

The Climate Resilience Gap

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RNRF

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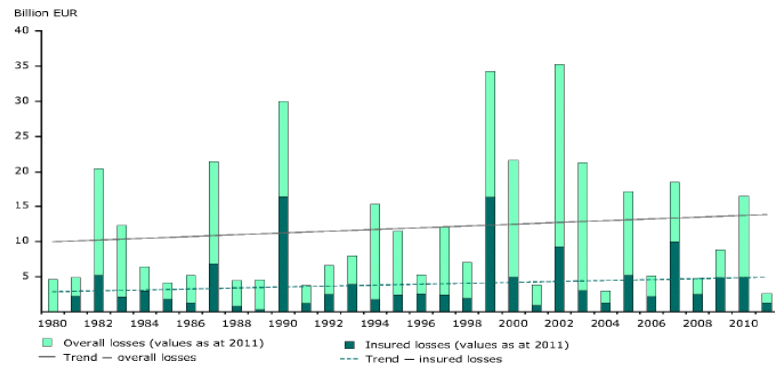


Climate Change Impacts: Loss / s ?

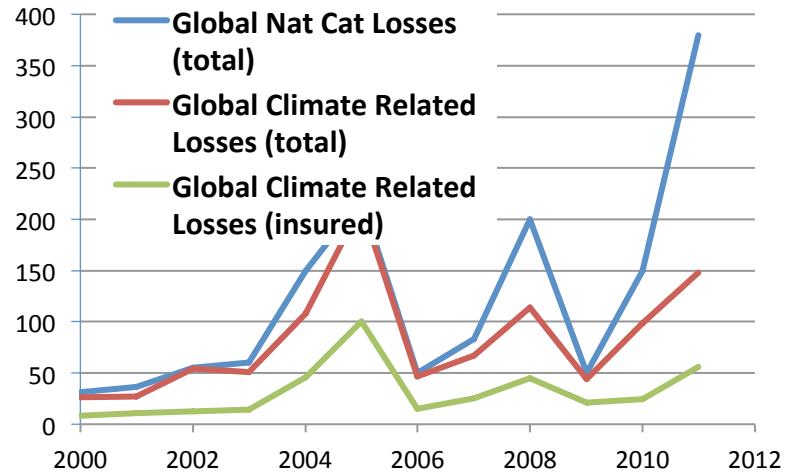
Worldwide Natural Disasters Losses 1980 – 2012 & EU& US Disaster Payments v Total Loss Cost Ratio



Graph 7: Natural disasters in EEA States (1980 to 2011) – overall and insured losses



Source: European Environment Agency, *Climate change, impacts and vulnerability in Europe 2012, An indicator-based report*, EEA Report No 12/2012.



Derived from MR NatCatSERVICE data 2012

Figure 4: Ratio of Total Federal Government Disaster Expenditures to Measured Losses

Source: Cummins, Suher, and Zanjani (2010)²

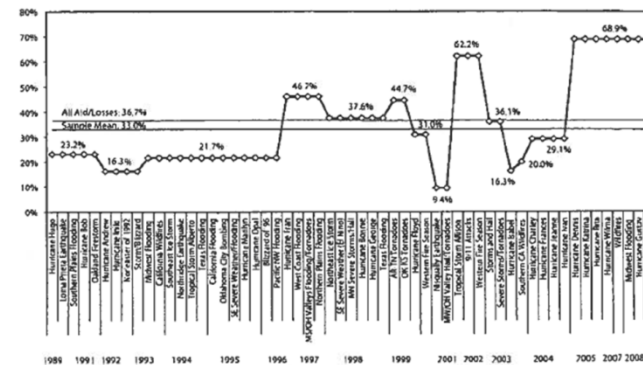
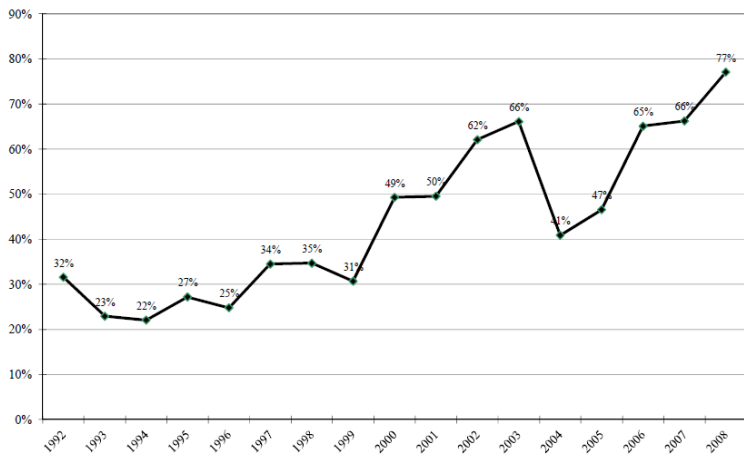


