Feasibility of, and preconditions for, stress testing the financial sector's resilience to climate change related issues

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FSB Meeting on Financial Stability & Climate Change Related Issues

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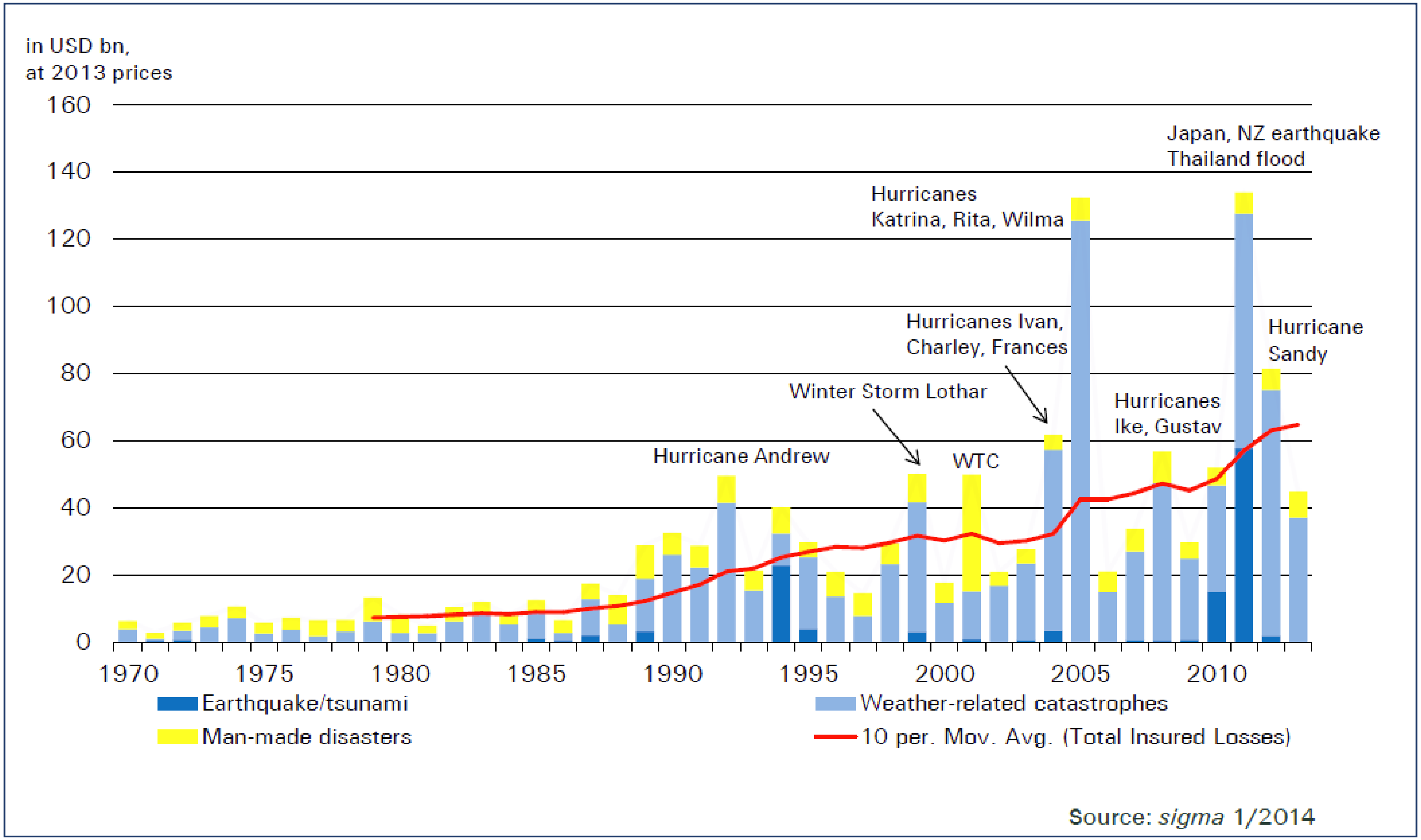
Global Re/Insurance Sector 1992 – 2015 from Ruin to Resilience: the story of climate risk stress tests and industry reform



Source: Swiss Re with grateful thanks to Esther Baur, Swiss Re

2011: Unprecedented natural disaster losses represent 1 in 12.5 year stress test: market stability

Business

Seismic change in insurance industry

Anthony Hilton

CITY COMMENT

LLOYD'S, the London insurance market, yesterday announced one of the worst annual losses in its history. No surprise there then. A year that has seen floods in Australia, earthquakes in New Zealand, floods in Thailand and the earthquake and tsunami in Japan made this the second-worst year on record for natural disasters – at least as measured by their insured cost – and the worst 12 months ever for Lloyd's in its 324-year history.

Claims on the market were just shy of £13 billion, so the reported loss of £516 million sounds quite modest in comparison. Nor did Lloyd's fare conspicuously better or worse than its main competitors round the world.

The surprise is what has happened, or rather not happened, since. The insurance industry's automatic response to a major claim is to jack up its rates for the following year so it can make more money and begin to rebuild its balance sheet. All the big insurance booms of the last 30 years – in the mid-1980s, the mid-1990s and in the years after 9/11 – were triggered by a chronic shortage of capital brought on by immediate past losses which made underwriters risk averse.

However, this time, and much to the concern of Lloyd's chief executive Richard Ward, it has not happened – or certainly not to the extent needed. Ward says he is "disappointed... that rates have not responded more positively".

Insurance at this level is a global market, so Lloyd's cannot go it alone. But the conundrum remains. A few months ago, Aon Benfield put the global cost to the industry of all the catastrophes last year at a staggering $107 billion. With all that capital leaving the industry, one would have thought it could not put rates up fast enough. Why has it not happened?

One explanation is that the insurance industry is a victim of its own increasing sophistication. Exactly 20 years ago, the industry was hit by Hurricane Andrew, which at the time and for many years after was the biggest single insured loss the industry had ever faced. It proved to be a wake-up call, and the industry began to experiment with computer modelling – unknown before Andrew – in an attempt to get a better handle not on whether disasters would happen but on what the consequences would be if they did.

This significantly increased its attractiveness to investors. Before the 1990s, the industry could not model, and therefore could not attract sophisticated capital quickly. But as its skills developed, so did its appeal to outsiders. The better modelling has made it possible for smart capital like hedge funds to come into the industry when times are good and get out before it all goes sour.

But it has not stopped there. As the modelling has become ever more sophisticated, it has exerted an ever greater influence over the market – often via that smart capital. Thus when the model says rates are too low, the market begins to respond without having to wait for a massive claim to make it obvious that the product had become underpriced. The best models are those which are specialised, so the trend has further developed towards much more specialist and niche pricing, and more segmentation of risk on geographic lines.

So the day may be gone – or certainly be going – when massive losses turned the whole market because they wiped everybody out. These days, they wipe out some but enough of the smarts have already got out of the way, have avoided the shock and therefore feel able to carry on as before. To the extent that this is now widespread, it would help explain why Ward has not seen the behavioural change he expected.

'It may well be that major shifts become rarer and and are replaced by mini-cycles on different lines'.

THERE are other changes too. Clients are also becoming more sophisticated, and multinationals are much better at retaining their best risks in-house and only putting the more dangerous stuff out into the market. This makes it harder for insurers and reinsurers to build balanced portfolios and that again encourages the trend towards specialisation.

At the same time, globalisation is bringing in more players. Even though these are often only in local markets, collectively they curtail the ability of the big reinsurers to move easily into and out of the market. Given that this is how they traditionally drove changes in pricing, it again helps explain how the dynamics of the market are evolving.

