Swiss Re

Climate Change and resilience building: a reinsurer's perspective

SWISS RE
150
YEARS

Swiss Re's climate change strategy

Coping with climate change requires both mitigation and adaptation measures

Swiss Re assesses and manages the risk

- Advance (our) knowledge about climate change risk
- Quantify climate change risk
- Integrate climate change risk into underwriting and risk management framework

Swiss Re seizes business opportunities

- Develop appropriate solutions for adapting to and mitigating climate change
- Traditional catastrophe insurance
- Weather risk solutions

Swiss Re influences the business environment

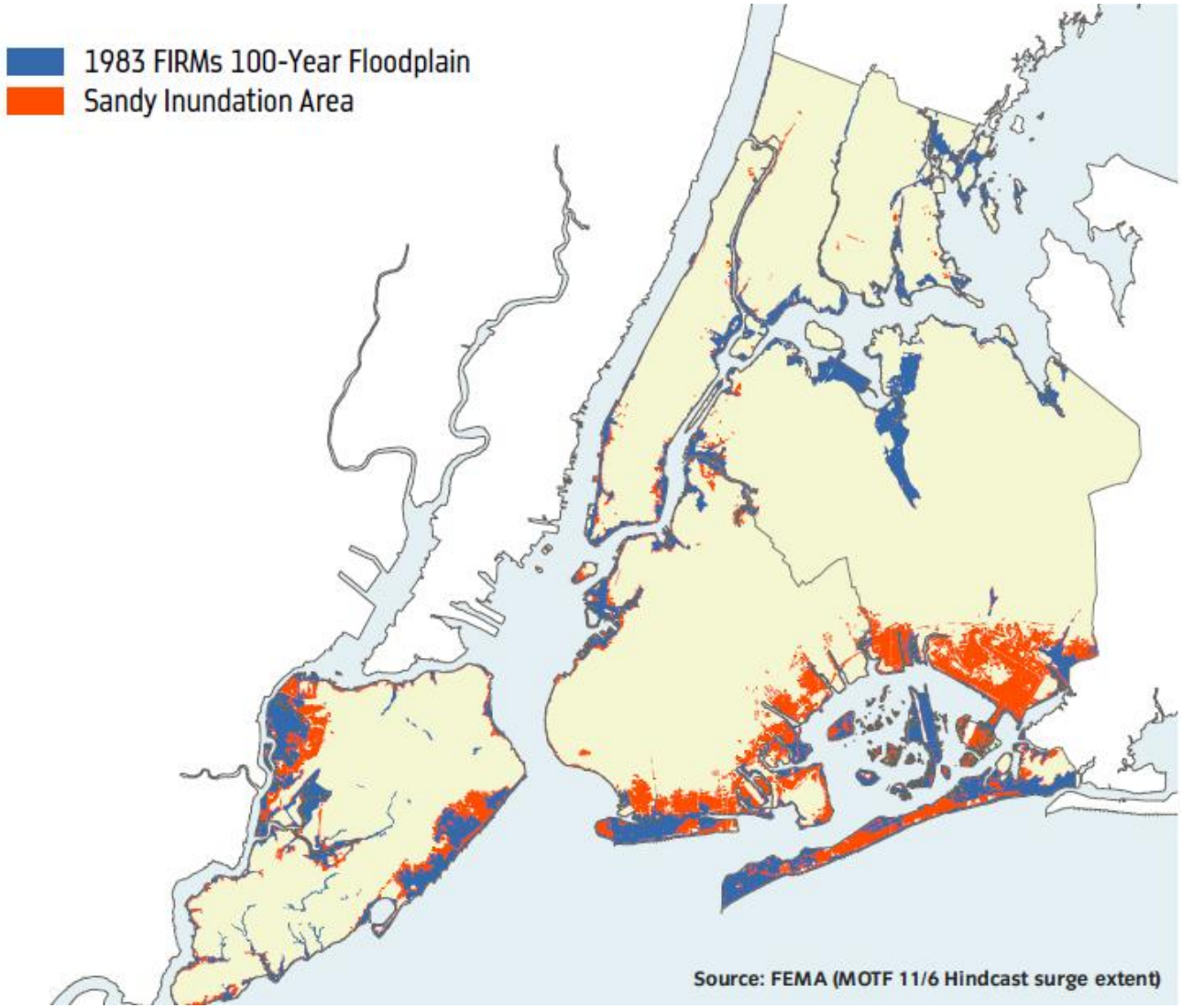
- Raise awareness, actively disseminate knowledge to all stakeholders and advocate a long-term, marked-based policy framework, through
- Publications, platforms (e.g. World Economic Forum), Centre for Global Dialogue, speaking engagements

Swiss Re leads by example

CO_{You2} Reduce and Gain Programme

- Greenhouse neutral since October 2003
- Reduced emissions per employee by 54.4% by 2013
- CO_{You2} Programme since 2006

FIRM maps vs Sandy Footprint



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

Economics of Climate Adaptation (ECA) Working Group, a partnership between the Global Environment Facility, McKinsey & Company, Swiss Re, the Rockefeller Foundation, ClimateWorks Foundation, the European Commission, and Standard Chartered Bank.

South Florida Case Study:
Focus on Risk from Hurricanes

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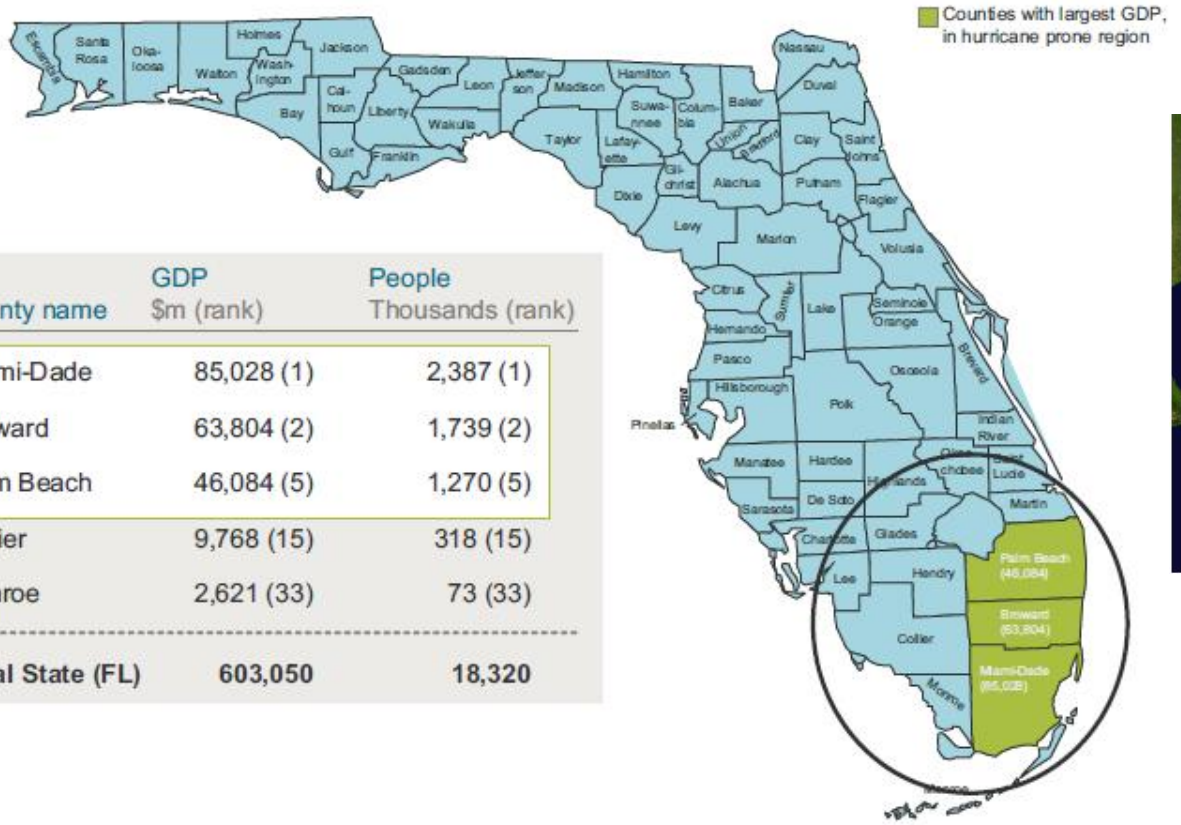
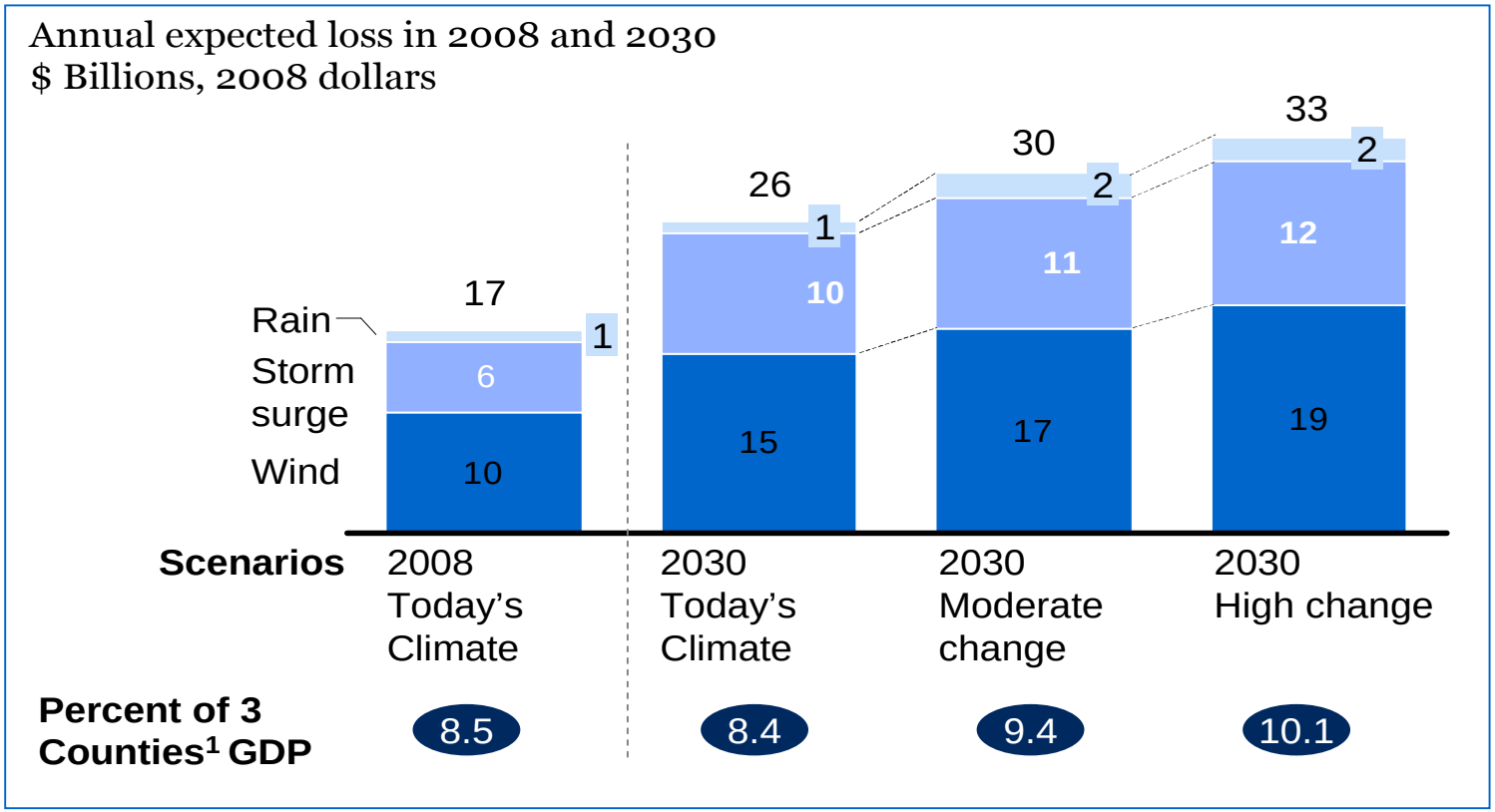
The case study area is home to some of the most populated and economically successful counties in the State



