Understanding Risk

Caribbean Conference

Proceedings from the 2019 UR Caribbean Conference

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Bahamas. Based on NASA image.

Understanding Risk Caribbean Conference

27-31 May 2019 | Barbados

Organized by:

From Risk to Resilience: A Foundation for Action

Cosponsors:



ACP-EU Natural Disaster Risk Reduction Program

An initiative of the African, Caribbean and Pacific Group, funded by the European Union and managed by GFDRR

In collaboration with:

#URCaribbean #ResilientCaribbean

Contents

Dear Understanding Risk (UR) Caribbean Conference Partners and Participants:

I would like to thank you for your support and engagement in the UR Caribbean Conference. With over 20 technical sessions and plenaries, UR Caribbean was a successful platform for launching critical dialogues on disaster risk and resilience across the region. These dialogues are crucial to reinforcing the regional collaboration needed to collectively tackle the disaster risk and resilience challenges facing the Caribbean.

Over the last 20 years, natural disasters have caused direct damages amounting to US$1.6 billion per year. Just a few months ago, with the onslaught of Hurricane Dorian on The Bahamas, we were reminded of the devastation these hazards can cause – the lives lost, communities decimated, and the hard-won development gains that can be wiped away in a matter of days. With climate change, extreme events such as these are expected to be the "new normal" for many small island developing states. Given the breadth and complexity of challenges posed, it will take coordination and action from multiple stakeholders to effectively address the threats posed by natural hazards and the effects of climate change.

The World Bank has been engaging in disaster risk management (DRM) in the Latin America and Caribbean region for over 15 years. Initial support focused on post-disaster recovery and has now grown to encompass all aspects of DRM - risk identification, risk reduction and mitigation, preparedness, post-disaster recovery and disaster risk financing – including the pioneering of creative approaches such as the Caribbean Catastrophe Risk Insurance Facility along the way. The World Bank is committed to continuing its collaboration with governments, regional organizations, such as the Caribbean Disaster Emergency Management Agency, and international entities to build disaster resilience across the region, and to supporting platforms such as UR Caribbean, that can serve as the foundation for collective disaster risk action in the Caribbean.

To maintain the momentum and capture the wealth of knowledge generated throughout UR Caribbean, the World Bank, with support from the Global Facility for Disaster Reduction and Recovery (GFDRR), compiled these proceedings of the conference. We hope this collation of lessons learned, connections made, and advances achieved during the conference will be a good reference tool for you all.

Thank you again for your support and participation, and I look forward to engaging with you at future Understanding Risk Conferences.

Sincerely,

Anna Wellenstein
Regional Director, Sustainable Development
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Ensuring Continuation of the Resilience Dialogue in the Caribbean

In the Caribbean, natural hazards are increasing in frequency and severity. This 2019 hurricane season, one of the most powerful Atlantic hurricanes to make landfall, Hurricane Dorian, swept through the region, devastating islands in northern Bahamas and claiming over 60 lives. To build a resilient Caribbean, it is imperative that we take collective action, arming ourselves with the best knowledge and technology to help manage our disaster risk.

From May 27 - 31, 2019, the Caribbean Disaster Emergency Management Agency (CDEMA) partnered with the World Bank's Latin American and Caribbean Disaster Risk Management team, the Global Facility for Disaster Reduction and Recovery (GFDRR), and the European Union (EU) to host the Understanding Risk (UR) Caribbean Conference in Barbados. When it comes to the conversation of disaster risk management and preparedness, everyone needs to come to the table and engage. UR Caribbean provided the platform for leading experts and practitioners from a wide range of sectors to do just that. It facilitated plenaries such as "*The Resilience Imperative: Charting a Caribbean Development Pathway in a Challenging Fiscal Environment*" that enabled CDEMA to partner with actors in the DRM space to have a rich discussion on several key Pillars of Resilience: (i) social protection, (ii) safeguarding infrastructure and (iii) enhancing economic opportunity. It also strengthened the emerging alliance between CDEMA and the World Bank around disaster risk in the region, which is evolving into a strategic partnership through positive advancements made post-conference.

With 18 member states and climbing, CDEMA acts as the Caribbean's principle disaster management body, working to identify natural and man-made disaster risk issues and facilitate solutions across the region. The core themes covered at UR Caribbean were particularly timely, as they helped lay the foundation for the decisions and actions to be taken at CDEMA's premier event, the 11th Caribbean Conference on Comprehensive Disaster Management (CDM), slated for December 2 - 6, 2019 in Sint Maarten. This year's conference theme is "*Safeguarding Our Communities, Livelihoods & Economies*" and aims to bring together all of CDEMA's member states for five days of intense discussions and workshops to promote disaster preparedness and risk mitigation. It will also help to further cultivate strategic partnerships designed to bolster national and regional capacities for disaster risk management.

CDEMA is committed to ensuring consistent engagement, regional coordination and knowledge exchange across the Caribbean. Thank you to the member states, regional organisations, international entities and partners who collectively support us as we work to build disaster resilience in the region.

Sincerely,

Ronald Jackson
Executive Director
CDEMA

Acknowledgments

The overwhelming success of the Understanding Risk Caribbean Conference has everything to do with the engagement and support of all who attended. To all participants, thank you for your valuable contributions to the disaster risk management space and your ongoing dedication to creating a more resilient Caribbean region.

Firstly, we would like to acknowledge and extend our sincere gratitude to our event partners. A special thanks goes to the Government of Barbados, the Caribbean Disaster Emergency Management Agency (CDEMA), the European Union (EU), and the Global Facility for Disaster Reduction and Recovery (GFDRR) for their partnership, with co-financing from the EU-funded Africa, Caribbean, Pacific - European Union (ACP-EU) Natural Disaster Risk Reduction Programme, managed by GFDRR. We would also like to take the opportunity to thank our collaborative partners including the Department for International Development (DFID), The Government of Canada, the Caribbean Catastrophe Risk Insurance Facility (CCRIF SPC), H2O Worldwide, Natural Disaster Risk Management in the CARIFORUM, Cloud Carib, C&W Communications, Barbados Tourism and Marketing, LIAT, the Barbados Museum and Historical Society, UWI TV Global, and the University of the West Indies, Cave Hill Campus.

Special thanks as well to additional collaborative partners such as the Caribbean Center for Disaster Medicine; American University of the Caribbean School of Medicine; the Caribbean Development Bank; the University of the West Indies Department of Disaster Management; the British Geological Survey; the University of the West Indies Seismic Research Centre; the World Food Programme (WFP); the Caribbean Institute for Meteorology and Hydrology (CIMH); Thorton Tomasetti; UNICEF; Humanitarian OpenStreetMap Team (HOT); the World Meteorological Organization (WMO); israAID; the United Nations Office of Disaster Risk Reduction (UNDRR); The Nature Conservancy; Willis Towers Watson; NepCol International LLC; NASA; Nova Scotia Community College; the British Virgin Islands' Department of Disaster Risk Management; the Organisation of Eastern Caribbean States (OECS); and the Overseas Development Institute (ODI).

We are particularly grateful to our opening, closing, and keynote speakers: The Honorable Prime Minister of Barbados, Mia Amor Mottley; Christian Leffler; Ambassador Gail Mathurin; Tahseen Sayed; and Dr. Angus Friday.

We are also thankful to the technical session leads, training leads, and coordinators for their extensive efforts in organizing their respective sessions. These include Pablo Suarez, Janot Mendler de Suarez, Gavin Macgregor-Skinner, Tyler Radford, Amy Macdonald, Hannah Gaventa, Luis Alton, Elizabeth Emanuel, Sumati Rajput, Jack Campbell, Mirtha Escobar, Ewa Korczyc, Bishwa Pandey, Melanie Kappes, Regis Chapman, Kathryn Milliken, Asha Williams, Yohannes Kesete, Eamonn Sheehy, Mark Quirk, Claudia Soto, Cecile Lorillou, Jeremy Collymore, Davide Miozzo, Erouscilla Joseph, John Harding, Andrea Grosvenor, Nora Guerten, Tim Webster, Shanna McClain, Montserrat Acosta Morel, Simon Young, Paul Saunders, Keren Carla Charles, Gavin Macgregor-Skinner, Elizabeth Emanuel, Eamonn Sheehy, Evangeline Inniss-Springer, Anna J. Hicks, Regis Chapman, Naraya Carrasco, Giovanni Michele Toglia, Melody Joy Benavidez, Rashmin Gunasekera, Thomas Moullier, Nicholas Callender, Adrian Trotman, Shawn Boyce, Steven Carrion, Juliana Castano Isaza, Crispín d'Auvergne, Emily Wilkinson, Neal Burnham, Patricia Shako, Carlos Uribe, Maria Kontro and Nahuel Arenas Garcia.

To the persons who facilitated logistics at our various venues, we thank you for your commitment and attention to detail. We would like to specially acknowledge Harclyde Walcott, Carla Springer-Hunte, Nicole Pinder, Paula Mascoll (UWI's Errol Barrow Centre for Creative Imagination); Ann Wallace, Cheryl Smith (UWI's Sagicor Cave Hill School of Business and Management); Ruth Aboab-Marshall (UWI Cave Hill Campus' Solutions Centre); Teresa Nicholls, Gillian St. Hill (Barbados Hilton Hotel); and Blenda Torres (American Express Global Business Travel).

A special thank you also to the event planning firm in Barbados, Premier Events; designers Christopher Bantum and Miki Fernandez; and videographers Rachelle Mayers, Chris Cooke-Johnson and Jorge Villalpando Castro for bringing the vision to life. Thank you as well to Carole Beckford and the former and current Cricket West Indies players who collectively "hit disaster risk for six" by raising awareness of disaster risk challenges in the region.

Finally, we are grateful for the guidance and support of the World Bank's Latin American and Caribbean Urban and Disaster Risk Management Practice Manager, Ming Zhang, and for assistance provided by World Bank teams in planning this event. These include Rosella Della Monica, Cindy Robles, Mirtha Escobar, Eda Parodi, Erika Vargas, Yukako Hiraki, Lorenzo Piccio, David Tucker, Maria Carolina Hoyos Lievano, Christelle Chapoy, Alejandra De La Paz, Brune Andre, Simone Balog and Jocelyn West. Many thanks for your efforts and enthusiasm to make UR Caribbean a success!

The UR Caribbean Core Team:

Mary Boyer, Kerri Cox, Joaquin Toro, Tayler Friar, Roberta Lovatelli, Jacqueline Chidothe, Bradley Lyon and Mariel Boden.

The Honorable Prime Minister of Barbados, Mia Amor Mottley, delivers a powerful keynote address to open the conference.

"It is our contention that it is only when moral and ethical leadership is given both at the national level and at the international level, that we will summon the courage to fight down these battles. Until such time, it is a form of idle entertainment for those who choose to watch."

—The Honorable Prime Minister of Barbados, Mia Amor Mottley

World Bank Country Director for Caribbean countries, Tasheen Sayed, offers opening remarks on the state of disaster risk in the Caribbean region.

Foreword

The Understanding Risk (UR) Caribbean Conference was held in Barbados from May 27 - 31, 2019. Nearly 500 participants representing over 20 countries, both from the region and internationally, gathered to attend. Leading experts and practitioners from a wide range of backgrounds including government agencies, the private sector, multilateral organizations, non-governmental organizations, research institutions, and civil society had the opportunity to participate in 24 technical sessions, 13 workshops, cultural experiences and risk data exhibits and to engage in critical conversations around disaster risk in the region.

UR Caribbean was organized by the World Bank's Latin America and Caribbean Urban and Disaster Risk Management team and the Global Facility for Disaster Reduction and Recovery (GFDRR), in partnership with the Caribbean Disaster Emergency Management Agency (CDEMA) and the European Union (EU); and was hosted by the Government of Barbados. This conference was co-financed by the European Union-funded Africa, Caribbean, Pacific – European Union (ACP-EU) Natural Disaster Risk Reduction (NDRR) Program, managed by GFDRR.

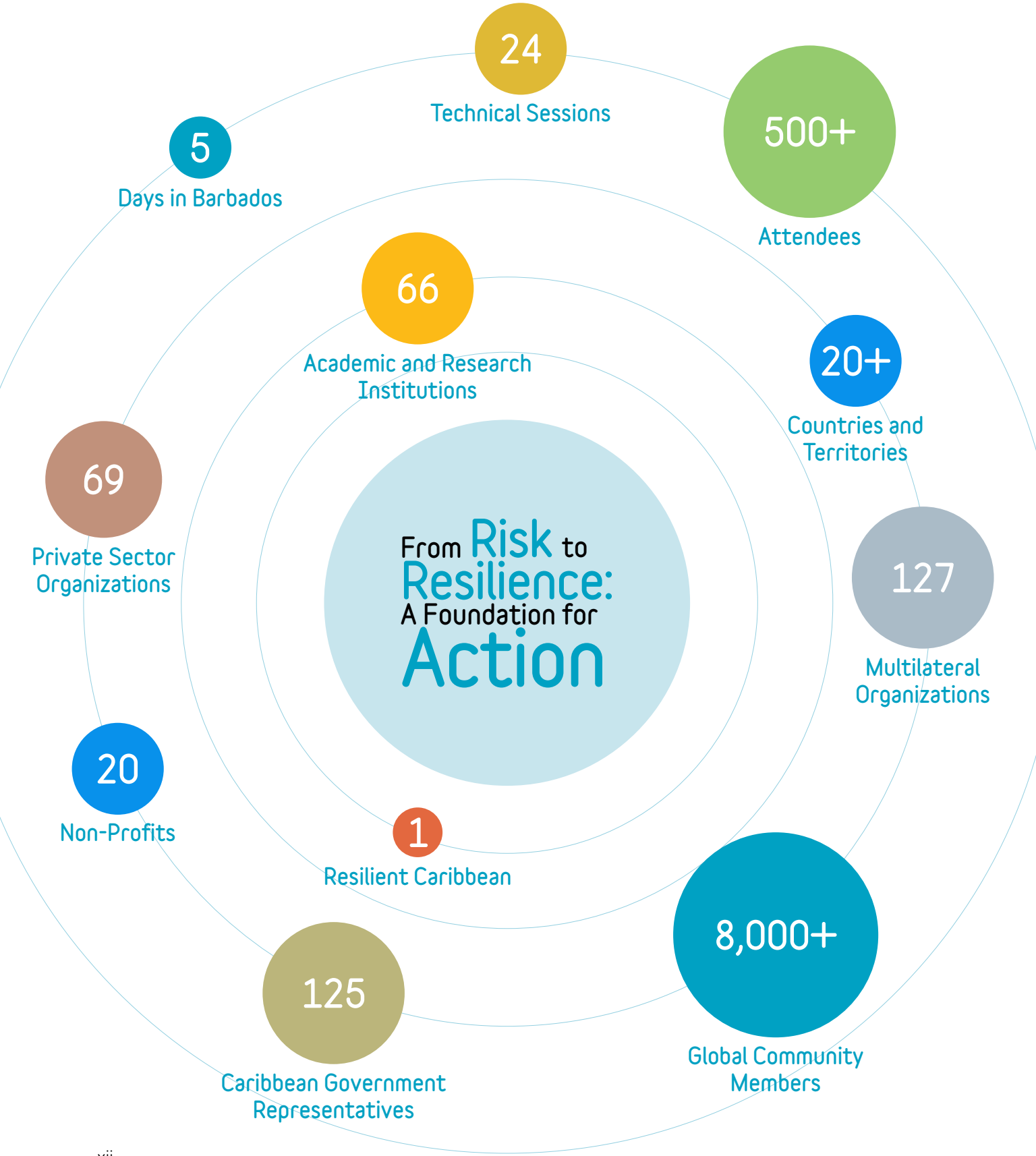
Launched with a provocative opening speech from The Honorable Prime Minister of Barbados, Mia Mottley, the conference was rich with hard-hitting sessions, presentations and plenaries covering themes across the DRM spectrum, including risk analytics and communication, physical resilience, fiscal resilience, urban resilience, coastal protection, hydromet and early warning systems, community engagement, and emergency preparedness. Some sessions touched on drawing connections between disaster risk and medicine; utilizing nature to improve or replace man-made coastal defenses; engaging with the often-overlooked educational sector; and amplifying the voices of the youth. These issues were tailored to the needs of the Caribbean and are elaborated on in the session summaries including in this Proceedings.

UR Caribbean was also an opportunity to celebrate the best of Caribbean culture with music, art, authentic cultural exchanges and community engagement activities. Art, in particular, was woven throughout the entire week's events through satellite imagery inspired by regional poets, fractal art and a series of "data-garden" installations – including tableaus, palm trees, bush tea plots, and benches – that were scattered across the University of West Indies, Cave Hill Campus' Errol Barrow Centre for Creative Imagination, and were designed to represent risk themes such as seasonal rain forecasts, disasters and financing over time.

To close the week, UR Caribbean hosted a "cRISKet" match (Cricket + Risk) that featured key actors in the DRM space and prominent figures from West Indies Cricket including James Adams, Tino Best, Sylvester Athanaze, Nikita Miller, Philo Wallace and more. Held the day before the start of the Atlantic hurricane season, this event raised public awareness of disaster risk across the region, with proceeds benefitting CDEMA's Regional Emergency Assistance Fund. Throughout the match, metaphors were used to draw connections between the game and how it relates to natural disasters; during one of the "overs", a batter was even blindfolded to depict the need for adequate early warning systems that help communities better prepare for disaster impacts.

The conversations held during UR Caribbean on the realities of risk and vulnerability in the region were timely. The conference allowed for small island states to share best practices, forge relationships, and reinforce regional cooperation in order to curb the region's overall risk associated with natural hazards and climate change. The UR Caribbean Conference laid the foundation for further disaster risk action in the region.

UR Caribbean by the Numbers



Abbreviations

AFAD	Disaster and Emergency Management Presidency of Turkey
APSFR	Areas with Potential Significant Flood Risk
AYII	Area yield index insurance
CHwB	Cultural Heritage without Borders
CRI	City Resilience Index
DASK	Turkish Catastrophe Insurance Pool
DRAS	Disaster Risk Analysis System
DRM	Disaster risk management
DRR	Disaster risk reduction
DTM	Digital terrain model
EU	European Union
GFDRR	Global Facility for Disaster Reduction and Recovery
ha	Hectare(s)
INSPIRE	Infrastructure for Spatial Information in the European Community
IPA	Instrument for Pre-Accession Assistance
IPA DRAM	Programme for Disaster Risk Assessment and Mapping
ISRBC	International Sava River Basin Commission
IUCN	International Union for Conservation of Nature
MoEU	Ministry of Environment and Urbanization (Turkey)
NBS	Nature-based solutions
NMHSs	National Meteorological and Hydrological Services
OpenDRI	Open Data for Resilience Initiative
PSI	Public Sector Information
Sava FFWS	Flood Forecasting and Warning System in the Sava River Basin
Sava HIS	Hydrological Information System for the Sava River Basin
SAR	Special administrative region
SEDESOL	Social Development Secretariat (Mexico)
SEE CRIF	Southeast Europe Catastrophe Risk Insurance Facility
SEE-MHEWS-A	South East Europe Multi-Hazard Early Warning Advisory System
SISI	Integrated Social Information System (Mexico)
SoFPAS1	Study of Flood Prone Areas in Serbia—Phase 1
UNDP	United Nations Development Programme
UR	Understanding Risk
WMO	World Meteorological Organization

Towards Resilient States:
Tools and Good Practice

Climate change-related impacts are widely felt among Caribbean States and loss of coastal resources is an emergent reality. The total damages to the region from 148 disasters between the period of 1950-2014 is estimated to be $52bn (Acevedo, 2016). Between the years 2000-2017, 13 of the Barrowing Member Countries of the Caribbean Development Bank experienced high rates of loss and damage from natural hazards estimated at $27bn, accounting for more than 50% of losses in the 75-year period (2016).

Climate change has therefore understandably been characterized as an existential threat to Caribbean economies and societies. This has spurred a call for action from stakeholders at the political, professional, academic, community, business and developmental partnership level.

The value proposition of Caribbean Resilient States calls for new ways of thinking and working. This method is fueled by efforts to apply scientific outputs which drive the innovation and social transformation needed to build a resilient state.

Our UR Caribbean session sought to initiate a dialogue about existing research, tools and practices at varying scales and their replicability. Contributors were drawn from academia, national, and regional DRM organizations, and touched on regional model tools, national programming experience, and research on tool application at the community and national levels. This diverse suite of initiatives sought to map community perception

Scene from Codrington town in Barbuda following the 2017 hurricanes.
Source: United Nations, Rick Bajornas

of vulnerability and risks, create a social vulnerability index anchored on a risk information platform, enhance community through strategic targeting, and use hazard impacting events to recalibrate risk management policy at the national level.

What we are highlighting is that an assessment of existing risk related knowledge and tools is key in the elaboration of community, national or other levels of risk information. In addition, it is critical to combine traditional and scientific methods in order to generate the risk profiles of our living spaces.

The intent was not to frame generalizations, but to explore issues around research that is responsive to practice and policy needs. Further, the session explored how this synergy can promote new ways of thinking and working to advance the idea of resilient Caribbean states.

A key challenge for the Caribbean Disaster Management Agency (CDEMA) was how to enhance the lessons learned from the Strategic Targeting Methodology (STM). This was introduced to the Caribbean by the IFRC as a tool that advanced us from awareness of susceptibility to heightened data collection and risks assessments, key steps in resilience programming.

Case Study: Exploring the Issues

In response to this gap, the Caribbean Risk Information Tool (CRIT) was developed by the International Federation of Red Cross and Red Crescent Societies and the CDEMA. The case study, by Thongs, sought to investigate the usefulness of this community-based risk information tool within the Caribbean and to examine the role of community-based and local-level approaches. Using the CRIT, information was collected from the Sangre Grande Regional Corporation in Trinidad and Tobago, making it possible to identify the peak months of disasters, the hazards with the highest impact in the regional corporation, the most susceptible communities, the communities that are in immediate danger or crisis, as well as the natural and man-made triggers of the most impactful disasters. This information proved useful in enhancing community dialogue on susceptibility and engagement towards mitigative and adaptive reflections.

The key challenge is to how to advance from community consciousness and engagement into policy and programmes that alter Social Vulnerability. This can be characterized as the physical, economic, political or social susceptibility of a community to damage by destructive events of natural or anthropogenic origin.

Cumberbatch et al sought to apply a Social Vulnerability Index to national efforts in Barbados in order to design a National Coastal Risk Information and Planning Platform. This serves as a key ingredient in shaping its adaptation agenda.

The SVI was developed based on five demographic categories: Socioeconomic, Gender, Age, Special Needs and Property Type. This comprises eight key census variables and is ranked from highest to lowest across all Enumeration Districts (ED) in Barbados. The process is broken down into the following steps:

1. A percentile rank was then calculated for each ED over each of these variables.
2. A count or flag was provided of the number of individual variables with percentile ranks of 0.75 or higher for each of the five themes and for the ED overall
3. A bidirectional matrix was used to simultaneously assess the results of the SVI and Vulnerability Flags approaches.

This Social Vulnerability Index provides an opportunity to build resilience by implementing targeted vulnerability reduction and risk mitigation programs directed at the most vulnerable geographic areas. The methodology is one that is being considered for replication in other Caribbean states provided that the social data has been digitized.

The Case Study by Inniss-Springer provide another lens on the approach to resilience programming where recovery planning can provide a platform for transformational approaches and processes. Catalyzing the recovery to resilience opportunity requires an important step: the validation of the assessment

findings to drive the process from crisis management to one that is more long term in its perspective. At the core of this is an evidence pool built on enhanced baseline data community resources, hazard experiences and interventions that strategically address all elements of the risk management cycle. Equally important observations are that topical terms such as "build back better" need an operational definition and must go beyond infrastructure and finance. Understanding o social dynamics is indispensable.

Lessons For Action

These case studies highlight some important considerations for efforts to frame resilience initiatives in the Caribbean which may be applicable elsewhere:

1. Whilst qualitative assessments of risks are useful, they may be insufficient to inform evidence-based policy and planning for resilience. Quantitative methods may address the evidence gap but can be compromised by data quality and availability.
2. The synergizing of these approaches may provide a better blueprint for coordinated action at all levels. Building on existing initiatives and collaborative partnerships can shorten the time of our journey.
3. The data challenge can be a major stumbling block if we await idealized availability. It will require that consideration be given to examining tool development that works with existing limitations. On the other side of the equation is how data analytics is used to map and harvest the volume of information to guide decision making.

