CCRIF
The Caribbean Catastrophe Risk Insurance Facility

CARIBBEAN CATASTROPHE RISK INSURANCE FACILITY

CCRIF
a Natural Catastrophe Risk Insurance Mechanism for the Caribbean

A Collection of PAPERS, ARTICLES AND EXPERT NOTES

VOLUME 2

November 2011

CCRIF, a not-for-profit company, is the first multi-country risk pool in the world

CCRIF: A Natural Catastrophe Risk Insurance Mechanism for the Caribbean

A Collection of Papers, Articles and Expert Notes

Volume 2

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Message from the Executive Chairman, Mr. Milo Pearson

I am very pleased to introduce the Caribbean Catastrophe Risk Insurance Facility's (CCRIF) second publication of technical papers and articles. Our first publication of this kind was released exactly two years ago in November 2009. This publication includes both technical papers and expert notes some of which are in the form of speeches which were delivered at meetings and conferences addressing disaster risk management and/or climate change. These papers, speeches and expert notes will help the reader and our members in general to deepen their understanding of natural hazards and catastrophe risk and the potential impacts of climate change on the region.

We feel that this booklet will be particularly useful to all governments, national disaster coordinators, finance and planning officials, meteorological and other scientific agencies, research institutions, students and regional and international organisations, as they participate in the creation and implementation of comprehensive disaster management frameworks towards the sustainable prosperity of our planet.

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About CCRIF

The Caribbean Catastrophe Risk Insurance Facility (CCRIF) is the first multi-country risk pool in the world, and is also the first insurance instrument to successfully develop parametric policies backed by both traditional and capital markets. It is a regional catastrophe fund for Caribbean governments designed to limit the financial impact of devastating hurricanes and earthquakes by quickly providing financial liquidity when a policy is triggered. CCRIF was developed through funding from the Japanese Government, and was capitalised through contributions to a multi-donor Trust Fund by the Government of Canada, the European Union, the World Bank, the governments of the UK and France, the Caribbean Development Bank and the governments of Ireland and Bermuda, as well as through membership fees paid by participating governments.

Sixteen governments are currently members of the Facility: Anguilla, Antigua & Barbuda, Bahamas, Barbados, Belize, Bermuda, Cayman Islands, Dominica, Grenada, Haiti, Jamaica, St. Kitts & Nevis, St. Lucia, St. Vincent & the Grenadines, Trinidad & Tobago and Turks & Caicos Islands.

CCRIF helps to mitigate the short-term cash flow problems small developing economies suffer after major natural disasters. A critical challenge is often the need for short-term liquidity to maintain essential government services until additional resources become available. CCRIF represents a cost-effective way to pre-finance short-term liquidity to begin recovery efforts for an individual government after a catastrophic event, thereby filling the gap between immediate response aid and long-term redevelopment.

Since the inception of CCRIF in 2007, the Facility has made eight payouts totalling US$32,179,470 to seven member governments. All payouts were transferred to the respective governments less than a month (and in some cases within a week) after each event.

Event	Country Affected	Payouts (US$)
Earthquake, 29 November, 2007	Dominica	528,021
Earthquake, 29 November, 2007	Saint Lucia	418,976
Tropical Cyclone Ike, September 2008	Turks and Caicos Islands	6,303,913
Earthquake, 12 January, 2010	Haiti	7,753,579
Tropical Cyclone Earl, August 2010	Anguilla	4,282,733
Tropical Cyclone Tomas, October 2010	Barbados	8,560,247
Tropical Cyclone Tomas, October 2010	Saint Lucia	3,241,613
Tropical Cyclone Tomas, October 2010	St. Vincent & the Grenadines	1,090,388
Total for the Period 2007 - 2010		US$32,179,470

CCRIF

CARIBBEAN CATASTROPHE RISK INSURANCE FACILITY

Vision Statement

CCRIF will be a key partner with the Caribbean region in its disaster risk management strategies to support long-term sustainable development goals.

Mission Statement

Our Mission is to serve Caribbean governments and their communities in reducing the economic impact of natural catastrophes. We provide immediate liquidity through a range of affordable insurance products in a way that is financially responsible and responsive to their needs.

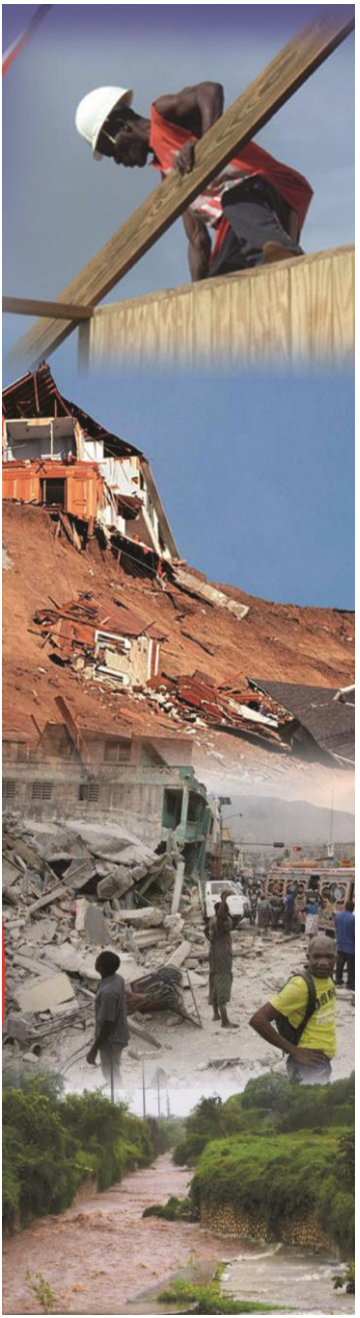
Products

CCRIF offers parametric insurance products that provide coverage for hurricane and earthquakes and will be offering coverage for excess rainfall by the end of 2011.

Customer Values

The clients of the not-for-profit CCRIF are the member countries of the Caribbean Community.
CCRIF promises its clients to:

1. Fill a gap in available insurance offerings for natural catastrophes
2. Ensure a joint reserve mechanism for future benefits
3. Provide member countries confidence in its ability to provide financial support
4. Supply tools and strategies for enhanced disaster risk management
5. Provide the highest degree of service at the best possible price
6. Ensure speedy payouts
7. Meet best standards in transparency and accountability
8. Effectively communicate with members and stakeholders



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About the Authors

Dr. Simon Young

Simon Young has a background in Earth Sciences. After completing his PhD, he joined the British Geological Survey (BGS), where he worked on a number of applied earth science projects including hazard mapping and risk assessment (in Central and South America) and volcano monitoring and disaster management (primarily in Montserrat in the Caribbean). After leaving BGS, Simon worked as a consultant to a number of public and private sector organisations in the Caribbean and beyond, undertaking catastrophe risk management assessments and providing disaster preparedness and recovery advice for natural hazards and climate change.

In October 2006, Dr. Young launched Caribbean Risk Managers Ltd (CaribRM) in a joint venture with CGM Gallagher Group. As CEO, Dr. Young continues to work with a wide variety of public and private sector clients across the Latin America/ Caribbean region and beyond in the advancement of their risk management and risk transfer goals. In particular, CaribRM is Facility Supervisor (operational and risk managers) of the Caribbean Catastrophe Risk Insurance Facility, the world's only parametric, multi-national sovereign cat risk pooling scheme.

Ms. Ekhosuehi Iyahen

Ekhosuehi Iyahen is the Project Development Manager for Caribbean Risk Managers (CaribRM). She joined CaribRM upon completion of an MSc in Environmental Policy and Regulation from the London School of Economics and Political Science (LSE). Graduating with a distinction in her thesis, which examined the use of risk transfer instruments in adapting to natural hazards within the Caribbean region, she brings a solid research background to her tasks and possesses excellent analytical and communication capabilities. In her current position Ms Iyahen is directly involved in the supervision of the Caribbean Catastrophe Risk Insurance Facility (CCRIF). She also provides broad

support for seeking, securing and implementing a range of CaribRM projects.

As lead researcher for CaribRM's activities in the area of index-based risk transfer solutions in the developing world, including climate change adaptation initiatives and options for Small Island Developing States, she has represented CaribRM at numerous workshops, seminars and symposiums.

Mr. Ronald Jackson

Ronald Jackson is the Director General of the Office of Disaster Preparedness and Emergency Management (ODPEM) Jamaica. He served formerly as Regional Coordinator for the Southern Parishes and as Senior Director of the Preparedness and Operations Division. Mr. Jackson has been integrally involved in disaster management operations in Jamaica and currently serves as guest lecturer on Disaster Risk Management in several tertiary institutions. He has been instrumental in the development of the Guidelines for Child-Friendly Disaster Management and Response, Reinstatement of the ODPEM Dedicated Communication Network and Revision of the Emergency Welfare Plan.

Mr. Jackson holds a Master of Science degree in Natural Resource Management and Environmental Resource Management from the University of the West Indies and a Bachelor of Science degree in Physical Planning and Environmental Resource Development from the University of Technology, Jamaica. He currently sits on the Caribbean Disaster Emergency Management Agency (CDEMA) Technical Advisory Board and is the co-chair for the Inter-American Network for Disaster Management.

Understanding the CCRIF Mechanism and Policies

By Ekhosuehi Iyahen and Simon Young
Caribbean Risk Managers Ltd., Facility Supervisor, Caribbean Catastrophe Risk Insurance Facility

This paper is based largely on various documents produced and disseminated during the preparation phase of CCRIF and over the past five years since the Facility has been in operation. These have included several Policy Research working papers produced by the World Bank Latin America and Caribbean Region Finance and Private Sector Development Unit in the Sustainable Development Network as well as numerous reviews conducted on the operations of the Facility.

Setting the Context

During the past several decades there has been a major increase in the costs of natural disasters across the globe. This is reflected in the huge jump from US$53.6 billion in losses in the 1950's to US$620.6 billion between 2000 and 2008[1]. This global upward trend in losses is no

[1] Kunreuther, Michel-Kerjan et al. 2009. At War with the Weather: Managing Large-Scale Risks in a New Era of Catastrophes. MIT Press, Cambridge, Massachusetts.

different from the experiences of the Caribbean region which has also seen a similar pattern in losses from disasters.

For Caribbean countries, the peculiarities associated with the impacts of natural hazards are particularly pronounced given their small physical and economic size. Comparatively, Hurricane Katrina, which is oftentimes used as a benchmark for significant catastrophe events, accounted for less than 1% of loss to GDP to the United States economy. On the other hand, Hurricane Ivan which occurred in 2004, resulted in over 200% of loss to GDP for the Cayman Islands and Grenada. It becomes clear that beyond the immediate and tragic loss of life, catastrophe events can also unleash a set of circumstances which can hinder a government's ability to effectively finance its immediate recovery and longer-term redevelopment processes. This impact has a further reverberating effect on the wider economy of the country whilst also exacerbating the poverty impacts on survivors.

Given the complex nature of natural disasters, analysing their full impacts on Caribbean countries is an expansive and particularly intensive task. Rather than focus on such a broad undertaking, this paper will simply seek to provide some insight into an innovative mechanism developed and employed by a number of Caribbean countries to address a small component of their financial risk as a result of their exposures to natural hazards.

Specifically the paper will seek to share some insight into what is known as the Caribbean Catastrophe Risk Insurance Facility (CCRIF) and how many Caribbean governments have employed the use of parametric insurance to proactively address part of the liquidity gap which is often experienced after a catastrophe. This is of course an important step on the part of these countries in comprehensively addressing their disaster risk exposures as it represents a significant shift in paradigm from the usual status quo of an *ex-post* approach to managing natural catastrophe risks.

Given the novelty of parametric insurance, particular attention will be paid to providing greater clarity to the technicalities, methodologies and modalities which are used to underpin the operations of CCRIF. This will include a detailed explanation of the underlying models used

to support the instrument, a review of the parametric nature of the triggers used and the parameters of the policies which countries purchase, and the methodology used to determine payouts in affected CCRIF member countries. The niche role of CCRIF within a wider disaster risk management framework will also be examined.

Liquidity Needs after a Disaster: The Grenada Experience

Governments are often challenged with the significant task of financing recovery efforts after a disaster. Whilst dealing with the fiscal demands to undertake relief operations such as ensuring the availability of emergency assistance and sourcing funding for shelter, food and medical attention for displaced persons, governments also have to contend with the simultaneous challenges of mobilising enough resources to undertake the medium- to long-term recovery and reconstruction process. This can include tasks that range from the clearance of debris to the restoration of critical services such as access to water and electricity for surviving populations to the reconstruction and rehabilitation of key public infrastructure. These expectations are themselves precariously balanced with the need for governments to subsidise the reconstruction of private assets such as homes for low-income families who would have been displaced as a result of a given catastrophe and all of which must be accomplished within a scenario of a dramatic decline in revenue.

In the case of Tropical Cyclone Ivan and its impacts on Grenada, the Government was faced with a situation in which the limited accrued reserves were quickly overwhelmed and significant difficulties were subsequently encountered in financing the public service bill, including salaries and the continuation of key services. This was coupled with a dramatic reduction in government revenues due to losses to the major income generating sectors and resulted in the subsequent inability of the country to service its debt obligations. As a result the Government of Grenada imposed a set of strict measures to generate income to stimulate the recovery process and the wider economy. Some of these measures included (i) an increase of about 45% in the retail price of fuel, (ii) an increase in excise taxes on alcohol and tobacco, (iii) a

special levy on incomes over US$375 per month for a five-year period, and (iv) greater investment in improved tax administration.

