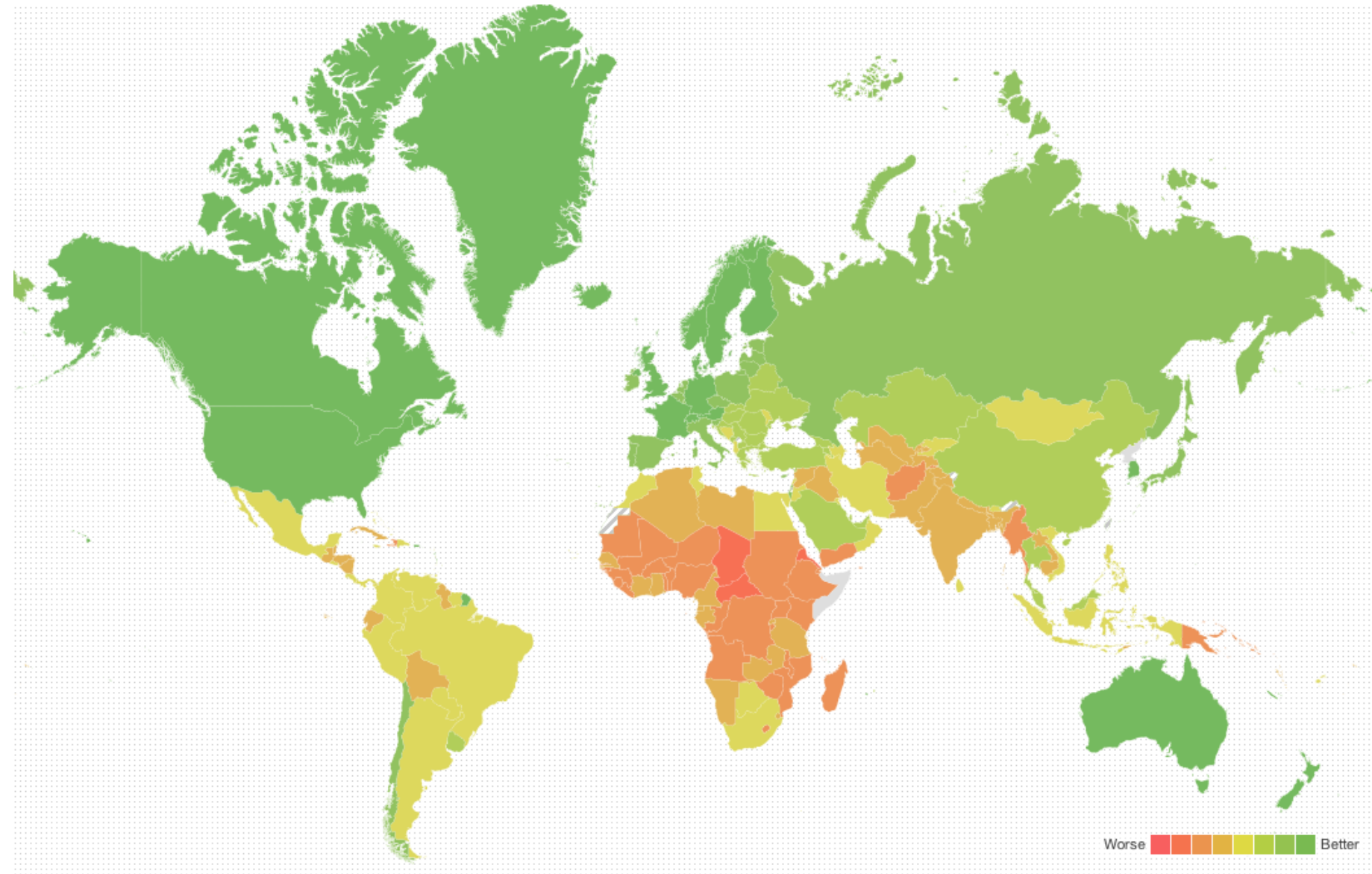


# City Climate Risk

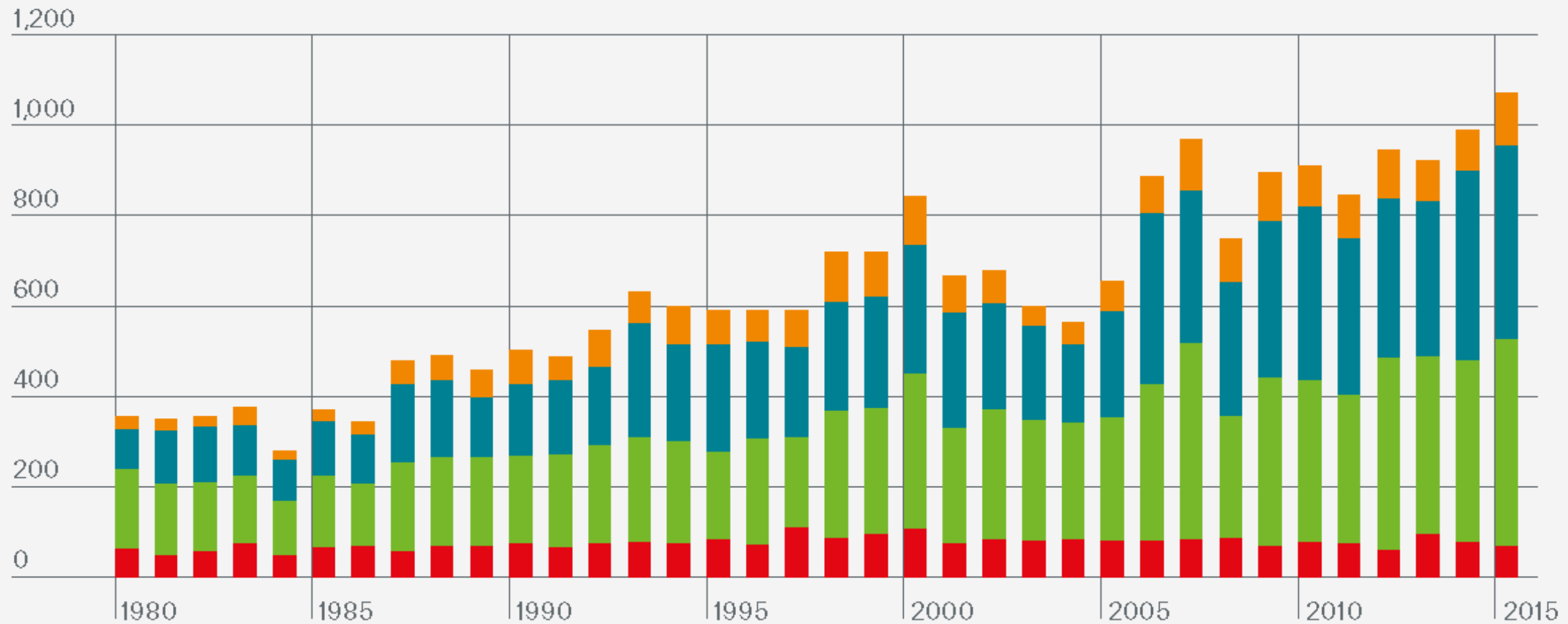
Investor Engagement and  
Finance Innovation for  
Urban Resilience



- What climate-related damage is foreseen?
- What is the financial extent of the risk?
- Are investors engaged to improve safety, livelihoods?
- What City finance innovation is anticipated?

# Trend in Natural Disasters: 1980 - 2015

Number of loss events 1980-2015



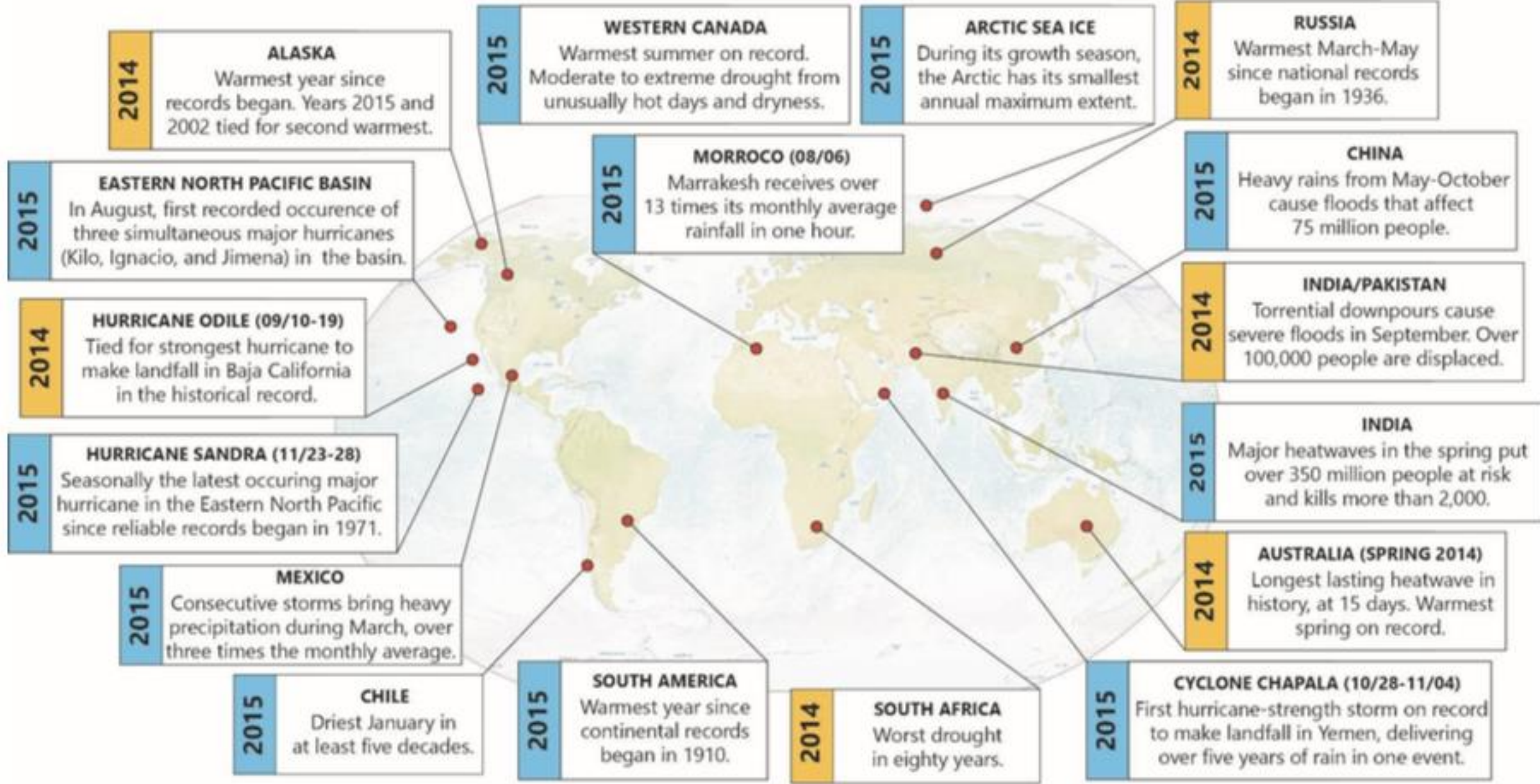
**■ Geophysical events:**  
Earthquakes, tsunamis, volcanic activity

**■ Meteorological events:**  
Tropical storm, extratropical storm,  
convective storm, local storm

**■ Hydrological events:**  
Flood, mass movement

**■ Climatological events:**  
Extreme temperatures, drought,  
wildfire

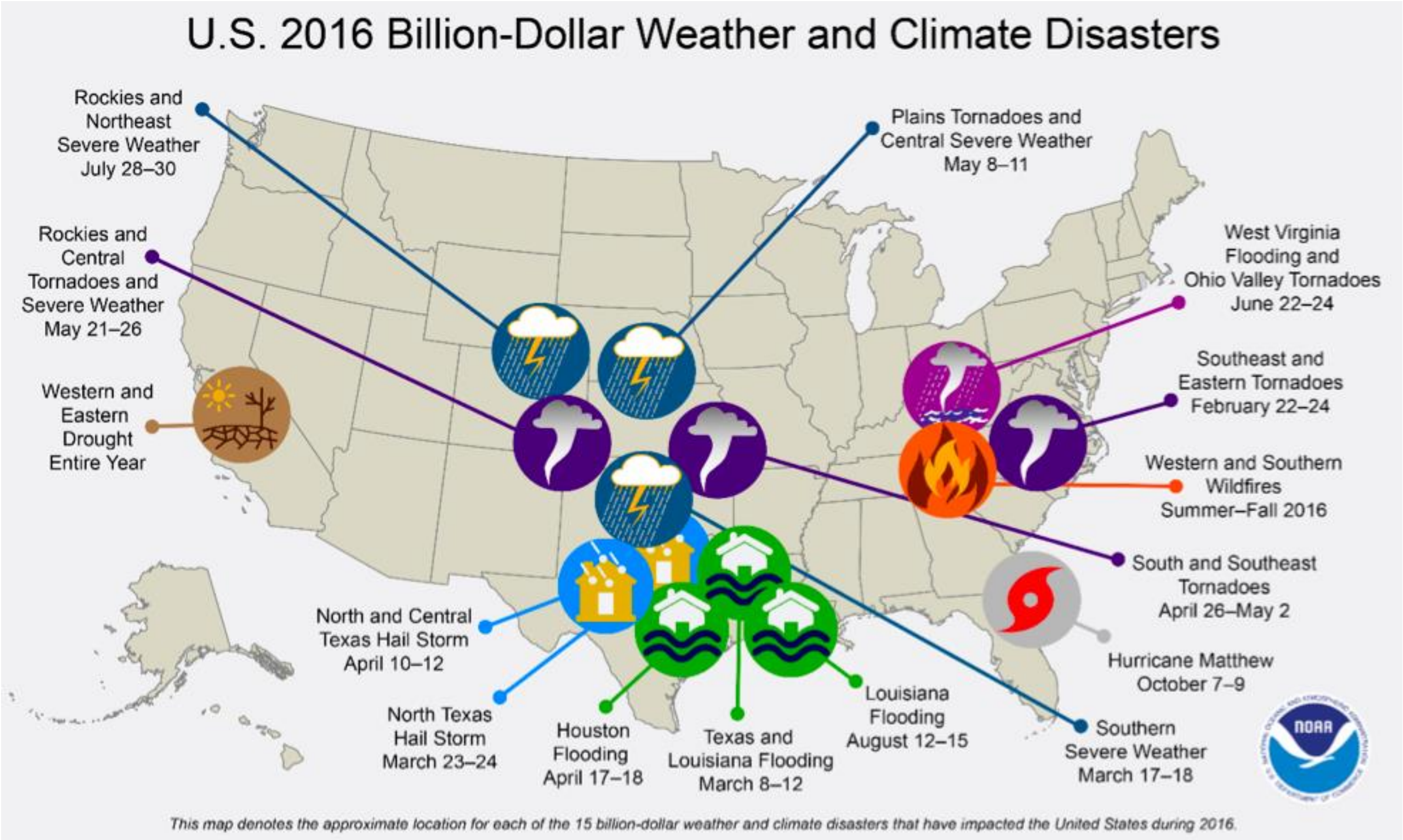
# Selected Significant Extreme Weather Events 2014-2015



Source: National Oceanic and Atmospheric Administration (NOAA), State of the Climate Reports, 2014, 2015.  
Some events were influenced by an unusually large El Niño pattern that emerged in the last half of 2015.

