

# **The Dynamics of Disaster** **“Impact, Recovery, and Mitigation”**

**A UVI Economic Summit**

**Final Project Report**



**Palm Court Harbor View Hotel**  
**November 11-12, 1996**

## Table of Contents

---

	<b>Page</b>
<b>BACKGROUND</b>	
The UVI Disaster Experience	2
The Dynamics of Disaster	2
<b>SUMMIT SUMMARY</b>	
Meteorology: Technology & Forecasting	5
Public Policy	7
Business Recovery Services	9
Construction Engineering	11
Financial/Banking & Insurance	12
Human Services	13
<b>APPENDICES</b>	
Program	15
Participants List	18
Future Plans	22
<b>Summit Presentations</b>	
Bridge Financing for Disaster Recovery	25
Business Disaster Preparedness Plan (BDPP)	28
Personal Tragedy	36

### *The UVI Disaster Experience...*

On September 15, 1995, Hurricane Marilyn crippled the University of the Virgin Islands less than a month after the start of the fall semester. Both campuses -- on St. Croix and St. Thomas -- sustained serious damage, but the grounds and facilities of the main campus on St. Thomas were devastated. Severe damage to the operational infrastructure and classroom and administrative buildings forced both campuses to suspend classes and close temporarily. The St. Croix campus resumed classes on October 9 and students returned to the St. Thomas campus a month later.

Hurricane Marilyn had followed only ten days on the heels of Hurricane Luis, a monstrous system that had decimated St. Maarten, Antigua and Anguilla and brushed the U.S. Virgin Islands. Consequently, damage incurred from Hurricane Marilyn was compounded by wind and water damage from Hurricane Luis. Although mitigation strategies were in process, UVI recovery was further hampered by wind damage from Hurricane Bertha in July 1996, and water damage from Hurricane Hortense in early September.

UVI administrators have worked earnestly since September of 1995 to restore both campuses -- and to mitigate potential damages from future storms.

### *The Dynamics of Disaster...*

The U.S.V.I. and the Caribbean are subjected to direct or indirect impacts from such natural disasters as tropical storms, hurricanes, earthquakes, tsunamis and volcanoes. The extent to which we can reduce the impact of natural phenomena is contingent on what we do before the storms. This suggests the three stages of action and reaction; impact, recovery, and mitigation.

#### *Impact*

The total damage was estimated to equal \$2.327 billion, and an estimated 15,000 Virgin Islanders, almost all within the St. Thomas district, lost their employment for at least several weeks because of Hurricane Marilyn.

#### *Recovery*

In the days and weeks following the storm, headlines clearly focused the community's attention, for example: "Relief Effort Hits Snag, Airlift Planes Grounded", or "WAPA has to Ration Water". In addition, destruction to the public educational system forced mandatory double sessions in the few schools that could function after the storm. A major controversy also developed over the accuracy of weather forecasts and sensitive communication of its meaning.

#### *Mitigation*

Following the last direct hit by a hurricane (Hugo in September 1989), a great deal of outward attention was paid to mitigation programs. Specifically, projects were identified and funded to be implemented to reduce the impact of future hurricanes. Little evidence has been presented to indicate the efficacy of ex ante mitigation projects.

On November 11 & 12, 1996, leading authorities and designated community leaders in the areas of meteorology, public policy, business recovery services, construction engineering, banking, insurance, and human services attended "The Dynamics of Disaster - Impact, Recovery, and Mitigation" - a UVI Economic Summit. As an interdisciplinary group, these participants collaborated to confront the adaptive challenges faced by a community in the wake of a devastating hurricane.

The summit's main objective was to:

- identify the areas of information and research needs for the U.S.V.I. in regards to mitigation and recovery from natural hazards;
- to assist the U.S.V.I. to recover more funds for hazard damages;
- to optimize the University's goal as a resource in the territory.



Participants reviewed and discussed the impact of Hurricane Marilyn and the recovery effort through different perspectives. Areas of focus included the role of economic status in determining access to support, levels of assistance, recovery speed and special financial products; minimizing and mitigating financial damage to businesses and households; the need and benefit of ways to mitigate natural disaster suffering for the most vulnerable among our population; and

proposals defining and organizing roles for regional and international institutions in the recovery and mitigation following a natural disaster.

On separate paths, numerous public policy and business practice recommendations have been made, some quite controversial, as a result of research at the federal and local level on: hurricane forecasting and related communication, building code amendment, emergency program management, business practices and community development programming.

This conference allowed the opportunity to share recommendations on these topics, explore dynamic relationships among them and define areas where additional research is needed. For instance, information management technology affects all



areas. With the tremendous advances being made, new perspectives will be required to make full use of these emerging technologies. Beyond the explicit theme of the conference; to examine the broad impact of natural disasters, an implicit theme is to reorient overall community development policy to integrate natural disaster management.

Included in this report are lists of information gaps and research needs generated by workshop participants for possible integration into natural disaster management planning agendas of business and government agencies.



*Thomas Brunt, III, Joanne E. Bozzuto, Esq., Dr. LaVerne E. Ragster, and Dr. Orville Kean were among the main speakers during the Plenary Session.*

## **Meteorology: Technology and Forecasting**

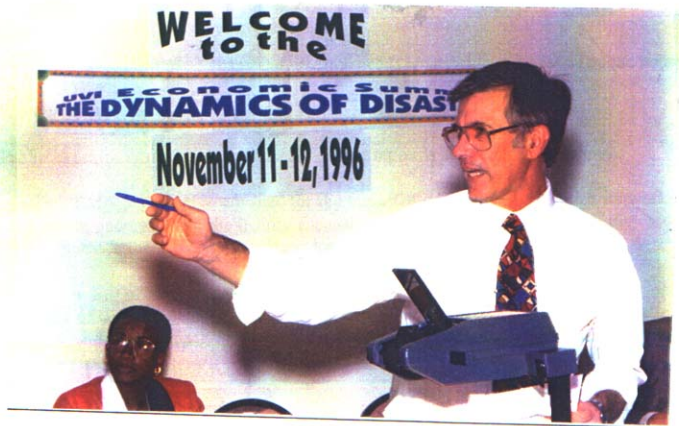
The National Weather Service and the National Weather Office in San Juan, Puerto Rico are responsible for warning and forecasting weather systems for the Virgin Islands and Puerto Rico and other islands in the Caribbean. Improvement in the area of technology and forecasting was made as a result of Hurricane Marilyn. The recently installed Doppler Radar used to track Hurricane Hortense proves advancement.

The following were information gaps identified in the area of meteorology.

### *Information Gaps*

- Utilize the Graphic Information System (GIS) as an inter-governmental agency tool. The GIS should include information on each public building in the island; such as its location, value, type of construction, use of the building, insurance coverage, etc. Such a database should be comprehensive, standardized, contemporary, maintained, managed, and updated on a periodic basis in Washington and the Virgin Islands. This will assist in the task of maintaining updated information. The Federal Emergency Management Agency (FEMA) would then have advance knowledge of information pertinent to recovery efforts prior to their arrival to the territory. The development and maintenance of a fully computerized wide area network GIS database can increase the efficiency, and reduce processing time, and at the same time accelerate the productivity of the entire operation. It can allow the outsourcing of the development of management and maintenance of the disaster response database and decrease overexpenditure on the part of FEMA. It can free-up existing resources and increase response efficiency by offering dual use opportunities to local, regional and federal authorities for other activities, project and programs. This system can also be utilized by local emergency personnel in cutting down response time. Details on making such information accessible to the public are pending.
- Promote the dissemination of intermediate-level information of hurricane forecasts to link and interpret National Hurricane Center's advisories for the media and the general public.
- Review historical earthquake-related geological data to help analyze the periodicity and past impacts of significant earthquake disasters. Address the development of physical and computer models or scenarios to predict the effect on wind speeds of high altitudes, orography and other Bernoulli factors, and the likely impacts of tsunamis on different regions of the Virgin Islands.
- Extend seismic monitoring.
- Promote more focus on utilizing technology to aide in the management of litigation assessment and recovery.
- Develop a procedure for optimal data gathering within the 6-12 hours after the event to expedite "state of emergency" declaration.