Fig. 4.3 Federal aid ratios: 1989 to 2008

Note: Each data point represents a specific disaster in our sample, with labels for the most significant disasters. The “all aid/losses” ratio is computed after adjusting loss and aid figures by our 2008 exposure index. This index captures both price-level changes and changes in the size of the housing stock. This yields a ratio that is not overweighted by recent disasters.

Cummins 2010 / 2013 Unfunded Federal Disaster Response Costs



*Over 75 year horizon
2008 dollars

*Social Security: 4.7T
GAO

*Unfunded Federal Disaster Recovery Costs \$1.1 T – 5.4T
Cummins (2010 / update 2013)

*Current US State Cat Funds
\$3T USD underfunded according to

<http://www.hawaiireporter.com/hurricane-sandy-pacific-tsunami-scare-expose-state-catastrophe-debts/123>
Citing GAO-10-568R Natural Catastrophe Insurance Coverage GAO 2010
Federal Financial Exposure to Natural Catastrophe Risk” J.David Cummins, Michael Suher, and George Zanjani (2010),
corrected.

Climate Resilience Gap



World Bank Definition of Resilience

- ‘the ability of a system, community, or society exposed to hazards to resist, absorb, accommodate to, and recover from the effects of hazard in a timely manner, including through the preservation and restoration of its essential basic structures and functions’. (Dickson, et. al, 2012).

US DHS Definition of Resilience

- ‘...the ability to adapt to changing conditions and withstand and rapidly recover from disruption due to emergencies. One major component of resilience is the capacity of society’s assets or its built environment to withstand or quickly recover from weather-related catastrophes...’

The optimal expenditure on insurance against the risk of natural catastrophe in a given year is the expected loss resulting from natural catastrophes in that year. Subtracting the expected loss as a proportion of GDP for each country from the insurance penetration figures for each country provides an estimate of the insurance penetration of each country, after accounting for the optimal insurance against the risks associated with natural catastrophes. This can be represented as:

$$\text{Insurance penetration (proportion of GDP)} - \text{expected loss (proportion of GDP)} \\ = \text{expected loss adjusted insurance penetration}$$

Worked example - Estimating underinsurance for Brazil in 2011

Non-life insurance penetration in 2011:	1.5%
LESS Expected annual loss (% of GDP):	(0.11%)
Expected loss adjusted insurance penetration:	1.3%
LESS Benchmark requirement (for middle income):	(1.9%)
Benchmarked insurance coverage:	-0.51%
Underinsurance (0.51% of nominal GDP in 2011 in \$US)	\$12.68bn

Source: Lloyds Global Underinsurance Report October 2012

Table 3 – Benchmarked insurance coverage (2011)



Rank	Country	Benchmarked insurance coverage	Underinsurance (US\$ bn)	Rank	Country	Benchmarked insurance coverage	Underinsurance (US\$ bn)
1	Netherlands	8.01	-	22	Norway	0.25	-
2	New Zealand	3.05	-	23	Malaysia	0.15	-
3	South Korea	2.55	-	24	United Arab Emirates	0.08	-
4	United States	2.53	-	25	Singapore	0.08	-
5	Canada	2.47	-	26	Hong Kong	-0.03	\$0.08
6	Germany	2.11	-	27	Poland	-0.15	\$0.78
7	Austria	1.67	-	28	Colombia	-0.17	\$0.57
8	United Kingdom	1.60	-	29	Thailand	-0.41	\$1.41
9	Australia	1.39	-	30	Brazil	-0.51	\$12.68
10	Denmark	1.36	-	31	Mexico	-0.67	\$7.78
11	Spain	1.05	-	32	Saudi Arabia	-0.93	\$5.35
12	South Africa	1.02	-	33	Chile	-0.97	\$2.40
13	Taiwan	0.97	-	34	China	-1.09	\$79.57
14	Ireland	0.75	-	35	Nigeria	-1.11	\$2.64
15	Italy	0.62	-	36	India	-1.18	\$19.72
16	Argentina	0.44	-	37	Turkey	-1.31	\$10.23
17	Israel	0.44	-	38	Egypt	-1.36	\$3.20
18	Sweden	0.44	-	39	Philippines	-1.36	\$2.90
19	Japan	0.43	-	40	Vietnam	-1.38	\$1.69
20	France	0.39	-	41	Indonesia	-1.67	\$14.12
21	Russia	0.34	-	42	Bangladesh	-2.64	\$2.99
	Total underinsurance		-		Total underinsurance		\$168.11