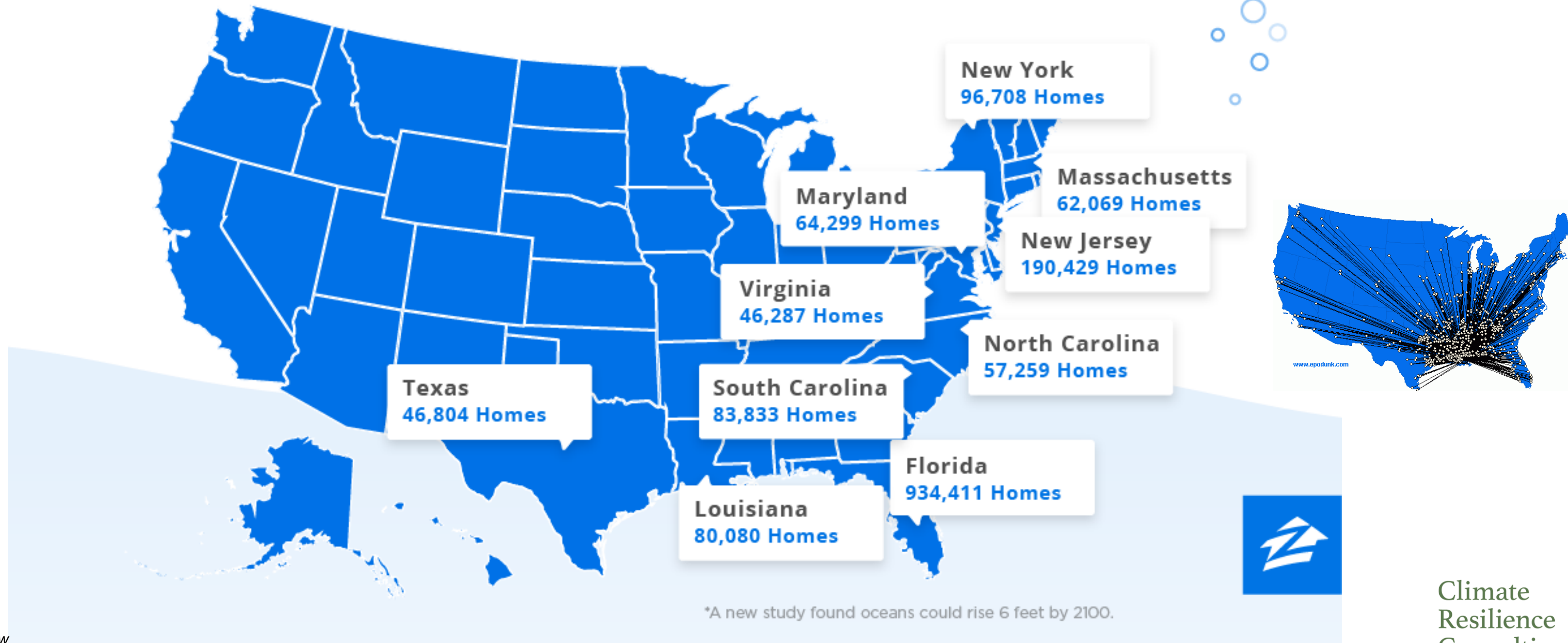


# 2016: Billion Dollar Weather and Climate Disasters



# Zwillow: In US 1.9M homes at risk

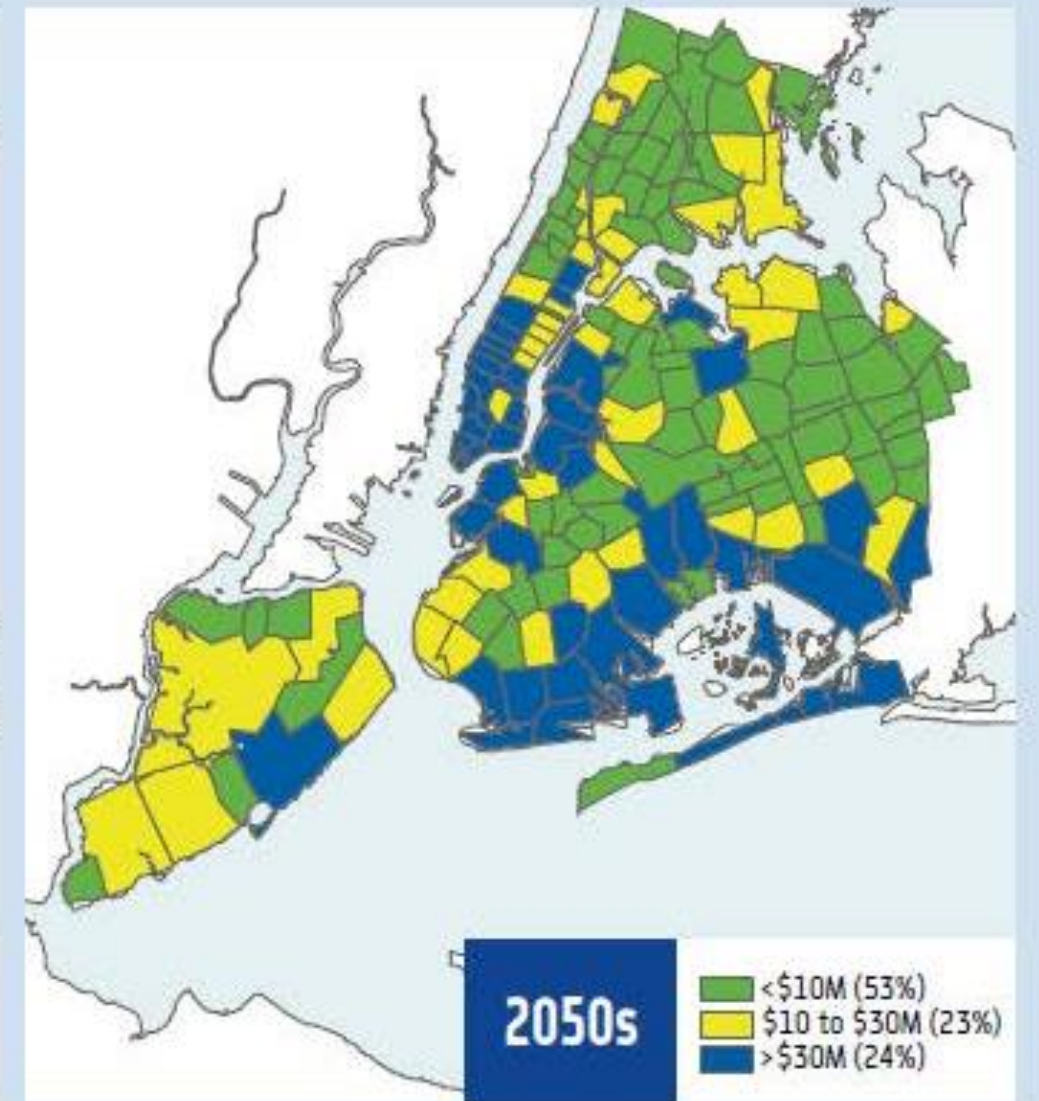
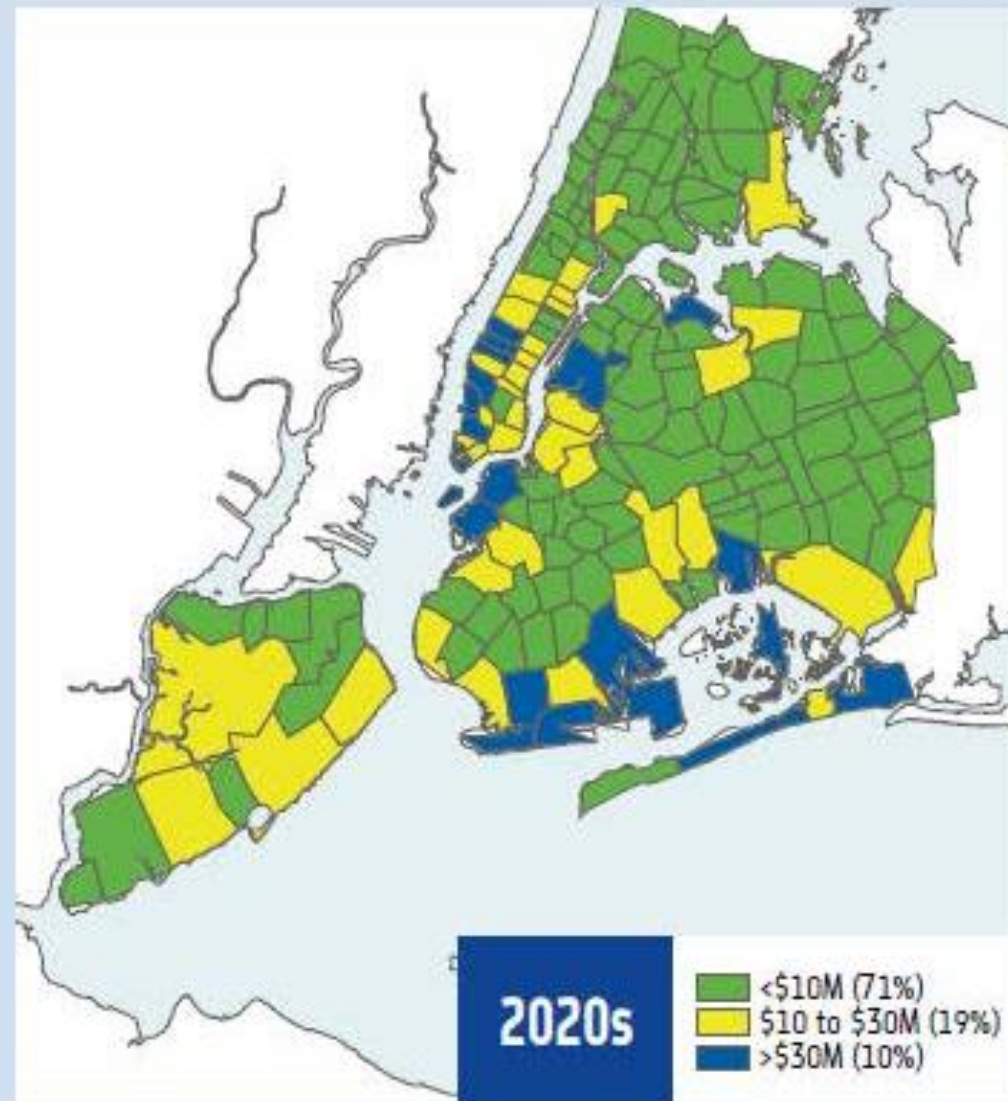
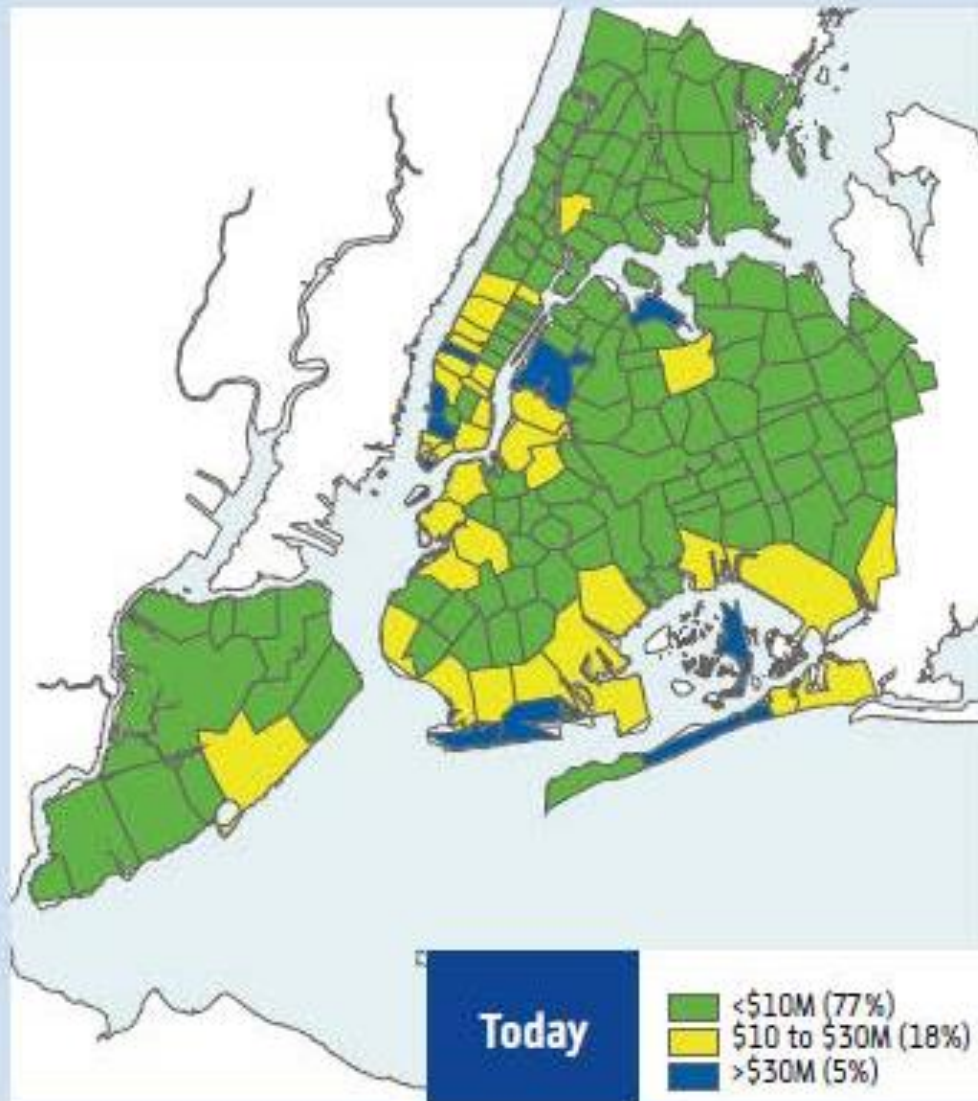
How many homes would be under water if the oceans **rose 6 feet**?\*  
Nationally, 1.9 million homes worth **\$882 billion**.





