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Taking Responsibility

Resilience Potential: Assessing Jamaica's "Bounce-Back" from Hurricane Dean

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Preface

With the passage of Hurricane Dean, Jamaica faces a unique opportunity to take stock of its hurricane-preparedness and disaster-management techniques. Supported by a grant from the Jamaica National Building Society, the Caribbean Policy Research Institute (CaPRI) conducted a detailed assessment of damage and citizens' responses. This paper presents the findings of that exercise, and its hoped that the discussions will help to shape national dialogue as it pertains to disaster risk reduction.

The input of many persons and institutions is acknowledged. The Planning Institute of Jamaica was very helpful in sharing the results of its post-Dean damage-assessment and in that regard special thanks is extended to Dr Wesley Hughes, Director-General of the Planning Institute of Jamaica. Additionally production of this paper was facilitated by inputs from Claire Bernard, Fitz Blair, Richard Case, Anthony Clayton, Kwesi Dennis, Sharlene Findley, Michelle Harris, Peter Jervis, Natainia Lummen, John Rapley, Balfour Spence, Kim-Marie Spence, Lloyd Waller, Tina Williams, and Cordia Thompson. Special thanks to the Jamaica National Building Society for underwriting the research leading to this paper.

As with all CaPRI's output, readers are encouraged to share their views with the organisation, as it is through informed dialogue that Jamaica will achieve greater disaster resilience potential, both nationally and at the community level.

Executive Summary

Climate Change researchers have constantly predicted a rise in the frequency and intensity of hydro-meteorological activities, including storms in the Caribbean. Jamaica's recent experiences with more intense and more frequent high magnitude storms appears to validate these predictions. After a prolonged period of relative inactivity prior to the 1980s the island has experienced increased numbers of high magnitude storms and extended periods of high intensity rainfalls. It is in that context that there is a need to reflect on the climatic challenges that face Jamaica, and the measures that are required to mitigate their impact.

As an island with a large proportion of the population relying on the agricultural sector, high population density in coastal areas and urban centres, an extensive road network and an economic dependence on the natural environment, Jamaica is particularly vulnerable to hurricanes. Storms and heavy rains cause extensive damage to the country's infrastructure, hinders economic growth, and contributes to increased levels of inflation. Consequently the sustainability of development in Jamaica is hinged on its capacity to effectively cope with more frequent hurricanes and to recover from their impacts. If economic stagnation related to the impact of hurricanes is not to be the norm, then Jamaica will need to improve the resilience of its economic sectors and that of its citizenry at large. The clamour is not for the creation of an ideal hurricane proof island but rather for greater realisation of the resilience potential.

The passage of Hurricane Dean provided an opportunity for the assessment of the level of resilience in the Jamaican economy and in communities; such an assessment can provide indicators of the stress thresholds existing in the society, and the capacity for rebound. Through a detailed examination of the storm's macroeconomic impacts, and through a field survey which examined the storm's impacts at the micro-level, as well as the country's response, this study has identified a number of options for future action. Although apparent improvements in Jamaica's resilience are identifiable there is evidence that much more remains to be done. For instance, the country needs to more effectively integrate state agencies and the communities into a comprehensive disaster-mitigation plan. It must also launch a debate as to the future of

rural Jamaica in light of the great cost involved in maintaining both rural infrastructure and certain parts of the agricultural sector. Other practical measures – from improving the nation's roofing-stock to applying proper standards in road-construction, as well as accelerating reconnection times of the principal utilities -- can be taken to make both the economy and society more resilient. Finally, some sub-sectors of the economy show a greater ability to resist storm damage than others, and these should probably be privileged in future development policy.

This report is not a final assessment. It is just a beginning, and dovetails work being done by other agents. Its aim is to help start a national dialogue on the way forward for Jamaica. These are, and will continue to be, trying times. But the country has a substantial stock of ingenuity upon which to draw in meeting the challenges, and it is incumbent upon the policy and political processes to help marshal that ingenuity.

Introduction: Resilience Potential

Vulnerability has been a key factor in the growth performance of Caribbean economies throughout their history. It is now well established that Caribbean states, Jamaica included, suffer from a particularly high degree of exposure to external shocks.[1] But the literature also contends that vulnerability is not the sole determinant of growth performance. Good policy can mitigate vulnerability in such a way as to minimise its detrimental impact, enabling Caribbean countries to better take advantage of the assets they have.

Climate-related events are among the external shocks that threaten Caribbean countries. Susceptibility to these events including hurricanes is reflected in extensive destruction to environment, infrastructure and human populations. These climatic shocks, particularly hurricanes are anticipated to become more prevalent as climate changes and will therefore further challenge the growth and development prospects of the region, unless a comprehensive approach to related policy formulation and implementation is adopted.

Comparative literature has noted, that government policies can mitigate vulnerability. This paper proposes to use the lens of Hurricane Dean to focus on the topic of Jamaica's vulnerability to hurricanes, and the effectiveness of existing policy response. The recent spate of high magnitude hurricanes, beginning with Hurricane Ivan in 2004, through Emily and Dennis in 2005 and Hurricane Dean in 2007, signifies increasing impact, the mitigation of which must be mainstreamed into future economic planning. Such events have in the past derailed economic projections and in the case of Hurricane Dean the projected economic growth for 2007 was reduced by 50% and the impact will add two percent to the inflation rate (inflation itself being inimical to growth, owing to its impact on purchasing and investing decisions). In the past, hurricanes had the ability to knock a growing economy off track. Unless Jamaicans are prepared to resign themselves to a generation of economic stagnation, we will have to overcome this challenge. Clearly, Jamaica will never be

[1] See, for example, Lino Pascal Briguglio, Lino Pascal, "Small Country Size and Returns to Scale in Manufacturing," World Development 26.3 (1998): 507-515; John Gafar, "Poverty, Income Growth and Inequality in Some Caribbean Countries," The Journal of Developing Areas 32.4 (summer 1998): 467-490; Ronald Ramkissoon, "Explaining Differences in Economic Performance in Caribbean Economies," (Aug.25, 2005) <www.cid.harvard.edu/events/papers/Paper_Caribeean%20.doc-24Aug2005.

able to render hurricanes inconsequential, but the country should endeavour to move as close as possible to the ideal goal of zero impact, in terms of both growth and inflation.

To do this, there is a need to improve both the resilience of the economy and the society, in order to accelerate "bounce-back" i.e. the amount of time it takes to restore economic activity, after a storm. In some respects, the country has come a long way in terms of its resilience, as is evidenced by declining number of death from hurricane impacts. There is therefore a need to replicate these positives in the economy. This paper therefore highlights national response to Hurricane Dean in order to identify weakness in the resilience of the economy, the public sector, and the society at large. Identification of these gaps will help to inform remedial measures that can enhance economic resilience and assist in the gaining a closer insight of sub-sectors that are likely to more resilient than others. This process will provide the directive for the promotion of more resilient industries in future economic planning.

The findings of this paper are based on a critical analysis of the official impact assessment compiled by the PIOJ[2]; in conjunction with a field survey conducted by the Caribbean Policy Research Institute (CaPRI), of affected communities in southern Jamaica, shortly after the storm.[3] The survey sought to ascertain citizens' responses to the storm in a socioeconomic cross-section of communities where the brunt of Hurricane Dean was felt. The key purpose was, first, to determine how different subsectors of the economy were affected by Dean; and second, to compare citizen and public sector preparedness and response strategies and identifying areas of weakness. It is in this regard that we seek to identify specific recommendations which could be used to guide future policy, in order to make Jamaica ever more "hurricane-resistant."

[2] Planning Institute of Jamaica, "Preliminary Assessment of the Socio-Economic and Environmental Impact of Hurricane Dean on Jamaica", September 2007.

[3] The Research Design used for this study was a Small Scale Descriptive Case Studies one. Such a study describes in-depth, the characteristics of a limited number of 'cases'. In this instance the cases were several communities located in 7 parishes along the southern belt of Jamaica - the unit of analysis. Data collection occurred a month after Hurricane Dean, beginning the 20th September, using an instrument designed to ascertain to answer two research questions. These were 1) What activities need to be undertaken by Jamaican communities in order to minimize possible damage in the event of a Hurricane? and 2) What factors play an important role in the rapid recovery of Jamaican communities after a Hurricane? A multistage sampling technique was used and the sample size was 300 (the sample size available to us given time and resource limitations). Given the nature of the small SSDCS research design, the analysis of the data was limited to univariate analysis. More specifically the analysis of frequency tables as such an approach is unable to ascertain accurate levels of causality.

