

**A REPORT ON THE COMMONWEALTH SCIENCE COUNCIL SPONSORED VISIT
OF DR. H. K. GUPTA TO JAMAICA, TRINIDAD AND BARBADOS DURING
AUGUST, 1995 IN CONNECTION WITH EARTHQUAKE HAZARD ASSESSMENT
AND MITIGATION PROJECT.**

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EXECUTIVE SUMMARY

I. Earthquakes are one of the worst natural calamities. Considering the vulnerability of developing countries to earthquakes, the Commonwealth Science Council, in collaboration with the National Geophysical Research Institute, Hyderabad has decided to undertake a project on earthquake hazard mitigating in developing common wealth countries. As a first phase of this programme, Dr. H. K. Gupta, Director National Geophysical Research Institute, visited Jamaica, Trinidad & Tobago and Barbados between 6th and 18th August 1995 for a study aimed to “Compile all available information on earthquake hazards including assessment and mitigation with a view to suggest ways for preventing future occurrences”.

II. The Caribbean islands have been seismically quite active. Investigation of the region defined by Latitude 15N and 25N and Longitude 90W and 75W contiguous with the region with latitude 0-25N and 75-50W including Caribbean countries was carried out for historical seismicity. One of the products is a list of earthquakes of magnitude 7.5 and larger. This includes 26 earthquakes. The earliest well documented event belonging to this category occurred in 1692 and the latest in 1976.

III. During the short visit to 3 island nations namely, Jamaica, Trinidad & Tobago and Barbados, detailed discussions were held with seismologists, engineers and administrators. Facilities for earthquake recording and analysis were visited. Sites of landslides following the Woodward earthquake of January 13, 1993 near Kingston was also inspected.

In the following, recommendations specific to these countries are included.

Jamaica

- 1) There is a need to add at least a couple of scientists to the Earthquake Unit, which is understaffed at the moment, and upgrade the existing seismic stations with modern data acquisition and transmission capabilities. A few strong-motion seismographs need to be added to the network. The central recording station at the Mona Campus also requires upgradation.
- 2) There is need to put together seismic data from Caribbean and nearby seismic stations to improve estimation of earthquake parameters.
- 3) The available earthquake information and geological data needs to be merged to develop suitable seismotectonic maps.
- 4) There is scope to apply Global Hazard Assessment Program (GSHAP) approach to Jamaican data to generate necessary earthquake hazard scenarios.
- 5) The National Building Code of Jamaica needs to be updated through suitably adopting CUBIC and taking into account the lessons learned from the recent earthquakes.
- 6) Potential areas of landslides and soil liquefaction need to be identified.
- 7) Preparation of seismic micro-zonation map of Kingston is urgently required.
- 8) Several important buildings in Kingston and elsewhere need retrofitting to better withstand future earthquakes.
- 9) Most of the buildings are constructed without following building codes. Efforts should be made to make it mandatory to follow building codes, particularly for the public buildings.

Trinidad & Tobago

- 1) The Seismic Research Unit at the University of Trinidad, St. Augustin Campus is doing a good job of managing data of 30 odd seismic stations flowing in. The data has been used for locating earthquakes and estimating their focal parameters. It is necessary to fold in the available information on geology and tectonic in preparing appropriate earthquake hazard maps for Trinidad and Tobago.
- 2) Several strong motion accelerographs need to be deployed.
- 3) It would be useful if NIHERST can take the initiative for collating all available information on important features like soil properties, soil liquefaction etc. so that more meaningful earthquake hazard maps can be compiled.
- 4) There is a need of creating a database for the Caribbean region where all geotechnical data could be stored and retrieved by the users.
- 5) Several buildings require retrofitting.
- 6) CUBIC should be made simple and easily understandable for public to use,
- 7) Making the Building Code mandatory, should be seriously considered.

Barbados

- 1) It is desirable to have a couple of seismologists trained and attached to either the Energy Division or the Caribbean Meteorological Institute.
- 2) There is a need for a Geotechnical Database.
- 3) Coastal conversation and possible threat from tsunamis-related studies need to be undertaken.
- 4) Building Code needs implementation at least for double storey buildings.

IV. On the basis of the visit to earthquake related facilities in the three Caribbean island countries, interaction with concerned officials and survey of the literature, the following general **recommendations** are made:

- 1) Damaging earthquakes have occurred in the past in the Caribbean and will occur in future. It is therefore necessary to assess the seismic hazard making use of the available data and modern approaches of hazard estimation.
- 2) The seismic stations currently operated need upgrading and a few stations need to be added to fill up the gaps.
- 3) Strong motion data in Caribbean countries is lacking. Several strong-motion accelerographs need to be deployed.
- 4) It is necessary to merge the seismic data of the Caribbean islands with the available seismic data from nearby regions.
- 5) It is desirable to add individuals to the existing infrastructure as well as train them on topic of seismic data acquisition, analysis and hazard estimation.
- 6) It is noticed that in developing countries a large number of people live in non-engineered buildings. It is therefore necessary to train the local engineers, managers on adopting approaches to make non-engineered structures earthquake resistant. Suitable training courses in this direction have already been developed. Such courses should be conducted in Caribbean islands.
- 7) Important civil buildings require retrofitting to combat possible earthquake hazard.
- 8) It is necessary to create a regional geotechnical data centre where all the available geotechnical data could be stored and made available to users.

- 9) Currently Building Codes in Caribbean countries are not followed. The existing building code "CUBIC" needs to be simplified and suitably adopted in various Caribbean countries based on local requirements. A simplified version of CUBIC which is easily understandable by public should also be made available.
- 10) Efforts have been made in a few Caribbean countries for disaster management which need modernization and suitable adoption in other Caribbean countries to suit local requirement.
- 11) The available earthquake information and geological data need to be merged to develop suitable seismotectonic maps. In a few of Caribbean island countries, such as Jamaica, it is possible to apply Global Seismic Hazard Assessment Program (G-SHAP) approach to generate necessary earthquake hazard scenarios.
- 12) Finally, there is a need of developing and implementing an action programme through support from outside agencies to minimize earthquake hazard in Caribbean. It should have two components:
 - a) Work to be done and/or additional facilities to be added in individual countries (such as addition/upgradation of data acquisition facilities building codes, microzonation, retrofitting etc.)
 - b) Creation of central common facilities (such as databases, training, education, international interaction etc.)