# Annual Expected Loss by Zip Code

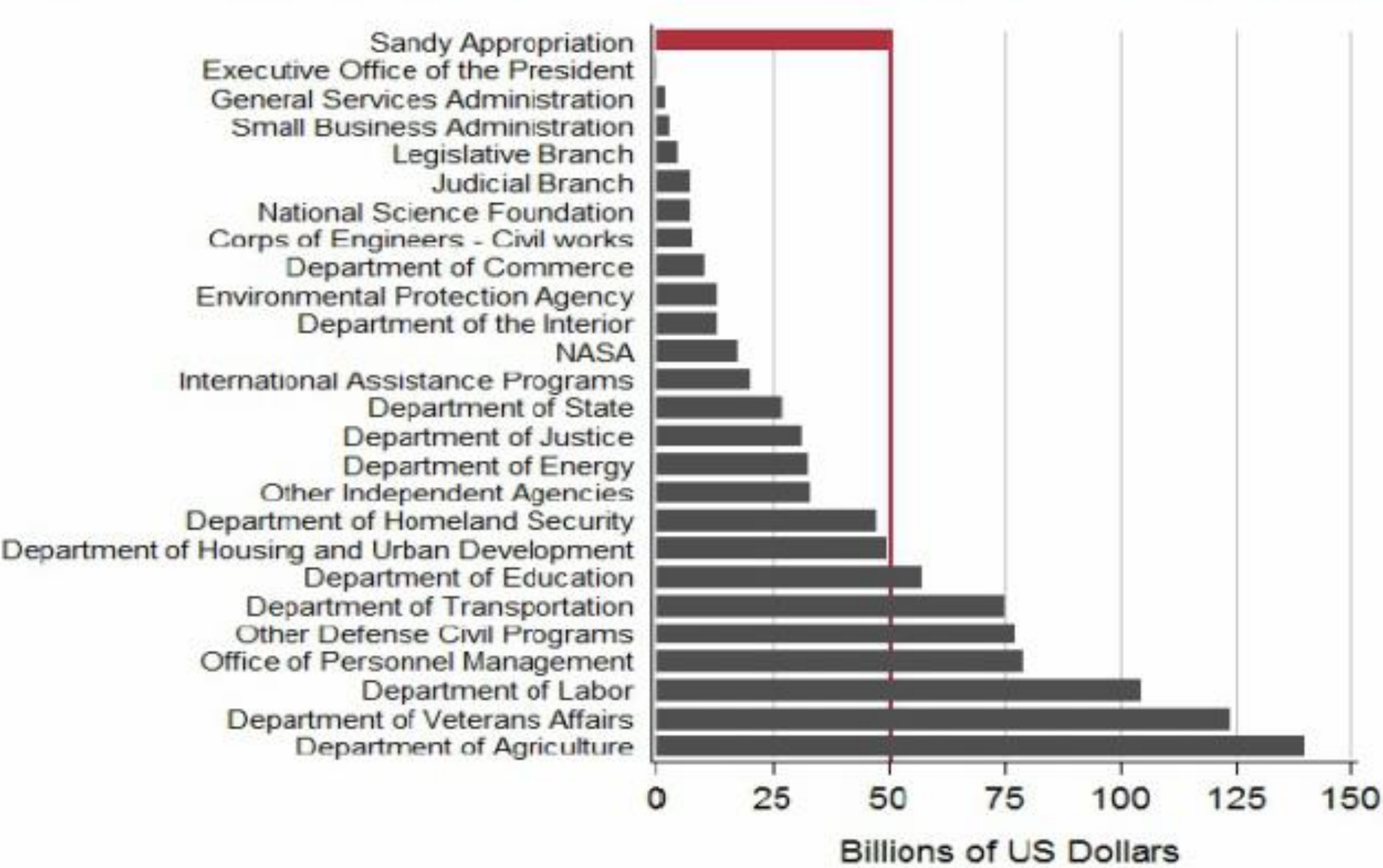
## Total Asset and Economic Activity Losses





# Sandy Supplemental vs. '12 Agency Outlays

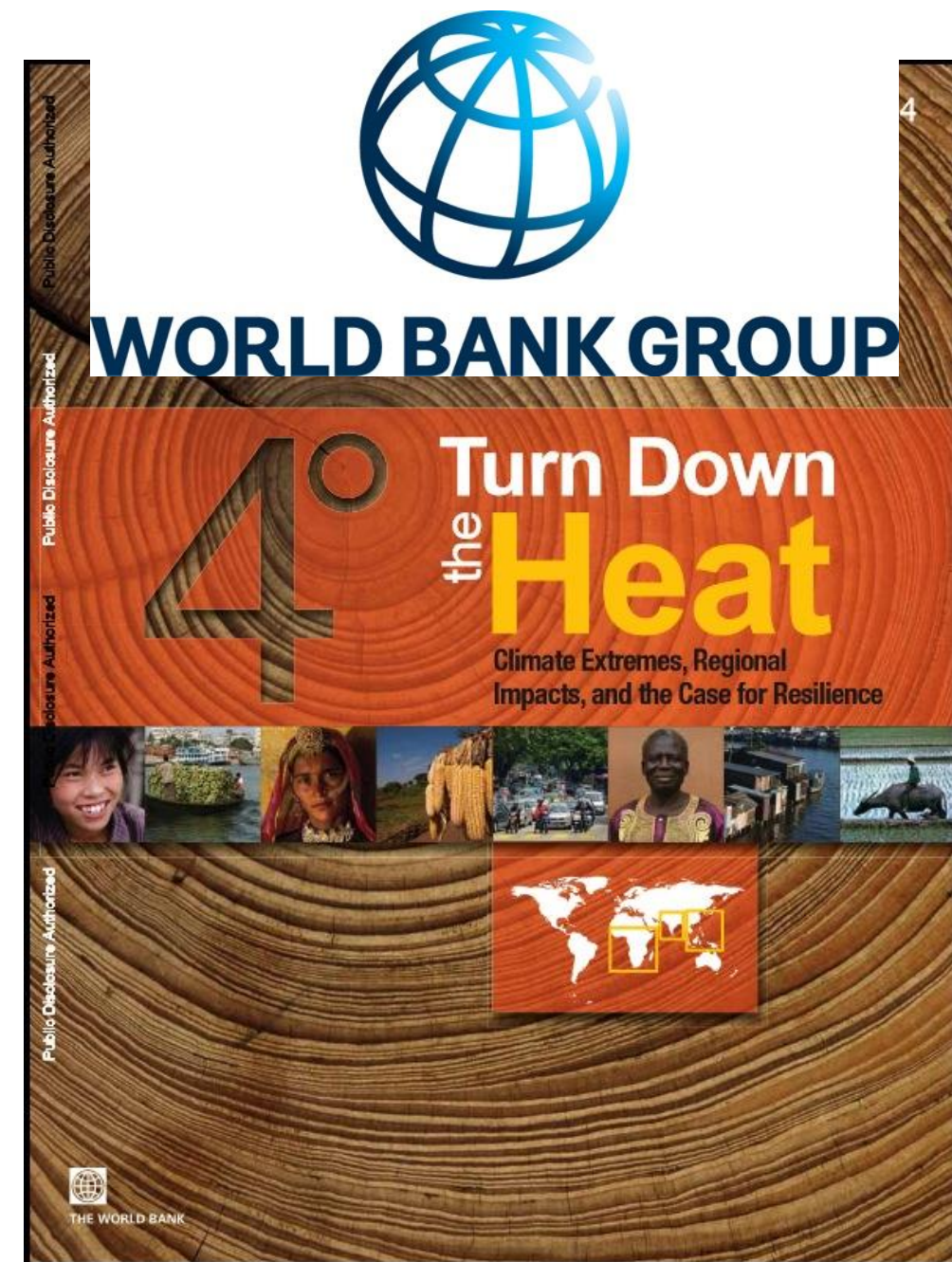
Sandy Supplemental Compared with 2012 Agency Outlays





# Climate Change Slows Middle Class Emergence

- Climate change threatens to erode progress made on poverty reduction
- Global incomes could decline 23 percent by 2100 relative to a world without climate change