Conclusion

The session has created a dialogue between CDEMA and the University of the West Indies on how these tools can be enhanced and applied to get more granularity of the social spatial dimensions of risks in our communities. It has also challenged dialogue on how this may inform resilience policies and programmes. Anchoring resilience data needs to primary sources of data collection, such as the census, should be explored.

It will also be valuable to examine how the CRIT and the SVI can be applied in the same space, and the options for their integrative application in policy and programming.

The Caribbean Disaster Emergency Management Agency in collaboration with selected Caribbean Islands and territories are expanding a collaboration initiative to enhance these tools and practices to scale. It is anticipated that the partnership around this initiative will be expanded to other partners working on the resilience agenda in the region, including the World Bank which will be managing a suite of recovery to resilience initiatives in the Caribbean.

References and Further Resources

Caribbean Disaster Emergency Management Agency: *Revisiting Community Engagement. The Strategic Targeting Methodology*

Dr. Gabrielle Thongs, Department of Geography, FFA, UWI: *CRIT: A Caribbean Multi-Hazard Decision Support tool to develop Disaster Risk Resilience.*

Dr. Janice Cumberbatch, CERMES, UWI; *Creating a Social Vulnerability Index for the National Coastal Risk Information and Planning Platform in Barbados – A Case Study.*

Dr. Evangeline Inniss Springer, Department of Disaster Management, BVI; *Recovery Planning to Resilience Programming. A process guide. nce Programming. A process guide.*

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"The challenges (natural disasters) are going to come.
It's going to cost us less if we are prepared.
It's gonna cost us more if we are not.
That's the bottom line."

—Sam Raphael, Hotelier, Dominica

Ready, get-set, go!
A System Approach to Continuous Community Engagement for Emergency Preparedness and Response

Introduction

The devastation caused by hurricanes Irma and Maria in 2017 in Sint Maarten, as well as hurricane Matthew in Haiti in 2016 created unconceivable challenges, emphasizing the need to continually improve preparedness for major disasters while also bringing new opportunities for growth and improvement in the Caribbean region.

In Sint Maarten, a systems approach to community engagement for disaster risk preparedness and response has been developed, which focuses on relationship building across diverse sectors and stakeholders concerned with under-resourced communities. This perspective puts community resiliency as a key public health factor and emphasizes collaboration, confidence and engagement as core competencies for disaster preparedness, response and recovery. Good practices in community engagement for disaster mitigation highlight success factors such as empowerment and capability building activities of the community disaster committees and volunteers. A good example of this can be found in the approach of the civil protection volunteers in Haiti.

Municipal Civil Protection Committee volunteers in Haiti. Photo: World Bank.

Background: Overcoming response challenges through collaboration

Hurricane Irma deeply impacted the mobilization of stakeholders in Sint-Maarten, raising many response challenges in a context of small island states. Roads, ports, airports and telecom suffered significant damage. Even neighboring countries logistic lines were disrupted. Response to health-related immediate needs was extremely difficult, leaving health and technical staff overstretched and exhausted. Such scale of a disaster affected people in the long run, taking lives indirectly in the aftermath of the Hurricane sometimes months later. These consequences question the methodology of post disaster assessments as long-term needs for support must be better considered.

Creating a Regional solidarity network is a way to partially address small island context specific response challenges. This can materialize for example by sending health staff from one country to another when the health sector collapses, overwhelmed by the needs. In terms of preparedness, simulation exercises could be conducted at the regional level. More generally sharing of lessons learnt, training opportunities, and creation of regional operating procedures should be promoted among Caribbean countries.

Haiti Case Study: Volunteers as agents of change in DRM

Haiti has taken a participatory and decentralized approach to disaster risk management, involving various stakeholders of the National DRM system, working together to make disaster risk reduction a reality. The National DRM system relies on a powerful and efficient network of volunteers managed by the Civil Protection Directorate (Municipal Civil Protection Committees or CCPCs). Volunteers are coming from the civil society and public institutions; they have multiple roles at each stage of an emergency that are essential for population outreach. In times of preparation they promote the creation and use of contingency plans and instruct about evacuation procedures. When a disaster strikes, they are instrumental in reaching the last-mile in terms of early warnings dissemination, organizing evacuation procedures, and shelter management while helping to reunite families and give support to humanitarian aid distributors. After a disaster,

Municipal Civil Protection Committee volunteers in Haiti. Photo: World Bank.

they provide information about assistance and reconstruction programs and help with clearing operations. Through regular trainings and simulation exercises, the Civil Protection Directorate (DPC) generates an ever-growing cohesion among CCPCs, and with the departmental and regional level as well. However, despite the recognition of the importance of volunteer work, the sustainability of this network is uncertain given their precarious status and high turn-over. A regional roadmap to strengthen volunteering management would be a strong support to national efforts to reinforce this essential network in times of a disaster.

Recommendations: Community Engagement and Emergency Preparedness

In face of increasing complexity and connectiveness of disasters, an approach based on cultural-systems thinking and collaboration at all levels – local, national and regional- is essential. Effective continuous community engagement is founded upon awareness and acceptance of stakeholders' perspectives and goals. St Maarten for example, is taking a "systems approach" that will increase a community's ability to continuously provide, obtain, promote and share risk information. Educational, public health, religious and healthcare institutions on the island work together to deliver consistent emergency preparedness messages to all citizens including vulnerable populations. The Caribbean Center for Disaster Medicine (CCDM) that includes international, regional, and community experts, educates, trains and conducts research to ensure accurate, relevant, timely and consistent communication on emergency preparedness. In Haiti municipal emergency preparedness and response capacity has improved with the commitment of Municipal Civil Protection Committees, which have been crucial in mobilizing community volunteers to respond to natural disasters. Strong relationships among system members of the community such as government, religion and education help build trust and cooperation before, during and following disasters.

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Educational, public health, religious and healthcare institutions on the island work together to deliver consistent emergency preparedness messages to all citizens, including vulnerable populations.


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Building Regulation for Resilience: Innovation for Risk Reduction and Finance

Introduction

How can the Caribbean region become more resilient to a changing climate that is expected to bring more frequent and intense disasters? This was the question on everyone's mind at the Understanding Risk Caribbean Conference. During the 2017 hurricane season, Hurricanes Irma and Maria devastated Dominica with disaster losses amounting to nearly 200% of GDP. A major contributing factor to this was the quality of the built environment—a lack of risk informed land use and compliance with up to date building codes. This example so starkly illustrates what is at stake if the built environment is not regulated adequately. To add another layer to this challenge, the Caribbean is made up of small islands with limited financial and technical resources. Solving this problem is going to require regional collaboration to drive efficiencies into building code processes and innovative new approaches to drive cost-effective financing solutions.

New Road Construction on the Mandela Highway in Kingston Jamaica. Photo: Debbie Ann Powell.

Daniel Best of the Caribbean Development Bank presenting at the Building Regulation for Resilience: Innovation for Risk Reduction and Finance session. Photo: World Bank.

The conference offered a platform for regional Caribbean organizations concerned with disaster risk reduction and how to finance it, convening for a half-day session to discuss the solution: a regional facility that supports the effective and efficient implementation of building and land use regulatory standards. The session brought together the key players for identifying the path forward, including: the Caribbean Development Bank (CDB), the Caribbean Disaster Emergency Management Agency (CDEMA), the CARICOM Regional Organization for Standards and Quality (CROSQ), the Organisation of Eastern Caribbean States (OECS), and the Caribbean Catastrophe Risk Insurance Facility (CCRIF). To finance such an effort, Shalini Vajjhala of re:focus Partners explored risk financing solutions that ranged from innovative insurance products to the expansion of insurance markets and providing incentives for mitigation investment. The session set the stage for the development of an innovative mechanism to fund mitigation investment, wherein the future benefits of investments in mitigation (e.g. effective implementation of up-to-date building codes and standards) are captured and those gains (e.g. deferred losses) are applied to incentivize mitigation investments in new construction and retrofit. The session laid the foundation for regional stakeholders to cultivate regional capacity to develop, maintain and support collaboration between member states on disaster risk reduction and finance.

Background

For context, it is broadly recognized that building code implementation has a crucial role to play in disaster risk reduction. The application of standards for safe siting and construction support a shift from managing disasters to reducing underlying risks. In developed economies, building code compliance is also a factor of growth and sustainability of the property insurance industry. With appropriate coordination, both regulations and property insurance reinforce one another to achieve risk reduction in the physical environment. In countries with effective property insurance systems, the feasibility of underwriting is always facilitated by the competence of the local regulatory authority in assuring both code compliance and reasonably predictable building performance under prescribed loads. Since neither lenders nor insurers have the capacity to manage plan review or site inspection independently, the presence of a competent regulatory system and an adequate building code makes this type of leverage for public safety possible.

Currently, in a number of Caribbean countries, a barrier to property insurance and reinsurance markets is uncertainty with how to price the market. Incomplete assumptions regarding loss exposure are a key contributor to this, due to uncertainties about climate change implications and about the quality of the built environment in the region. The Building Regulatory project under the Caribbean Regional Resilience Building Facility[1] will aim at bridging this gap.

[1] The Caribbean Regional Resilience Building Facility is financed by the European Union and managed by the Global Facility for Disaster Reduction and Recovery.

The Caribbean region has a high percentage of informal construction, a factor that makes the region particularly vulnerable to disaster risks. It is estimated that between 60 to 70 percent of construction in urban area is characterized as "informal construction." This means that construction is not informed by appropriate standards of siting and construction. This factor combined with the increased frequency and intensity of hurricanes, storm surge and floods in the region lead to a significant expansion of vulnerable settlements. It is, therefore important that the region prioritizes measures to ensure safe construction such as referencing updated hazard maps in local building codes, promoting the certification of builders, supporting improved building materials and regulatory practice, and ensuring compliance with suitable land use and building code provisions.

Previous efforts to create a Caribbean-wide approach to building regulations[2] have been unsuccessful largely due to the lack of a robust centralized organizational structure that is able to not only provide training, accreditation and testing services, but also adapt to complexities in the built environment and emerging technologies.

In the face of increasing vulnerability and disaster risks in the Caribbean, regional initiatives need to be intensified to support land use and building code compliance. The small islands of the Caribbean face unique resource and capacity constraints. In this context, by leveraging regional bodies to pool and strengthen building technology research facilities, building standards development and training centers on safe planning and construction practices should be expanded and further encouraged by regional and international partners.

Case Studies

Currently, there is an opportunity to utilize the CROSQ as a centralized hub for institutional and workforce capacity building across the Caribbean region. They are already well-positioned for this role with the technical expertise and wide-reaching influence throughout the CARICOM countries via the network of Bureaus of Standards they oversee through the CROSQ Secretariat. Already, CROSQ has led a very successful effort to formulate an energy efficiency building code for the region that helps reduce CO_2 emissions for both commercial and residential construction. This effort can serve as a roadmap for future regional building code efforts that aim to facilitate and strengthen national building regulatory capacity across CARICOM member states[3].

Recommendations

Based on an initial scoping of the needs and demands in the Caribbean, Building Regulation for Resilience (BRR) recommends the development of a regional building regulatory framework and potential establishment of a regional facility for building technology and safety. Through the support of the EU Caribbean Regional Resilience Building Facility, this will address better building regulation, increased availability of risk information to key multiple stakeholders including re/insurance industry, and capacity building and training. Anticipated activities include:

- Completion of Building Regulatory Capacity Assessments (BRCA) to accompany insurance markets assessments in up to 10 members (tbd) of CARICOM.
- Based on the recommendations of the BRCAs, support technical assistance, capacity building and training for increased resilience in new and existing building stock and construction industry in CARICOM countries.
- Develop a scope of regional services for technical

[2] For example, there was an attempt to develop a Caribbean uniform building code in the 1980's, but this initiative did not raise sufficient attention and support.

[3] BRR is already active in the region. For example, it has been supporting the introduction of a new Building Act in Jamaica, passed by Parliament in January 2017. It currently provides technical assistance in the last phase of the finalization of a new and best practice building code adapted from model building codes of the International Code Council. It is also starting a new engagement in Saint Vincent & the Grenadines.

UR

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#URCaribbean, #ResilientCaribbean

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assistance on increased data availability and in building and property insurance regulation.

- Explore with regional partners (e.g. CDEMA, CROSQ, UWI, U-TECH etc.) the possibility of hosting a regional service center to support the expansion of building regulatory capacity across the region.
- Upon the identification of a regional host organization, provide strategic support through strategic partners such as IBTS, the International Code Council, IBHS and ASTM.

Conclusions

Effective building regulations and land use planning are the key link between: 1) leveraging the existing body of risk and vulnerability analytics, 2) applying this knowledge to guide future investment and infrastructure development, and 3) reducing uncertainties around risk to key stakeholders, such as building owners, building regulators, investors, and the insurance and construction industries. When these forces work together, they can incentivize risk reduction in the built environment in the public and private domains (e.g. homes or business facilities built to an agreed upon standard).

This workshop successfully built consensus on a path forward with key regional stakeholders agreeing that CROSQ should be the technical lead on this initiative with critical support from CDB, CDEMA, and OECS. Since the UR session at the end of May 2019, conversations between these stakeholders have been ongoing with support from the World Bank.

Session Contributors

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Shalina Vajjhala, refocus

"We are running out of time."

—Caribbean citizens and leaders raise their voices

Challenges in Developing Bidirectional Community Risk Communication: An Opportunity to Share Science, Evidence and Technology Solutions

Introduction

Critical knowledge gaps and challenges in channeling communications from individuals and communities to government, and from government to individuals and communities seriously hinder efforts for building disaster resilience and responding to disasters at all levels. Information deficiency is most serious at our local level, especially in terms of spatial information on risk, resources, capacities of communities, and means for bidirectional risk communication. We live and work on islands where broadly communicating risk information to the community and specific information to highly vulnerable populations in a way that is meaningful to them is very challenging.

Background

Our personal experiences dealing with disasters in the Caribbean have identified the need to:

1. **Build a culture of preparedness where** every segment of our society, from individual to government, industry to philanthropy, must be encouraged and empowered with the information it needs to prepare for the inevitable impacts of future disasters.

Aerial view of the devastation in Roseau, Dominica on September 28, 2017. Hurricane Maria inflicted catastrophic damages and at least 15 deaths in this Caribbean island.
(Photo by Jose Jimenez Tirado/Getty Images).

2. **Ready our islands for catastrophic disasters by strengthening** working relationships with partners across all levels of government within and between island nations. Small island states must access new sources of scalable capabilities to quickly meet the needs of overwhelming incidents, taking a multi-hazard approach toward preparedness. Whether the hazard falls under natural, anthropogenic, or an act of terrorism, preparation is key.
3. **Reduce the complexity of decision-making** and continue to be responsible stewards of the resources we are entrusted to administer. We must also do everything that we can to leverage data to drive decision-making and reduce the administrative, financial, and bureaucratic burdens that impede impacted individuals and communities from quickly receiving the assistance they need.

Case Study

On the island of St. Maarten/St. Martin, as we moved from immediate response and recovery to long term recovery, we reflected on the lessons identified from September 6, 2017, when Category 5 Hurricane Irma slammed into the island. In doing so, we contemplated not only how to increase our readiness for catastrophic disasters, but also how best to reduce impacts from future disasters. We realized that we needed to shift the way we think about disasters, and how we communicate, so that we can be better prepared in the future.

But to truly foster a culture of preparedness, we must go beyond our government programs. We are engaging all stakeholders—including government, nongovernmental organizations, the private sector, adult citizens and the youth—to join as partners to combine and streamline activities in this effort.

So how do we join together to meet this goal? We began our discussion with four areas where we believe we can drive change.

1. We need to acknowledge that during a disaster, individuals in the impacted communities are the first responders. After Hurricane Irma, people had to look after themselves not just for hours or days but for many weeks. We need to empower and prepare individuals with lifesaving skills to help speed response and recovery efforts.
2. We need to reduce the financial burden of disasters to individuals, businesses, and governments by identifying ways to better understand and reduce risk. Communities using crowd sourcing, citizen science, and volunteer monitoring can play a key role in helping generate data to identify and understand risk. Citizen scientists can build and operate their own instruments to gather data by using amateur radio. Six Sigma Projects, an open-source software and hardware-based equipment, can be replicated by digital manufacturing techniques. This could include 3D printing for water testing, food safety, environmental testing, and has the option to share real-time risk information using web-based forums.
3. We need to build more resilient communities to reduce risks to people and property. Cellphones and unmanned aerial vehicles enable the general public to assist in the classification of photos, video, and reduces the time needed to analyze large data. Rapidly restoring bidirectional lines of communication is critical in saving lives after a disaster.
4. We need to assist communities with their continuity planning to ensure that essential government services function following a disaster. This also includes issuing emergency alerts and notifications as well as bidirectional risk communication to ensure citizens and governments are informed of what's happening at the local level. This functionality will allow all parties to take protective actions before and during disasters.

Challenges

In our session we discussed how to promote new collaborations and sharing of science, evidence and technology solutions within and between island states. Session participants expressed

Session Panelists – Jess Beutler, Gavin Macgregor-Skinner, Margje Troost, Joy Arnell, Priyanka Thirumur, Fenna Arnell, and Louis Jeffry.
Photo: Dr. Gavin Macgregor-Skinner.

a need for formal systems to be established between islands using video conferencing, telemedicine, and agreements to support the sharing of resources - both people and things- between islands. All participants agreed that we need be inclusive, participatory, and ensure a transparent dialogue ensues when responding to these challenges with the following steps:

Build Government-Community Collaboratives to Better Understand Risk

In many locations, there are serious gaps in up-to-date, hyper-local data on a community's infrastructure, basic services, assets, and vulnerabilities. Individuals and community organizations are a valuable, yet underutilized source of this information. Collaborative data generation and mapping projects using participatory mapping techniques (like OpenStreetMap, What3Words, and WeMap) are helping unite government agencies and community data generators in filling this gap, leading to better understanding risk.

What information might communities have on the places they live which is not available to governments? Do you have a process for systematically gathering this information through community mapping? Social media? Open data projects? Other sources?

Develop Key Messages in Advance

Many key messages can be written before disaster strikes so they can be quickly disseminated before an event, during the response, and in the recovery stages. In disaster planning this is known as a "phased approach" and can save valuable time when in the midst of a crisis response.

Do you have a key message document to help you quickly create and adapt communication products for your audiences?

Identify New Communication Channels

Before a disaster, communities can contribute local knowledge on assets and vulnerabilities that help governments better assess risk and develop contingency plans. After a disaster, when all primary communication systems and technology fail, we must think creatively and adapt to the crisis by identifying new communication channels.

What systems do governments and communities use to share information on risk and preparedness before a disaster? What happened when your communications systems failed or were disrupted? Can people go "back to basics"?

What alternate communication channels have you used? SMS Text messaging, social media, outdoor speakers to run public service announcements, radio announcements, mass producing printed materials, signs and

billboards, or relaying messages by word of mouth?

Create Culturally Appropriate Materials

Cultural norms influence how people behave, so culture has important implications for emergency communication. Our island societies are multicultural and multilingual, and for St. Martin/St. Maarten more than 100 nationalities officially reside with a population of about 77,000. Therefore, it is important to use widely understood terminology and to provide clear and localized language messages, particularly for audiences with low literacy.

Partner Up

How did we collaborate to determine our number one priority, which was reaching the most vulnerable communities? These groups include those that had chronic medical conditions, required daily medications, needed a source of electricity, were unable to access transport, families with young children, or those with no access to clean water or food.

How can Island Nations adopt and use technology with limited access to expert knowledge and determine which technology would be most applicable in identifying resources to train locals?

Boots on the Ground

After the 2017 hurricane, talking with people face-to-face gave us a better understanding of the reality's survivors were facing. It also helped identify public health information gaps in our materials so we could make adjustments.

How can we best work with partners to disseminate appropriate, accurate, and timely information to the public? What ways can we engage non-government organizations, community groups, volunteers, and individuals to ensure their actions are coordinated and effective? What platforms do we have or need to ensure what we learned is captured and shared?

Recommendations and Next Steps

1. Establish and strengthen capacities of Community Based Organizations so that they may be partners and assets in Emergency Preparedness and Disaster Management.
2. Create a platform for direct dialogue and mutual understanding of expectations between Government and Community Based Organizations.
3. Implement an emergency communication system between Government and Community Based Organizations that meets the need of existing cultural, education, and language challenges.

Conclusion

Joy Arnell closed our session by stating, "Our vision is to create a comprehensive community-based emergency preparedness system that stands aligned with national strategies and utilizes community mobilization as a means to encourage community jollification and resilience of individual community members."

Our session presenters were associated with the islands of Sint Maarten/Saint Martin, Bonaire, Aruba, Curacao, Saba, Sint Eustatius, Guadeloupe, Martinique, Saint Barthelemy.

Participatory mapping by school children provides local data and detailed understanding of locations and their risk. Photo: Tyler Radford, Humanitarian OpenStreetMap.

Well-designed disaster risk financing strategies are developed before a disaster strikes, integrated into core public finance systems, and combine risk retention and transfer instruments in the context of an effective legal framework.

—World Bank Caribbean DRM Team


SURGERY
OPERATING/RECOVERY ROOMS
READY TO EXIT
DESTINATION
EVENT
REQUEST
STAFF NOT AVAILABLE
AL CARE
READY TO EXIT
REQUEST
EVENT
STAFF NOT AVAILABLE
EXTRA STAFF CALLED

The Power of Games:
Playing a Game to Understand Risk and Change Organizational Culture

Introduction

The estimated 44 million people of the Caribbean live on up to 100 islands in at least 28 island nations and must make decisions about many health, safety, financial, and environmental risks. There are many different kinds of risk and clearly "risk" is a very broad topic. The islands share similar challenges, including small but growing populations, limited resources, remoteness, susceptibility to disasters, vulnerability to external shocks, excessive dependence on international trade, and fragile environments.

People rely on platforms for sharing experiences and lessons learned between different sectors, languages and cultural groups across the Caribbean in order to facilitate improved disaster risk reduction. Greater awareness among actors in emergency management, disaster medicine, and risk management of the diverse sources of local expertise in their region is always a topic of conversation. Fortunately, many people are engaged in risk reduction activities, and in some cases, they can exert direct personal control over the risks they face. In other cases, they can only act indirectly by influencing social processes. In all cases, they need a diverse set of cognitive, social, and emotional skills in order to understand the information they receive, interpret its relevance, and articulate their views to others. The Caribbean Center for Disaster Medicine helps people acquire these skills through formal education, workshops, exercises and simulations, and applying lessons learned from personal experiences.

"Friday Night at the ER" was played for one hour, managing a hospital emergency department. The objective was to keep costs low and the quality high – in a simulated time span of 24 hours.
Source: Dr. Gavin Macgregor-Skinner.

Background

Simulation games, like "Friday Night at the ER" have the capacity to shift mental models. Mental models are frameworks that we construct subconsciously, which help us to understand and predict the world around us. They are dynamic, and change based on our understanding of reality. Our mental models serve as useful tools in understanding risk and problem solving, but are often incomplete and can be inaccurate, because they are a personalized representation of reality rather than reality itself. Playing "Friday Night at the ER" helps visualize both the problems we face in communication, collaboration, resource shortages, time constraints, lack of information, and more importantly, the paths to solving them.

"Friday Night at the ER" is a hands-on experiential learning tool, where players interact with one another, participate in active learning, and experience a modeled version reality where they can learn from their actions. They are faced with a problem and must find a solution. During a simulation game, players face the flaws and gaps in their understanding, and challenge their mental models. "Friday Night at the ER" game is capable of not only yielding a mental model shift but also to be realistic about the path from understanding to action.

Case Studies

Our approach at the Caribbean Center for Disaster Medicine is to empower decision-making and risk management by facilitating game play and using participatory, game-based processes for accelerating learning. This process fosters dialogue and promote action through real-world decisions with an emphasis on strengthening disaster risk management. We use simulation games to provide a hands-on opportunity for demonstrating the importance of systems thinking, collaboration across borders, and data-driven decision making. Games can meaningfully engage people in experiencing complex systems to better understand their current or potential role in transforming them. Elements to such games include consequences for the players and their community in a way that is serious and fun. Game play provides a group learning experience that generates a collective intelligence that can set the stage for deep discussion and truly participatory dialogue.