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

Result:
Expected losses by scenarios and by hazard

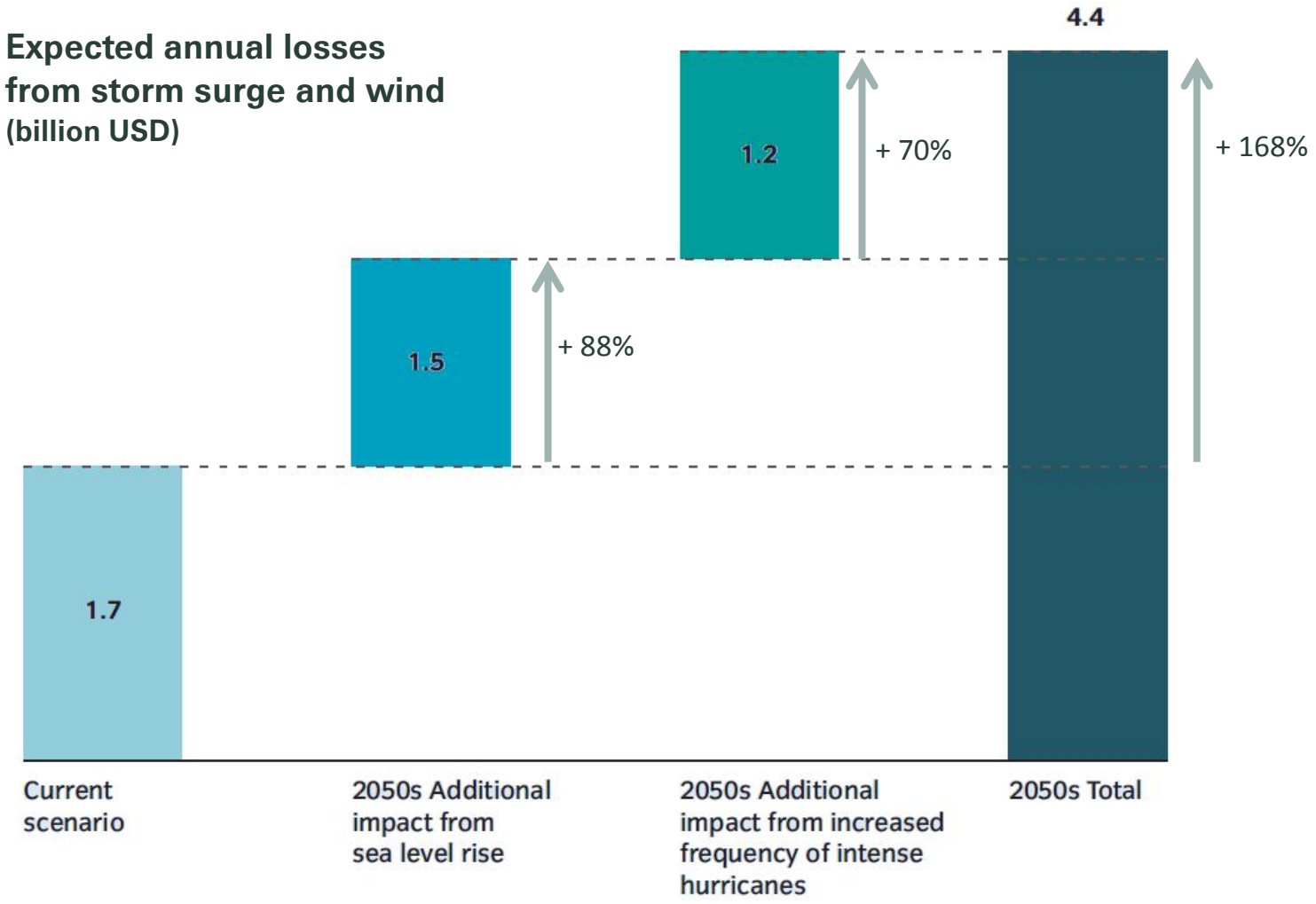
Example Florida:



