Climate Change and resilience building: a reinsurer's perspective

Southeast Florida Regional Climate Leadership Summit
The cost of disasters is widening along with the gap between uninsured and insured losses

Global natural catastrophe losses, 1970-2013 (in USD bn)

Source: Swiss Re *sigma* 1/2014
Climate change is not the main driver for rising natural catastrophe losses in recent decades

Ocean Drive, FL, 1926

Ocean Drive, FL, 2013

Drivers

- Growth of wealth
- Concentration of values in exposed areas (e.g. coasts)
- Increasing vulnerability
- Climate change as a potential new driver in future (storms, floods, droughts)
**Swiss Re's climate change strategy**

Coping with climate change requires both mitigation and adaptation measures

<table>
<thead>
<tr>
<th>Swiss Re assesses and manages the risk</th>
<th>Swiss Re seizes business opportunities</th>
</tr>
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<tbody>
<tr>
<td>■ Advance (our) knowledge about climate change risk</td>
<td>■ Develop appropriate solutions for adapting to and mitigating climate change</td>
</tr>
<tr>
<td>■ Quantify climate change risk</td>
<td>■ Traditional catastrophes insurance</td>
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<tr>
<td>■ Integrate climate change risk into underwriting and risk management framework</td>
<td>■ Weather risk solutions</td>
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<table>
<thead>
<tr>
<th>Swiss Re influences the business environment</th>
<th>Swiss Re leads by example</th>
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<tbody>
<tr>
<td>■ Raise awareness, actively disseminate knowledge to all stakeholders and advocate a long-term, marked-based policy framework, through</td>
<td>■ Greenhouse neutral since October 2003</td>
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<td>■ Publications, platforms (e.g. World Economic Forum), Centre for Global Dialogue, speaking engagements</td>
<td>■ Reduced emissions per employee by 54.4% by 2013</td>
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<td></td>
<td>■ CO₂You2 Programme since 2006</td>
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</table>
Climate-resilient development needs to **assess** and **address** total climate risk

**Objectives**

- Provide decision makers with the **facts and methods** necessary to design and execute a climate adaptation strategy
- Supply insurers, financial institutions, and potential funders with the **information** required to unlock risk prevention funding and deepen global risk transfer markets

**Methodology**

1) Follow a rigorous risk management approach to **assess** local total climate risk, the sum of
   - today’s climate risk,
   - the economic development paths that might put greater population and value at risk
   - the additional risks presented by climate change

2) Propose and prioritize a basket of adaptation measures to **address** total climate risk on an economic basis
The working group studied 18 regions with diverse climate hazards:

- New York: Tropical cyclones and storm surge risk to a metropolis
- Hull, UK: Flood and storm risk to urban property
- US Gulf Coast: Hurricane risk to the energy system
- Florida: Hurricane risk to public and private assets
- Caribbean: Hurricane risk to small islands
- Guyana: Flash flood risk to a developing urban area
- Mali: Risk of climate zone shift to agriculture
- Tanzania: Drought risk to health and power generation
- China: Drought risk to agriculture
- Samoa: Risk of sea level rise to a small island state
- India: Drought risk to agriculture

South Florida Case Study:
Focus on Risk from Hurricanes

The case study area is home to some of the most populated and economically successful counties in the State.

<table>
<thead>
<tr>
<th>County name</th>
<th>GDP $m (rank)</th>
<th>People Thousands (rank)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miami-Dade</td>
<td>85,028 (1)</td>
<td>2,387 (1)</td>
</tr>
<tr>
<td>Broward</td>
<td>63,804 (2)</td>
<td>1,739 (2)</td>
</tr>
<tr>
<td>Palm Beach</td>
<td>46,084 (5)</td>
<td>1,270 (5)</td>
</tr>
<tr>
<td>Collier</td>
<td>9,768 (15)</td>
<td>318 (15)</td>
</tr>
<tr>
<td>Monroe</td>
<td>2,621 (33)</td>
<td>73 (33)</td>
</tr>
<tr>
<td>Total State (FL)</td>
<td>603,050</td>
<td>18,320</td>
</tr>
</tbody>
</table>

Hurricane Andrew
Result: Expected losses by scenarios and by hazard

### Example Florida

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Scenarios</th>
<th>2008 Today’s Climate</th>
<th>2030 Today’s Climate</th>
<th>2030 Moderate change</th>
<th>2030 High change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rain</td>
<td>17</td>
<td>26</td>
<td>30</td>
<td>33</td>
<td>2</td>
</tr>
<tr>
<td>Storm surge</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Wind</td>
<td>8.5</td>
<td>8.4</td>
<td>9.4</td>
<td>10.1</td>
<td></td>
</tr>
</tbody>
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**Percent of 3 Counties¹ GDP**

- 2008: 8.5%
- 2030 Today’s Climate: 8.4%
- 2030 Moderate change: 9.4%
- 2030 High change: 10.1%

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1 2008 Moody’s

*SOURCE: Swiss Re; team analysis*
Sea level rise and altered hurricane frequencies significantly increase losses in New York City

Expected annual losses from storm surge and wind (billion USD)

- Current scenario: 1.7
- 2050s Additional impact from sea level rise: 1.5
- 2050s Additional impact from increased frequency of intense hurricanes: 1.2
- 2050s Total: 4.4

Results
Annual Expected Loss by ZIP code

Current drivers of loss: east and south shores of Staten Island, southern Brooklyn and Queens, Brooklyn and Queens waterfront and southern Manhattan.