What Happens When There Is Not Enough Money to Pay for Loss and Damage ?

- It depends...
 - recent research suggesting that it is only the uninsured portion of a disaster loss that tends to lead to permanent macroeconomic losses
(von Peter, G., S. von Dahlen, S. Saxena (2012). “Unmitigated disasters? New evidence on the macroeconomic cost of natural catastrophes.” Working Paper, Bank for International Settlements)
 - **Potential tort litigation ?** (see Geneva Association http://www.genevaassociation.org/PDF/Risk_Management/GA2011-RMSC5.pdf) (See also <http://web.law.columbia.edu/climate-change>)

Insurance Is Part of the Solution to Bridging the Climate Gap



BANK FOR INTERNATIONAL SETTLEMENTS

BIS Working Papers No 394 Unmitigated disasters? New evidence on the macroeconomic cost of natural catastrophes

by Goetz von Peter, Sebastian von Dahlen, Sweta Saxena
Monetary and Economic Department
December 2012

JEL classification: G22, O11, O44, Q54.

Keywords: Natural catastrophes, disasters, economic growth,
insurance, risk transfer, reinsurance, recovery, development.

“Abstract

This paper presents a large panel study on the macroeconomic consequences of natural catastrophes and analyzes the extent to which risk transfer to insurance markets facilitates economic recovery. **Our main results are that major natural catastrophes have large and significant negative effects on economic activity, both on impact and over the longer run. However, it is mainly the uninsured losses that drive the subsequent macroeconomic cost, whereas sufficiently insured events are inconsequential in terms of foregone output.** This result helps to disentangle conflicting findings in the literature, and puts the focus on risk transfer mechanisms to help mitigate the macroeconomic costs of natural catastrophes.” (emphasis added)

