Swiss Re developed a methodology to quantify local climate risks

The Economics of Climate Adaptation work involved a consortia of clients

- GEF
- UNEP
- Rockefeller Foundation
- Climate Works
- Swiss Re
- Standard Charter Bank
- McKinsey

Objective

- Provide national and local decision-makers with necessary facts and frameworks to design adaptation strategies and deliver financial resources

Approach

- Global project from September 2008 until July 2009
- 8 different case studies with focus on different climate impact and countries
- Definition of globally applicable methodology and collection of adaptation facts

This work involved an analysis of climate risks and adaptation measures across 8 countries

Our case study in Florida focused on hurricanes and sea level rise

Our approach has been adopted by bodies such as the UN and the EU, in conducting “bottom-up” climate risk assessment

Florida

Malta

U.K./U.N.

China

North Korea

Samoa

Guyana

Tanzania

India

Maharashtra
Case study methodology

**Map of areas at risk**
- Identify most relevant hazard(s) in case location
- Identify areas that are most at-risk, by overlaying hazard(s) on:
  - Population
  - Economic value (GDP)

**Estimate of potential loss**
- Hazard: Develop frequency and severity scenarios
- Value: Quantify assets and income value in area at risk
- Vulnerability: Determine vulnerability of assets and incomes to the hazard

**Set of adaptation measures**
- Identify potential adaptation measures
- Determine societal costs and benefits and basic feasibility
- Interviews with experts
- Economic analysis

**Implementation assessment**
- Assess current progress against the measures
- Understand requirements to implementation
- Determine actions required to implement measures

- Where and from what is the State most at risk?
- What is the magnitude of the expected loss?
- What measures should be considered?
- How can measures be implemented?
Input into adaptation strategy
Modeling severe weather impacts

**Inputs**

- Hurricane predictions based on two components
  - Wind speeds
  - Sea level rise

- Building structure values and content values
  - By zip code
  - By asset class

- Expected GDP growth predictions

- Vulnerabilities curves based on complex modeling

**Drivers**

- Hazard module
- Asset module
- Vulnerability module

**Calculation**

- Change in severity of hazard for different scenarios
- Asset distribution for different asset classes by zip code
- Vulnerability curves for different assets

**Output**

- Expected loss
Quantifying expected losses at zip code level (annual expected loss)

Loss frequency curves (the frequency of a loss equaling or exceeding a specific value)

A resilience (adaptation) cost curve

Climate risk is best tackled with a portfolio of adaptation measures

Source: Team analysis

List of potential measures to reduce hurricane damage

1. Sand bags
2. Opening/ masonry
3. Temporary floodwall
4. Levee and floodwall
5. Targeted hardening (utilities)
6. Home elevation
7. Local levees
8. Road elevation
9. Roof (various)
10. Beach nourishment
11. Vegetation management
12. Financial risk transfer
13. Undergrounding (utilities)
14. Substation backup

Example Florida
Global overview:
Expected loss averted by adaptation measures

Percent of expected loss (high climate change scenario), 2030¹

100% = total expected loss

Mali Guyana UK Samoa China² India Tanzania Florida

- Remaining loss
- Non-cost-effective measures, CB>1
- Cost-effective measures, CB<1

¹ Based upon select regions analyzed within the countries (e.g., Mopti, Mali; Georgetown, Guyana; Hull, UK; North and Northeast China; Maharashtra, India; Central regions of Tanzania; Southeast Florida, U.S.)
² Based upon moderate scenario data and analysis
Public-Private Partnerships in Risk Management
Massive gap between total and insured losses shows insurance potential


Source: Swiss Re Economic Research & Consulting, sigma catastrophe database
Disasters place a significant burden on the public sector

- Despite prevention and mitigation efforts, no country can fully insulate itself against extreme natural disasters.
- The brunt of economic losses from natural disasters ends up with individuals, corporations and governments, both on national and sub-national level.
- Government budgets are impacted by:
  - Primary effects include immediate expenses for emergency relief efforts, costs for rebuilding public infrastructure or loss of capital and durable goods.
  - Secondary effects, for instance, include lower economic growth, lower tax and non-tax revenues, budget deficits, increased indebtedness and costs from refinancing, higher inflation or currency movements.
### Closing the Gap: Including ex-ante instruments into the overall risk financing strategy

#### Ex-ante risk financing

<table>
<thead>
<tr>
<th>Private Citizens / Individuals</th>
<th>Corporations / Commercial Enterprises</th>
<th>Government’s exposure (state budget)</th>
<th>(Re-)insurance policies</th>
<th>Reserve funds, parametric reinsurance, catastrophe bonds</th>
</tr>
</thead>
</table>

- Smaller gap between economic and insured losses
- Reduced financial burden for the government after an event
- Less volatility for the state budget and more planning certainty

#### Ex-post financing

- Debt financing
- Budget reallocation
- Donor assistance
- Tax increases
- Others

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Including ex-ante instruments in the overall risk financing mix helps a government to lower its financial exposure to catastrophic risks, natural and man-made.
Case study Caribbean: Caribbean Catastrophe Risk Insurance Facility (CCrif)

Solution features

- The CCRIF offers parametric hurricane and earthquake insurance policies to 16 CARICOM governments.
- The policies provide immediate liquidity to participating governments when affected by events with a probability of 1 in 15 years or over.
- Member governments choose how much coverage they need up to an aggregate limit of USD 100 million.
- The mechanism will be triggered by the intensity of the event (modelled loss triggers).
- The facility responded to events and made payments:
  - Dominica & St. Lucia after earthquake (2007)
  - Turks & Caicos after Hurricane Ike (2008)
  - Haiti, Barbados, St. Lucia, Anguilla and St. Vincent (2010)

Involved parties

- Reinsurers: Swiss Re and other overseas reinsurers.
- Reinsurance program placed by Guy Carpenter.
- Derivative placed by World Bank Treasury.
Case study Malawi: Index drought insurance

Solution features

- Insured peril: Drought
- Payments to assist small-holder farmers following droughts
- Index-based coverage: Reflects correlation between maize yields and rainfall
- Under the contract, the Government of Malawi will receive up to USD 5 million through the World Bank in case of extreme drought affecting maize production
- If the maize production falls 10% below the historical average due to shortfalls in rainfall, the Government of Malawi will receive the payout
- The UK Department of International Development (DfID) provided financial support to pay the initial premium
Case study Haiti: The Microinsurance Catastrophe Risk Organization (MiCRO)

Solution features
- Insured perils: Hurricane, earthquake and rainfall
- Payments are made to microfinance borrowers post-disaster to reduce their loans and provide emergency cash
- Parametric and basis risk policies are distributed through a local Haitian microfinance institution, Fonkoze
- Trigger: Index measured at Fonkoze branches in Haiti
- Basis risk absorbed by new donor funded company, MiCRO
- Inception: March 2011

Involved parties
- Insured: Fonkoze
- Sole Reinsurer: Swiss Re
- Other partners: MercyCorps, CaribRM, Guy Carpenter

Background information
- Haiti is a nation that is susceptible to catastrophes and is unprepared for the costs of response
- Prior to the setup of MiCRO, Fonkoze's clients bore 100% of natural disaster risk
- MiCRO was named “Company Launch of the Year” at The Review magazine’s annual Worldwide Reinsurance Awards in September 2011.
Disaster Risk Financing - a priority on the global agenda
Thank you
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