- Develop digitized records (scanned) as opposed to paper files to reduce the risk of losing important documents.
- Improve telephone/cellular/other communications (within the territory) for use in the time immediately after a disaster.



*Top Photo: Dr. Robert W. Burpee, Director of the Tropical Prediction Center*

*Bottom Photo: Summit Participants*

---

## **Public Policy**

---

The local government is required to maintain a current mitigation plan with FEMA. As a result of Hurricane Marilyn, several federal programs were activated. The Robert T. Stafford Disaster and Emergency Assistance Act was at the forefront of the VI's recovery effort. Other programs initiated included the Hazard Mitigation Program, Small Business Administration Loan Program, Individual and Family Grant Program, Disaster Employment Assistance, and the Disaster Housing Program.

The following were information gaps and research needs identified in the area of public policy.

### *Information Gaps...*

- Publicize priorities of the government for grant proposals and funding guidelines.
- Prepare FEMA personnel in advance for the impacted community into which its workers are coming. In understanding the history and culture, or the resources available, they would be more efficient in the delivery of their services.
- Develop a list of recommendations to FEMA to facilitate the continuity of a seamless exchange of communication between the federal government and the local organizations and agencies, and develop a mechanism for the organizations and development of small unit recovery plan.
- Increase grant writing workshops, revealing priorities so that the public can apply for what's available. Once applications are submitted, the public needs to be informed regularly on the application process.
- Inform Office of Management and Budget and other government agencies of available UVI expertise in planning and developing priorities.
- Inform federal agencies and FEMA of the need to support small businesses in the early recovery stages.
- Standardize the Federal Emergency Management Agency's (FEMA) employee turn-over rate.
- Prepare FEMA personnel in advance of the needs of the impacted community with accurate and up-to-date information to determine which workers and how many should be sent to the impacted area, and to effectively aide in the recovery effort.



*Research Needs...*

- Research the need to clarify the application process for Hazard Mitigation and Public Assistance Programs.
- Research the need to develop recommendations for simplifying the chain of command in the FEMA organization.



*Athniel "Addie" Ottley focused on communication during the Plenary Session.*

*Dr. Solomon S. Kabuka addressed the business needs of the Virgin Islands.*



---

## **Business Recovery Services**

---

The Virgin Islands is considered by many the tourism capital of the Caribbean. Many businesses suffered a tremendous loss due to the hurricane. Major airlines limited flights, hotels closed, businesses closed or laid-off employees. Over a year later, the economy continues to show signs of a struggle.

The following is a list of information gaps and research needs identified in the area of business recovery services.

### *Information Gaps...*

- Develop a disaster plan for private businesses in order to mitigate losses.
- Conduct a survey of damaged structures sustained and why businesses fail following a major disaster.
- Illuminate possible efficient and affordable energy alternatives that can power business machines in the recovery period.
- Illuminate processes which the public and private sector can adapt to facilitate doing business in a cash flowing environment.
- Form local contingency planning groups to discuss the needs of businesses in the recovery period. These recommendations should be developed and sent to local and federal agencies that assist businesses.
- Collect data on point of failure analysis for the confirmation of facilities.
- Identify advance business recovery techniques to broad use.
- Devise a coalition to assist in economic recovery.
- Educate the public on how the economy works in general with respect to making allocations and choices during the recovery process. Many times the public don't have the information they need on how resources need to be allocated. Businesses need to get back and jump-start so that they can participate in the economy again.

*Research Needs...*

- Research the need to develop partnerships in the community between public and private leadership groups.
- Research the need to define long-term economic goals in the territory.
- Research the need to empower low and middle income groups to derive opportunity from disaster - these groups are more dependent on government assistance programs.
- Research the need to formulate a territorial disaster plan.
- Research the need to develop strategies for assuring the inclusion of small business entities in recovery activities.
- Research the need to identify and organize the use of thermo senses in determining the status of electrical systems.



*Summit Participants*

---

## **Construction Engineering**

---

The occurrence of three hurricanes and several tropical storms have caused major concern among government officials. Contractors, architects, and homeowners attended seminars to familiarize themselves with the revised building codes. Government officials and the community recognized that any measure taken to reduce the risk of damage will be expensive.

The following were information gaps identified in the area of construction engineering.

### *Information Gaps...*

- Collect and study data on the infrastructure on the placement of water and telephone lines. The hazard and vulnerability of power plants, water pump stations and other facilities should be considered. Vulnerability maps should be developed for FEMA, VITEMA, and other care providers. All future infrastructures must be built in areas less vulnerable. Proposed projects include: underground power lines for the Virgin Islands Water and Power Authority and the University of the Virgin Islands; and improved traffic signal lights (through the Department of Energy).
- Formulate a plan to visualize the status the community should be in the moment disaster strikes, and immediately after. An evaluation of the possible impact of the plan to determine the need for readjustments in the society should be completed so that it can be revised and adopted before the disaster occurs.
- Accept possibilities of natural disaster when building effectively for the future.
- Evaluate the implementation, enforcement, and compliance of the building codes.

---

## **Financial/ Banking & Insurance**

---

Following the occurrence of Hurricane Marilyn, the financial institutions in the territory temporarily halted transactions. This left many without the necessary cash needed to purchase emergency supplies, or conduct personal business. The possibility of such activity occurring again is just cause for concern.

The following is a list of information gaps identified in the area of banking.

### *Information Gaps...*

- Facilitate conducting business in an environment where electronic or off-island databases are available to bankers.
- Research the availability of utilizing insurance receipts for use as collateral in obtaining bridge financing.
- Develop a mitigation funding source in the V.I. so that mitigation measures can be implemented.
- Distribute information on the availability, limitations, and the terms of bridge financing so that it is known how to pursue such goals and terms.
- Clarify how compliance to building codes influence insurance codes, and the probability of insurance premiums based on storms occurring or structures withstanding windstorm forces.

---

## Human Services

---

The Department of Human Services played an instrumental role in the recovery efforts of the V.I. Several programs and assistance were administered and many Virgin Islanders received aide based on family need.

The following were information gaps and research needs identified in the area of human services.

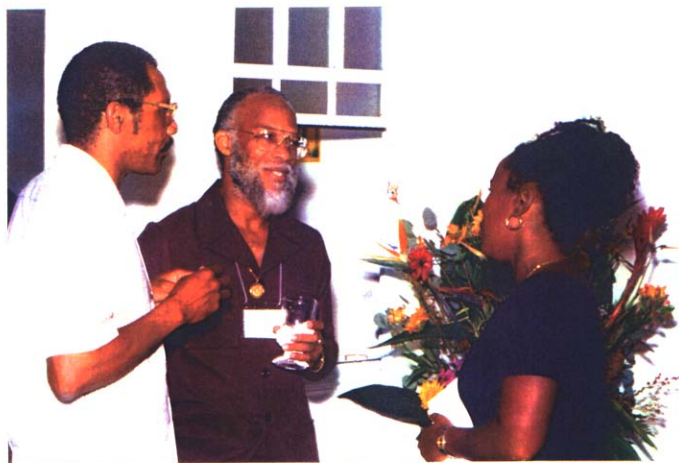
### *Information Gaps...*

- Conduct public education on land tenure and ownership issues to reduce problems associated with obtaining the required documentation on the property as a prerequisite for Federal Aid.
- Ensure that there is a resource of communicators for foreign language speakers, visually or hearing impaired. They must be identified in advance so that assistance can be provided where there is a need. Research their special needs in an environment where critical information is communicated through radio.
- Develop a registry of seniors and the disabled so that the Department of Human Services could service those in need. The possibility of local churches and organizations being assigned the task of securing property and/or moving others to shelters prior to the disaster can aide the department. The training of additional personnel to provide assistance for seniors can be implemented.
- Launch a campaign to get people prepared for the possibility of another disaster. This may include preparation by the Mental Health Department officials so that the populace, including children and senior citizens, and the media can rationalize the impact of an inevitable natural hazard, and to have maximum information about the crisis so that they won't overreact or panic. This includes educating the marine community on boating safety before, during and after the storm.
- Publicize information on the process of distributing goods and services during times of emergency.
- Communicate and assess various needs of the community.