According to reports from the World Bank, despite all of these efforts, Grenada's fiscal situation continued to be challenging as the country still faced a fiscal financing gap of 4.5% of GDP for 2005 with the total debt increasing to 150% of GDP. Furthermore, instead of focusing on recovery and reconstruction, the Government was distracted by the need to finance the emerging resource gap and this therefore led to a delay in the recovery and reconstruction process.

The experiences borne out in Grenada demonstrated once again the challenges which can be encountered during the difficult post-disaster periods, as addressing the liquidity gap has not always been earmarked for the most proactive and deliberate action plan by governments. Traditionally addressing this absence of liquidity has involved a heavy reliance on international donor assistance after an event. Despite this, there has been a growing recognition in recent times that although donor assistance is a key part of the wider recovery and redevelopment process, these funds often take a significant period of time to become available and more often than not are targeted at specific projects.

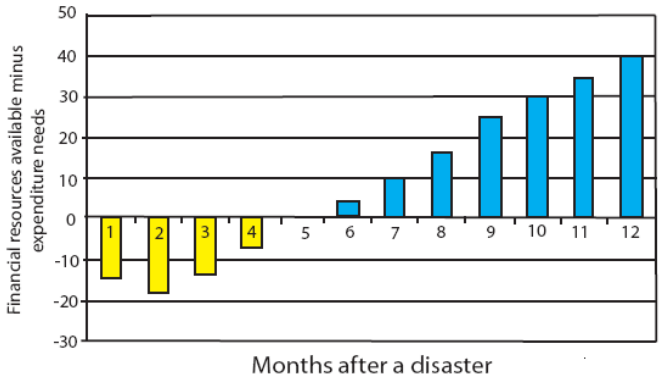


Figure 1: Liquidity Gap
Source: World Bank (2008) "Operational Innovation in Latin America and the Caribbean, Volume 2 Number 1: The Caribbean Catastrophe Risk Insurance Facility: Providing Immediate Funding After Natural Disasters.

The need to employ a variety of *ex-ante* and *ex-post* risk financing instruments to address these financial exposures has emerged as a strategy which governments can seek to employ in addressing this issue. This strategy can include a range of mechanisms from the consistent accumulation of financial reserves to the utilisation of contingent debt agreements to an application of insurance and alternative risk transfer solutions. Likewise, the utilisation of tax increases as was employed in the case of Grenada, or reallocating funds from other budget items or putting in place measures to access domestic and international credit and borrowing from multilateral finance institutions after a catastrophe occurs are all measure which can be exercised in addressing this fiscal gap.

CCRIF itself was created out of the recognition that natural catastrophes impose a significant burden on the financial ability of the state to function after a disaster due to an unavailability of liquidity. The Facility was launched in 2007 and structured as an insurance instrument to provide coverage similar to business interruption insurance in the event of losses from tropical cyclones or earthquakes. Similar to a mutual insurance company, CCRIF is controlled by the participating states, all of whom pay a premium directly related to their individual risk exposure and purchase coverage up to a limit of US$100 million for each insured hazard (tropical cyclones and earthquakes) within a given year. By pooling their risks into a single diversified portfolio, insurance costs are significantly lowered with pricing reduced by half of what it would traditionally cost if countries were to purchase coverage individually (see Figure 2).

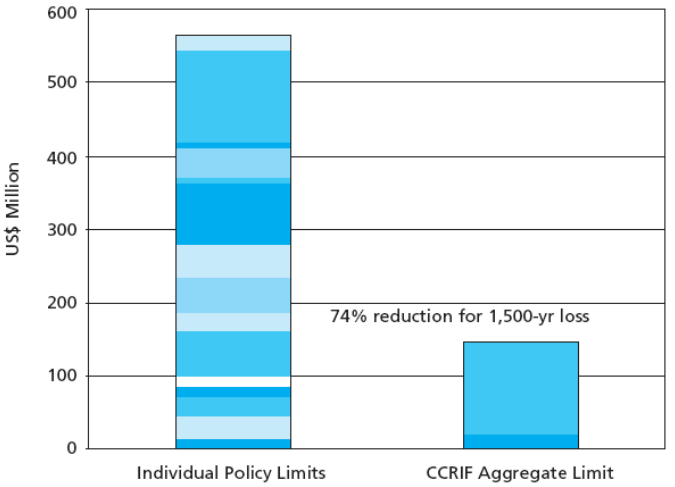


Figure 2: Insurance Costs
Source: World Bank (2010) World Bank. 2010. A Review of CCRIF's Operations After its Second Season

EXPLAINING THE CCRIF PARAMETRIC INSTRUMENT

Apart from the benefits attained through pooling risks, a key feature of the CCRIF instrument is the fact that the insurance contract issued by the Facility is "parametric" in nature. A parametric instrument disburses funds based on the occurrence of a pre-defined level of hazard, without having to wait for an on-site loss assessment. This feature is quite different from a traditional indemnity-based insurance product in which claims are paid based on formal confirmation of a loss through on-site verification. For the CCRIF instrument, the payouts which countries receive are made on the basis of pre-established trigger event losses which in turn are derived from a model in which hazard inputs are measured in terms of wind speed and storm surge in the case of Tropical Cyclones or ground shaking for earthquakes.

The selection of a parametric instrument as a basis for the CCRIF policies was largely driven by the fact that parametric insurance is generally less expensive than an equivalent traditional insurance indemnity product as it does not require a loss assessment procedure in case of a disaster. Parametric insurance also provides for claims to be settled quickly. This is an important feature considering the urgent need for liquidity after a catastrophe. In addition, the instrument is also less exposed to moral hazard and adverse selection problems (which are costly to monitor) because the cost of insurance can be immediately related to the probability of an event, and the payout is independent of any mitigation put in place after the policy is issued. This also was a positive feature given for the utilization of CCRIF's parametric policies by a multiplicity of member countries.

Despite these benefits, parametric products are exposed to basis risk, *i.e.*, the possibility that claims payment may not perfectly match the individual losses. Although this is a significant challenge in terms of the development of the instrument, careful design of index insurance parameters can be used to help reduce the basis risk associated with the tool. Furthermore, as large institutions, governments are able to better accommodate basis risk better than, say, individuals.

Developing the Underlying Catastrophe Model

In undertaking the development of the CCRIF parametric insurance coverage, significant investment went into developing the underlying catastrophe model. Catastrophe models are essential tools in assessing the risk associated with catastrophe events. For the most part they are based on robust datasets containing (i) a hazard module, (ii) an exposure module, (iii) a vulnerability module, (iv) a damage module and (v) a loss module (See Figure 3). The CCRIF model is no different, with the modules all developed within the context of the particular hazards of relevance to the client countries, these being tropical cyclones and earthquakes. This process was a significant undertaking in terms of the collection of data and requires a continuous investment in updating and populating the model with new information. The development of the CCRIF catastrophe model is an important contribution to national and regional risk management

institutions through its collection of a significant set of detailed databases on national catastrophe risk exposures in its member states. This is important specifically because prior to this initiative most member countries had for the most part never undertaken any major effort to collate this information which would be critical in understanding the catastrophe risks faced at a national and regional level.

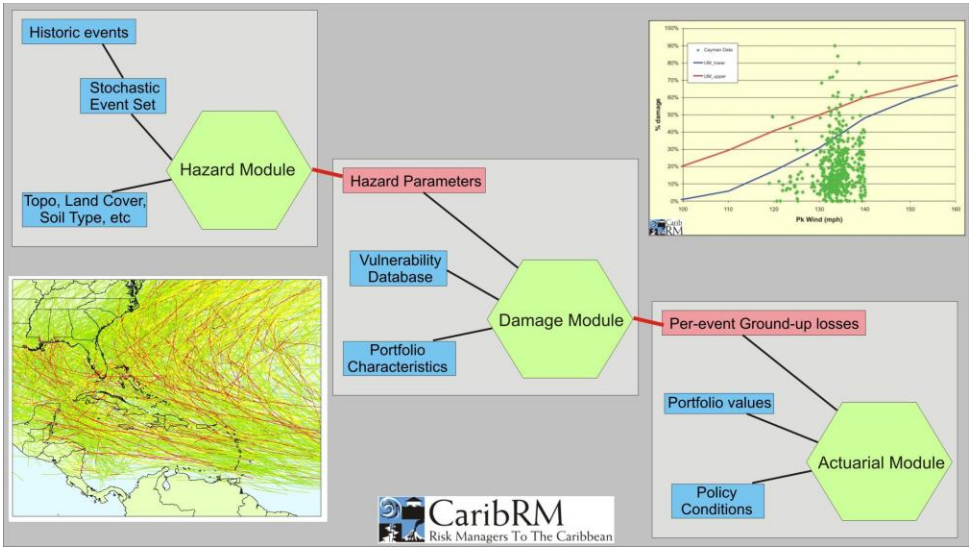


Figure 3: Catastrophe Risk Modeling Process
Source: World Bank. 2010. A Review of CCRIF's Operations After its Second Season

In terms of the actual catastrophe model, the hazard module defines the frequency and severity of a peril, at a specific location. This is done by analysing the historical frequencies and reviewing scientific studies on the severities and frequencies in the region of interest. Once the hazard parameters for each peril are established, simulated stochastic event sets are generated which define the frequency and severity of thousands of simulated cyclone or earthquake events. This module can analyse the intensity at a location once an event in the simulated set has occurred. This module models the attenuation/degradation of

the event from its location to the site under consideration and evaluates the propensity of local site conditions to either amplify or reduce the impact.

In developing the exposure module, the exposure values of “assets at risk” are estimated either from available secondary data sources or are derived from the distribution of population. This “proxy” approach is used when the preferred specific site by site data is not available. Based on these data, the module then computes the value for all types of exposures as a product of multiplication of the area of total building inventory and the average replacement cost per unit of inventory.

In terms of the vulnerability module, the starting point was to quantify the damage caused to each asset class by the intensity of a given event at a site. The development of asset classification was based on a combination of construction material, construction type (say, wall and roof combination), building usage, number of stories and age. Estimation of damage was measured in terms of a mean damage ratio (MDR). The MDR is defined as the ratio of the repair cost divided by replacement cost of the structure. The curve that relates the MDR to the disaster (earthquake or hurricane) intensity is called a vulnerability function. Each asset class and building type will have different vulnerability curves for each peril.

To calculate the losses, the damage ratio derived in the vulnerability module is translated into dollar loss by multiplying the damage ratio by the value at risk. This is done for each asset class at each location. Losses are then aggregated as required. Government assets or assets that are likely to be financed with government resources can be easily isolated and an assessment of financial needs for reconstruction calculated, thereby defining the damage module. Based on the likely timing for reconstruction, these costs can be ventilated between short, medium and long term financial needs.

The loss module developed as part of the catastrophe model focuses on estimating the losses from the damage distribution. When dealing with government losses, the module estimates relief and recovery costs, as well as tax revenue losses.

In terms of the actual CCRIF coverage which countries purchase, this is capped at 50% of total estimated government losses. The reasons for selecting this figure was based on the estimation that such an amount would be sufficient to cover the immediate emergency liquidity needs which governments might require as greater resources are mobilised to assist the longer-term recovery and redevelopment efforts.

Selection of Contract Attachment and Exhaustion Point

Regarding the actual CCRIF policies and coverage selection, all countries are required to make three key decisions regarding their coverage selection. These are:

The selection of an attachment point - This parameter can essentially be described as the severity of the event which gives rise to a payment and therefore is the loss value at which the contract is triggered and functions like a deductible in a standard insurance policy. Payouts are made on the policy when the modelled loss for an event in a member country equals or exceeds the attachment point specified in the contract. The policy holder, in this instance the specific country, covers all losses below the attachment point.

The attachment point applies equally to all storms. There is no accumulation of attachments (deductible) from storms for which the modelled loss was less than the attachment point. As the modelled loss increases above the attachment point, the corresponding payout increases up to the exhaustion point (see below). The current policies issued by CCRIF have a minimum attachment point equivalent to a 1-in- 15-year loss for a tropical cyclone and 1-in 20-year loss for an earthquake. This is the loss amount which is likely to be exceeded only once in fifteen (or twenty) years.

The selection of an exhaustion point - This refers to the severity of the event at or above which the maximum payment is triggered. For the 2009-2010 policy year CCRIF member countries selected exhaustion points between 1 in 75 and 1 in 200 years.

Selection of the coverage limit - The policy/coverage limit is the difference between the attachment and exhaustion points (exhaustion-attachment) multiplied by the ceding percentage (the amount of risk between the attachment and exhaustion points that the country is transferring to CCRIF). The coverage limit is the maximum amount that can be paid out under the contract in any one year for any one peril. Payouts for events that have indexed modelled loss that exceeds the exhaustion point are paid out at the coverage limit.

The policy limit applies to the full term (one year) of the contract; the total amount paid out under the contract during the one-year period will not exceed the policy limit, whether that policy limit is due to payout from one large event or multiple smaller events that each trigger payments under the contract. Since CCRIF is designed to address the liquidity problems caused by impacts from catastrophic hazard events, it is expected that attachment points for country contracts will be selected such that payouts are triggered only by low-frequency, high impact events (for example 1-in-50-year events) rather than recurrent events.