# Climate Change is Not the Only Driver of Risk

Ocean Drive, FL 1926  
2013



Ocean Drive FL





# American Infrastructure Grade: D+

2017

INFRASTRUCTURE  
REPORT CARD



MAKING THE GRADE

AMERICA'S GRADES

STATE BY STATE

SOLUTIONS

THE IMPACT

GET INVOLVED



## America's Infrastructure Scores a

# D+

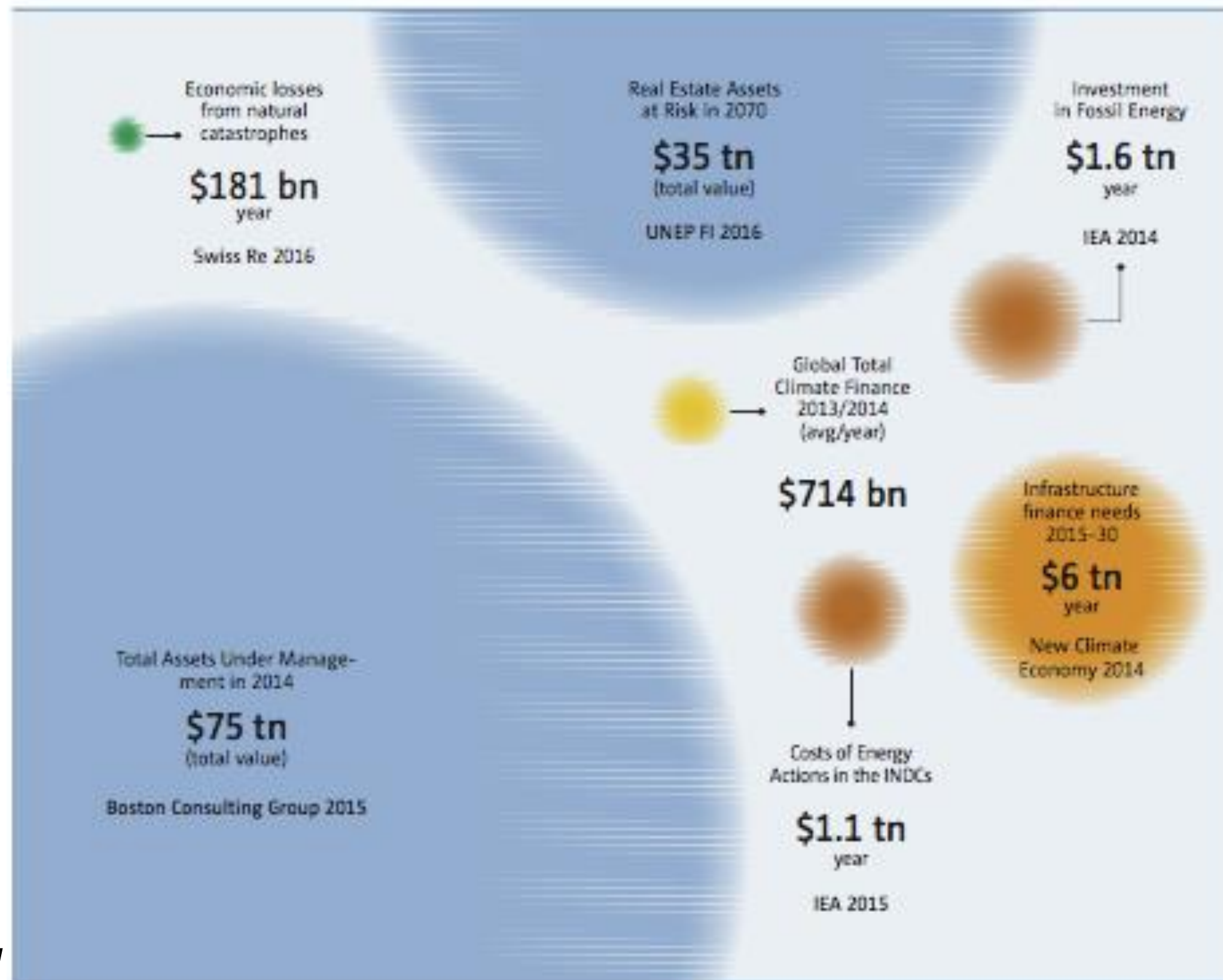
TAKE  
ACTION



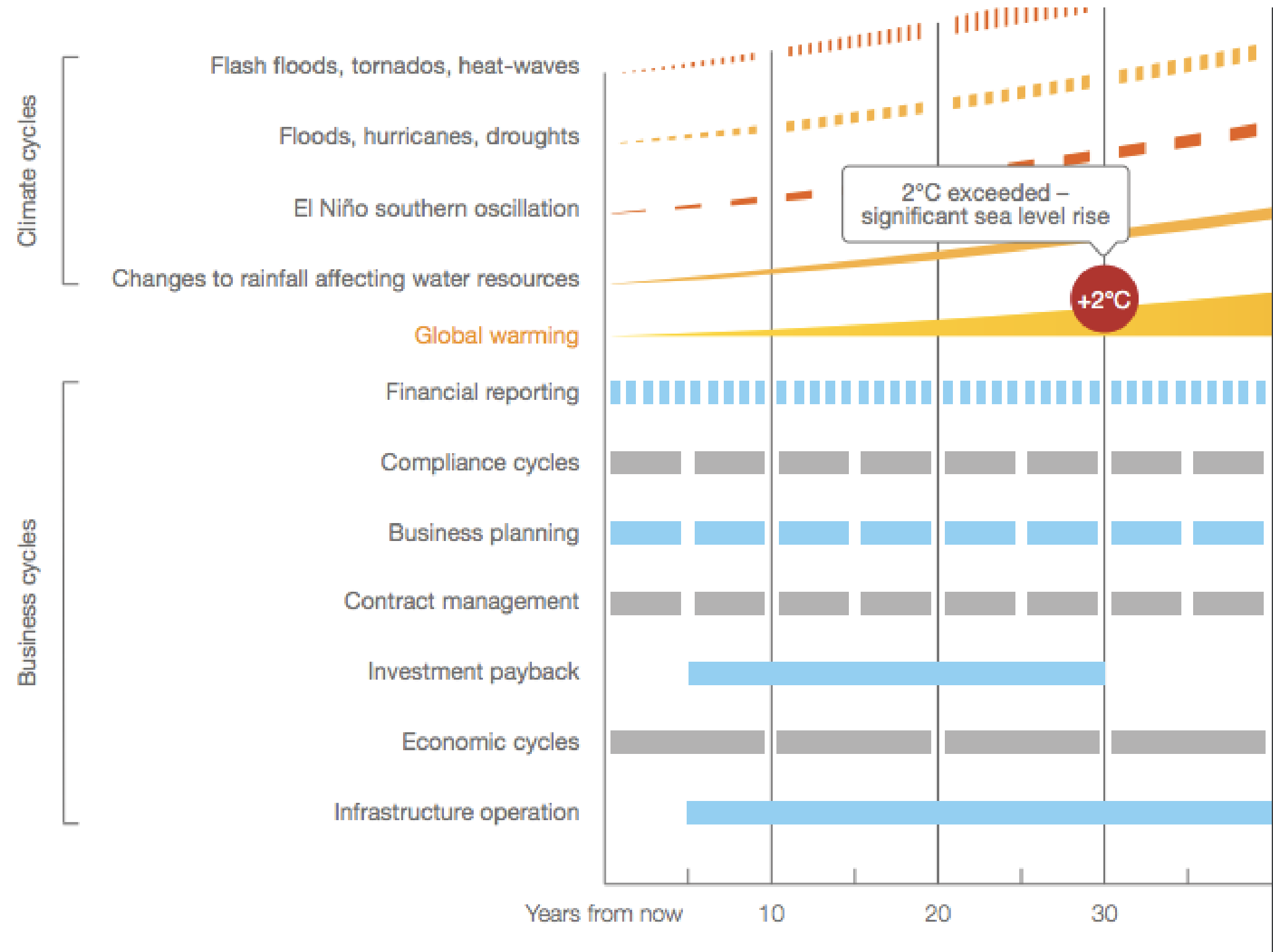
- What climate-related damage is foreseen?
- What is the financial extent of the risk?
- Are investors engaged to improve safety, livelihoods?
- What City finance innovation is anticipated?



# AUM \$75T ('15) | Real Estate Asset Risk \$35T ('70)

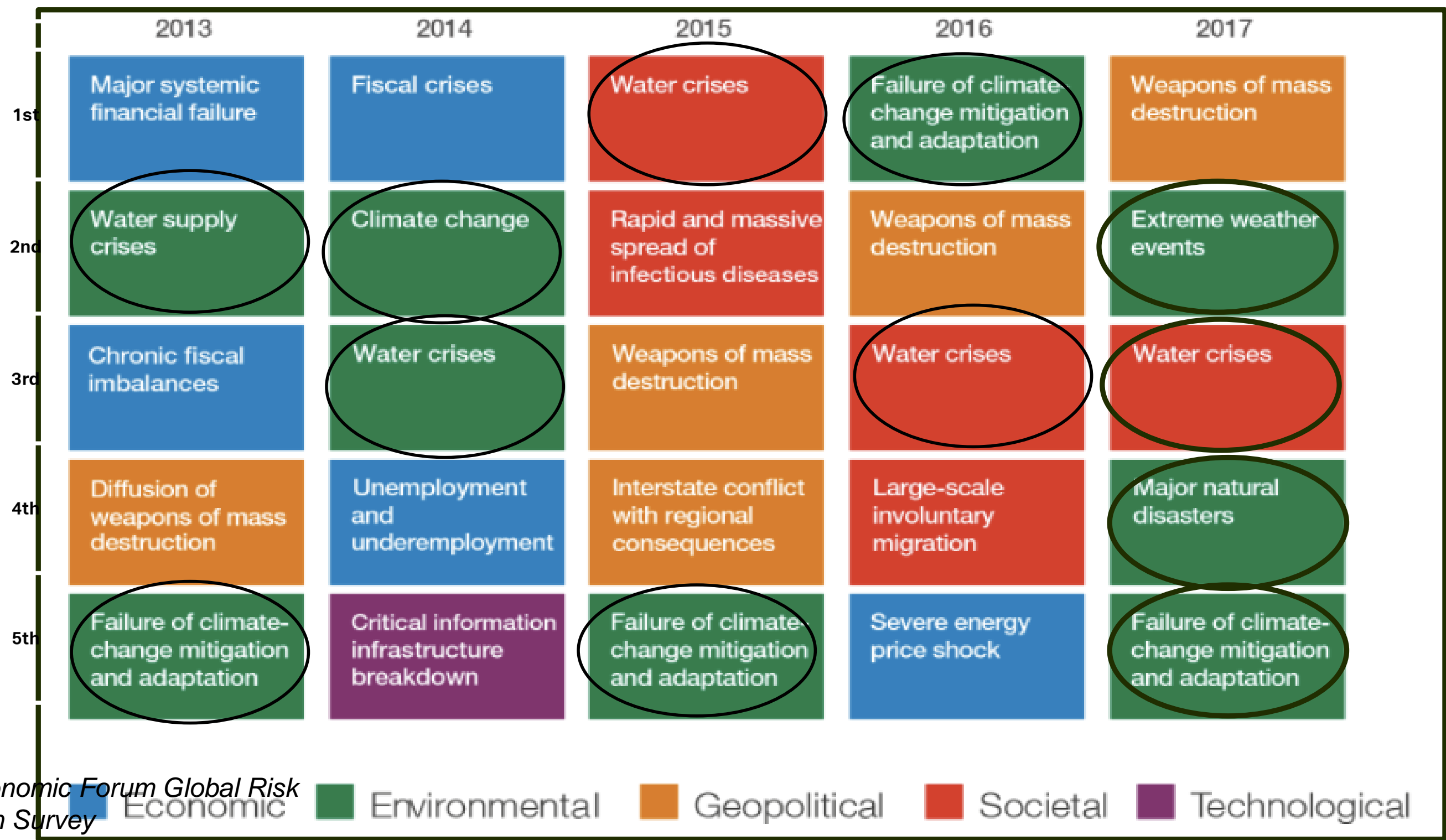


# Climate Risk & Business Cycle Timelines Misaligned











# WEF: Global Risk Report '17 – Climate Risk Impact



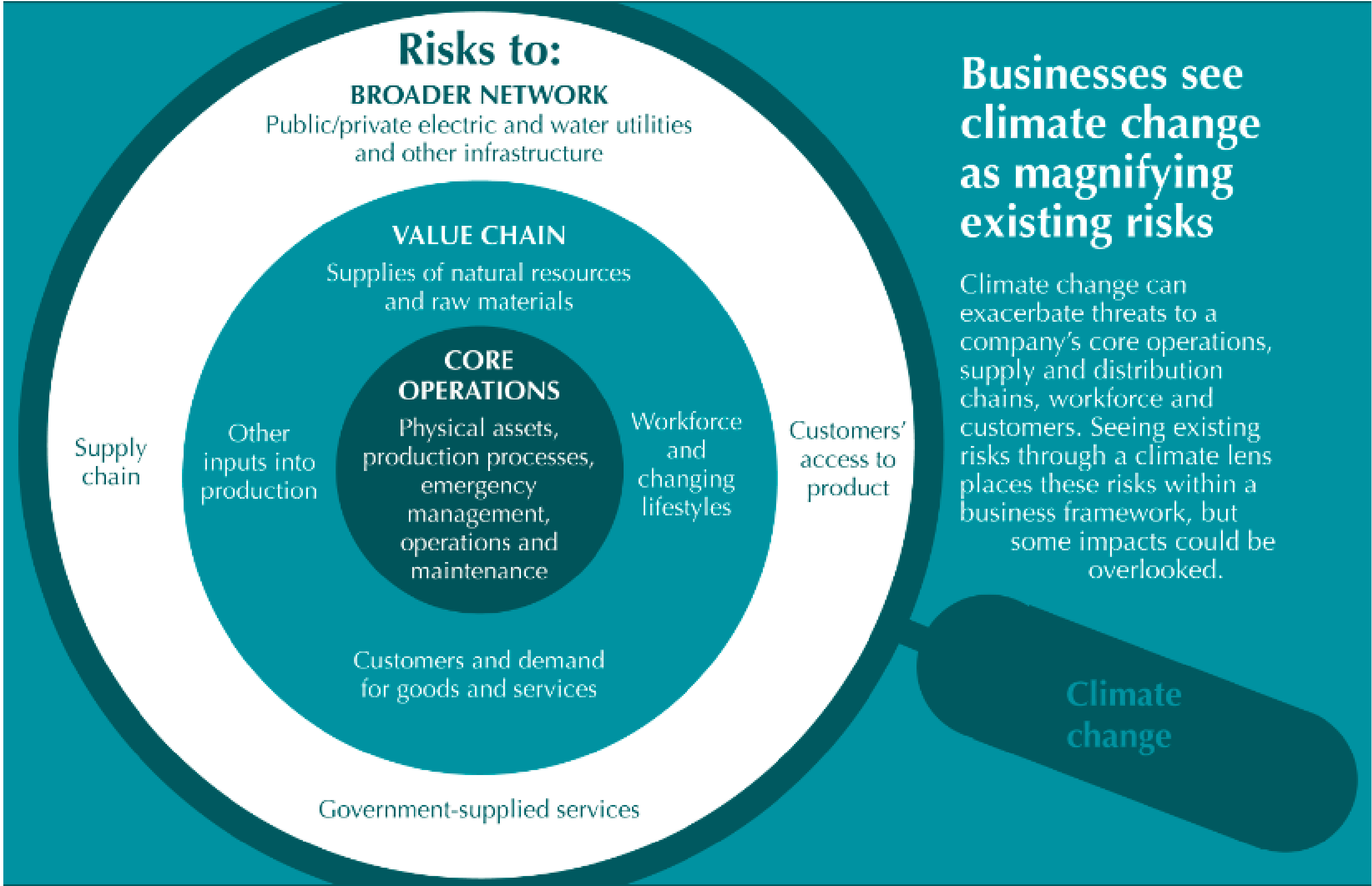
# Climate Adaptation: Risk and Opportunity

Vertical Investments	Sample Sub-Segments	Examples of Identified Companies
 <p>Water</p>	<p>+ Water efficiency products (low flow, loss reduction), desalination and re-use</p>	<p>+ Company that treats and recycles water</p>
 <p>Agriculture</p>	<p>+ Drought resistant seeds, drip irrigation, precision agriculture, resilient food storage &amp; logistics</p>	<p>+ Company that examines weather data to provide insurance to farmers</p>
 <p>Healthcare</p>	<p>+ Pharma, vaccines vs. new disease vectors (e.g., blue tongue, dengue), resilient facilities for extreme weather events</p>	<p>+ Company that provides climate health analytics to hospitals</p>
 <p>Energy</p>	<p>+ Resilient generation: CHP, distributed, backup; Resilient distribution: micro-grids, storage and disaster recovery</p>	<p>+ Company that manufactures systems for wind and solar assessment</p>
 <p>Coastal Area</p>	<p>+ Early warning systems, advanced weather/ climate resilient materials, design tech</p>	<p>+ Company that provides flood maps for coastal regions</p>
 <p>Insurance / Financial</p>	<p>+ Specific climate related risk insurance, risk assessment, micro-lending and micro-insurance related to adaptation efforts</p>	<p>+ Company that provides parametric insurance services</p>



- What climate-related damage is foreseen?
- What is the financial extent of the risk?
- Are investors engaged to improve safety, livelihoods?
- What City finance innovation is anticipated?