Our workshop, **"Empowering decision-making and experience risk through participating in a game"**, was guided by trained facilitators. Four players per table each played the role of a hospital department manager. It is a scenario-based, tabletop exercise that challenges teams to manage a fictitious hospital during a simulated 24-hour period. Patients and staff arrive and depart, workloads are uneven, events pop up unexpectedly, department managers make decisions and communicate, finances accumulate, and quality indicators are measured. The hospital setting is familiar to people in all industries and cultures, so it works well as a universal learning tool. All participants that played "Friday Night at the ER" were introduced to principles of Systems Thinking and how to apply the concepts and understand how to share accountability through interdisciplinary teamwork.

There are many other simulation games that cover a range of topics, from climate change and clean energy to disaster risk reduction and resilience. Simulation games are usually facilitated by trained instructors who create a fun and realistic gaming environment and guide a post-game discussion to teach players systems thinking concepts. All of the games can be played many times by the same participants. Other games include:

- **World Climate Simulation** is a role-playing exercise of the United Nations climate change negotiations for groups. It is unique in that it uses an interactive computer model to rapidly analyze the results of the mock-negotiations during the event. You can use the World Climate Simulation to build climate change awareness and enable people to experience some of the dynamics that emerge in the United Nations climate negotiations.
- The **Beer Distribution Game** has been used to demonstrate and understand a number of key principles of supply chain management used to distribute

a single item, in this case, cases of beer are used. It was developed in the early 1960's. Each game session is followed by a detailed debrief to teach players systems thinking concepts.

- A game called **Keep Cool** is a board game that facilitates experiential learning about the difficulties of international climate politics but also focuses on communication and team building. Players represent countries and must react to climate impacts during game play in an attempt to control rising global temperatures.

Participants gather in a multidisciplinary training opportunity to learn about systems thinking. *Source:* Dr. Gavin Macgregor-Skinner.

Challenges

It is important for organizations to promote a culture of learning at all levels but sometimes adults are reluctant to play a board game or understand the value of participating in a simulation. Barriers to organizational learning include poor communication, weak feedback processes, and a lack of purpose. Organizational culture is an important consideration when assessing an organization's ability to change and successfully implement new practices. Simulation games focus on experiential learning, using a holistic learning model that involves a cyclical process of experiencing an activity, reflecting on that activity, applying it to real life situations, and then evaluating the impact of the activity for future actions

Conclusions

Experiential learning provides a method for presenting vital information in a way that compensates for different learning styles and is adaptable for changing environments. It provides a unique and specific experience that can be tailored to groups and organizations. It is anticipated that structuring learning experiences using games will assist participants to successfully assimilate organizational information into their mental models and produce more effective decision making.

At the Caribbean Center for Disaster Medicine, we strengthen capacity using simulations that provide experiential learning, learning without fear of failure, learner centered, and promotion of independence and skill development. Role playing provides immersive training without elaborate set up, is relatively low cost, and beneficial for team training and changing attitudes. Games can provide a simplistic model that allows for a focus on subject matter central themes and provides a common experience to launch discussion. Games are also often visually appealing and viewed positively by players, which can encourage open communication of difficult topics.

Session Contributors

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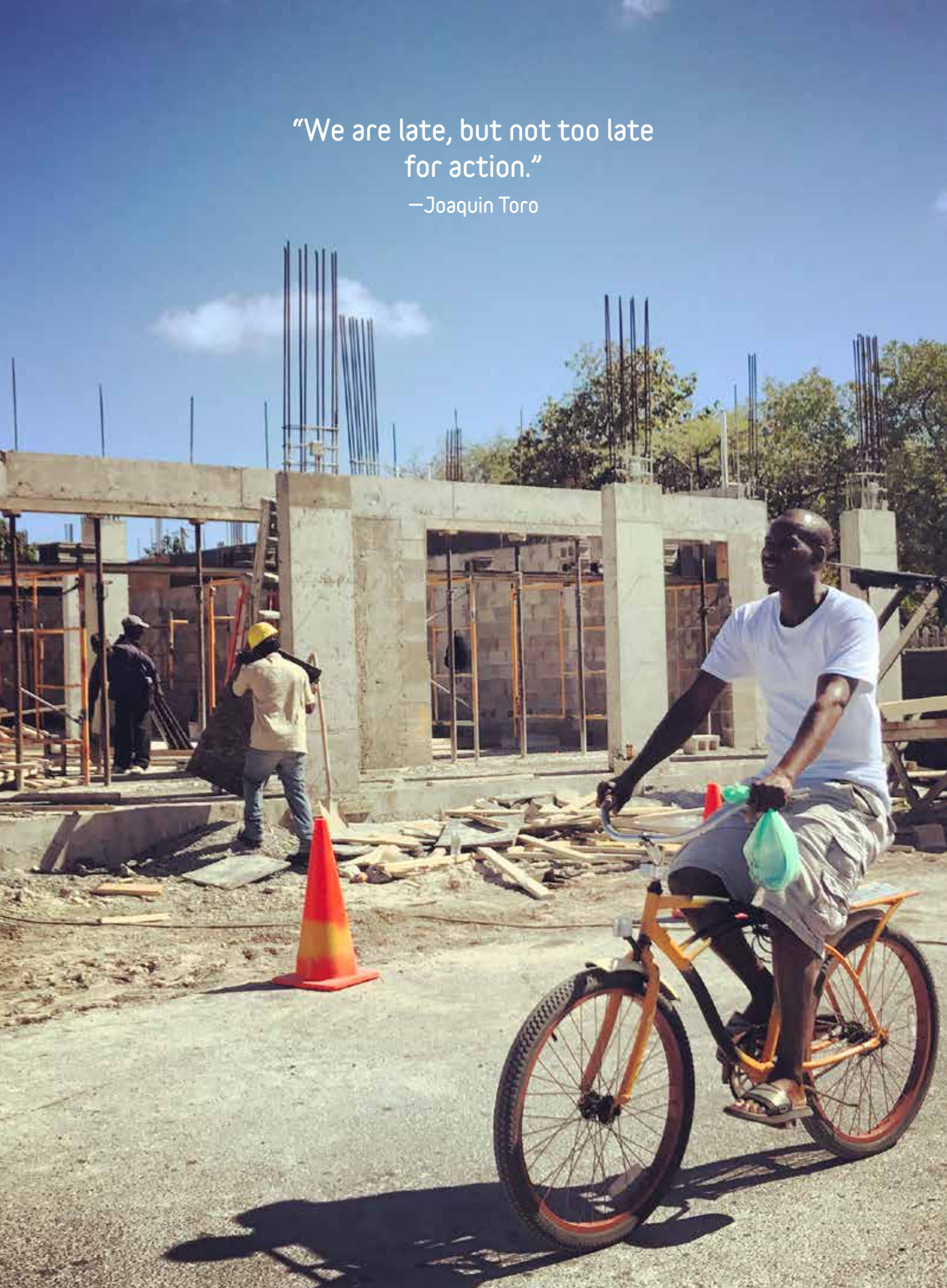

"We are late, but not too late
for action."
—Joaquin Toro

Building Resilient Housing in the Eastern Caribbean

Background

A home can be a family's biggest asset and a source of generational wealth as parents often give it to children, so with one disaster most of a family's wealth can be wiped away. The destruction of homes also have major social impacts and can negatively affect childhood learning and development. The housing sector often incurs some of the greatest damage when natural disasters such as hurricanes strike countries in the Eastern Caribbean Region. In the past decade the region has been hit with several major hydro-meteorological events that produced widespread devastation. In 2017, Hurricane Maria caused major damage to more than 70% of the housing stock in Dominica, with damages totaling US$354 million which represents 66% of the 2016 GDP. Recovery costs for the housing sector alone were estimated at US$1,403 million. Sint Maarten was hit by Hurricane Irma in September 2017, and then suffered additional devastation as Hurricane Maria produced heavy rainfall over the island as it passed through the region two weeks later. The back-to-back events left significant damage throughout the built environment. The 2016 floods in Saint Vincent and the Grenadines damaged 189 houses at a cost of US$4.6 million, while the 2013 floods in Saint Lucia left US$2.15 million in damages to the housing sector. These cases represent only some of the more significant incidents of natural disasters which have shocked and distressed small island states in the Eastern Caribbean.

Eastern Caribbean countries are working to improve the resilience of their housing stock through assessing current conditions, enhancing housing stock and improving policies. Poor housing resilience is often associated with low-income households, as high construction cost drives families to build in high-risk zones under inadequate standards. In this session, panelists discussed what Eastern Caribbean countries such as Sint Maarten, Saint

Photo: Anna Bryukhanova.

Vincent and the Grenadines, Saint Lucia and Dominica are doing to improve the resilience of their housing programs.

Case studies

Housing Recovery in the Commonwealth of Dominica

Currently, Dominica is facing the monumental task of rebuilding its housing stock, and not just replacing or repairing the houses that were destroyed by Hurricane Maria, but ensuring that both new construction and repairs are of quality to be resilient against future disasters in order to protect the lives and livelihoods of citizens. The scope for housing recovery efforts entails in integrated systems approach and encompasses ensuring all elements of the housing construction industry are aligned towards the production of resilient structures.

The government's strategy to resilient recovery of the housing sector is comprehensive in scope encompassing examination of the elements of housing production such as the regulatory framework; material quality, supply and distribution; finance mechanisms; technical capacity; insurance; and site-specific hazard screening. More specifically, it incorporates revision of building codes, ban on importation of inferior construction material, **training of construction labor force and homeowners on resilient construction practices** (software intervention), hiring of additional personnel in government departments, and development of financial assistance programs.

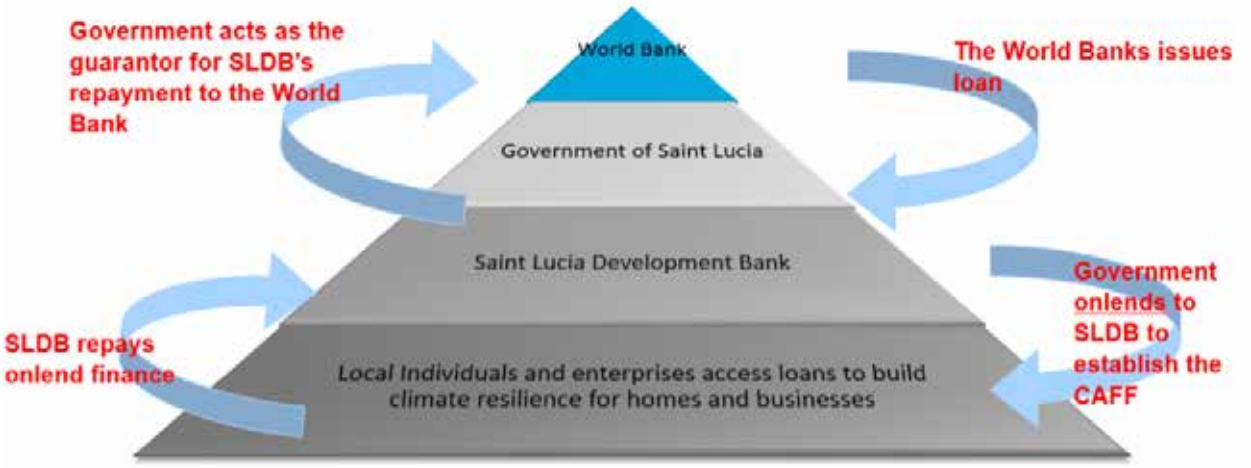
As Dominica has embarked upon the endeavor to become the **First Climate Resilient Country** in the world, its interventions under the overarching National Housing Repair and Reconstruction Programme is set to position the housing sector firmly on the course of resilience.

Better Living Standards through Affordable Housing in Saint Vincent and the Grenadines

The mission of the Housing and Land Development Corporation (HLDC) is to facilitate the implementation of Government's housing program through assistance provided to the Ministry of Housing in improving the quality of life of low- and moderate-income families in Saint Vincent and the Grenadines by making available to them affordable housing opportunities. The country's housing market is characterized by low- to upper-middle-income styled houses and informal settlements altogether accounting for more than 36,000 homes, with principal financing mechanisms being traditional mortgages or incremental construction, the latter being a prime choice of the informal settlements. Within the past 15 years, the HLDC has produced more than 1200 new houses through its collection of housing programs such as the 100% mortgage facility to public servants at the indigenous financing facilities; disaster relocation housing; post-disaster housing rehabilitation; the Housing Reconstruction and Rehabilitation Project; the Lives to Live program (which seeks to provide improved sanitary and physical access facilities to elderly, disabled or otherwise disadvantaged citizens); and the Housing Infrastructure Improvement Project (through

Source: Facilities for Resilience in Saint Lucia.

Figure 1: The CAFF Loan Model



Source: Saint Lucia Development Bank.

which roads, water and electricity are delivered to a number of sites). HLDC pivots it operations to not only focus solely on the house structure, but it also engages in development of the wider **community context** in recognition that resilience ought to manifest at various scales and not just in isolated, disjointed sites, in order to improve the overall resilience of the nation.

In its institutional alliance with the National Emergency Management Organization (NEMO) and Ministry of Housing, the HLDC has been involved with the provision of housing for over 400 low-income and highly vulnerable households, and they benefit from the services of the Physical Planning unit which provides active supervision to all project sites and ensures the implementation of Building Codes in new construction, renovations, and rehabilitations.

The Climate Adaptation Finance Facility (CAFF) is the flagship resilience-focused product offered by the Saint Lucia Development Bank (SLBD) with funding made available from the Climate Investment Funds's Pilot Program for Climate Resilience, implemented through the Disaster Vulnerability Reduction Project. It is designed to offer climate change adaptation loans which are affordable, equitable across socio-economic and gendered lines, and which will provide incentives for pre-emptive vulnerability reduction. The CAFF will provide readily accessible loans to small businesses and households for investments and/or livelihood activities that support climate adaptation or disaster vulnerability reduction. Again here, an **integrated systems approach** to resilience is adopted; one which seeks to improve resilience not just in the housing sector, but also in the business sector in order to reduce vulnerability to business assets and secure livelihoods.

In its first 12 months of existence, the CAFF disbursed 40 loans totalling approximately US$420,000. The majority (35) of the loans went towards residential interventions, while 4 were directed towards agriculture, and 1 towards manufacturing/tourism/service. Challenges identified include only collateralized loans offered, lack of awareness of "climate adaptation interventions", public misperceptions, and challenging economic conditions. Going forward, as the program adapts and expands, consideration is being given to utilizing credit unions as on-lending institutions, improving public communication, targeted expansion to other sectors, and targeted marketing to businesses.

Results of the Rapid Housing Sector Diagnostic in Sint Maarten

The Rapid Housing Sector Diagnostic Tool enocmpasses a a methodology for a comprehensive housing assessment that enables more effective policy and project interventions. The tool was used to examine both the supply (housing availability, associated costs, and constraints) and demand (prevailing income levels, affordability, and financing options) sides of the housing market in Sint Maarten.

It advances a critical step in the direction of establishing a strategic bridge between housing and housing finance in that it serves as a diagnostic/audit/assessment methodology that it links policy makers, developers, bankers, and end users in both the formal and informal housing markets; identifies the housing demand-supply divergence across income levels; offers recommendations for developing housing and housing finance products for each income segment; and empowers cross-sector discourse and collaboration for more meaningful interventions and policies in the housing sphere.

Key findings from the Sint Maarten housing sector diagnostic include:

- *Housing Finance*. Mortgage loans averages US$250,000, and outstanding mortgage loans totalled almost 48% of GDP.
- *Land*. High land prices are driven by institutional constraints and physical limitations. In terms of domain (public) land, lease agreements are not being strategically directed towards the most efficient use of land and there is limited enforcement of agreed clauses; many parcels have not been developed regardless of the 2 year development clause, resulting in speculation; and rents have not been updated and do not reflect the value of land. With regard to private land, it was found that succession land was often trapped in family disputes, and large land parcels are held in hands of few landholders.
- *Regulations and Procedures*. The permitting process is lengthy and uncertain, averaging 6 months for a single house and between 10 to 18 months for a larger project; the building code dates to 1935, and does not include hurricane resistant building guidelines; residential development is only allowed in land located above the 50m altitude line thus leading to large lots, and high infrastructure costs.

Key recommendations arising from the analysis of the results of the housing sector disgnostic include: Incentivize development of "affordable housing", improve land supply, improve land management, support rental housing market development, special programs for low income households, improve technical capacity and financial resources, and improve data collection.

Conclusions

The challenges to building resilient housing in the Eastern Caribbean are numerous: high exposure to natural disasters, rugged terrain, high land costs, inadequate planning, rapid urbanization, small scale, poor land titling, high cost of construction, high import duties, lengthy procedures and cost of obtaining construction permits, limited housing, inexistant or outdated land or urban policy, poor enforcement of building codes, inadequate mortgage finance systems, high inflation, poor contract enforcement, limited access to credit, high perception of mortgage risks, little capital market funding for lenders, and lack of income. Though many, these challenges are not insurmountable, and strategies for their resolution or mitigation are already underway in several countries in the region. When it comes to post-disaster redevelopment, benchmark for resilience is not fixed and varies from one country to another, and although the strategies developed and implementation thereof will differ, common underpinnings encompass the objective that the (re)construction needs to be strong, so that assets and livelihoods become less susceptible to future shocks; fast, so that people can resume their normal life sooner; and inclusive, so that nobody is left behind during the course of recovery.

Session Contributors

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Delegates from across the Caribbean share their stories at the "Voices of Resilience" youth plenary.

"Stories prove to be more resilient than hurricanes and disasters. The buildings may fall but stories will always remain. You just have to be imaginative and hopefully have people who are open-minded enough to tell stories in unconventional ways. They are more impactful than pamphlets and they are more effective than brochures."

—Shakira Bourne, Barbadian writer and filmmaker

Barbadian writer, Shakira Bourne, shares a poem as part of the UR Caribbean "Voices of Resilience" youth plenary.

Launch of European Union Programs to Increase Disaster Resilience in the Region

Photo: EU Launch Event speakers including: (at podium) The Hon. Prime Minister of Sint Maarten, Leona Romeo-Marlin; Stephen Boyce; Daniela Tramacere; Anna Wellenstein; Isaac Anthony; Fabian McKinnon.

During the UR Caribbean Conference, the European Union (EU) launched two programs, in partnership with the World Bank's Global Facility for Disaster Reduction and Recovery (GFDRR), that are designed to strengthen resilience and adaptation capacity in the Caribbean region to the benefit of the most vulnerable. . The programs will support Caribbean countries as they plan for long-term resilience and climate smart growth strategies, and design and implement innovative policy and investment initiatives. The two programs being funded are the Caribbean Regional Resilience Building Facility (USD 31 million) and the Technical Assistance Program for Disaster Risk Financing and Insurance in Caribbean Overseas Countries and Territories (OCTs) (USD 3.4 million).

Caribbean Regional Resilience Building Facility

This Facility will support 15 Caribbean countries by providing financial and technical assistance to mainstream resilience; leveraging investments to reduce vulnerability; and expanding financial protection against disasters such the 2017 Irma and Maria hurricanes. Beneficiary countries include: Antigua and Barbuda, Bahamas, Barbados, Belize, Dominica, Dominican Republic, Grenada, Guyana, Haiti, Jamaica, St. Kitts and Nevis, Saint Lucia, St. Vincent and the Grenadines, Suriname, and Trinidad and Tobago. See here for more information.

TA Program for Disaster Risk Financing and Insurance in Caribbean OCTs

This TA Program will help Caribbean OCTs to understand their financial exposure or contingent liability to disasters; provide an overview of financial protection tools available; assess the feasibility of participating in insurance mechanisms; and facilitate the sharing of knowledge among OCTs. It will be carried out within the framework of the Caribbean OCTs' Resilience, Sustainable Energy and Marine Biodiversity Programme - ReSEMBiD, implemented by Expertise France, the World Bank, and GFDRR with the objective of strengthening environmentally sustainable economic development in Caribbean OCTs.

Beneficiary countries include: Anguilla, Aruba, St. Barthelemy, British Virgin Islands, Bonaire, Cayman Islands, Curacao, Montserrat, Saba, Turks and Caicos Islands, St. Eustatius and St. Maarten. See here for more information.

Launch Event Speakers

Ms. Daniela Tramacere, Head of EU Delegation to Barbados

Honorable Prime Minister Leona Romeo-Marlin, Sint Maarten

Ms. Anna Wellenstein, World Bank Regional Director for Sustainable Development for Latin America and the Caribbean

Fabian McKinnon, ReSEMBiD Program Director, Expertise France

Mr. Isaac Anthony, Chief Executive Officer, CCRIF SPC

Launch of Canada's Caribbean Resilience Facility

Photo: Launch of Canada's Caribbean Resilience Facility, held at the Hilton Hotel's Charles Fort. [From Left to Right: Richard Sutherland, Yohannes Kesete, Benoit Pierre Laramee, Joaquin Toro, Her Excellency Marie Legault, Ming Zhang, Naraya Carrasco, Leah April, Mirtha Escobar, Christine Hogan, Leonardo Iannone]

Given the frequency and severity of disasters in the Caribbean, and the impacts of a changing climate, institutional capacities in the region are often challenged to prepare for and respond to disasters before the next one occurs. This is evident in the significant delay that exists between the disaster event and the start of reconstruction projects. During the UR Caribbean Conference, the Global Facility for Disaster and Reduction and Recovery (GFDRR), in partnership with Canada, launched the US$ 15 million Caribbean Resilience Facility (CRF) that is designed to address these challenges.

The CRF will support countries so they can respond more effectively to natural disasters; accelerate the implementation of reconstruction projects and other resilient activities; and implement institutional reforms for public financial management that incorporate gender-informed disaster responsiveness. Support will be provided across three components:

1. Technical Assistance and Implementation Support for Recovery and Resilience-Building Programs: This component will provide technical support and build government's capacity to accelerate resilience recovery and reconstruction.
2. Mainstreaming Climate Resilience and Gender across the Public Financial Management Cycle: This component will provide technical assistance to integrate resilience and gender considerations into core public financial management functions, systems and protocols in order to enhance the allocative efficiency of emergency financing.
3. Knowledge Management and Peer-to-Peer Exchange: Activities under this component will enable peer-to-peer knowledge exchange, compile lessons learn and develop other knowledge and learning products, as needed.

GFDRR is the secretariat of the CRF, a single donor trust fund, and activities will be implemented by the World Bank. Beneficiary countries include Antigua and Barbuda, Belize, Dominica, Grenada, Guyana, Jamaica, Saint Lucia, Suriname, and St. Vincent and the Grenadines.

Launch Event Speakers

Benoit Pierre Laramee, Senior Director, Caribbean Regional Programme, Canada

Her Excellency Marie Legault, The Canadian High Commissioner

Cointha Thomas, Permanent Secretary, Ministry of Finance, Economic Growth, Job Creation, External Affairs and the Public Service, Saint Lucia

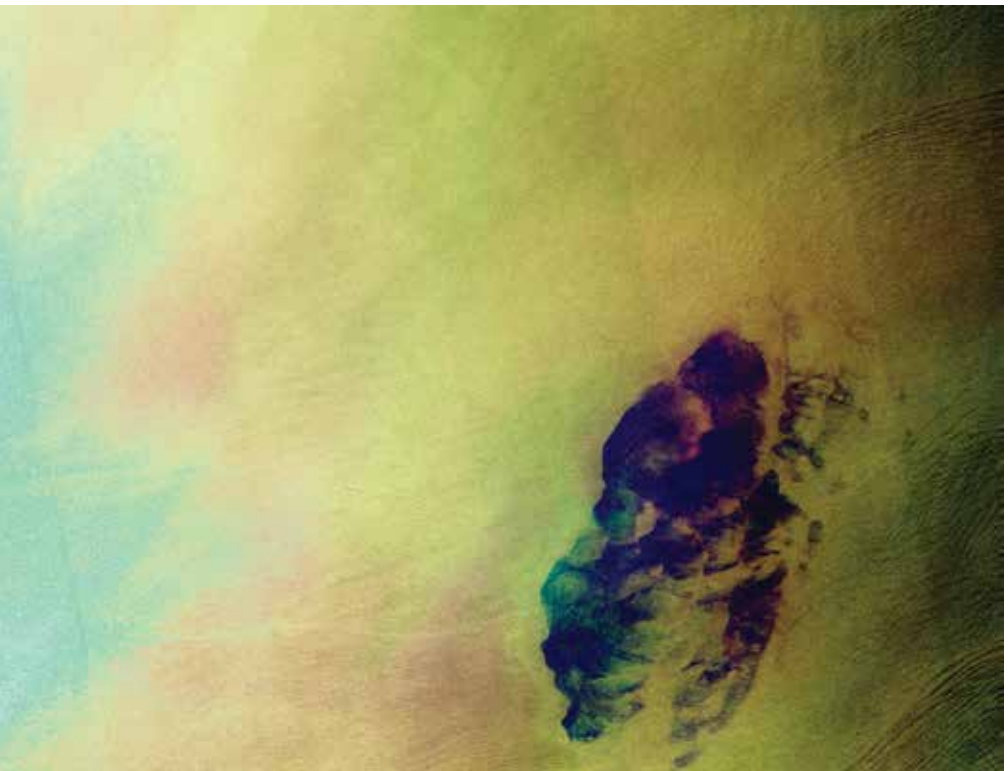
Julie Dana, Head of the Global Facility for Disaster Reduction and Recovery (GFDRR)

Christine Hogan, The World Bank Executive Director for Canada, Ireland and the Caribbean

Visualizing Risk and Resilience

Art can help us better understand and deal with disaster risk across the globe. In addition to a variety of launches, technical trainings and sessions, the conference offered a unique way to better understand the resilience agenda through community engagement initiatives using art. Starting with the Opening Ceremony, UR Caribbean collaborated with the Barbados Museum and Historical Society to add "risk layers" to some of the standing exhibits, resulting in one-minute video installations that augmented the museum's collection to consider the effects of natural hazards. In addition, art was woven throughout the entire week's events through a series of "data-garden" installations—including tableaus, palm trees, bush tea plots, and benches—scattered across the University of West Indies Cave Hill campus, that were made to represent risk themes like seasonal rain forecasts, disasters and financing over time, and even fractural hurricanes.