The coverage limit which is selected will depend on the capacity of the country to absorb losses and also what premium it wishes to pay. In the case of tropical cyclones, a payout would depend on the cyclone's wind speed and path relative to the country and on the attachment and exhaustion points and coverage limit that the country has selected. The payout increases as the modelled loss increases, due to higher wind intensity or a closer track (or both) for the storm.

When developing a parametric contract with CCRIF, a member country will identify a level of financial impact on the government treasury, beyond which it would want to receive an immediate cash injection; this value is an appropriate starting point for identifying an attachment point for the contract. Once an attachment point has been selected, the exhaustion point can be based on the cost of the contract and the maximum amount that the country is interested in paying for the CCRIF catastrophic coverage. The frequency with which the hazard exceeds the attachment point (as identified by the member

country-specific hazard curve) and the range between attachment and exhaustion point (that is, the policy limit) are the determinants of the premium cost to a member country.

Based on a risk curve derived for a specific member country, it is possible to identify the modelled loss that corresponds to a specific payout amount. These choices which are made by the countries in terms of selecting their attachment and exhaustion points as well as coverage limits are critical in determining the coverage which countries purchase. It is therefore a process which should involve personnel from at least the Ministry of Finance, the disaster management office and any planning/sustainable development units, but may also involve a number of other actors.

Conclusion

In conclusion, it is important to note that CCRIF is not meant to be disaster insurance but rather catastrophe insurance and hence is most suitable only for those events which overwhelm the capacity of the state to respond effectively, to primarily high intensity, low frequency events. Similarly the instrument is not meant to cover the entire risk profile of countries as a result of a catastrophe but instead is meant to ensure that there is some measure of liquidity available to governments as resources are mobilised to assist with the longer-term recovery and redevelopment processes. Utilising a single financial tool to address the entire financial risk profiles of countries exposed to natural catastrophes is inefficient and impractical and hence insurance instruments such as CCRIF are best placed within a comprehensive financial strategy for covering a variety of event probabilities and types and in which an array of instruments are employed.

A Tool for Climate Change Adaptation in the Caribbean

By Simon Young, Ekhosuehi Iyahen and Gina Sanguinetti Phillips

While climate change is a global phenomenon, its consequences are not evenly distributed throughout the world. Developing countries and small island nations, like those in the Caribbean, are among the most vulnerable to the adverse effects of climate change, as they have fewer resources to adapt socially, technologically and financially. Because of this, it is anticipated that climate change will have far-reaching effects on the sustainable development of the Caribbean region, and may perhaps affect the region's ability to attain some of the United Nations Millennium Development Goals by 2015.

Additionally, Caribbean populations are largely concentrated in coastal areas where much of the infrastructure may not be able to withstand the significantly stronger winds, deeper incursions from more forceful ocean surges, and heavier rains that are likely to occur due to climate change. The anticipated climate changes will accelerate the erosion of beaches, coastal land and protective mangroves. Houses, hotels and other buildings, along with roads and other infrastructure in the coastal zone are vulnerable, as are those who live and work there. Despite greater precipitation during storms and other peak periods, more frequent and longer droughts are expected in parts of the

Caribbean this century. In recent years, many countries in the region have experienced drought, affecting access to water and lowering agricultural productivity. Thus, two economic sectors of critical importance to the Caribbean – tourism and agriculture – will be heavily impacted by climate change.

The vulnerability of Caribbean countries to climate events is evidenced by the impact of hurricanes, tropical storms, and flooding in the region. Over the last three decades, the Caribbean region has suffered direct and indirect losses estimated at US$700 million and US$3.3 billion respectively owing to natural disasters associated with extreme weather events.

Historically, the discussion around climate change has been focused mainly on mitigating climate change with significant attention paid to controlling greenhouse gas emissions by the industrialised countries. However, developing countries have been successful in their efforts to elevate the importance of climate adaptation in international climate finance discussions which has led to proposed increased funding for adaptation measures. For example, the 2009 Copenhagen Accord called for fast-start funding of US$30 billion between 2010 and 2012, to be divided appropriately between adaptation and mitigation (UNFCCC, 2010). The 2010 Cancún Agreements included the intention of industrialised countries to raise US$100 billion in long-term funds to support climate action in the developing world by 2020 and established the new Cancún Adaptation Framework to allow better planning and implementation of adaptation projects in developing countries through increased financial and technical support[2].

Estimating the potential economic consequences of the impacts of climate change on Caribbean countries is difficult, due to varying global climate change scenarios, limited geographical projections for the region, and an inadequate inventory of vulnerable assets and

[2] United Nations Framework Convention on Climate Change. 2011. Report of the Conference of the Parties on its sixteenth session, held in Cancun from 29 November to 10 December 2010

resources in these economies. Caribbean leaders and decision makers have indeed recognised the need for sound quantitative data to support the development of national climate adaptation strategies, plans and programmes. To facilitate this, the Caribbean Catastrophe Risk Insurance Facility (CCRIF) launched a study for the Caribbean region in February 2010 to create a knowledge base which would provide valuable information to decision makers about the optimal use of limited resources for adaptation.

Based on the Economics of Climate Adaptation (ECA) methodology developed by the ECA Working Group[3], the study provides the facts and tools required to develop quantitative adaptation strategies that can be incorporated into national development plans to increase resilience against climate hazards. The fact base is built around two elements:

- **A risk baseline**, providing transparency on current and future expected losses from climate risks for three climate scenarios. The assessment of the future risk baseline is based on the concept of total climate risk, i.e., the total future risk that could arise from adding the effects of climate change and economic growth to the current risk level
- **An assessment of adaptation measures** that could be taken, including an analysis of the expected costs and benefits of risk mitigation and transfer measures

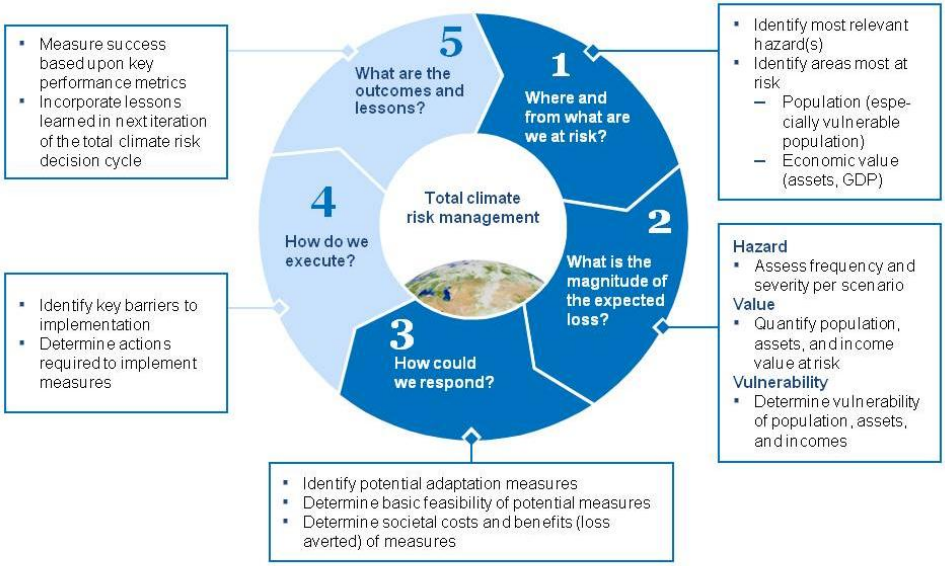
The innovation of the ECA methodology lies in its positioning across different knowledge sectors, spanning climate science, the financial industry and economic research[4]. The analysis is based on joining four main elements:

1. Climate change scenarios based on the most recent available scientific evidence

[3] A consortium of public and private players including the Global Environment Facility (GEF), UNEP, Swiss Re, the Rockefeller Foundation, Climate Works, Standard Chartered, McKinsey & Company, and the European Union.
[4] ECA Working Group. 2009. Shaping Climate Resilient Development - a framework for decision-making.

2. Hazard models forecasting the occurrence of hurricanes or other damaging events
3. Economic damage functions linking the intensity of events to economic impact
4. Value distribution models describing each country's economic and population exposure to hazard in a granular, precise way

The ECA framework poses five questions, each driving different sets of analyses as shown in Figure 1.



SOURCE: Economics of Climate Adaptation

Figure 1: The ECA Approach for Total Climate Risk Management

The study focused on the first three questions:

1. **Where and from what are we at risk?**
2. **What is the magnitude of the expected loss?**
3. **How could we respond?**

It was implemented by CCRIF and regional partners, including the Caribbean Community Climate Change Centre and UN Economic Commission for Latin America and the Caribbean, with analytical support provided by McKinsey & Company and by Swiss Re, who developed the loss assessment model.
The first phase was conducted in eight Caribbean countries: **Anguilla, Antigua and Barbuda, Barbados, Bermuda, the Cayman Islands, Dominica, Jamaica, and St. Lucia.**

The analysis focused on quantifying the potential impact of climate change on three relevant natural hazards:

- Hurricane-induced wind damage
- Coastal flooding/storm surge
- Inland flooding due to both hurricanes and non-tropical systems

For each country, the study examined the impact of the three key hazards on its infrastructure (including housing) as well as the tourism and travel, industry, and service sectors. Additionally, the study analysed the economic impact of climate change in the agriculture sector for a few selected countries including detailed analyses for Belize and Jamaica. An assessment of the risk of salinisation of groundwater due to changes in rainfall pattern and rising sea levels in Jamaica was also conducted. Key findings for the eight pilot countries are:

- **Current climate risk is already high, with expected losses of up to 6% of local GDPs. This economic damage is comparable in scale to the impact of a serious economic recession – but on an ongoing basis.**
- **Climate change could result in a damage increase equalling an additional 1 - 3% of GDP in the worst-case scenario**
- **Some countries can avoid up to 90% of the expected damage by implementing cost-effective adaptation measures**
- **A balanced portfolio of risk mitigation and risk transfer measure will be needed**

Current climate risk is already high, with expected losses of up to 6% of local GDPs. This economic damage is comparable in scale to the impact of a serious economic recession – but on an ongoing basis.

The damage potential under current climatic and economic conditions is already high, with annual expected losses totalling up to 6% of GDP in some countries. The expected loss from the climate risks considered varies significantly across pilot countries, ranging from 1% of GDP in Antigua and Barbuda to 6% of GDP in Jamaica. Such differences are driven by a diverse set of factors, including:

- Topography/exposure to coastal hazards
- Economic significance of particularly vulnerable sectors (e.g., residential assets which are typically less well protected against climate hazards)
- Location (e.g., in "Hurricane Alley")

Among the hazards considered, hurricane-induced wind damage has the largest damage potential, accounting for up to 90% of the overall damage. The contribution of coastal flooding/storm surge to total damage is higher in low-lying countries. In the Cayman Islands, for example, coastal flooding/storm surge accounts for about 45% of total damage potential.

Climate change could result in a damage increase equalling an additional 1 - 3% of GDP in the worst-case scenario

On a local scale, climate change can severely modify the risk profile of a country by impacting:

- Local sea levels
- Hurricane intensity
- Precipitation patterns
- Temperature patterns

In the study's high climate change scenario, sea levels may rise by up to 15mm/year (excluding local geological effects such as uplift/subsidence), and wind speeds may increase by approximately

5% as a consequence of the expected rise in sea surface temperature in the hurricane genesis region.

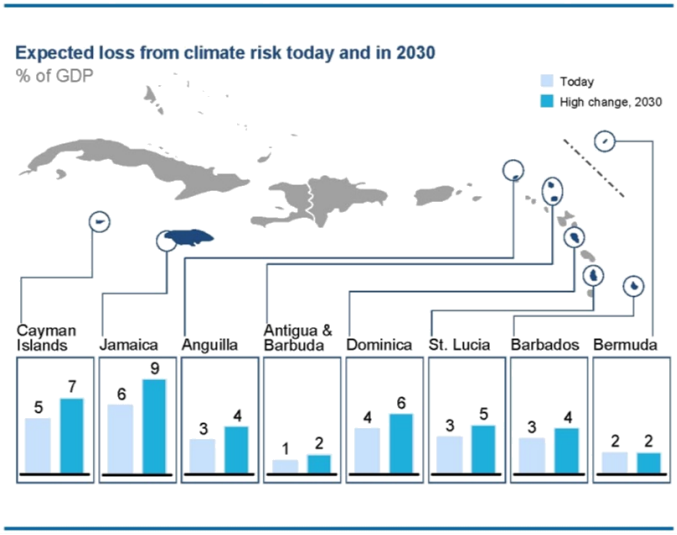


Figure 2: Expected Loss from climate risk today and in 2030 Source: Enhancing the climate risk and adaptation fact base for the Caribbean (Preliminary Results).CCRIF. 2010.

This is significant because even small local changes may have large effects due to the non-linear correlations between climate and hazards. For example, a 200-year event in Bermuda might become a once-in-a-lifetime (75-year) event as a result of these seemingly small changes. Since the infrastructure in most countries cannot deal with the type of events which we are currently affected by, increased hazards due to climate change effects present a serious dilemma in terms of the region's resilience and capacity to cope.