# Business Risk from Climate Change is Beyond the Fenceline

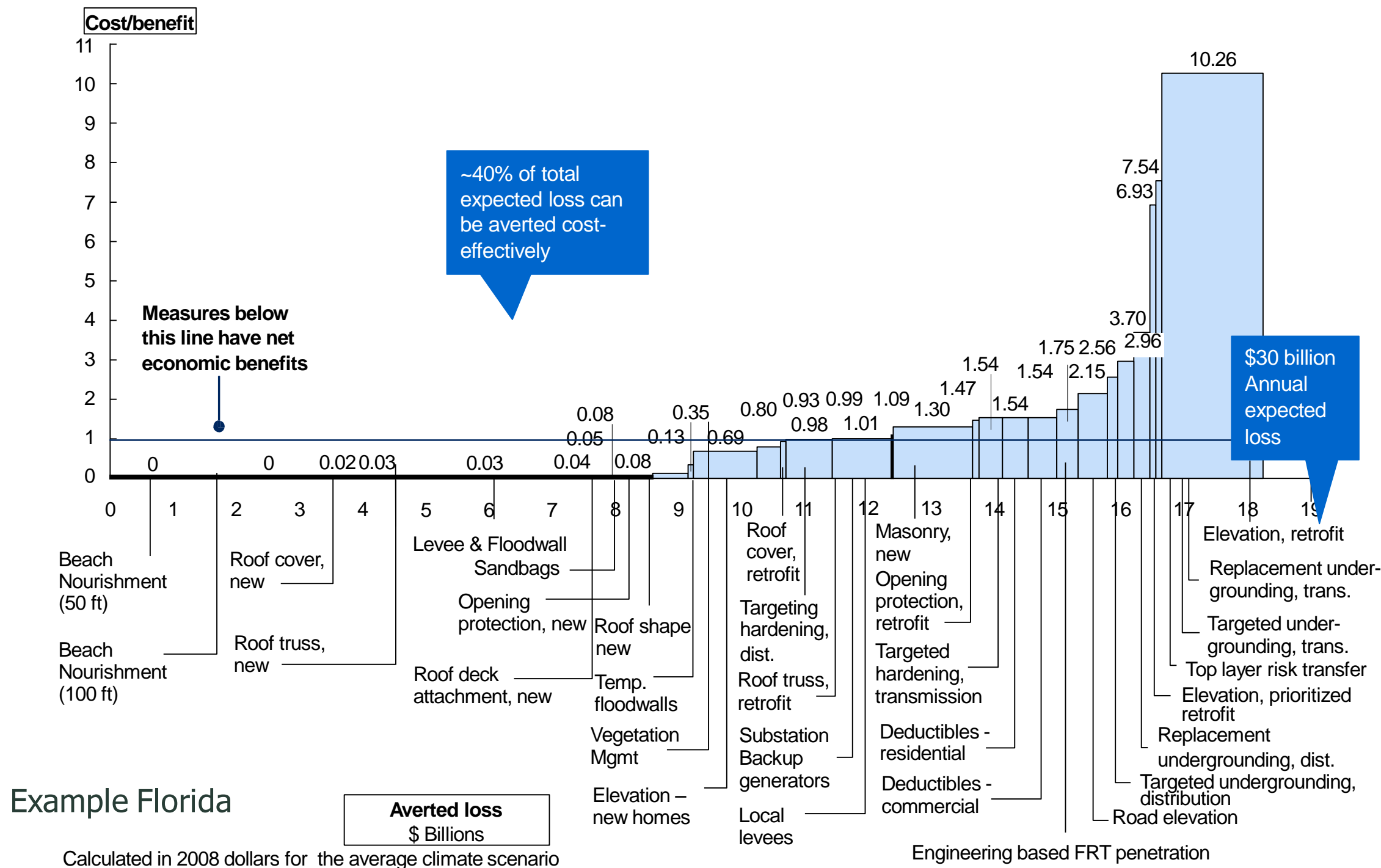




# Corporate Action: ERM • Innovation • CSR • Supply Chain • PPP

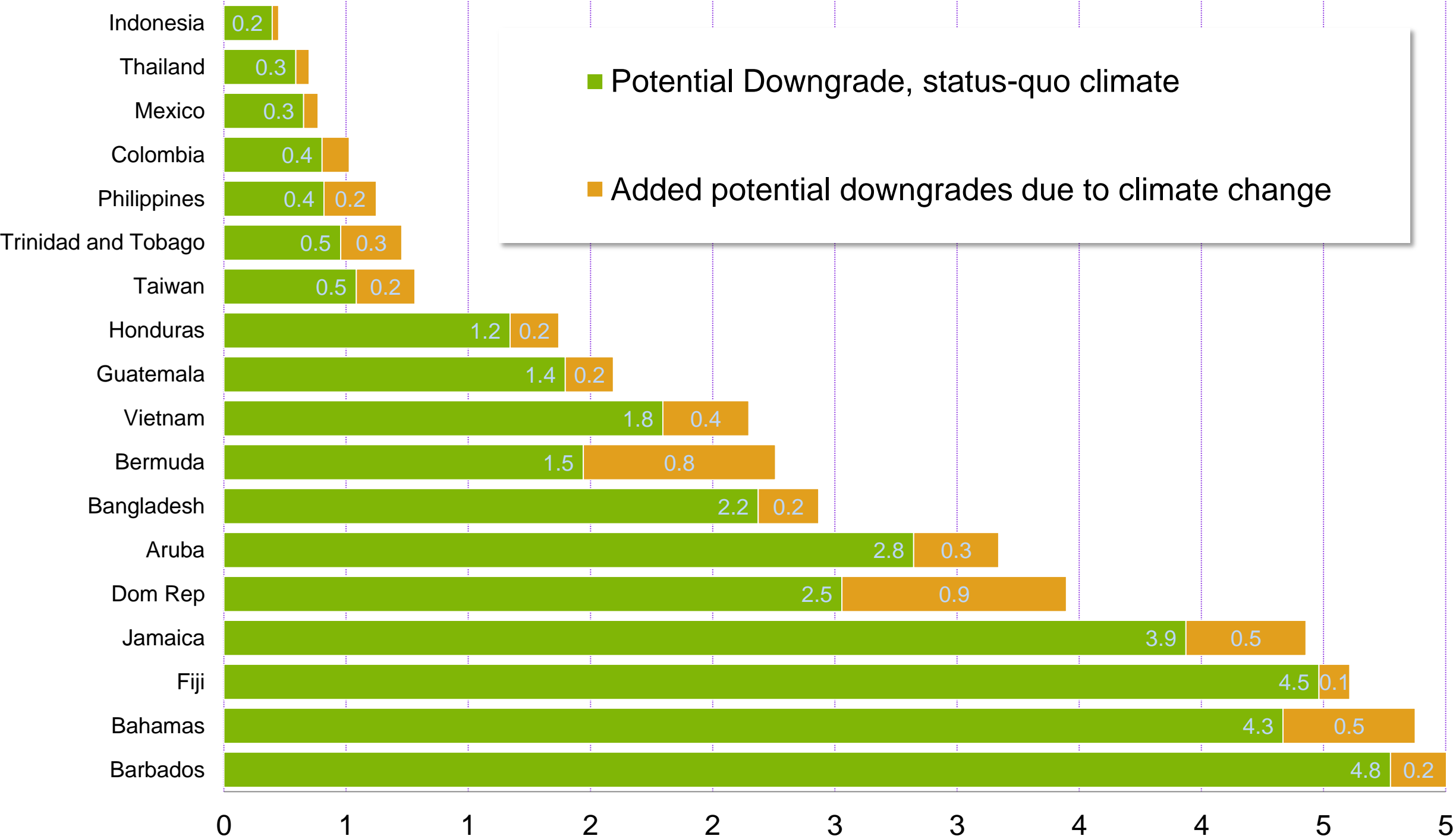


# Adaptation Options (FL example)

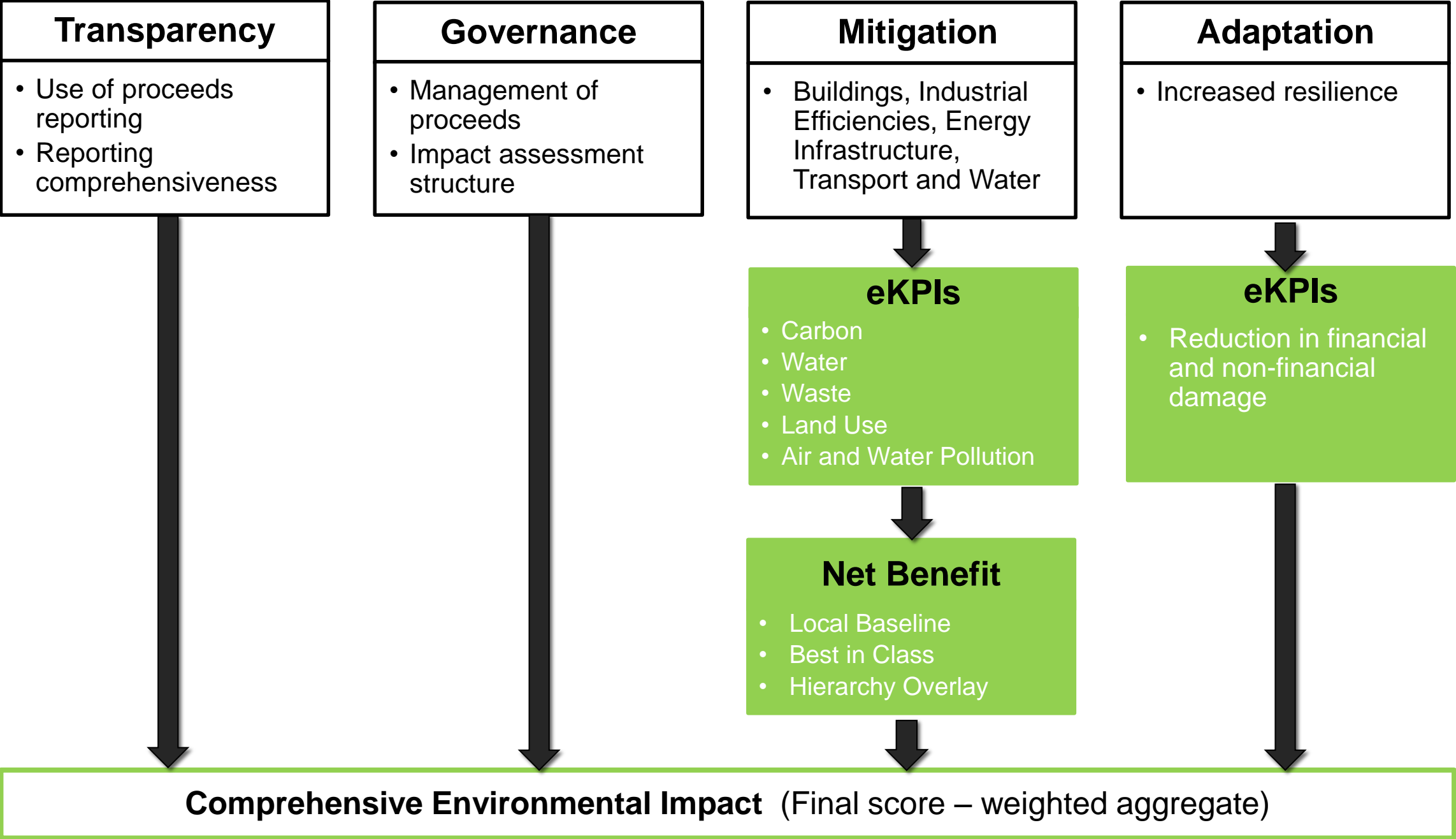




# Potential Sovereign Rating Downgrade due to Climate Risk



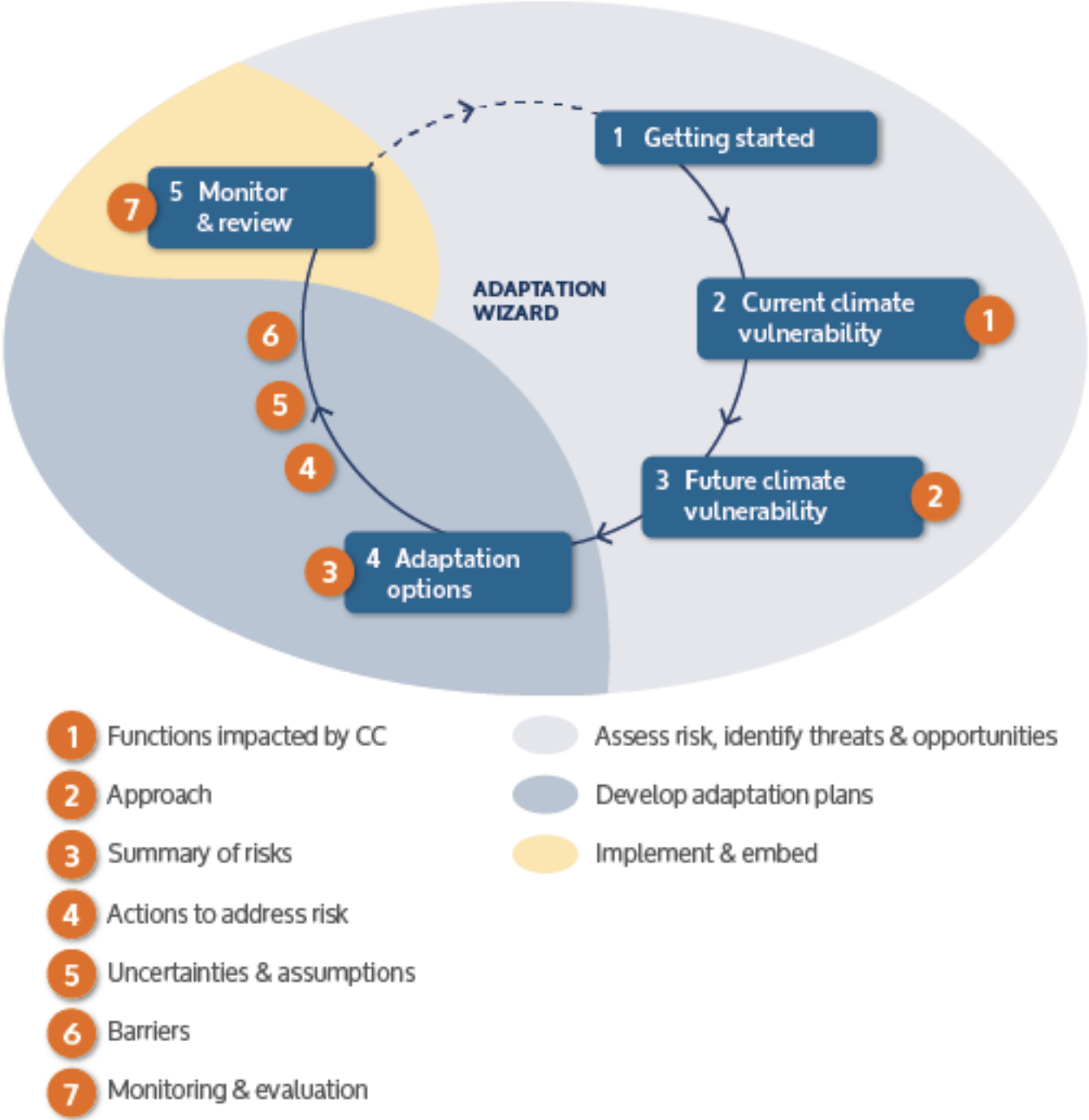
