Proceedings of the Caribbean Conference on Natural Hazards: Volcanoes, Earthquakes, Windstorms, Floods

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Preface

The nations bounding the Caribbean Sea have been the sites of major natural disasters in the past. For example, the town of St. Pierre in Martinique was completely destroyed, with the loss of approximately 30,000 lives, as a result of the eruption of Mount Pelée in 1902 while the island of Montserrat has still not fully recovered from the devastation caused by Hurricane Hugo in 1989. Circum-Caribbean countries will continue to be exposed to the effects of various natural hazards such as earthquakes, volcanic eruptions, tropical cyclones, floods, etc. Several incidents since the Conference in October 1993, including five felt earthquakes of magnitude greater than 5.0 in the eastern caribbean, - three minor volcanoseismic crises in Montserrat and the extensive burning of sulphur deposits at the Soufriere in southwest Dominica, have served as reminders to the people of the region of the dangers they must coexist with.

The nature of each hazard is different and the level of awareness and degree of preparedness to cope with a particular hazard varies from place to place mainly depending on its frequency of occurrence. However, although local losses from natural hazards, in terms of economic damage, loss of life and injuries, fluctuate from time to time, the vulnerability of people and their property to damage from natural hazards increases with rapid population growth, increased urbanization and the dependence on sophisticated infrastructure.

The occurrence of one or more of these natural phenomena in certain areas is inevitable. But losses from them can be substantially reduced by the adoption of certain mitigating actions. Adoption of measures to mitigate the effects of earthquakes, volcanic eruptions, tropical cyclones, floods or landslides requires a clear understanding of where and why these phenomena occur, the recurrence rates for the large events and the possible locations and severity of hazardous effects that they can generate. In particular, the importance of attempting natural risk mitigation within a regional framework cannot be understated for the small island states. The International Decade for Natural Disaster Reduction (IDNDR: 1990-1999) provides an additional impetus towards attempting to effect some of these goals.

In October 1993, to commemorate the 40th anniversary of the Seismic Research Unit (SRU) of The University of the West Indies (UWI), St. Augustine, and as an activity of the IDNDR, a Caribbean Conference on Natural Hazards was organized and hosted by the SRU and the Department of Civil Engineering, with support from several local and regional organizations including:

- Centro Regional de Sismología para América del Sur (CERESIS)
- Caribbean Disaster Emergency Response Agency (CDERA)
- Association of Professional Engineers of Trinidad & Tobago (APETT)
- Department of Physics, UWI, St. Augustine
- Geological Society of Trinidad & Tobago (GSTT)
- Association of Trinidad & Tobago Insurance Companies (ATTIC)
- National Emergency Management Agency of Trinidad & Tobago (NEMA)
- Trinidad and Tobago Bureau of Standards (TTBS)
- Trinidad and Tobago Institute of Architects (TTIA)
- Meteorological Service of Trinidad & Tobago

The theme of the Conference was "Improving natural hazard awareness and reduction in the circum-Caribbean region" and its purpose was to provide an opportunity for individuals

or groups involved in hazard assessment, vulnerability reduction and disaster management in the Caribbean, Central America and northern South America to:

(i) Present results of current research focussing on the region.
(ii) Identify regional problems of outstanding interest in these fields and put forward suggestions as to how these could be tackled cooperatively by regional institutions.
(iii) Share monitoring and analysis technology and risk mitigation strategies developed at regional and extra-regional institutions.

The major topics of the Conference were:

(i) Earthquakes, earthquake hazards and risk.
(ii) Volcano and earthquake monitoring instrumentation.
(iii) Volcanoes, volcanic hazards and risk.
(iv) Engineering for wind and earthquake forces.
(v) Windstorms, floods, storm surges.
(vi) Mitigation of natural disasters.

The five-day long (October 11-15) Conference was attended by more than 150 individuals from 33 countries involved in research or other activities related to natural hazards, especially as applied to the Caribbean, Central America and northern South America. This included geoscientists, engineers, architects, planners, policy makers, oceanographers, insurance executives, disaster managers, meteorologists, medical doctors, etc. In addition to the main conference, the Organization of American States (OAS) and the Pan American Health Organization (PAHO) ran concurrent workshops focussing on vulnerability reduction in schools and hospitals respectively. A meeting of the CERESIS governing council was also held during the Conference period. The IDNDR day on Wednesday October 13, coordinated by CDERA, was devoted to general aspects of disaster mitigation and management with a view towards enabling Caribbean participants to discuss accomplishments and formulate strategies in view of the World Disaster Conference which was to be held in Japan in May 1994.

Fifty-nine oral and poster presentations,of which five (5) were keynote lectures, were made in the main Conference sessions. The invitation to authors to submit their papers for publication in a Conference Proceedings yielded thirty-five (35) complete manuscripts. This publication is a collection of those papers, together with the abstracts for presentations for which complete manuscripts were not received.

The papers cover a broad spectrum of topics, display a good mixture of basic and applied research and, with the exception of windstorms and floods, can be considered as providing a representative sampling of the multidisciplinary and wide-ranging nature of the investigations undertaken to improve our understanding of natural hazards and how to mitigate their effects. The approximate split in papers is about 17 in seismology, 1 in instrumentation/networks, 3 in volcanology, 1 in meteorology, 10 in engineering for earthquake and wind forces and 3 on socio-economic and public issues. The small number of contributions for windstorms and floods is attributable to the lateness in including these topics since the Conference was originally being organized to cater for volcanic- and earthquake-related hazards only.

Although some aspects of natural hazards are better understood and documented than others, the Conference presentations and accompanying discussion clearly pointed to the necessity in the Caribbean for improved volcano monitoring using such modern technology as GPS, further work on establishing quantitative seismic hazard levels, the revision of the Caribbean Uniform Building Code (CUBiC) and improved dissemination of research results to end users who, in most cases, are not members of the academic community.

The papers are published in an order slightly different from how they were presented at the Conference. However, with few exceptions, the individual papers and their groupings

are arranged in a manner which I hope the readers will find to be logical and consistent. This publication should hopefully significantly add to the currently small amount of literature available on natural hazards focussing on the Caribbean region.

The Caribbean Conference on Natural Hazards: Volcanoes, Earthquakes, Windstorms, Floods would not have taken place without the generous material and financial support provided by the following institutions, companies, organizations and individuals:

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Contents

Seismicity, Tectonics and Crustal Structure

Attenuation and Site Effects

Seismic Hazard

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(their addresses are at the beginning of their respective contribution)