1. Natural Disasters: The Global Context

During the 1990s, several high-magnitude natural disasters occurred in both developed and developing societies. The types of natural hazards that triggered these disasters varied from less predictable occurrence of earthquakes, to more predictable seasonal floods and storms. Other less immediate and slowly evolving hazards such as drought and environmental degradation affected even more people with potentially greater costs for their future. More than anything else, the media images of natural disasters at the close of the twentieth century underscored the human consequences and social dimensions of these events. For instance, Hurricane Mitch damaged up to 70 per cent of the infrastructure in Honduras and Nicaragua in 1998, devastating the economies of Central American countries, which are yet to recover fully. One year later, the worst cyclone in 100 years hit the Indian state of Orissa, affecting ten times as many people as Hurricane Mitch, and destroyed18, 000 villages in one night. [4]

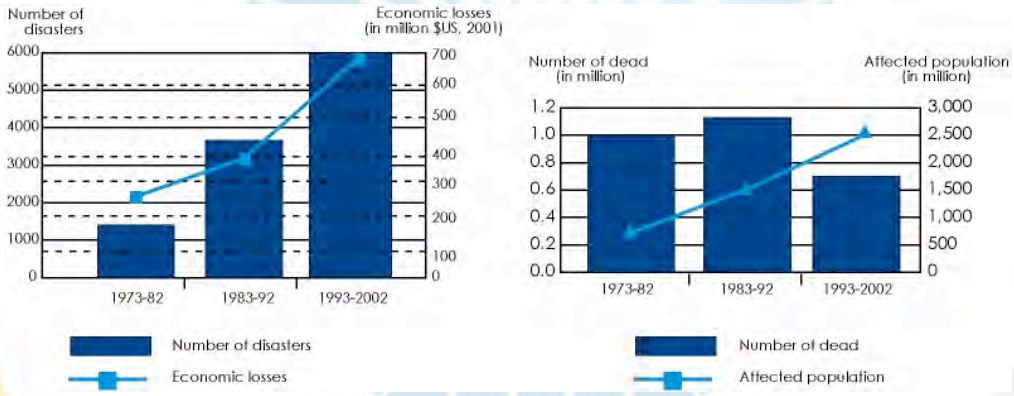
The trend during the last three decades shows an increase in the number of natural hazard events and an increase in the number of affected populations (Figure 1). It is noteworthy however that, even though the number of disasters has more than tripled since the 1970s, associated death has been reduced by 50 percent. Nonetheless, the economic cost of these disasters has increased phenomenally. Global annual economic losses associated with such disasters have increased, which averaged US$75.5 billion in the 1960s, rose to US$138.4 billion in the 1970s, US$213.9 billion in the 1980s and US$659.9 billion in the 1990s.[5] In 2000, the insurance industry recorded 850 major loss events in the world, one hundred more than the previous year. While disaster-related losses in 2000 were lower than the US$

See UN/ISDR, Living with Risk: A Global Review of Disaster Reduction (Geneva: United Nations International Sustainable Development Reduction, 2004.)

[5]See UNDP, *A Global Report: Reducing Disaster Risk: A Challenge For Development,* (New York: United Nations Development Programme, 2004). http://www.unisdr.org/eng/about_isdr/bd-lwr-2004-eng.htm ; See CIFEG, *Diagnostic Study for the DIPECHO Action Plan for Central America and the Caribbean,* (Brussels: International Centre for Training in the Geosciences 1997).;Mohammed Dore and David Etkin, (2002) *Natural Disasters, Adaptive Capacity and Development in the 21st. Century,* in Mark Pelling, *Natural* Disaster and Development in a Globalising World *(*London: Routledge,2002); See UN/ISDR, *Countering Disasters, Targeting Vulnerability,* (Geneva: United Nations International Sustainable Development Reduction, 2001).
<http://www.unisdr.org/public_aware/world_camp/2001/pdf/>

100 billion of 1999, the UN/ISDR (2004) argues that they provide little comfort to the overall trend during the past decade. Overall, the 84 great natural disasters recorded in the 1990s number three times as many as those that occurred in the 1960s. Indeed, the combined economic loss of US$ 591 billion in the 1990s was eight times greater than that of the 1960s. Ten thousand people died in natural disasters in 2000, compared to more than 70,000 in the previous year, or over 500,000 in the previous ten years (Figure 2). These figures must be treated with caution though, as the accompanying social and economic cost of disasters is difficult to estimate.[6] The Caribbean experience thus mirrors a global trend: the challenge of protecting human lives from natural disasters has largely been met, and the challenge is now to turn attention to the ever-worsening economic threat.

Figure 1: Economic and Human Impacts of Disasters 1973-2002



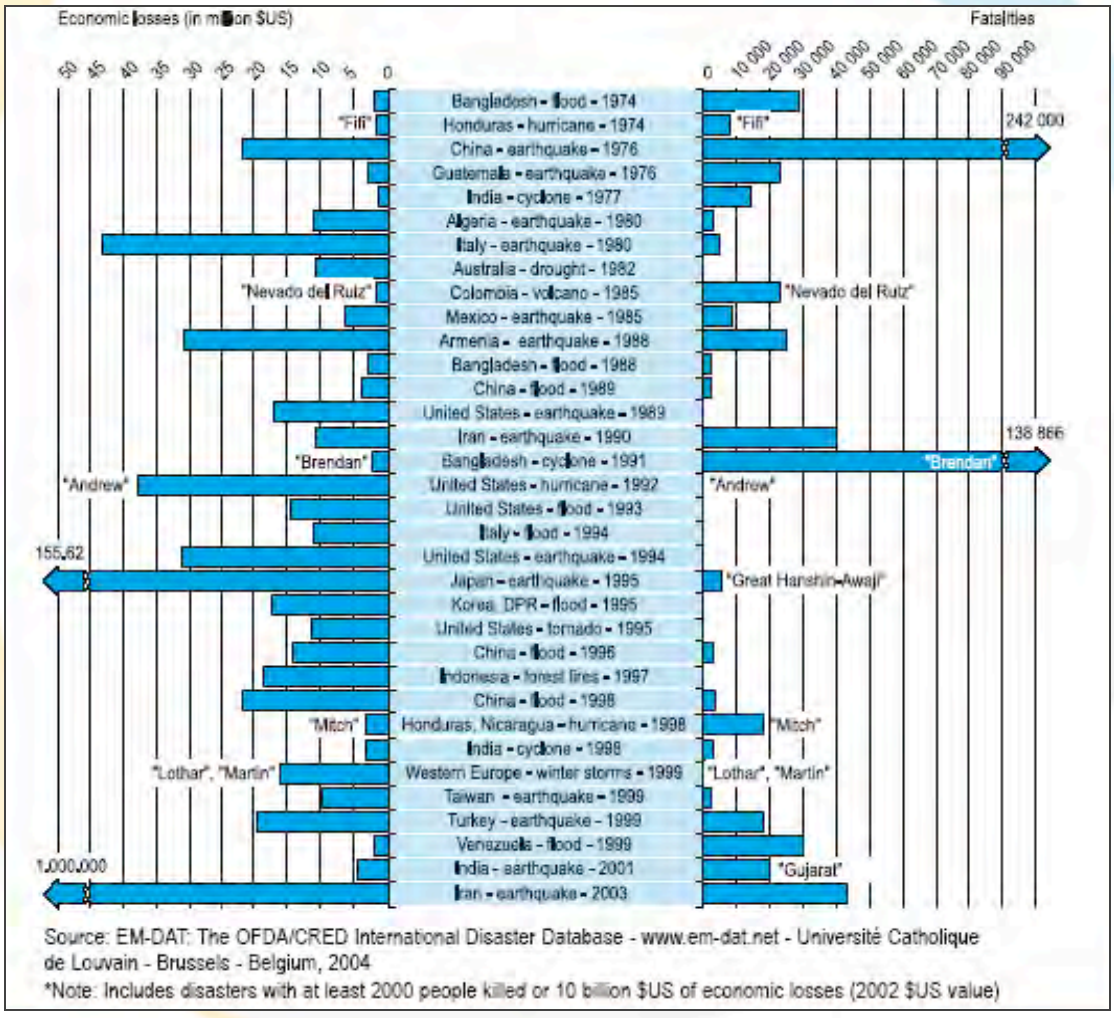
Source: EM-DAT: The OFDA/CRED International Disaster Database - www.em-diat.net-Université Catholique de Louvain - Brussels - Belgium, 2004
*Note: Includes drought, earthquake, epidemic, extreme temperature, famine, flood, industrial accident, insect infestation, miscellaneous accident, land/debris-slides, transport accident, volcano, wave/surge, wildfire and windstorm.

Disasters seem to have a disproportionately large impact on very poor and very rich societies. The percentage of economic loss in relation to the Gross National Product (GNP) in developing countries far exceeds that in developed countries and it is even more relevant for Small Island Developing States (SIDS), such as those found in the Caribbean Sea, with long-term consequences for human development. In very poor societies with few valuables, natural disasters result in the highest casualty totals, as

[6] UN/ISDR, 2004

demonstrated in the impact of the May 2004 flood rains in Haiti. In contrast, the impact of natural disasters on richer societies is the converse, with fewer casualties but much higher property damages. This sheds some light on the Jamaican experience: it is perhaps a measure of the country's relatively good record on social development that it must now turn its attention to managing the economic impact of hurricanes, the greater future threat.

Figure 2: Major Disaster Impact in the last 30 Years



Source: EM-DAT: The OFDA/CRED International Disaster Database - www.em-dat.net - Université Catholique de Louvain - Brussels - Belgium, 2004
*Note: Includes disasters with at least 2000 people killed or 10 billion $US of economic losses (2002 $US value)

Disasters not only affect the poor and characteristically more vulnerable countries but also those thought to be well protected, as is evidenced by the recent experiences of Canada, Czech Republic, France, Germany,

Poland, United Kingdom and United States with regard to record-setting floods of such magnitude that previously accepted procedures for protection and the utility of structural barriers have had to be re-evaluated. [7]

While the drama of disasters and the urgent international activity to provide emergency relief commands the attention of the international media for only a few days, the consequences of disasters last much longer and are more poignantly measured in isolation – lives lost, livelihoods disrupted, property destroyed and environments damaged. These losses impede human development and often erode previously hard-won individual and national accomplishments. They also compromise current and future resources upon which present and future generations depend.

There is a growing acceptance that the risk of disasters is fundamentally linked to environmental problems and unresolved issues essential for sustainable development. More countries now accept that political leadership cannot be allowed to focus only on loss and destruction of social assets and economic resources but in addition disaster reduction policies and measures need to be implemented with the aim of enabling societies to be more resilient to natural hazards and ensuring that development efforts do not increase vulnerability to those hazards. It is equally significant that the reduction of risks is viewed as a continuous series of endeavours pursued across social, economic, governmental and professional sectors of activity. [8]

Instead of being understood as a specialization of security, emergency services or experts, comprehensive disaster risk reduction needs to involve many segments of society – starting with those members of the public who are themselves most exposed to anticipated hazards.