### *Research Needs...*

- Research how children's trauma can be reduced through group activity during the recovery stages when school is not in session.

- Research how to make counseling services or other sources of support available to all who experience natural disasters during the recovery states to promote mental health.



*Summit Participants*

## **Summit Program**



9:00 a.m. - 9:30 a.m.

## OPENING

## WELCOME

**Orville Kean, Ph.D.**  
 President  
 University of the Virgin Islands

9:45 a.m.-12:00 p.m.

## PLENARY SESSION

What Happened to Us on 15 Sept. 1995.

*An orientation of participants to conference objectives, with a review of the different perspectives on the impacts of Hurricane Marilyn and the recovery effort.*

## Moderator:

**LaVerne E. Rogster, Ph.D.**  
 Acting Vice President for Research & Land Grant  
 ECC Director, UVJ

## Speakers:

**Joanne E. Bozzuto, Esq.**  
 Director  
 Bureau of Internal Revenue

**Athniel "Addie" Ottley**  
 President  
 Outley Communications

**Marie E. González**  
 FEMA Hazard Mitigation Officer

**Thomas Brunt, III**  
 President, St. Thomas/St. John  
 Chamber of Commerce

**Robert W. Burpee, Ph.D.**  
 Director  
 Tropical Prediction Center

**Mr. Edward B. Brown, III**  
 District Manager  
 Business Recovery Services

12:30 p.m. - 1:30 p.m.

## LUNCHEON SESSION

## Moderator:

**S. B. Jones-Hendrickson, Ph.D.**  
 Professor of Economics, UVJ

## Speaker:

**Robert W. Burpee, Ph.D.**  
 Director, Tropical Prediction Center  
 National Hurricane Center

1:30 p.m. - 2:30 p.m.

## SECTION A-1

## Construction, Mitigation and Insurance

## Moderator:

**Frank L. Mills, Ph.D.**  
 ECC Associate Director  
 Research Institute, UVJ

## Speakers:

**Joseph E. Minor, Ph.D., P.E.**  
 University of Missouri-Rolla  
**Robert DeJongh**  
 DeJongh & Associates

1:30 p.m. - 2:30 p.m.

## SECTION A-2

## Technology and Forecasting

## Moderator:

**Walter G. Peacock, Ph.D.**  
 Program Director of Research  
 Int'l Hurricane Center, FIU

## Speakers:

**Richard A. Moore, Ph.D.**  
 Director of Research  
 Globusvet  
**Marie E. González**  
 FEMA Hazard Mitigation Officer

2:45 p.m. - 3:45 p.m.

## SECTION B-1

## Business Recovery Planning for Technology

## Moderator:

**Solomon S. Kabuka, Ph.D.**  
 Professor of Business, UVJ

## Speaker:

**Edward B. Brown, III**  
 District Manager  
 Business Recovery Services

2:45 p.m. - 3:45 p.m. SECTION B-2  
Preparedness for Natural Hazards in the Caribbean

**Moderator:** Roy Wallington  
ECC Associate Director  
Extremal Institute, UVI

**Speakers:** Lixion Avila, Ph.D.  
National Hurricane Center  
William R. McCann, Ph.D.  
Earth Science Consultants, Inc.

4:00 p.m. - 5:00 p.m. SECTION C-1  
Personal Tragedy

**Moderator:** Betty H. Morrow, Ph.D.  
Professor of Anthropology, FIU

**Speakers:** Catherine L. Mills  
Commissioner  
John Coppenhaver  
Senior Executive Project Manager, IBM

4:00 p.m. - 5:00 p.m. SECTION C-2  
Bridge Financing for Disaster Recovery

**Moderator:** S. B. Jones-Hendrickson, Ph.D.  
Professor of Economics, UVI

**Speaker:** Percival Clouten  
Banco Popular

DAY 2 - NOVEMBER 12, 1996

CONCURRENT SESSIONS

9:00 a.m. - 10:30 a.m. SECTION D-1  
Business Recovery Planning

**Moderator:** Leo Francis  
Director of Facilities, UVI

**Speakers:** Solomon Kabikka, Ph.D.  
Professor of Business, UVI  
Robert Noland  
President, Noland & Associates

10:45 a.m. - 12:15 p.m. SECTION E-1  
Federal Government Assistance

**Moderator:** Gwen-Marie Moolenaar, Ph.D.  
Director of Sponsored Programs, UVI

**Speakers:** Datsymae Evans  
Associate Director  
Federal Grant Management Unit, OMB  
Joneita Durdan  
Territorial Public Assistance Officer  
Office of Management & Budget

10:45 a.m. - 12:15 p.m. SECTION E-2  
Business/Household Relations in Disaster Recovery: The Role of  
Economic Status

**Moderator:** Basil Ottley  
Research Analyst, UVI

**Speakers:** Richard Moore, Ph.D.  
Director of Research  
Globalwest Management Co.  
Maik Sekou, Ph.D.  
ECC Consultant, UVI

12:30 p.m. - 2:00 p.m. LUNCH

2:00 p.m. - 4:00 p.m. Closing Plenary

**Remarks**  
Eric Haessler, Esq.  
Consultor at Law

**Synopsis and Research Agenda**  
Roy A. Wallington  
ECC Associate Director  
Extremal Institute, UVI

**Vote of Thanks**  
LaVerne E. Ragster, Ph.D.  
Acting Vice President for Research and Land Grant Affairs  
ECC Director, UVI

## **Participants List**

---

## PARTICIPANTS LIST

---

**VELMA A. ABRAMSEN**

Assistant to the Director  
Eastern Caribbean Center, UVI

**LIXION A. AVILA, PH.D.\***

Hurricane Specialist  
National Centers for Environmental Prediction  
National Weather Service

**EDWARD B. BROWN, III\***

District Manager  
Business Recovery Services

**THOMAS BRUNT, III\***

President  
St. Thomas/St. John Chamber of Commerce

**ROBERT W. BURPEE, PH.D.\***

Director  
Tropical Prediction Center  
National Hurricane Center

**PERCIVAL E. CLOUDEN\***

Vice President  
Banco Popular de Puerto Rico

**JOHN COPENHAVER\***

Senior Executive Project Manager  
IBM Crisis Response Team

**JOAN CREQUE**

Administrative Assistant  
Eastern Caribbean Center, UVI

**JACQUELYN D. DAVIS**

Administrative Assistant  
Eastern Caribbean Center

**SHARLEEN DABREO**

Office of Disaster Preparedness  
Government of the British Virgin Islands

**JONETTA DARDEN\***

Territorial Public Assistance Officer  
Office of Management & Budget, USVI

**STANLEY DAWSON**

V.I. Inско, Corporation

**ROBERT DEJONGH\***

President  
DeJongh & Associates

**JOE ELMORE**

American Red Cross  
St. Thomas/St. John Chapter

**DAISYMAE EVANS\***

Associate Director  
Federal Grant Management Unit  
Office of Management & Budget

**JOAN HARRIGAN-FARRELY**

Consultant  
Eastern Caribbean Center, UVI

**LEO H. FRANCIS\***

Director of Facilities  
University of the Virgin Islands

**MARIE E. GONZÁLEZ\***

Hazard Mitigation Officer  
Federal Emergency Management Agency

**DERRICK GUMBS**

American Red Cross  
St. Thomas/St. John Chapter

**ERIC HAESSLER, ESQ.\***

Counselor at Law

**BETTY HERN MORROW, PH.D.\***

Professor of Anthropology  
Florida International University

\*Speaker  
\*Moderator

**S.B. JONES-HENDRICKSON, PH.D.\***

Professor of Economics  
University of the Virgin Islands

**CHERILYN HODGE**

Administrative Assistant  
Eastern Caribbean Center, UVI

**IAN HODGE**

Associate Director  
Small Business Development Agency  
University of the Virgin Islands

**SOLOMON S. KABUKA, PH.D.\*\***

Professor of Business  
University of the Virgin Islands

**ORVILLE KEAN, PH.D.\***

President  
University of the Virgin Islands

**JERRILYN KING**

Administrative Assistant  
Eastern Caribbean Center, UVI

**SHIRLEY LINCOLN**

Consultant  
Eastern Caribbean Center, UVI

**WILLIAM MCCANN, PH.D.\***

Earth Science Consultants, Inc.