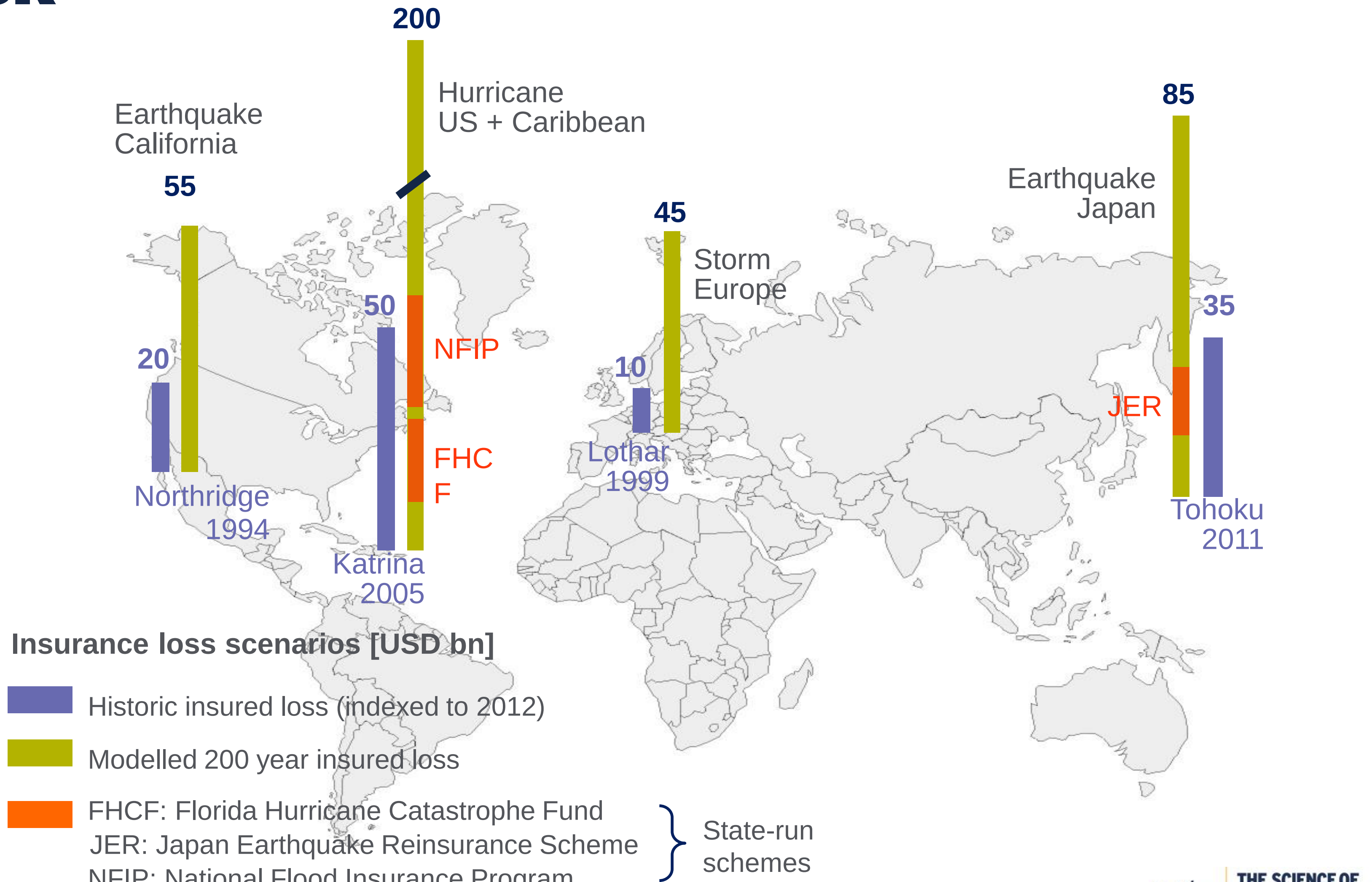
The long-term consequence of this arguably is the end of the insurance cycle – the end of the spectacular booms and horrendous busts that have characterised the last 300 years. That, however, would be a big call, and it would be a brave person who argued that the industry had grown up at last. But it may well be that the major shifts become rarer and are replaced by mini-cycles in different lines and geographies as capital flows in and out.

This in turn has implications for the way insurance companies are run. The traditional model was that they made so much money in the good times that they never bothered too much about efficiency and cost control.

But in the brave new world where excess returns become much more unusual, where underwriting becomes less of a skill and more commoditised, the differentiator between businesses may well be operational efficiency – the back office not the front office. That really will come as a shock to the industry.

Anthony Hilton's archive
standard.co.uk/anthonyhilton

Managing Extremes: The history of experience is *not* an understanding current risk



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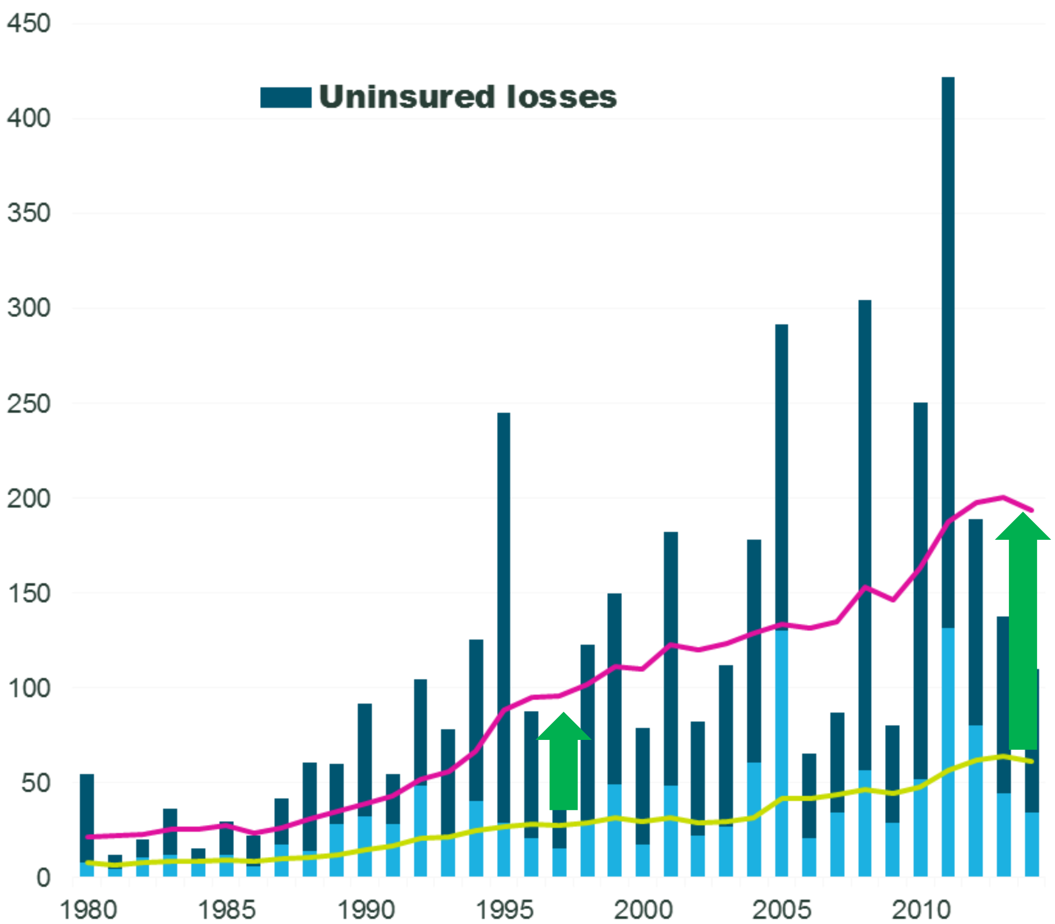
Source: Swiss Re with grateful thanks to Ivo Menzinger, Swiss Re

Most current climate losses are not insured, let alone current climate related risks

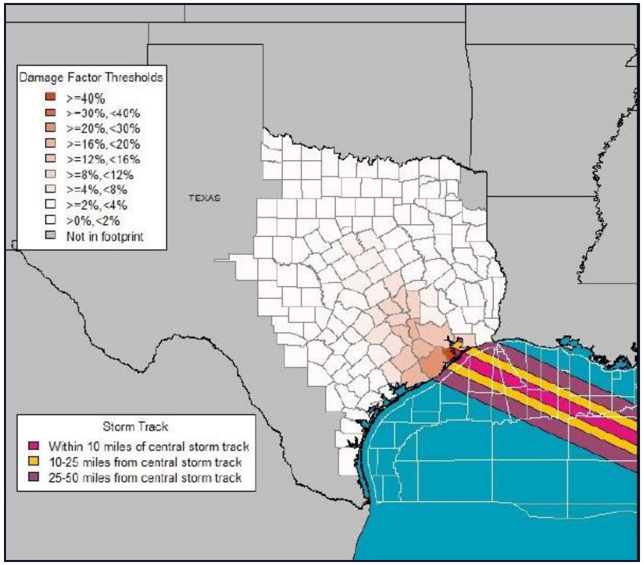
Global natural catastrophe losses 1980-2014, in USD billion (2014 prices)

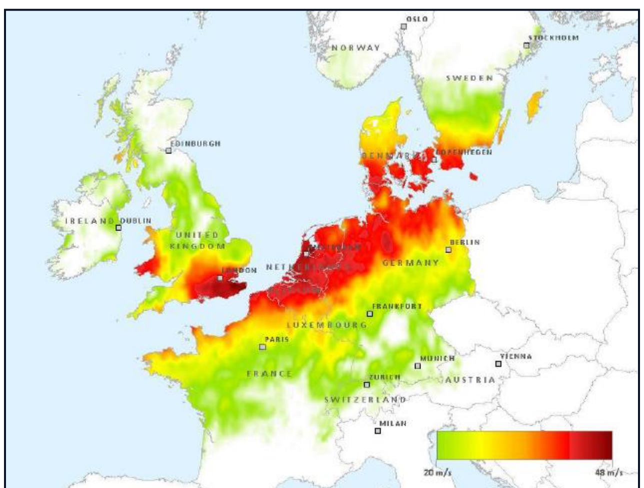


- The majority of natural disaster losses are not covered by insurance, leaving society with a resilience gap
- The resilience gap in 2014 amounted to USD 75bn
- Resilience gap growth, due to climate change, economic development, population growth and a higher concentration of assets