This understanding is essential if communities are to become more resilient to the effects of hazards so that disaster losses can be reduced in coming years. Such socially engrained and professionally routine activities make the news much less often, perhaps because they are mostly concerned with people doing their work, focused on incorporating risk awareness into their daily existence. Nonetheless, they are the key to successful, and sustainable, disaster reduction strategies.

[7] UN/ISDR 2004, 4.
[8] Ibid., 8.

2. Natural Disasters in the Caribbean

Over the past three decades, more than 150 million people have been affected by environmental disasters, of which more than 100,000 have died and more than 12 million have been direct victims of these phenomena in Latin America and the Caribbean. In addition, the total amount of damage caused by disasters for the entire region is more than US$65million. Small Island Developing States (SIDS) in the Caribbean are among the most affected. The CRED database shows 475 disasters in 30 countries within the Caribbean between 1990 and 1996. Hurricanes and storms account for 47 per cent, floods for 29 per cent, earthquakes for 10 per cent and eruptions and droughts for 5 per cent each. [9]

Historically, environmental hazard-events such as hurricanes, storms, droughts, landslides and volcanic eruptions are the bane of the Caribbean, causing widespread damage and deaths in the region. With the exception of Guyana, Caribbean territories fall within the hurricane belt and have all experienced the impact of meteorological disasters. The region has experienced major hurricanes such as Hugo, Andrew, Gilbert, David, Floyd, and Lenny. The primary economic base of the Caribbean region, with its focus on agriculture, tourism, forestry and fisheries exports, makes the economies of the region extremely susceptible to disasters.[10] The point is further expounded by Spence, 1998 who posits that the increasing intensity and frequency of environmental disasters result in these small island developing states becoming increasingly dependent on food imports and the rates of nutrition-related health problems are on the rise

Table 1 summarizes selected demographic and economic variables as well as disaster types and their impacts in the CARICOM member states for the period 1973-2003 based on The CIA World Factbook 2004 and

[9] **CFIEG 1997, pg.**

[10] **Neville Nicholls, *CDB Disaster Management Programme: Lessons and Experience Speeches and Statement, The Caribbean Disaster Preparedness Seminar,* (Jamaica, 2001); CIFEG 1997, pg.; See FAO Newsroom, *Small Island Developing States Facing Growing Vulnerability,(Italy: Food and Agriculture Organization of the United Nations, 2003);* See UNDESA, The Ten Year Review of the Barbados Programme of Action (New York: United Nations Department of Economic and Social Affairs Division for Sustainable Development ,2004).**

CRED database. It must be pointed out that the CRED database only contains data for disasters that fulfil at least one of the following criteria:

1. 10 or more people reported killed
2. 100 people reported affected
3. Declaration of a state of emergency
4. Call for international assistance

The disaster impact figures can thus only be considered as conservative estimates. Cumulative effect of smaller disasters may have been much greater in individual countries.

The table shows that over 7 million people have been affected and almost 5 billion US dollars worth of damage has occurred in the CARICOM countries from 1973 to 2003. It also shows that hurricanes and floods are the most common and most destructive of disasters in the Caribbean. Furthermore, countries with larger area, more population and lower income tend to suffer more in terms of people affected. Countries with higher incomes tend to suffer greater economic losses. For example, over 4 million people have been affected in Haiti, the poorest (per capita GDP US$1,600) and most populous (over 8 million inhabitants) of CARICOM member states but economic losses have been relatively low at about 211 million dollars. Bahamas, on the other hand, with a much lower population (approx. 300,000) but much higher per capita income (US$16,800) has suffered 500 million dollars in losses while only about 3,000 people have been affected. Jamaica and St. Lucia have, however, suffered highly both in terms of number of people affected (in relation to total population) as well as economic losses.

These disasters have caused widespread damage to social and economic infrastructure, resulting in widespread social dislocation. For example, following Hurricane Gilbert in 1988, Jamaica lost an estimated US$90 million due to the subsequent decrease in the number of tourist arrivals. Antigua suffered similarly following Hurricane Luis in 1995, when tourist arrivals dropped by 60-70 per cent. In Dominica, Hurricane David in 1979 seriously damaged 60 per cent of the housing stock.

In addition to direct and indirect losses, economic consequences are crucial given the repercussions for the development of a country's economy. For example, losses incurred in Dominica from the impact of Hurricane David in 1979, stood at US$ 45 million or 20.6 per cent of the island's GDP. About 37 per cent of this loss was in the farming sector. Similarly, losses in Anguilla occasioned by Hurricane Luis in 1995 were

US$55 million or 14 per cent of GDP).[11] There is also the need for protection from the sea in the region. In St Vincent for example the phenomenon of marine erosion, in the form of the collapse of the coastline, has caused damage to housing in the village of Layou (in the west of the country) and presents a threat to the only road on the island's Caribbean coast.[12]

[11] CIFEG, 1997; UNDP, 2004.
[12] CIFEG, 1997.

Table 1: Selected demographic and economic variables and disaster impacts in CARICOM states in the 1973-2003 period.

	Area sq. km	Population (x 1,000)	GDP per capita	Total GDP (millions)	Drought		Earthquake		Famine		Flood		Landslide		Volcanism		Hurricane		Total people affected	Total damage (millions)
					People affected	Damage (millions)	People affected	Damage (millions)	People affected	Damage (millions)	People affected	Damage (millions)	People affected	Damage (millions)	People affected	Damage (millions)	People affected	Damage (millions)		
Anguilla	102	13	8,600	104	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	150	2.3	150	2.33
Antigua & Barbuda	443	68	11,000	750	75,000	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	76,684	0.5	151,684	0.50
Bahamas	13,940	300	16,800	5,099	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	3,200	500.0	3,200	500.00
Barbados	431	278	16,200	4,496	0	0.0	0	0.0	0	0.0	100	0.0	0	0.0	0	0.0	7,237	101.5	7,337	101.50
Belize	22,966	273	4,900	1,280	0	0.0	0	0.0	0	0.0	19,600	2.7	0	0.0	0	0.0	218,570	325.6	238,170	328.30
Bermuda	53	65	36,000	2,330	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00
British Virgin Islands	153	22	16,000	320	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	3	12.0	3	12.00
Cayman Islands	262	43	35,000	1,270	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	300	0.0	300	0.00
Dominica	754	69	5,400	380	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	85,991	50.1	85,991	50.10
Grenada	344	89	5,000	440	0	0.0	0	0.0	0	0.0	0	4.7	0	0.0	0	0.0	1,210	10.8	1,210	15.50
Guyana	214,970	706	4,000	2,792	607,200	29.0	0	0.0	0	0.0	38,000	0.0	0	0.0	0	0.0	0	0.0	645,200	29.00
Haiti	27,750	8100	1,600	12,180	103,000	0.0	0	0.0	1,060,000	0.0	393,657	0.0	1,060	0.0	0	0.0	2,800,659	211.3	4,358,376	211.30
Jamaica	10,991	2700	3,800	10,210	0	6.0	300	0.0	0	0.0	896,712	1263.0	0	0.0	0	0.0	845,319	1092.5	1,742,331	2,361.50
Montserrat	102	9	3,400	29	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	13,000	8.0	0	0.0	13,000	8.00
St. Kitts & Nevis	261	39	8,800	339	0	0.0	0	0.0	0	0.0	0	0.5	0	0.0	0	0.0	12,980	0.0	12,980	0.50
St. Lucia	616	164	5,400	866	0	0.0	0	0.0	0	0.0	0	0.0	175	0.0	0	0.0	83,950	1089.3	84,125	1,089.30
St. Vincent & the Grenadines	389	117	2,900	339	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00
Suriname	163,270	437	3,500	1,533	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00
Trinidad & Tobago	5,128	1010	9,600	1,060	0	0.0	17	25.0	0	0.0	210	0.0	0	0.0	200	0.0	51,000	5.1	51,427	30.10
Turks & Caicos Islands	430	20	9,600	231	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00
TOTAL					785,200	35.0	317	25.0	1,060,000	0.0	1,348,279	1,271	1,235	0.0	13,200	8.0	4,187,253	3,401	7,395,484	4,739.93

(As damages are expressed in US dollars (based on data from the CIA World Factbook 2004 and CRED database

The situation concerning SIDS of the Caribbean region continues and will continue to be one of exposure and growing disaster vulnerability due to new challenges and emerging economic, social and ecological issues.[13] Consequently, these countries have to face certain peculiarities and inherent difficulties in planning for and responding to natural disasters. These include the high probability that a single natural disaster event becomes a national catastrophe; the high probability of impacts in multiple territories by the same event, given the size and geographical proximity of the territories comprising the region; the probability of impacts being experienced from more than one event in the same year or season; unsafe informal settlements in vulnerable locations; uninsured low income housing and inconsistent application of building codes; and heavy reliance on the environment and natural resources such as beaches and coastal resources which are vulnerable to the extreme weather systems. In light of this high level of vulnerability in the Caribbean region, the need for stringent zoning management and physical development planning cannot be overemphasized if disaster risk reduction is to become a sustained reality. [14]

Given the currently high level of disaster vulnerability and the bleak predictions of intensification of natural hazards and disasters in the Caribbean region, it is imperative that disaster risk management programmes and policies be developed if development gains are not to be whittled away by environmental disasters. It is crucial that national government policies and international technical assistance adopt modes of development that prevent risk exposition and reduce future human losses and displacement.

[13] FAO, 2003; Ariyabandu, 2001
[14] Nicholls, 2001.