Finally, UR Caribbean partnered with renowned Argentinian neo-figurative artist, Santiago Espeche, who produced a series of "satellite art" installations inspired by Caribbean poetry. To achieve this, satellite information—which in its raw form comes in shades of grey—was reinvigorated with color. "According to the artist, just like a childhood memory or a glance at the stars, a satellite image is not only the sum of pixels and colors, but a poetic composition of imaginary verses." Espeche describes his work with satellite art as a merging of figuration and abstraction, science and poetry. This exhibition was displayed throughout the conference, and added to the growing dialogue on the connection between art and disaster resilience.



Is there an I without there being a you? 2019.

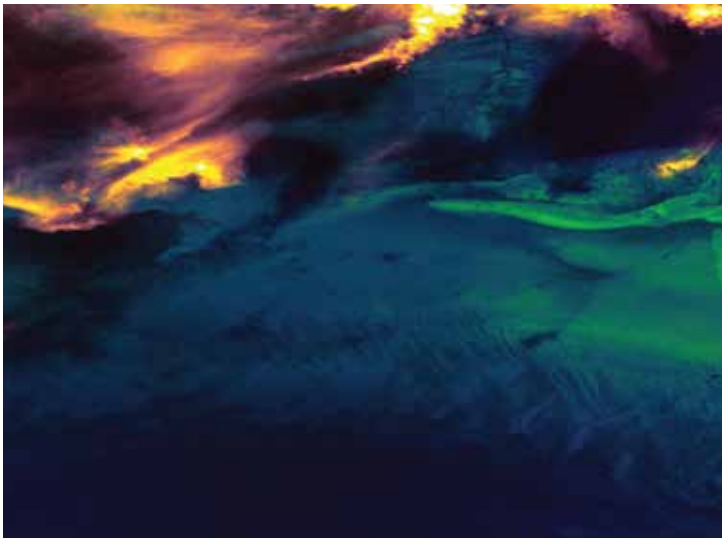
Tell me, without a six is
there a seven?
Would there be a hell,
without a heaven?
What about the being of
light without dark?
Would there have been
a flood without an ark?
Or would the rain exist
without the sunshine?
...

—Leslie Alexis

Natural Mystic. 2019.

There's a natural mystic blowing through the air
—Robert Nesta Marley

marine to noon on AméricasAirplane
First the dark meer
begins to breathe gently into green
into light & light green
until there are like blue
...
—Kamau Brathwaite



Marine to Noon. 2019.

where they will be mountains & ridges
& villages & ozure indigo sunsets
of lapis lazuli & white salt marking its finely
corrugated edges
& stretching out into thousands of tongues.
...
—Kamau Brathwaite

Tongues. 2019.

"Risky Timelines" data sculpture and contributor, Alanis Forde.

Top: The CARICOF DataGarden illustrated a seasonal rainfall forecast. Above: Data sculpture on Caribbean tourism landings before and after a major hurricane.

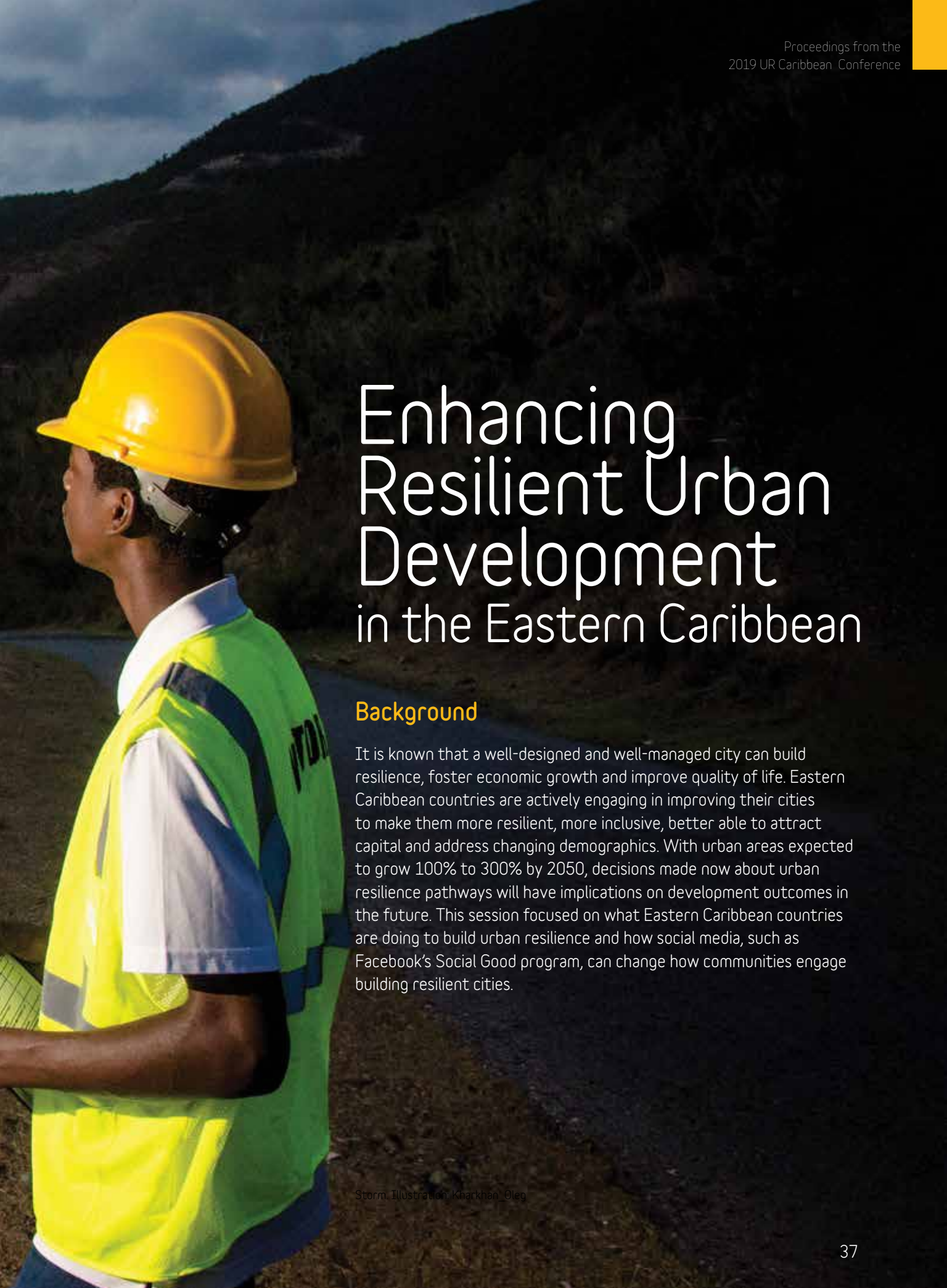
Tayler Friar, communications consultant interviews Pablo Suarez, artist-in-residence at the National University of Singapore on the data-garden installation at the University of West Indies, Cave Hill campus.

Risk visualization was integrated with palm trees to illustrate disaster risk timelines.

Closing speaker, Angus Friday, helps with planting in the DataGarden.

Kathy-Ann Caesar, of CIMH, helps add to the seasonal forecast plot of the DataGarden.

Photo: © Randle Martina



Enhancing Resilient Urban Development in the Eastern Caribbean

Background

It is known that a well-designed and well-managed city can build resilience, foster economic growth and improve quality of life. Eastern Caribbean countries are actively engaging in improving their cities to make them more resilient, more inclusive, better able to attract capital and address changing demographics. With urban areas expected to grow 100% to 300% by 2050, decisions made now about urban resilience pathways will have implications on development outcomes in the future. This session focused on what Eastern Caribbean countries are doing to build urban resilience and how social media, such as Facebook's Social Good program, can change how communities engage building resilient cities.

Storm Illustration, Kharkhan Oleg

Case studies

St. Georges, Grenada—The Caribbean's First Climate Smart Capital City

In the last 15 years, an important series of events propelled Grenada to look at Blue Economy as a source of growth. In 2004 Grenada was hit by Hurricane Ivan which caused damages worth over 200% of GDP, leading the country to restructure its debt. Then, in 2005 a second hurricane caused significant damage and further destabilized the country's economy. Following the 2008 financial crisis, increasingly, Grenada could not meet its debt obligations, and investments dwindled, and unemployment rose to around 40%. By 2013, Grenada had to design a structural adjustment program which was supported by the IMF and World Bank. One solution to this crisis was to develop a Blue Growth Master Plan- an integrated spatial plan for their marine and coastal environments and the economic activities they can support sustainably. The Master Plan is based upon existing coastal clusters; a total of which 9 were identified in consultation with local stakeholders. Blue Growth is seen as one of the key strategies to generate jobs, and it is hoped that increased investment in these coastal clusters will stimulate jobs, alternative livelihoods, and economic growth, thus reducing pressure on fisheries.

Grenada's Blue Growth Coastal Master Plan has been developed into an investment prospectus with a portfolio of over US$1 billion worth of projects. The country is a founding member of the Caribbean Climate Smart Accelerator which is providing support for Grenada's aspirations. The accelerator has 27 member nations and over 40 international private sector organizations, with both the IDB and the World Bank as partners.

Countries interested in possibilities for blue growth master planning or investment are encouraged to approach the accelerator of guidance on a way forward.

Figure 1. Grenada's Blue Growth Coastal Master Plan

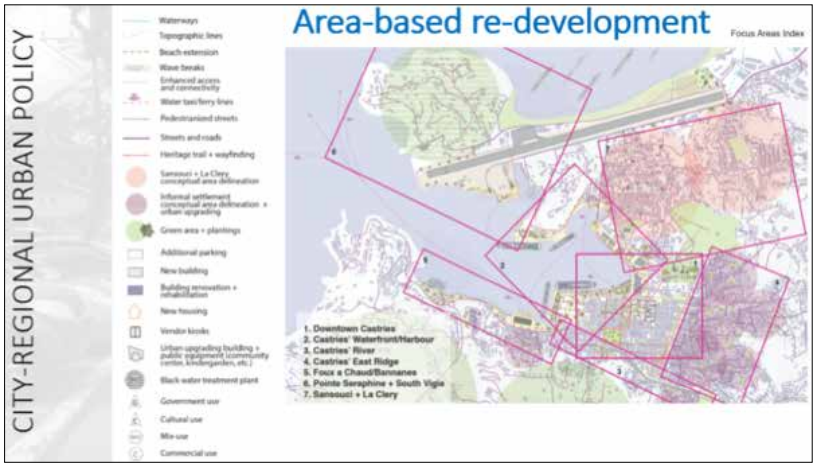
Source: Patil, Pawan G.; Diez, Sylvia Michele. 2016. *Grenada - Blue growth coastal master plan (English).* Washington, D.C. : World Bank Group. http://documents.worldbank.org/curated/en/358651480931239134/Grenada-Blue-growth-coastal-master-plan.

Castries Vision 2030—Saint Lucia

In 2018, a review of the 2008 National Vision Plan was done through the lens of a new body of science with regards to Urban Development and Planning, as expressed by the Sustainable Development Goal (SDG) #11, the New Urban Agenda (NUA). This approach assured the mainstreaming of requirements of such international conventions into Saint Lucia's overall planning strategies. The review exercise entailed key factors to realign 2008 objectives with SDGs / NUA / International Guidelines on Urban and Territorial Planning (IGUTP); reconsider overall balance between a people- and tourism-centered approach; reconsider overall balance between and car and people-centric approach; reconsider interplay between and area-based urban policy for core-city, waterfront/harbor and the wider city-region; adjust to new topics that emerged since 2008, including climate change resilience and socially more inclusive planning; and to shift from a blueprint physical/master-planning approach to a more strategic and flexible multilevel and multi-actor action planning and implementation approach.

A key component on this process was the adoption of a Participatory Planning Approach with a key activity being the first Castries Urban Forum (CUF), which saw widespread

Figure 2. Map Illustrating 7 Focus Areas for Immediate Interventions within Castries Core City Area, Saint Lucia.



Source: Draft Castries Vision 2030 Report.

participation of representatives from various national organizations and groups within the Castries city-region. The Forum produced a declaration containing 10 Vision Statements that were combined into an Integrated Vision Statement that now serves as a motto for the Castries Vision 2030: "Making Saint Lucia's Capital a Vibrant, Resilient and Smart Heritage City for its Residents and Visitors". A key distinction of this Vision 2030 Plan is the inclusion of a roadmap for the implementation.

Urban Resilience Considerations for Arnos Vale and Kingstown Revitalization in SVG

The Government of Saint Vincent and the Grenadines (SVG) is currently receiving technical assistance from the World Bank with the main objective of enhancing their urban resilience and financial planning strategies, namely for the creation of a 'modern city' on the 133-acre former airport site in Arnos Vale; and to redevelop the capital city of Kingstown. This program is aligned with the National Economic and Social Development Plan (2013-25) and its vision to achieve sustainable economic growth, job creation, poverty reduction and improving the quality of life for all Vincentians.

The Government has taken steps to advance this ambitious agenda by developing a working group to focus on the development of Arnos Vale, that has engaged in visioning and other planning exercises. The Government is currently advertising for a firm to develop master plans for the area. In addition, the Government has reached out to the World Bank Group for technical assistance. To this end, the World Bank Group, with support from the European Union's ACP-EU NDRR program is engaging in a series of activities to enhance the resilience urban development agenda. The

Figure 3. Aerial view highlighting key waterways in Kingstown, St. Vincent.

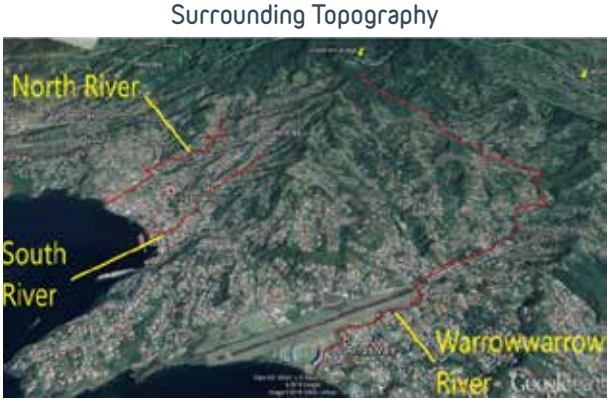


Figure 4. Aerial view highlighting key waterfront sites for development in Kingstown, St. Vincent.

Source: "Urban Resilience Considerations in the Design of the Modern City at Arnos Vale and the Kingstown Revitalization Project, Saint Vincent" Presentation at Understanding Risk Caribbean.

Government and the World Bank Group co-hosted a workshop and stakeholder consultation with representatives from ministries, agencies, private sector, community based, civil society, the Caribbean Development Bank and the EU. The aim of the event was to describe the principles of urban resilience, collect feedback from stakeholders on the development agenda and to build consensus on the way forward. The outcomes from this workshop was presented during the session.

Global and Regional Insights on the Pilot Program for Climate Resilience

The Pilot Program for Climate Resilience (PPCR) supports developing countries and regions in building their adaptation and resilience to the impacts of climate change. To achieve this, first the PPCR helps governments in integrating climate resilience into strategic development planning across sectors and stakeholder groups. Then, it provides concessional and grant funding to put the plans into action and pilot innovative public and private sector solutions.

The PPCR invests in some of the world's most vulnerable countries with particular focus on small island developing states (SIDS) as they are at the frontline of experiencing the impacts climate change. Thus far, 20% of PPCR have been invested in SIDS, with US$250 million for nine Caribbean and Pacific island nations. PPCR also invested more than $200 million for most vulnerable countries to upgrade climate data and services for climate-smart project design.

PPCR has promoted resilient urban development globally in three key ways:

- **Integrating—**Blue, grey and green infrastructure through nature base solutions and hybrid approaches to urban development
- **Programming—**Providing flexible funding streams to maximize finance for development programmatically instead of through project-by-project approaches
- **Cooperating—**Multilateral development banks have scaled-up prioritized adaptation & resilience investments jointly with SPCRs as leverage platform.

PPCR has promoted resilient urban development in the Caribbean through the following:

- **Mainstreaming adaptation and resilience** into urban development
- **Developing governments' capacity** to update building codes, construction regulations and engineering standards for resilient infrastructure
- **Innovating financing** through first credit lines to banks in the developing world for climate resilience.

Facebook's Social Good Tools

Facebook is a leader in today's world of social media, and since the creation of the original social networking platform, it has created its Social Good suite of applications which aligned with Facebook's mission to bring the world closer together. Social Good has four main themes of engagement with users: charitable giving, crisis response, health and mentorship.

- **Charitable Giving.** Though **Fundraiser pages** all US verified nonprofit can create or donate to a Fundraiser from their Facebook Page. Whether the goal is to respond to a current event, raise money for a specific program or generally support your cause, supporters can donate to Fundraisers directly on Facebook in a few simple clicks. What's more, Facebook does not charge any administrative fees for this service, so all monies donated go directly to the intended recipient agency.
- **Crisis Response.** The Crisis Response tool offers two key functions: Safety Check and Crisis Pages.
  - *Safety Check*
    In the wake of a natural or man-made crisis, a global crisis reporting agency alerts Facebook. Alternatively, if a lot of people in the affected area are posting about the incident, Safety Check will be activated and those people

in the area may receive a notification from Facebook to mark themselves safe.

- *Crisis pages*
  Upon the activation of Safety, a dedicated Facebook Crisis Page that contains information about the active crisis is established to help bring people together, who are located in the affected areas. Individuals, nonprofits and businesses can post to a specific Crisis Page to find and offer help following a crisis.

- **Health.** The health features of Social Good help blood banks recruit and retain donors, help identify health emergencies, and provide resources and alert providers so people can get the help they need.
- The **Mentorship** enable people in search of support and advice to connect with people who have the expertise or experience to help. The platform allows organizations to launch a scalable mentorship program, or provide an additional layer of support for existing mentorship programs.

Conclusions

Approaches to urban resilience must integrated measures at various scales, from the individual, to the social unit, to community, to sub-national region, to national, to global regions. The Eastern Caribbean region being perhaps the most vulnerable in the world due to the confluence of factors such as location, topography, human settlement patterns, geomorphology, size of landmass, small economies, etc. must seek to employ a range of approaches towards achieving urban resilience.

Session Contributors

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Approaches to urban resilience must integrate measures at various scales, from the individual, to the social unit, to community, to sub-national region, to national, to global regions.


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Financial Planning for a Rainy Day: Using Information to Build Smart Solutions

Introduction

The Caribbean region is frequently battered by storms and hurricanes, resulting in greater pressure on public finances and, in many cases, increasing levels of debt. Since 1950, 511 disasters worldwide have hit small states—that is, developing economies with populations of less than 1.5 million. Of these, 324 were in the Caribbean, home to a predominant share of small states, killing 250,000 people and affecting more than 24 million through injury and loss of homes and livelihoods[1].

The economic impacts of these events are profound and long-lasting. On average, the annual cost of disasters for small states is nearly 2% of GDP—more than four times that of larger countries[2]. For instance, Hurricane Maria is estimated to have cost Dominica 225% of its GDP, while the hurricane damage for Grenada in 2004 was 200% of GDP, leaving huge reconstruction needs that cripple economies and take years to fulfill[3].

Smart financing arrangements put in place before disasters strike can help national budget holders better weather storms. Risk information plays a powerful role in helping countries decide which pre-arranged financing instruments are best-suited for economies to manage macro-fiscal shocks resulting from natural disasters. This depends on a dynamic combination disaster risk data with macroeconomic models to know where and how to deploy pre-arranged financial risk management mechanisms as part of prudent macro-fiscal frameworks.

1 https://www.imf.org/external/pubs/ft/fandd/2018/03/pdf/otker.pdf.
2 https://www.imf.org/external/np/pp/eng/2016/110416.pdf
3 https://www.researchgate.net/publication/323664225_Bracing_for_the_Storm_For_the_Caribbean_building_resilience_is_a_matter_of_survival

Session contributors from the public and private sector discuss financial planning and how available information influences policy decissions. Photo: World Bank.

Background

Over the last decade, the World Bank and governments globally have worked together to develop their financial risk management strategies, which enable a shift towards a proactive risk management approach. An increasing number of countries are now developing financial protection strategies— that is, a suite of policies and financial instruments—to secure access to financing in advance of shocks. This strategy also helps to protect the fiscal balance and budget when disasters strike. By making funding more predictable and timely, such instruments work to further improve the resilience of national and subnational governments, households, and businesses.

The Caribbean countries with their Latin America neighbors have pioneered the development of many creative and innovative financial solutions which have been replicated globally. For example, the Caribbean Catastrophe Risk Insurance Facility (CCRIF-SPC), established in 2007, was the first ever multi-country risk pool in the world. The success of this has traveled far and wide with the Africa Risk Capacity (ARC) owned and implemented by African countries, and the Southeast Asia Disaster Risk Insurance Facility (SEADRIF) emerging to cover Cambodia, Lao PDR, and other countries in the region.

Financial risk analytics empowers governments to take more informed decisions by bridging the gap between raw risk data and information that is useful to policy makers. This is a prerequisite for effective use of risk financing strategies and tools. Many governments have chosen to include improving the quality and availability of financial risk information relating to natural hazard and climate risks, and the adoption and adaptation of financial risk analytical tools in their overall risk financing and insurance strategies.

Case Studies

At the conference, the session "Financial Planning for a Rainy Day: Using Information to Build Smart Solutions", brought in different perspectives from public and private sector to discuss how available information influences policy decisions. This discourse explored several issues. Firstly, it examined how countries make decisions about the appropriate combination of instruments. Such instruments could vary from contingent finance, risk transfer, reinsurance or capital markets. The dialogue also focused on the utility of customized contingent debt instruments to better protect economies from impacts of adverse weather events of different intensities and frequencies. There was an exchange on the roles that different partners such as the private sector, the donor community, as well as multi-lateral institutions can play in bridging information gaps and addressing implementation challenges while supporting countries to scale up risk financing solutions. The session highlighted the perspectives of Ministries of Finance from Dominica and Grenada, donors represented by Department for International Development (DFID), United Kingdom, as well as the private sector represented by Swiss Re. The session was jointly chaired by experts from the World Bank's Global Facility for Disaster Reduction and Recovery (GFDRR) and the World Bank Treasury.