1 2008 Moody's

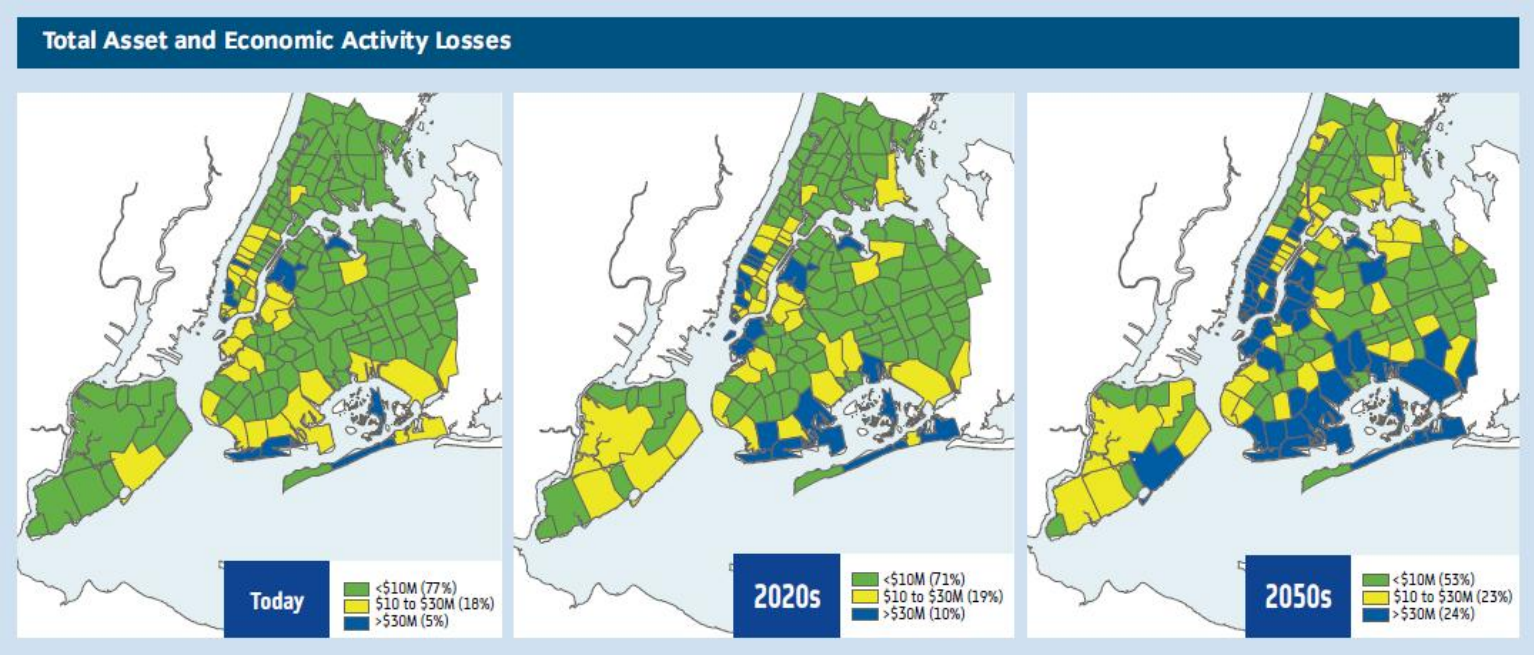
SOURCE: Swiss Re; team analysis

Sea level rise and altered hurricane frequencies significantly increase losses in New York City



Source: www.nyc.gov: A Stronger More Resilient New York

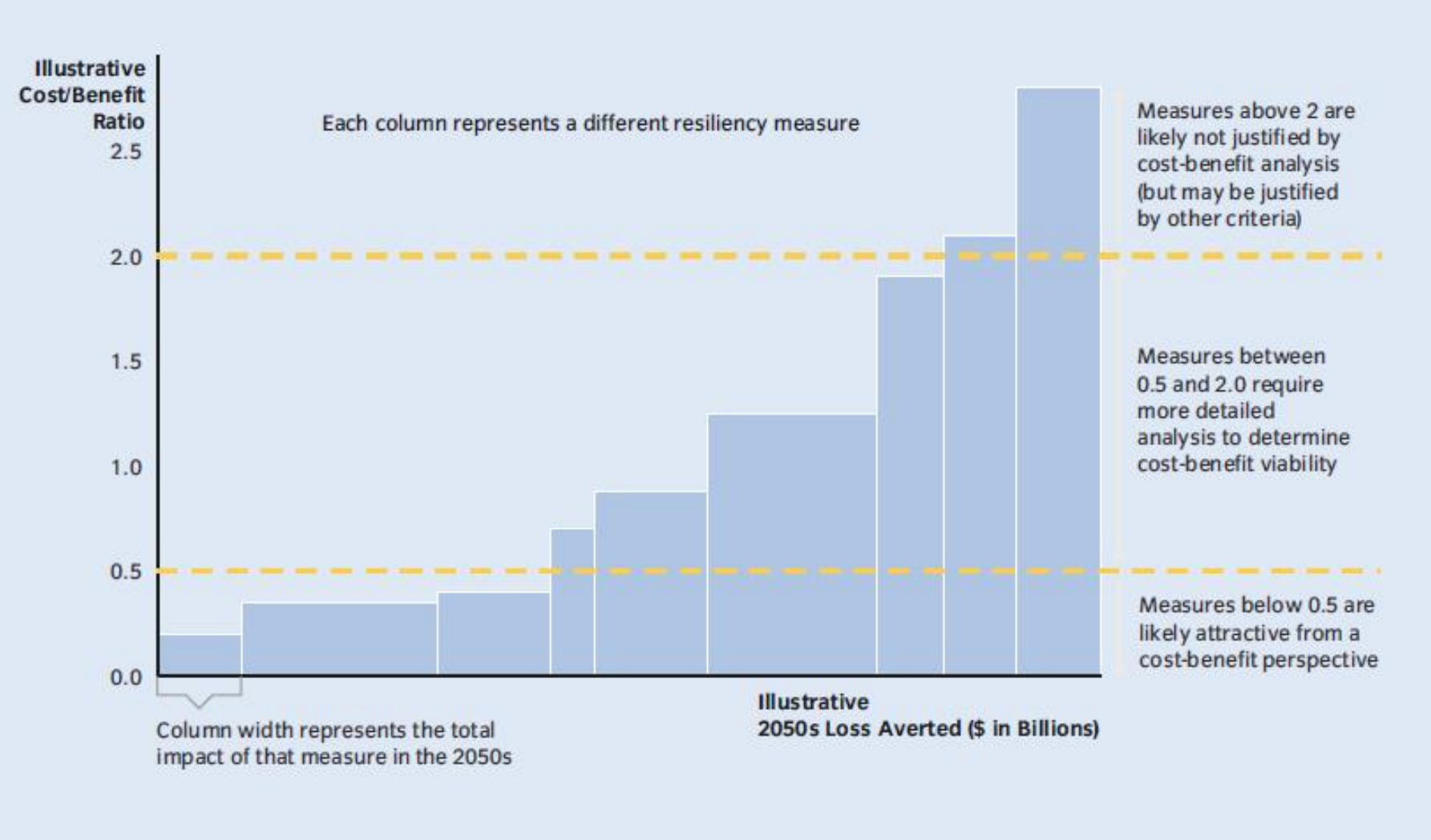
Results
Annual Expected Loss by ZIP code



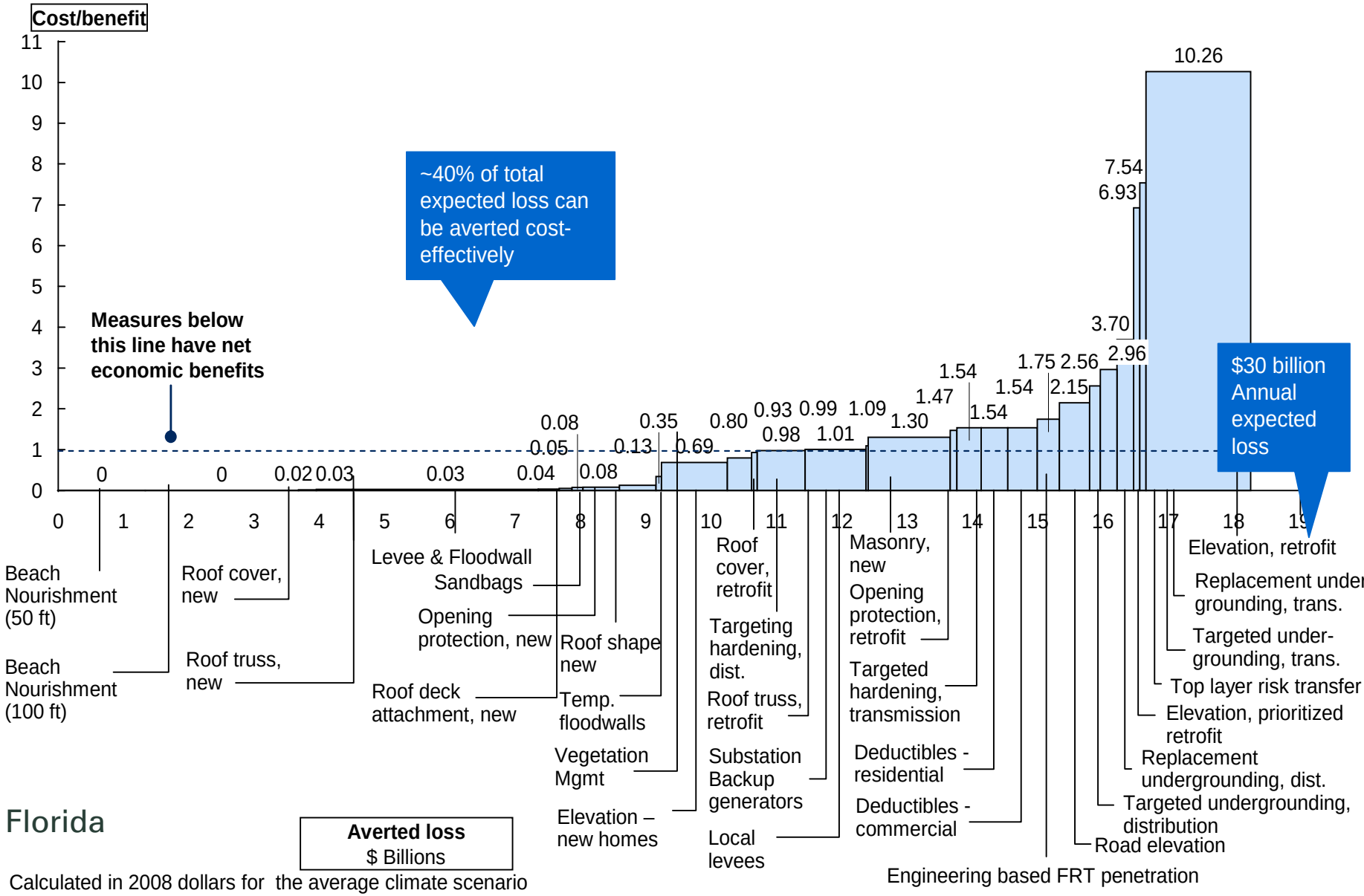
Source: A Stronger, More Resilient New York