3. Changing Practices in Disaster Management

Disasters have traditionally been viewed as one-off or exceptional events not related to the ongoing social and developmental processes, and the course of action taken in dealing with disasters has largely been one of emergency management and relief with welfare orientation. This kind of ideology only allowed for after-the-event action and disaster victims were made distant or removed from planning and action. Communities were identified as 'beneficiaries' by departments in charge of development activities, while in disaster terminology they were termed 'victims'. Governments and relief agencies responded to disasters without taking into account the social and economic implications and causes of these events. This general response gradually changed during the 1970s onwards to 'contingency planning,' emphasising preparedness measures, such as stock-piling of relief goods, preparedness plans and a growing role for relief agencies such as the Red Cross. However it was soon realised that people's vulnerability was a key factor in determining the impact of disasters, and so emphasis changed to using vulnerability analysis as a tool to disaster management. By the end of the 1990s, it became quite clear that development processes were not only generating different patterns of vulnerability but were also altering and magnifying patterns of hazard. Consequently disasters came to be no longer viewed as extreme events created by natural forces but as unresolved problems of development, with the recognition that risks (physical, social and economic) unmanaged or mismanaged for a long time, led to the occurrence of disasters.[15] The linkages between disaster and development involved a paradigm-shift from relief to a more comprehensive approach known as disaster risk management. This approach builds on and incorporates all the previous stages on the relief–risk management continuum from the perspective that all development activities have the potential to increase or reduce risk.[16]

Community Based Disaster Management, the bottom-up approach, has received wide acceptance because communities are considered the best judges of their own vulnerability and can make the best decisions regarding their own well-being. After all, for these communities, preparing to face hazards and risk management is a continuous process linked to

[15] **Suvit Yodmani, ed., Isabel Ortiz, *Disaster Preparedness and Management*: Social Protection in Asia and the Pacific. 2001, 481-502.**
<http://www.adb.org/Documents/Books/Social_Protection/chapter13.pdf/>; Malagoda Ariyabandu, *Bringing Together Disaster and Development –Concepts and Practice, Some Experience from South Asia,* 2001;
[16] **Daniel Maxwell, (Programmes in Chronically Vulnerable Areas: Challenges and Lessons Learned. Disaster 23 no.4, (1999), 373-384; UN/ISDR, 2001; Ariyabandu, 2001.**

their livelihood activities. This contrasts with the 'event' or 'relief' approach adopted by the institutional structures, and offers many lessons for integrating alternative approach to disasters into the main stream.[17]

In the English-speaking Caribbean, over the years and especially since the establishment of the Pan-Caribbean Disaster Preparedness and Prevention Project (PCDPPP), a number of initiatives for disaster loss-reduction have been undertaken. Beginning in 2001, the UNDP supported a highly successful cost-sharing initiative with the USAID, Office of Foreign Disaster Assistance, the UNDP Office for the Eastern Caribbean located in Barbados and the Caribbean Disaster Emergency Response Agency (CDERA), to develop a Comprehensive Disaster Management Strategy (CDM) for the Caribbean region, and to strengthen CDERA to spearhead its implementation. The CDM strategy which was adopted in June 2001 has as its goal "Sustainable Development in the Caribbean" to be realised through the strategic objective of "Integration of CDM into the Development Process of CDERA member states". The CDM represents a new departure and a significant development in the way critical agenda are developed in disaster management in the region[18] Although the CDM strategy has been presented to seven national consultations for consideration for adoption at the national level, so far only the British Virgin Islands has begun integrating the CDM process into its integrated development strategy.

[17] *Yodmani, 2001*
[18] UNDP, 2004

4. Disaster Management in Jamaica

The Office of Disaster Preparedness and Emergency Management (ODPEM), which falls under the Ministry of Local Government and Environment (MLE), is the national focal point responsible for disaster management and the implementation of disaster policy in Jamaica. The ODPEM works in conjunction with the National Disaster Committee (NDC). There are also various working committees, including those on public education, health, finance and disaster relief.

At the local level, there is a disaster management system, which relies heavily on the local planning authorities. Parish Disaster Committees (PDCs), supported by a Parish Disaster Co-ordinator, are located within each of the parish councils. These PDCs are further grouped into regions, with a Regional Co-ordinator assigned for the Northern, Southern, Eastern and the Western Regions of the island. The role of the regional coordinators is to act as Parish Liaison Officers for the ODPEM.

The Meteorological Services Division, also under the MLE, has the national responsibility to issue warnings and watches for hydro-meteorological hazards, including droughts, during the preparedness stage of a disaster.

The mandate of the ODPEM is structured within the context of a National Disaster Plan, hazard- specific sub-plans and more recently, a National Hazard Mitigation Policy.

4.1 National Disaster Plan

The overall aim of the National Disaster Plan is to detail arrangements to cope with the effects of natural and/or man-made disasters occurring in Jamaica. It seeks to assign responsibilities and to provide coordination of emergency activities connected with major disasters, in general and specific ways. It also encourages a process of learning to adequately cope with the recovery from a disaster, from both local and other experiences. The plan therefore addresses the short and long term objectives of the National Emergency Organization (NEO), and will be subject to continuous scrutiny, review and upgrading as deemed necessary, based on operating and other experiences. As such, it will be continuously strengthened and expanded in its scope, content, membership composition, administrative and policy guidelines, rescue, relief and recovery procedures, and in regional and international relationships with similar organizations (Ministry of Environment, 2005).

4.2 National Hazard Mitigation Policy

The National Policy on Hazard Mitigation provides a framework for integrating hazard mitigation into all policies, programmes and plans at national and community levels. It sets out the broad goals and guiding principles for hazard risk reduction, and thus informs the development of national hazard mitigation plans.

Jamaica's vulnerability to multiple natural and human-induced hazards and their repeated impact on the social and economic fabric of the society are challenges to the attainment of sustainable development. These challenges are further compounded by social issues such as poverty, the location of human settlements in high-risk areas, environmental degradation and instances of poorly constructed infrastructure and housing.

In a globally changing economic environment, Jamaica's ability to mobilize external disaster assistance will be diminished as international aid organizations and development partners impose more stringent criteria for assistance, owing to the increasing cost associated with disaster impacts globally. It is within this context that hazard mitigation is being promoted as a priority in Jamaica's policy agenda. There is increasing recognition that hazard mitigation, through the implementation of risk-reduction measures, can play a significant role in sustainable development. In that regard, it is timely that Jamaica has now articulated a policy that reflects the national desire to factor hazard mitigation into the overall development framework. The vision of the policy is to have a society in which hazard mitigation has evolved to become a part of everyday life. This vision is predicated on the recognition that a community-based approach must be the focus of any intervention. This policy therefore promotes the active participation and partnership of communities, governmental and non-governmental organizations, the private sector and development partners, in the conceptualization, design and implementation of hazard mitigation measures. It also provides the basic guidelines for realization of the benefits of hazard mitigation to the achievement of sustainable development.

The main purpose of the policy is the provision of a framework for the integration of hazard mitigation into all policies, programs and plans at all levels of society. As such the policy promotes the institutionalization of hazard-risk reduction measures that lead ultimately to the process of hazard-impact mitigation. Since hazard mitigation is not an end within itself, the policy is grounded in the belief that the mainstreaming of hazard-mitigation measures must be an integral part of the sustainable

development process. As such, its primary goal is to facilitate the attainment of Jamaica's sustainable development objectives through minimization of physical, economic and social dislocations caused by hazards and disasters.

The scope of the policy involves the application of structural and non-structural mitigation measures by the society in general and communities in particular, to lessen the adverse effects of natural and human-induced hazards. Specifically, these measures incorporate disaster prevention, preparedness, emergency response and rehabilitation and reconstruction.

Within the context of its institutional and legislative framework, the implementation of the policy will be spearheaded by ODPEM, but with the recognition that there are currently a number of institutional mandates whose frameworks support the objectives of hazard mitigation. The primary goals are therefore the acceleration of sustainable development and minimization of physical, economic and social dislocations through the implementation of hazard mitigation strategies. In that regard the main objective is to provide an integrated legislative, regulatory and institutional framework that will support hazard mitigation at all levels of society. Achievement of this objective hinges on the promotion of collaboration among all stakeholders towards the achievement of reduced hazard impacts.

The policy is grounded in the key guiding principles of accountability among institutional and community stakeholders, equity of access to resources, and partnership inclusiveness and participation of all stakeholders. Strategies for achieving the goals of the policy will focus on the engagement of communities, the building of relevant institutions and capabilities to reduce vulnerability, expansion of hazard/disaster information base, the harnessing of local knowledge and experiences and the engagement of the scientific community. The effectiveness of strategies will depend on the development of mechanisms for financing hazard mitigation. This policy document is intended to provide a broad framework for hazard mitigation. The design of strategies that are specific to different hazards to which Jamaica is vulnerable will form part of a separate document detailing the policy implementation plan.

Priority areas for action include the integration of hazard mitigation into national policy and legislative/regulatory frameworks, sensitization, public education and outreach at all levels of society, initiation of long-term programmes of hazard-risk mapping and community-based disaster management planning. The primary challenge to the implementation of

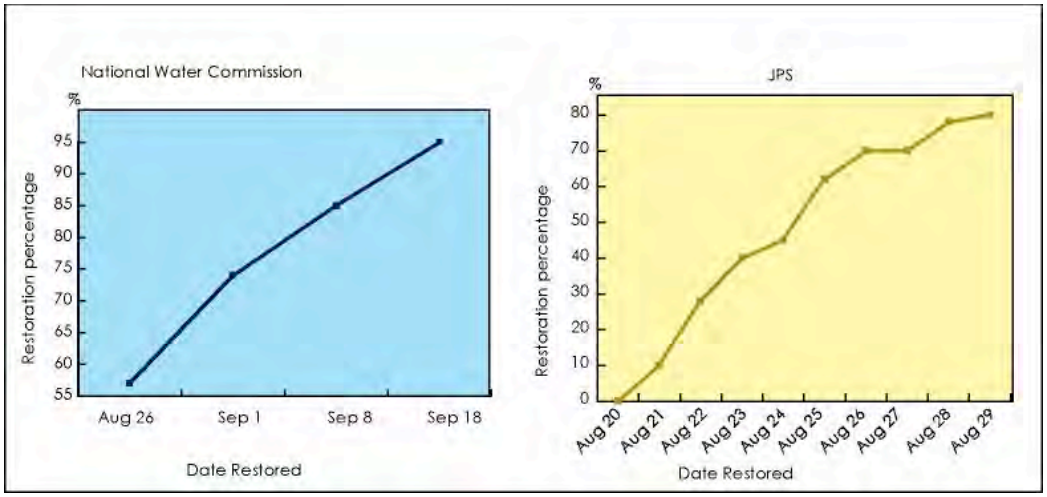
this policy is how to effectively create a culture of hazard mitigation at all levels of society.