The session further examined information, tools, and analytics countries find useful, particularly in understanding the trade-offs different financial instruments pose when deciding which is most appropriate to protect against fiscal shocks following a disaster; and what are some of the big gaps that if addressed could go a long way in enhancing how small-island

The Caribbean countries with their Latin America neighbors have pioneered the development of many creative and innovative financial solutions which have been replicated globally. For example, the Caribbean Catastrophe Risk Insurance Facility (CCRIF-SPC), established in 2007, was the first ever multi-country risk pool in the world.

economies make decisions on the right set of instruments. The private sector provided insights on some of the new and innovative products available that can support Caribbean countries. Once the appropriate selection is made, improvements can be applied to the technical design of the financial instrument. The session also had reflections on the role that the donor community can play to create an enabling environment for Caribbean countries to make decisions that are best suited for them; and support them to successfully implement financial solutions.

Challenges and Recommendations

The session provided space for reflections on challenges different partners experience to effectively contribute to strengthening financial resilience in countries. Particularly, the design of the session provided an opportunity for them to think from one another's perspective on what they could do differently to collaborate more effectively on building the right set of financial solutions. The session highlighted some challenges and gaps that pointed to the need for:

1. Customized information for designing specific instruments: While there has been a significant investment in development of risk information to help countries with making sound decisions about financial solutions, gaps remain with regard to customized information that address individual demand and needs. For example, countries such as Dominica and Grenada could benefit from further investment in models that provide information on policy decisions. For example, the optimal size of a Disaster Vulnerability Fund could provide ex-ante support for risk reduction and preparedness and then also be triggered to respond to emergencies. Similarly, information needs remain to help countries improve financial planning. An example of this could be in estimating optimal allocations for setting funds aside so that they can be triggered in years where there are disasters.
2. Simple design, communication, and implementation of financial solutions: Often the design and implementation of existing instruments can be quite complex, and therefore difficult for country counterparts to understand. There is a critical need for impartial advice and information. While designing instruments, involving relevant partners in all aspects is fundamentally important. In addition, particularly in small island states, given capacity constraints, instrument design should be simple and adequate training should be provided on procurement processes to help strengthen country systems. This is particularly important for mobilizing pre-arranged financial instruments quickly after emergencies. Often procurement rules vary across development partners for post-disaster funds, and for those that are more complex, funds are delivered.
3. Innovative instruments that help reduce debt burdens that countries face because of frequent events. Given the high-level of debt distress that the region continues to face, developing information for designing instruments that could help countries with debt management is a priority in the region. This could include, for example, designing long term debt instruments with inclusion of special 'hurricane' clauses; negotiate with creditors to include disaster-triggers in debt agreements that would extend debt service through deferred principal and/or interest payments; explore debt-for-nature swaps which allow sovereign debtors to leverage their debt service obligations in a way that frees up resources for the financing of climate change adaptation and conservation efforts, etc. The role of donors and private sector remain crucial in facilitating the development of such innovative solutions.
4. Increasing coverage of risks through existing instruments: There was discussion on the need for information that will help determine appropriate levels of coverage through existing instruments as well as new instruments to enable countries optimal coverage, particularly for large events.

This would require information that will help policy makers determine what is the optimal level of coverage through existing instruments. For example, increasing coverage under Caribbean Catastrophe Risk Insurance Facility (CCRIF-SPC) could imply higher premiums, but would ultimately result in a better value for money for the upfront investment. Other instruments such as Catastrophe Bonds, while typically more expensive and complex, can be cost effective if designed to complement other instruments and to target coverage with larger payouts for more extreme events.

5. Stronger public and private sector relationships for open and effective collaborations: Having an open dialogue among governments, development partners, and the private sector is critical to developing the right set of financial solutions in country. Development partners can play a key role in providing incentives for better financial management by investing in pilots of innovative instruments so that costs associated with such instruments can be subsidized. Private sector remains ahead of the curve with data and risk information; while public data should be better integrated into risk profiles to improve accuracy particularly for public assets. Finding ways in which this data can be made open, accessible, and useable by countries and practitioners would open new avenues of on-ground collaboration to build smart financial solutions.

Conclusions

The session provided an opportunity for different partners to think about the information needs and gaps in the Caribbean region and work more effectively to build smart financial solutions. Over the past decade, a lot of progress has been made in the Caribbean region. However, there remains a need for greater information that can:

- Be customized for more effective decision-making
- Help simplify design and communication of complex financial instruments
- Explore innovative solutions for debt management
- Identify optimal coverage of risks through existing instruments
- Leverage private sector knowledge.

Finally, the key principle for enabling these is stronger engagement and collaboration across different partners - ranging from governments, development partners, private sector as well as other stakeholders so that there can be synergies for sustainable financial management of macro fiscal shocks in the Caribbean region.

Session Contributors

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Sumati Rajput, World Bank (author)

Development partners can play a key role in providing incentives for better financial management by investing in pilots of innovative instruments so that costs associated with such instruments can be subsidized.

Julie Reifer-Jones, CEO of LIAT, discusses building resilience to climate and disaster risk in the private sector.

"Understanding a problem is the first step to solving it... This means: investing in better preparedness; stronger infrastructure; more fiscal buffers for difficult times; strengthened social safety nets; and opportunities to better manage the Caribbean region's natural resources."

—Tahseen Sayed, World Bank Director for the Caribbean

Panellists Ming Zhang, Julie Reifer-Jones, Jensen Sylvester, Brian Reid, and Keren Charles pose after a plenary on "Engaging the Private Sector."

SpatialEdge: From Risk to Real Time Insight

Introduction

The Caribbean region often faces extreme weather events, causing lasting property damage and loss of lives. The cost of response, recovery and reconstruction has been an enormous burden to the governments in the region. According to data compiled by UNISDR, about 40% of the world population has been affected by natural disasters from 2000-2012, causing 1.2 million deaths and an economic loss of US$1.7 trillion.

The recurrence of such events will tax public spending in post-disaster recovery, reconstruction and emergency support during and aftermath of the disaster. The vulnerability of assets in many countries in the Caribbean combined with its location and associated hazard increases the risk of loss or damage. A clear understanding of potential damage, disruption and vulnerability of exposure will be important step in the disaster risk management process. Quantifying actual damage, loss and disruption in the aftermath of the disaster will help in recovery and reconstruction efforts. To this goal, having accurate exposure and vulnerability data are key to making informed decisions.

St John, Virgin Islands—Hurricane Irma, 2017. Photo: cdwheatley.

Background

The Caribbean region is one of the most vulnerable in the world, and bears the brunt of unavoidable natural disasters, exacerbated by climate change. Because many of these countries are relatively small and have their main commercial activities situated near the coastline, damage caused by natural hazards worsen and impose large costs on fragile economies.

In order to build resilient societies, policymakers and the public in the Caribbean region must have access to optimal data, information and platforms to inform good decisions. Data, technology and stakeholder engagement could result in a good planning tool in all phases of disasters.

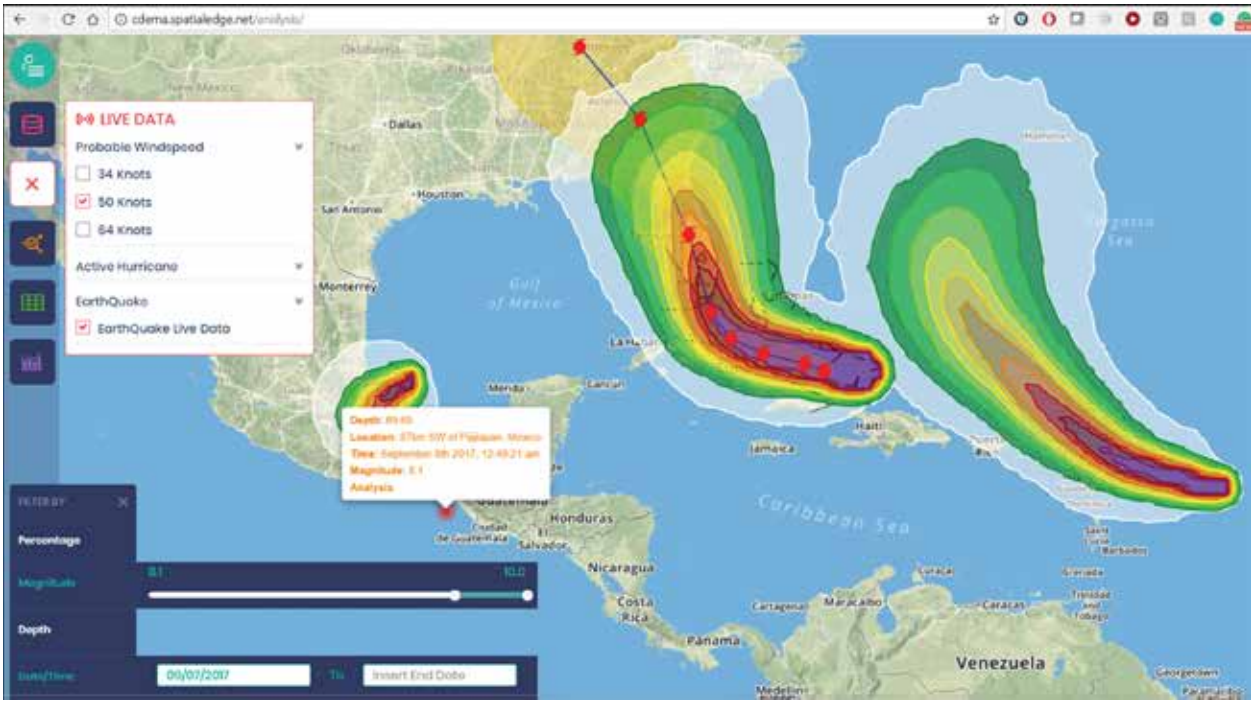
NepCol has been working with the Caribbean Disaster Emergency Management Agency (CDEMA) to help create a comprehensive disaster management information system that will be helpful for Caribbean governments and stakeholders engaging in disaster preparedness. The platform being harnessed, named SpatialEdge, is an innovative solution with a user-friendly interface designed for comprehensive real-time disaster risk analysis. This tool combines the power of geospatial technology, business intelligence, and a content management system to empower decision-makers with real-time insights and situational awareness from an easy-to-use dashboard. Instead of multiple systems, sometimes at odds with each other, it allows engineers, planners, data managers, emergency responders and decision makers to access real-time information.

NepCol has also released another product called "MapWoW!", a mobile data collection solution which helps surveyors gather geo-referenced photos of assets. The collected data from MapWoW! integrates with the SpatialEdge platform where it can add value to understand vulnerability of the assets and make decisions about mitigating impacts during adverse natural events.

Case Studies: The Use of SpatialEdge in 2016-2017

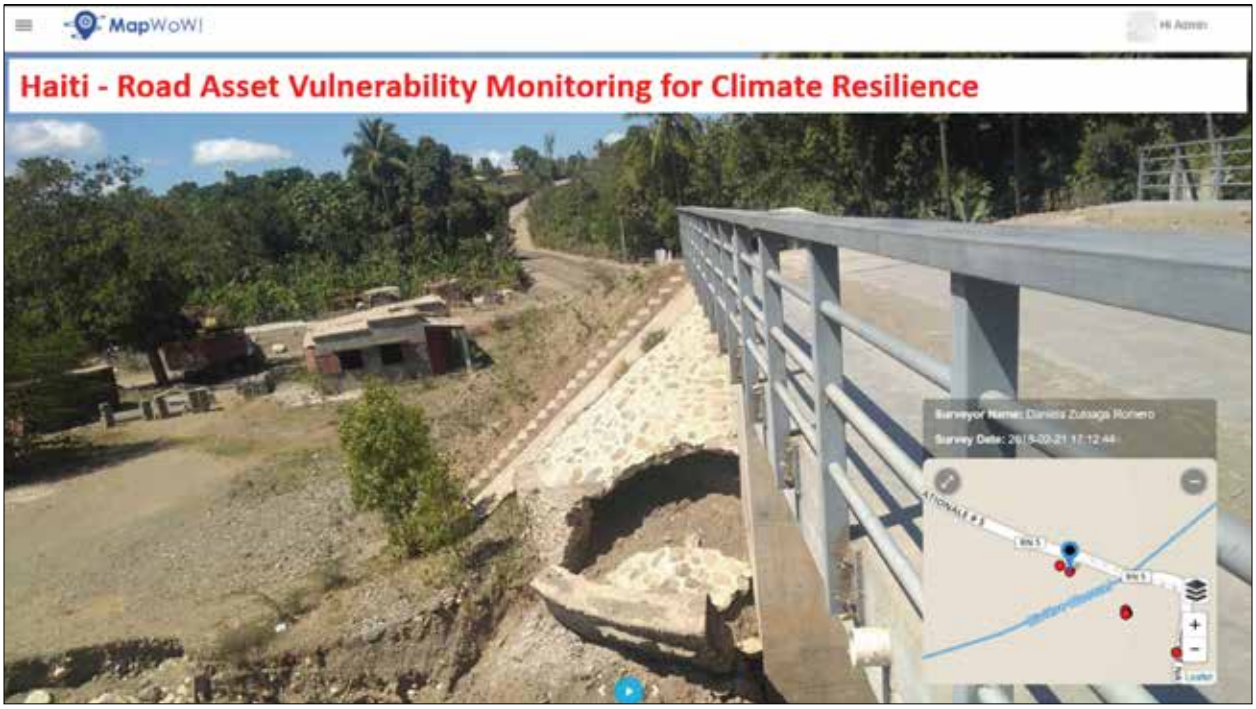
SpatialEdge has been used by CDEMA to monitor and forewarn Caribbean countries and assist decision makers. Three concurrent hurricanes were churning along the Caribbean basin on 2017, which made the situation worse

Figure 1: SpatialEdge dashboard



Source: NepCol

Figure 2: Vulnerability assessment using MapWoW!



Source: Interamerican Development Bank (IDB) team.

in the region already reeling from Hurricane Harvey. SpatialEdge programmatically fetched tropical storm hazard data from the National Hurricane Center (NHC) and created real-time analytics during these events. While there are a few applications that provide visualization of this type, SpatialEdge is further upping the ante in developing real-time analytics by using dynamic data in evaluating the impact and exposure on populations. As a hurricane changes its course or magnitude, the analysis results reflect in real-time to help decision makers, rescue and recovery operations, and actors compiling post-damage need assessments during the evolving situation.

Hurricane Matthew landed in Haiti on October 4, 2016, as a Category 4 Hurricane near Les Anglais in the Sud Department and left the next day to the Northwest Coast. It created unprecedented damage to a country still recovering from a massive earthquake in 2010. The hurricane nearly or completely destroyed around 200,000 homes and unleashed a total destruction of crops in the Grand'Anse and Sud Departments.

Immediately afterwards, the SpatialEdge application was implemented to help the Government of Haiti in understanding the real-time impact of this disaster and visualize the estimated damage and loss.

Recommendations and Conclusion

Optimal data and technology are certainly the key to making informed decisions during the challenging times. A major constraint in the Caribbean is getting optimal data for analysis. Data collection and management is not often prioritized as data-centric approach is not very common in the region. This leads poor or no data collection and data-analytics. Available data are often not shared among stakeholders. This lack of data transparency as well as data silos has further added to the complexity to utilization of data in decision-making.

Capacity building on data collection and analysis is another area that needs further investment.

CDEMA in itself does not have capacity or mandate to collect spatial data in each country. It relies on member countries

Use of SpatialEdge by CDEMA during hurricane season of 2017. *Source:* NepCol.

to facilitate the collection and collation of spatial data.

It is essential that regional disaster management agencies like CDEMA should have unhindered access to spatial data at each country.

The platform and tools are not easily accessible to policy makers, planners and emergency responders. Having access to real time data and analytics could save hundreds of lives as well as minimize disaster-related loss.

CDEMA is developing a GIS based risk information platform called GeoCris, and it could serve as regional disaster risk information platform which needs support in creating a GeoSpatial Platform for Resilience to Natural Disasters.

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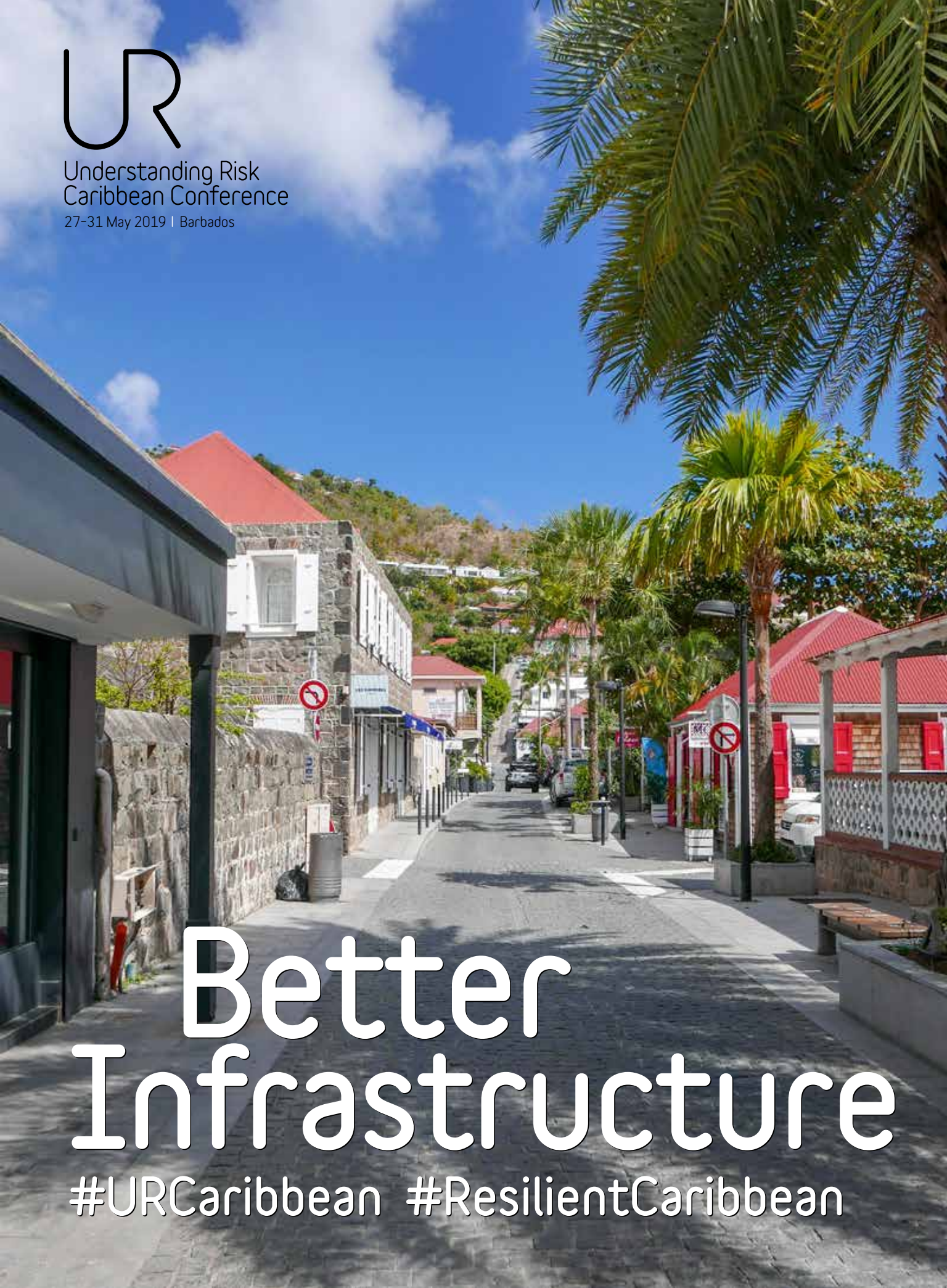


UR

Understanding Risk
Caribbean Conference

27–31 May 2019 | Barbados

Better Infrastructure

#URCaribbean #ResilientCaribbean

Weather, Water and Climate Risk Management in the Caribbean

Background

Caribbean states continue to be severely impacted by weather, climate and water related hazards often leading to significant losses. Hazard assessments, forecasting products and services have been developed and implemented through various initiatives to support disaster risk reduction (DRR). These initiatives have (i) supported the development and publishing of climate monitoring and forecasting products and the establishment of the Caribbean Regional Climate Centre (RCC) at the Caribbean Institute for Meteorology and Hydrology (CIMH); (ii) provided resources for the establishment of the Caribbean Dewetra Platform (CDP)—currently used in the Caribbean for near real-time monitoring and impact-based forecasting; (iii) supported the enhancement of numerical weather prediction and hydrological modelling for improved lead times; and (iv) fostered innovative approaches to climate and disaster risk management.

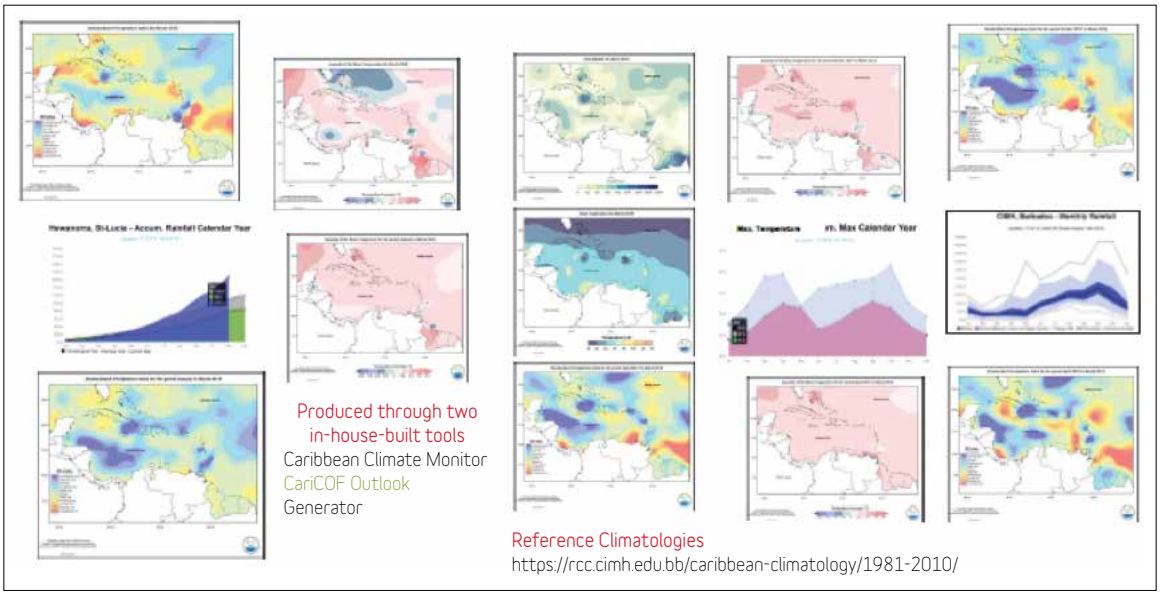
Bahamas—Hurricane Dorian. Photo: Shubham Singh.

The CIMH is working with the Food and Agriculture Organisation (FAO) and other partners, including the Caribbean Disaster Emergency Management Agency (CDEMA) and Italian International Centre on Environmental Monitoring (CIMA) Research Foundation, to implement the Resilient Environment and Agricultural Caribbean Habitats (REACH) project. The project has been designed with a special emphasis on developing a two-way communication mechanism to manage climate related agricultural risks and leverages existing services provided by the CIMH. It is expected that the CIMH and National Meteorological and Hydrological Services (NMHS) will support the initiative through the provision of weather and climate products and services that support the management of climate risk in agriculture and food security, among other sectors. Complementing initiatives being implemented by the CIMH and other partners are enhancement of the CDP and a demonstration of the application of the Rapid Analysis and Spatialisation of Risk (RASOR) platform in the Caribbean for risk assessment and risk forecasting. Snapshots of the integrated suite of operational products, services and tools developed and managed by the CIMH and other partners, were presented during the Understanding Risk Caribbean Conference.

Caribbean Regional Climate Centre

Climate change and increasing climate variability are having adverse effects on climate sensitive socio-economic sectors on Caribbean Small Island Developing States (SIDS). These impacts are expected to grow in the future if appropriate cost-effective adaptation strategies are not implemented. Adapting to climate change and increasing variability requires that the best information on past, current and future climate be available to support decision-making in the Caribbean. The goal of the Caribbean RCC is to support the region's socio-economic development by generating suites of user defined climate products and services to inform risk-based decision-making, particularly in climate sensitive sectors, at the national and regional levels across the Caribbean. These products and services include climate monitoring and seasonal climate outlooks of rainfall and drought, dry spells, temperature, heat waves, wet days and extreme wet spells; newsletters and bulletins tailored to specific users (meteorologists, hydrologists, agriculture, tourism, health, water and coral reef managers); data services and user interface mechanisms. Figure 1 illustrates a snapshot of products developed by the RCC that are used to support decision making within various sectors.