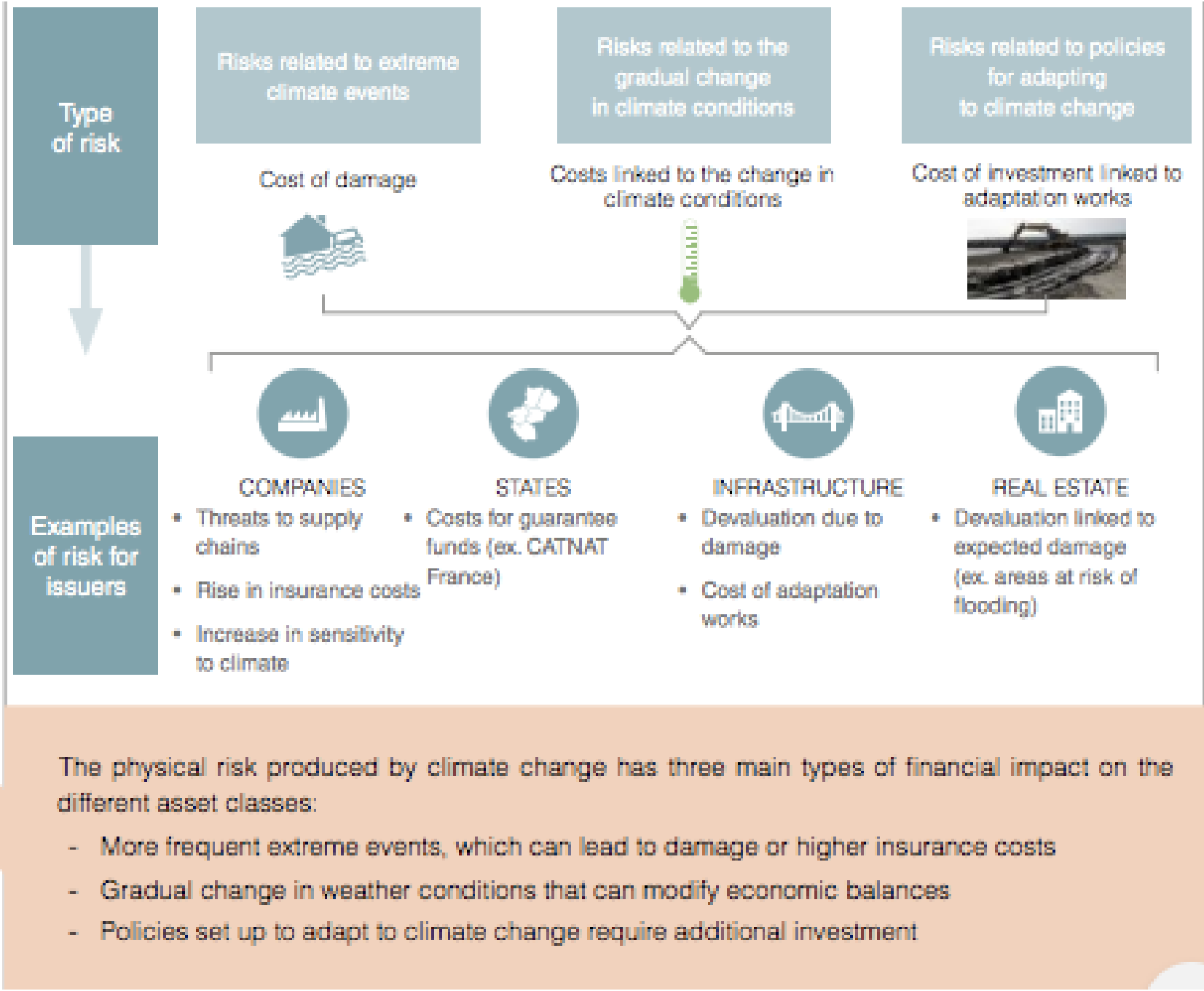
# S&P's Green Bond Evaluation



\* eKPI – Environmental Key Performance Indicator



# European Law: French Art. 173-VI; UK Adaptation Reporting Power

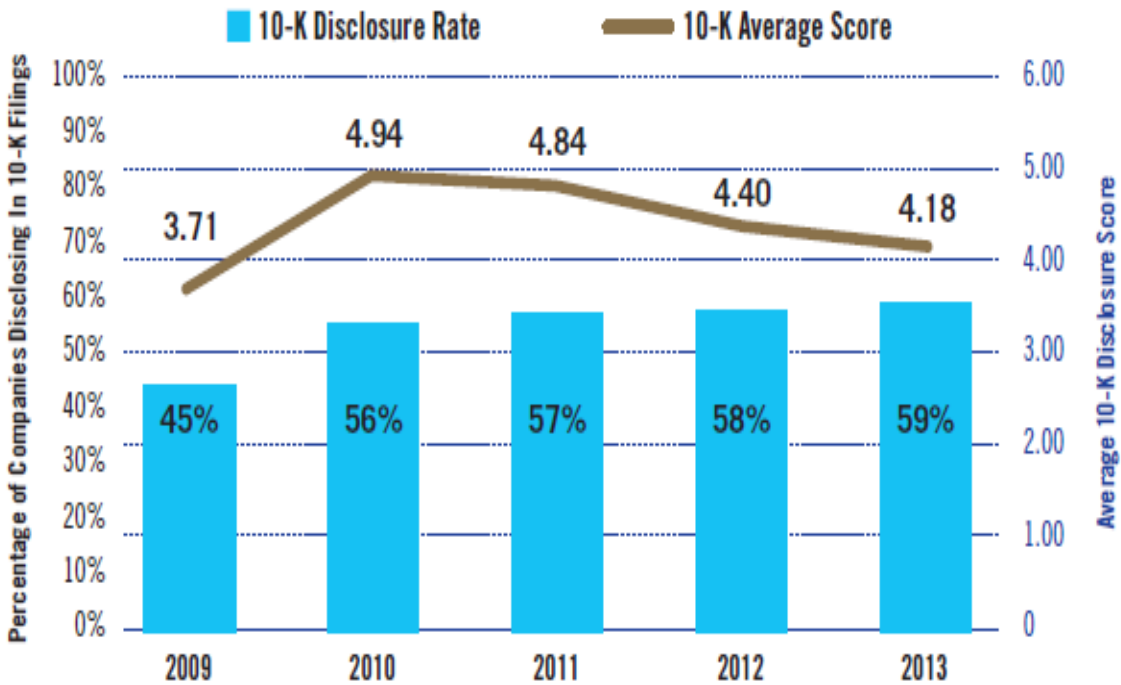


# Climate Risk Disclosure



FIGURE 1: 10-K CLIMATE DISCLOSURE BY S&P 500 COMPANIES, 2009-2013

(Note: 10-K disclosure scores range from 0-100)