The immediate next step towards meeting the objectives of the policy is therefore the development of a strategic implementation plan focusing on specific measures to be undertaken in the implementation of the Policy.

5. Hurricane Dean

Hurricane Dean gave researchers a timely opportunity to assess the degree of progress that has been made in trying to make Jamaica more hurricane-resistant. In some respects, official figures suggest that lessons learnt from Hurricane Ivan have influenced responses to subsequent hurricanes. For instance public utility companies such as Jamaica Public Service Company (JPSCo) and National Water Commission (NWC) had increased investment in mitigation measures to reduce the impact of hurricanes on their facilities, thereby significantly reducing the recovery time. For this reason over 50% of the island was reconnected within seven days of impact as opposed to weeks (See figure 3).

Fig 3: Reconnection of Utilities post-Dean



Source: National Water Commission (NWC) and Jamaica Public Service (JPS)
The figures listed are approximations provided by the respective utility companies. The time span for restoration post-Dean differs between the two utility companies.

The storm had a negative impact on the country's economic sectors. Even though the island has come a long way since Hurricane Gilbert plunged a dynamic economy into recession, it was still the case that the modest economic progress made since the start of 2007 was again derailed by the passage of Hurricane Dean to the point where growth has been revised downward and inflation has increased.

5.1 The Overall Impact

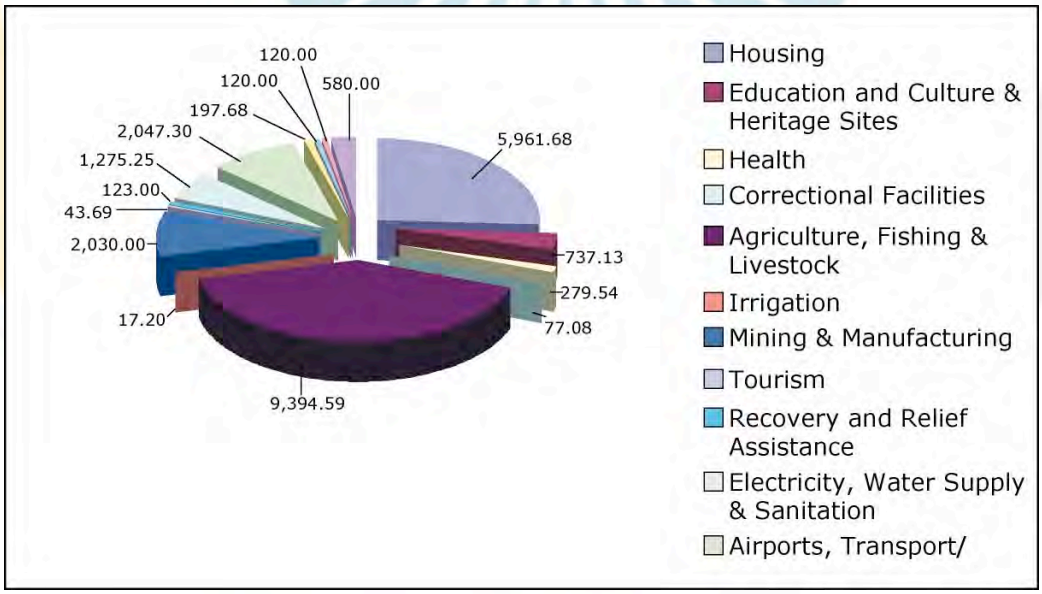
In the aftermath of Hurricane Dean, the Planning Institute of Jamaica (PIOJ) in collaboration with the Office of Disaster Preparedness and Emergency Management (ODPEM) and the National Environmental Planning Agency (NEPA) published preliminary estimates of the damages and losses to the economy, the impact on affected populations, and the financial priorities for rehabilitation and reconstruction. Based on these figures, it is now possible to comprehensively understand the extent of impact. Preliminary estimates of the total cost of impact stands at approximately J$23 billion, or US$326.94. This amounts approximately 10% of the country's gross domestic product (GDP). The productive sector was the most impacted while the social sector (schools, hospitals) accounted for less than a third of the damage. Nonetheless, some 518 schools and public educational institutions and an estimated 70, 000 houses suffered some form of damage. On that point, it is interesting to note that CaPRI's field survey revealed that by far the most common property damage reported by citizens was to roofs. 58.7% of those surveyed reported roof damage; only 12.4% reported damage to the rest of the house, and a mere 3.3% reported complete loss of house and contents. This echoes the PIOJ's own survey data, which found that most of the damage done to schools and police stations was related to roofs. In that regard the construction of more resistant roofs should be given priority in housing construction for a more hurricane resilient society. Infrastructural damage accounted for 15% of the cost of damages, whereas environmental damage accounted for only 0.5% of the total cost.

Set against the fact that only 6 persons died as a result of the hurricane (4 males, 2 females); the impact of Dean in this regard is consistent with the view that Jamaica has significantly reduced fatalities from impact. Against this background building greater resilience in the economic sectors through hurricane mitigation measures is a priority for economic loss reduction.

The assessment of the Hurricanes economic impact highlights some stark realities, In terms of differential impacts on sectors and sub-sectors of the economy, the bulk of production losses occurred in the agricultural sector, with more than a third of the total cost of Hurricane Dean to Jamaica resulting from actual or expected losses in agricultural output. In light of the fact that the agricultural sector accounts for a mere 5% of GDP and faces strong competition from low cost imports due to inefficiencies in production yet accounts for an oversized share of national economic

vulnerability points to the need for commensurate policy decisions. Equally, the fact that most of the additional 2% increase in inflation is likely to result from food shortages, further raises the question of the sustainability of current agricultural practices and norms in a scenario of increasing hurricane frequency and intensity. Any review of the agricultural sector in terms of its vulnerability to hurricane must take into consideration that small farmers are among the most vulnerable of the citizens surveyed during this study. As such, loss of livelihood among these farmers has dire consequences for the social wellbeing of Jamaica. In the short term, a closer look at which sub-sectors of agriculture will enable us to develop a better understanding of how the country might better prepare them for storms.

Figure 4. Macroeconomic Effects of Hurricane Dean ($million)



Closer examination of figure 4 reiterates the vulnerability of the agricultural sector predominantly accounted for by small farmers. However, from all indications public response to the recovery and rehabilitation of the sector has been minimal. Public Response was concentrated on fisheries and mining in the agricultural sector. Moreover, public costs are outdone by private spending at a rough ratio of 4:1.

5.2 Damage to Infrastructure and the Poverty Connection

Hurricane Dean moved along the southern coast of Jamaica and as such much of the damage to schools and infrastructure occurred in southern parishes. The principal damage was to roofs and buildings. It is interesting to note the heavy concentration of damage in Manchester and St. Elizabeth, which together accounted for approximately forty percent of the total number of schools damaged. Kingston, by comparison, fared relatively well in proportionate terms. But it is noteworthy that most of the damage was concentrated in poorer areas.

The residents of the sampled communities were qualitatively categorized as either rural or urban. Rural residents comprised the bulk of the sample accounting for over 74%, while residents within these communities were categorized as either poor, very poor, middle income or mixed. 82.9 % of those categorized as poor suffered severe to very severe damage, similarly 92% of those categorized as very poor suffered severe to very severe damage. This is in contrast to 59% of middle-income respondents experiencing severe to very severe damage. These values validate the greater vulnerability of the poorest members of society and thus the need for comprehensive policy decisions that integrate poverty alleviation with disaster risk reduction.

Table 2: Relationship *between economic status and severity of damage experienced*

Impact	Poor	Very Poor	Middle Income
Minor	17.1%	8.1%	40.6%
Severe	31.3%	40.5%	34.4%
Very severe	51.6%	51.4%	25%

Higher incidence of the damage reported in our field survey was found in poor communities

Table 3: Comparative Severity of Damage between Rural and Urban Areas

Areas	Impact		
	Minor	Severe	Very Severe
Urban	29.6%	32.4%	38%
Rural	19.1%	48.2%	32.7%

Rural areas are more vulnerable than urban areas. According to the study, level of impact among those living in rural communities ranged from severe to very severe with nearly 81% being so affected, whereas only 70.4% of those living in urban areas were so affected.

Table 4: Severity of Damage amongst Rural and Urban Areas and Community Categories

Areas	Impact		
	Minor	Severe	Very Severe
Urban Poor	12.5%	56.3%	31.3%
Urban Very Poor	0%	45.5%	54.5%
Rural Poor	18.8%	22.9%	58.3%
Rural Very Poor	11.5%	38.5%	50%

Among impacted persons, the poor and very poor were most severely affected, as reflected in the extent of damage sustained during Hurricane Dean. Within these groups, those residing in urban areas were most extensively impacted. The implication of this is that the urban poor are indeed the most vulnerable to the impact of hurricanes. This is shown in the table # 3 above where 100% of those categorised as urban very poor sustained severe to very severe damage, whereas only 88.5 % of rural very poor were so impacted. Conversely, 87.6% of those categorised as urban poor experienced severe to very severe damaged compared to 81% of rural poor were so impacted.