Figure 1: Drought, rainfall, and temperature monitoring products from the Caribbean RCC



Source: Caribbean Institute for Meteorology and Hydrology.

Caribbean Dewetra Platform

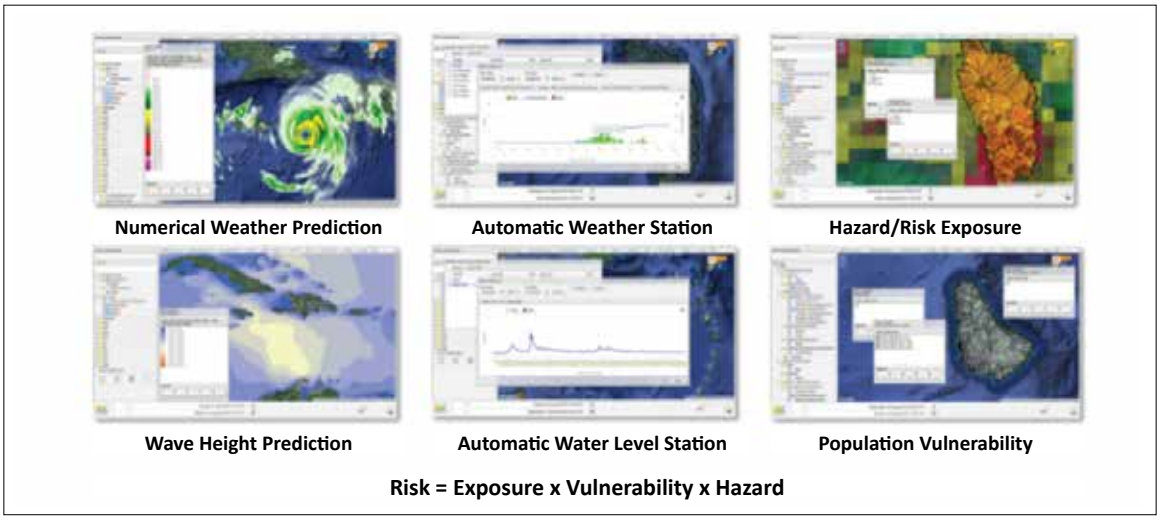
The range of natural hazards the Caribbean is exposed to annually, coupled with its vulnerabilities, make the region's risk profile one of the highest in the world. Extreme weather, and its associated hazards, produce annual national losses capable of exceeding 100% of a country's Gross Domestic Product (GDP) in exceptional cases. Over recent decades, improvements in meteorological forecasting and national early warning networks have reduced socio-economic losses. To further reduce losses, the CIMH in 2007 commenced providing the CDEMA with weather scenarios on evolving systems to support the development of qualitative impact information to inform response actions. Through the use of the online CDP—a spatio-temporal platform capable of integrating evolving hazard data, socio-economic and vulnerability information —this collaborative arrangement has evolved to the production of quantitative impact-based forecasts that are continuously updated as the hazard forecast information improves. Regional collaborations with meteorological personnel, disaster managers and others which utilized the platform to provide impact-based forecasts while risk-informing decision-making has proven extremely valuable during the evolution and passage of adverse weather.

The CDP provides an online multi-user collaborative tool that supports impact-based forecasting and early warning prior to the onset of severe weather (see Figure 2). Products made available through the CDP include but are not limited to (i) satellite-based observations, (ii) weather radar data, (iii) near real-time hydro-meteorological data from in-situ monitoring stations, (iv) numerical weather prediction outputs, and (v) numerical wave height prediction outputs. The ability to overlay exposure and vulnerability data provides a powerful workflow for a qualitative determination of risk and supports scenario planning and impact analysis.

Rapid Analysis and Spatialisation of Risk Platform

Through the "Expanded Weather and Climate Forecasting and Innovative Product and Service Development and Delivery in the Caribbean" project executed through the African Caribbean Pacific ACP-EU Caribbean Development Bank Natural Disaster Risk Management (CDB-NDRM) programme funded by the European Union (EU), the CIMH worked with the CIMA Research Foundation to demonstrate the applicability of the Rapid Analysis

Figure 2: Heat waves, dry spells, rainfall exceedance for crops, relative rainfall change from the Caribbean RCC



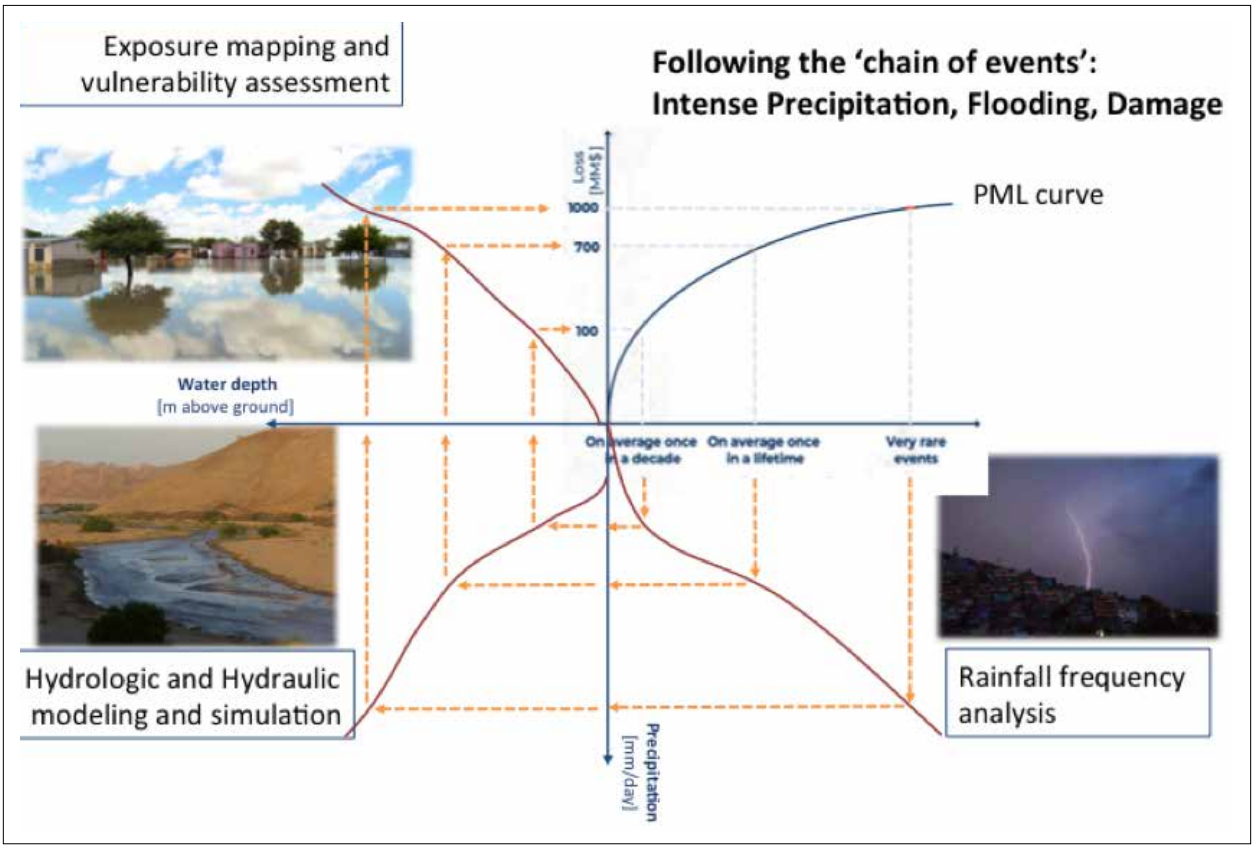
Source: Caribbean Institute for Meteorology and Hydrology.

and Spatialisation of Risk (RASOR) platform to the Caribbean context. RASOR performs multi-hazard risk analysis for the full cycle of disaster management, including targeted support to critical infrastructure monitoring and is seen as a useful complement to the CDP for enhanced disaster risk reduction through the quantification of risk. RASOR offers a single work environment that generates new risk information across hazards, data types and user communities. Two (2) applications of the RASOR platform were demonstrated.

The first application demonstrated a workflow for a building scale flood risk assessment. The target watershed was the Holetown watershed located in Barbados. The workflow for the risk assessment is illustrated in Figure 3. Starting from the development and application of design storms generated through a rainfall frequency analysis procedure, a rainfall-runoff model (HEC-HMS) was developed for the watershed to obtain design hydrographs for multiple return periods. Probabilistic inundation depths were obtained from a hydrodynamic model (TELEMAC) for various blockage scenarios of the culvert below the major road crossing. A damage model, based on stage-loss vulnerability curves, simulated the impact on different building typologies within the community in terms of direct economic losses. These simulations allowed for the calculation of Probable Maximum Loss (PML) and Average Annual Loss (AAL).

The second application demonstrated the feasibility of country scale risk forecasting through the extraction of the wind field from a hindcast of the passage of Hurricane Matthew over Haiti. At the time, outputs from the CIMH Weather Research and Forecasting (WRF) 4km model were used to support preparedness actions. Through RASOR, the wind hindcast, exposure and vulnerability data were managed to demonstrate a

Figure 3: Flood risk assessment workflow applied to Holetown demonstration



Source: CIMA Research Foundation.

workflow for the quantification of expected losses at the district level since information was unavailable at the building level. Satellite-based data were used to define building exposures. The hazard metric used was wind speed at 10m. In the absence of observed data, vulnerability functions were developed for specific building types from regional generic curves in order to provide a hindcast of expected losses. Such a workfkow may be used to support forecast-based financing. However, further evaluation of forecast skill would be required.

Resilient Environment and Agricultural Caribbean Habitats Project

The (REACH) Project is being implemented through a partnership between the CDEMA, the CIMH, the CIMA Research Foundation, under the overall coordination of the United Nations Food and Agriculture Organization (FAO). The objective of the REACH Project is to enhance the capability of small farmers and their communities to organize and manage Agricultural Disaster Risk Management initiatives through improved access to and joint management of relevant agro-meteorological two-way information flows and joint design and implementation of adequate agricultural risk management practices to enhance their resilience to shocks and hazards. The project will make use of the existing tools, products and services made available by the CIMH, some of which were presented in this paper.

Conclusion

During the UR Caribbean Conference, the CIMH received positive feedback regarding the products and services offered. These products and services provided by the CIMH are made available through various user interfaces. Notwithstanding, ensuring that actionable information is received by vulnerable communities continues to be challenging. Emerging from these challenges, it was clear that engaging social science practitioners is key to the design, development and delivery of early warning products. Such an approach is currently being implemented through the work of the Early Warning Information Systems Across Climate Time Scales (EWISACTS) Consortium. It is expected that the Consortium will also be of benefit to early warning workflows at weather time scales. The CIMH will continue working with its partners through internally and externally funded research and development programs to support risk mitigation and build further capacity across the region.

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Photo: World Bank.

Applying a Social Lens to Disaster Risk Management in the Caribbean

Introduction

Climate shocks disproportionately impact the poor and can also push non-poor households into poverty. Yet the social needs of these populations can often be largely unmet at the very outset of an emergency.

National social protection programmes provide an opportunity to address needs prior to and following an emergency, at the scale and speed required. Globally, it is estimated that 2.5 billion people benefit from safety nets.[1] Yet while social protection systems are intrinsically shock-responsive, most instruments have typically focused on the reduction of chronic poverty and providing support across the life cycle. The third function, risk management, has not received as much emphasis.[2]

Achieving more shock-responsive social protection requires investing in ex-ante measures - that is, preparatory efforts to make a social protection system ready to respond flexibly and at scale. In general, five key factors are considered: data and information management systems, beneficiary targeting, delivery mechanisms, adaptive finance, and coordination among different institutional and other actors.

[1] For more information on Social Safety Nets, please visit: http://documents.worldbank.org/curated/en/427871521040513398/The-state-of-social-safety-nets-2018.

[2] For more information on Shock-Responsive Social Protection in Latin America and the Caribbean, please visit: https://europa.eu/capacity4dev/file/91746/download?token=I_cf6KuI.

Case Study: Why invest in shock-responsive or adaptive social protection?

There is general acknowledgment that making social protection systems more adaptive or shock-responsive is a good investment. Surprisingly however, there is limited quantitative analysis on this topic. A glimpse of the potential is articulated in a "Return on Investment" analysis that the World Food Programme (WFP) recently undertook based on the emergency cash transfer programme implemented in Dominica in 2018. It found that investments in preparedness measures to strengthen social protection systems and programmes would represent savings in both time and money. There could be a one-month faster response in providing cash transfers to already enrolled social protection participants at a cost saving of US$500,000 per year in emergency response. By further investing in a national social registry, even those not enrolled in the social protection system would receive assistance two months faster than normal (WFP, 2019).

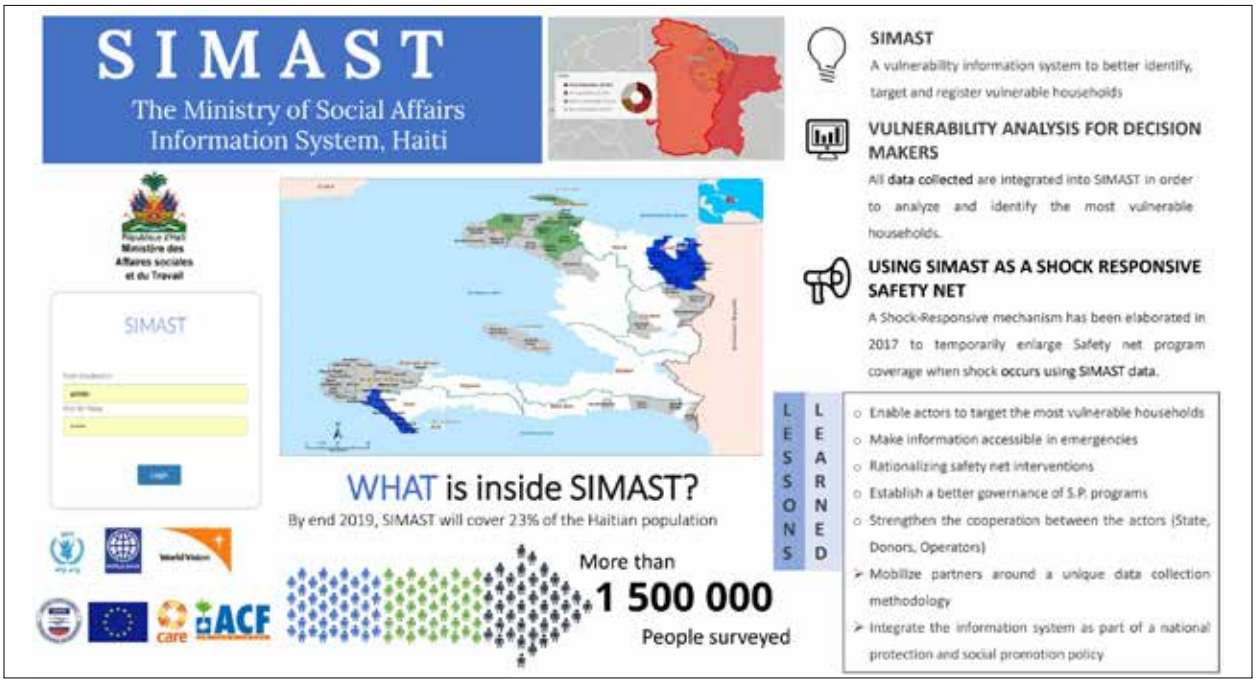
Recommendations: Action in the Caribbean

Caribbean Governments have already started taking the necessary steps toward strengthening social protection to be more responsive to shocks, and there is a growing interest in linking social protection and disaster management systems for increased climate resilience.

In **Haiti**, the Ministry of Social Affairs and Labour (MAST) has, in partnership with WFP, developed a vulnerability database to better identify, target and register vulnerable households. Today this national information system, "SIMAST," is the largest social database in Haiti, with more than 1.5 million people surveyed, and 23% of the population to be covered by the end of 2019. SIMAST supports the implementation and institutionalisation of social safety net programmes, including a shock-responsive safety net.

The **Jamaica** Household Disaster Impact and Needs Assessment (JHDINA) allows the country to respond more effectively with emergency relief support in the event of a disaster. This comprehensive tool has been developed with the assistance of the World Bank, allowing damage and emergency needs information to be collected by different humanitarian stakeholders in a digitised format, including the use of photos, GPS mapping and recommendations to be transmitted in real time.

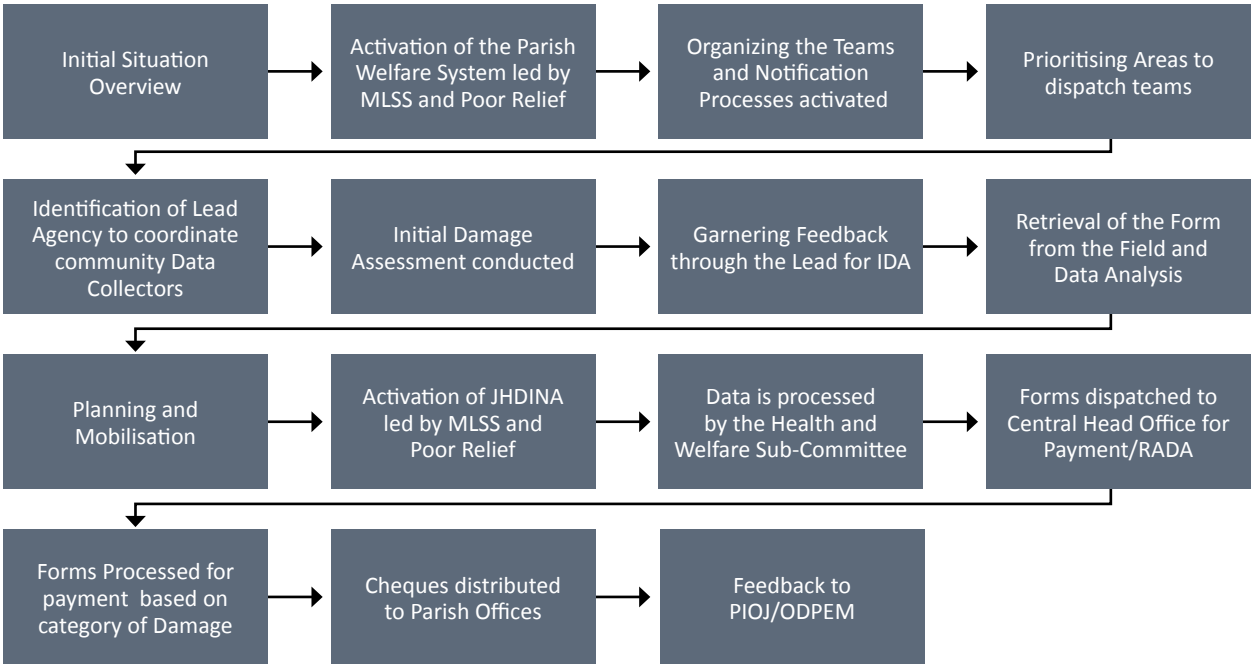
Figure 1: SIMAST: A vulnerability information system for households



Source: WFP

Figure 2: Jamaica Household Disaster Impact and Needs Assessment

Source: WFP



Conclusion and New Frontiers

Adaptive and shock-responsive finance is also being investigated in more detail among different governments, as well as humanitarian and development partners in the Caribbean. Key features of an effective climate risk finance strategy would require a consideration of various populations' vulnerability and exposure to different hazards. Liquidity needs to adequately finance an ex-ante response would also need to be addressed. Based on these analyses, a tailored risk finance strategy would emerge that provides a risk-layered approach that optimises the combination of a range of climate risk finance instruments, and which can then be appropriately linked to national social protection

A variety of partners in the Caribbean, including WFP and the World Bank are committed to support national efforts to strengthen government social protection systems to become more adaptive and responsive to shocks. This is an essential component towards enabling a climate-resilient Caribbean.

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Risk Caribbean Conference

End-to-End Early Warning Systems
What Does it Take to Avoid a Disaster

Introduction

The 2017 hurricane season has been described by development and scientific communities as one of the deadliest periods to be experienced in the Caribbean which resulted in more than 300 lives lost.[1] Two Category 5 hurricanes—Hurricanes Irma and Maria—hit the Caribbean and devastated several countries including Dominica, Puerto Rico, Antigua and Barbuda and Sint Maarten. In Dominica this resulted in damages and losses of about US$ 1,311 million, an equivalent of 226% of the island's 2016 gross domestic product (GDP). High levels of certainty, intensity and frequency of such extreme events will only increase with climate change in the future.

Without the strong performance of hurricane track monitoring and forecasting coupled with the warnings that were provided to the population, the consequences of the 2017 hurricane season could have been much worse. This event demonstrated that a strong Early Warning System (EWS) plays a critical role for the safety and well-being of the entire region. However, the hurricane season also revealed a number of challenges and short-comings of the current system, such as:

1. The lack of specific forecasts of storm surges and flash floods
2. Limitations in the dissemination of information, especially to indigenous populations
3. Inter-institutional collaboration and communication that would benefit from strengthening

With EWS being much more than measuring devices and sirens, the question arises: How can we efficiently enhance the entire end-to-end system?

[1] Caribbean 2017 Hurricane Season an evidence-based assessment of the Early Warning System, World Meteorological Organization (WMO) ; World Bank ; Global Facility for Disaster Reduction and Recovery; United Nations Office for Disaster Risk Reduction (UNISDR) ; CDEMA ; Caribbean Meteorological Organization (CMO), WMO (2018)

Background

Effective EWS are complex mechanisms that provide timely warnings for informed decision-making and actions by the population, and therefore, they need to be people-centered. This requires the coordination of a multitude of actors: Modelers to analyze risk, meteorologists and hydrologists that monitor and forecast hydrometeorological phenomena, the emergency and communication agencies for efficient transmission of information, and the emergency organizations that prepare for a crisis with capacity building, evacuation plans, protocols, drills, and the community to take adequate action when the time comes. Therefore, taking the necessary steps coupled with effective communication across all actors before, during and after an event is a critical factor for the efficiency of any EWS.

Case Studies

The Caribbean is embarking on a process to further strengthen their EWS. With its 13 independent countries and many overseas territories, the Caribbean is a heterogeneous region with both challenges and great potential. Some challenges particularly affect the smaller countries that have less than 200,000 inhabitants and struggle with limited financial and human resources. However, great opportunities lie in complementing national-level capacities through regional-level collaboration and support structures. A first step toward that goal is to develop a regional EWS strategy to coordinate and address key shortcomings and streamline efforts.

The CREWS[2] (Climate Risk and Early Warning Systems) funded "Strengthening Hydro-Meteorological and Early Warning Services in the Caribbean" project (also known as "CREWS Caribbean")[3] is a regional project that aims at strengthening and streamlining end-to-end early warning systems. During the first phase of the project, a regional diagnostic will guide the development of a holistic regional strategy to strengthen and streamline early warning systems across the CARICOM countries. This strategy shall serve to coordinate efforts, funding and projects that support a more harmonized and efficient approach to EWS. In addition, it will provide a framework for national-level strengthening of EWS based on clarified regional support and input those countries will receive. Furthermore, the strategy will help to identify and design pilot project investments to strengthen impact-based forecasting in selected countries. These combined efforts demonstrate a holistic approach to regional cooperation and coordination to deliver a 'cascading' system that feeds into weather, climate and flood forecasting.

While CARICOM countries are directly targeted in the CREWS Caribbean project, all islands and territories will benefit from regional knowledge sharing and training opportunities that support increased cooperation in the region.

Regional centers and organizations such as the Caribbean Disaster Emergency Management Agency (CDEMA) and the Caribbean Institute for Meteorology and Hydrology (CIMH) are partners in developing the regional strategy. They have greater capability and

Training session participants discuss and identify opportunities to build sustainable EWS.

[2] https://www.crews-initiative.org/en.
[3] https://www.gfdrr.org/en/crews-caribbean

the mandate to support national services and early warning systems, and their role increases, especially in the cases similar to the recent hurricanes. By further strengthening this complex system and its collaboration and coordination mechanisms, countries will enhance decision-making during severe events and increase resilience in the region.