Source: Swiss Re Economic Research & Consulting and Cat Perils, Sigma on natural catastrophes and man-made disasters
With grateful thanks to Ivo Menzinger, Swiss Re

Developing Stress Tests 1: Realistic Disaster Scenarios





RDS		Industry Loss	Lloyd's damage-factors provided?	Lloyd's property distribution tables provided?	Scenario ID
Two events – North-East windstorm		USD 78bn	Yes	No	41
Two events – South Carolina windstorm		USD 36bn	Yes	No	42
Florida Windstorm – Miami-Dade		USD 125bn	Yes	No	2
Florida Windstorm – Pinellas		USD 125bn	Yes	No	3
Gulf of Mexico Windstorm	Onshore	USD 107bn	Yes	No	12
	Offshore	USD 4.5bn	No	n/a	
European Windstorm		€ 23bn	Yes	Yes	8
Japanese Typhoon		¥ 1.5trn	Yes	Yes	13
California Earthquake – Los Angeles		USD 78bn	Yes	Yes	4
California Earthquake – San Francisco		USD 78bn	Yes	Yes	5
New Madrid Earthquake		USD 47bn	Yes	Yes	6
Japanese Earthquake		¥ 5trn	Yes	Yes	9
UK Flood		GBP 6.2bn	No	No	51
Terrorism – Rockefeller Center		n/a	No	No	43
Terrorism – Exchange Place		n/a	No	No	44

Further Information: Lloyd's Realistic Disaster Scenarios available here

Lloyd's Emerging Risks Research : Food System Security (Multi-bread basket failure and related shocks) available here

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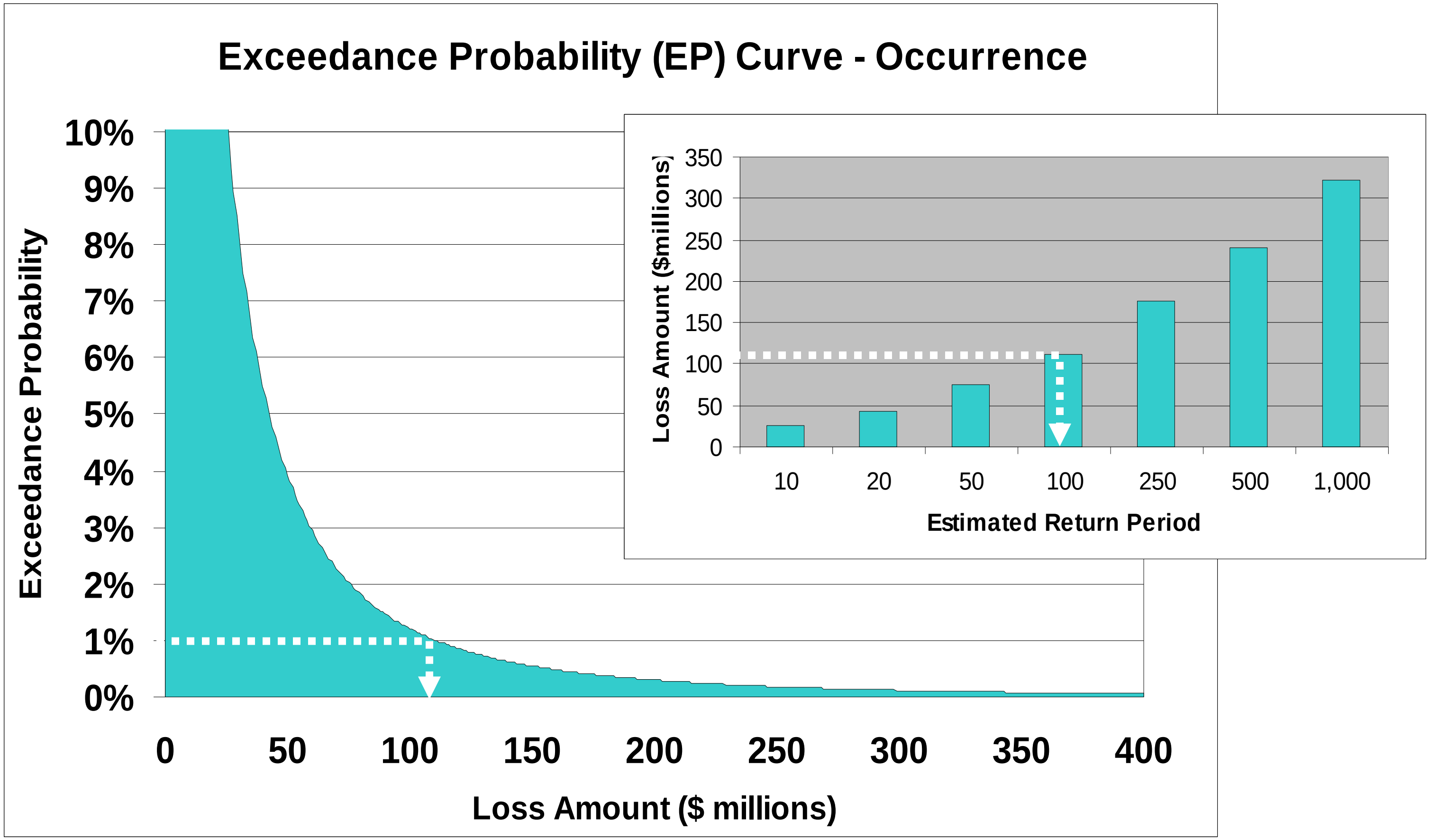
Source: Lloyd's, Realistic Disaster Scenarios, January 2015 with grateful thanks to Trevor Maynard, Lloyd's

The Output that Transformed a Market: Loss Exceedence Probability Curve



Source AIR Worldwide, with grateful thanks to Ashish Jain

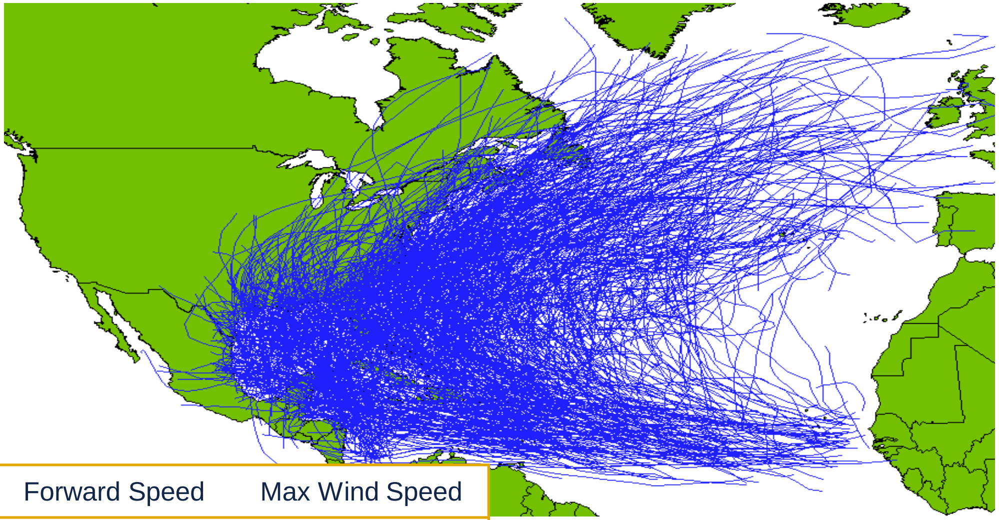
Developing Event Generation Module for Hurricanes Begins with Collection and Cleaning of Historical Storm Data

Over 1000 Historical Tracks (~10 Tracks per year)

Wind Speed and Central Pressure Along Storm Track

16.00	-73.70	08/11/06Z	55	999	TROPICAL STORM
16.30	-75.40	08/11/12Z	60	995	TROPICAL STORM
16.70	-76.80	08/11/18Z	65	993	HURRICANE-1
17.40	-78.10	08/12/00Z	65	992	HURRICANE-1
18.20	-79.30	08/12/06Z	75	988	HURRICANE-1
19.20	-80.70	08/12/12Z	80	984	HURRICANE-1
20.50	-81.60	08/12/18Z	90	980	HURRICANE-2
21.70	-82.20	08/13/00Z	90	976	HURRICANE-2
23.00	-82.60	08/13/06Z	105	966	HURRICANE-3
24.40	-82.90	08/13/12Z	95	969	HURRICANE-2