This could also be explained by housing characteristics. It is a well-known fact that urban poor and very poor areas are characterised by zinc fences and cardboard structures whereas rural poor and very poor areas have better housing structure and as such are more resistant.

Table 5: Damage to Schools

Parish	No. of Schools	Total Estimate Cost Million
Kingston and St. Andrew	76	113.18
St. Thomas	25	38.13
Portland	26	11.97
St. Mary	25	26.57
St. Ann	51	48.07
Trelawny	19	19.94
St. James	32	53.81
Hanover	21	10.65
Westmoreland	21	13.25
St. Elizabeth	50	136.49
Manchester	58	166.98
Clarendon	53	43.47
St. Catherine	61	35.36
Schools Equipment & MoEY Offices		10
TOTAL	**518**	**727.86**

(MoEY refers to the Ministry of Education and Youth)

Forty-seven police stations in eleven parishes had to be relocated as a result of storm damage, a timely reminder of the poor state of police stations throughout the country. The health sector fared better as 258 of the 304 health centres were operational within a week of the passage of the hurricane and only one of the 25 hospitals island wide (the Lionel Town Hospital) suffered damage to the extent that services were interrupted for up to 5 days after the event.

The country's road network sustained heavy damage, particularly those along the south coast. In fact, nearly a half (43.4%) of the cost of restoring and repairing roads borne by the National Works Agency (NWA) was spent in two southern parishes – St. Thomas and Portland. The NWA reported that within five days of the event, at least partial access had been restored to 95% of the 446 roadways that had been blocked by the storm, with full access restored to 70% of these. This report is corroborated

by the findings of the survey conducted by CaPRI - respondents reported road access as an obstacle.

With regard to transportation, although the KMA (Kingston Metropolitan Area) accounts for a quarter of the island's population and a third of the most-affected southern parishes less than 10% of the cost of road restoration was borne in Kingston and St. Andrew (KSA). The NWA attributes this to better road-and-drainage maintenance in Kingston and also to the hilly topography of some rural areas resulting in additional surface and landslide clearance, and the rebuilding of retaining walls.[19] One possible way to enhance the resilience of the road network may therefore be to further decentralise the maintenance of roads, along with the revenues needed to undertake the task, and set performance standards for parish councils. Incentives and sanctions could be use to reward and punish good performers.

As far as the nation's housing-stock was concerned, there was a concentration of damage in a few southern parishes, with some faring better than others. Clarendon, St. Catherine and St. Thomas together accounted for well over half the total damage to the housing stock. Once again, Kingston fared relatively well. Over 10% of the damaged houses in Clarendon and St. Catherine were totally destroyed, a degree of damage unprecidented in any other parish.

[19] Interview with Desrick Litchmore, National Works Agency, 24 October 2007.

Table 6: Damage to Houses

	Number Assessed	Minor Damage	Cost $	Major Damage	Cost $	Totally Destroyed	Cost $	No Damage
Kingston and St. Andrew	5746	2643	49,952,700	2682	506,898,000	342	258,552,000	
St. Thomas	4479	2679	50,633,100	1429	270,081,000	371	280,476,000	
Portland	1505	764	14,439,600	641	121,149,000	100	75,600,000	
St. Mary	1486	664	12,549,600	758	143,262,000	74	55,944,000	17
St. Ann	532	276	5,216,400	215	40,635,000	41	30,996,000	
Trelawny	346	75	1,417,500	244	46,116,000	27	20,412,000	
St. James	1146	659	12,455,100	347	65,583,000	40	30,240,000	
Hanover	358	155	2,929,500	16	31,941,000	34	25,704,000	
Westmoreland	203	97	1,833,300	93	17,577,000	13	9,828,000	
St. Elizabeth	2338	1367	25,836,300	896	169,344,000	75	56,700,000	
Manchester	3515	1591	30,069,900	1708	322,812,000	216	163,296,000	
Clarendon	10713	4243	80,192,700	5161	975,429,000	1327	1,003,212,000	
St. Catherine	5759	2840	53,676,000	2307	436,023,000	612	462,672,000	
TOTAL	**38126**	**18053**	**341,201,700**	**16650**	**3,146,850,000**	**3272**	**2,473,632,000**	**17**
							5,961,683,700	

This snapshot picture reveals that, on the face of it, Kingston and St. Andrew emerges as the consistently most resilient parish to have experienced the brunt of Dean. This may be due to a political urban bias, which favours resource allocation towards the capital city. Alternately, economies of agglomeration may be at work, whereby it is more efficient to improve resiliency, the larger the concentration of population. Determining the factors in play may help us to learn either how the country can make rural parishes more resilient, or whether in fact the country has a long-term interest in encouraging the development of urban subsectors when it comes to building economic resilience.

5.3 Recovery

5.3.1 Utilities

With regard to the recovery of utilities, the survey conducted by CaPRI indicated that the most prevalent hindrance to citizens return to normalcy was the lack of electricity. Contrary to expectations damage to

housesdid not prevent householders from returning to work. When severity of household damage was cross tabulated against inability to return to work, no clear relationship emerged, nor were blocked roads a significant impediment to people returning to work in affected communities as only 14.4% reported this as an obstacle to the resumption of economic activity. On the other hand, a third of the respondents (30.9%) cited lack of water for their inability to return to work, and 47.9%, the lack of electricity.

In addition the survey noted that the sanguine estimates of the restoration of electricity put out by the Jamaica Public Service Company (JPS Co.) did not square with the reported experiences of households surveyed. Where JPS Co reported a fairly rapid restoration of electricity once the storm had passed (see Figure 3), only 15.7% of respondents in our field survey reported a regular electricity supply within one week of the storm's passage. With regards to the resumption of water supply there was a slight increase in the numbers as16.7% reported regular water supply within a week of the storm's passage. Some of the discrepancy between citizen reports and those of the agencies in question arises from the fact that the survey targeted only affected areas and did not assess the country as a whole. Whilst the specification of "regular" would have ruled out supply interruptions that the public utilities might consider normal[20], a Gleaner commissioned national poll[21] also showed a discrepancy between the figures coming from the utility agencies and the citizenry. On August 25th to 26th, 38% of JSP Co. customers reported having normal electricity while the JPS Co. reported 88% restoration. Similarly NWC figures showed a discrepancy, as only 50% of citizens had regular water supply according to the poll whereas NWC was reporting 94% restoration. It may be that what is considered restoration by official sources stands at variance with what citizens perecive as restoration. The key point, however, is that at least in the perception of citizens, a gap opened between their own preparedness to return to work and the ability of the public utilities to facilitate it; If this gap is narrowed, then economic recovery time will be significantly reduced. Interestingly, the loss of telecommunications access was not cited by citizens as a major obstacle to returning to work as only 6% of respondents in the survey cited this as a hindrance. This concurs with anecdotal evidence that, aside from technical glitches in the days

[20] The NWC counts the number of systems in operation and the production levels; and then estimates the percentage of the population who have regained their regular water supply. The information published by JPS is based on the number of customers that have been restored to the grid, as a percentage of the total number of customers on our system.

[21] This poll was done by Bill Johnson in 84 communities island-wide. The results were published in the Jamaica Gleaner on Friday, August 31, 2007.
http://www.jamaica-gleaner.com/gleaner/20070831/lead/lead9.html

following the storm, the country's cellular network operated fairly well – evidence for the virtues of a competitive telecommunications sector.

5.3.2 Preparation

A peculiar paradox emerged in the household survey, over a third (33.8%) of respondents reported very severe damage to their property, and another 44.7% reported severe damage; most of which remains unrepaired, at the time of the survey. Despite this degree of damage, when asked whether they had been well-prepared for the hurricane, three-fourths of the respondents said yes. Moreover, over two-fifths of the respondents in the survey, when asked "how could you have better prepared or prevented damage to your property", responded "nothing." Taken together, these findings reveal an apparently high degree of fatalism in the Jamaican populace when it comes to hurricanes. Apparently, preparedness to many Jamaicans merely amounts to being able to weather the storm, and not to "bounce back" quickly from it.

This fatalistic response highlights deficiencies in Jamaica's disaster education initiatives. Such deficiency in disaster education puts in question the level of interaction between parish disaster committees and the local communities that fall within their jurisdiction. The pertinent question here is whether the mandate of these committees is confined to the distribution of relief as seem to be the norm or should they be proactive in partnering with communities in promoting disaster education initiatives that will enhance preparedness, prevention, mitigation, emergency response and recovery.

The partnership between local communities and disaster management decision makers must recognise local resilience initiatives and incorporate these into the planning process for disaster risk reduction. These local initiatives are often cost-effective, and creative. Moreover the promotion of these initiatives bypasses the traditional reluctance that often characterise community response to external loss reduction strategies. This is primarily because these initiatives are generated within the community and as such the "buy-in" that is a requisite for successful implementation already exists.

In short, the country is thus operating well below its resilience potential. The culture of mitigation advocated in National Hazard Mitigation Policy[22] can go a far way in improving national resilience but the participation and

[22] The National Hazard Mitigation Policy was approved by Cabinet in November 2005.

partnership of local people is critical to the achievement of this endeavour.

5.3.3 Aid

Better public education seems to be one obvious solution. In the same way that some public health campaigns have yielded impressive gains in awareness and consequent changes in lifestyles and behaviour, so too could citizens be better educated to see hurricanes not as an irresistible foe but as a challenge to be met and overcome. However, a closer look at the data may reveal some structural explanations for this apparent passivity. It is telling that when asked what the chief obstacle was to full repairs of damage to housing stock, the most common answer given was "money." Equally, when those who answered that nothing could have been done to better prepare for the storm was cross tabulated with those who answered that more money was needed to better respond, a strong and positive relationship emerged. Given the small sample size, one has to be wary of drawing categorical inferences. All the same, the findings square with the overall results from the household survey which found that, the expected inverse relationship between social class and vulnerability held. That is to say, the poorer a household is, the more likely it is to suffer damage which it is unable to repair.