The Understanding Risk (UR) Caribbean Conference in Barbados offered a platform to better understand the strengths, weaknesses, and the key opportunities for a regional end-to-end early warning system. Actors across sectors were gathered for a session to discuss ways, needs, and opportunities to foster collaboration and communication in order to sustainably strengthen EWS in the Caribbean. Participants included representatives from the regional organizations, national meteorological and hydrological services, national disaster management organizations, gender bureaus, planning offices, communities, and the private sector to determine the weakest links in the system in order to work towards a more resilient Caribbean.

The inputs from the UR Caribbean session are informing the development of the diagnostic and the regional hydromet and early warning systems strategy, currently underway under the CREWS Caribbean project.

Challenges and recommendations for effective EWS in the Caribbean

During the UR Caribbean session, participants had the chance to explore the challenges of efficient communication, fast action and quick decision-making through a role play in which a storm is rapidly approaching a fictional (and yet so real!) island. Subsequently, the group identified and discussed key challenges and avenues of opportunity to strengthen early warning systems in the region. Four main topics emerged prominently during the discussion: forecasting, communication, collaboration, and capacities.

Forecasting:

- The audience expressed a strong call for the development of impact-based forecasting with simple color-coding to understand the level of impact, and community awareness-raising efforts.
- Lack of resources, limited observational infrastructure, and outdated data management systems were identified as important challenges. This prompted a discussion on the new business models that should be developed in future.
- Forecasts, even at their best, are never 100% certain due to the complex nature of a natural phenomena. Preparedness is key, and investing smartly upfront is critical.
- A regional mechanism of communicating needs and feedback would be valuable.

Communication:

- Communication to the population is a crucial point, especially nowadays when wrong information or information without a basis win over official forecasts and warnings. Social media have a great impact on the fast dissemination of early warnings, but their reliability is often difficult to control. Messages have to be less technical and synergies must be found with national media firms. Given the multiple contexts in the Caribbean, various methods of communication should be leveraged, taking advantage of modern technology without giving up on traditional mediums such as radio broadcasts or megaphones. In the realities of rapid technological development, countries should consider which of them are applicable to their context.
- The language barrier was brought up as a challenge in the Caribbean context which adds complexity to issuing messages and warnings.
- Communication with vulnerable groups was also identified as a major challenge to be addressed by an effective EWS in the Caribbean.
- Continuity of the communication systems during disasters is critical, and solutions can be investigated at the regional level to avoid fatal communication failure.

Collaboration:

- The need for better collaboration was mentioned—not only between the national and regional levels, but also between groups in a country

such as organizations involved in disaster risk financing (to ensure quick fund mobilization) and development partners and donors (to ensure synergies instead of fragmentation).

- Different instances, from limited regional collaboration to good working relations and collaboration between countries were discussed, suggesting a significant variability across the region as well as the opportunity to learn from established best practices.
- Sharing of information, the centralization of data storage, creation of a hub, and access to open data were discussed as great opportunities for effective EWS in the Caribbean.
- The initial feedback was that there is room for optimization, starting from standardization of technical requirements for equipment (at the regional level and with WMO standards), to data collection and monitoring, to the further alignment of the SOPs for agencies.
- Partnership with universities and research centers was identified as a significant opportunity to build a sustainable EWS.

Capacity:

- Countries are facing a tough situation when trying to hire and retain a skilled workforce. Development strategies should have a clear plan for the development of skill sets needed for agencies and ways to retain them.
- Given the young population of the Caribbean, investing in training and in education is an opportunity that cannot be neglected. Awareness should start at school level and be followed by an adequate curriculum in relevant sciences and job creation. This should include an evaluation of the potential role of the private sector in the development of capacity building and training programs.

Conclusions

The occurrence of hurricanes in the Caribbean is not a matter of "if" but a matter of "when". While investments in risk reduction and adaptation are critical to increase physical resilience in the region, there will always remain a significant threat to life and livelihood to vulnerable populations due to the high intensity of the natural disasters.

Overall, the region has a significant but unevenly distributed capacity, which poses many challenges but also great opportunities through close collaboration. With consistently high-quality forecasts and strong progress in delivering warnings to the community, many lives can be saved, and potential economic losses reduced. A regional strategy will help with the vision, coordination and joint action to achieve this long-term goal.

The consideration of vulnerable groups and gender differences is also central to a regional strategy. It is integral that this developmental approach be gender informed. This will ensure EWS and preparedness messaging reach across entire populations, giving everybody an equal opportunity to make informed decisions.

Lastly, building awareness among decision makers while pooling the expertise from technical partners, regional agencies, and national institutions is critical to strengthen the complex chain of required actions to ensure well-functioning end-to-end EWS to better protect the Caribbean region.

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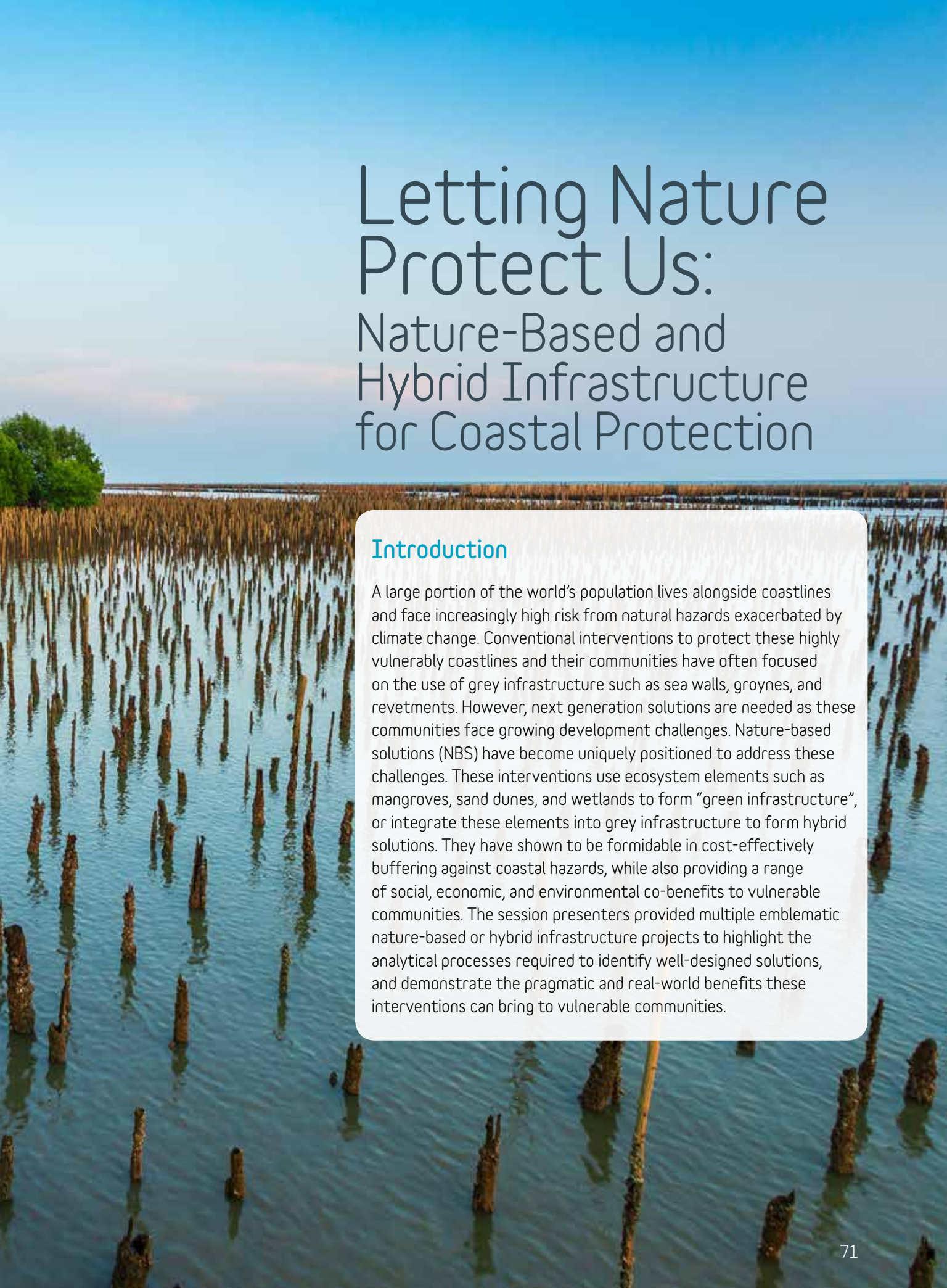
"For people who survive these things (natural disasters), it's kinda like grief that you never forget."

—Dr. Yvonne Weekes, Author, Montserrat

Suriname aerial mangrove roots. Photo: banjongseal324.



Letting Nature Protect Us:

Nature-Based and Hybrid Infrastructure for Coastal Protection

Introduction

A large portion of the world's population lives alongside coastlines and face increasingly high risk from natural hazards exacerbated by climate change. Conventional interventions to protect these highly vulnerably coastlines and their communities have often focused on the use of grey infrastructure such as sea walls, groynes, and revetments. However, next generation solutions are needed as these communities face growing development challenges. Nature-based solutions (NBS) have become uniquely positioned to address these challenges. These interventions use ecosystem elements such as mangroves, sand dunes, and wetlands to form "green infrastructure", or integrate these elements into grey infrastructure to form hybrid solutions. They have shown to be formidable in cost-effectively buffering against coastal hazards, while also providing a range of social, economic, and environmental co-benefits to vulnerable communities. The session presenters provided multiple emblematic nature-based or hybrid infrastructure projects to highlight the analytical processes required to identify well-designed solutions, and demonstrate the pragmatic and real-world benefits these interventions can bring to vulnerable communities.

Case Studies

Four case studies from World Bank efforts in the Latin America and Caribbean (LAC) and East Asia Pacific (EAP) region were highlighted. One excellent local hybrid infrastructure case study from southern Barbados was also presented by Baird & Associates, which emphasized the importance of using grey infrastructure to enhance green solutions.

Building Coastal Resilience in Jamaica

In Jamaica, the World Bank started with the development of the Coastal Management and Beach Restoration Guidelines, for the provision of a wide range of options that included hard, nature-based, and non-structural solutions for coastal protection. During this effort, it was evidenced a lack of ecological and physical data for the proper understanding of ecosystems contribution to climate adaptation and disaster risk reduction. As a result, the Program on Forests (PROFOR) funded a technical assistance that aims at conducting detail analysis on the role of mangrove forests in coastal resilience. Ecological data (i.e. Species diversity and abundance, tree complexity, fisheries production); physical data (i.e. soil retention in roots system, carbon fluxes, water quality, and wind and wave force attenuation); and socio-economic data (livelihoods-dependent on fisheries, fish as food security), have been collected in three coastal areas at risk. In addition, a nationwide coastal flood risk assessment has been concluded in order to estimate the coastal protection services provided by mangroves as avoided economic loss. In this regard, percentages of people protected, as well as built infrastructure (residential and industry), have been calculated. Besides informing decision makers about the avoided economic losses due to mangrove forest coverage, this technical assistance aims at building capacity on the ground by working with the local university (University of West Indies, Jamaica), and providing multiple workshops to government representatives and local NGOs. Final results of this detailed study will be ready by November 2019.

Experts examine mangrove forest coverage.

Source: Juliana Castaño-Isaza.

Revisioning the Urban Waterfront in Panama

Panama City has expanded its urban footprint by 350% in four decades. To address this issue, together with the growing climate challenges, a multidisciplinary World Bank team including Environment, Water, Transport, Urban Development and Disaster Risk Management, has been involved in this effort to provide a holistic set of potential interventions to ensure human well-being, reduce disaster risks, and adapt to a changing climate. With GFDRR support, the team has been conducting a strategic flood risk assessment and evaluating how natural (e.g. mangroves and riparian vegetation) and hybrid solutions (e.g. mixed green, grey, structural and non-structural interventions) could contribute to flood risk resilience in Panama's coastline and the Tocumen-Tapia watersheds. In particular, this study aims at evaluating the influence of natural infrastructure in reducing flood and erosion risk in the study area; appraise the impact that historical changes in mangroves and riparian vegetation may have had on catchment and coastal flood risk; identify and prioritize hybrid solutions for flood risk reduction; and assess the effectiveness of prioritized solutions and conduct a cost-benefit analysis.

Engaging Communities in Vietnam with Hybrid Infrastructure

NBS can contribute to increased community resilience and well-being by contributing to employment generation and sustainable livelihood opportunities/diversification in agriculture, fisheries, tourism, ecological restoration, conservation and management in addition to increasing food security, providing educational opportunities and awareness raising on climate and disaster risks. The World Bank project, The Vietnam Mekong Delta Climate Resiliency and Sustainable Livelihood, was presented as a case study to showcase what social co-benefits in an NBS

Caption. Photo: World Bank.

Rockley Beach Restoration and Boardwalk.

Source: Kevin MacIntosh, Baird & Associates.

project looks like in practice. The project is encouraging coastal shrimp farmers to shift from intensive shrimp farming—which is a very risky business, given the potential for shrimp diseases and storms that disrupt operations—to a combination shrimp mangrove system. The reconstruction of a mangrove belt (in combination with sea dikes) will help reduce the impacts of storm surges and flooding along the coast. Converting to a shrimp-mangrove system creates opportunities for farmers to become certified as a sustainable seafood operator at the international level, which can increase the price of their products in the market and increase income. A shift into certified organic mangroves has been estimated to generate a yearly net benefit of $992 per hectare per year.

Barbados Waterfront Improvement: Using Grey Infrastructure to Enhance the Green

The small island of Barbados is situated at the easternmost extent of the Lesser Antilles, and relies heavily on tourism associated with its coastal ecosystems, such as sandy beaches and coral reefs, for its GDP. Understanding the importance of these coastal ecosystems to the economy, Barbados has become a leader in the Caribbean in the use of Integrated Coastal Zone Management. As part of the country's Coastal Infrastructure Programme, several projects that include hybrid infrastructure interventions have been implemented. One of these was the "Rockley Beach Restoration and Boardwalk" led by Baird and Associates who were responsible for the final design, including physical modeling, coastal analyses, and construction review services. This project resulted in a 1.6 km long boardwalk and beach expansion from Rockley to Coconut Court that not only enhanced the aesthetics of the beach, but restored and

improved the nesting habitat of sea turtles. What was previously eroding shoreline is now stabilized and expansive beaches, used by humans and wildlife. And a system of plantings at the top of the beach works together with the engineered filtration system to purify run-off water before it reaches the shoreline, which has improved coastal water quality. To date, the boardwalk has been widely enjoyed by locals and tourists alike, and has revitalized the southern coast.

Challenges and Recommendations

While the World Bank and other institutions have made excellent progress on mainstreaming nature-based solutions and addressing issues that impede the scale-up of these interventions, further work must to be done to create improved enabling conditions for the implementation of these next generation solutions.

- There must be a greater effort in collection and management of robust or high-quality data (both social and natural) as this data if often limited. For instance, high-quality topographic and bathymetric data is not always available to run coastal hazards assessments.
- To improve our knowledge of the role of ecosystems in coastal risk reduction, stronger monitoring and evaluation systems must be improved as they are usually outdated and/or not implemented due to capacity limitations.
- Basis for economic valuation is highly subjective, and more robust assessments must be created to more concretely and quantifiably capture the benefits of implementing nature-based solutions
- High-level government will to conserve and introduce nature-based solutions is limited, due to lack of knowledge and restricted economic assessments comparing multiple approaches. Continued awareness raising, demonstration of successful NBS projects, and improved assessments of costs and benefits can close knowledge gaps and reduce uncertainty in employing these nature-based interventions.
- Although there's growing evidence on the socio-economic benefits that we gain from ecosystems, nature-based infrastructure is not yet considered under the most national accounting systems.
- There can also be difficulties in getting community buy-in for NBS projects, as they can pose a potential land use conflict and require complex stakeholder engagement given the cross-sectoral nature of these interventions. A well-designed nature-based solutions project must understand the local dynamics and ensure it involves the participation of communities.

Further Resources

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Disaster Risk Financing in Overseas Countries and Territories

Introduction

The Caribbean region is exposed to a variety of natural hazards, which have significant negative impacts on their economic and fiscal stability. The global trend toward increasing climate variability is likely to exacerbate many of these hazards. Costs of recovery and reconstruction from disasters can result in increased debt, unsustainable budgetary deficits and unreliable funding streams for many countries in the Caribbean. In addition, the absence of macroeconomic stability makes it harder for Caribbean countries to implement poverty reduction policies. The Caribbean Overseas Countries and Territories (OCTs) can be particularly financially vulnerable. Many OCTs cannot access the same financial products offered to sovereign countries, and constitutional relationships may not have provisions in place for rapid disbursement of post-disaster assistance. On top of that, in many cases, limited fiscal space and human resources impact the ability of OCT governments to undertake necessary fiscal risk assessments and synthesize an approach to disaster risk financing (DRF) with a comprehensive disaster risk management (DRM) strategy. OCTs are seeking ways to take control of reducing their fiscal vulnerability and enhancing their long-term resilience and capacity to adapt to extreme and recurrent natural events.

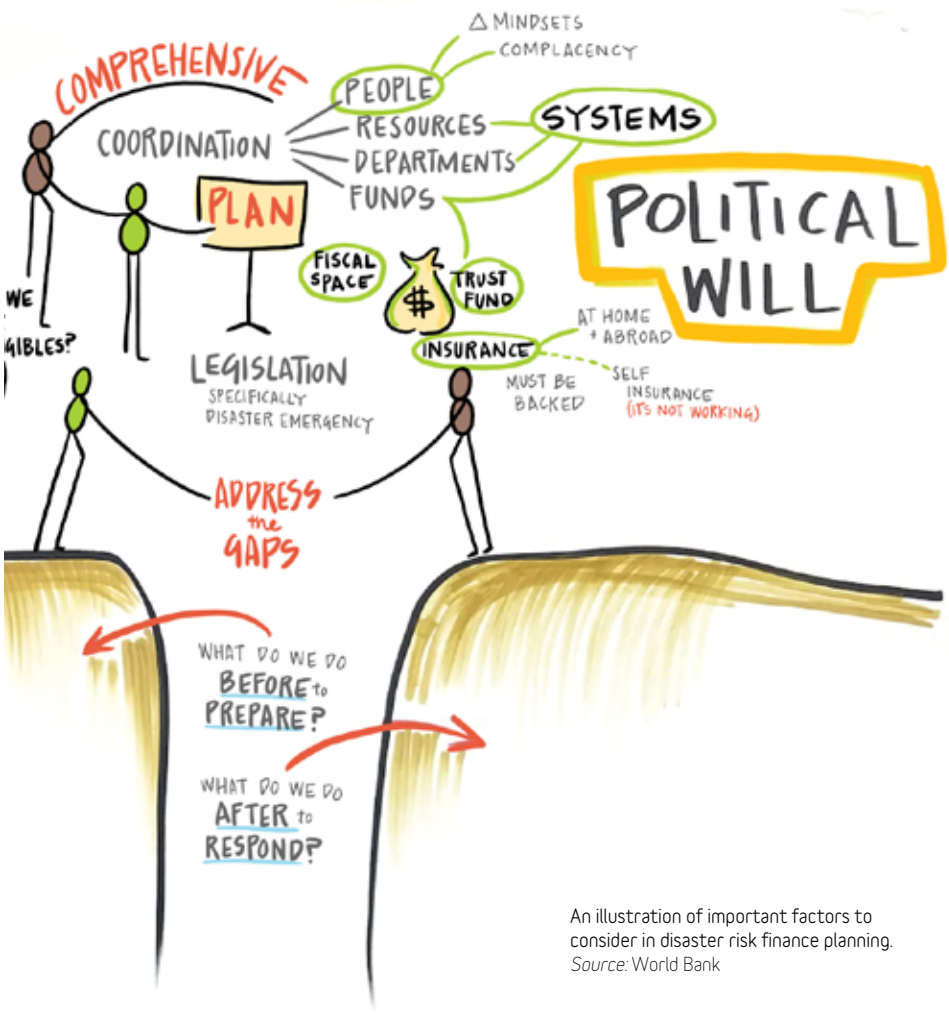
Background

A technical workshop at Understanding Risk Caribbean provided an overview of the Disaster Risk Financing Technical Assistance (DRF TA) available to Caribbean OCTs through the EU-funded Technical Assistance Program for Disaster Risk Financing and Insurance in Caribbean OCTs which is part of the Resilience, Sustainable Energy and Marine Biodiversity Program (ReSEMBiD). Assistance

through this TA includes the development of innovative DRF options, capacity building within OCTs on use of existing risk transfer mechanisms such as the Caribbean Catastrophe Risk Insurance Facility (CCRIF), and working with OCTs to promote informed decision-making on disaster risk financing. This session was geared towards government officials and ReSEMBiD focal points in OCTs, but was open to all conference participants.

Case Studies

The DRF TA has already been successfully implemented in Belize, Grenada, Jamaica and St. Lucia. Key developments include St. Lucia adopting the first national DRF strategy in the Caribbean, and Jamaica following close behind. Minister Winston Garraway of the Ministry of Climate Resilience in Grenada spoke about how the DRF TA has positively impacted risk-based financial decision making in Grenada. Ms. Alma Gomez, Insurance Supervisor of Belize, touched on the importance of dialogue taking place between the regulator, the insurance industry, and governments in order to strategically benefit from risk transfer options. Montserrat's Financial Secretary, Colin Owen, shared his experiences working with the World Bank over the last few months and his expectations of the engagements over the next couple years.



An illustration of important factors to consider in disaster risk finance planning.
Source: World Bank

Conclusion

Experience regionally and globally has shown that when countries adopt a risk layering approach with multiple complementary risk retention and risk transfer instruments, supported by robust hazard and loss data and sound legal and public financial management systems, disaster response can be more timely and cost effective. The World Bank is proud to launch their DRF component of the ReSEMBiD program and looks forward to working with OCTs to strengthen their ability to cope financially with disasters.

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cRISKet!
Hitting Disaster Risk for Six!

On May 31, 2019 - one day before the start of the hurricane season – the Caribbean Disaster Emergency Management Agency (CDEMA), World Bank, European Union, Global Facility for Disaster Reduction and Recovery (GFDRR) hosted a "cRisket" match (Cricket + Risk) to raise public awareness of disaster risk across the region.

Two seasons ago, Hurricanes Irma and Maria wreaked havoc on many islands in the region, further cementing the need for public and private sectors, academia, NGOs, international partners, and citizens to collectively take action to reduce the fiscal, physical and socio-economic impact of hurricanes, volcanoes, earthquakes, floods, landslides, and other hazards in the region.

This cRisket match wrapped up the Understanding Risk (UR) Caribbean Conference – that consisted of five days of sessions and workshops, delivered by more than 20 regional and international organizations, for 500+ participants from over 20 Caribbean countries. The conference served as a foundation to further action across the region.

The game of cricket offers an elegant way to think of disaster risk in the Caribbean region. Think of the ball as a hurricane, spinning as it advances towards the vulnerable wicket, threatening to hurt those who are not well protected. In this game, we had talented players who can see the danger coming, and anticipate its direction and likely impact, well before it hits—just like an early warning system for hurricanes! Imagine if you were playing with a partial blindfold, unable to know what may hit you when... This T-10 match invited both players and onlookers alike to reflect on risks in the Caribbean through the lens of cricket.