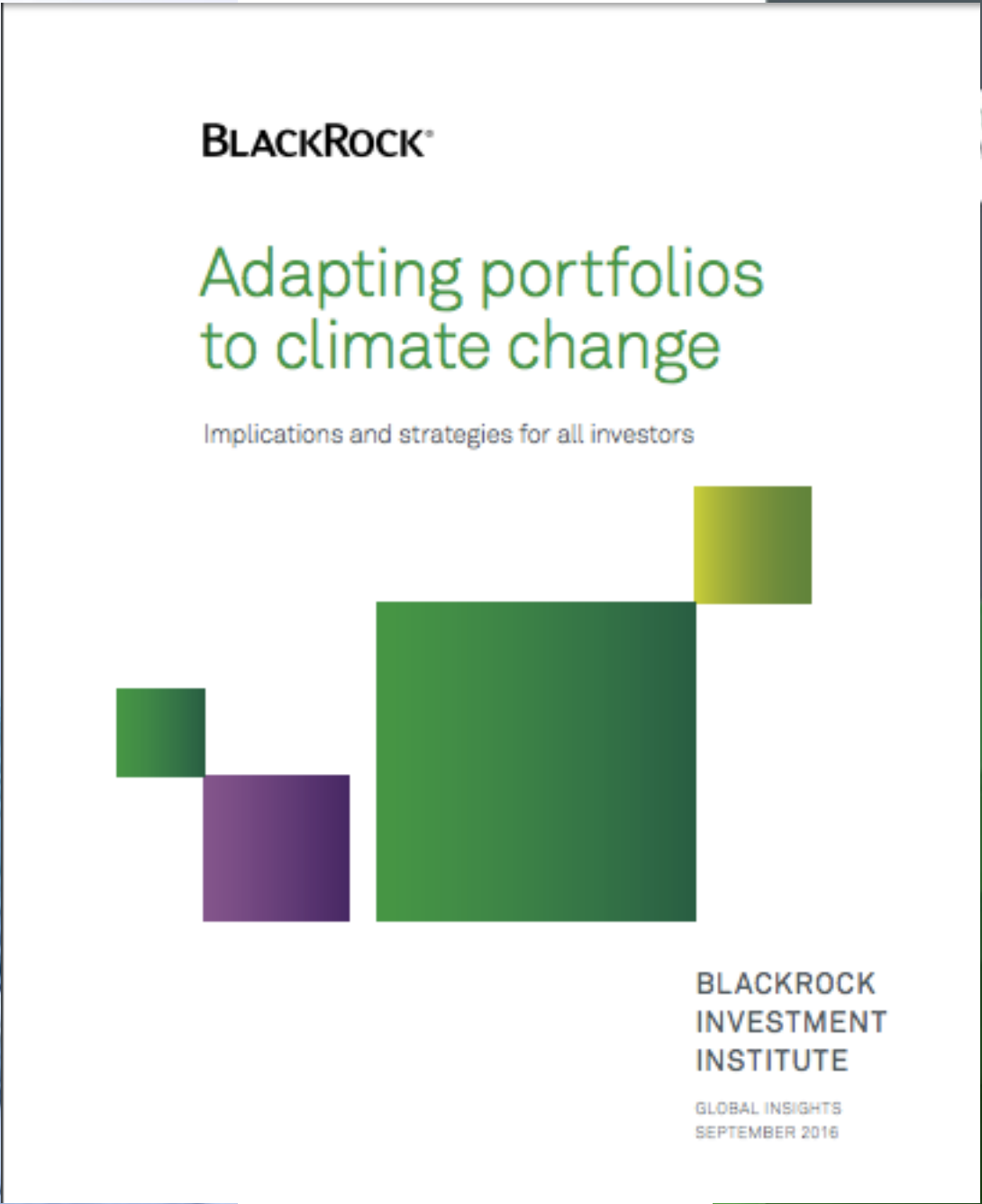


WORKING DRAFT: FOR COMMENT  
SUSTAINABILITY ACCOUNTING STANDARDS BOARD

## Phase I Report of the Task Force on Climate-Related Financial Disclosures

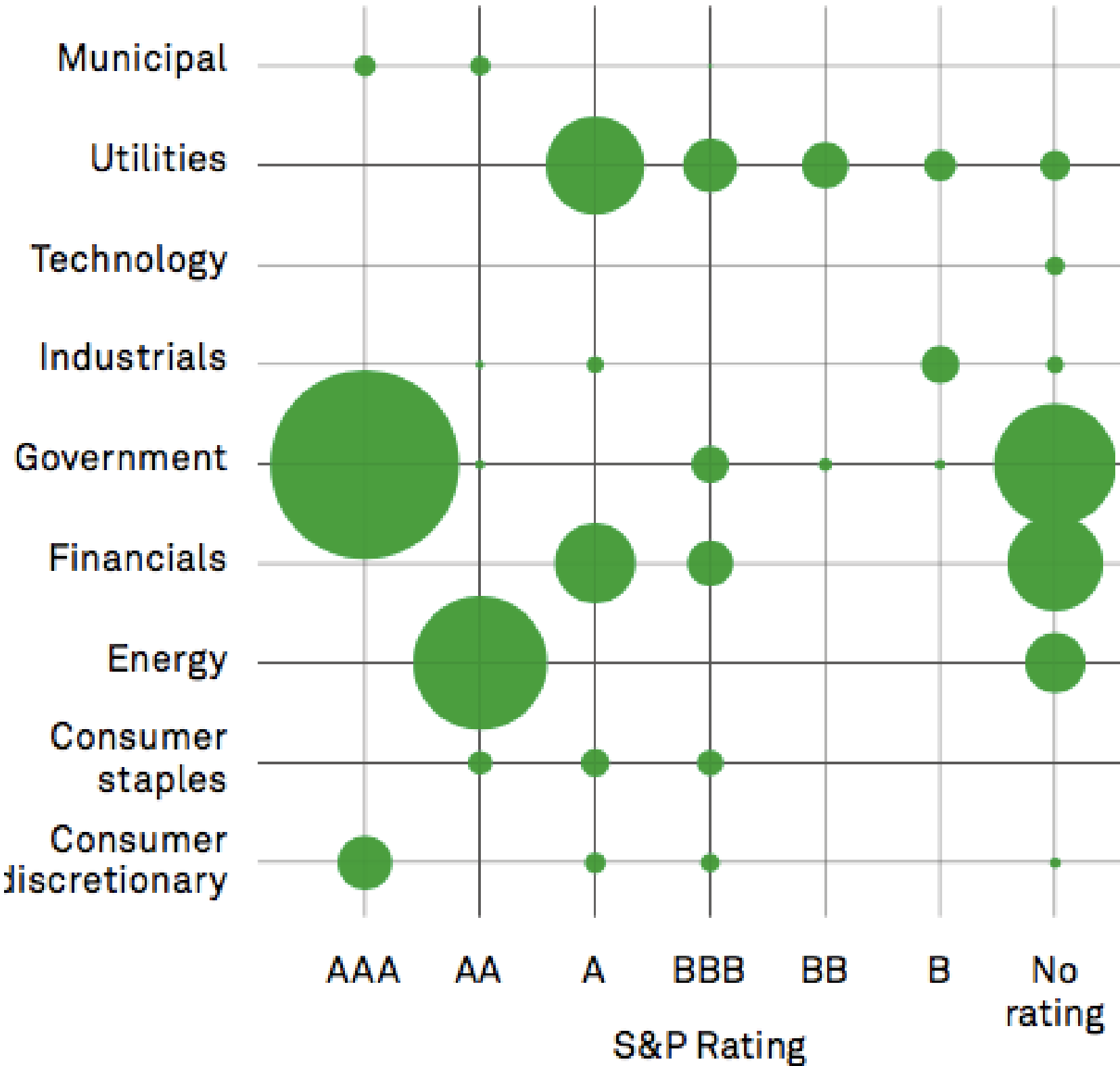
Presented to the Financial Stability Board  
March 31, 2016

# Investor Awareness of Climate Risk

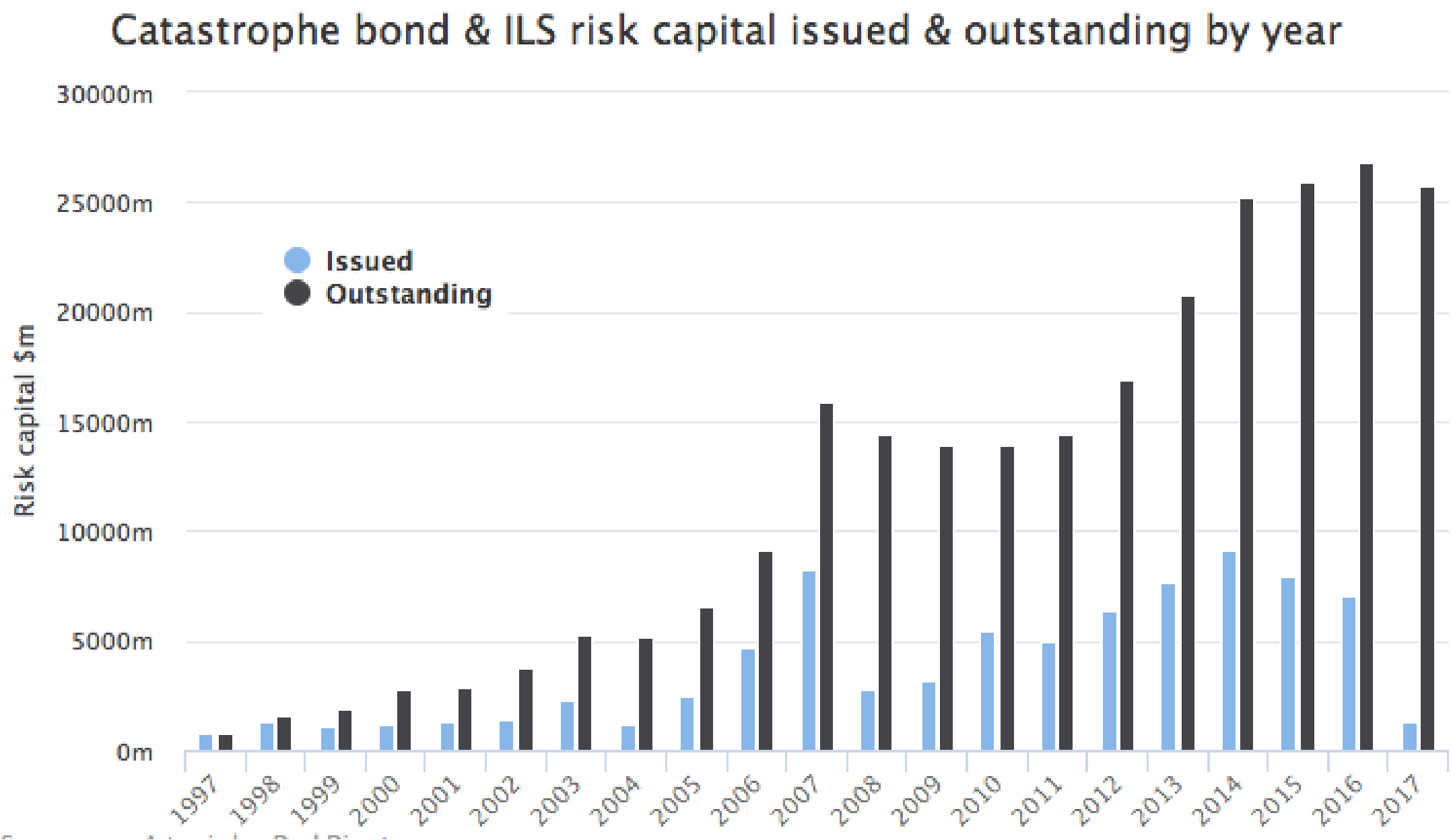




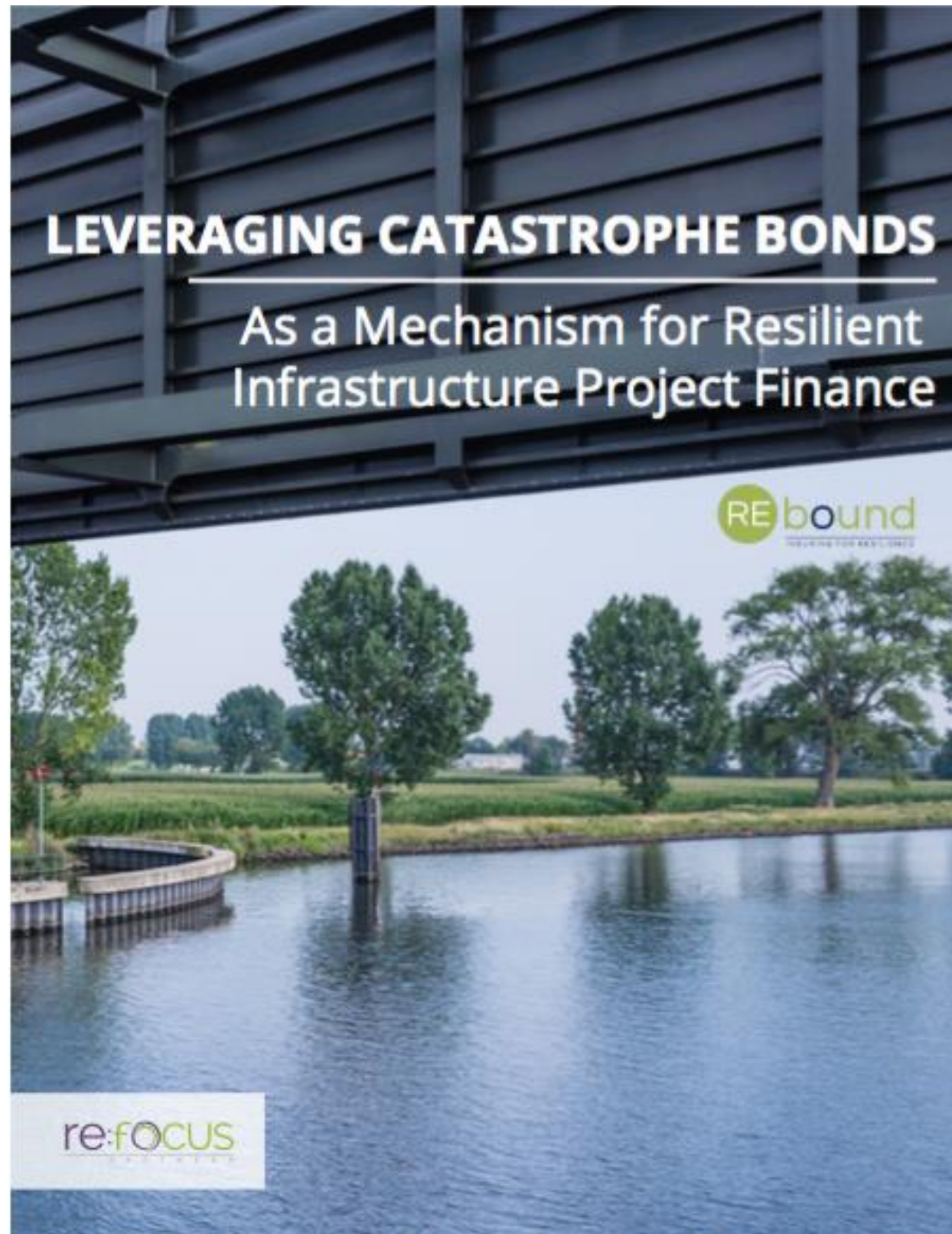
# Green Bonds \$42B '15 (\$11B '13 )



# Catastrophe Bond Transactions



# Innovative Adaptation Finance Mechanisms

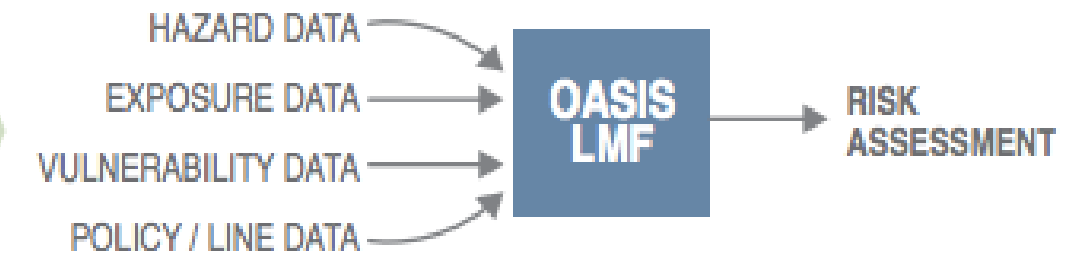


## Oasis Platform for Catastrophe and Climate Change Risk Assessment

Better risk assessment achieved through the **3** components of the OASIS Platform:

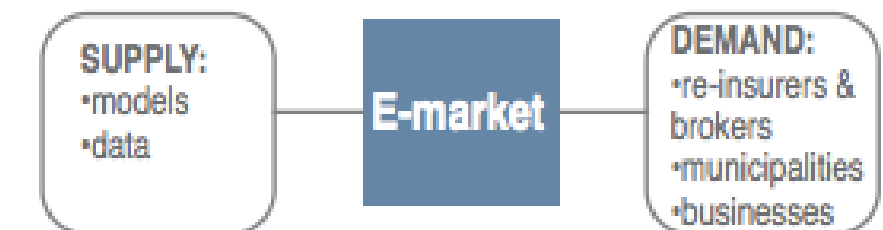
### ① Loss Modeling Framework (LMF)

Assesses standardized data to quantify potential economic and financial consequences from catastrophic events



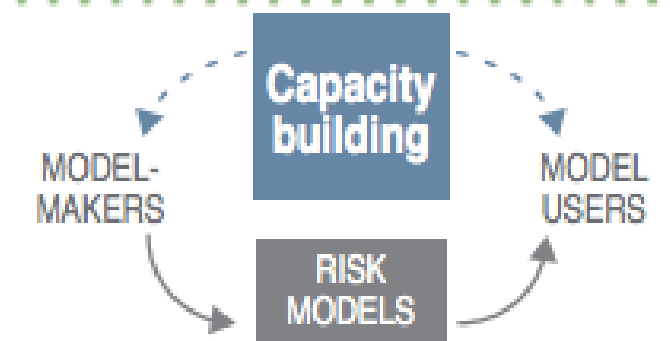
### ② E-market

Links supply (of risk assessment models) with demand for these models by end users.