- 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



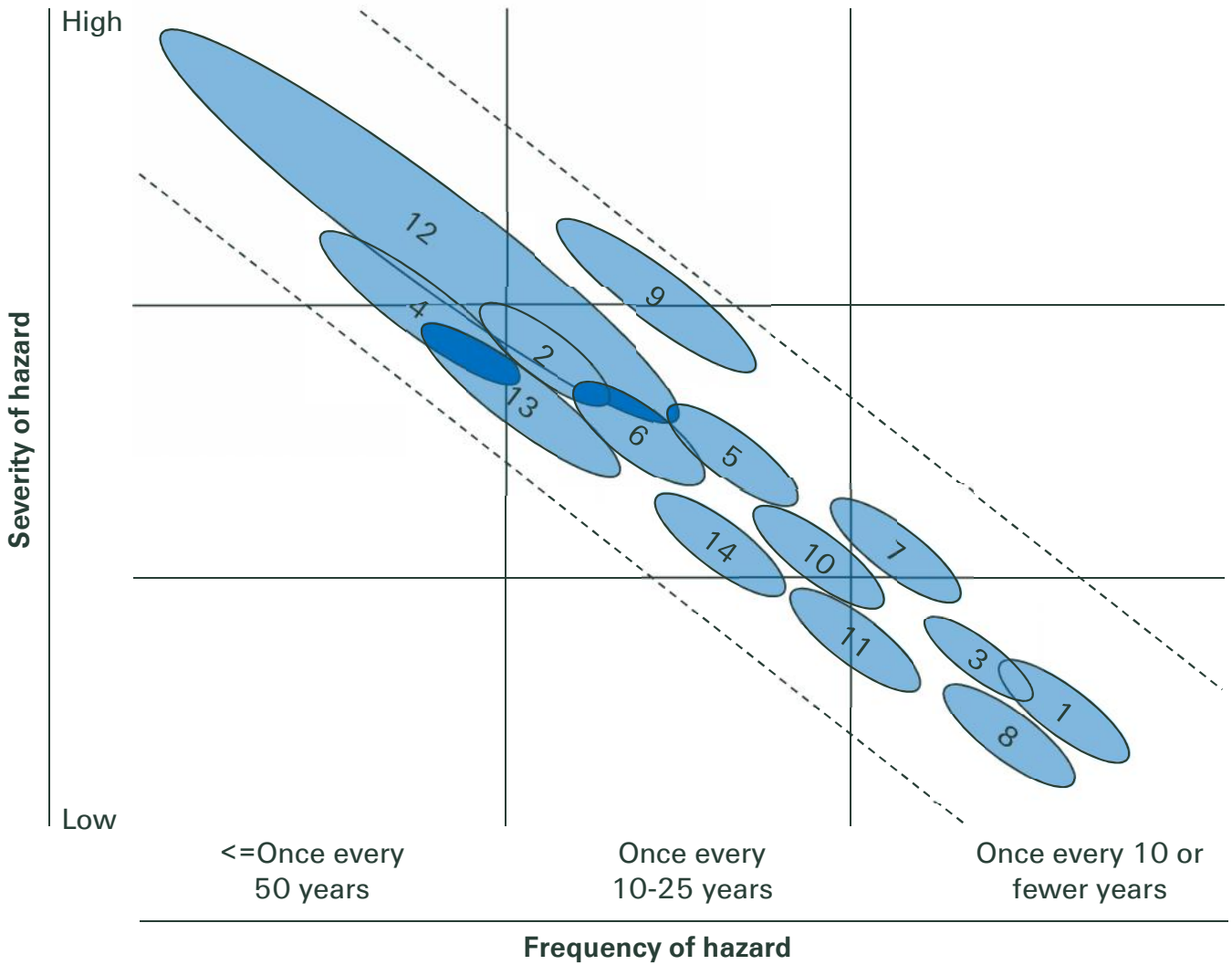
Locally specific adaptation cost / benefit curve



Example Florida

Calculated in 2008 dollars for the average climate scenario

Climate risk is best tackled with a portfolio of adaptation measures



List of potential measures to reduce hurricane damage

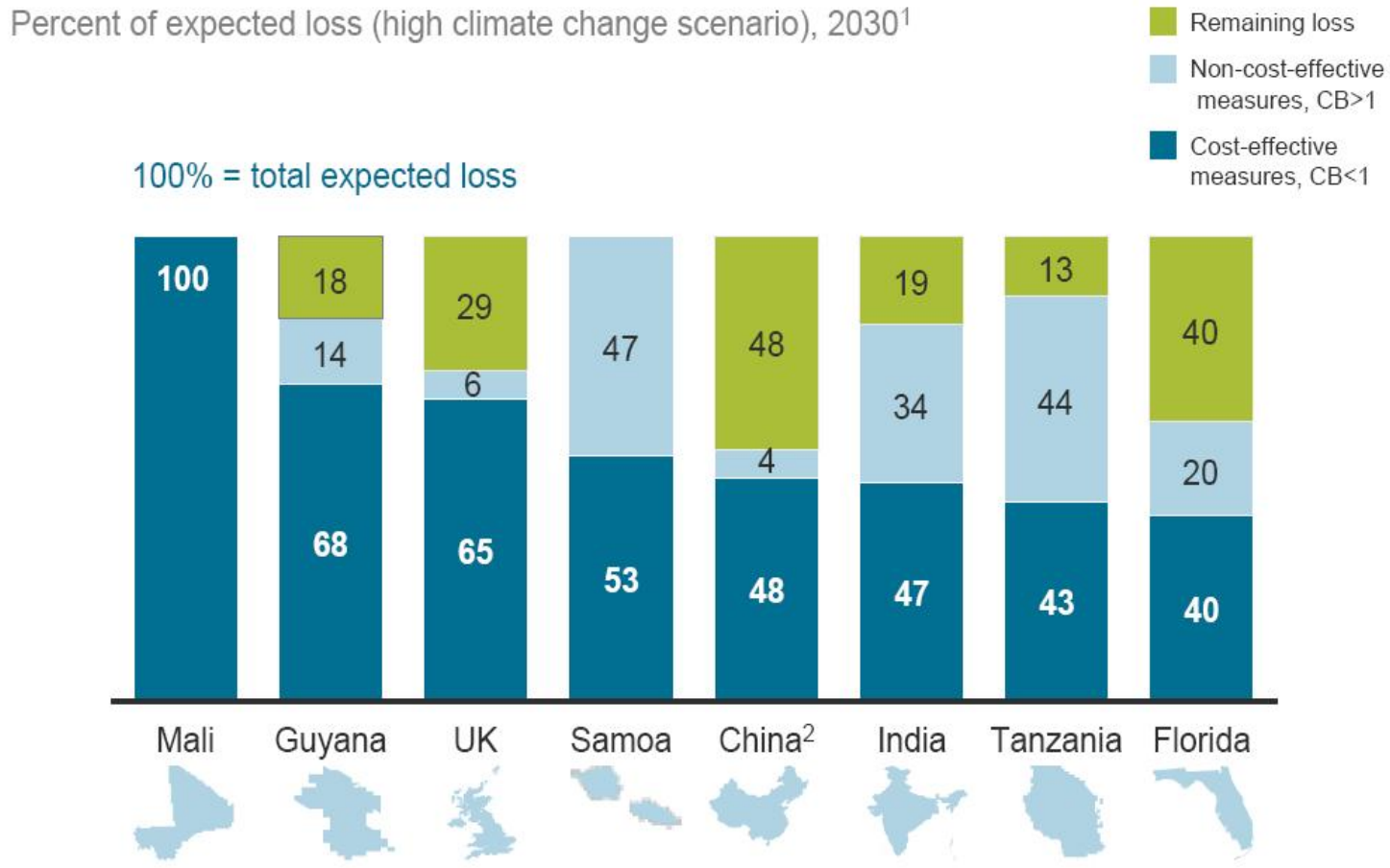
1. Sand bags
2. Opening/ masonry
3. Temporary floodwall
4. Levee and floodwall
5. Targeted hardening (utilities)
6. Home elevation
7. Local levees
8. Road elevation
9. Roof (various)
10. Beach nourishment
11. Vegetation management
12. Financial risk transfer
13. Undergrounding (utilities)
14. Substation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