North Atlantic Tropical Cyclone Tracks Since 1900



Detailed Landfall Characteristics

		Central Pressure		Rmax		Forward Speed		Max Wind Speed	
Hurricane	Date	(in)	(kPa)	nmi	km	kt	km/hr	kt	Km/hr
Galveston	9/9/00	27.64	93.6	14	26	10	18	77	143
Central Gulf	9/13/19	27.99	94.8	32	39	10	18	91	167
New England	9/21/38	27.76	94.0	50	93	40	24	85	158
•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•
Helene	9/27/58	27.52	93.2	20	32	14	26	93	176
Donna	9/11/60	28.87	97.1	34	63	20	37	85	158

Data sources include:

- NOAA
- National Hurricane Center
- National Weather Service
- National Climatic Data Center
- Japan Meteorological Agency
- Joint Typhoon Warning Center
- Shanghai Typhoon Institute

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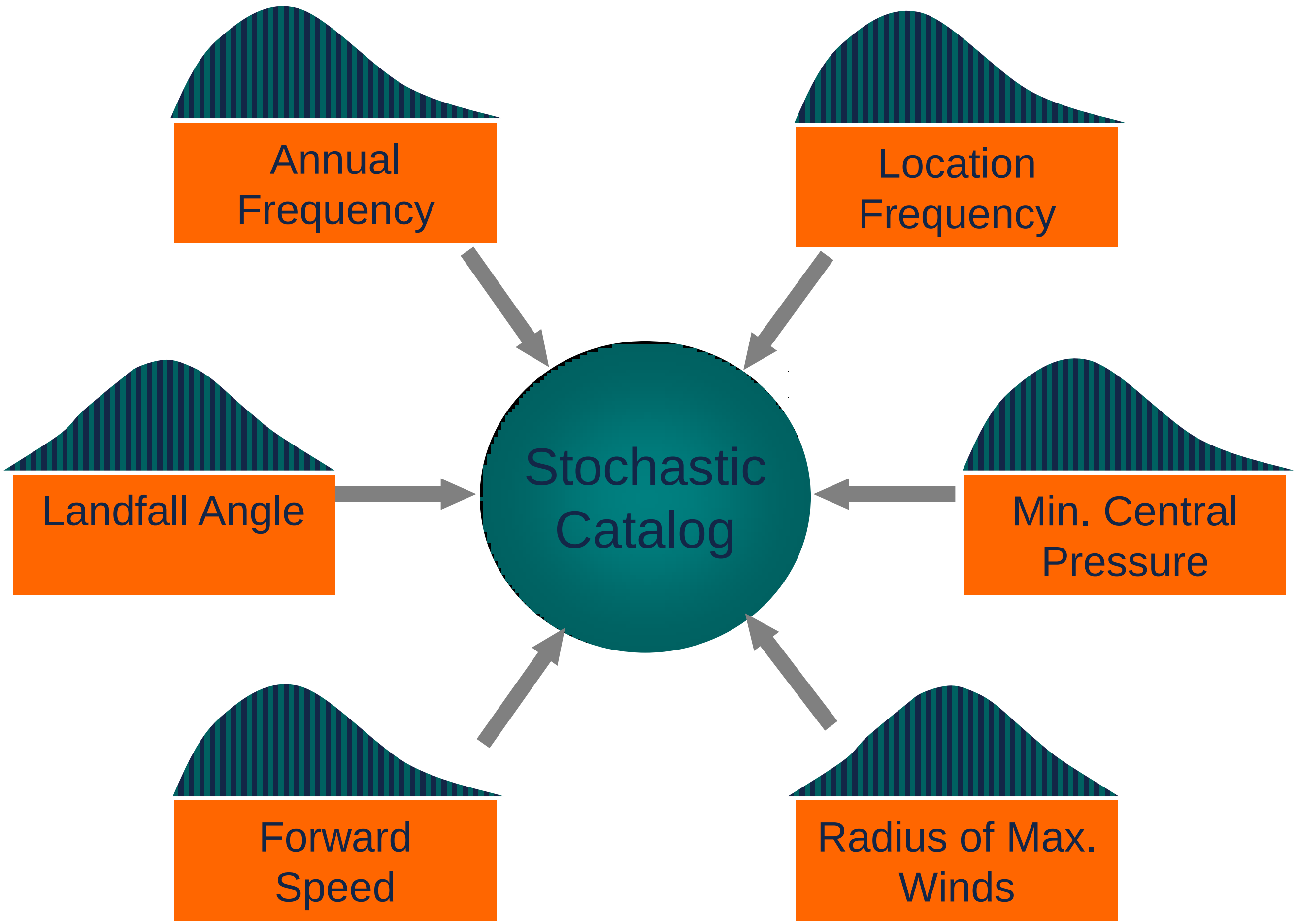
Source AIR Worldwide, with grateful thanks to Ashish Jain

Stochastic Hurricane Catalog Generated from Distributions of Important Storm Characteristics



With grateful thanks to Ashish Jain, AIR Worldwide

Eg: AIR's Stochastic Catalog Contains Storm Parameters for Each Event in a Given Year

Year	Event ID	Day	LF Num	SS	LF Seg	CP	Max Wind Speed	Landfall Lat	Landfall Long	Radius Max Wind	Forward Speed	Landfall Angle
1	1	280	1	1	7	984	80	28.291	-96.492	12	15	20
3	2	231	1	3	22	963	113	29.472	-83.236	11	14	23
4	3	269	1	2	43	979	96	34.891	-76.42	13	23	32
4	4	230	1	2	5	969	102	27.048	-97.297	12	19	45
5	5	285	1	2	4	975	97	26.002	-97.16	14	18	34
8	6	289	1	4	10	944	132	26.689	-93.713	9	20	18
8	7	204	1	1	39	987	76	32.689	-79.563	16	18	19
9	8	245	1	3	30	957	114	25.952	-80.131	12	16	23
11	9	290	1	2	43	979	98	34.93	-76.33	18	16	20
.	.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.

Willis note: Events sets can also be informed by outputs of high resolution global/regional climate models that physically replicate the earth's atmospheric/ocean system and can resolve some patterns of extreme weather features. The integration of extreme European Windstorm clustering features into modelling and regulatory capital stress tests is an example of this.

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Source: With grateful thanks to Ashish Jain, AIR Worldwide