**CAROL MAYES**

The Nature Conservancy

**CATHERINE L. MILLS\***

Commissioner  
Department of Human Services

**FRANK L. MILLS, PH.D.\***

Associate Director  
Research Institute  
Eastern Caribbean Center, UVI

**JOSEPH E. MINOR, PH.D.\***

Professional Engineer  
University of Missouri-Rolla

**NORMA MONTES**

Administrative Specialist  
Eastern Caribbean Center, UVI

**GWEN-MARIE MOOLENAAR\***

Director of Sponsored Programs  
University of the Virgin Islands

**RICHARD MOORE, PH.D.\*\***

Director of Research  
Globalvest Management Co.

**TIFFANY E. MOORHEAD**

Department of Public Works  
St. Croix, VI

**ROBERT NOLIND\***

Nolind & Associates

**MAXINE NUÑEZ, PH.D.**

Dean of Instruction, St. Thomas Campus  
University of the Virgin Islands

**ATHNIEL "ADDIE" OTTLEY\***

President  
Ottley Communications

**BASIL OTTLEY\***

Research Analyst  
Eastern Caribbean Center, UVI

**DENIS PAUL, PH.D.**

Vice President for Academic Affairs  
University of the Virgin Islands

**WALTER G. PEACOCK, PH.D.\***

Program Director of Research  
International Hurricane Center

**LAVERNE E. RAGSTER, PH.D.\***

Acting Vice President for Research and Land  
Grant Affairs; & Director, Eastern Caribbean  
Center, UVI

**MALIK SEKOU, PH.D.\***

Consultant  
Eastern Caribbean Center

\*Speaker

\*\*Moderator

**BASIL H. SMITH**

V.I. Inesco Corporation

**HENRY H. SMITH, PH.D.**

Director

Water Resources Research Institute, UVI

**RUTH E. THOMAS**

UVI Board of Trustees

**ELEANOR THRAEN, PH.D.**

Executive Assistant to the Governor

Office of the Governor

**ED TOWLE, PH.D.**

President

Island Resources Foundation

**LEROY M. WALKER**

Inter-Ocean Insurance

**ROY A. WATLINGTON\***

Associate Director

Extramural Institute

Eastern Caribbean Center, UVI

**GLENN WILCOX**

R.R. Caribbean, Inc.

**JENNIFER WILSON**

International Hurricane Center

Florida International University

---

**MEMBERS OF THE PRESS**

---

**LEE CARLE**

News Director

WSTA Radio

St. Thomas

**PATRICE JOHNSON**

Reporter

Daily News

St. Thomas

---

**PLANNING COMMITTEE**

---

Edward B. Brown, III

S.B. Jones-Hendrickson

Solomon S. Kabuka

Richard Moore

Robert Noland

LaVerne E. Ragster

\*Speaker

\*Moderator

## **Future Plans**

The Eastern Caribbean Center of the University of the Virgin Islands will sponsor future summits on issues that affect the Virgin Islands and the Caribbean region.

As a significant educational entity in the Caribbean and the *alma mater* of many leaders throughout the region, the University will use its relations with the present generation of leaders to promote a general commitment to incorporating natural hazard considerations into all manner of governmental responsibilities.

On all levels of education, there is need for supplementation of educational resource materials with information about the natural phenomena that can affect each community. The University will encourage local and regional educators to join in an effort to review present curricula to assess their contents with respect to including the effects of natural phenomena upon societal and institutional structures.

The University will utilize future summits of the type reported upon here to promote the exchange of knowledge and the forming of resource-sharing networks among local and regional decision makers and economic planners.

The University of the Virgin Islands will continue its part in the effort, already started with this Economic Summit and with the Consultation of Experts on Tsunamis, to employ the most effective technology in the information-gathering and warning systems for hurricanes and tsunamis.

Educating the general public through direct informal strategies about hurricane, earthquake, volcano, mudslide, fire and tsunami threats will remain a focus of the University. In this effort, the University will work with the VITEMA (Virgin Islands Emergency Management Agency) locally, with CDERA (Caribbean Disaster Emergency Relief Agency) and with regional health agencies.



## **Summit Presentations**

**Dynamics of a Disaster:  
“Impact, Recovery, and Mitigation”  
Bridge Financing for  
Disaster Recovery**

presented by:

*Percival E. Clouden*  
Banco Popular de Puerto Rico  
Virgin Islands Region

- ◆ Bridge Financing after a disaster can be an important aspect of the recovery process.

As we are aware, Bridge Financing bridges a gap until a specific event occurs that repays the loan.

Our experience tells us that after a disaster, insurance proceeds or other financial assistance take some time to be disbursed into the hands of the claimant.

This therefore, puts a dependency on Financial Institutions to be flexible and cooperative but protective of its assets.

- ◆ In the case of households where insurance coverage existed, the claim process would have been completed and agreed upon by both the Insurance Company and the Insured.

The Insured can then negotiate with a Financial Institution, a bridge loan of say 40% of the settlement amount to begin the rebuilding process, while the settlement check is being prepared. (This process can take 4-8 weeks.)

Once the funds are received, the Bank also listed as joint payee, establishes an escrow account from which it pays-off its bridge loan and monitors the rebuilding process to ensure the funds are used to restore the dwelling to its pre-disaster condition or better. Any surplus funds are the borrower's benefit.

- ◆ Another scenario is where there is no expectation of insurance proceeds, i.e. WAPA, since there is no Pole Insurance.

The board may request an intermediate term loan from local Financial Institutions either on a participative or non-participative basis, to begin immediate replacement of poles and lines, with the understanding that 12-18 months later, a bond issue will be made, and a portion of the proceeds will be used to liquidate the bridge loan. This is typical for utility companies.

- ◆ Bridge loans and the circumstances that create them are generally exceptions to normal operations of the borrower and require special decisions by management.

Consequently, lenders consider bridge loans apart from seasonal, term or permanent capital loans.

Bridge loan analysis focuses on two areas:

- i. The likelihood of the event that will repay the loan occurring and
- ii. The ability to service the debt in case the event does not occur.

If the event were not to occur, the Bank could be left with a very long term loan or a permanent capital loan.

As part of the analysis, the Bank decides if the resultant loan could be properly serviced and if it would comply with loan policy.

- ◆ Bridge loans are normally structured with maturities that coincide with the anticipated event. Demand Notes or renewable 90-day Notes are avoided because these instruments are not self-policing. When a maturity date falls on a bridge loan, the loan should be paid in full. If it is not paid, either the event has been delayed or a failure has occurred.

#### **WHAT CAN GO WRONG WITH A BRIDGE LOAN:**

- ◆
  - Prior liens on the insurance proceeds or divergent claims, such as in a diverse situation.
  - Uninsured damage to the asset intended for sale to repay the bridge loan.
  - Lack of firm commitment to refinance by another institution who intends to pay off institution.
  - Inability of the borrower to meet all contingencies of financing commitment.