Example Florida

Source: Team analysis

Global overview:
Expected loss averted by adaptation measures

ECONOMICS OF CLIMATE ADAPTATION

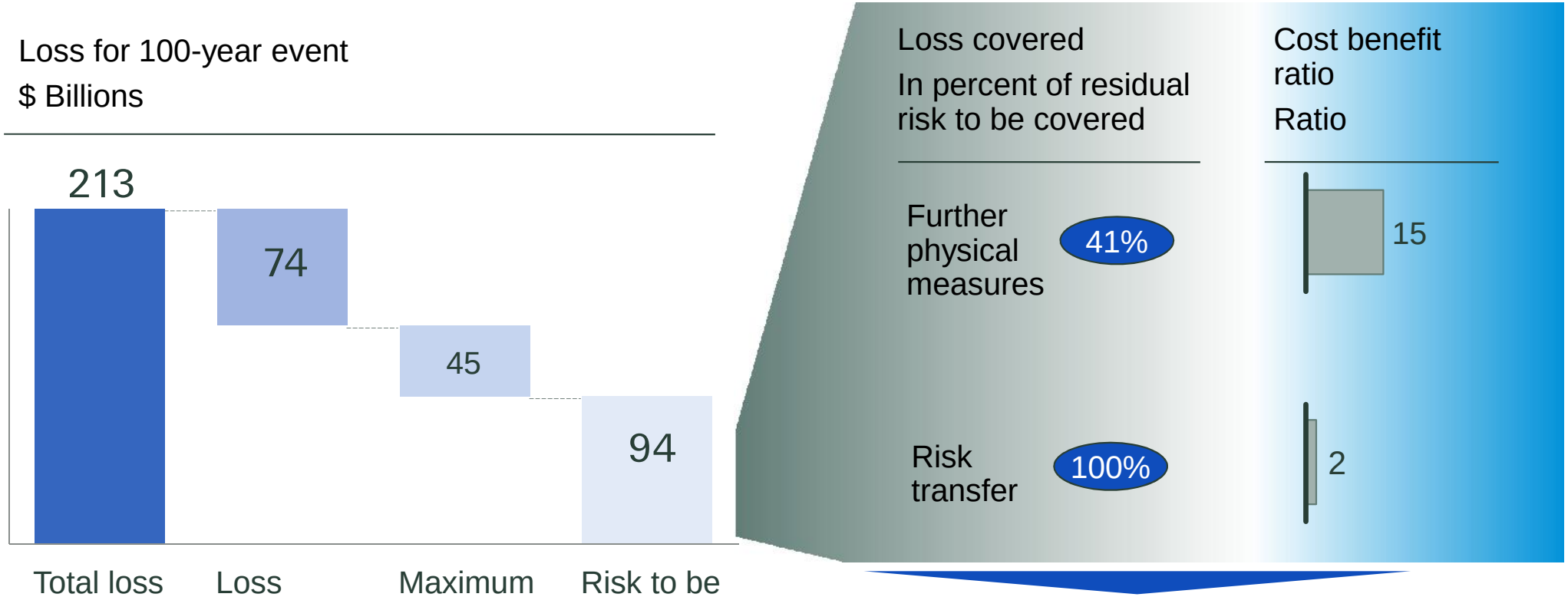


1 Based upon select regions analyzed within the countries (e.g., Mopti, Mali; Georgetown, Guyana Hull, UK; North and Northeast China; Maharashtra, India; Central regions of Tanzania; Southeast Florida, U.S.)
2 Based upon moderate scenario data and analysis

Risk transfer may be more cost efficient than physical measures in addressing low frequency events

ILLUSTRATIVE

Example of evaluation of alternative options to cover residual risk



Risk transfer offers the full desired level of coverage and is more cost-effective than remaining physical measures

ECA full report *featuring the first 8 case studies, 164 pages*

http://media.swissre.com/documents/ECA+Brochure-Final.pdf

New York*: Tropical cyclones and storm surge risk to a metropolis*

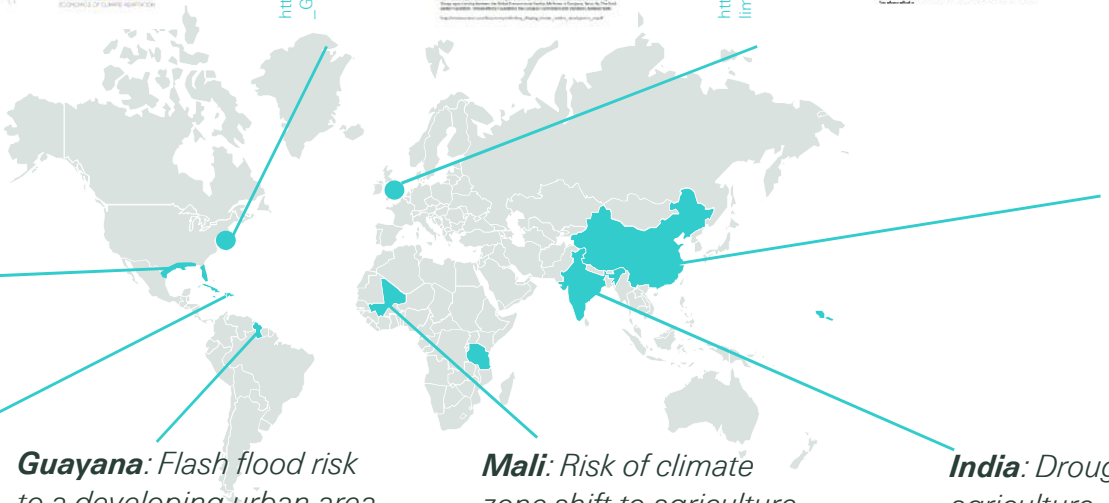
http://media.swissre.com/documents/ECA_New_York_Gov_Factsheet.pdf

Hull, UK*: Flood and storm risk to urban property*

http://media.swissre.com/documents/Economics_of_Climate_Adaption_UK_Factsheet.pdf

US Gulf Coast: *Hurricane risk to the energy system*

http://media.swissre.com/documents/Entergy_study_exec_report_20101014.pdf

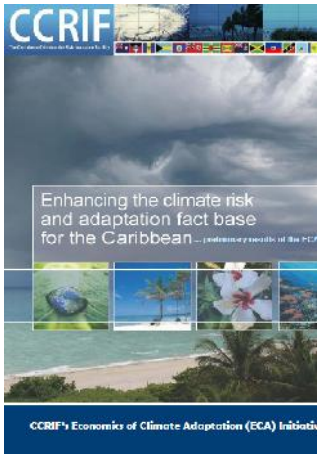


China*: Drought risk to agriculture*

http://media.swissre.com/documents/rethinking_shaping_climate_resilient_development_en.pdf#page=74

Caribbean*: Hurricane risk to small islands*

http://media.swissre.com/documents/ECA+Brochure-Final.pdf



Guayana*: Flash flood risk to a developing urban area*

http://media.swissre.com/documents/Economics_of_Climate_Adaptation_Guyana_Factsheet_en.pdf

