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Making Sense of Nat Cat Risk

IRFRC 2017

IFoA GI Asia International Working Party

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29 June 2017

Agenda

1 About the IFoA GI Asia International Working Party

2 Making Sense of Nat Cat Risk

3 Next Steps for the Working Party

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1 **About the IFoA GI Asia International Working Party**

2 Making Sense of Nat Cat Risk

3 Next Steps for the Working Party

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Who we are

- GI Asia International Working Party created in Q2 2016
- The first in Asia for the Institute & Faculty of Actuaries UK
- We have members from Singapore, the UK, Hong Kong, India, China and Malaysia
- We are from across the broad background from brokers, consultancies, reinsurers, insurers, and working in various functions

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Working Party Vision

The vision for the framing of the objectives of the working party is captured by the following mission statement:

“The goal is to be the first regional working party formed outside UK of the IFoA, reaching out to support GI actuaries in the APAC region, to deliberate issues in the region specifically and in turn to support career growth for members in the region more specifically as well as to promote and raise awareness of the profession in the region as a whole, paving way for more such forum for the regions outside UK, and for other actuarial disciplines.”

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What is the intention of the working party

- To facilitate a market wide research on risks specific for the APAC region
- To develop relationships with regulators and local actuarial bodies
- To develop initially an understanding of the GI insurance and actuarial issues / hot topics
- To identify the perceived relative importance of these issues / hot topics for GI actuaries
- To focus on specific topics of interest, common to multiple markets, and to provide fresh light and new understanding

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Who are you?

IFoA The A

1. Integrity
2. Competenc
3. Impartiality
4. Compliance
5. Communica

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Responsibility is *te risk*

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Who are you?

IFoA The Actuaries' Code

1. Integrity
2. **Competence and Care**
3. Impartiality
4. **Compliance**
5. Communication

2.2 Members will not act unless:

a) they have an appropriate level of relevant knowledge and skill; or

b) they are acting on the advice of an individual who has the appropriate level of relevant knowledge and skill and all interested parties are aware that this is the case; or

c) they are acting under the direct supervision of another member who is taking professional responsibility for that work.

5.3 Members will take such steps as are sufficient and available to them to ensure that any communication with which they are associated is accurate and not misleading, and contains sufficient information to enable its subject matter to be put in proper context.

Responsibility is on all of us to ensure we understand and communicate risk

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The Risk Landscape: Aon Global Risk Survey 2017

1 Damage to reputation/brand	2 Economic slowdown/slow recovery	3 Increasing competition	4 Regulatory/ legislative changes	5 Cyber crime/ hacking/viruses/ malicious codes	6 Failure to innovate/meet customer needs	7 Failure to attract or retain top talent	8 Business interruption
9 Political risk/ uncertainties	10 Third party liability	11 Commodity price risk	12 Cash flow/ liquidity risk	13 Property damage	14 Directors & Officers personal liability	15 Major project failure	16 Exchange rate fluctuation
17 Corporate social responsibility/ sustainability	18 Technology failure/ system failure	19 Distribution or supply chain failure	20 Disruptive technologies/ innovation	21 Capital availability/credit risk	22 Counter party credit risk	23 Growing burden and consequences of corporate governance/ compliance	24 Weather/natural disasters
25 Failure to implement or communicate strategy	26 Merger/acquisition/ restructuring	27 Injury to workers	28 Failure of disaster recovery plan/ business continuity plan	29 Loss of intellectual property/data	30 Workforce shortage	31 Environmental risk	32 Crime/theft/fraud/ employee dishonesty
33 Lack of technology infrastructure to support business needs	34 Inadequate succession planning	35 Product recall	36 Concentration Risk (product, people, geography)	37 Aging workforce and related health issues	38 Accelerated rates of change in market factors and geopolitical risk environment	39 Interest rate fluctuation	40 Globalization/ emerging markets
41 Unethical behavior	42 Outsourcing	43 Resource allocation	44 Terrorism/ sabotage	45 Climate change	46 Asset value volatility	47 Natural resource scarcity/ availability of raw materials	48 Absenteeism
49 Social media	50 Sovereign debt	51 Pandemic risk/ health crises	52 Share price volatility	53 Pension scheme funding	54 Harassment/ discrimination	55 Kidnap and ransom/ extortion	

www.aon.com/2017GlobalRisk

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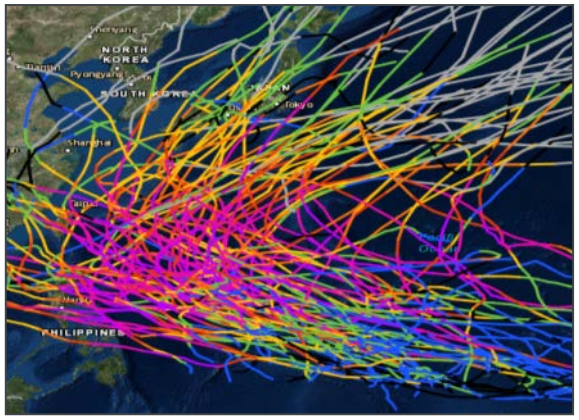
But what about APAC?

