

Pan American Health Organization

Grenada after Hurricane Ivan

Second Interim Report
on the
Damage to Selected Healthcare Facilities

by
Tony Gibbs
CEP International Ltd

30 September 2004

Acknowledgments

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Hon Ann David-Antoine – Minister of Health & the Environment
Mrs Gemma Bain-Thomas – Permanent Secretary, Ministry of Health & the Environment

Pan American Health Organisation:

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Introduction

The Event

Hurricane Ivan struck Grenada in the afternoon of Tuesday 07 September 2004. According to the National Hurricane Centre (Miami) the eye of Ivan passed about 10 km south of the airport at Point Salines. According to the National Hurricane Centre the sustained (1-minute) wind speed in the eye wall at that time was 120 mph. The Caribbean Uniform Building Code (CUBiC) prescribes a reference (50-year return period) pressure equivalent to a 1-minute wind speed of 85 mph. Therefore the wind forces due to Ivan in the north eye wall (*ie* the southern part of Grenada) could have been of the order of twice what was envisaged for non-critical facilities by CUBiC. Critical facilities, such as some healthcare facilities, would warrant design forces between 25% and 50% higher than for non-critical facilities.

A mitigating factor was that the hurricane had an unusually fast forward motion so that it did not linger over Grenada. This would have reduced the structural damage. In addition, fast-moving hurricanes deposit less rain on the target area.

Assignment

The Pan American Health Organisation (PAHO) commissioned CEP International Ltd to undertake an assessment of the damage to eleven healthcare facilities in Grenada.

The Brief

A first report estimating the cost of repairs to the facilities was to be presented by 22 September 2004¹ in order to provide information for ECLAC's study for the Government of Grenada and for the UN in Geneva. This was done by means of a very rapid assessment on 21 & 22 September. The summary of the results of that very rapid assessment are in an appendix dated 24 September 2004. (This was a revision of the original document submitted on 22 September 2004.)

This second report on repair costs is aimed at a donor's conference scheduled for early October 2004. It revises the costs on the basis of more detailed examinations and measurements of the facilities

¹the 49th anniversary of Hurricane Janet in Grenada

which took place from 23 to 30 September 2004. This second report is due for delivery by the end of 30 September 2004.

A third and final report will be prepared with a wider brief including diagnoses of failures, vulnerability assessments and retrofitting recommendations. The third report is to be completed by the end of November 2004.

The Observations

Limitations

In the time available we were able to observe the nature of the damage to the facilities without the benefit of invasive investigations. We were not able to interview all of the custodians of the various facilities. It is expected that this would be achievable during the final phases of the assignment in October and November 2004.

Extent of Damage to Buildings

All of the facilities suffered some damage. None was completely destroyed. The amount of damage varied from 5% to 75% of the individual facilities taken as a whole.

Roofs

Wherever there was damage it was likely to be to the roofs. Almost all of the roofs suffered sufficient damage to impair the efficient functioning of the facilities. In some cases only the roofing (weather covering) was lost. In such cases the buildings would leak profusely whenever there was rainfall. In other cases the roof structure was lost completely or in large measure. In such cases the process of repair would be much more time-consuming and expensive.

Vertical Envelopes

The other envelope components that suffered damage or complete loss were windows and external doors. In some cases even the shutters protecting windows were damaged or removed completely.

Structures

There were some cases where entire structures were destroyed.

Meteorological Context

None of the above should be surprising if we are to accept the wind hazard information provided by the National Hurricane Centre on Ivan. We were unable to obtain any anemometer records in

Grenada. In the absence of such records the National Hurricane Centre is probably our best guide as to the intensity of Ivan.

Anomalies

It is a common observation in great hurricanes that there are some houses which suffer no damage. We saw a few such examples in our inspections. Those examples were unremarkable in shape, materials and other external characteristics. By that we mean that those buildings seemed similar to many others that had been damaged significantly. It would be worthwhile studying those examples much more closely during the remainder of the assignment.

Climate Change

Much controversy surrounds this subject. There is certainly no unanimity among scientists about the extent of global warming and effect of global warming on the weather patterns of this planet.