Overall, expected loss as a proportion of GDP could rise to between 2% and 9% in the high climate change scenario by 2030. In absolute terms, expected loss may triple between now and 2030, with wind remaining the single largest contributor. Economic growth is typically the greatest driver of the rise in expected loss, accounting for some

60% of the increase in all countries, with the exception of Jamaica, where it accounts for approximately 40%. Figure 2 shows the expected loss as a percentage of GDP from climate change today and under the worst-case scenario for the eight pilot countries.

Some countries can avoid up to 90% of the expected damage by implementing cost-effective adaptation measures

Decision makers can select both risk mitigation and risk transfer initiatives to address current climate hazards and respond to the growing threat of climate change. Risk mitigation responses are adaptation measures aimed at reducing the damage. They include asset-based responses (e.g., dykes, retrofitting buildings) and behavioural measures (e.g., enforcing building codes). Risk transfer solutions, such as catastrophe risk insurance, are adaptation measures aimed at limiting the financial impact for people affected by distributing the risk to other players in the market. Risk transfer solutions are particularly effective in the case of low-frequency and high-severity events such as once-in-100-year catastrophes by limiting the financial impact of these events.

The study selected 20 appropriate adaptation measures and for each of these measures, quantified the benefits – i.e., averted losses – as well as costs, and computed a cost-benefit ratio. This calculation accounts for cost of capital, investment costs and operating costs. Based on this cost-benefit analysis, the study compiled a portfolio of cost-effective adaptation measures for each country.

In some countries, up to 90% of the expected loss in 2030 under the high climate change scenario can be averted cost-effectively using risk mitigation initiatives. However, there are significant differences across countries.

The expected loss that can be averted cost-effectively is driven by various factors, for example, the value of buildings and the share of expected loss caused by coastal flooding/storm surge. The best approach for each country is determined specifically by its topography, exposure to hurricanes, and value and vulnerability of

assets.

In St. Lucia, for example, only a small share of the expected loss can be averted cost-effectively using risk mitigation measures as shown in Figure 3, the cost-benefit analysis of mitigation measures for St. Lucia. To address the residual risk beyond this level, it is economically more effective to purchase a risk transfer solution than to implement further risk mitigation measures.

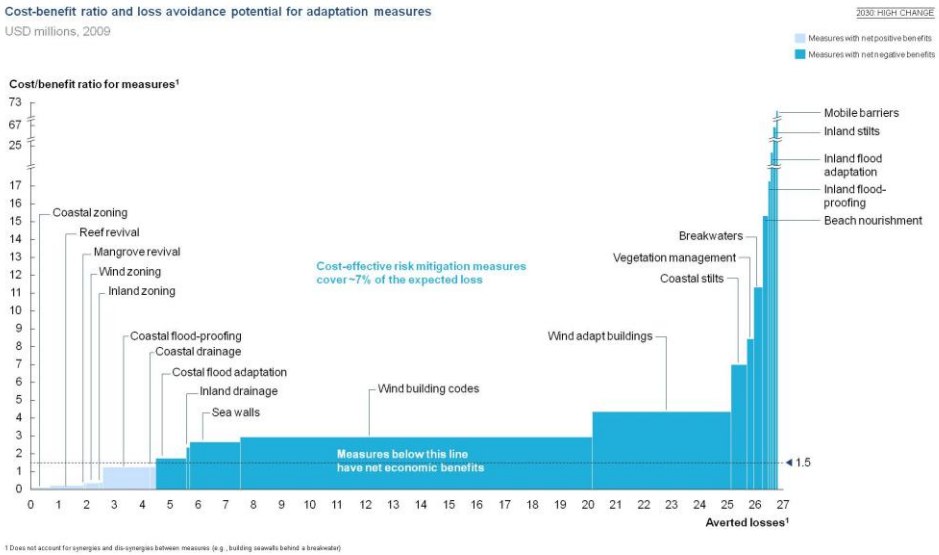


Figure 3: Cost-benefit ratio for mitigation measures for St. Lucia. Source: Enhancing the climate risk and adaptation fact base for the Caribbean (Preliminary Results).CCRIF. 2010.

A balanced portfolio of risk mitigation and risk transfer measure will be needed

Together, the results of the study illustrate the importance of a balanced portfolio of measures in each country. It is important to underline that the findings discussed above are based purely on

economic considerations. However, decision makers have to consider other important elements, such as safeguarding life and the human cost of misery. As a consequence, the results of the study do not imply that risk mitigation should not be pursued in all countries. The findings suggest that the focus of an adaptation strategy in countries where only a small share of the damage can be averted cost-effectively (e.g., Dominica and St. Lucia) should be on the following two principles:

- Using suitable risk mitigation initiatives to protect human lives
- Building on risk transfer solutions to protect economic assets

The study included an assessment of the impact of climate change on the agriculture sectors with detailed analysis of Jamaica and Belize, focusing on the most economically important crops. The analysis showed that potential changes in net production volumes in 2030 vs. 2009 range from -45% (sugar cane in Belize) to +10% (banana in Belize). The change in yields induced by potential climate zone shift is the main driver of the change in production volume. Crop yields are not expected to change uniformly across countries – while some regions get significantly less suitable for specific crop types, others might not be affected as much by climate change. The analysis also showed that the change in severity of hurricanes has the potential of increasing damage for all countries and crops.

Figure 4 shows the next steps that can be taken to put the final results of the ECA study into action. These steps range from fully understanding the results to designing a cost-effective portfolio of adaptation measures, accessing funding by submitting fact-based requests, and accelerating implementation.

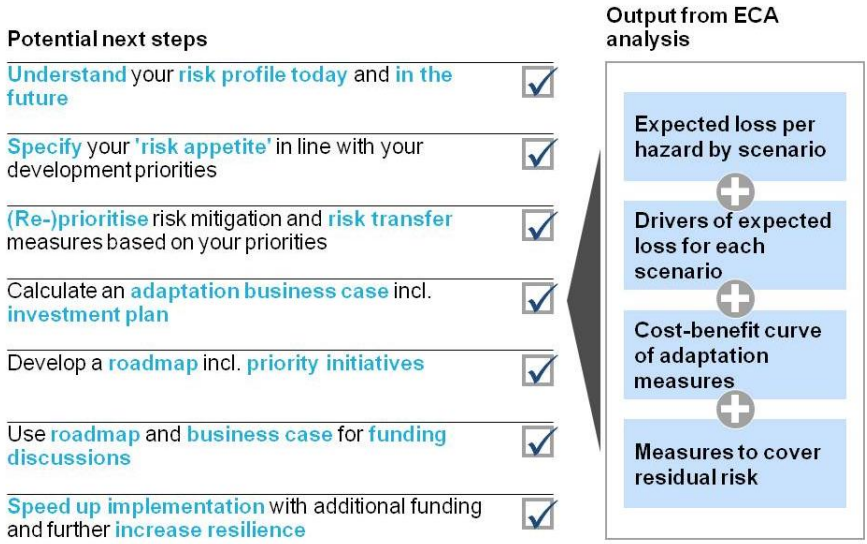


Figure 4: Potential Next Steps to Turn Findings into Action
Source: Enhancing the climate risk and adaptation fact base for the Caribbean (Preliminary Results).CCRIF. 2010.

The study provides a sound economic fact base that countries can use to further develop their national climate adaptation and disaster management strategies. For example, the study prioritises areas and sectors at risk and provides clear inputs for building an economically viable portfolio of adaptation initiatives designed to increase each country's resilience. There will need to be compromise in terms of the measures which are eventually adopted as part of a country's adaptation framework and this study can be a starting point for initiating the painful but necessary dialogue which must be undertaken either now or in the future.

Additionally, the results of this study can be used by governments in multi-lateral and bilateral funding discussions. Given the current and future financial situation of many developed and developing countries, access to international adaptation funding will be enhanced by a country's ability to support effective business cases with sound quantitative data. This study provides a relevant toolkit to aid Caribbean countries to do this.

Helping Caribbean Countries Understand Hurricane Risks and Enhancing their Preparedness during Hurricanes... CCRIF's Real-Time Forecasting System (RTFS)

By Simon Young, Ekhosuehi Iyahen and Elizabeth Emanuel

The Context

The changing climate is a global driver of increasing disaster risk and threatens to undermine the critical development gains made by the most vulnerable countries, including small island developing states such as those here in the Caribbean. Over the last three decades, the Caribbean region has suffered direct and indirect losses estimated at US$700 million and US$3.3 billion respectively, owing to natural disasters associated with extreme weather events. This is likely to become worse as the impacts of climate change become more pronounced. Hazard impacts resulting from this climate variability have exposed the vulnerability of key sectors in the Caribbean such as tourism, agriculture, fisheries, and water resources.

The Caribbean Catastrophe Risk Insurance Facility (CCRIF) had its genesis in the very recognition of the debilitating effect climate-related hazards can have on Caribbean countries. The impact of Hurricane Ivan on the Caribbean in 2004 was a brutal reminder of the

need for the provision of catastrophe risk insurance for countries within the region and resulted in the creation of CCRIF, a novel idea, nurtured by Caribbean governments into a successfully operating and globally unique risk transfer solution. Since its inception in 2007, CCRIF continues to be included in the disaster risk management strategies for sixteen countries in the Caribbean Region who are members of the Facility. This is operationalised through the provision of hurricane and earthquake insurance coverage that CCRIF provides to its member countries which ensures that members have access to liquidity within fourteen days after a catastrophe event occurs. CCRIF issued 30 annual policies to 16 CARICOM countries (its members) for the 2009-2010 policy/financial year.

It is clear that CCRIF's policies do not obviate the need for Caribbean governments to continue to invest in mitigation activities and in other financing mechanisms to cover relatively small losses that occur more frequently such as flash floods, tropical storms and heavy rainfall. CCRIF therefore provides a cost-effective solution to one part of the larger comprehensive disaster management (CDM) process. With this in mind, CCRIF has adopted the fundamental principle of building the capacity of its members to reduce their vulnerabilities and heighten their resilience by supporting other aspects of disaster and risk management and to this end has committed substantial resources and effectively engaged with key regional partners and institutions to develop and implement a range of initiatives that support the sustainability of the countries of the Caribbean. Some of these initiatives include:

- The development of the Real-Time Forecasting System (RTFS), a storm impact forecast tool which provides disaster managers, meteorological officers and policy makers with real-time hurricane hazard and impact information during a tropical cyclone.
- The development and implementation of a technical assistance (TA) programme geared towards helping Caribbean countries deepen their understanding of natural hazards and the potential impacts of climate change on the region. Within the TA Programme, CCRIF recently conducted a study on the Economics of Climate

Adaptation in eight Caribbean countries towards providing a tool to assist the region's decision makers in defining and developing sound climate adaptation strategies. Under this programme, CCRIF also has engaged in an agreement with the University of the West Indies to provide scholarships to students pursuing courses of study related to disaster risk management

- Providing technical assistance for the reconstruction of Haiti after the January 2010 earthquake
- Engaging in Memoranda of Understanding with a range of regional organisations such as Caribbean Disaster and Emergency Management Agency (CDEMA) and United Nations Economic Commission of Latin America and the Caribbean (UN-ECLAC) towards enhancing the disaster risk management capacity of the Region.

An Introduction to the Real-Time Forecasting System (RTFS)

The RTFS provides countries with access to hazard and impact maps in Google Earth which show wind speed over terrain, wave height in open water, storm surge height and inundation along the coast, cumulative rainfall over the duration of the storm, and wind effects on vegetation, structures and electrical power.

The Real-Time Impact Forecasting System (RTFS) is a storm impact forecast tool which provides users (CCRIF member countries and various international development partners) with access to real-time estimates of the expected hazard levels and impacts on population and infrastructure for all tropical cyclones, thereby contributing to public safety. This integrated, 3D, high-resolution modelling platform is able to produce detailed information on the expected hazard levels

and the impacts from tropical cyclones for the entire Caribbean region.

CCRIF provides the RTFS tool to its 16 member countries at the start of the Atlantic Hurricane Season on June 1 each year. In 2010, CCRIF provided over 100 users with access to the RTFS at no cost. The development of the RTFS was made possible by technical support from Kinetic Analysis Corporation (KAC) and the Caribbean Institute of Meteorology and Hydrology (CIMH).

The RTFS and CCRIF's parametric hurricane policies are built on the same hazard and loss estimate modelling platform, which means that the hazard footprints from the final track of storms in the RTFS are the same as those used in the hazard loss estimate model which underpins CCRIF's policies.

By providing advance knowledge of a hurricane's expected site-specific impacts, the RTFS can assist meteorological officers and disaster management coordinators to support effective preparedness and response, evacuation decision making, planning for pre-positioning of equipment and supplies, activation of mutual assistance arrangements and asset management as well as for contingency planning to secure critical infrastructure and operations.

In other words, the RTFS can effectively:

- Assist with contingency planning by providing a preview of what might happen if a given storm continues along a projected path, and activate appropriate contingency plans based on this insight
- Assist with shelter management by identifying impact areas and shelter locations to support shelter allocation decisions
- Identify potential damage to shelters, thereby aiding decision makers to plan for alternatives
- Assist with determining emergency interventions by identifying areas where populations are at risk so that decision makers can issue warnings and plan for assistance.

This real-time service therefore provides enhanced value to participants by improving their understanding of hurricane risks.