Mali*: Risk of climate zone shift to agriculture*

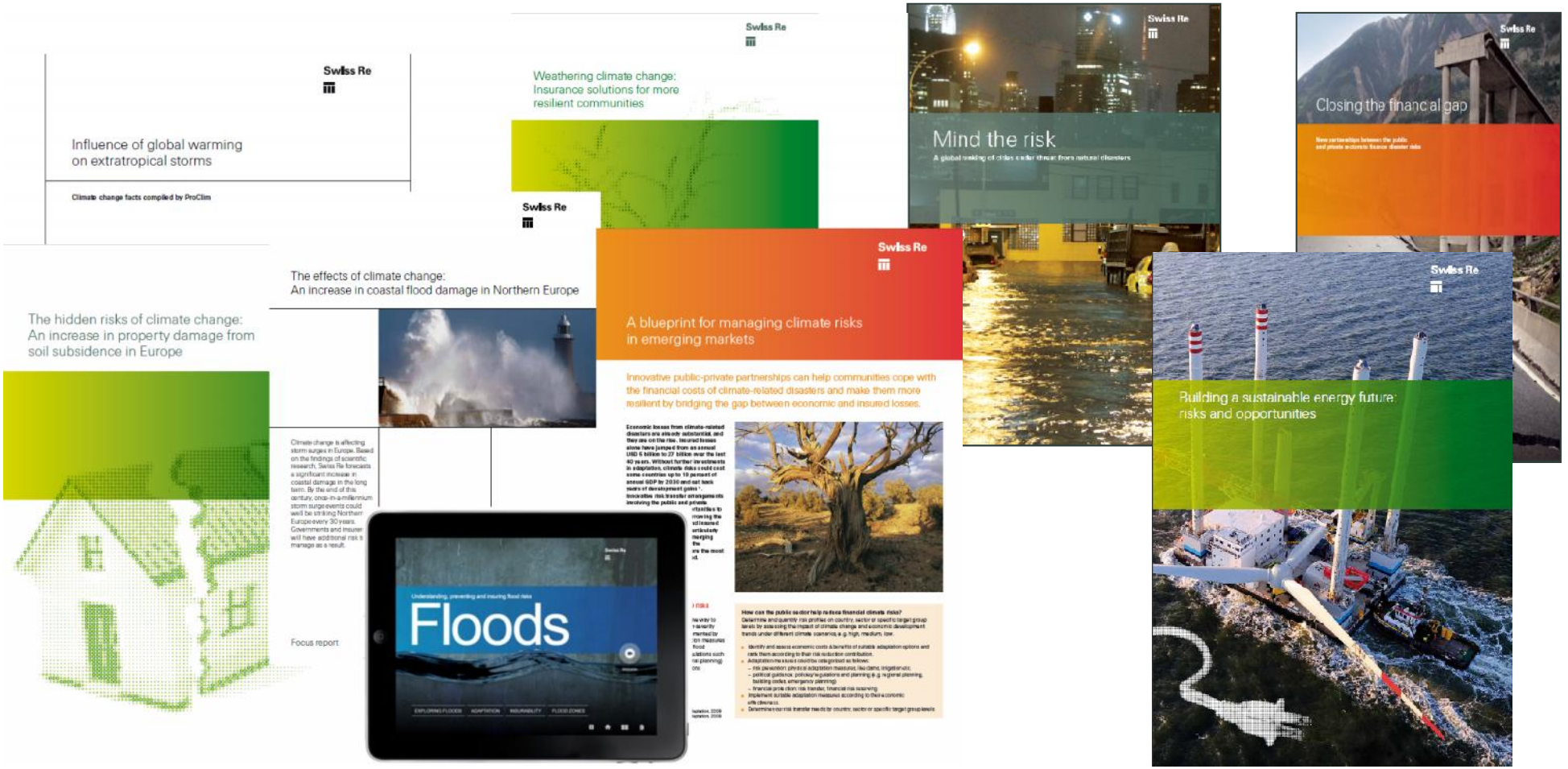
http://media.swissre.com/documents/Economics_of_Climate_Adaptation_Factsheet_Mali.pdf

India*: Drought risk to agriculture*

http://media.swissre.com/documents/Economics_of_Climate_Adaptation_India_Factsheet.pdf

Advancing Knowledge on Climate Risk

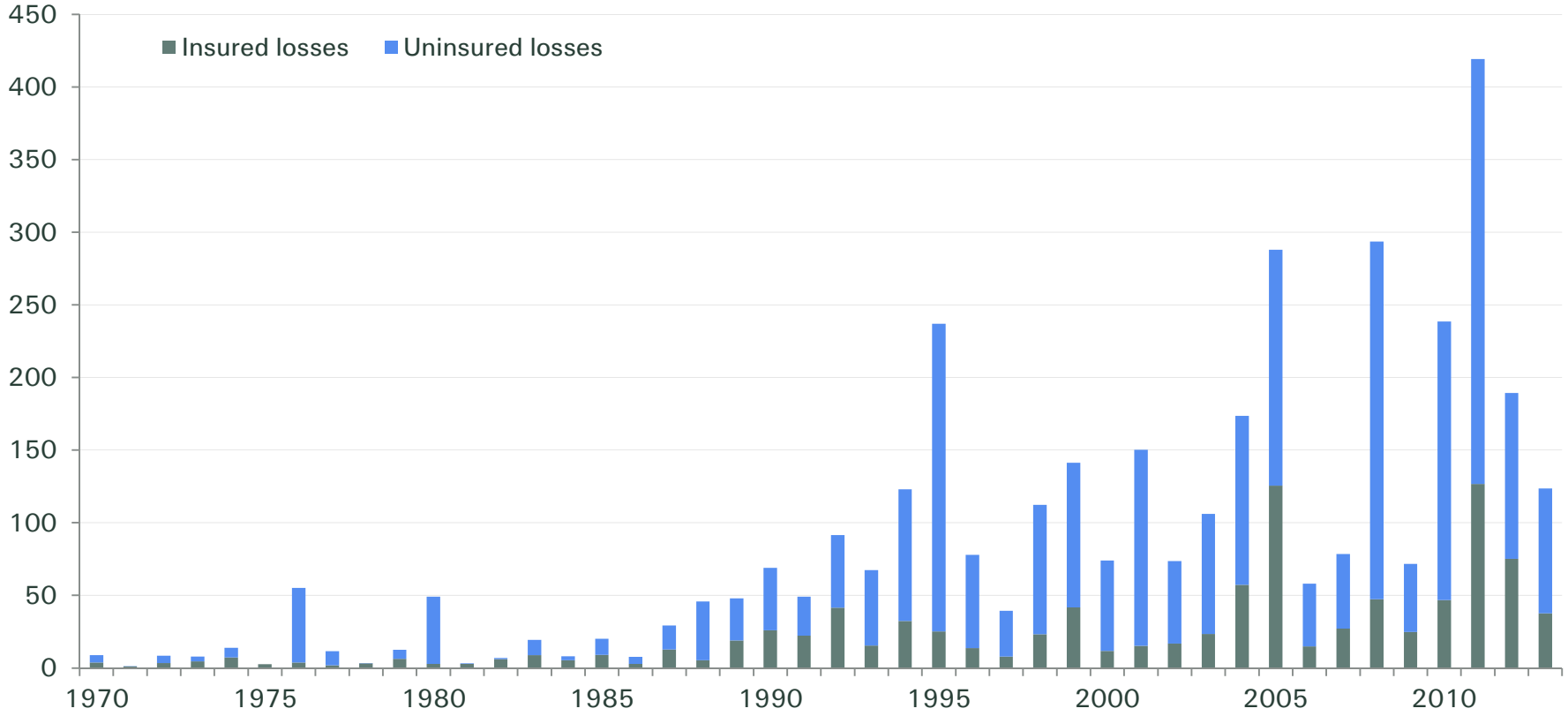
Climate risk research and publications



Closing the protection gap

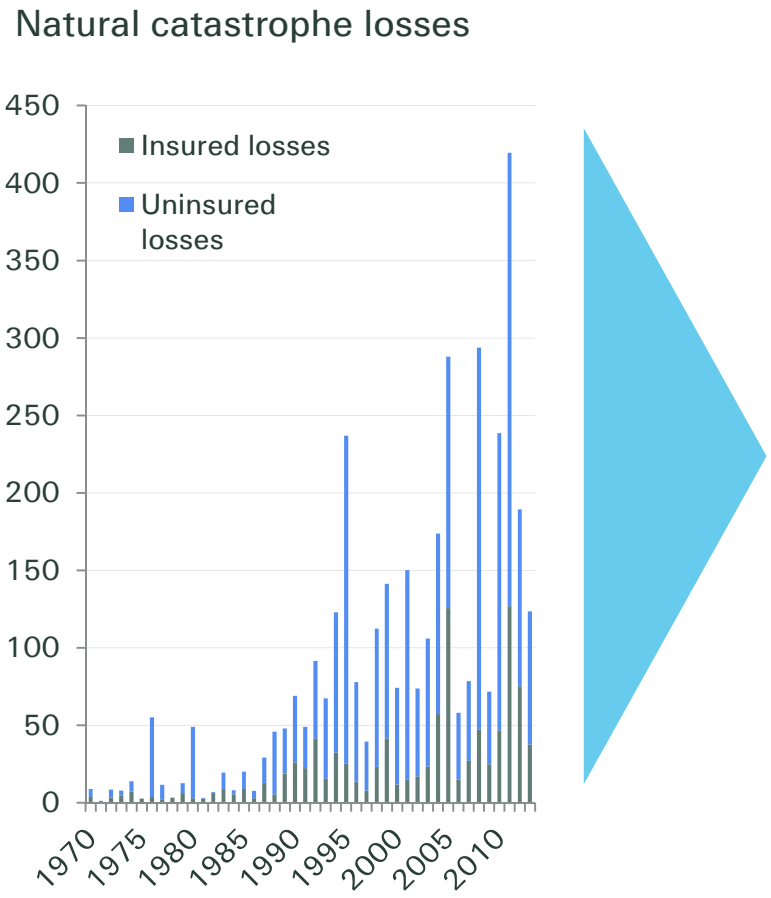
Massive gap between total and insured losses shows insurance potential

