Economics of Climate Adaptation

World Forum of Catastrophe Programmes

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Prepared by

CaribRM
Risk Managers To The Caribbean
• CCRIF has recently supported the first phase of a study of the economics of climate adaptation (ECA) for the Caribbean

• Meaningful quantification of the impacts of CC on risk, and ways to cost-effectively adapt (risk reduction + risk transfer) – at national and sectoral level

• Climate change clearly brings variability to hydro-meteorological hazards (generally upward, particularly for catastrophe hazards)
Economics of Climate Adaptation (ECA) project

Key questions and objective of the Economics of Climate Adaptation approach

Questions
- How can we measure and predict the impact of climate change on our economies?
- How can we prepare to adapt to this impact?

Methodology’s objective
- Provide decision makers with facts and a common approach to assess and address any location’s ‘total climate risk’ in a cost-effective manner.
Methodology overview

Our approach for total climate risk management

1. Where and from what are we at risk?
   - Identify most relevant hazard(s)
   - Identify areas most at risk
     - Population (especially vulnerable population)
     - Economic value (assets, GDP)

2. What is the magnitude of the expected loss?

3. How could we respond?
   - Identify potential adaptation measures
   - Determine basic feasibility of potential measures
   - Determine societal costs and benefits (loss averted) of measures

4. How do we execute?
   - Identify key barriers to implementation
   - Determine actions required to implement measures

5. What are the outcomes and lessons?

SOURCE: Economics of Climate Adaptation
So far, we have examined eight countries and four hazards. Additionally, we analysed the impact of climate risk on the agriculture sector in Belize and Jamaica.
## Scope of analysis

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<th>Sector</th>
<th>Detailed analysis</th>
<th>Preliminary analysis</th>
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<td><strong>Pilot countries</strong></td>
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<td>St. Lucia</td>
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<td><strong>Further countries</strong></td>
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<td>Belize</td>
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<td>St. Vincent and the Grenadines</td>
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Sector analysis - driven by importance to national economy
• Climate change threatens Caribbean development

• Annual expected losses amount to up to 6% of GDP

• Varies significantly across pilot countries
  – From 1% of GDP in Antigua & Barbuda to 6% of GDP in Jamaica

• Could increase by 1 to 3% of GDP by 2030 (worst case scenario)
  – i.e. the absolute expected loss may triple

• This economic damage is comparable in scale to the impact of a serious economic recession – but on an ongoing basis
Expected loss from climate risk today and in 2030

% of GDP

- Cayman Islands: 5 today, 7 high change, 2030
- Jamaica: 6 today, 9 high change, 2030
- Anguilla: 3 today, 4 high change, 2030
- Antigua & Barbuda: 1 today, 2 high change, 2030
- Dominica: 4 today, 6 high change, 2030
- St. Lucia: 3 today, 5 high change, 2030
- Barbados: 3 today, 4 high change, 2030
- Bermuda: 2 today, 2 high change, 2030
Impacts of climate change on the risk profile

- Climate change can severely modify the risk profile of a country by impacting:
  - Local sea levels (greater risk in low-lying countries; accounts for about 45% of total damage in Cayman Islands)
  - Hurricane intensity (largest damage potential; up to 90% of overall damage)
  - Precipitation patterns
  - Temperature patterns

- In our high climate change scenario, sea levels may rise by up to 15mm/year and wind speeds may increase by around 5% as a consequence of the expected rise in sea surface temperature in the hurricane genesis region

- It is important to note that even small local changes may have large effects due to the non-linear correlations between climate and hazards

- A 200-year event in Bermuda, for instance, might become a once-in-a-lifetime (75-year) event as a result of these seemingly small changes
• Differences are driven by a diverse set of factors, including:
  – Topography/exposure to coastal hazards
  – Economic significance of particularly vulnerable sectors (e.g. residential assets)
  – Location (e.g. in “Hurricane Alley”)
Adaptation measures

• **Risk Mitigation**
  – Measures aimed at reducing the damage
  – Includes asset-based responses (e.g. dikes, retrofitting buildings) & behavioural measures (e.g. enforcing building codes)
  – In some countries these measures can cost-effectively avert up to 90% of the expected loss in 2030 under a high climate change scenario

• **Risk Transfer**
  – Measures aimed at limiting the financial impact for people affected by transferring part of the risk to a third party (e.g. catastrophic risk insurance or the capital market)
  – Include both traditional insurance products and alternative risk transfer instruments (e.g. cat bonds)
  – Play a key role in the case of low-frequency, high-severity weather events such as once-in-100-year catastrophes
For each of these adaptation measures, we quantified the benefits – that is, averted losses – as well as costs, and undertook a cost-benefit analysis.

There are significant differences in the share of the expected loss that can be averted cost-effectively across countries.

This is driven by:
- Value of buildings
- Importance of coastal flooding/storm surge
The risk from coastal flooding/storm surge can be mitigated more cost-effectively than wind hazard

- Low-lying countries such as Cayman Islands (where coastal flooding/storm surge accounts for around 45% of the damage) can therefore increase their resilience in a more economically effective manner than a mountainous country such as Dominica (where coastal flooding/storm surge accounts for only some 15% of the potential damage)

Together, the results of the study illustrate the importance of a balanced portfolio of measures in each country

- Using suitable risk mitigation initiatives to protect human lives
- Building on risk transfer solutions to protect economic assets
## Effectiveness of the risk mitigation measures analysed

Expected loss (high climate change, 2030) USD millions

<table>
<thead>
<tr>
<th>Country</th>
<th>Cost-effective measures, cost-benefit ratio &lt; 1.5</th>
<th>Non-cost-effective measures, cost-benefit ratio &gt; 1.5</th>
<th>Residual loss</th>
<th>Average cost-benefit ratio of cost-effective measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cayman Islands</td>
<td></td>
<td></td>
<td>310</td>
<td>0.2</td>
</tr>
<tr>
<td>Anguilla</td>
<td></td>
<td></td>
<td>30</td>
<td>0.2</td>
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<tr>
<td>Bermuda</td>
<td></td>
<td></td>
<td>290</td>
<td>0.2</td>
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<tr>
<td>Barbados</td>
<td></td>
<td></td>
<td>280</td>
<td>0.6</td>
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<tr>
<td>Jamaica</td>
<td></td>
<td></td>
<td>840</td>
<td>0.5</td>
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<tr>
<td>Antigua and Barbuda</td>
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<td></td>
<td>50</td>
<td>0.6</td>
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<tr>
<td>St. Lucia</td>
<td></td>
<td></td>
<td>60</td>
<td>0.6</td>
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<tr>
<td>Dominica</td>
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<td></td>
<td>10</td>
<td>0.6</td>
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</tbody>
</table>

= 100%
ECA next steps

Potential next steps to turn these analyses and insights into action

**Potential next steps**

- Understand your risk profile today and in the future
- Specify your 'risk appetite' in line with your development priorities
- (Re-)prioritise risk mitigation and risk transfer measures based on your priorities
- Calculate an adaptation business case incl. investment plan
- Develop a roadmap incl. priority initiatives
- Use roadmap and business case for funding discussions
- Speed up implementation with additional funding and further increase resilience

**Output from ECA analysis**

- Expected loss per hazard by scenario
- Drivers of expected loss for each scenario
- Cost-benefit curve of adaptation measures
- Measures to cover residual risk
Thank you

ECA brochure with preliminary results available