RTFS Support for Haiti

As a result of the earthquake which occurred in Haiti on January 12, 2010, the vulnerabilities of the Haitian population to natural hazards have been especially heightened as a significant part of the population remains displaced and without shelter. In light of these heightened exposures and risks, CCRIF has enhanced the site-specific features of the RTFS for Haiti in order to support the ongoing management of displaced populations.

CCRIF is currently working with the Civil Protection Directorate in the Ministry of the Interior and the Meteorological Centre in Haiti along with international relief agencies to provide them with relevant and actionable information for management of refugee tent-camps, safekeeping of their occupants, and for general displaced population planning purposes. For critical locations, such as aid operation centers, refugee camps and transportation hubs, the RTFS will produce site-specific estimates of expected wind speed and coastal flooding heights during the approach of a storm. Information will be made available in various formats optimised for the required applications.

How the RTFS is Operationalised – The Technical Details

For all active tropical storm systems, the RTFS computes the intensities of the storm hazards along the forecasted track, and the potential impact of those hazards on affected territories. This information is updated with each storm advisory issued by the National Hurricane Center (NHC). The storm modelling platform which simulates the storm, uses as inputs the latest storm forecast information and other relevant weather data downloaded from the NOAAPORT satellite.

From the analysis described above, the following map and tabular information is provided by the RTFS:

- maximum expected hazard intensity for wind speed, wave and storm surge height, and cumulative rainfall across the entire impact area of the storm
- estimates of the impact on the territory by varying hazard levels
- estimates of the operational impact of the storm on major ports and airports
- maximum expected hazard values from the current storm as forecast, for up to five user-selected locations. For the maximum wind speed values, the time at which the maximum will occur is also provided.

CCRIF hazard and impact estimates are provided for areas between 55˚W-91˚W longitude and 8˚N-34˚N latitude.

The RTFS data or results are provided in kml format, which can be displayed in Google Earth. This allows the user to display the map layers over the Google Earth background, which puts the hazard and impact data layers in an easy to visualise local geographic context.

The RTFS is made available via the CCRIF website at www.ccrif.org. In terms of currency of information, users can benefit from an RTFS feed that is updated very six hours, consistent with each storm advisory issued by the National Hurricane Center (NHC). Modelling results are available within 30 minutes of the latest NHC forecast. Essentially, the RTFS outputs are for the exclusive use by governmental and non-governmental agencies involved in hurricane risk management. Outputs can be used to produce reports, maps, and other guidance documents in support of emergency management. Emergency managers can use the RTFS information as triggers for preparedness and alert procedures.

Figures 1 and 2 show the footprint maps of wind, and storm surge for various storms.

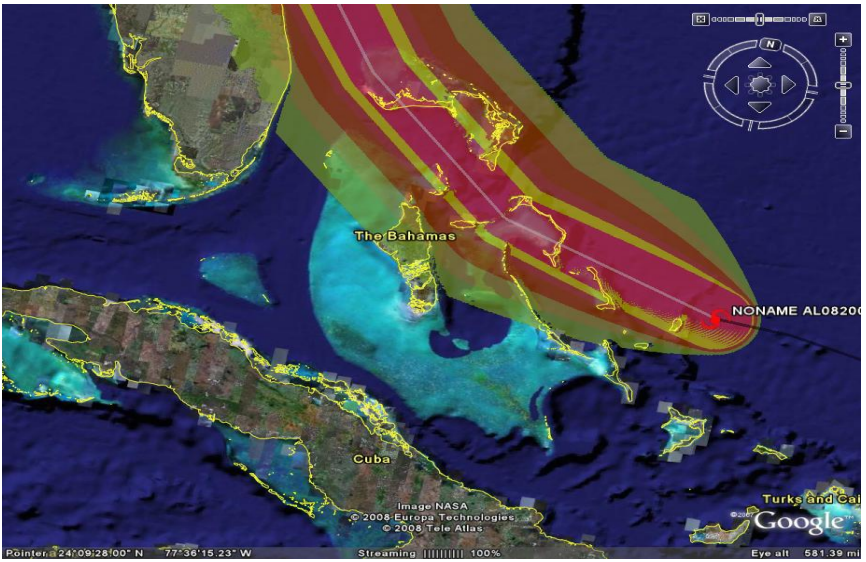
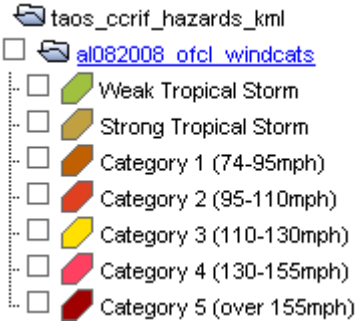


Figure 1: Wind Speeds (Maximum) Source: A Guide to Understanding the Real-Time Impact Forecasting System, CCRIF, 2010



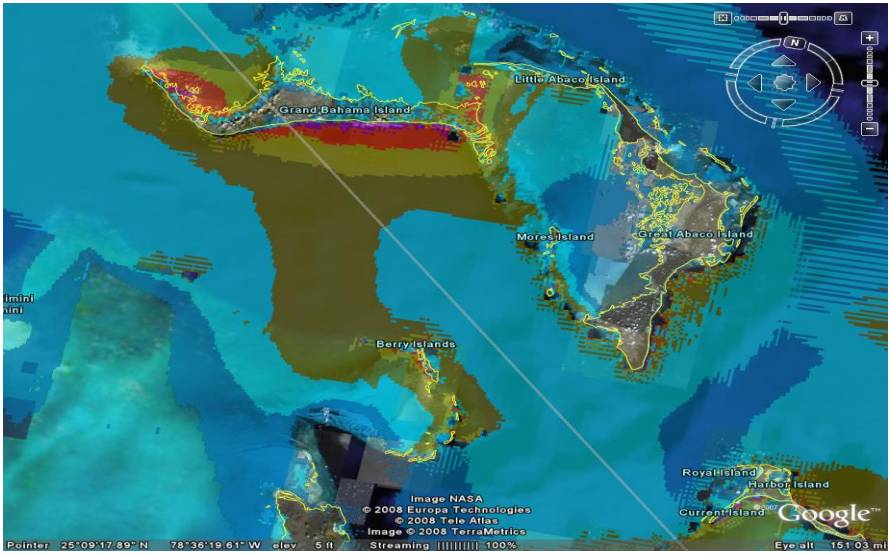


Figure 2: Storm Surge Heights (Peak)
Source: A Guide to Understanding the Real-Time Impact Forecasting System, CCRIF, 2010

SUPPORT AND OUTREACH TO FACILITATE RTFS USAGE BY MEMBERS

CCRIF provides a sub-licence to the Caribbean Institute for Meteorology and Hydrology (CIMH) to access the RTFS and use it for training and support purposes. One of the goals of this initiative is to enhance the understanding and use of the RTFS within the region and this is supported by a number of activities undertaken by CIMH as follows:

- Briefing the Caribbean Disaster and Emergency Agency (CDEMA) country preparedness team(s) each time a storm is approaching one or more of the CDEMA member states

- Using RTFS as training material in its teaching programme for meteorology students
- Organising familiarisation and training workshops for Caribbean meteorological officers and disaster management agencies prior to the start of the hurricane season
- Providing technical support to RTFS users such as technical advice on interpretation of hazard information from the RTFS on an as needed basis

Documents and Resource Materials Provided to RTFS Users

- **RTFS User Guide (for accessing secure RTFS site on CCRIF's website)**
- **RTFS Data User Guide**
- **Google Earth Notes**
- **TAOS-RTFS Outputs for user selected locations**
- **A Guide to Understanding the Real-time Impact Forecasting System**
- **CCRIF RTFS Training Manual**

Assessment of the Use of the RTFS in 2010

During the period, June 1 –November 30, 2010, the RTFS site was accessed 331 times by 11 CCRIF member states. The site was visited primarily during Tropical Cyclones Igor, Richard, Nicole, Matthew, and Tomas. Jamaica was by far the largest user, with one third (111) of the visits, followed by Haiti with 54, and Barbados with 41. Belize, Bahamas, Turks & Caicos Islands, Anguilla, Dominica, Cayman Islands, Trinidad & Tobago and Bermuda also visited the site. International agencies operating in Haiti accessed the site from the United States, Switzerland and the UK.

In an attempt to assess the value of the RTFS to its members and whether the tool was effectively meeting their needs, CCRIF undertook an analysis of the use of the system by conducting a survey of persons who received access to the RTFS via the CCRIF website. The survey provided information related to:

- The demand for the RTFS by meteorological officers and disaster management officers
- Knowledge of the RTFS
- Usage of the RTFS
- Suggested changes/additions to the RTFS
- Adequacy of instructions for accessing the RTFS
- Usefulness of the documentation provided on the RTFS– was it seen/user friendly (RTFS Booklet Q & A; User Guide for the RTFS)
- Usefulness of the training provided by CIMH on the RTFS

It was clear from the survey that respondents felt that the RTFS was useful and could be part of the overall disaster management framework of their countries.

THE RTFS IN 2011

Based on the findings of the survey, CCRIF prepared a plan containing a range of strategies for enhancing the value and level of usage of the RTFS. During 2011, CCRIF implemented the following activities:

- Developed a 2-day course on the RTFS and delivered two sets of training in the RTFS using its online training platform. The development and delivery was this course was a collaborative effort of CCRIF, CIMH and KAC. The course is titled ""Understanding and Using the CCRIF Real-Time Forecasting System" and includes clear learning objectives, course modules, accompanied by appropriate training materials. Seventy-eight persons from across the region participated in the training.
- Appointed a RTFS coordinator to provide technical support with respect to the RTFS to countries during the hurricane season

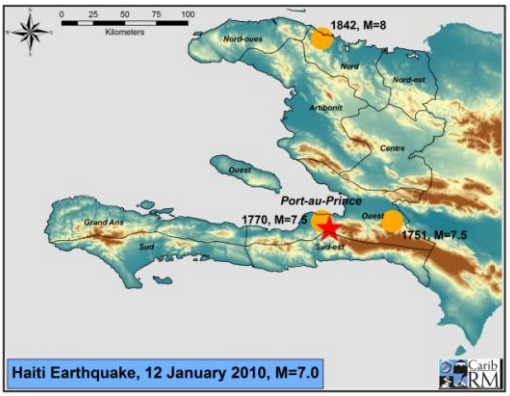
- Developed a concise RTFS Communication Strategy – this would include raising awareness of the value of the RTFS among decision makers – not only among officials who would actually use the tool
- Reviewed and Revised the RTFS Question and Answer Booklet and RTFS Brochures
- Reviewed and adopt some of the technical recommendations made by RTFS users for enhancement of the RTFS system itself such as the archiving of previous storms

CCRIF will continue to find ways to support the sustainability of the small island states of the Caribbean and feels that the RTFS is one tool to help these countries better manage in the face of increasing hazards. CCRIF will continue to assess the RTFS to ensure that it is effectively meeting the needs of its members as they move towards reducing their vulnerabilities and embracing a culture of hazard risk reduction.

2010 Earthquake in Haiti
Update on Recovery Efforts and Lessons Learned

By Ronald H. Jackson & Diane Allen West

Introduction



Haiti is now in its 21st month in the rebuilding phase of its recovery since the earthquake of January 12, 2010 struck its capital city Port-au-Prince and the three neighbouring towns of Léogâne, Jacmel and Petit-Goâve at magnitude 7.0 causing unprecedented damage to its already fragile economy. Despite full international cooperation to 'Build Haiti Back Better', challenges persist in realising the goals of creating a stable and sustainable economy.

The Haitian Initiative

The Haitian Government, whilst advocating global support for redevelopment maintains that its situation is difficult but not desperate. It regards the experience as "an opportunity to unite Haitians of all classes and origins in a shared project to rebuild the country on new foundations". Thus it introduced the Haitian Action Plan for National Recovery and Development which indicates Haiti's vision and goals for redevelopment - all programmes and initiatives which are coordinated through the Interim Haiti Reconstruction Committee (IHRC) co-chaired by the then Haitian Prime Minister Jean Max Bellerive and President Bill Clinton.

Challenges for Haiti and the IHRC

To date only 30% of pledges made to the IHRC have been realised, which unfortunately correlates to the delayed pace of reconstruction. Private initiatives and international donor funding have been generous, but not sufficient to sustain the structure of rebuilding. For the Haitian Government, the situation is not the better for having to grapple with the implications of the IHRC completing its mandate on October 21, 2011. It is hoped however, that due to events which saw the installation of new Prime Minister, the Honourable Garry Conille (October 18, 2011), efforts will be hastily and effectively mobilised to buy more time and secure an extension from the IHRC.

First Lesson Learned: Establish international frameworks for managing in cases of severe losses.

The role of the IHRC and the continuity of business as usual in Haiti opens up what should be a critical debate and a most positive lesson learned throughout the international community. That is: the need for the creation of a framework for the management and coordination of international efforts and initiatives for the emergency relief operations for all small island developing states *in cases of extreme or total economic failure resulting from disasters* and that such systems should be designed to equitably accommodate (and obligate) all nations and international parties in making the appropriate interventions whilst working in tandem with local or regional operations. This should of

course involve global financing of plans which cover risks against severe economic losses.