Natural catastrophe losses 1970-2013, in USD billion (2013 prices)



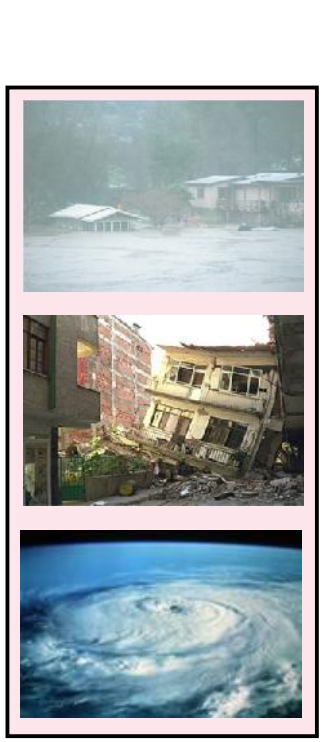
Source: Swiss Re Economic Research & Consulting, *sigma* catastrophe database

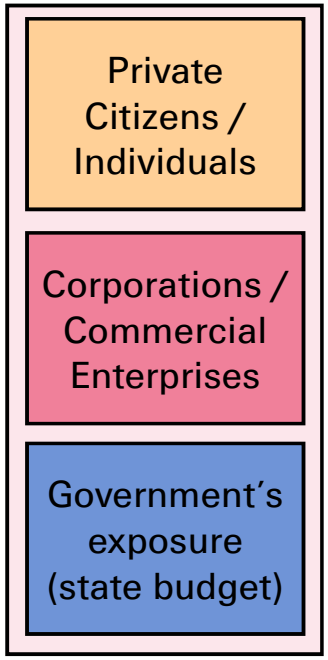
Disasters place a significant burden on the public sector

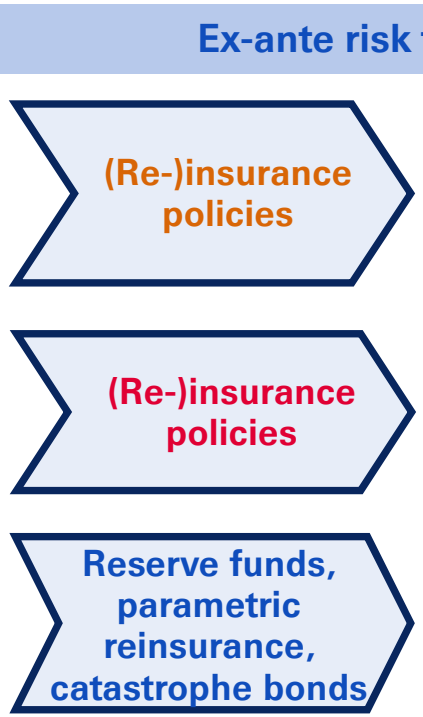


- Despite prevention and mitigation efforts, no country can fully insulate itself against extreme natural disasters
- The brunt of economic losses from natural disasters ends up with individuals, corporations and governments, both on national and sub-national level
- Government budgets are impacted by:
  - 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

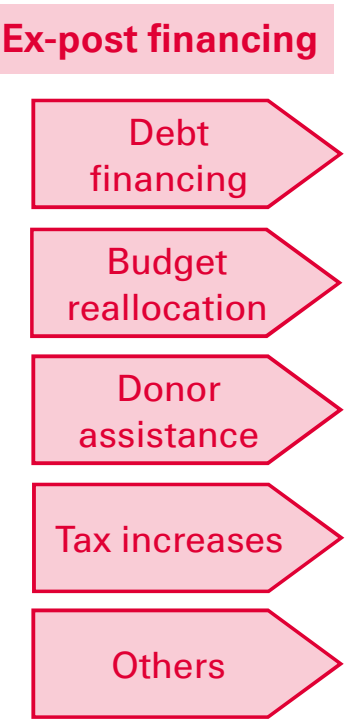
Closing the Gap: Including ex-ante instruments into the overall risk financing strategy







- 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



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)

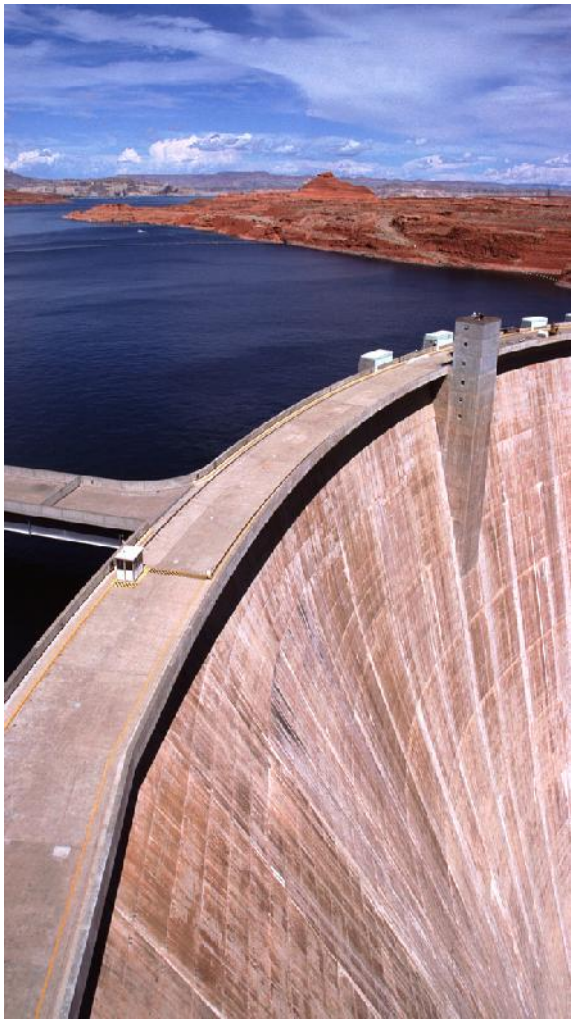
Solution features

- 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
- Time horizon: January 2014– July 2015
- Transaction Size: USD 450 million
- Largest of it's 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 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.

Case study:
Miami Dade County Public Schools–
Custom multi-year structured cover

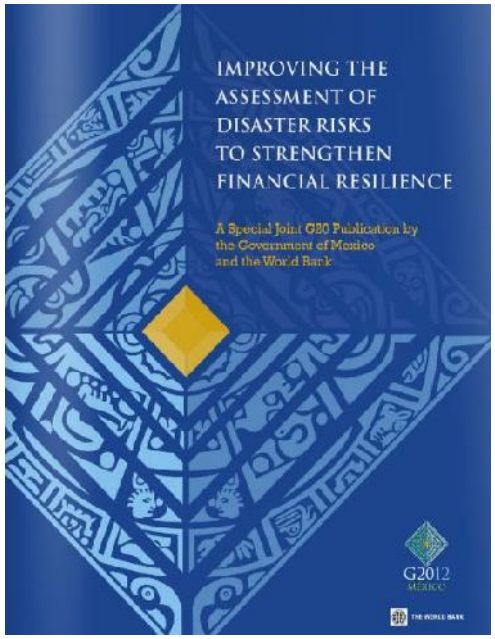
Solution features

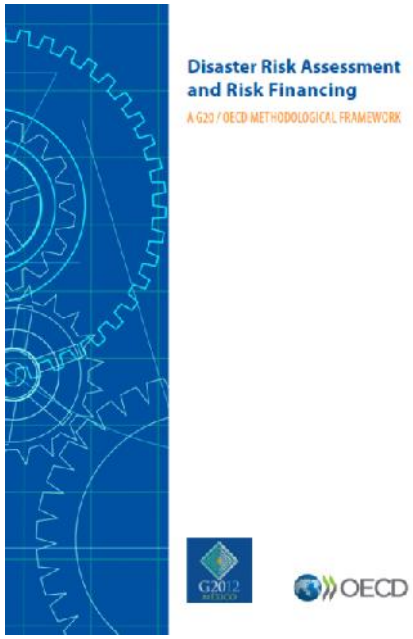
- Insured peril: Named Windstorm and associated flood
- Multi-year structured cover: USD 100m
- Covering indemnified losses from NWS to soften impact to broader school system
  - 3 year coverage with unlimited reinstatements
  - Term Aggregate Deductible
  - Fixed premium over term
  - No claims bonus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