Rising incomes will thus go a long way towards reducing fatalism and improving resilience for all. But in the short term, some policy interventions may be possible. Given that the most commonly reported damage was to roofing; and that the most commonly sought support for repair was money;[23] it seems that government could adopt policies which will seek to aid householders in building better roofs, as well as create an economic atmosphere that will encourage Jamaicans to adopt mitigation strategies - seek loans to do so. This will help to markedly[24] improve the countries resilience potential. Presently, monetary relief targets the poor, not the persons most affected by the disaster; *per se*. The former Prime Minister – Hon Portia Simpson – Miller, approved a temporary increases in PATH & NIS allotments as well as an amnesty from mortgage payments to the NHT, in the aftermath of Hurricane Dean, however, there was no disaster-specific relief monetary mechanism, despite the increased frequency and magnitude of disasters.

[23] The size of the survey conducted merits a certain measure of caution in the interpretation of the results. The answer to the question of what more was needed and the response of money was the majority's opinion. Nevertheless the relief response to Dean was one of the best in Jamaica's history, with companies ranging from Sugar factories to funeral parlours offering aid to their 'neighbours'.

[24] According to Peter Jervis, Principal Engineer, Jervis & Associates, the wire nails used in most buildings in Jamaica should be used only for temporary construction works. The nails are too small for the rafters since they are not corrugated or grooved, it does not bind to the wood.

5.4 Damage to the Economy

The most vulnerable sector of the Jamaican economy, as per Hurricane Deans experience, was the primary sector. The agricultural sector was badly hit. Tourism fared comparatively well according the Ministry of Tourism's own investigation.[25] This may be attributed to the fact that most resort properties are located along the North Coast and so were spared the worst of the storm. However, proximity to the storm's path can only be used to explain part of the discrepancy between damages to North and South Coast properties. While 42.5% of South Coast proprietors reported extensive damage so too did 29.1% of those on the North Coast. It is important to note, though, that the figure of damages to tourism do not compare perfectly with those for damage to the agricultural sector, as the tourism sector only measured actual damages and not future foregone income whereas the agricultural sector did. Nonetheless, unless one assumes that anxiety about hurricanes might be accentuated among potential foreign clients, the ability of the industry to resume operations depends chiefly on the ability of the business accommodating them and the airlines flying them in. By and large, these operations were restored within days.

It is also heartening to discover that while the data for manufacturing remain incomplete, the PIOJ is reporting minimal losses in this sector. The PIOJ attributes this to the level of preparedness within the sector. It would appear that the development and use of company disaster plans, including business continuity arrangements, could be the way forward. Precautionary measures taken by businesses, as well as the operations of security forces, kept looting to a minimum. However, despite the minimal impact on the manufacturing sector cement production was adversely impacted by Dean, a significant weak point which will be discussed below.[26]

Disaggregating the farm economy, we can see how some sub-sectors were particularly vulnerable. The big losers were coffee, sugar, bananas and, above all, domestic crop producers, cumulatively they accounted for 80% of the total agricultural loss, with domestic crops accounting for a quarter of the losses. The loss in the domestic crop sector is particularly significant, given the socio-economic background of many of the farmers in this sector.

[25] Jamaica, Ministry of Tourism, Report on the Response and Progress of Recovery of Jamaica's Tourism Sector from Hurricane Dean (Kingston: Tourism Monitoring and Policy Division, 20 September 2007). It must be noted that this report only measures physical damage, and not losses suffered by the industry such as foregone revenue or losses connected to such things as power-supply interruptions.
[26] Claire Bernard, Planning Institute of Jamaica, correspondence, 18 October 2007.

Fisheries fared badly losing $310 million. An estimated $2 billion was lost in mining. Taken all together, the primary sector accounted for virtually all (98.4%) of the losses incurred in the productive sector (see Figure 4) and nearly half (49.8%) the total losses incurred in the island. In short, the vulnerability of the primary sector stands in stark disproportion to its current profile in the economy. If Jamaica once tried to build its economy on a foundation of export revenues from the primary sector, the impact of Dean indicates the need to reassess this reliance and develop a more sustainable approach thereby shifting away from the primary sector. This approach could increase the country's economic resilience in the face of hurricanes. It is significant, that the country's manufacturing sector suffered little in the way of damage. On the other hand, it deserves underscoring that, cement production once again suffered. Being a nodal industry, slowdowns at the cement plant quickly reverberates throughout the economy, as happened last year. This brings into sharp focus the current policy regime for the supply of cement to the local market.

Returning to the agricultural sector, it is also worth underscoring that while domestic crops suffered the greatest damage, this arose from the destruction of existing plantings. As evidenced in Figure 3, the sub-sector's ability to "bounce back" quickly is evident in the fact that the supply interruption is expected to be temporary. Nonetheless, the inflationary impact of these shortages is noticeable to all, and knocks growth off track. But the policy response is not simply a matter of nudging the country towards food imports and away from domestic supplies. These farmers are often among the most poor and vulnerable of the rural population. Increasing their resilience is an urgent priority. One possible solution might be found in the fact that livestock farmers suffered less severe damages than others, since livestock can be housed. Still, unless adequate shelter can be built, livestock too can be vulnerable. Another option would be to encourage the use of sturdy greenhouse technology, which has proved quite resilient.[27] Whether green-housing or livestock-raising, any measure has cost implications which need considering. It may be, therefore, that resilience can only be improved if such policies were combined with a policy of land titling, provided it improved the access of small farmers to credit, enabling them to upgrade their resilience. There is need for much attention to be paid to disaster planning here, parallel to that in the private sector.

[27] Interview with Cordia Thompson, agricultural consultant, 26 October 2007.

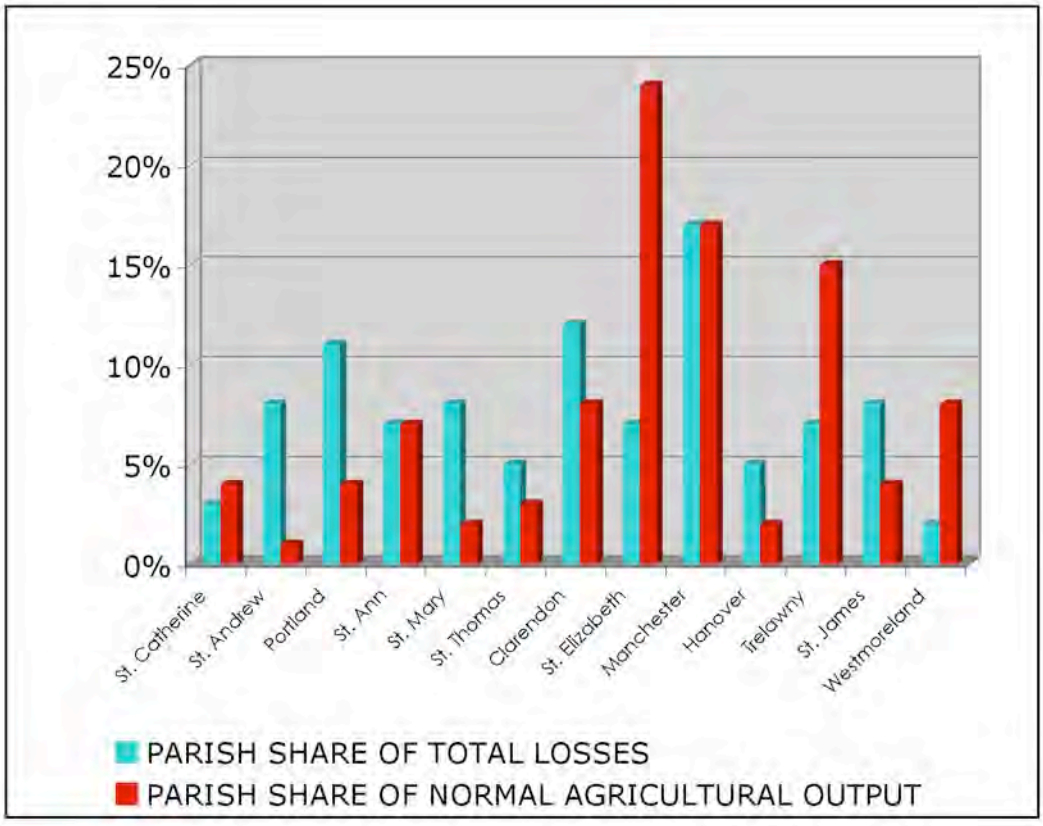
In assessing resilience, it is interesting to compare how different crops held up. Among food crops, three-fourths of the plantain crop was lost, whereas losses of legumes, vegetables and cereals proved to be somewhat more marginal (see Table 7).

Table 7: Estimated Proportions of Crops Lost to Hurricane Dean

CROP	LOSS BY	TOTAL % OF
Legumes	368	10.77
Vegetables	946	11.44
Condiments	446	19.67
Fruits	263	13.51
Cereals	129	12.14
Plantains	693	74.52
Roots and Tubers	1514	23.68
TOTAL	4359	100

The variable performance of parishes is also significant. St. Elizabeth, long celebrated as the island's "breadbasket," held up relatively well. Accounting for 24% of the country's gross agricultural output, it suffered only 7% of the island's agricultural losses (see Figure 5). All the other southern parishes – with the exception of Manchester -- suffered losses out of proportion to their gross output, as would be expected given that the storm's exposure was to the south coast. St. Andrew fared particularly badly: accounting for a mere 1% of gross output in normal times, it accounted for 8% of the island's losses, which may be a consequence of marginal farms in hilly areas.