Some Critical and Recurrent Challenges in the Rebuilding Phase

Land Management

Throughout the rebuilding phase, Haitians continue to meet the challenges of clearing 900,000 cubic metres of debris within devastated areas and in appropriating land for public use and urban planning. The inequities in land ownership and the loss of institutional memory or records of land titles and ownership are major issues yet to be resolved. Moreover, against the background that more than 60% of Haiti's population live in rural areas, the management of arable land is strategic for the revitalisation of Haiti's agricultural sector which according the USDA, is the key to economic stability and recovery in Haiti.

The Environment – Disaster Risk Management (DRM)

Another area of critical importance is the Environment-Disaster Risk Management sector, which involves the deconcentration of population and the relocation of families to designated areas outside the city. This is a priority based on **lessons learned about how highly concentrated populations increase risks during disasters**. The Sigma Report (1/2011), for example, made the assessment that major risks associated with earthquakes are directly linked, not to the disaster itself but to the potential damage it brings to over-populated city centres where a single occurrence could cause the deaths of hundreds of thousands. The Report states that:

> ***"….fatalities and insured losses from earthquakes are rising because population growth and higher population density, especially in urban areas, exposes more people to a single damaging earthquake and many of the rapidly growing urban areas are with high population densities are located in seismically active areas. Due to this the***

probability for earthquakes with high death tolls continuously increases, although seismic threat itself remains unchanged".[5]

Second Lesson Learned: Promote environmental, urban and infrastructural planning based on DRM principles

The lesson learned from this assessment is not just the need for the enforcement of improved building standards along with disaster resilient infrastructure, but the need for more strategic planning for housing developments, residential communities and commercial centres that are eco-friendly and embrace DRM principles. Such plans must mitigate against the high concentration of persons inhabiting a single location thus decreasing the overall vulnerability of the general populace.

Urban planning must also be complemented by effective governance which through legislation, policies, standards and special regulation, establishes comprehensive building codes and makes hazard mapping a pre-requisite in all aspects of infrastructural development. It should also be mandatory, not only in Haiti, but in all CARICOM countries – particularly the smaller islands of CARICOM with more than 80% of their infrastructure built along coastal areas - that all structures pre-dating the last fifty years be reassessed and refitted to fulfil current building standards and become resilient to current disaster risks and suitable to climate change adaptation needs.

Third Lesson Learned: Establish improved risk-transfer measures for immediate post-disaster relief

The Haitian experience has afforded all developing nations to become more reflective and proactive about their own preservation. The experiences of Chile and New Zealand in 2010 serve as good case studies of the benefits of risk transfer. In those countries, insurers absorbed significant portions of the total economic losses incurred. However, whilst developing states advocate for global support in

[5] Swiss Re: Sigma (1/2011)

financing national reinsurance programmes, less affluent nations can adopt models similar to that of India where micro-mitigation risk transfer initiatives such as the microinsurance scheme *'Afat Vimo'* has been met with considerable success.

Case of India

In India, after the devastating 2001 Gujarat earthquake, about 15 million persons directly or indirectly affected faced disaster-induced financial losses even after having benefited from relief support. A survey revealed that only two percent had been covered by an insurance scheme during the earthquake. A Regional Risk Transfer Initiative was then designed in cooperation with insurance providers. This inclusive risk transfer initiative served as a complement to a local DRM agency's (AIDMI)[6] Livelihood Relief Fund. The plan covers 19 disasters including explosions, riots, cyclones, earthquakes and landslides and costs an annual premium of less than US$5. Damage to the policyholders' houses, household assets, trade-stock and losses of wages due to accidents are covered. The earning household member's life is also covered. In India, it is felt that as the poor are most disadvantaged by disasters, microinsurance is emerging as a most positive opportunity for them.

CCRIF's Role

In looking at CCRIF's Strategic Plan 09/10 – 10/11[7], it is posited that the Haitian experience presents new opportunities or a unique awareness raising opportunity for the Facility. CCRIF which provides insurance coverage for 16 CARICOM countries, demonstrates that it is motivated to expand its services as a result of its own lessons learned from the 2010 earthquake in Haiti when it states:

> ***"…the small size of that payment relative to the levels of devastation highlights the need for increased levels of coverage that would result in larger payouts which can do even more to stabilise***

[6] All India Disaster Mitigation Institute
[7] CCRIF Strategic Plan 09/10-11/12, Strategic Objective 4, p.9

government services and provide a springboard to more rapid and comprehensive recovery"

In light of the above, CCRIF has committed to working with key donors to facilitate members attaining these levels of coverage. If Haiti is considered a suitable emerging market (where finance for risk transfer is almost negligible at this stage of recovery), high levels of advocacy and diplomacy will be required from the region to support the Community's goals in this area, bearing in mind that to date US$ 990 billion of committed pledges still remains to be collected to continue the rebuilding process in Haiti.

Fourth Lesson Learned: Haiti takes responsibility for improving its own crisis management mechanisms

Apart from enhancing DRM practices in building its own disaster resilience, the Haitian Government has recognised an urgent need for the country to reinforce more rigorous crisis management mechanisms during disasters. The Government has stressed the need to improve local means for civil protection, training, staffing and equipping communities and department (parish) personnel. They have charged the ministry with responsibility for operational crisis management and stressed that its own public authorities should be prepared for any crisis threatening the nation.

The Haitian Government has recently established the National Council for Civil Protection to take charge of defining strategies to reduce Haiti's vulnerabilities and improve its responses in major crises. Legislatively it has sought to enforce risk prevention policies, tighter regulation and standardisation policies and procedures related to all aspects of urban planning, public works, transportation, communication, agriculture and natural resources.

Whilst Haiti aims to improve its own national capacity to manage disasters, the Caribbean Community stands prepared during the rebuilding phase, to assist in the joint planning (with international parties) to help build Haiti's institutional capacity and strengthen key internal mechanisms for future sustainability.

CARICOM's Role

Having made a significant contribution to Haiti's recovery during the acute emergency stage, CARICOM in the transitional phase (according to the Executive Director of CDEMA, Jeremy Collymore[8]), has plans to continue providing tents for the 650,000 persons still living in camps. Over the next three years, CARICOM through the Office of the Special Representative for Haiti will continue its advocacy for governments and private entities to support economic recovery in Haiti. To date, CARICOM has, for example, offered Haiti market access for 45 products with the hope of increasing this to 65 (or by 50%) in the near future. Private sector interests as well as the regional diaspora continue to work (often discretely) on making financial contributions.

On a most positive note, opportunities are ever increasing for CARICOM business interests, as the reconstruction projects could invite tenders for large-scale building projects particularly as there are considerable acreages of designated lands for the development of new communities.

CARICOM's involvement in Haiti's recovery, even with significant financial limitations remains steadfast and committed to engaging the process of diplomacy and bilateral cooperation – the medium through which developed nations must be reminded that pledges are to be honoured and without financial reinforcement all gains made at great sacrifice will be lost. As it rebuilds, Haiti remains threatened perennially by hurricanes and cyclones and is deemed a State most vulnerable to climate changes. Its state of affairs is and will remain for many years, intensely fragile and must therefore be handled with great care.

Conclusion: ODPEM's Role

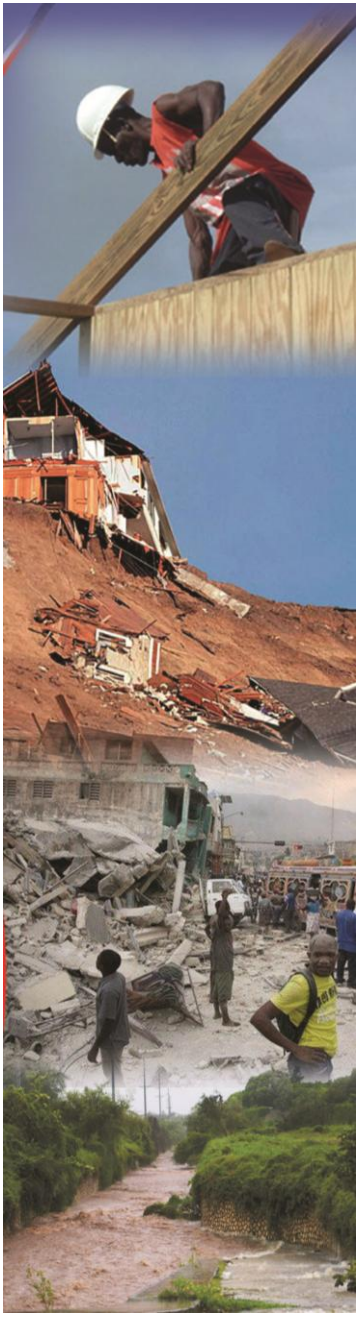
The ODPEM, having its own mandate for the coordination of CARICOM relief efforts in the Northern Caribbean, was part of the early relief operation in Haiti following the 2010 earthquake and will continue to do its part in monitoring, forecasting and implementing

[8] Jamaica Observer interview September 26, 2011

appropriate programmes within the CDM framework in fulfilling its objective of advancing disaster preparedness and emergency management nationally and regionally.

In January 2012, the ODPEM will host a national earthquake simulation exercise which will highlight and address some of the lessons learned in Haiti but which will serve primarily to test and assess Jamaica's own national capacity to manage and respond to disasters of similar magnitude.

For the benefit of all small island states of CARICOM, the ODPEM will shortly launch its new Country Work Programme which documents the way forward for disaster risk management and which, it is hoped, will serve as a guide for all of CARICOM to effectively inform strategies to achieve the collective impact of creating a disaster resilient region.



Section 3:

Expert Notes and Speeches

Caribbean Partnerships for Disaster Risk Reduction…the CCRIF Experience

By Mr. Milo Pearson, Executive Chairman, CCRIF
at the 34th Annual Miami Conference on the Caribbean and Central America, Miami, USA
December 2, 2010

Chairman, fellow panelists, ladies and gentlemen, on behalf of the Caribbean Catastrophe Risk Insurance Facility, I am very pleased to have been invited to participate in this important event.

My presentation today will highlight the importance of partnerships in disaster management and demonstrate how the Caribbean Catastrophe Risk Insurance Facility is built on partnerships that operate in a participatory and collaborative framework all geared towards advancing the sustainability of the small island states of the Caribbean. This is critical as over the last three decades, the Caribbean region has suffered annual losses estimated at up to 6% of GDP owing to natural disasters associated with extreme climatic and geophysical events. This is likely to become worse as the impacts of climate change become more pronounced.

I would like to begin by providing you with an overview of CCRIF and how effective partnerships have contributed to the success of the Facility to date.

CCRIF is the first - and currently the only - multi-country risk pool in the world. It is also the first insurance vehicle to successfully develop parametric policies backed by both traditional risk transfer and capital markets. Basically, CCRIF is a regional catastrophe fund for Caribbean governments, designed to limit the financial impact of devastating hurricanes and earthquakes by quickly providing financial liquidity when a country's policy is triggered. The Facility operates as a public-

private partnership, and is set up as a non-profit 'mutual' insurance entity in the Cayman Islands.

In essence, CCRIF issues parametric insurance policies for hurricanes and earthquakes using modelled hazard parameters as a basis for loss estimation and loss payment to 16 countries in the Caribbean. Parametric policies enable very rapid payouts since there is no need to wait on loss adjusters to estimate damage after an event, which can take a considerable amount of time. This provides governments with liquidity to help with immediate post-disaster recovery as well as medium-term rebuilding efforts.

Two days ago marked the end of a very active Atlantic Hurricane Season with 19 named tropical cyclones passing through the Caribbean. CCRIF's role in immediate post-disaster recovery was once again highlighted during this season as, in September and November, the Governments of Anguilla, Barbados, Saint Lucia and St Vincent & the Grenadines received payouts totalling over US$17 million following the passage of Hurricanes Earl and Tomas. And in January of this year, CCRIF was the first organisation to release funds to the Government of Haiti after the devastating January 12 earthquake, when it paid almost US$8 million based on that country's earthquake policy. Policies were also triggered in previous years.

CCRIF's mission is to serve Caribbean governments and their communities in reducing the economic impact of natural catastrophes by providing immediate liquidity through a range of affordable insurance products in a way that is financially responsible and responsive to their needs. As we pursue this mission, we recognise the critical role of establishing partnerships for sustainability. CCRIF engages in partnerships at three levels to fulfill our mission:

1. We are working with our members in the region to establish and make available a knowledge bank of relevant and credible resource materials on risk transfer, CCRIF products and disaster risk reduction as well as to facilitate the exchange of technical, scientific and management information on risk transfer mechanisms so that our members are well informed prior to purchasing our products

2. We are working with key regional organisations to design and implement programmes to strengthen Caribbean governments' disaster response and mitigation capacity as well as developing strategic alliances through MoUs and other mechanisms with regional institutions to reduce the existing vulnerabilities in the small island states of the region.
3. We are working with organisations at the regional and international levels on collaborative projects that are designed to develop institutional enabling environments and regional supporting mechanisms for knowledge sharing, scaling up good practices, capacity building and technology.

These partnerships are already resulting in 'win-win' situations that benefit all stakeholders involved, leading to improvements in managing risks and to sustainable development. Also, it has enabled the Facility to take advantage of regional knowledge and expertise. The Facility is therefore a full partner in the development of the Caribbean region, providing technical assistance and developing alliances to improve disaster risk management in the region.