Exposure Data Relevant for Climate Risk Modeling

Location

Geocode Match Level

Street Address

City

Postal Code

Replacement Value

Building

Policy Terms

Limits

Deductibles

Primary Building Characteristics

Construction

Occupancy

Age

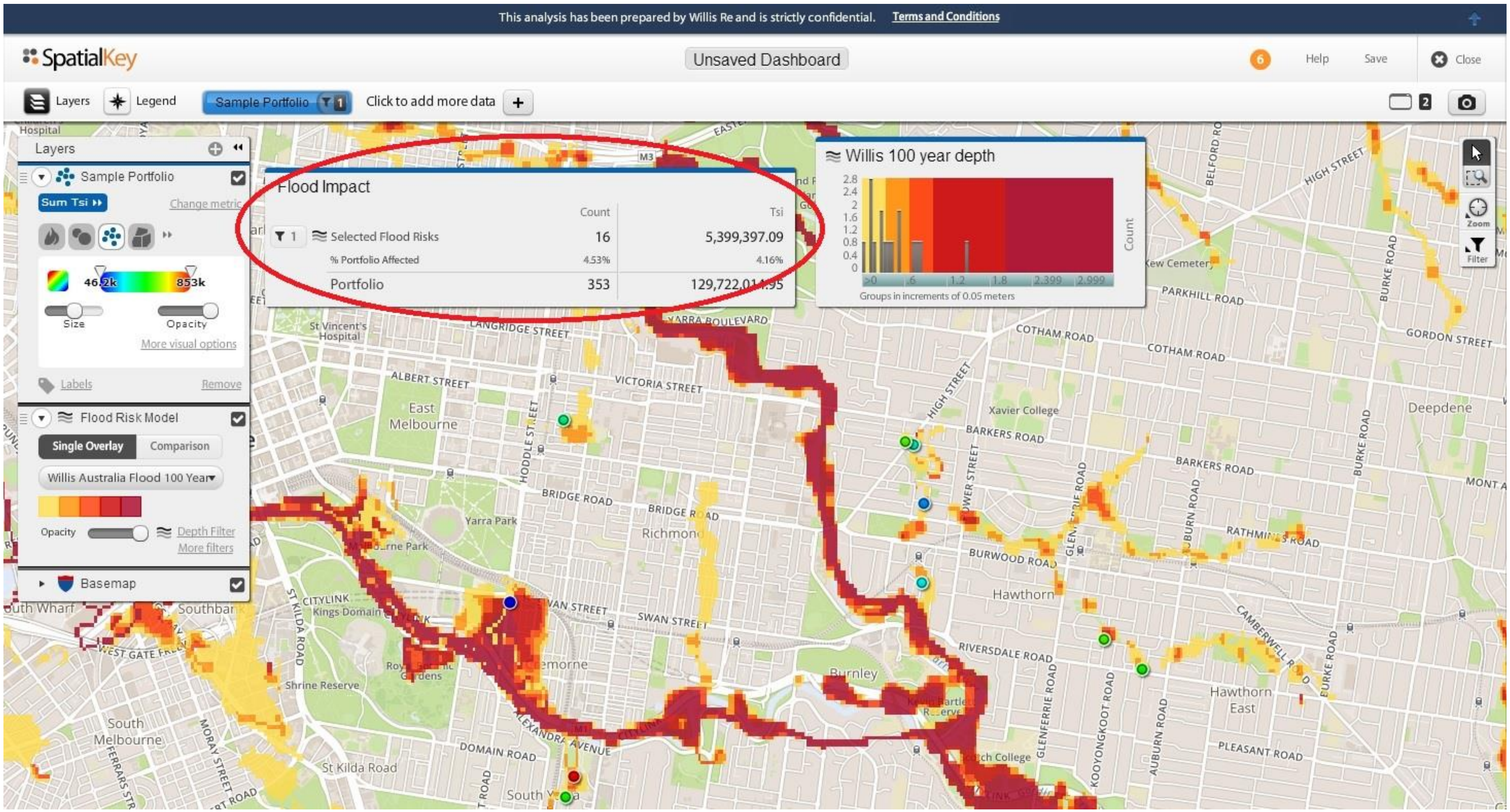
Height

Additional Building Characteristics

Window Protection	Glass Type	Glass Percent	Roof Geometry	Roof Covering	Roof Covering Attachment
Roof Deck	Roof Deck Attachment	Roof Anchorage	Wall Type	Wall Siding	Exterior Doors
Soft Story	Building Shape	Torsion	Foundation Type	Foundation Connection	Special EQ Resistant Systems

Source: With grateful thanks to Ashish Jain, AIR Worldwide

Flood Risk Mapping Insurance portfolio in Melbourne



Source, Willis Re Australia

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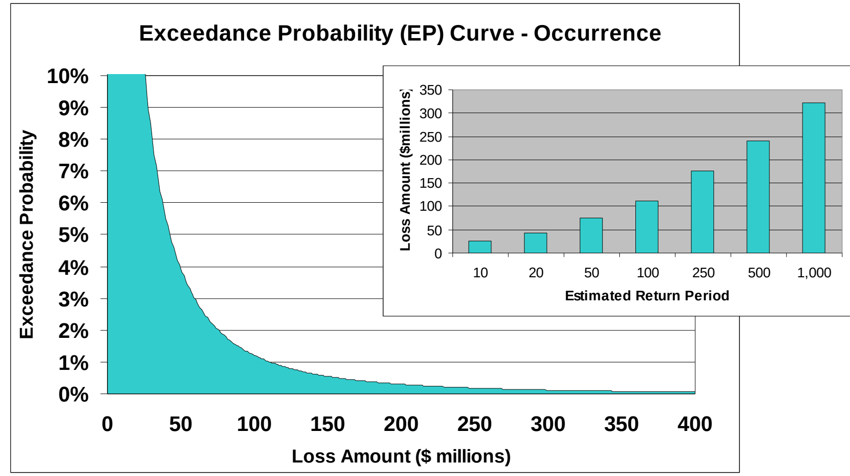
Catastrophe Models Provide a Wide Range of Outputs

(EQ epicentres, storm tracks, flood inundation, wave heights, bushfire extents, drought, etc)



Event	Year	Company Loss	Event Info
520075080	934	2,811,789	MW 9.1 EQ Tokyo Metropolis Osaka Aichi Kanagawa Shizuoka
520175271	2179	2,672,028	MW 8.9 EQ Tokyo Metropolis Osaka Aichi Kanagawa Shizuoka
520078334	975	1,951,563	MW 8.8 EQ Osaka Aichi Tokyo Metropolis Shizuoka Kanagawa
520465021	5782	1,946,088	MW 8.8 EQ Osaka Aichi Shizuoka Tokyo Metropolis Kanagawa
520146644	1820	1,786,625	MW 8.8 EQ Osaka Aichi Shizuoka Kanagawa Tokyo Metropolis
520707864	8811	1,658,605	MW 8.9 EQ Osaka Aichi Shizuoka Hyogo Mie
520114374	1422	1,634,955	MW 8.7 EQ Aichi Osaka Shizuoka Tokyo Metropolis Kanagawa
520061523	764	1,625,767	MW 8.7 EQ Aichi Osaka Shizuoka Tokyo Metropolis Kanagawa
520469875	5842	1,605,027	MW 8.8 EQ Osaka Aichi Shizuoka Mie Hyogo
520592171	7368	1,562,932	MW 8.9 EQ Osaka Aichi Shizuoka Mie Hyogo
520632643	7871	1,562,240	MW 8.8 EQ Osaka Aichi Shizuoka Mie Hyogo
520283997	3533	1,475,085	MW 7.9 EQ Tokyo Metropolis Kanagawa Saitama Chiba Shizuoka
520673869	8386	1,465,897	MW 8.8 EQ Osaka Aichi Shizuoka Mie Hyogo
520315162	3920	1,444,885	MW 8.7 EQ Aichi Osaka Shizuoka Mie Hyogo
520036823	457	1,397,606	MW 8.6 EQ Aichi Shizuoka Osaka Kanagawa Tokyo Metropolis

Source: with grateful thanks to Ashish Jain, AIR Worldwide

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Physical Climate & Natural Hazard Risk Stress Tests

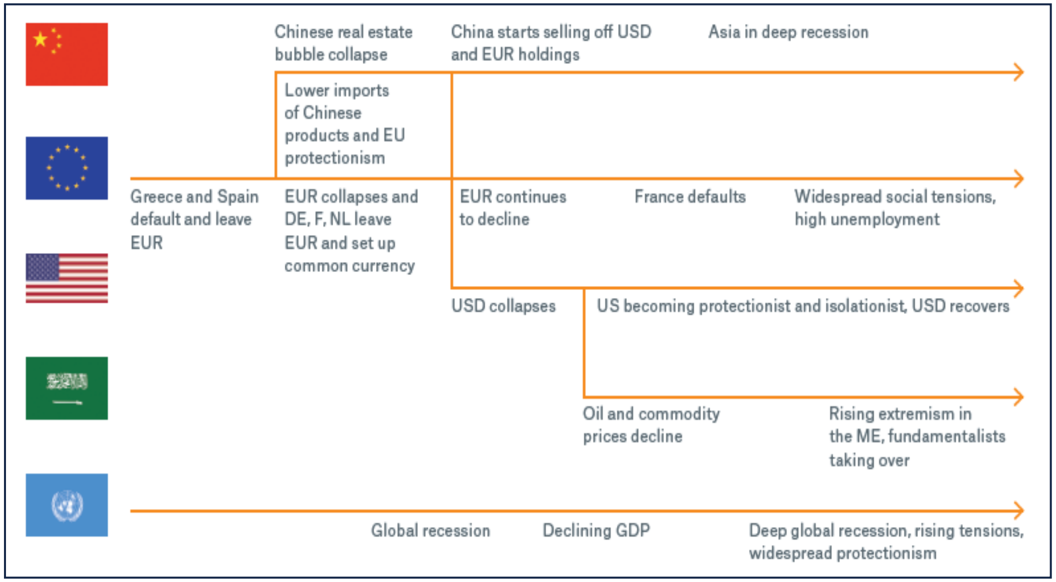
- After 25 years of application climate risk stress tests via catastrophe risk modelling is mainstreamed and routine within developed and many emerging insurance markets, for pricing, portfolio and capital management & reg/rating requirements, including corporate captives. Each individual risk can be assessed against impact on group risk and capital charges.
- All portfolios that are reinsured are subject to cat modelling by each re/insurer and intermediaries. A single reinsurance transaction can require the modelling (stress testing) of millions of assets , worldwide, against 10,000 simulated ‘current’ years). Most insurers are reinsured every year.
- All this creates intense scrutiny of data, assumptions, methodologies and model sensitivities. Every choice has a financial impact on transactions and ratings and regulatory capital of firms: model upgrades become major market ‘events’.
- A mature sector. Three leading vendors operating since late 1980s provide main competing platforms that serve majority of re/insurers and institutions, augmented by regional specialists and in-house models by the largest underwriting institutions & advisers/brokers.