#### **COMMON LENDERS ERRORS**

- ◆
  - Failure to consider all the contingencies that could prevent repayment.
  - Event which allows for only partial payment of the Bridge loan. i.e. cost overruns, interests costs.
  - Not analyzing the secondary source of repayment sufficiently.

If the anticipated repayment event does not occur, the borrower should have the ability to carry and eventually repay the debt.

#### **Mitigating Factors: To make the recovery process less severe or more bearable.**

1. The office of the Lieutenant Governor - Banking and Insurance must embark on an educational process throughout the Virgin Islands Communities on the importance of Insurance coverage, types of Insurance and technical aspects.

This can be done for homeowners and entrepreneurs and sponsored by the banking institutions, insurance companies, agencies and the Division of Banking and Insurance.

2. Timely settlement of Claims will avoid bridge loans and thus reduce cost. There should be legislation to set the time frame from agreement to receipt of proceeds.
3. Import of temporary construction labor.

**Dynamics of a Disaster:  
“Impact, Recovery, and Mitigation”  
Business Disaster Preparedness Plan  
(BDPP)**

presented by:

*Dr. Solomon S. Kabuka*  
Professor of Business  
University of the Virgin Islands

## BUSINESS DISASTER PREPAREDNESS PLAN (BDPP)

Presented at the *UVI Economic Summit: The Dynamic of a Disaster*, By Dr. Solomon S. Kabuka  
November 12, 1996, Harbor View Hotel, St. Thomas, U.S. Virgin Islands

### A. BUSINESS RECOVERY PLANNING

WHAT?

A PROCESS OF MAKING DECISIONS PRIOR TO A DISASTER ON  
HOW TO SPEED UP RECOVERY OF YOUR BUSINESS AFTER  
THE DISASTER

WHY?

DISASTER TIME IS NO TIME TO THINK STRATEGICALLY;  
NOR IS IT TIME TO OPTIMIZE ON YOUR BUSINESS ACTIONS

## **BUSINESS DISASTER PREPAREDNESS PLAN (BDPP)**

Presented at the *UVI Economic Summit: The Dynamic of a Disaster*, By Dr. Solomon S. Kabuka  
November 12, 1996, Harbor View Hotel, St. Thomas, U.S. Virgin Islands

### **B. FEATURES OF A BUSINESS DISASTER PREPAREDNESS PLAN (BDPP)**

#### **I - PHYSICAL LOSSES**

##### **LOSSES/LIABILITIES/ASSETS**

##### **ACTION PLAN**

##### **1. BUSINESS FACILITY**

##### **1.1 COMPLIANCE WITH BUILDING CODES**

##### **1.2 DISASTER PROTECTION FEATURES**

##### **1.3 INSURANCE COVERAGE**

##### **2. INVENTORY**

##### **2.1 DISASTER PROTECTION FEATURES**

##### **2.2 INSURANCE COVERAGE**

##### **3. EQUIPMENT**

##### **3.1 DISASTER PROTECTION FEATURES**

##### **3.2 INSURANCE COVERAGE**

##### **4. SUPPLIES**

##### **4.1 DISASTER PROTECTION FEATURES**

##### **5. DOCUMENTS**

##### **5.1 DISASTER PROTECTION FEATURES**

##### **5.2 KEEPING DUPLICATES AT A SAFE LOCATION**

## **BUSINESS DISASTER PREPAREDNESS PLAN (BDPP)**

Presented at the *UVI Economic Summit: The Dynamic of a Disaster*, By Dr. Solomon S. Kabuka  
November 12, 1996, Harbor View Hotel, St. Thomas, U.S. Virgin Islands

### **II - ECONOMIC/FINANCIAL LOSSES AND OBLIGATIONS**

<b>LOSSES AND OBLIGATIONS</b>	<b>ACTION PLAN</b>
<b>1. SALES</b>	<b>1.1 STAND-BY INVENTORY ORDERS</b>
	<b>1.2 STAND-BY SUPPLY ARRANGEMENTS</b>
	<b>1.3 DISASTER CLAUSE IN THE CONTRACT</b>
	<b>1.4 INSURANCE COVERAGE</b>
	<b>1.5 BRIDGE FINANCING FOR NEW INVENTORY/SUPPLIES</b>
	<b>1.6 VENDOR/SUPPLIER FINANCING</b>
<b>2. ACCOUNTS RECEIVABLES</b>	<b>2.1 FACTOR CONTRACT</b>
	<b>2.2 BARTER WITH DEBTORS</b>
<b>3. CREDITORS</b>	<b>3.1 MORATORIUM ARRANGEMENT</b>
	<b>3.2 BANK CREDIT ARRANGEMENT</b>
<b>4. PAYROLL</b>	<b>4.1 BANK BRIDGE FINANCING</b>
	<b>4.2 BARTER ARRANGEMENT</b>
<b>5. SUPPLIERS</b>	<b>5.1 BANK BRIDGE FINANCING</b>
	<b>5.2 MORATORIUM ARRANGEMENT</b>
	<b>5.3 BARTER ARRANGEMENT</b>
	<b>5.4 SUPPLIER FINANCING</b>
<b>6. GOVERNMENT</b>	<b>6.1 MORATORIUM ARRANGEMENT</b>



## BUSINESS DISASTER PREPAREDNESS PLAN (BDPP)

Presented at the *UVI Economic Summit: The Dynamic of a Disaster*, By Dr. Solomon S. Kabuka  
November 12, 1996, Harbor View Hotel, St. Thomas, U.S. Virgin Islands

### III - OPERATIONS LOSSES/DECISIONS

#### ACTION PLANS

#### 1. COMMUNICATIONS

##### 1.1 DISASTER RESILIENT TECHNOLOGY

##### 1.2 ALTERNATIVE ARRANGEMENTS

#### 2. BUSINESS RE-OPENING

##### 2.1 RE-OPENING DATE(S) UNDER VARIOUS SCENARIOS

#### 3. BUSINESS HOURS

##### 3.1 POLICY UNDER VARIOUS DISASTER SCENARIOS

#### 4. PRICING

##### 4.1 POLICY UNDER VARIOUS DISASTER SCENARIOS

#### 5. AUTHORITY

##### 5.1 DISASTER POLICY

## BUSINESS DISASTER PREPAREDNESS PLAN (BDPP)

Presented at the *UVI Economic Summit: The Dynamic of a Disaster*, By Dr. Solomon S. Kabuka  
November 12, 1996, Harbor View Hotel, St. Thomas, U.S. Virgin Islands

### IV. PERSONAL ASSETS

- 4 TYPES OF BUSINESS STAKEHOLDERS - OWNERS
- EMPLOYEES
- CUSTOMERS
- SUPPLIERS

\* EACH HAS PERSONAL ASSETS THAT DISASTERS AFFECT; WHICH  
IN TURN AFFECT THE EFFICIENT AND EFFECTIVE OPERATION  
OF THE BUSINESS.