Our partnerships and collaborations have contributed to us being responsive to the needs of our members in many ways. This is evidenced by:

- our members renewing their policies each year over the past three years and the confidence that regional governments are expressing in the operations of CCRIF and the role that parametric insurance plays in disaster risk management
- development of a new excess rainfall product which will be available in early 2011 to complement our current wind-based hurricane policies. The regional rainfall model – upon which the excess rainfall product is based -- was launched in February of this year in collaboration with the Caribbean Institute of Meteorology and Hydrology (CIMH) – our main partner in the development of this new product.
- development and implementation of a Technical Assistance (TA) Programme that aims to help Caribbean countries deepen their understanding of natural hazards and the

potential impacts of climate change on the region. Within the TA Programme, CCRIF recently conducted a study on the Economics of Climate Adaptation in eight Caribbean countries towards providing a tool to assist the region's decision makers in defining and developing sound climate adaptation strategies. CCRIF partnered with the Caribbean Community Climate Change Centre (CCCCC), UN-ECLAC and other regional institutions to conduct the data collection and analysis for the study. Preliminary findings of the study revealed that current climate risk is already high, with annual expected losses of up to 6% of GDP in some countries and that, in a worst case scenario, climate change has the potential to increase these expected losses by 1 to 3 percentage points of GDP by 2030.

- our work in collaboration once again with the Caribbean Institute for Meteorology and Hydrology (CIMH) to extend support to Haiti after the January earthquake, particularly in hazard mitigation and future disaster prevention. CCRIF is supporting CIMH in providing tools to help planners and relief workers in Haiti to make better decisions about where to re-settle people and re-build infrastructure to minimise their exposure to flooding and landslides
- efforts to bring together the finance and insurance sector with the disaster management community as well as the meteorological agencies and other national stakeholders. To this end, CCRIF has conducted a number of seminars and workshops where these officials have interacted. Through this process, CCRIF has opened the eyes of finance officials to the high cost of natural catastrophes in the Caribbean region, a cost that is going to increase with climate change and which threatens the sustainable development of the region. After I leave this conference I head to Montego Bay in Jamaica where CCRIF is one of the main sponsors of the signature annual comprehensive disaster management conference in the region.

As you see, we are trying to do more than simply provide parametric insurance policies to our members. We continuously work towards

engaging our members and supporting them in the development and implementation of strategies for disaster risk management. We know that our success in the region can only be ensured through collaborative arrangements and partnerships that not only foster support for disaster risk management but build on existing mechanisms, institutions, tools and capacities towards sustainable prosperity.

In closing, I would like to reiterate the value of multi-level partnerships that involve different government sectors, research institutions, donors, and private firms in the development of long-term disaster management strategies. We know that CCRIF's success is based on working with our partners in the region from the inception of ideas through to implementation.

CCRIF demonstrates that an innovative product can be enhanced and integrated into national and regional disaster management systems with effective and sustainable partnerships not only to improve those systems but also to improve the product itself. As the famous anthropologist Margaret Meade once said, "A small group of thoughtful people could change the world. Indeed, it's the only thing that ever has." This, for me, is the fundamental importance of partnerships.

Climate Change: Economic Impacts on the Caribbean Small Island States and Implications for Sustainable Development

By Mr. Isaac Anthony, Board Member CCRIF and Permanent Secretary Ministry of Finance, Saint Lucia
Second Committee (Economic and Financial Committee) of the United Nations General Assembly, New York City
October 26, 2010

Chairman, fellow panelists, Ambassadors, members of the Foreign Service, ladies and gentlemen. On behalf of the Government of Saint Lucia and the Caribbean Catastrophe Risk Insurance Facility, I am honoured to have been invited to speak at this most important event.

My presentation will highlight the economic impacts of climate change on small island states of the Caribbean, review the implications for sustainable development, and present some innovative tools which our region is using to help our population adapt to the effects of climate change.

Climate change is a global phenomenon with wide-spread implications for all. However, its consequences vary, with small island states, which are already vulnerable in several respects, being particularly susceptible to the negative effects of climate change.

It is well recognised and agreed that developing countries and small island nations like those in the Caribbean will be among the first and hardest hit by the predicted adverse effects of climate change. In short, the relative burden of additional climate risk the region faces is the highest in the world, while at the same time we have fewer resources to adapt socially, technologically and financially. It is thus anticipated that climate change will have far-reaching effects on the sustainable development of the Caribbean, including our ability to realise the United Nations Millennium Development Goals by 2015.

Climate change will likely lead to more frequent high-intensity hurricanes, and the warming ocean is already causing a rise in sea level and negative impacts on protective coral reefs. Caribbean countries, where the populations and infrastructure are largely concentrated in coastal areas and where a large proportion of economic activity is linked to the weather or the coastline, will be particularly vulnerable to stronger winds, greater inundation from more forceful storm surge and waves, and heavier rains. These anticipated climate changes will accelerate the erosion of coastal beaches, inundation of low-lying land and loss of protective mangroves. Coastal houses, hotels and other buildings, along with roads and other infrastructure, are vulnerable, as are those who live and work there.

Climate change is also expected to increase rainfall variability. Greater, and therefore more damaging, precipitation during storms and other peak periods will be juxtaposed with more frequent and longer droughts.

The vulnerability of CARICOM countries to climate events is already evidenced by the increasing impact of hurricanes, tropical storms, drought and flooding in the region. During just one hurricane in 2004, two Caribbean nations each suffered economic losses which totalled close to 200% of their annual GDP and a further 7 countries were also severely impacted. Regional losses totalled over 6 billion US dollars for the event.

Over the past year alone many countries in the region, including my own, experienced drought, affecting access to water and resulting in a drop in agricultural productivity. At the other end of the rainfall spectrum, Jamaica received extreme rainfall from a non-cyclonic system in late September causing damage to infrastructure alone which totalled more than one hundred and fifty million US dollars. Many other countries have been affected by heavy rain events during the current rainy season, again including my own.

I can thus report, first hand, that the Caribbean is already suffering the negative impacts of increased climate variability. Adapting to this more hostile environment is not an option, it is a critical priority.

Preliminary findings of the Caribbean regional Economics of Climate Adaptation (ECA) Study, led by the Caribbean Catastrophe Risk Insurance Facility in collaboration with other Caribbean institutions and supported by McKinsey & Company and Swiss Re, confirmed that the damage potential under current climatic and economic conditions is already high, with annual expected losses totalling up to 6% of GDP in some countries. In a worst case scenario, climate change has the potential to increase these losses by 1 to 3 percentage points of GDP by 2030. For our islands, this is comparable in scale to the impact of a serious economic recession – but on an ongoing basis. Apart from the social and environmental disruption, the fiscal balance of these states is simultaneously severely undermined. At the national level this translates to cuts in revenue, an increase in spending needs, worsening public finances and increasing debt.

A classic example of this was the impact of Hurricane Ivan on Grenada, which was particularly severe and typifies the type of challenges posed by weather- and climate-related disasters. Hurricane Ivan made landfall on Grenada on September 7, 2004, as a category 3 storm, with sustained winds of a 120 mph and gusts reaching 135 mph. Prior to Hurricane Ivan, Grenada's economy was projected to grow at an annual rate of 5.7 percent; after Ivan, a negative growth of -1.4 percent was forecast. Revenues dried up, public expenditure sky-rocketed, sovereign credit rating declined, debt became expensive, and many years of growth were erased overnight.

The central challenge for the region, in which many countries are striving to attain developed country status by 2030, is therefore to develop climate change adaptation strategies which allow for achievement of future developmental goals. The risks associated with doing nothing, taking a business as usual approach, are simply too severe to contemplate.

Ladies and gentlemen, it has been articulated by many that if the Caribbean countries fail to adapt, they are likely to take direct and substantial economic hits to their most important sectors such as tourism, which depends on the attractiveness of the natural coastal environments and which is hugely dependent on coastal infrastructure, and agriculture (including fisheries), which is the most highly climate-sensitive sector throughout the world. These two sectors are the highest contributors to employment in many Caribbean countries, as well as being key economic engines, and so an inability to adapt to climate change will not only increase unemployment but have potentially debilitating social and cultural consequences to individual livelihoods, local communities and national development.

Therefore, for the Caribbean, adaptation, rather than mitigation, has to be our primary focus. Adaptation strategies must become the mechanism to manage risks, adjust economic activity to reduce vulnerability, and improve business certainty. It must be recognised that adaptation must be perceived in the long-term as it will take time to quantify risks of climate change and to build capacity to minimise costs and to take advantage of any benefits.

Adaptation mechanisms could range from infrastructural (for example building coastal defences), through behavioural (for example altered food and recreational choices) and managerial (for example altered farm practices) to policy (for example planning regulations). In fact, there is no clear picture of the limits to adaptation, or the costs, and this is partly because effective adaptation measures are highly dependent on specific geographical and climate risk factors as well as institutional, political and financial constraints. However, despite the uncertainties, we are beginning to act … for example, many of the countries in the region have compiled long-term national development plans that speak to the implementation of various adaptation strategies … and the Implementation Plan for the CARICOM Regional Framework for Achieving Development Resilient to Climate Change is currently being finalised.

The global community is largely focused on climate change mitigation strategies that aim to reduce the contribution to the causes of climate change, by lowering the level of greenhouse gases in the atmosphere – either by implementing activities that reduce the emission of carbon dioxide and other greenhouse gases (GHGs) or by increasing forests and other carbon sinks that remove carbon dioxide (CO_2) from the atmosphere. Although the contribution of Caribbean countries to global greenhouse gas emissions is small, many countries in the region are putting in place strategies to reduce their emissions, an effort driven by both a desire to contribute to climate change mitigation and the need for greater energy security. Most of our countries are developing cutting-edge energy policies which focus heavily on displacing fossil fuels with renewable energy production, combined with energy conservation and efficiency. Since our national commitment to a sustainable energy future was made at the fifth conference of the parties in Bonn, my own country, Saint Lucia, has taken substantial steps towards energy independence, developing geothermal, solar and wind projects across the country. Activities such as these will indeed reduce the region's carbon footprint and contribute to the sustainable prosperity of Caribbean countries by reducing their dependence on imported hydrocarbons, creating a more positive balance of trade and leading to environmental and economic benefits.

As I focus on adaptation strategies for climate change I must, at this point, speak to the Caribbean Catastrophe Risk Insurance Facility (CCRIF) within the context of climate change. The CCRIF model represents an innovative risk transfer option, which can be included in disaster risk management strategies for countries vulnerable to hurricanes, earthquakes and other natural catastrophe events, and can be a critical component of a country's climate change adaptation strategy. Sixteen countries in the Caribbean are members of CCRIF. For these countries, CCRIF:

1. covers the post-disaster liquidity gap faced by governments between immediate emergency aid and long-term redevelopment assistance

2. enables governments to receive money quickly, with the payout calculated completely objectively; and

3. minimises the burden of governments to provide exposure information prior to coverage being initiated and loss information after a disaster

It is interesting to note that CCRIF was born out of a response to the debilitating effects climate related hazards can have on Caribbean countries. The impacts of Hurricane Ivan on the Caribbean in 2004, which I have already alluded to, were brutal reminders of the need for the provision of catastrophe insurance for countries within the region. This novel idea nurtured by Caribbean governments into a successfully operating and globally unique risk transfer solution, shows how risk transfer instruments can be a key part of a country's risk management framework. Through the pooling of capital into a collective reserve and spreading of risks geographically, the Facility provides extremely cost-efficient coverage options for its participants against extreme natural events, the socio-economic impacts of which are beyond the management capacity of any individual country. CCRIF issues parametric insurance policies, which use modelled hazard parameters as a basis for loss estimation and payment. Parametric policies enable very rapid payouts, providing governments with liquidity to help with immediate post-disaster recovery as well as medium-term rebuilding efforts.

Some members of the Facility have already begun to see benefits. Most recently, in September, the Government of Anguilla received a payout of US$4.28 million following the passage of Hurricane Earl in this very active 2010 Hurricane Season. Currently CCRIF offers hurricane and earthquake coverage; however, we are in the final stages of developing a product to cover against extreme rainfall events. CCRIF also has a number of other active research and development projects, including assistance to a regional pool of electrical utilities to bring cost-efficient coverage options against wind risk to their overhead transmission and distribution systems, and other projects catalysing development of index-based insurance products to serve farmers and micro-finance institutions and clients.

We also support other capacity and knowledge-building activities through our Technical Assistance programme, which in turn supports increasingly active working relationships with many regional institutions in the areas of disaster risk management, climate change and the economics of sovereign risk.

We believe that CCRIF can serve as a template for other areas of the world, meeting the needs of governments with similar exposures. In fact, currently, nations in the South Pacific are looking to adopt a regional disaster insurance plan based on the CCRIF model. Within wider discussion and negotiations on climate change, the CCRIF is highlighted as the only working model of a multi-national and parametric-based catastrophe risk pool and is considered a viable template for expansion and/or replication globally as part of the overall climate change adaptation framework.

As we recognise the urgent need for adaptation, we also see that a wide variety of tools are needed. While we focus primarily on reducing our exposure to climate risks through climate-smart development, we must nevertheless understand the fact that not all risk can be fully mitigated, and that risk transfer solutions such as CCRIF provide a cost-efficient route to reducing the huge negative consequences of individual catastrophe events across the region.

As I close, I encourage you, in working with small island states and in setting your agendas, to remember that SIDS need lasting adaptation strategies that can help to provide security for the livelihoods of our peoples and protection against an ever changing and increasingly unpredictable and hostile climate.

