must be drills, rehearsals, meetings, training, and regular updating of obsolete information (Quarentelli, 1987 and 1985; Britton, 1987; Gillipsie, et. al., 1987). In short, there must be coordination and cooperation if disaster preparedness is to be effective and efficient in actual disaster situations.

The most important aspect of preparedness involves education and training of organizational members and the population at large. It involves "the training of emergency personnel and the education of administrators, policy makers, and the public concerning potential hazards and response procedures." (Waugh, 1988, p. 113-114). The organizations should be involved in the process of teaching their members and the general population what is expected of them during a disaster situation. Therefore, when organizations are in the process of creating, developing, or updating their disaster plan they need to take these factors into account.

If disasters are defined within a social framework, then it is also important for disaster plans to consider the behavior of the population under stress situations. People respond to a situation depending on how they, and their significant others, define that situation; on whether or not they perceive immediate danger to their families, themselves, and their property. Whether or not people respond and how they respond involves much more than an emergency warning or announcement by local officials or



meteorologist. Therefore, preparedness planning needs to adjust to the behavior of the general population rather than forcing the population to adjust to the disaster plans of a particular organization. After all, "if you ignore "people" in your planning, your planning will be ignored" (Dynes, 1985, p. 2).

Gillipsie et. al. (1987), focusing on the conceptualization and measurement of disaster preparedness, indicate that there are a variety of factors which are associated with and need to be taken into account when trying to determine the level of disaster preparedness of a particular organization. Previous experience with disasters and interorganizational relations are positively associated with disaster preparedness. Previous experience may serve to show organization administrators that disasters can and do happen and that there is a great need to be prepared in case the same type of phenomena repeats itself. Therefore, we expect that organizations which have responded in the recent past to disaster situations will have well-designed, up-to-date disaster plans relative to those with no previous experience.

The available literature suggests that interorganizational communication and coordination in non-disaster situations is an important predictor of successful communication during times of crisis (Aguirre and Bush, 1991; Nigg, 1987). That is, if organizations have good communications in their day-to-day functions, the communication will most probably also be good during a disaster situation (Nigg, 1987). It is the purpose of this study to also examine interorganizational relationships and communication

during non-crisis situations.

### **Individual Response**

An important objective of this proposal is to develop a systematic research strategy to understand the Puerto Rican population's cognitive, affective, and behavioral reactions towards disaster situations. Special attention will be given to natural disasters and how the population responds to them. It is expected that with this systematic approach, disaster-related variables will be surveyed or observed at four critical periods: pre-disaster, at impact, during immediate recovery, and during follow-up visits. We will observe how individuals and organizations plan, prepare, respond, and recover from actual disaster situations.

Knowledge of Puerto Ricans' ideas and beliefs associated with natural, disaster preparedness, and response is necessary to develop appropriate educational and informational campaigns. It is also important to have baseline information of this population's emotional and behavioral reactions to predicted disaster situations. Once recorded, this information can serve as pre-disaster baseline or control for comparison with data and observations obtained during actual disaster situations (see Shore, 1986), thus, facilitating the selection of appropriate variables for on-site observation, follow-up programs, and theoretical research (Logue, et al., 1981).

As indicated previously, there have been multiple disaster situations recorded in the history of Puerto Rico. During this

century alone, we have experienced several major earthquakes, eight hurricanes, and numerous landslides and floods (see Appendix B). Available information of the population's attitudes, emotional and behavioral responses to these crises are limited to popular anecdotal descriptions which have usually served the competitive needs of the mass media rather than the need to report facts accurately (Dynes, 1985). This is what Wenger, et al. (1980) have described as the media's large "dose of literary license". These popular descriptions emphasize those episodes in which individual or community responses have been inappropriate or counter-productive. Further, as indicated by Dynes (1985), official reports usually highlight statistical and financial concerns providing little understanding of the human experience during disaster situations.

The scientific literature on socio-cultural and psychological responses to disaster preparedness and real disaster situations in Puerto Rico is extremely limited. Available information is mostly anecdotal and leads to the conclusion that disaster preparedness and management in Puerto Rico could actually be based on unproven assumptions and myths about individual beliefs and behavioral response patterns.

Most disaster researchers agree that popular conceptions and biases such as the "disaster syndrome," the "social jungle," and the "irrational victim" have dominated the disaster research and preparedness fields (Wenger, et al., 1980). According to these views, disaster victims typically react in maladaptive and

dysfunctional ways such as: becoming helpless and dependent, resorting to looting, aggression, and other antisocial reactions, or losing control as they become victims of hysteria and panic reactions. However, Quarentelli (1984) and Dynes (1985) indicate that ethnographic observations in actual crisis situations contradict these negative biases. Nevertheless, "misunderstandings" by government officials, organizational planners, and community leaders may have negative effects on the assistance provided to the affected population during disaster situations (Quarentelli 1984, 1987).

These conceptual biases, myths, and "traditional wisdom" are reflected in the disaster response information provided in the mass media (Gómez, 1989) and may serve to explain the perceived limited effectiveness of previous disaster preparedness efforts (FEMA, 1985). However, research evidence indicates that conventional wisdom and perceptions concerning individual disaster response and behavior do not receive empirical validation (Dynes, 1985; Quarentelli, 1984; Wenger, et. al., 1980). While the same conclusion may be expected in Puerto Rico, there is an urgent need to establish a solid empirical database on the Puerto Rican population's individual and collective attitudes and responses to disasters and disaster situations. The research literature on disasters, developed in the continental United States and elsewhere, will provide the research team with reliable and up-to-date theoretical and methodological information which will be used in the development and implementation of the proposed research