Increases in Frequency and Intensity of Windstorms

There is a general feeling that windstorms have increased in frequency and severity in recent decades. This “feeling” is unreliable as a measure of the facts. Certainly there has been a dramatic and irrefutable increase in economic losses during the past three decades as compared with earlier decades. But this has more to do with demographics than with the weather. The trend is for population shifts towards coastlines which are more vulnerable to windstorms and for greater concentration of populations in urban areas as opposed to dispersed rural agricultural communities. Also there is the much better reporting of disasters through global television networks. As recently as 1976 an earthquake in Tangshan (China) killed several hundred thousand people and yet went largely unreported for months. Much less cataclysmic events are known of instantly around the world today.

Nevertheless, it is worth examining the possible effects of climate change on the frequency and severity of wind hazards.

The Greenhouse Effect

The main source of energy for our planet is the sun. In spite of the considerable amount of energy provided by the sun (about 20,000 times as much as the total of all man-made power stations on earth) the temperature of the earth would be 30 degrees celsius colder were it not for the blanketing effect of the atmosphere. This is the so-called greenhouse effect. The atmosphere consists mainly (99.9%) of nitrogen, oxygen and argon. The remaining trace gases are mainly water vapour, carbon dioxide, ozone and methane. An important function of these trace gases is to absorb the thermal radiation emitted by the earth and send it back to the earth’s surface thus reducing dramatically the

loss of heat. An increase in these greenhouse gases is therefore blamed for global temperature rise. Global temperatures have been measured accurately and reliably for over 100 years. The absolute rise has been quite small (less than 1 degree celsius) during this period. However the rate of rise has increased quite dramatically during the past thirty years, hence the alarm.

Deforestation and Industrialisation

Natural forests covered 35% of the earth's surface as recently as the nineteenth century. Now that figure has been reduced by a third. This has resulted in a significant change in the water and radiation balance of the planet. An even more important development is the use of fossil fuels (coal and oil) for our energy needs. This leads directly to an increase in the carbon dioxide content of the atmosphere. Various models predict a range of temperature rises for the planet. That range is between 1 and 5 degrees celsius over the next sixty years. Two-thirds of this increase is attributable to increases in carbon dioxide and chlorofluro-carbons (CFCs). (CFCs are used as propellants in sprays and in refrigerators and foamed plastics.)

Munich Reinsurance

Dr Gerhard Berz, Head of Munich Re's Geo Risks Research Department, states:

“We will have to get used to the fact that hot summers like the one we had in Europe this year² must be expected more frequently in the future. It is possible that they will have become more or less the norm by the middle of the century. The summer of 2003 was a ‘summer of the future’, so to speak. For many years we have been warning about the elevated danger of heat waves and the associated problems and risks. Warmer summers mean a rise in the intensity and frequency of severe weather events. A heated-up Mediterranean and a warm North Atlantic increase the risk that particularly strong low-pressure systems will form in autumn and winter with torrential rain and extreme wind speeds. This was confirmed by the devastating floods in southern France at the beginning of December and the intense low-pressure system called Jan over west and central Europe shortly before Christmas.”

The quickening pace and diversity of climate change serves only to raise the stakes in this high pressure game.

The Results

Damage Levels

Information on damage levels for the individual buildings within the facilities are summarised in

²2003

Appendix B to this report. These are based on the more detailed assessment of 23 to 30 September.

Repair Costs

The estimates based on the very rapid assessment of 21 & 22 September are presented for completeness in Appendix C.

The estimates based on the more detailed assessment of 23 to 30 September are presented in Appendix D. These are the current figures which should be used until the final report is issued towards the end of November 2004. It must be noted that these current figures do not consciously allow for any retrofitting which may be indicated by the vulnerability assessments to be conducted in October and November. In particular, no account has been taken of the earthquake hazard in estimating repair cost at present. This will be done for the final report.

Photographs

A selection of photographs taken between 09 and 28 September are attached as Appendix A.

Appendix A

Photographs