Physical Climate & Natural Hazard Risk Stress Tests

- Data and tools cover much/most assets and populations in most OECD and G20 members and many emerging and developing countries. Climate risks include windstorm, storm surge, riverine flood, tornado/hail; drought; bushfire; heat wave,. In addition + seismic, pandemic + terrorism.
- Insurance sector operationally focuses in current and near future risk 1-3 years ahead. Future projections use same tools and methodologies but with projected hazard distributions and exposure trends and vulnerability functions.
- It is a major enterprise. The sector has invested approximately $15-20bn in research, development and operation of these applications over the last 25 years. The professional demography of the industry has changed and deep integration with science communities.
- These platforms and data rarely, employed outside of insurance domains, and could be applied to wider sectors/uses to understand the current, and future climate (and wider risks) to uninsured assets and wider economic & social exposures.

Re/Insurers' 1 in 200 Solvency Stress Tests Beyond Physical Risks.

Scenario	Probability of occurrence	Life	Non-Life	Health
Industrial	0.5%		x	
Pandemic	1%	x	x	x
Accident insurance: Accident in travel group	0.5%		x	x
Accident insurance: Stadium incident	Type 2: not relevant for target capital		x	x
Hailstorm	Type 2: not relevant for target capital		x	
Disability	0.5%	x		
Daily benefit scenario	0.5%			x
Default of reinsurers	Depends on RI portfolio	x	x	x
Financial distress	0.5%	x	x	x
Deflation	0.1%	x	x	x
Under-provisioning	0.5%		x	x
Anti-selection for health insurers	0.5%			x
Historical market scenario	each 0.1%	x	x	x
Terrorism	0.5%	x	x	x
Longevity	0.5%	x		



Source: Swiss Solvency Test

Source: International Actuarial Association

Risk and capital management: stress tests to quantify potential impact of risk exposures.

Example: Swiss Re Annual Report

Insurance risk stress tests: Single event losses with a 200-year return period[1]

Pre-tax impact on economic capital in USD billions, as of 31 December	2012	**2013**	Change in %
Natural catastrophes			
Atlantic hurricane	–2.8	**–4.5**	60
Californian earthquake	–2.4	**–3.5**	47
European windstorm	–2.6	**–3.8**	44
Japanese earthquake	–2.9	**–3.3**	16
Life insurance			
Lethal pandemic	–2.6	**–2.9**	11

[1] Single event losses with a 200-year return period show for example that there is a 0.5% probability over the next year that the loss from a single Atlantic hurricane event could exceed USD 4.5 billion. The impact excludes earned premiums for the business written and reinstatement premiums that could be triggered as a result of the event.

Financial market and credit risk stress tests

Pre-tax impact on economic capital in USD billions, as of 31 December	2012	**2013**	Change in %
Market scenarios			
100bp increase in credit spreads	–3.3	**–3.6**	10
30% fall in global equity markets (incl. hedge funds)	–2.9	**–4.3**	49
15% fall in global real estate markets	–0.6	**–0.6**	0
100bp parallel increase in global yield curves	–0.1	**0.6**	–654
Credit stress test			
Credit default stress	–1.5	**–2.0**	33

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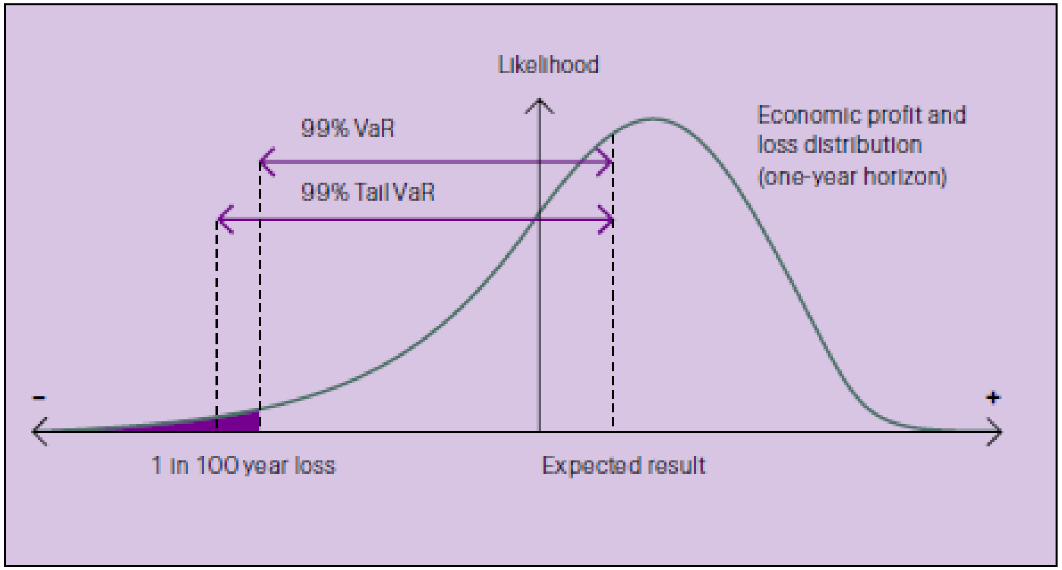
Source: Swiss Re Annual Report 2013 with grateful thanks to Esther Baur, Swiss Re

Fully integrated risk and capital management: Group capital requirements based on 99% Tail VaR



Group capital requirement based on one-year 99% Tail VaR

USD billions, as of 31 December	2012	**2013**
Property and casualty	7.8	9.1
Life and health	7.3	6.6
Financial market	10.5	13.3
Credit[1]	1.9	3.0
Simple sum	**27.5**	**31.9**
Diversification effect	–10.9	–12.0
Swiss Re Group	**16.6**	**20.0**

[1] Credit comprises credit default and credit migration risk.

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Source: Swiss Re Annual Report 2013 with grateful thanks to Esther Baur, Swiss Re

And also, for example… Munich Re

Group Economic Risk Capital Report

(with example major loss drives, excluding diversification benefits)

Peril (hazard)	US$ Billions	
Property & Casualty		**10.0**
Atlantic Hurricane	3.4	
European Storm	2.3	
California Earthquake	1.9	
Life & Health		**9.0**
Market		**12.5**
Equity	5.8	
General Interest Rate	5.3	
Specific Interest Rate	5.2	
Property Risk	2.2	
Currency Risk	2.6	
Credit		**6.7**
Operational Risk		**1.7**
Simple Sum		**39.9**
Diversification Effect		**-13.3**
Munich Re Group 1 in 200 Capital Requirement		**26.9 billion**

Source: Munich Re Annual Report 2014

Observations

Defining 'Climate' without the Political & Policy Overlay 'Climate' is patterns of weather: now, in the future and in the past. Re/insurers evaluate risk by understanding patterns of (extreme) weather through temporal and spatial scales. From operational & financial stability perspective re/insurers focus in evaluating current climate risks

Risk is Risk Climate (like all) risk is the product of hazard distributions (perils), exposures (population, assets, systems), and related vulnerability functions (physical, economic or political). It is necessary to understand the processes through which risk and loss is produced.

Beyond Average Climate risk is produced by the likelihood of excess stresses on exposures. In the context of physical climate, it is extremes of weather (frequency, severity or duration) beyond tolerable limits in specific geographical areas. Generalised statistics (e.g. average temperature) are not tractable in risk evaluation at local or global scales.

Breaking Point Likelihood of exceedence of specific thresholds in defined locations produce risk. A 6.4m storm surge; 3 days in excess of 43 degrees Celsius in a city; storm gusts in excess of 120 km/h; less than 55mm rainfall at critical growing season. About stresses on systems.

It's about the Exposure Multiple academic analysis has shown the primary driver of the growth climate related losses since early 1970s due to increase in exposure of vulnerability. These drivers of increasing climate risk will continue and probably accelerate in years ahead, especially in developing / emerging economies.

Observations cont.

Anthropogenic Climate Change is an Input to the Risk. Not the risk itself Climate change relentlessly changes the distribution of hazards often in an undesirable direction making the breaching of stress thresholds and losses increasingly more likely. These events could happen today; climate change simply makes them more likely. This is an essential point.

The Signal beyond the Noise Most re/insurers agree we are beginning to see the influence of a specific climate change signal in selected hazard distributions. More climate change / extreme event sensitivity than expected in some geographies; this influence will grow.

Signal becomes Chorus This intersects with exposure growth to produce relentless, inevitable, structural increase in risk and losses as percentage wealth and associated human with political impacts.

Most 'Slow Onset' Disasters are a Misnomer Eg global warming driven sea level rise at 3mm / year and the risk to NYC or Tokyo. The risk is a storm surge / tsunami in excess of 5m. This risk relentlessly increases year by year for both risks. For tropical cyclones the increasing frequency of high intensity Category 4 & 5 storms and pole ward shift of storm tracks caused by warming oceans further increases the annual risk year by year.