Role of Risk Transfer



The role of risk transfer

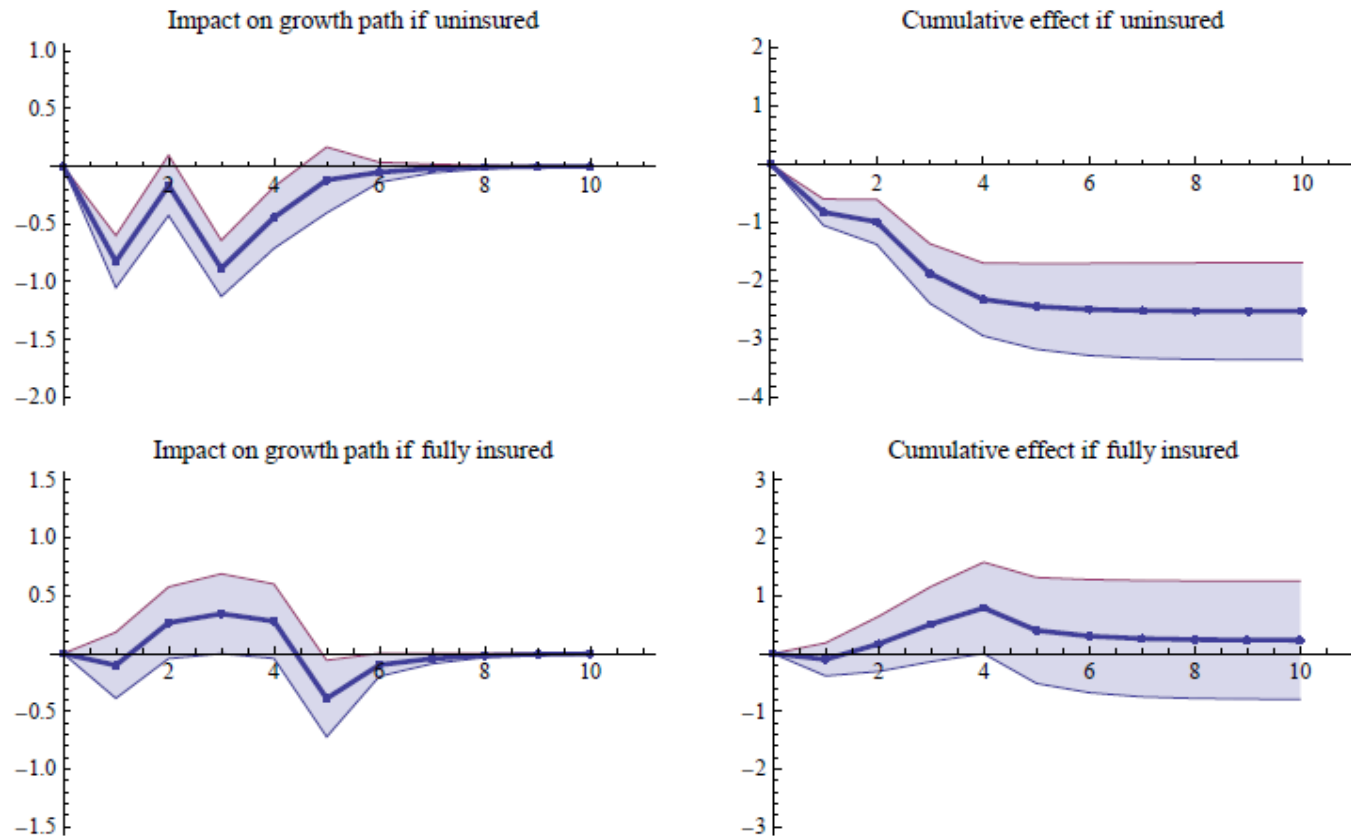


Figure 4: The impulse response function traces out the path of GDP growth over time by simulating the recursive equation (4) using the regressor $\text{Log}_{10}(\text{Loss})$, with the estimated coefficients from Table 3 (column 1), as described under Figure 2 (10,000 realizations). The upper panels simulate the growth response to a completely uninsured event of severity equal to the mean size of uninsured losses in the sample. The lower panels simulate a hypothetical fully (100%) insured event of severity equal to the mean size of insured losses.

“Unmitigated Disasters? New Evidence on the Macroeconomic Costs of Natural Catastrophes”, von Peter, et al 5 December 2012, BIS Working papers no 394. Available at www.bis.org
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Welfare Economics of Disaster Assistance: Theory vs Reality



- *“the rapidly expanding dollar size of governmental post disaster relief now confronts the budgetary and fiscal mandate realities in many countries to reduce government expenditures. It is thus valuable at this time to review the fundamental welfare economics of post-disaster government aid and to reconsider the private market insurance and mitigation options that may be available to reduce these government expenditures.”*
- *“The reality, of course, is that government transfers may entail significant costs,”*
- *“In cases where an insurable interest is a requirement to purchase insurance, risk transfer through insurance markets may systematically reduce the need for post-event government aid, and a requirement for individuals to purchase such insurance could be welfare enhancing as a second-best outcome.”*

Climate Change Legal Liability: Tort Liability; Administrative Action



- Recent U.S. Climate Change Liability Decisions

- *AEP v. Connecticut*
- *Comer v. Murphy Oil*
- *Native Vill. of Kivalina v. Exxon Mobil*
- *Lattimore v. United States*, No. 12-1092 (Supreme Court)
 - Known as *In Re Katrina Canal Breaches Consolidated Litigation*

- Administrative / Civil Actions

- *Czech Republic/Micronesia* (2009-2011)
- *Palau* (2011)
- *Stichting Urgenda* (2013)
- *Bangladesh* (2011): first country in the world to incorporate climate change into its constitution
- CEQ: Draft NEPA Guidance On Consideration of The Effects Of Climate Change And Greenhouse Gas Emissions



Why Isn't Climate Risk Science Enough to Incentivize Behavior & Public Policy Change ? & How Can We Incent Change ?



Challenge

- Economics ...
 - Fear has limitations as a driver – especially if immediate risks are competing for attention & are easily understood.
 - Our industry has identified risks but has provided only one unified recommendation for solutions: risk based pricing
 - Resiliency and exposures are now so far out of economic balance that risk based pricing is often unaffordable

Research Opportunity

- Economics research focused on alternatives to isolated recommendations for RBP.
- New models which show options for risk financing – especially transition to resiliency sufficient to make RBP affordable – are essential for insurance to affirm its role in society...