## **BUSINESS DISASTER PREPAREDNESS PLAN (BDPP)**

Presented at the *UVT Economic Summit: The Dynamic of a Disaster*, By Dr. Solomon S. Kabuka  
November 12, 1996, Harbor View Hotel, St. Thomas, U.S. Virgin Islands

### **AREAS OF VULNERABILITY FOR THE PERSONAL ASSETS**

#### **VULNERABILITIES**

#### **ACTION PLAN**

#### **1. SHELTER**

- 1.1 SET ASIDE SPACE IN BUSINESS FACILITY
- 1.2 MAKE HOUSING ARRANGEMENTS WITH HOTEL, ETC
- 1.3 TEMPORARY REPAIRS ASSISTANCE
- 1.4 CASH ADVANCES FOR EMPLOYEES/SUPPLIERS
- 1.5 DISASTER PAYMENT FOR EMPLOYEES

#### **2. FOOD**

- 2.1 DISASTER FOOD BANK
- 2.1 CASH ADVANCES FOR EMPLOYEES/SUPPLIERS
- 2.3 DISASTER PAYMENT FOR EMPLOYEES

#### **3. ESSENTIALS**

- 3.1 DISASTER SUPPLIES
- 3.2 CASH ADVANCES FOR EMPLOYEES/SUPPLIERS
- 3.3 EMPLOYEES REPAYMENT PLAN
- 3.4 DISASTER PAYMENT FOR EMPLOYEES

#### **4. COMMUNICATION**

- 4.1 DISASTER PERSONNEL CONTACT PLAN
- 4.2 DISASTER BUSINESS/MANAGEMENT CONTACT PLAN

## **BUSINESS DISASTER PREPAREDNESS PLAN (BDPP)**

**Presented at the UVI Economic Summit: *The Dynamic of a Disaster*, By Dr. Solomon S. Kabuka  
November 12, 1996, Harbor View Hotel, St. Thomas, U.S. Virgin Islands**

### **V. OTHER FEATURES OF BDPP**

- 1. BUSINESS BANKRUPTCY**
- 2. SELLING THE BUSINESS**
- 3. CLOSING THE BUSINESS**
- 4. DISASTER BUSINESS FUND - 0.5% TO 5% OF SALES; USE BUSINESS CASUALTY TAX WRITE OFF.....\$50M.**

**LIKE NIGHTMARES, DISASTERS ARE A RECURRING REALITY;  
YOU EITHER PLAN FOR THEM BEFORE THEY HAPPEN OR YOU  
RISK FACING A DISASTROUS BUSINESS NIGHTMARE AFTER  
THEY HAPPEN !!!!! THE CHOICE IS IN YOUR HANDS!!!!!**

**Dynamics of a Disaster:  
"Impact, Recovery, and Mitigation"**

**Personal Tragedy**

presented by:

*Catherine L. Mills*  
Commissioner  
Department of Human Services

**Dynamics of a Disaster: Impact, Recovery and Mitigation**  
***Personal Tragedy***  
November 11, 1996

## **OVERVIEW**

On September 15, 1995, Hurricane Marilyn, a category 1, 2, 3, or four storm, depending on how scared you were, where you lived, or how much damage you received, hit the Virgin Islands. St. Thomas and St. John were particularly hard hit, but St. Croix also suffered significant damage. Subsequently, on July 8, 1996, Hurricane Bertha hit the Territory and we started reeling and recovering from this second attack. It is important to remember that, in many instances, there were homes, businesses, and the economy in general, that had never quite bounced back from Hurricane Hugo and its wrath of September 17, 1989. Into this arena enter our most fragile groups of people: the elderly, the disabled and low income female headed households with children.

## **DHS STAFF WERE ALSO VICTIMS**

The Department of Human Services (DHS) plays a very special part in addressing the aftermath of a natural disaster. We are responsible for the two single largest individual assistance programs that address basic needs: food through the Food Stamp Program and assistance to pay for personal items' expenses and medical care, including burial, through the Individual and Family Grant (IFG) Program.

It is essential to note that in addition to mobilizing staff to address these federally funded programs, DHS operates, outside of the prison system, the largest number of programs for persons in need of residential care and food delivery for those who are elderly and homebound. Due to the critical nature of these programs, DHS cannot close or reduce these programs (300 in foster care, 170 in homes for children, youth or the aged) after a disaster strikes, but must continue to provide food, staffing and shelter to them on a daily basis.

Recognizing the aforementioned, and taking into account that most of the staff who

work in these programs are also hurricane victims without electricity or, in some instances living in the shelters, these programs continued. Additionally, staff including the Commissioner, were being asked to participate in a constant barrage of post-disaster meetings to address disaster needs with FEMA, the American Red Cross, VOLAG, (representing the voluntary agencies), other government agencies, the Governor, federal officials coming for two to three days to review disaster needs and federal officials calling and requesting counts of the victims and their needs, each one specifying a different calculation from the one before. All of this, of course, while working in a building with intermittent power from a generator that breaks down for days or even weeks at a time.

Remember that in all of this, as I mentioned before, most of our staff are working and going home to houses that are damaged and without power. The lines at the supermarkets are lengthy and, unless you use only canned goods, you had to shop frequently. Stores were closed in the evening. Food distribution did start, but it occurred in the daytime and many staff heavily resented that they had to work so hard and were also victims, and did not have the time to get in line for the most popular commodities, water, ice, flashlights, stoves and radios. DHS set up an internal distribution system on-site for departmental staff, but never received enough of the popular items to satisfy staff.

I cannot stress enough that DHS' staff performed herculean tasks, as did many other government agencies, but staff's general consensus was that care givers are very much ignored during the recovery process. The U. S. Public Health sent scores of persons to work in the health field, but with the exception of the U. S. Department of Agriculture, and a disaster specialist from the U. S. Department of Health and Human Services, all federal personnel that arrived in the Territory, linked to DHS, were primarily there to assess needs and support or advocate for their special needs groups. ***A lesson to be learned from this is that if we expect care givers to perform at optimum levels, we need to have special accommodations for them and stress counseling tailored to their needs.***

DHS recognized the manpower disaster resultant needs and submitted a grant request to FEMA, but it was denied. Why? Because VOLAG, by law, is required to respond in the areas we requested. I think there is a failure to recognize that many territorial VOLAG members are themselves government employees and could not leave

their jobs to do volunteer work. Furthermore, organizational volunteerism is more of an American concept and is not as strong here. A classic example of this misunderstanding was a serious query of a FEMA official to me, after we requested this assistance, why don't you use Boy Scout troops to take water, food and ice to senior citizen homes and visit them daily. The FEMA official was not aware that our troops are primarily headed by women and if their eldest sons could perform this function they would have to start at home while their mothers worked. ***Two lessons to be learned from this are: (1) FEMA laws do not take local cultural differences into account and they do not seem to have the flexibility to accommodate special needs. (2) FEMA officials need cultural sensitivity awareness when going into new places.***

## **RESPONSE TO SPECIAL NEEDS GROUPS**

After Hurricanes Marilyn and Bertha, DHS provided both locally and federally funded services or cash assistance, including:

- ▶ Approximately \$14 million (St. Croix: more than 49,000 persons received and on St. Thomas/St. John: More than 33,000 thousand received) in Hurricane Marilyn disaster food stamps and \$910,00 in Bertha (all 9,148 were in the St. Thomas/St. John District) were distributed
- ▶ Expanded Meais-on-Wheels from 677 to 1,024 elderly persons.
- ▶ Traveled the island in multi disciplinary teams to individually check on all disabled persons, foster children, Head Start families and elderly known to us.
- ▶ Opened a FEMA funded senior shelter at Bolongo, a smaller one on St. John and admitted six emergency placements to the homes for the aged.
- ▶ Issued \$45 million after Marilyn (22,384 households) and, to date, \$1.2 million (1,475 housenoids) after Bertha, to IFG eligible persons.
- ▶ Provided interpreter services at Recovery Centers for the hearing impaired and Spanish speaking residents.
- ▶ Increased individual and family counseling for our clients.
- ▶ Increased Homemaker Services to the elderly with a federal grant from the U. S. Health and Human Services and buried the indigent dead.
- ▶ Trained our staff, other governmental agencies and legislative staff on



responses to the elderly. It was provided by a federal official, facilitated by DHS (Seniors have difficulty with smell, therefore, more prone to eating spoiled food, difficulty with hearing, and recovery centers, are noisy and this results in their not advising they did not understand for fear of appearing dumb if they say no, etc.)