Distinguish between Evaluating / Reporting on Climate Risk of the Organisation with contribution its contribution to overall Risk (eg emissions) An essential point.

Observations cont.

Climate Change Risk reflects Warren Buffet's view of the Stock Market

In the short term, the climate system is like a voting machine, in the long term, it is a weighing machine. In general we have no idea what the weather / climate will be next year (although the El Nino of 2016 may be an exception) but we can be pretty sure losses will be greater in 5-10 years' time. As risk drivers, the laws of physics reign supreme.

(For a 'metaphor' of global climate risk trends…think of risk development via exposure growth as compound interest; risk development via global warming as dividend reinvestment and the loss events themselves as the gyrations of the stock market.) Regardless of shorter term 'system/market' fluctuations the med/long term increase in overall risk is very predicable.

Realistic Energy Projections

From a financial stability, fiduciary duty perspective it seems inconceivable that we should not be planning for a world consuming significantly more fossil fuels in 2050 than we are today. This takes account of IEA WEC US EIA scenarios with 'bullish' outlook on carbon reduction policies, renewables and energy technologies. The fundamentals of demographic trends, economic development and boundless cheap hydrocarbons make this increase all but inevitable. From financial, economic and social perspectives, this collective impact in carbon growth on extremes and risk is of deep concern.

Reveal and Evaluate the Risk

Most crashes are caused by risk steadily building up in systems and being ignored, unconsciously or deliberately. Without appropriate identification, evaluation, management and disclosure markets to not work. Current climate and natural hazard is a major growing risk that is largely overlooked by finance and economics outside of insurance.

Observations cont.

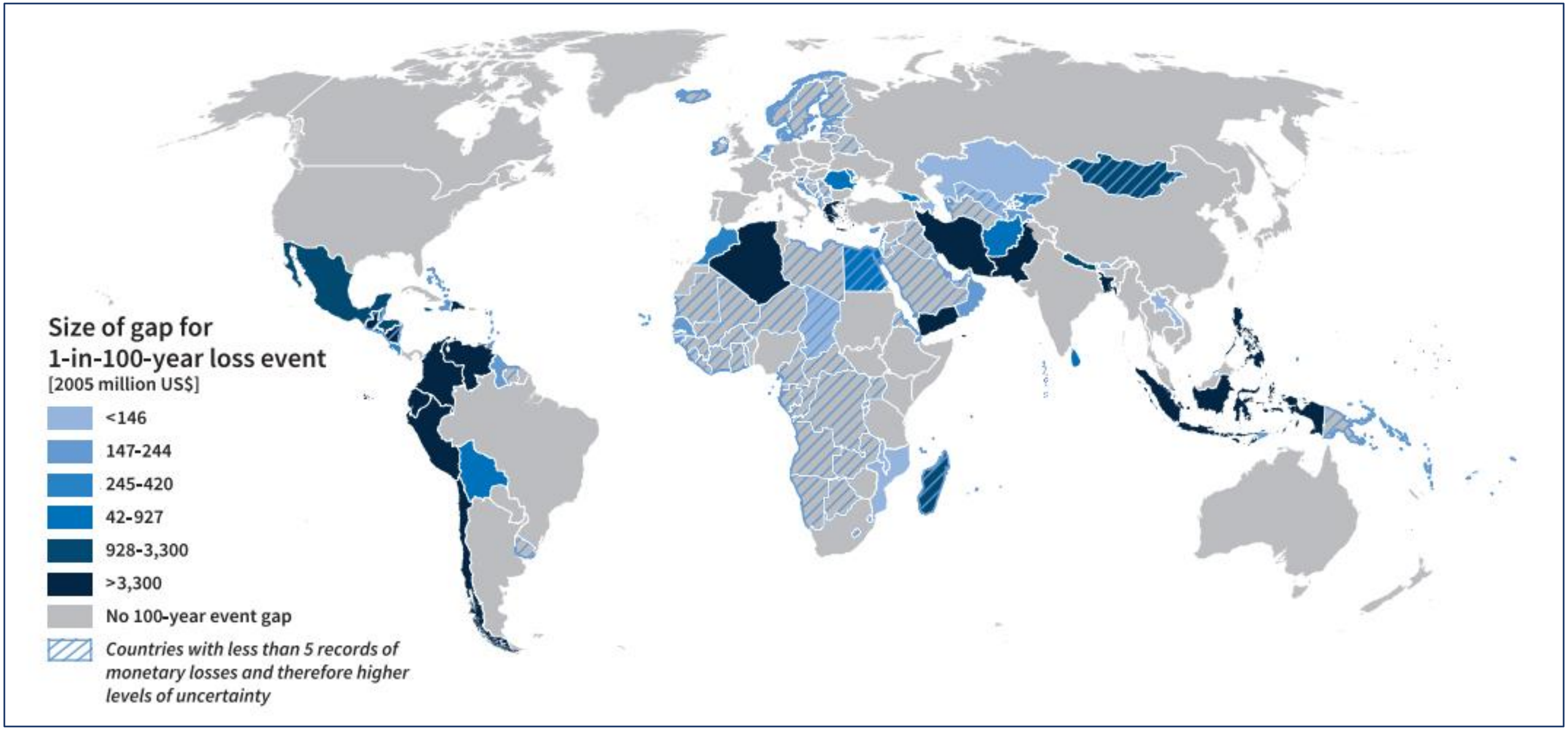
All Models are Wrong.. But models of climate extremes and natural hazard share some fundamental attributes unlike other financial risks. The hazards obey the laws of physics with physical limits, events marching to their own rhythm outside of markets, free of market sentiment and unaffected by predictions. These hazards are publically visible, recorded by massive stores of public data and subject to assessment by the meteorology and scientific community. Not very analogous to mortgage backed securities.

Provide analysis of Climate Risk with other Natural Hazards While understanding the current focus on climate, not incorporating other natural hazards is sub-optimal from a management, technical and even political point of view. The net increase in adding the other perils to these stress tests is marginal compared to the benefits for financial stability and a coherent regulatory response to natural hazard/environmental risks.

Reporting Incentivise Science Reporting requirements transform data quality and analytical capabilities and organisation competencies because lower quality analysis and uncertainty is punished by stakeholders and because it increases uncertainty, there is a economic rationale to adequately assessing risk.

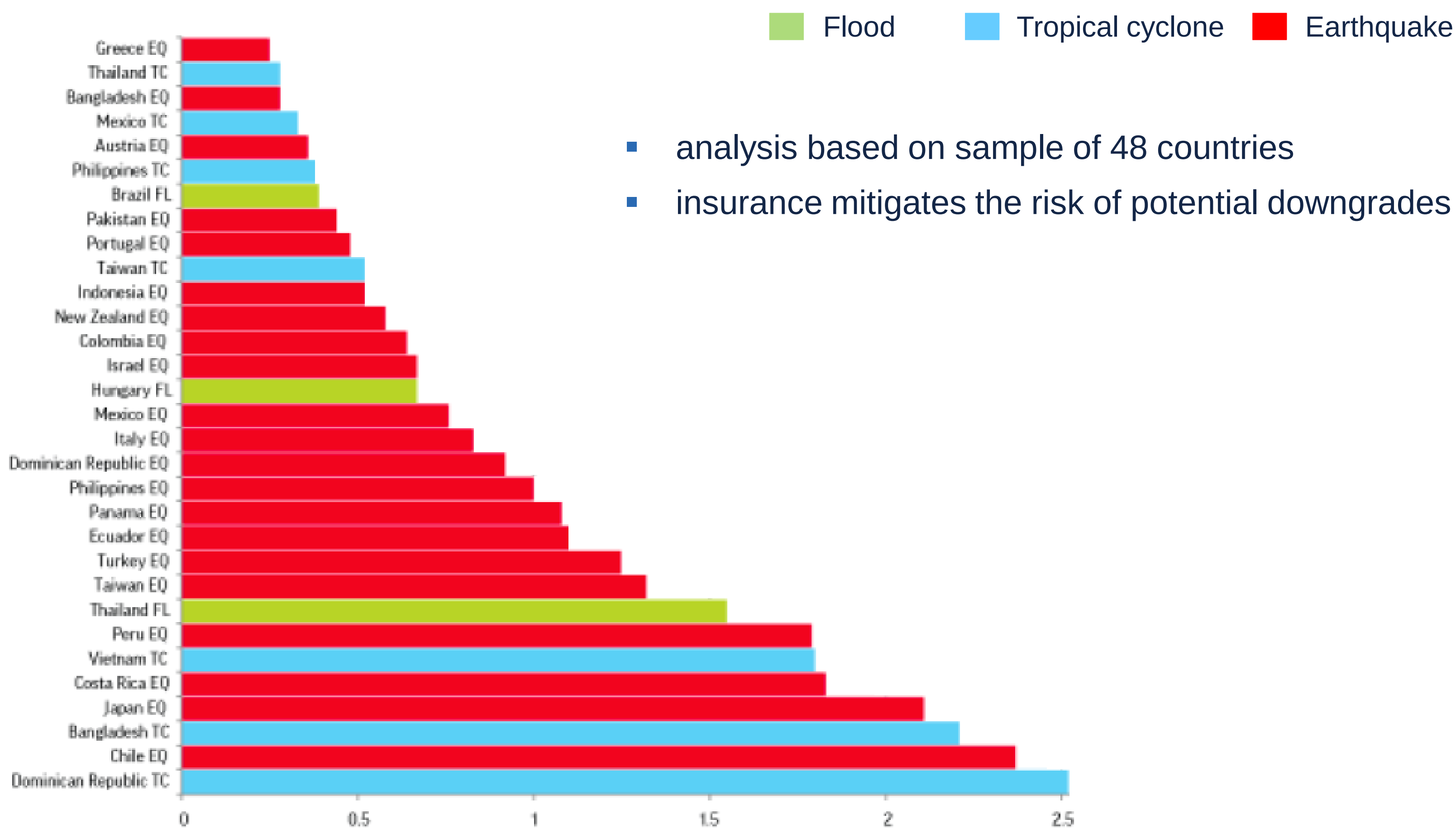
Manage Risk to Achieve Resilience and Deliver Sustainability
Sustainability and Risk are two sides of the same coin. We wouldn't have to be 'sustainable' if there was no risk. A key to route achieving sustainability is understanding and managing risk within tolerable parameters.