Policy Exemplar – with economic focus but science limitations



- Flood Re

- Economic framework
- Cross subsidy
- Focused on affordability
- *“The proposed new scheme, Flood Re, offers some promising, innovative approaches for dealing with affordability and availability, but it has fundamental shortcomings”**.

Limitations ? Does not include climate science projections.

*“The design of the Flood Re scheme, which is expected to last until at least 2035, has not taken into account adequately, if at all, how flood risk is being affected by climate change. For this reason, it is likely to be put under increasing pressure and may prove to be unsustainable because the number of properties in future that will be at moderate and high probability of flooding has been significantly underestimated.”**

(Source: *Response to public consultation on ‘Securing the future availability and affordability of home insurance in areas of flood risk’ Swenja Surminski, Florence Crick, Jillian Eldridge and Bob Ward August 2013 Centre for Climate Change Economics and Policy Grantham Research Institute on Climate Change and the Environment)

Addressing Affordability in NFIP



- **Kousky and Kunreuther August 2013**
- Addresses this economic question: “How might the NFIP provide insurance to residents who may require special treatment, such as low-income homeowners residing in flood-prone areas, because they cannot afford the higher risk-based premiums?”
- Recommendations:
 - not be done through discounted premiums
 - means-tested voucher program only (not traditional subsidy) plus
 - loan program for investments in loss reduction measures, which would be tied to the property;
 - Loans can be forgiven if needs based testing is met and specific ‘resiliency standard’ (risk mitigation) is achieved; and
 - Premium made affordable by reductions in the NFIP risk-based premium for those loans where repayments are not waived.
- Limitations: risk mitigation costs estimates are over-optimistic –see next slides



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Abstract

Key Findings

Recommendations

Take-Up Rates for Flood Insurance in the High-Risk Areas of New York City Are Low

- Approximately 3.6 percent of New York City structures are in the high-risk areas defined by the 2007 flood map, and most of the structures (72 percent) are homes for one to four families. Approximately 55 percent of the one- to four-family homes in the high-risk areas had federal flood insurance on the eve of Hurricane Sandy; approximately three-quarters of one- to four-family homes in the high-risk areas on the 2007 map are subject to the mandatory purchase requirement. Of these, about two-thirds have flood coverage. Among homeowners not required to buy coverage, the take-up rate is only approximately 20 percent.

Although Insurance Experts Reported That Processes Worked Well, the Insured Reported Gaps in Coverage

- The biggest gaps were limited basement coverage, lack of coverage for additional living expenses incurred because of flooding, lack of coverage for earth movement that results from flooding, lack of coverage for business interruption or business expenses, inadequate coverage for mixed-use buildings, and varying coverage for street and area closures imposed by civil authorities.

Changes in the National Flood Insurance Program Will Affect New Yorkers

- The Federal Emergency Management Agency issued preliminary work maps for the new flood insurance rate map in June 2013, and the new map is expected to go into effect in 2015. Approximately 32,000 structures that were outside the 2007 high-risk areas and not built to floodplain standards will now be in New York City's high-risk flood zones.
- Flood insurance premiums will increase. The increase could well rise \$5,000 to \$10,000 for structures that are outside the high-risk areas of the 2007 map but in the high-risk areas of the updated map that is projected to take effect in 2015. These increases could reduce property values and pose hardships for low-income households.

Research Questions

What did flood insurance coverage in New York City look like before Hurricane Sandy, and what has been Sandy's effect on flood insurance markets?

What consequences have ongoing changes in the National Flood Insurance Program had for New Yorkers?

What issues should policymakers consider in response to the substantial increase in insurance premiums?

What key data should be collected, and what analyses should be done to evaluate potential responses?