### ③ Capacity Building

Training for model-makers and model users to develop and use catastrophe risk models using standardized approach and data.





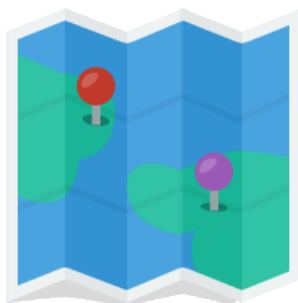
## Global Adaptation and Resilience Fund



### THE INVESTMENT OPPORTUNITY

\$500 million - \$1 billion growth equity vehicle that invests in 10 - 20 companies

#### Climate Risk Maps



Weather/Climate Analytics



Flood Risk Models



Climate Risk Consulting/Engineering

#### Climate Adaptation Tools



Water Efficiency Devices



Drought Resistant Agriculture



Climate Resilient Healthcare



- What climate-related damage is foreseen?
- What is the financial extent of the risk?
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# Every \$1 for Risk Mitigation Saves Society \$4



National Institute of  
BUILDING SCIENCES

Security & Disaster  
Preparedness

## Multihazard Mitigation Council





# Bang for the Buck— Infrastructure Spend \$1.44

Fiscal Stimulus Multipliers	
As of 2011Q3	
	Bang for the Buck
Tax Cuts	
Refundable Lump-Sum Tax Rebate	1.22
Nonrefundable Lump-Sum Tax Rebate	1.01
Temporary Tax Cuts	
Child Tax Credit, ARRA parameters	1.38
Payroll Tax Holiday for Employees	1.27
Earned Income Tax Credit, ARRA parameters	1.24
Job Tax Credit	1.20
Making Work Pay	1.19
Payroll Tax Holiday for Employers	1.05
Across-the-Board Tax Cut	0.98
Housing Tax Credit	0.82
Accelerated Depreciation	0.29
Loss Carryback	0.25
Permanent Tax Cuts	
Extend Alternative Minimum Tax Patch	0.53
Make Dividend and Capital Gains Tax Cuts Permanent	0.39
Make Bush Income Tax Cuts Permanent	0.35
Cut in Corporate Tax Rate	0.32
Spending Increases	
Temporary Increase in Food Stamps	1.71
Temporary Federal Financing of Work-Share Programs	1.64
Extending Unemployment Insurance Benefits	1.55
Increase Defense Spending	1.53
Increase Infrastructure Spending	1.44
General Aid to State Governments	1.34
Low Income Home Energy Assistance Program (LIHEAP)	1.13

*Note: The bang for the buck is estimated by the one-year \$ change in GDP for a given \$ reduction in federal tax revenue or increase in spending.*

Source: Moody's Analytics

## Spending Increases

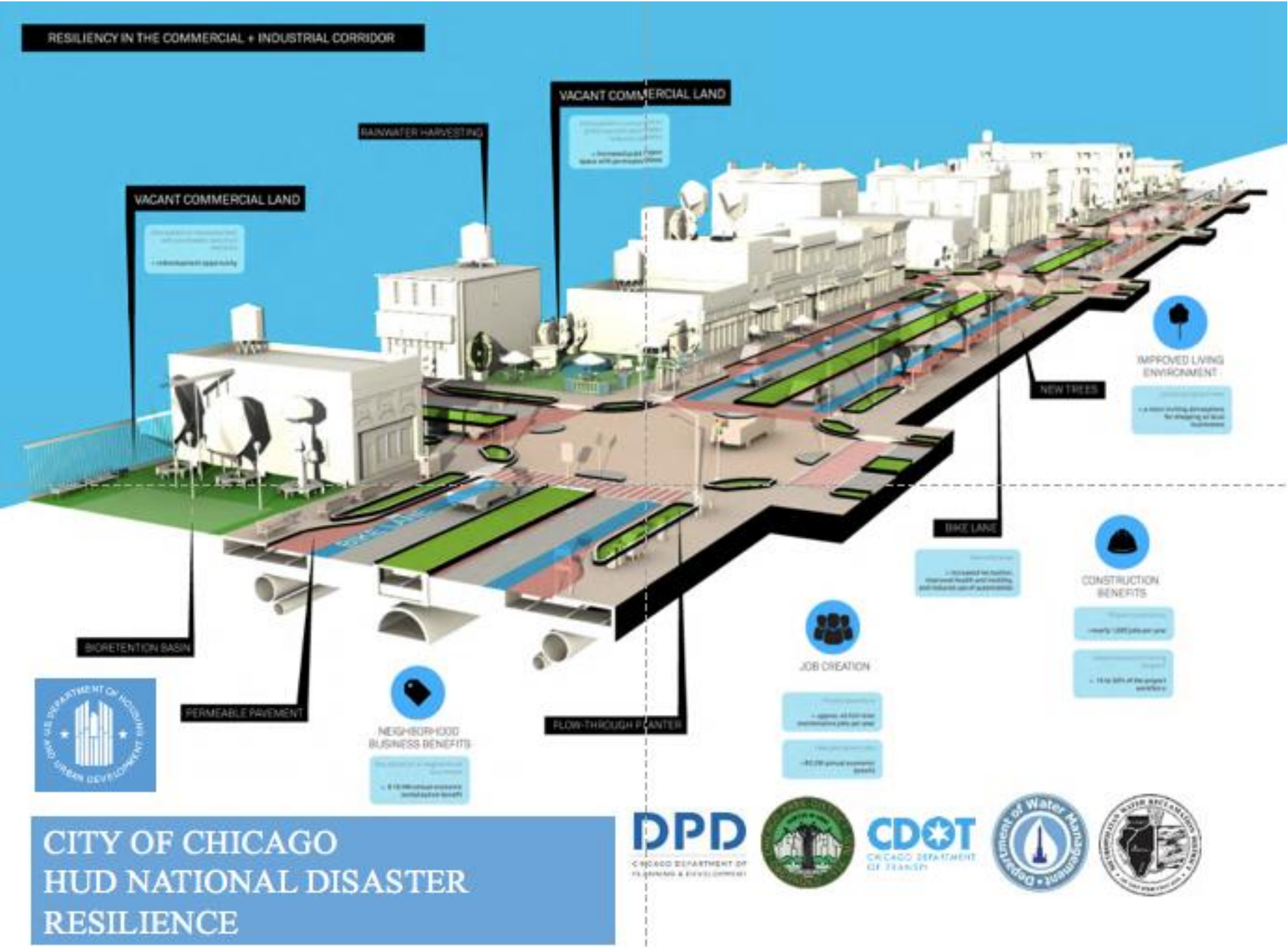
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# Cities know the Risks are Beyond Climate Vulnerability



# National Disaster Resilience Competition





# C40 Cities Finance Facility

## C40 Cities Finance Facility



The C40 Cities Finance Facility (CFF) facilitates access to finance for climate change mitigation and resilience projects in C40 cities in developing countries and emerging economies.



City Resilience Strategies



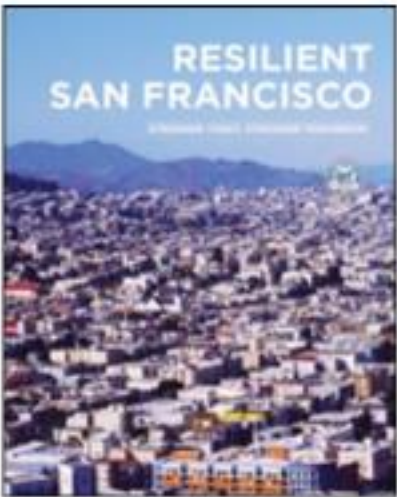
New York City



New Orleans



Berkeley



San Francisco



Norfolk



Boulder

Anticipated



# Urban Resilience to Extremes SRN



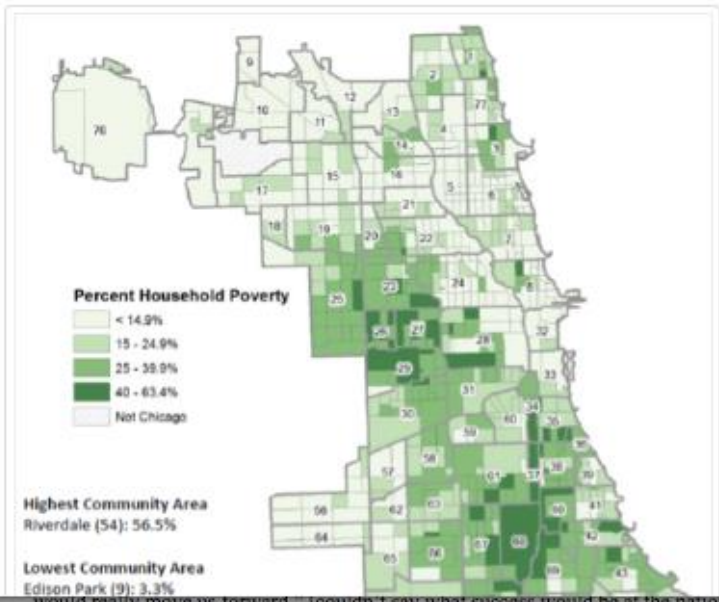


# How Health, Climate Change, and Social Justice Intersect in Chicago

by 3p Contributor on Wednesday, Dec 14th, 2016 SOCIETY

SHARE

  122  38   



# As Feds Devalue Science, It's Time To Take It to the City

by 3p Contributor on Wednesday, Mar 1st, 2017 SOCIETY

SHARE

  8  16   



I'm immersed in a fascinating variety of projects for the Rockefeller Foundation and Regional Plan Association and all include a similar question about how to finance urban resilience. That got me wondering: What well-known financing solutions could help us to finance more adaptation today?

Here are seven:

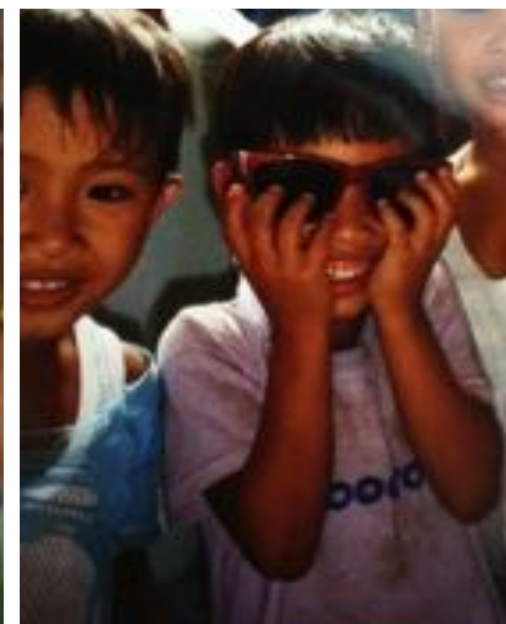
1. **Climate Reinvestment Act:** In the post-housing bust period, Community Reinvestment Act funds have shifted to financing schools and the like from funding low-income housing. This has been a shift for banks that used to achieve their CRA goals within their general market share in low-value mortgages. So, what if banks to meet the credit needs of the communities where they operate used CRA investments for resilience that improved communities, such as green infrastructure to absorb stormwater and prevent flooding? Or how about LaSalle Bank, which a decade ago paid for tree planting along the Chicago marathon route counter urban heat island and runner's heat stress.

2. **General Obligation Bonds:** Cities are reluctant to assume more debt, worried especially about damaging their credit ratings. Yet, deferred maintenance, presumably triggered partly by insufficient bonds to pay for infrastructure improvements, means that much of the country's infrastructure earns a dismal grade of D+ from the Society of Civil Engineers. Credit raters, though, are rational actors and more of them are mindful of resilience – vis-a-vis **Standard & Poor's recent reports** on the impact of climate risk on sovereigns and corporations – and it's a great time to borrow with interest rates low and investors seeking to diversify from stocks in a bull market.



# Parking lot





Joyce Coffee  
Joyce@climateresilienceconsulting.com

Climate  
Resilience  
Consulting