Growing application of these approaches and metrics. UN: Countries assessed as facing fiscal financing gap for a 1-in-100 year loss event



Source: Global Assessment Report, 2015, UNISDR

Standard & Poor's: Natural disasters can impact sovereign credit ratings

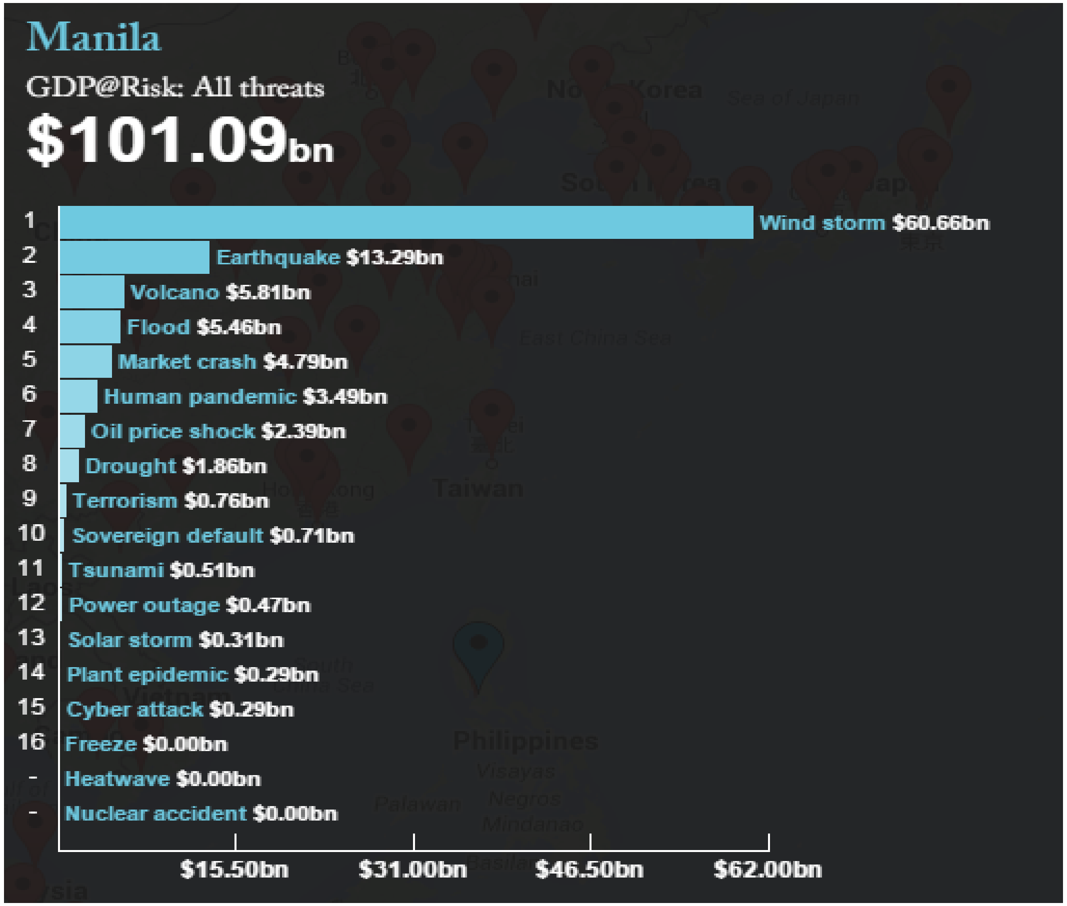


- analysis based on sample of 48 countries
- insurance mitigates the risk of potential downgrades

Hypothetical rating downgrade in notches (AAA, AA+, AA-…)

Source: Standard & Poor's, Data Swiss Re, with grateful thanks to Ivo Menzinger, Swiss Re

Cities / Sub-state Regions provide a scale for maximum climate risk impact and financial instability



Source: Lloyd's / University of Cambridge Centre for Risk Studies, 2015
With grateful thanks to Trevor Maynard, Lloyd's

Willis Research Network | THE SCIENCE OF MANAGING EXTREMES

Royal Society Report, November 2014
Resilience to Extreme Weather

The re/insurance sector has made considerable progress in evaluating the risks posed by extreme weather. These risks now need to be better accounted for in the wider financial system, in order to inform valuations and investment decisions and to incentivise organisations to reduce their exposure.

This could be done through a requirement for public and private sector organisations to report their financial exposure to extreme weather at a minimum of 1 in 100 (1%) per year risk levels.

Making Decisions Based on Evidence

Recommendation 5

UN World Conference on Disaster Risk Reduction (WCDRR) Sendai, Japan

Business, professional associations and private sector financial institutions, including financial regulators and accounting bodies… to integrate disaster risk management, including business continuity, into business models and practices via disaster risk-informed investments... and engage in the development of normative frameworks and technical standards that incorporate disaster risk management;

UN Sendai Framework for Disaster Risk Reduction 2015-2030

March 2015, paragraph 36(c)

‘Re/Insurance Style’ Climate Risk Stress Tests – Benefits & Implications

- Beyond re/ins sector can be focussed on current and near-term climate risks (physical and transitional) to produce coherent, proportionate and tractable evaluations. Insurers stress test ‘real-world’ assets and economic systems
- A tried and tested approach, around 25 years in re/insurance risk trading, management and regulation, accounting & credit rating.
- Same framework, tools and methodologies can be used to evaluate future risks and wider risk factors. From public policy and reg changes to water security
- A time machine for the Tragedy of the Horizons: by addressing the core risk of extremes and stresses a tractable method of providing a ‘time machine’ for these risk. We apply a trade off of reduced risk probability of major loss events happening now with contemporary awareness, evaluation and management.
- By placing a tractable and proportionate price on risk we provide a reasoned and proportionate value on risk reduction and resilience and a mechanism for enabling that equation to be integrated into financial decisions.
- Same techniques can provide economic levers for other challenges - eg incentivising wider risk reduction (carbon emission mitigation) or valuing assets such as natural capital by accounting for their economic contribution to risk reduction / resilience.

Climate Risk Stress Testing & Financial Stability – Avenues for Consideration

- Examine the opportunities that may be afforded by employing the experience of the re/insurance sector in developing stress tests for physical and non-physical risks and if how these may be applicable more widely and appropriately and issues that may arise.
- Using insurance style assessment approaches, It would be feasible to undertake trail/research stress tests on mortgage portfolios, loans secured on property and other assets of banks and other financial institutions including asset managers to physical climate risk – now and in the future.
- Similar stress tests could be researched on corporates, and public entities including sovereigns, cities and public enterprises, assets and utilities.
- This is a fundamental physical climate risk reference that needs to be understood and maintained. There will be regional and sectoral variations with accumulations and diversification of risk that needs to be better understood.
- The same insurance-style risk evaluation frameworks can be used to evaluate the evolving level of transitional climate change risk on specific enterprises, sectors and markets
- Groups of interested parties are already emerging, such as the '1 in 100 Initiative'. It would be possible to develop a working group(s) to consider these opportunities, undertake research testing of these approaches and report back in late 2016.