Figure 5. Shares of Normal Agricultural Output and Losses due to Dean, by Parish



5.5 Micro-Social Comparisons of Sources of Assistance

Disaster assistance especially as it relates to emergency response and recovery is a critical component of disaster management and risk reduction. Generally official assistance is thought of as emanating from the government but increasingly micro level studies such as this one are revealing that communities are the main providers of assistance during crisis situations. This is reflected in the results of the survey conducted by CaPRI in the aftermath of Hurricane Dean (Table 8).

Table 8: Sources of Relief Assistance during Hurricane Dean

Source	Frequency	Percentage
Neighbours	56	34.2%
Family	55	33.5%
Non-governmental associations	20	12.2%
Government	19	11.6%
Civic Associations	1	8.5%
Total	**164**	**100%**

It is revealing that nearly 65% of the assistance received during the impact of Hurricane Dean came either from family members or members of the community. Indeed government assistance ranked fourth of the six sources identified. These results have significant implications for policy design in relation to disaster risk reduction, particularly in relation to community-specific needs. There is need for formalization of community risk management mindset in Jamaica.

One of the traditional methods for distributing government aid is to rely on civic and charity organizations, such as the Catholic Relief Services and the Adventist Development & Relief Agency (ADRA). It is possible that some persons would then have been unaware of the source of the aid they received. Moreover, again, in order to receive more benefits, people might under-report the amount of relief given.

Nonetheless, in a society where government is the main recipient of aid, so little relief was attributed to it, even with the civic organizations accounted for. With 20.7% coming from civic and non-governmental associations, and 11.6% of relief coming from government in these severely affected areas, further investigation is warranted. There was also a confirmed report of the community shelter for the infamous community of Portland Cottage being locked for Hurricane Dean. The high degree of assistance from neighbors and friends demonstrate a high level of social

capital. Social Capital can be simply defined as: "the attitude, spirit and willingness of people to engage in collective, civic activities."[28]
It augurs well for the widespread implementation of Community Risk Management and cooperation with the Parish Disaster Committees, including the formalization of Community Disaster Plans.

LOCAL EXAMPLE OF COMMUNITY BASED FLOOD RISK REDUCTION INITIATIVE: THE RIO COBRE FLOOD EARLY WARNING SYSTEM

The Rio Cobre Flood Early Warning System (FEWS) involves a network of telemetric gages and community-based river gauges that provide early warning for communities in the lower Rio Cobre Valley. The system was developed jointly by the Water Resources Authority and the Office of Disaster Preparedness and Emergency Management, through funding from the UNDP in 1996. It was modeled on the initiatives undertaken by a local community in St Catherine, namely Rivoli-Thompson Pen.

Residents of Rivoli have traditionally monitored the rise of the Rio Cobre River during periods of extended high intensity rainfall, through the use of stakes to determine the rate of overflow. When critical levels are reached the community's designated "runners" had the responsibility of running through the community to raise the alarm of the rise in flood waters. This community level initiative was improved upon through the establishment of a network of telemetric gages and the fixing of a permanent river gauge in the community. The gauge has a marked critical level which is monitored by gauge readers and when this critical level is reached, the gauge readers advise the "callers" and "runners". The "callers" are responsible for passing this information, often via telephone, to the Parish Disaster Coordinator, police and fire Services. The "runners" continue to perform their traditional functions.

[28] http://www.nonprofitbasics.org/ CompleteGlossary.aspx?ID=-1

6. Conclusion and Recommendations

The key picture which emerges from these findings is that while on the whole, the country is making real progress towards becoming more hurricane-resistant, key weak points exist, and that these in turn have a negative impact on the remainder of the economy. The primary sector as a whole, and agriculture in particular, are most vulnerable. So, too, is cement production. Citizens are themselves relatively well prepared, as evidenced by their reports that they were ready to return to work quickly. However, among poorer residents, there is an unacceptably high degree of resignation which appears to be directly linked to their poverty. Finding ways to establish partnerships with the communities in the development of mitigation measures in line with their finances and way of life, including recovery funds, is vital. Equally important is housing quality, particularly that of roofs. The nation's housing-stock should probably be revamped to make roofs more hurricane-resistant - we should ban wire nails. Parish Councils should also be more vigilant in monitoring construction in their area. These alone would go a long way towards helping citizens to become better prepared for hurricanes. These weak points highlight the need for greater involvement of the communities in the design and implementation of their community disaster plans.

When it comes to public and quasi-public sector responses, clear advances have been made in the speed in which utilities are reconnected, and the speed with which roads are cleared. Nonetheless, more progress needs to be made. Citizen

REGIONAL EXAMPLE OF COMMUNITY BASED FLOOD RISK REDUCTION INITIATIVE: MARRIAQUA COMMUNITY DISASTER MANAGEMENT PLAN

The Marriaqua Community is an extensive valley system in St Vincent and The Grenadines. The valley is traversed by three river systems namely the Zenga, the Teviot and the Yambou, which are the sources of periodic flooding in the communities. In 2002, the Caribbean Disaster Emergency Response Agency (CDERA), with funding from the Japan International Coordination Agency (JICA), began implementation of the Caribbean Disaster Management Project (CADM) – a community-based flood management project, in three pilot communities, including the Marriaqua Valley.

The project focused on flood hazard mapping and community-based disaster management planning to achieve the objectives of flood risk reduction. It involved partnership with the communities in the development of flood hazard maps and the design of a community disaster management plan by the communities. In that regard the communities identified their sources of threat and proposed appropriate mitigation strategies for flood loss reduction. A more recent addition to the plan is the instillation of a low cost, low technology community early warning system in the upper reaches of the rivers. The communities are responsible for the monitoring and maintenance of this system. They are also responsible for the development of appropriate evacuation plans, under the auspices of the Marriaqua Disaster Committee. The early warning system is in the testing phase but the community evacuation plan has been operational since 2005.

feedback on the speed of reconnection of light and water differs substantially from that reported by the agencies in question. Whatever the reality, the experience and perception of ordinary Jamaicans suggests that priority must be assigned to the speedier resumption of electricity. Enabling citizens to return to work two or three days earlier than is the current practice, and thereupon to enable them to resume work at full capacity, would itself minimise the detrimental impact on the economy. This necessitates a more resilient infrastructure, something which obviously has cost implications. Engineers from JPS repeatedly told us that one obvious solution – beginning a national programme of burying power-lines – would be prohibitively expensive. It would also necessitate regulatory change to speed up approval processes in urban areas, while enabling investors to recoup the cost of their investment. However, they did underscore the importance of the company's current programme of replacing wooden standards (poles) with stronger and more durable concrete ones, the current rate of replacement being 2,000 per year.

Whether by accelerating this programme or by looking at new solutions, the programme to expand network resilience will be central to improving the readiness of the country as a whole. Presumably, some of the cost would be made back from savings, resulting from reduced damage during storms; and given that the economy as a whole would stand to benefit, some of the added cost could be recouped from a surcharge on consumers, provided this surcharge went into a fund to be used not to pay for restoration, but for the adoption of more resilient plant and infrastructure. A strategy of upgrading the country's electrical grid would not be possible in the short term, given budgetary constraints. Then emphasis should be given to those regions where the most dynamic economic activities are concentrated – which would be urban and resort areas. If economic resilience is to be achieved, CaPRI suggests the following:

- Economic policy should prioritize the development of dynamic industries over traditional ones; the role of the primary economy must be diminished over time, and government policy should actively encourage this shift.
- A careful look must be given to agriculture. As a vulnerable sector whose post-hurricane impact on the economy is negative, the country needs to debate what its long-term future should be.
- A campaign to improve the roofs of the country's houses should be undertaken. Banning smooth wirenails and creating other incentives for householders to hurricane-proof their

roof.[29] One suggestion is the creation of a special loan-fund for householders.

- Tax Incentives for hazard risk reduction could be provided for persons who voluntarily undertake mitigation measures especially to roofing and in accordance with required standards.
- Public education needs to more aggressively incorporate the citizenry and their knowledge into disaster risk management, and to raise their expectations as to what an acceptable level of preparedness is. It should set as an ideal that Jamaica should one day make itself "hurricane-proof".
- Speedier restoration of public utilities must be prioritized. In part, this will entail investments in infrastructure. A special surcharge could be imposed, the receipts of which could be used only to add new, more resilient infrastructure. Policy should thus become pro-active – better preparing for future storms – rather than reactive – responding to the effects of a storm after it has passed. Government policy should focus on assisting the utilities to speed up their reconnection times, and performance-targets should be set, with an assessment following each storm. Government should embark on a programme of identifying vulnerable points in the road network[30] – in particular, coastal roads – and investigate the possibilities of relocating or reinforcing these particular points, especially with regards to drainage.
- Increased accountability should be placed at the parish level, with appropriate resources being made to parish councils. In particular, the duty of maintaining roads, making the farm sector more hurricane-proof and of engaging the communities in their disaster management planning should be assigned to parish councils. It may even be possible to create incentive schemes whereby star performers among parish councils could be rewarded and laggards penalized.
- To incorporate the population into a campaign of hurricane-readiness, and to increase accountability of agencies responsible for disaster-management, national campaigns under a logo like "Make Jamaica Hurricane Proof" could be

[29] **Peter Jervis, Peter Jervis and Associates, correspondence 14th November, 2007.**

30 The post-Hurricane Dean condition of the roads is quite bad. According to John Allgrave, civil engineer at Wallace Evans Jamaica Limited, the main problem maybe with the asphalt used to surface the roads. The locally produced bitumen easily strips off the aggregate. The asphalt then emulsifies and does not bind to the stone. The surface unravels due to the combined action of water and vehicular traffic. The base becomes exposed, so creating the massive and rough potholes.

conducted, giving rewards to such things as best new ideas, best school, best parish, best business. These could be awarded on either a regular basis, or after the passage of each storm, helping to move the mindset from fatalism in the face of hurricanes to one of opportunism, rising to challenges and making gains.