- ▶ Operated specialized Recovery Centers for senior citizens, along with FEMA representatives
- ▶ Served as advocates throughout the process for many on an individual basis, including assistance to employees

## LESSONS LEARNED

1. The hearing impaired are at a total loss and many become dependent on others after a disaster as almost all communication emanated from radios.
2. DHS has only two interpreters for the hearing impaired and, in the case of a disaster, we need about ten times that. Additionally, more written information needs to be developed and posted daily in central locations. FEMA's "Recovery Times" was good, but it is not timely enough to meet this need. We also probably need a centralized listing of special needs' persons. DHS is aware only of those who actually receive our services.
3. Disaster literature and programs need to also be in French, for those who do not understand English or Spanish. We also need to develop a roster of residents who speak other foreign languages to assist after a disaster. For example, we had in the Bolongo Shelter a German senior citizen and we had to look for a private citizen to communicate for us.
4. Legal guidance needs to be more readily available after a disaster for special needs' residents. We also need to start a campaign now to address property ownership issues. We have a lot of residents, particularly the low income and elderly, who live on family land or in the home of a deceased relative and they need legal guidance to ensure that they will be eligible for federal financial aid in the future, especially

since many do not have insurance.

5. We need to recognize that the poor in very small houses were at a disadvantage if they suffered severe damage. The \$25,000 Home Repair Grant was based on square footage, therefore, if you had a small home you would only get a portion of the \$25,000. Those with larger homes, got the full \$25,000, then \$12,600 from IFG to use for structure and, thereafter, more financial assistance from the American Red Cross for unmet needs. FEMA needs to be more flexible when addressing the needs of the humble poor; their homes have to be rebuilt as well.
6. We need to develop a comprehensive listing of the fragile elderly who are not DHS clients so that we can more readily assist them. Perhaps, we also need to have churches or organizations adopt groups of them and be responsible for helping these seniors in the physical preparations necessary for a storm and advocate for them in recovery.
7. FEMA used a new approach of having multiple teams sent to the Territory in stages. This resulted in our having to familiarize each new set with the quirks and details of what was in progress and it was somewhat frustrating to this local official.
8. We need to resolve more expeditiously the shelter needs of the disaster victims, particularly the special needs population. There were instances where the elderly in shelters started to decompensate after being there for over a month and had to be removed and placed in the homes for the aged. The disabled and elderly cannot, and should not, continue in shelter placement for long periods of time.

## Conclusion

The Territory has a 30% plus poverty rate, therefore, more assistance will be needed after a disaster. This is coupled with insurance costs that are so high as to make them unaffordable. We all need to find ways to address this. Many of our people are not assertive in seeking assistance, for fear of appearing rude or ungrateful, which may result

in their not appealing their denials or following through on assistance requests. We all need to work on this matter.

Major depression sets in when we hear of a storm approaching. More realistically, I think we need to start a major public information campaign to prepare folks for the fact that disasters are a way of life in the Caribbean and we have to pray that they will be smaller ones, but we have to accept that they will occur.

FEMA and the local government have been responsive to the disaster needs of the Territory, but we all need to now sit back and analyze our shortcomings. I applaud UVI for this initiative and I view it as part of the solution. Let us all continue from here.

# Comparing Hurricane and Earthquake Risk and Research Funding

## A Report

presented by:

*Walter G. Peacock, Ph.D.*  
Program Director of Research  
International Hurricane Center  
Florida International University

***Due to population concentrations and an expected increase in hurricane activity over the next 20 years (Gray), and based upon historical occurrences, it seems major losses from hurricanes are more likely than those from earthquakes. Yet the funding for mitigation clearly is in the other direction by large margins.***

- Dr. Bob Sheets, former director of the National Hurricane Center

## **Introduction**

This paper presents preliminary findings of a comparison of populations at risk for hurricanes and earthquakes. The findings present not only populations at risk, but also historical comparisons of damage resulting from earthquakes and hurricanes. In addition, preliminary analysis on the disbursement of research funding is included. The purpose of this analysis is to address some of the disparity between research funding for earthquake research and funding for hurricane research.

## **Methodology**

The findings for the populations at risk are based on 1990 Census block group data as furnished by FEMA. The FEMA data is from the CD's produced for FEMA by Roy Associates through a FEMA contract with Michael Baker Engineering. The figures reported here were calculated by overlaying the census data polygons with the polygons that represent earthquake and hurricane risk. Hawaii and Alaska are not included in the seismic database. However, it is important to note that both Hawaii and Alaska are considered a high earthquake risk, and Hawaii is also considered a high hurricane risk. Therefore, the total populations for these states are included in the appropriate risk populations.

Hurricane risk is presented for both 100 and 200 mile buffers from the east and gulf coast of the United States, from Texas to Maine. By high hurricane risk we mean populations that are vulnerable to the effects of a hurricane, both wind and rain. Twenty-three states, including Hawaii, are either totally or partially at risk to feel the effects of a hurricane. One hundred miles is considered the areas at the highest risk; however, historically, hurricane effects have been felt even further inland (inland effects of

---

Sheets, Robert, 1995. Personal Communication to James Baker, NOAA Under Secretary and Administrator.

Hurricane Hugo, for example).

High risk earthquake areas are based on county boundaries with the "Static Coefficient Aa" ground motion acceleration" as represented on NEHRP Maps. This seismic layer was furnished by FEMA. There are seven risk levels with the highest being seven and the lowest one. High Risk, for the purpose of this analysis, is considered level five and above, or coefficients of .2 or above. Fifteen states, including Alaska and Hawaii, have areas with high risk. A geographic representation of the 48 contiguous states can be seen in figure 1.

Damage and death figures from hurricanes and earthquakes have been gathered from National Hurricane Center Technical Reports. In addition, these same reports have been the source for the information on research funding. Our goal is not to present this information as new shocking information, but rather, to bring to the forefront, once again, the overwhelming inequality. This information is not new, but clearly, it is information forgotten and ignored.

## Findings

### Population

According to 1990 Census figures, the population of the United States was approximately 248,709,873. We acknowledge that populations in a six-year span (the time since the census) change, sometimes dramatically; however, these figures are still our best estimates. The close to 249 million people in the US live in approximately 102 million housing units. Of the close to 249 million people in the United States, a little more than a quarter (27.9%) are most vulnerable to feel the effects of a hurricane. More than 69 million people live within 100 miles of the Gulf coast, Atlantic coast or in the state of Hawaii. This population lives in more than 49 million housing units. While this population is most at risk for the serious effects resulting from hurricanes and tropical storms, as we all too often see, as tropical systems move inland, the effects become more widespread.

If the buffers from the coast extend inland another 100 miles (making the total coastal buffer 200 miles), an additional 26.5 million people are at risk to feel the effects of a tropical weather system. This increases the total at risk population to close to 69.5 million. In addition, close to 11 million more housing

units are at risk, increasing the total at risk housing units to a little more than 49 million. Roughly 39% of the total population, then, lives within geographic areas of high vulnerability for the effects of tropical weather systems with close to 28% at the greatest risk. Using the more conservative buffer of 100 miles from the coast, almost twice as many people are at the greatest risk for hurricanes than those at the highest risk for earthquakes.

In the United States, 14.7% (nearly 37 million people) of the total population lives in geographic areas of high earthquake risk. The vast majority of this population lives in the state of California, with the remaining population living primarily in the western United States, including Alaska and Hawaii. The exception to this is the population at risk along the New Madrid Fault in the central United States. In addition, almost 14 million housing units are within the geographic areas of high risk. This figure is close to 14% of the total housing units in the United States. Yet, while a significant number of people and housing units are at risk for earthquakes, approximately 48% more people are vulnerable to the effects of tropical weather systems. In fact, in the last 100 years, more deaths and damage can be attributed to major tropical weather systems than to major earthquakes.

#### Deaths and Damage

During the 1900's (through February 1996), approximately 15,000 people lost their lives as a result of the 30 deadliest tropical weather systems in the contiguous United States.<sup>2</sup> In fact, 15,000 is a conservative number since it does not account for storms that resulted in less than 30 deaths (such as Hurricane Andrew). Earthquakes, during this same time period, caused approximately 1,500 deaths.<sup>3</sup> Hurricanes, then, in the continental United States, caused close to ten times more deaths in the 20<sup>th</sup> century than earthquakes. During this century, hurricanes likewise caused more property damage.