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Abstract

Key Findings

Recommendations

- Policymakers are considering a range of options that could provide residents with some relief from the cost of insurance premiums. These include risk-mitigation measures, such as dunes, levees, and building retrofits, and programs that provide financial assistance to low-income households.
- New York City should work with the Federal Emergency Management Agency to collect data on structure elevations and other structure characteristics in the high-risk zones in order to better project likely premium increases and the types of mitigation measures that would be most effective to reduce premium. To design and evaluate strategies for addressing affordability in New York City, more information is also needed on the relationship between National Flood Insurance Program premiums and household income.
- New York City should also work with FEMA to make sure that the benefits of risk-mitigation measures are properly reflected in NFIP rates, and with FEMA and the New York State Department of Financial Services to increase take-up rates. Finally, New York City should consider a multilayered approach to mitigation and protection. A suite of mitigation tools and incentives should be considered based on specific physical and socioeconomic attributes of New York City neighborhoods. These might include low-interest loans or grants to individuals to fund mitigation efforts or larger-scale coastal protection measures to fortify whole neighborhoods. They might also include changes in land use that remove structures from some areas.

Economic Research Needs to (Re)Define Role of Insurance in Society – RBP is not enough



- Define “Affordability” for Property Premium
 - Catalogue existing work
 - Separate Commercial from Personal Lines
 - Expand
- Define economic relationship between RBP that achieves ‘affordability’ and costs for risk mitigation to get to resultant premium
- Address unique challenges to existing behavioral econ theory that underpins insurance concept: moral hazard link to mobility of workforce / society
- Define beneficial ‘externalities’ that result from resilience
 - Infrastructure Assets
 - Commercial Assets
 - Personal Asset
- Reconsider current “underinsured” metrics
- Reconsider use of national GDP as indicator of disruption – substitute local

Economic Research Needs to (Re)Define Role of Insurance in Society – RBP is not enough



- Develop integrated models which show what 'part' / role insurance can play
- Define mathematically economic loss avoidance value (see BIS WP 394 study – but need 'next gen')
- Develop regional risk specific (flood, fire, wind etc.) risk financing model options to transition from 'current state' to 'climate resilient state' – where 'climate resilient' means that risk based premiums are 'affordable' upon transition completion. (Note: for some segment – below poverty line – means tested cross subsidy may always be necessary)
- Consider whether Kousky / Kunreuther approach is feasible or new approaches are required.

Actuarial Climate Risk Index

American Academy of Actuaries, Casualty Actuarial Society, Canadian Institute of Actuaries and the Society of Actuaries



Collaboration to pursue the creation of the Actuarial Climate Risk Index (ACRI).

Phase 1:

- framework design phase, the project now proceeds to the structuring phase

Phase 2:

- integration of regional composite indicators overlain with
- relevant multi-year regional climatic models
- regional economic impacts

Outputs possible: prediction of longer term loss impacts in a particular region.

If completed ACRI basis for:

- insurance underwriting;
- related cost-benefit analyses for risk mitigation and adaptation; and
- a dialogue between policy makers and the insurance industry about regional and local capital needs over time to reduce the climate resilience gap and achieve resilience.

“Determining the Impact of Climate Change on Insurance Risk and the Global Community: Phase 1: Key Indicators”, American Academy of Actuaries, Casualty Actuarial Society, Canadian Institute of Actuaries and the Society of Actuaries, December 2012



Climate Change Impact – An Insurers Perspective

Capabilities and Impacts



- Climate change impacts different insurers differently
- Share expertise to mitigate the economic risks.
- Restructure products / build new products (http://www.rms.com/news/NewsPress/PR_022711_v11ushu.asp 28 Feb 2011 RMS upgrades models); American Academy of Actuaries, Casualty Actuarial Society , Canadian Institute of Actuaries on the development of an "Actuaries Climate Risk Index" (ACRI)
- Consider more closely the increasing concentrations of exposure in coastal areas. Balance demand with resilience and use insurance to insert resilience through BETTERMENT ENDORSEMENTS
- Think proactively about ‘on the ground’ response to flood events and work closely with government and disaster relief agencies on disaster planning.
- Consider the impact that an unstable climate could have on global asset values, which may generate a mismatch against insurance liabilities.

Climate Resilience Gap Conclusions



- The frequency and severity of climate driven natural disasters is increasing.
- The percentage of natural disaster damage that is insured is decreasing.
- It is mainly the uninsured losses that drive the subsequent macroeconomic cost, whereas sufficiently insured events are inconsequential in terms of foregone output.
- High potential risks are becoming uninsurable.
- The “current state” of resilience response is not sustainable.
- A significant investment in resilient infrastructure and development is required.
- We are in a period where an upgrade of infrastructure is critical – adaptation should be implemented as a component of this investment.
- Other adaptation tools are available and should be considered.