As a Director of Finance, I am faced daily with decisions weighing investment of scarce resources in projects and programmes aimed at achieving broad development goals against the urgent need for investment in climate change adaptation. Having contributed so little to changing our earth's climate, my fellow Caribbean citizens are now being faced with bearing much of the cost.

As a region, we look forward to working with our international partners to continue building the quantitative business case for adaptation investment, including through public-private partnerships (PPPs) such as CCRIF, while simultaneously pursuing the more efficient flow of fast-start and long-term adaption funding to successfully implement climate-smart development.

Remarks - Opening Ceremony of the 6th Meeting of the World Forum of Catastrophe Programmes

By Dr. W^{m}. Warren Smith, President, Caribbean Development Bank
Montego Bay, Jamaica
October 24, 2011

As President of the Caribbean Development Bank (CDB) – and as a former member of CCRIF's Board of Directors, it is indeed an honour to be able to offer remarks at this meeting of the World Forum of Catastrophe Programmes.

As a Caribbean institution that is involved in disaster risk management in the region, CDB is pleased that this meeting is being held in the Caribbean for the first time. I believe that the information which will be shared within the next few days can be put to good use as you incorporate new ideas into your own work.

The past two years have been difficult ones: the just released International Federation of the Red Cross and Red Crescent world disasters report notes three mega-disasters in 2010 and 2011:

- the January 2010 earthquake in Haiti;
- massive flooding in Pakistan in July 2010; and
- the earthquake and tsunami that occurred in Japan in March of this year.

Reportedly, natural disasters resulted in almost 300,000 deaths in 2010, making it the deadliest year of the decade. The 2010 Haitian earthquake was classified as the second deadliest natural disaster of the decade after the 2004 Indian Ocean tsunami.

According to the Insurance Information Institute, the exceptional spate of natural catastrophes during the first half of 2011 alone, caused approximately USD265 billion in economic losses, a figure that

tops the USD220 billion in losses posted in all of 2005. And the cost of disaster damage is rising.

The case of Caribbean small island and coastal states and their vulnerability to natural hazards is a story that is well known.

In the last year and a half, CDB has had to respond to the emergency and infrastructure rehabilitation needs of several of its Borrowing Member Countries as a result of earthquakes, Hurricane Tomas, and a series of non-seasonal extreme rainfall events.

This pattern of extreme hydrometeorological events is with us to stay, and expected to be further exacerbated by global climate change. Growing urbanization and environmental degradation are likely to further compound the problem.

The Caribbean is particularly vulnerable to the impacts of climate change.

For three categories of loss: hurricane damage, loss of tourism revenue, and infrastructure damage, alone, the annual projected cost of Caribbean inaction to climate change impacts is projected to total USD22 billion annually by 2050 and USD46 billion by 2100. By 2100 these losses are estimated to represent 75% or more of the GDP of islands such as Dominica, Grenada, Haiti, St. Kitts and Nevis, and the Turks & Caicos, islands. Therefore, it is imperative that we do not perpetuate “inaction” and proceed to be proactive.

The comparatively small nature of a majority of our States does not allow them to easily diversify their risks, and with the rising frequency and intensity of natural disaster events, there is high priority to reduce vulnerability and limit fiscal exposure.

In the context of high indebtedness, and recessionary conditions, access to post-disaster credit is challenging and the quantum of funds to cover emergency and recovery needs can be daunting.

Governments in the region are often forced to divert funds from priority development projects to support emergency and recovery needs, thereby derailing planned development goals. They may raise new debt, at expensive post-impact capital market rates.

At current levels of indebtedness some countries may be significantly restricted in both access to and quantum of credit they are able to secure. Traditionally, they have also relied on the donor community for assistance, a modality which is recognizably slow, and ineffective to often fulfill the increasing scale of needs.

When governments are constrained to re-allocate budgets post disaster, significant liquidity crunches can emerge.

So where are we? Where do we need to be and how do we get there?

Where are we?

Reasonably good progress has been made towards the advancement and embedding of Comprehensive Disaster Management at a regional level. The year 2013 should mark the emergence of a third five-year, regional Comprehensive Disaster Management Strategy. This strategy will consolidate and further develop capacities in emergency preparedness and response, risk mitigation investment for critical infrastructure protection, management of recovery systems as well as in risk transfer and the use of innovative disaster risk financing products.

In most of our countries, we have managed to reduce loss of life, but the spectre of significant and/or catastrophic economic impact is ever present, and looms pervasively large.

Where do we need to be and how do we get there?

I will focus by remarks specifically on recovery systems and risk transfer as these areas have received proportionately less attention in the regional comprehensive disaster management landscape. This is by no means an acknowledgement that we are entirely in a zone of

comfort in relation to our emergency response and preparedness systems, or in our risk mitigation investments.

Significant strides have already been made through the development and operation of CCRIF since 2007 in terms of the development of the first pooled multi-country, parametric catastrophic risk insurance instrument, covering hurricanes and earthquakes.

As you will learn tomorrow, further strides are being made in the context of the development of the Micro Insurance Catastrophe Risk Organisation (MiCRO). MiCRO was formed with the goal of helping Haiti's micro-entrepreneurs protect themselves in the economic aftermath of natural catastrophes. Caribbean Risk Managers Ltd. – here this evening – is one of the founding partners and I am pleased to say that the CDB provides support by administering a multi-donor trust fund for the purpose of operating the facility.

DESPITE THESE ADVANCES, THERE IS A NEED TO:

- continue to create additional risk transfer and disaster financing products, in the context of hazards to which key economic sectors are exposed – conversations are already beginning about the possibilities of weather indexed crop insurance; and to
- develop and intensify the agenda to further assist policy makers to devise financial protection strategies against natural disasters. Such strategies are required to help our member governments mobilise resources in the aftermath of a disaster, while buffering their long-term fiscal impacts (CDB would be specifically interested in facilitating dialogue and an agenda of harmonised action in this area).

Currently there is very little evidence of a structured, quantitative, evidence-based, sector approach to measurement, characterisation and management of natural hazard risk across Ministries of Finance and Economic Planning. A focused, quantitative portfolio approach to natural hazard risk in the predominant economic sectors is required.

Focusing only on disaster financing options as one sub-facet of comprehensive disaster management, there are two options: *ex-post*, countries typically have donor relief assistance, budget reallocation, domestic credit, external credit, donor reconstruction assistance, and tax increases; *ex-ante* financing measures include budget contingencies, reserve funds, contingent debt facilities, parametric insurance, traditional insurance and catastrophe bonds.

How should a country invest in these options to handle both small and recurrent losses and catastrophic losses? How have we been investing?

Is the level of sensitisation, depth of knowledge and capacity to pursue this type of approach, sufficient, in our countries?

While current existing regional risk transfer and financing have built-in oversight and monitoring, as greater numbers of national and regional risk transfer and disaster financing mechanisms and products emerge, there will be a need for more coordinated, harmonised and concerted oversight and monitoring. This, coupled with the need to develop capacities and skills to make informed decisions about the best investments in disaster financing instruments, will require an expanded country skills base in this area.

For example do we have a sufficient regional knowledge base on how the global reinsurance sector works? Do we have a level of comfort about how our reinsurers are distributing their own risk? What will events such as Hurricane Irene and the Japan and New Zealand earthquakes do to catastrophe insurance costs? We need to have the technical expertise to be able to interact more optimally with global reinsurance and international capital markets as well as to validate our reinsurance investments.

Many of our countries do not have pre-developed national recovery plans or plans for national business continuity. Recent experiences have shown that, when faced with a catastrophe-related challenge, countries have scrambled to develop national recovery coordination

strategies and entities. Fundamentally, countries should be prepared past the exhaus-tion of their emergency preparedness and response systems, beyond the limits of their extant mitigation, and, using disaster financing options at their disposal, to have systems in place to enable effective, efficient, rapid recovery and business continuity as a country. This is another potential area CDB is interested in supporting.

The development and utilization of a country catastrophe risk financing strategy in tandem with the availability of pre-developed recovery planning and coordination systems will go a long way in reducing natural disaster development speed-bumps, and increasing long-term country resiliency.

As middle-income countries, in a hazard-prone region, the dearth of good collated temporal hazard and loss data, and well established data collection systems to enable evidence-based decision making is lamentable.

Under ideal circumstances, the region should be in a space where we better collect and manage national hazard and loss information, developing cost-effective temporally extensive, relevant databases. We should be able to trade and utilize such data in the research and development of innovative risk transfer and financing mechanisms, taking a more considered, structured and quantitative approach to the management of catastrophic risk within our overall pursuit of comprehensive disaster management. This will greatly improve our ability to make informed decisions. Also we need to always monitor the new and emerging class of catastrophic risk insurance and risk financing products. This meeting – and other similar gatherings – is one way in which we can learn about new risk financing options.

I would like to end by officially declaring this meeting “Open” and wish you a very successful meeting.

Climate Change and Insurance in the Caribbean

By Dr. Simon Young, CEO, Caribbean Risk Managers Ltd
Facility Supervisor, Caribbean Catastrophe Risk Insurance Facility (CCRIF)

Insurance is a business which has the assessment and management of risk at its core. In all parts of the insurance industry, there is a need to price risk; insurance and reinsurance underwriters must set a price for taking on risk, and the insurance buyer (often represented by an intermediary or broker) must be able to judge whether that price is reasonable.

In the Caribbean, the general insurance business model (as opposed to the life insurance industry, which will not be further discussed here) is such that natural catastrophe hazards play a dominant part in risk assessment and management. Catastrophe hazards require particular attention because they do not follow the usual 'laws' of insurance; in particular, single events can cause losses to a large proportion of clients covered by an insurance company simultaneously, especially if that company only underwrites risk in one or a few geographically neighbouring islands (as is common in the Caribbean). The need to be able to pay lots of claims all at once requires insurers either to purchase their own insurance, called reinsurance, which is expensive, or to hold a large amount of cash reserves, which is also expensive. Thus the cost of underwriting catastrophe risks, particularly in the Caribbean, requires particular attention to be paid to assessing that risk, both now and in the future.

Another feature of the Caribbean is the key role played by hydro-meteorological (water and weather) hazards in the cost of risk, hurricanes being the most obvious example. At all scales, from national governments to individuals, hurricanes are an immense source of both social and economic risk. However, coastal waves and storm surge, flooding and landslides triggered by heavy rainfall, and droughts caused by lack of rain, are also the source of considerable

risk. Any changes to the frequency or intensity of these risky events is of great interest to insurance companies and their reinsurers, particularly on a year-to-year basis but also over longer time periods.

Even if insurers themselves do not think the assessment of changing risks in the face of climate change is important to their business, the regulators of the insurance industry are increasingly moving to risk-based metrics to judge the long-term sustainability of insurance companies. Although most advanced in Europe, such risk-based regulation will undoubtedly be implemented in the Caribbean before too long, and the assessment of climate change risks will become a necessary part of insurance industry operations.

In addition to the direct impacts of climate change on the Caribbean insurance industry, the tools on which the industry already relies are the same tools that are critical to successfully managing climate change risk. In the language of climate change, managing the new conditions resulting from global warming is termed 'adaptation', and putting a price on current and future risk is critical to successful and cost-efficient adaptation. Adaptation must involve a reduction in climate risk – if not now then going forward in terms of development planning. Climate risk is already very high in the Caribbean, and two of the major economic engines, tourism and agriculture, are both highly climate-exposed. Development needs to become more 'climate-smart' throughout the region, but with climate change bringing additional future climate risk, sustained growth without adaption to the future hazard landscape will not be achieved.

While reducing current and future risk must be a priority, there is a threshold at which investment in risk transfer (paying someone else to take the risk rather than bearing the cost oneself) is more cost-efficient than risk reduction. Insurance is the most common form of risk transfer, although a new suite of instruments, largely available in the capital markets and known collectively as 'alternative risk transfer', has been developed to complement traditional insurance. Broadening access to risk transfer is thus a necessary part of climate change adaptation.

In this context, the Caribbean has been at the forefront of developing new risk transfer tools to address climate change risk. The Caribbean Catastrophe Risk Insurance Facility (CCRIF) is a first-of-its-kind government risk-sharing platform, aimed at assisting member countries to manage part of their catastrophe risk exposure. As highlighted earlier, catastrophe risks are those which generate many losses simultaneously. For almost all governments in the Caribbean, a direct hit by a major hurricane is the largest single risk its economy, and thus its society, faces. While great strides have been made across the region in reducing the societal impacts of hurricanes and other natural hazard events in the past several decades, the economic aspects of such catastrophes had gone largely un-managed. Reliance on post-disaster assistance from donors was the plan. With CCRIF, the governments have developed a mechanism which enables them to share their risk, with payouts available when most needed. The success of CCRIF (which recently paid out almost US$13 million to 3 countries in the eastern Caribbean within 2 weeks of the passage of Hurricane Tomas) has catalysed other initiatives to bring innovative risk transfer solutions to other sectors of industry and the population at particular risk, for example in the agricultural sector and to support micro-finance lending.

In conclusion, the insurance industry is already playing and will continue to play a critical role in climate change adaptation across the Caribbean, bringing both the tools and expertise to assess and price climate risk and the innovative products required to assist countries, businesses and individuals to more cost-effectively manage that risk.

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