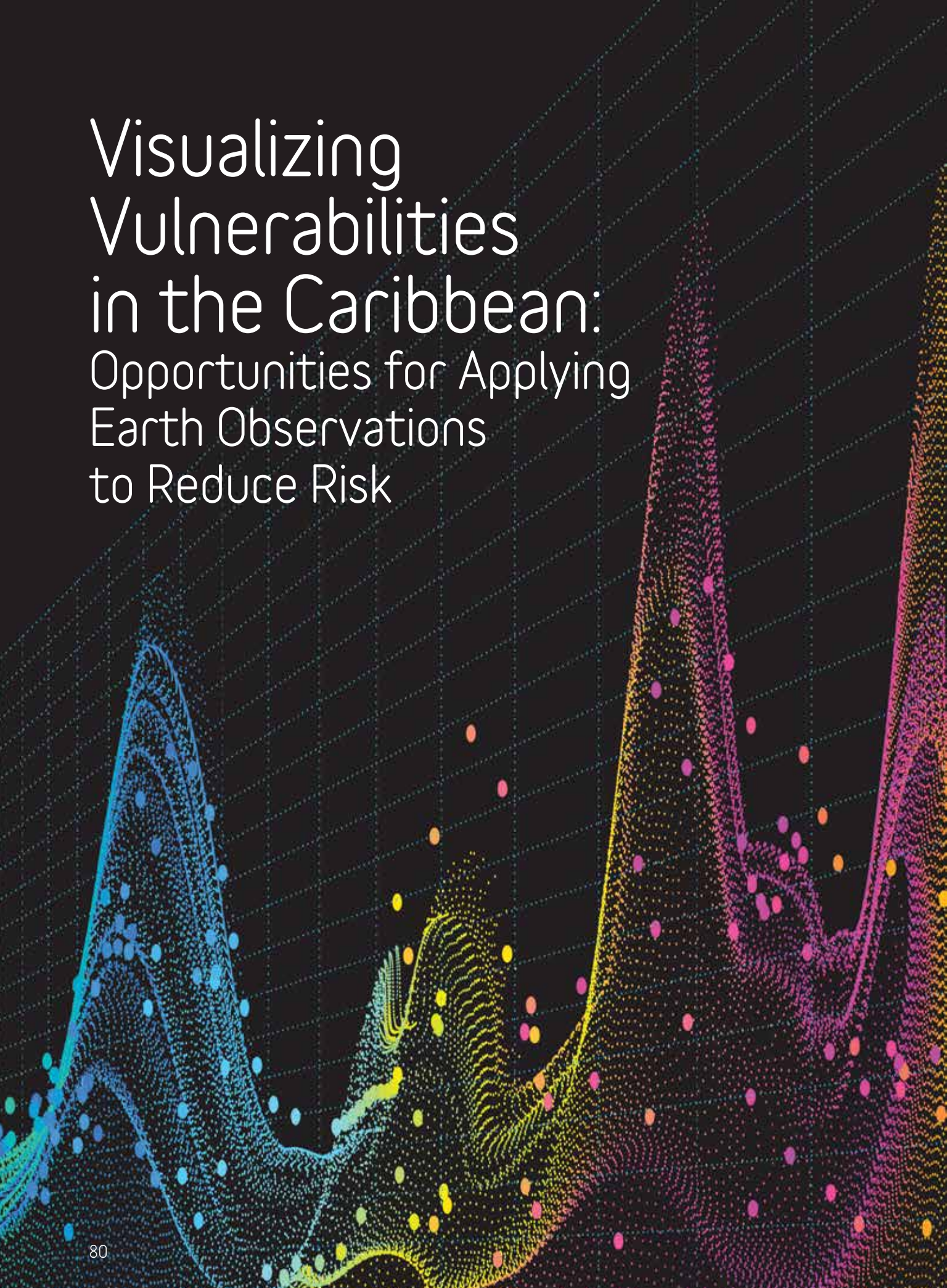
Prominent players from the region participated in the match included Tino Best, James Adams, Sylvester Athanaze, Ridley Jacobs, Donald Barthley (Zorol), Nixon McLean, Michael Matthews, Sherwin Campbell, Resheleel Griffith, Kyle Mayers, Charlene Taitt, Dwayne Smith, Nikita Miller, and Philo Wallace.

Clockwise, top to bottom: captions here please. Photo: photohrapher.


BARTHLEY
8


Understanding Risk
Caribbean Conference
JOSEPH
2
From Risk
to Resilience:
Action

Visualizing Vulnerabilities in the Caribbean: Opportunities for Applying Earth Observations to Reduce Risk



What does it mean to be vulnerable?

In recent years Caribbean states have been increasingly impacted by some of the worst disasters ever recorded, causing widespread destruction, loss of life, and long-term economic damage to multiple sectors. The ability for communities to anticipate, cope with, resist and recover from the impacts of natural hazards largely relies on their understanding of disaster risk. While much is known about the hazard component of risk, and exposure is gaining increased appreciation in the insurance and infrastructure arenas, much uncertainty remains in identifying and unpacking the elements of vulnerability. In part, these challenges are due to its largely social construct, which are difficult to contextualize without consideration of the interconnected system which places populations in situations of heightened fragility.

To make progress with understanding and mitigating current and future vulnerabilities, there is increasing interest to use Earth observations (EO) as a method for envisaging vulnerability. In order to do so, new methodologies are needed to first identify the variables that contribute to vulnerability and then assign complementary Earth observation capabilities that enable the visualization of this element. This includes identifying physical and environmental vulnerabilities connected to the built and natural settings, social and economic vulnerabilities that affect markets and administrative structures, and an understanding that different levels of vulnerabilities exist among different populations.

Visualizing Vulnerabilities

The ability to move from risk to resilience relies heavily on the adaptive capacities and social cohesion of communities - identifying opportunities for collaboration and sharing of collective knowledge while taking advantage of these opportunities across socio-economic, political, and institutional systems in order to adjust to changing environments. For example, island communities may be well prepared for flooding and sea level rise, but might not consider drought and heat wave conditions. Limitations in these capacities prevent preparedness actions that can reduce risk—but what does social cohesion and adaptive capacity look like? For many, this means connectivity to local and global markets, populations living in areas exposed to particular risks (e.g., coastal, high mountain, islands), and complex and compound environmental variability.

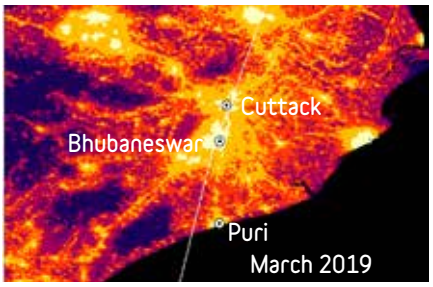
When considered individually, there exist a number of Earth observation and remote sensing tools that can begin to help visualize the elements of vulnerability. EO data are a resource for quantifying community risk and visualizing the interconnectedness of populations, key infrastructure, and climate-related processes. Through high-resolution optical imagery and active sensors, remote sensing technologies enable disaster risk managers to quantify pre-disaster vulnerabilities (see Figure 1) as well as post-disaster damage (see Figure 2). Exposure of assets to disasters can be characterized for modeling applications, including critical infrastructure, the inference of vulnerability, and the progression of risk through time. The ability to monitor recovery remotely can provide critical data that can be used to model economic resilience over a period of years and decades, potentially leading to new avenues for modeling secondary impacts.

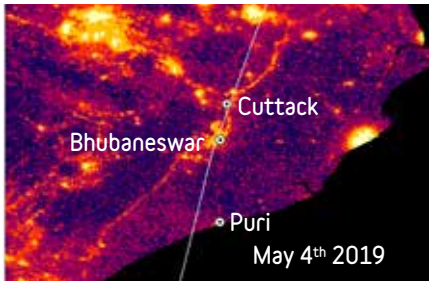
Even when imagery is available for understanding vulnerability and risk, a timely and targeted understanding of how to apply this data for taking early action and mobilizing investment is needed.

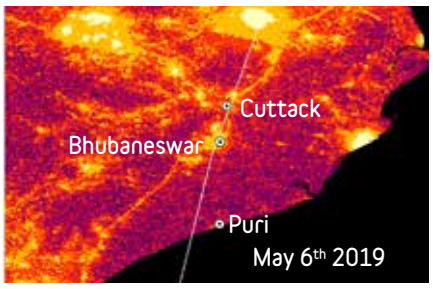
▲

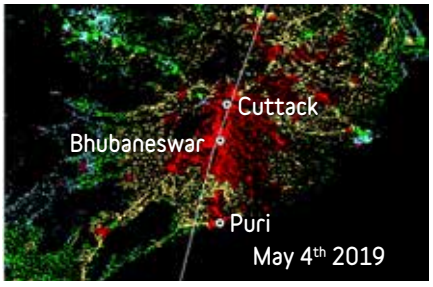
Figure 1. The Palabora mining pit has been growing steadily in size since 1965, and is the largest open mine in South Africa. Operations have moved underground leading to structural collapses and damage to nearby roads, power and water lines, and other infrastructure. Using LandSat and SRTM data, NASA researchers are using data to improve the understanding of how continued underground mining will deform the land surface and lead to further collapse and impact to surrounding communities like Phalaborwa, in the future.

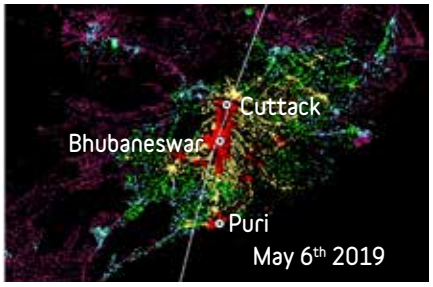
Source: Stevens, J. and A. Nussbaum, 2019.











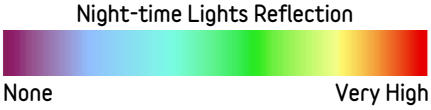


Figure 2. Night time lights in Bhubaneshwar-Cuttack-Puri city regions of India where Tropical Cyclone Fani first made landfall reflect power restoration and outage based on pre-event and post-event night-lights (Visable Infrared Imaging Radiometer Suite, VIIRS) daily composites. These data products show energy usage before and after the event, and assist in recovery by reflecting those without power restoration over extended periods of time.

Source: Esquivias, G. R., and C.K. Huyck, 2019.

From Data to Decisions

The islands of the Caribbean are individually unique, but collectively face a number of similar challenges to a host of natural hazards, exposures, and vulnerabilities. Identifying these common challenges, and aligning shared interests in addressing them can lead to the development of collective, resilience-based solutions across the region. Even when imagery is available for understanding vulnerability and risk, a timely and targeted understanding of how to apply this data for taking early action and mobilizing investment is needed.

EO data products and visualizations do not automatically translate to specific decisions but instead must be interpreted; beneficiaries and end users of data must therefore be trained in integrating data products into decision frameworks and must understand the limitations of these products. Academia, local humanitarian non-governmental agencies (e.g., the national societies of the Red Cross Red Crescent movement), regional and local emergency management agencies (e.g., Caribbean Disaster Emergency Management Authority), and national hydrological and meteorological (hydro-met) agencies all share a role in integrating data into the decision making process. In many situations globally, the mandate to provide specific types of data is relegated to a specific number of agencies; therefore, though advances in the types and availability of data are ever growing, challenges exist with fragmentation in data sharing, and varying roles and responsibilities in data production, analysis and use, which can limit the effectiveness of integrating Earth observation information into disaster management frameworks, and thus from building resilience.

Policies and governance opportunities exist for building collective and shared concern and lasting engagement before the next disaster occurs. Data producers and end users can establish networks, technical expertise, and trust before a disaster happens. Learning how to develop decision support systems quickly is important for reducing loss of life, livelihoods, and property. Finally, embedding risk reduction and risk communication strategies that match the nature of risk and the needs of those using EO data can support effective decision making. As we are better able to coordinate data needs and improve integrated risk-informed approaches, the ability to translate complex community vulnerability and risk into effective action becomes more likely.

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Activating the Sustainable Blue Economy-Promoting Coastal Resilience in the Caribbean

Summary

The Sustainable Blue Economy presents opportunities to develop the full potential of marine resources in the Caribbean through building safe and resilient coastal communities, ensuring healthy and productive oceans, and creating sustainable and inclusive economic growth. Around the world, Small Island Developing States (SIDS)—or, more accurately, "Large Ocean" States are starting to explore sustainable ways to integrate their marine resources into national planning. The session featured observations from the Sustainable Blue Economy Forum, held in Nairobi, Kenya in November 2018, including lessons and opportunities for the Caribbean. Presenters profiled key initiatives currently underway, including the UK Commonwealth Marines Economies Programme, the Blue Economy program within the World Bank and the PROBLUE multi-donor trust fund, and the Caribbean Development Bank's (CDB) work on blue accounts to promote resilience through investments in blue ecosystems. Innovative approaches were also highlighted, and it is anticipated that the discussions will sensitise the participants to how the development space is evolving for SIDS.

Photo: cosmin4000

Introduction

In the old 'business-as-usual' model, nations develop their ocean economies through the exploitation of maritime and marine resources - for example, through shipping, commercial fishing, and oil, gas, and mineral development. Often, countries may not pay adequate attention to the effect of these activities on the future health or productivity of the same resources and the ocean ecosystems in which they exist. The 'sustainable blue economy' concept provides a more holistic vision and develops not only traditional marine resource use, but also looks at more intangible 'blue' resources such as traditional ways of life, carbon sequestration and coastal resilience in order to help vulnerable states mitigate the devastating effects of poverty and climate change.

International Development Partners (IDPs) are devoting resources to the methodical exploration of sustainable blue economy solutions. This session highlights some of the areas of work that are relevant to the Caribbean.

Canada

The November 2019 Sustainable Blue Economy Conference in Nairobi, Kenya examined in depth the role of oceans, seas and marine resources as a central part of the delivery of the 2030 Agenda for Sustainable Development, including the Sustainable Development Goals (SDGs). Sustainability of the ocean's resources is a global priority and will require global solutions framed within national and regional priorities. The 'blue economy' is an emerging concept that encourages sustainable exploitation, innovation and stewardship of our ocean and its life-giving 'blue' resources, and Canada`s commitment was reiterated through its G7 presidency with a key theme of 'working together on climate change, oceans and clean energy'. The Canada-led Ocean Plastics Charter, launched at the Leaders' Summit and since endorsed by 16 countries and 20 companies, outlines concrete actions to combat marine plastic litter and protect our oceans for generations to come.

The challenges faced by the Caribbean region and the Pacific islands are similar, including climate change, degradation of ocean environment, lack of coastal resilience, and issues of access to financing. There are some key differences as well, for example in the Pacific Islands, fisheries constitute a driver of the economy and therefore, mechanisms were implemented to licence official waters. The Pacific Islands also undertook a leadership role to be part of the solution to tackle climate change, and committed to reducing ship emissions. In the Caribbean, the main driver is tourism, and there is less collaboration due to regional competition. In addition, there are no established maritime boundaries. Lessons point to the need to: put a value on natural resources; incentivize and monetize sustainable and resilient choices; make sustainable Blue Economy (SBE) a local initiative; use SBE to drive regional collaboration; and push and support global solutions where they are required.

Case studies – Donor based interventions in the Blue Economy

World Bank

Blue Economy is crucial for the Caribbean region, which is the most tourism-dependent region in the world, with associated revenues representing 15% of the region's GDP. PROBLUE is a new Multi-Donor Trust Fund, housed at the World Bank, that supports the development of integrated, sustainable and healthy marine and coastal resources. With the Blue Economy Action Plan as its foundation, PROBLUE contributes to the implementation of Sustainable Development Goal 14 (SDG 14) and is fully aligned with the World Bank's twin goals of ending extreme poverty and increasing the income and welfare of the poor in a sustainable way.

PROBLUE is part of the World Bank's overall oceans program, which in 2018 amounted to around $4.1 billion with a further $1.5 billion in the pipeline. PROBLUE Focuses on Four Key Areas:

- The management of sustainable fisheries and aquaculture

- Addressing threats posed to ocean health by marine pollution, including litter and plastics, from marine or land-based sources
- The sustainable development of key oceanic sectors such as tourism, maritime transport and off-shore renewable energy
- Building government capacity to manage marine resources, including nature-based infrastructure such as mangroves, in an integrated way to deliver more and long-lasting benefits to countries and communities

Cross-cutting issues such as poverty, livelihoods, gender, climate change and maximizing finance for development are interwoven throughout the program.

Caribbean Development Bank (CDB)

For small islands and coastal developing states such as the Caribbean, the ocean's role as an important generator of subsistence and income is magnified. Many small island developing states (SIDS) with extensive marine areas are exploring ways to capitalise their dominant resource base: oceans and coastal areas. A development strategy grounded in the blue economy will enable the Caribbean to promote the growth of existing productive sectors, expand into emerging blue industries, improve food security, and potentially reduce dependence on imported fossil fuels. Immediately, this addresses different aspects of at least seven of the 17 Sustainable Development Goals (SDGs), with the potential to drive progress in several others.

While several blue economy initiatives can be highlighted within the Caribbean, the scope and scale remains below the potential, mainly because the blue economy has not been formally recognised as an important economic driver. Leveraging a blue economy strategy will allow Caribbean countries to more effectively drive the triple bottom line of sustainable development: growing the economy, protecting the environment, and advancing social well-being. A blue economy strategy that forays into new growth sectors and expands existing ones in a sustainable manner will facilitate faster economic growth and can usher in a new Caribbean economic development paradigm, that is more diversified and less vulnerable to external shocks. The effective adoption of the blue economy concept requires not only a focus on the specific activity associated with utilising the resource, but also, mainstreaming ocean sustainability into economic modelling and decision-making. To support the blue economy approach and investment, appropriate policies, legislation, incentives and infrastructure must accommodate the transition. Specifically, the policy mix, legislation and regulation, processes and other governance structures should align with the strategy, in order to maximise economic potential and value added.

United Kingdom

The Commonwealth Marine Economies (CME) Programme was announced by the British Prime Minister in 2015 and subsequently launched in 2016. The aim of this UK Government programme is to support 17 Commonwealth Small Island Developing States (SIDS) in identifying the potential of, and developing, their marine economies (also referred to as blue economies) in a sustainable, resilient and integrated way. The programme promotes growth, innovation, jobs and investment, whilst safeguarding healthy seas and ecosystems. In partnership with the SIDS, the programme will develop and implement national Maritime Economy Plans to ensure the Programme leaves a lasting legacy. The programme is showcasing UK world leading expertise in marine science through its main delivery partners:

United Kingdom Hydrographic Office (UKHO), the Centre for Environment, Fisheries and Aquaculture Science (Cefas) and the National Oceanography Centre (NOC).

A few examples of the work delivered in support of marine economies since its launch include:

- Supporting the hurricane relief effort and boosting trade and tourism in Dominica by installing ocean sensors and

tidal gauges to allow safer port movements and access for larger vessels.

- Safeguarding Belize's citizens and their livelihoods by installing a tidal gauge to provide coastal hazard warning at the Port of Belize, in Belize City.
- Supporting sustainable growth in Guyana by helping their wild brown shrimp industry achieve Marine Stewardship Council Certification (sustainability accreditation).
- Supporting development of Blue Economy in the Seychelles by providing guidelines that underpin the development of a 'Blue Bond' to support a sustainable fisheries project.
- Supporting the development of a valuable aquaculture industry for Caribbean Spiny Lobster in St Lucia and the wider Caribbean through a feasibility study and a pilot project.
- Increasing navigational safety and efficiency in both the Caribbean and South-West Pacific through extensive seabed mapping and updating charts, allowing SIDS to better understand and manage their marine assets.
- Improving compliance with International Conventions by working with the Governments of St Vincent and the Grenadines, Grenada and Vanuatu to improve hydrographic governance.
- Supporting resilient Caribbean Fisheries by developing a tool which helps Caribbean countries in assessing the vulnerability of their fisheries sectors and to implement national commitments relating to climate resilient fisheries and livelihoods. This supports a wider ongoing initiative which has developed a Caribbean climate risk insurance product enabling vulnerable fishing communities to recover after often devastating climatic disasters.

The UK is also leading The Commonwealth Blue Charter —an agreement by all 53 Commonwealth countries to actively co-operate to solve ocean-related problems and meet commitments for sustainable ocean development, ensuring that the Commonwealth takes a fair, equitable, inclusive and sustainable approach to ocean economic development and protection.

Commonwealth Blue Charter Action Groups guide the development of tools and training, specifically around: Commonwealth Clean Ocean Alliance, Coral Reef Protection and Restoration, Mangrove Ecosystems and Livelihoods, Marine Protected Areas, Ocean Acidification, Ocean and Climate Change, Ocean Observation, Sustainable Aquaculture and Sustainable Blue Economy.

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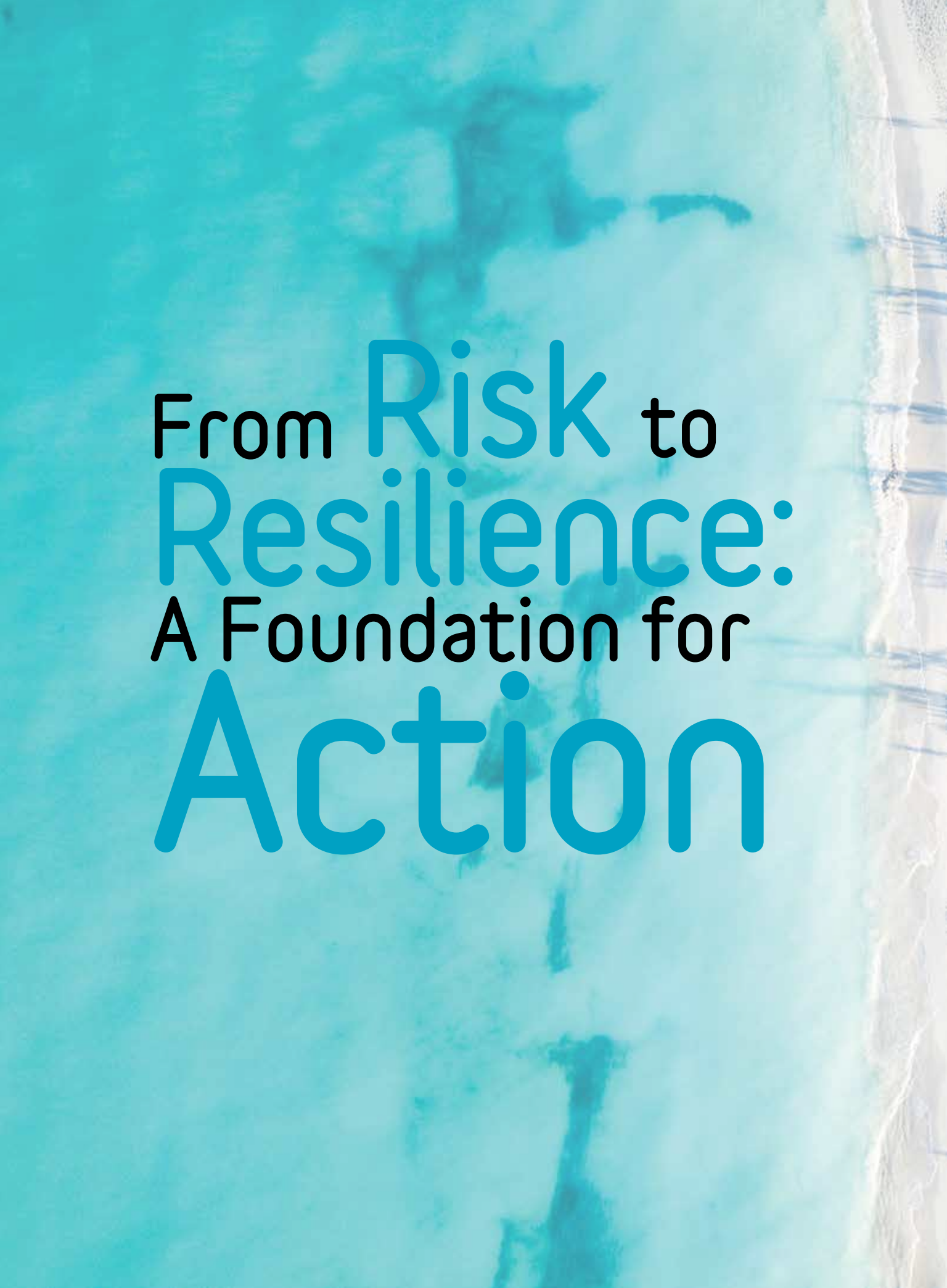
We need to preserve and manage mother earth better.
We need to take care of it,
and change the way we do things.

—Irvince Auguiste, Kalinago Territory, Dominica

"The event is timely as it comes at a juncture when the Caribbean region is currently engaged in articulating a Resilience Pathway in the face of the known challenges, threats and uncertainties associated with Climate Change,"

—Ronald Jackson, Executive Director, CDEMA.


From Risk to
Resilience:
A Foundation for
Action

What is Understanding Risk?

Understanding Risk (UR) is an open and global community of over 8,000 experts and practitioners interested and active in the creation, communication, and use of disaster risk information. This vibrant community—a diverse group of people from the private, public, nonprofit, technology, and financial sectors—meets at the UR global forum every two years. Each iteration of the UR Forum has produced new ideas and partnerships that have improved risk information and helped to integrate evidence into policy making and development planning.

This publication captures the experiences, lessons, and best practices in the field discussed at the Understanding Risk Caribbean Conference, held in Barbados, from May 27 to May 31, 2019.

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