Under future scenarios: Same geographic regions, plus northern Queens and the Bronx

Under 2050s scenario: 400% increase in ZIP codes which have an AEL of USD 30 million
A resilience (adaptation) cost curve
Locally specific adaptation cost / benefit curve

Example Florida

Calculated in 2008 dollars for the average climate scenario

Averted loss $ Billions

~40% of total expected loss can be averted cost-effectively

Measures below this line have net economic benefits

Cost/benefit

11

10

9

8

7

6

5

4

3

2

1

0

0

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

Beach Nourishment (50 ft)

Beach Nourishment (100 ft)

Roof cover, new

Roof truss, new

Levee & Floodwall Sandbags

Opening protection, new

Roof shape new

Temp. floodwalls

Vegetation Mgmt

Elevation – new homes

Elevation, retrofit

Road elevation

Engineering based FRT penetration

Replacement undergrounding, trans.

Targeted undergrounding, trans.

Top layer risk transfer

Elevation, prioritized retrofit

Substation Backup generators

Local levees

Vegetation Mgmt

Masonry, new

Opening protection, retrofit

Targeted hardening, dist.

Targeted hardening, transmission

Deductibles - residential

Deductibles - commercial

Replacement undergrounding, dist.

Targeted undergrounding, distribution

~40% of total expected loss can be averted cost-effectively

Measures below this line have net economic benefits

Calculating in 2008 dollars for the average climate scenario
Climate risk is best tackled with a portfolio of adaptation measures

Frequency of hazard

<table>
<thead>
<tr>
<th>Severity of hazard</th>
<th>Once every 50 years</th>
<th>Once every 10-25 years</th>
<th>Once every 10 or fewer years</th>
</tr>
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<tbody>
<tr>
<td>Low</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td></td>
<td></td>
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</tbody>
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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

Source: Team analysis

Example Florida
Global overview:
Expected loss averted by adaptation measures

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

100% = total expected loss

- Mali: 100, Remaining loss 100, Non-cost-effective measures, CB>1 68, Cost-effective measures, CB<1 32
- Guyana: 29, Remaining loss 29, Non-cost-effective measures, CB>1 6, Cost-effective measures, CB<1 23
- UK: 47, Remaining loss 47, Non-cost-effective measures, CB>1 5, Cost-effective measures, CB<1 42
- Samoa: 19, Remaining loss 48, Non-cost-effective measures, CB>1 4, Cost-effective measures, CB<1 15
- India: 13, Remaining loss 44, Non-cost-effective measures, CB>1 44, Cost-effective measures, CB<1 0
- Tanzania: 40, Remaining loss 40, Non-cost-effective measures, CB>1 20, Cost-effective measures, CB<1 20
- Florida: 100, Remaining loss 100, Non-cost-effective measures, CB>1 68, Cost-effective measures, CB<1 32

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
The Road Ahead: Closing the protection gap
**Closing the Gap: Including ex-ante instruments into the overall risk financing strategy**

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 Uruguay: Largest Energy Risk Transfer to Protect Against Drought Risk

Solution features

- Insured peril: Drought
- Payments to be used to purchase energy from alternative sources when drought conditions cause lack of hydro power
- Derivative contract: between UTE, Uruguayan state-owned hydro-electric power company, and World Bank Treasury. Risk is then placed in the market
- Payment mechanics:
  - Trigger: Level of rainfall monitored at weather stations
  - Settlement: Market price of brent crude oil
- Transaction Size: USD 450 million
- Largest of its kind in the weather risk management market

Involved parties

- Client: UTE (Uruguayan state-owned power company)
- Arranger: World Bank Treasury
- Risk Takers: Swiss Re and Allianz
Case study United States: Alabama – First parametric cover for a government in an industrialized country

Solution features

- Insured peril: Hurricane
- Payments to offset economic costs of hurricanes
- Trigger type: Disaster occurring within a defined geographic area ("box") along coast ("cat-in-the-box")
- Trigger based on wind speed of hurricane eye as it passes through pre-determined box
- Payout in as little as two weeks
- Time horizon: July 2010 – July 2013
- First parametric catastrophe risk transfer for a government in an industrialized country

Involved parties

- Insured: State Insurance Fund of Alabama
- Swiss Re: Lead structurer and sole underwriter
Case study:
Miami Dade County Public Schools—
Custom multi-year structured cover

Solution features
- Insured peril: Named Windstorm and associated flood
- Multi-year structured cover: USD 100m
- Covering indemnified losses from NWS to soften impact to broader school system
  - 3 year coverage with unlimited reinstatements
  - Term Aggregate Deductible
  - Fixed premium over term
  - No claims bonus
- Time horizon: May 2013 – May 2016
- Customized multi-year structured risk transfer for major school district

Involved parties
- Insured: Miami-Dade County Public Schools
- Swiss Re: Lead structurer and sole underwriter
- Broker: AJ Gallagher
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