Tropical weather systems in the continental United States during the last century caused significant property damage. Adjusting all losses to 1994 dollars, the 30 most costliest hurricanes

---

<sup>2</sup>Hebert, Paul J., Jerry D. Jarrell, and Max Mayfield. 1996. The Deadliest, Costliest, and Most Intense United States Hurricanes of this Century (and Other Frequently Requested Hurricane Facts). NOAA Technical Memorandum NWS TPC-1. Updated February 1996.

<sup>3</sup>Raapaport, Ed. Personal communication to Dr. Robert Sheets, Director of National Hurricane Center as compiled in Dr. Robert Sheets memorandum to NOAA Under Secretary and Administrator, James Baker.

resulted in losses of over 100.7 billion dollars.<sup>1</sup> Of the 30 most costliest tropical weather events, 23 have exceeded \$1 billion in damage with the costliest event Hurricane Andrew in 1992 with damage of over \$28.6 billion. In addition, three events in Puerto Rico and one in Hawaii resulted in damages exceeding \$1 billion.<sup>2</sup> In comparison, only 6 earthquakes in the continental United States during the 1900's have caused over \$1 billion in damage (in 1990 dollars).<sup>3</sup>

Thirteen major and 31 minor earthquakes in the continental United States and six large earthquakes in Hawaii and Alaska caused approximately \$47.97 billion in damage, less than half of the damage caused by the costliest hurricanes during the same time period.<sup>4</sup> Until the 1994 Northridge earthquake, the hurricane to earthquake damage ratio was as high as 4.5. Yet, even though tropical weather systems kill more people, damage more property, and place at risk more people and housing units than earthquakes, research funding overwhelmingly favors earthquake research over hurricane research.

#### Research Funding

Research funding disproportionately favors earthquake research. Over \$350 million annually funds earthquake research and mitigation through both the federally funded sources. The National Earthquake Hazard Reduction Program (NEHRP) which includes NSF, FEMA, USGS, and NIST funds \$100 million in research. Other federal funding from agencies including the Department of Transportation, USAID, NASA, Veterans Administration, Bureau of Reclamation, Department of Energy, Department of Defense, HUD and Health and Human Services amounts to an additional \$250 million. Of the NEHRP funding, about \$30 million is from NSF. In addition, FEMA distributes about \$15 to \$22

---

<sup>1</sup>Hebert, Jarrell, and Mayfield. p. 8.

<sup>2</sup>Hebert, Jarrell, and Mayfield. p. 8.

<sup>3</sup>Gray, William. 1995. Personal communication to Dr. Robert Sheets, then director of the National Hurricane Center. Gray cites the NOAA National Geophysical Data Center report of September 1992, titled CATALOG of Significant Earthquakes 2150 BC to 1991 AD for earthquake figures.

<sup>4</sup>Gray, p. 3.



million of the NEHRP funding.<sup>8</sup> Tropical weather systems do not have a NEHRP equivalent.

Hurricane research, mitigation and operations share about a \$50 million annual budget.<sup>9</sup> This includes funding for hurricane aircraft reconnaissance and the National Hurricane Center. In the 1994-1995 fiscal year, FEMA spent \$2.89 million on the hurricane problem, up from its previous allocation of \$0.9 million.<sup>10</sup> Just as FEMA spends 5 to 10 times as much on earthquakes than tropical weather, NSF disproportionately funds earthquake projects. According to Rappaport's sources, NSF grants for tropical weather research were \$646,000 in 1992, \$750,000 in 1993, and \$875,000 in 1994. Compared to NSF's \$30 million share of NEHRP, NSF grants close to 30 times more money for earthquake research/mitigation than for tropical cyclone research/mitigation.

The majority of federal money for hurricanes, however, does not go to research. "Most of the Federal funding for hurricanes goes to support [surveillance] and forecasting, not research... By contrast, a very high percent of Federal funding for earthquakes is directed to research. I am told that the NSF has four project monitors whose efforts go fully to earthquake research implementation. NSF has no such exclusive hurricane research monitor. Can there be any doubt that Federal research [funding] for earthquakes is quite out-of-balance in comparison with hurricane research?"<sup>11</sup>

#### **Discussion**

As we can see, during the 1900's, tropical weather systems caused more damage and deaths than earthquakes. Additionally, today, more people are at risk to feel the effects of tropical weather systems than are at risk for a major earthquake. However, funding for research and mitigation clearly goes the other way. No one can suggest that we know all that we need to know

---

<sup>8</sup>Sheets, p. 2 and Rappaport, p. 2.

<sup>9</sup>Sheets, p. 2.

<sup>10</sup>Rappaport, p. 3.

<sup>11</sup>Rappaport, p. 3.

<sup>12</sup> Dr. William Gray, noted hurricane specialist in personal communication with Dr. Robert Sheets.

about tropical weather systems, as a predictive science or as a sociological phenomenon. Neither can anyone suggest that we understand all we need to know about wind engineering. The findings presented here suggest some issues that need to be further addressed.

Clearly, we need to understand more about tropical weather systems. Our knowledge must extend beyond predicting landfall. Unlike with earthquakes, we know that we will have to deal with more hurricanes making landfall in the United States. In fact, in the first four months of the 1996 hurricane season, three storms have already affected populations on the east coast of the United States causing millions, if not billions, of dollars in damages and claiming at least thirty lives. We need more research that addresses issues related to prediction, evacuation, wind engineering, and mitigation just to highlight a few.

In order to facilitate more research, a tropical weather system equivalent of NEHRP is necessary. Only through long term consistent support can we begin to understand the dynamics of tropical cyclones. Comparative projects are necessary so we can understand not only the science of hurricanes, but also how culture and political economy alter the sociological terrain a storm travels.

In no way are we suggesting that earthquake research is over funded. Our intent is only to highlight that in comparison, hurricane research is grossly underfunded. Damage, deaths and populations at risk all emphasize indicate that we must take the hurricane problem more seriously

### *About UVI...*

The University of the Virgin Islands was chartered in 1962 as the College of the Virgin Islands. It is a co-educational, publicly funded, land-grant institution accredited by the Middle States Association of Colleges and Universities to grant bachelor of science and bachelor of arts degrees; and associate in arts and associate in science degrees and master's of arts degrees in education, business administration and public administration. UVI currently enrolls about 3,100 full and part-time students on its main campus in St. Thomas and sister campus on St. Croix. UVI conducts research in its academic divisions and at its MacLean Marine Science Center, Agriculture Experiment Station and the Virgin Islands Environmental Resource Station. It serves the community through the Eastern Caribbean Center, the Bureau of Public Administration, Continuing Education Division, Cooperative Extension Service and the Small Business Development Center.

### *The UVI Eastern Caribbean Center...*

The mission of the UVI Eastern Caribbean Center (ECC) is to foster rational development of the Eastern Caribbean, including the U.S. Virgin Islands. The ECC seeks to improve relations among the countries and territories of the region by facilitating quality collaborative ventures. It further seeks to build institutional capabilities both domestically and regionally. The ECC conducts and sponsors research in the U.S. Virgin Islands and the rest of the Eastern Caribbean, and disseminates information to enhance the contribution of scientific inquiry to human well-being in the Caribbean region.

---

**The Dynamics of Disaster - "Impact, Recovery, and Mitigation"**, was prepared for the Eastern Caribbean Center (ECC) of the University of the Virgin Islands with support from the National Science Foundation (NSF) by Jacquelyn D. Davis. Permission granted to reprint with credit to author and the Eastern Caribbean Center. The information herein does not reflect the views of the NSF or the ECC.

*To obtain copies, contact:*

Eastern Caribbean Center  
University of the Virgin Islands  
2 John Brewer's Bay  
St. Thomas, VI 00802

November, 1996