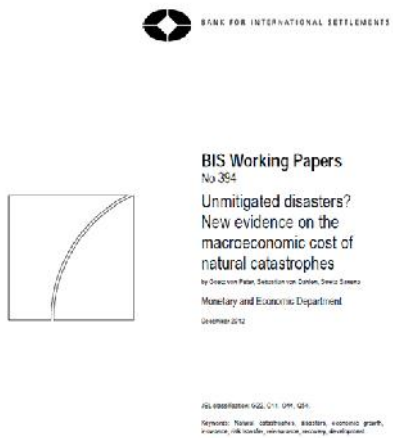
Involved parties

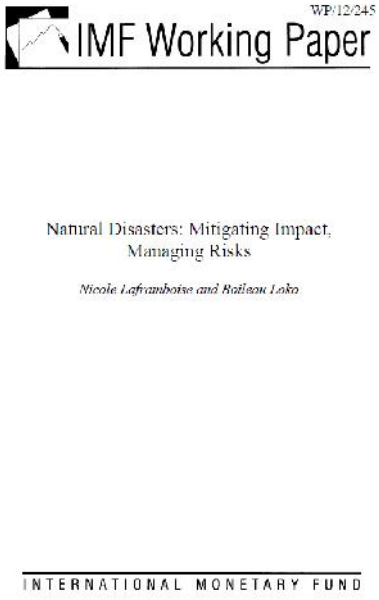
- Insured: Miami-Dade County Public Schools
- Swiss Re: Lead structurer and sole underwriter
- Broker: AJ Gallagher

Disaster Risk Financing - a priority on the global agenda







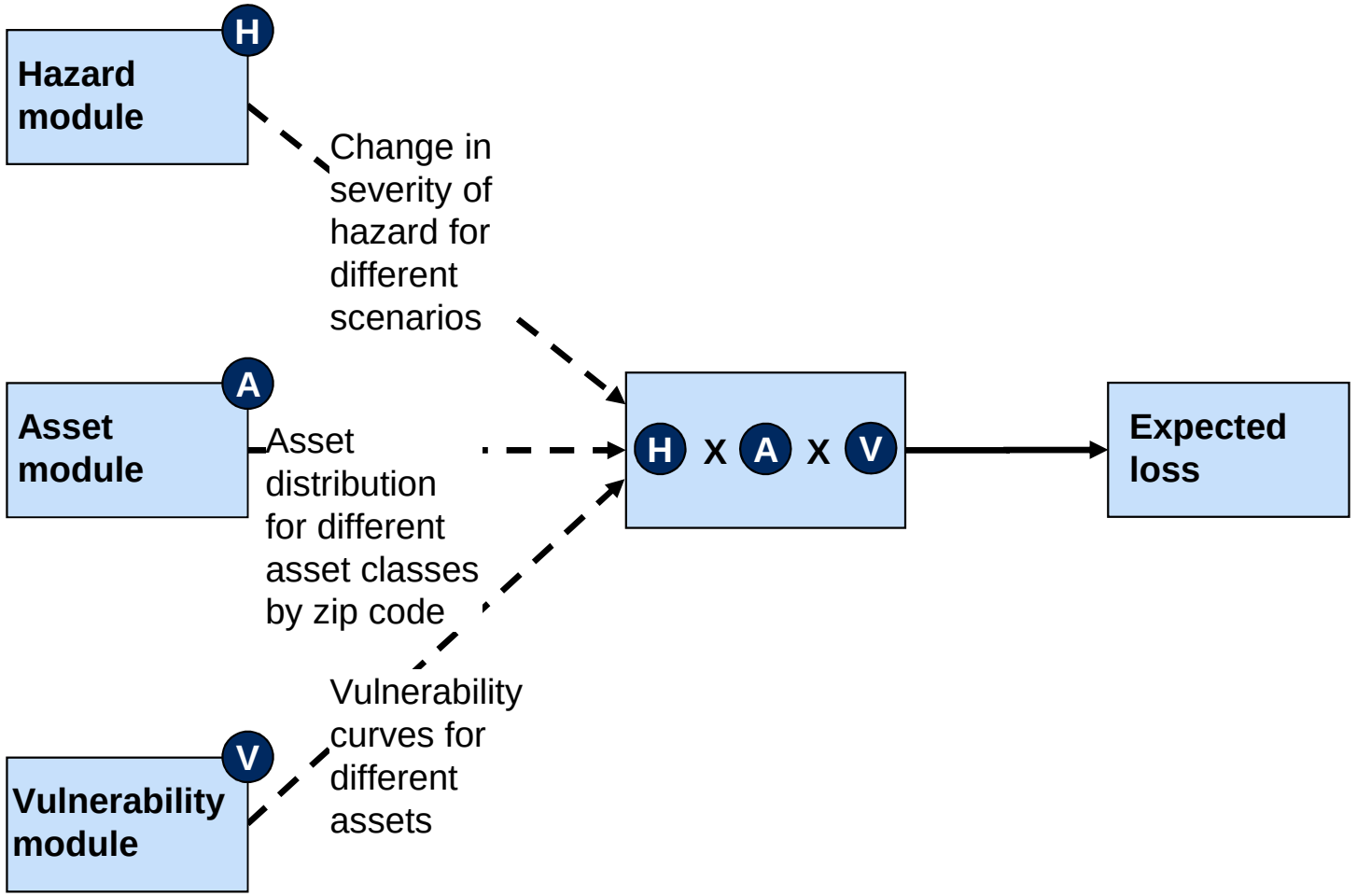


Appendix

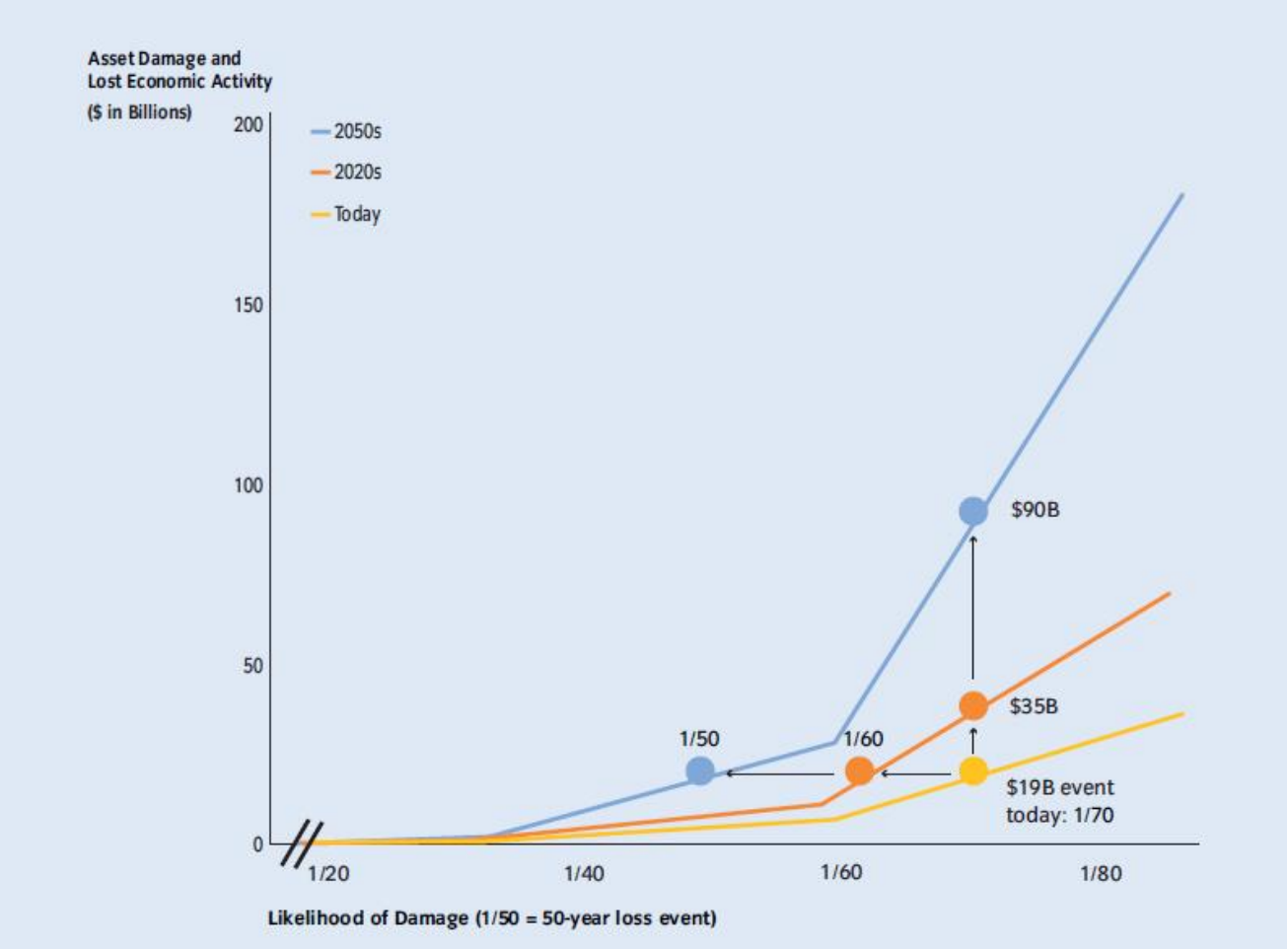
Modeling severe weather impacts

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



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



Source: www.nyc.gov: A Stronger More Resilient New York

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