Thailand flood

Japan Earthquake and Tsunami

New Zealand Earthquake



Typhoon

Volcanic Risk

Jakarta Flood

- Seven of the top ten Mega Cities will be in Asia by 2025

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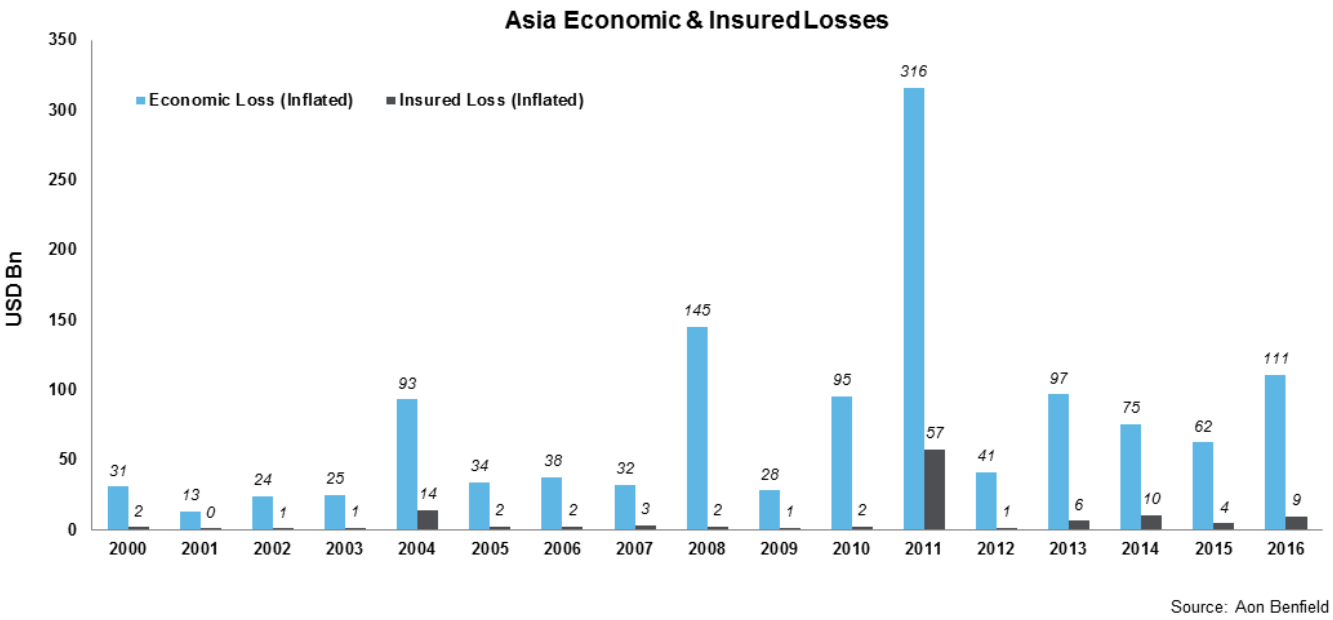
Asia Economic and Insured Losses from Catastrophes

- In 2016 just over 10% of catastrophe losses in Asia were insured (US 53%, Europe 33%)
- Minimal insured experience to help develop and validate models



Source: Aon Benfield

Insured to Economic Loss %	
US	53%
Europe	33%
APAC	12%
AU/NZ	40%
Japan	40%
Asia (exJPN)	6%

- Understanding nat-cat more widely and accurately may help us design products to allow more prefunding for nat-cat loss in Asia (via insurance pools, fund, bonds etc.)

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Regulatory Requirements: an example of China

- China's second-generation solvency regime, China Risk-Oriented Solvency System (C-ROSS) has come into effect since 1st January 2016.
  - The old supervisory regime did not take into account catastrophe risk of non-life insurance business, which was regarded as one of drawbacks of the old regime.

- *Regarding non-life insurance risk, C-ROSS computes non-cat risk capital and cat risk capital respectively and uses them to compute the whole non-life insurance risk capital with a coefficient of correlation.*

$$MC_{Non-life} = \sqrt{\mathrm{MC}_{Non-Cat}{}^2 + 2 \times \rho \times \mathrm{MC}_{Non-Cat} * \mathrm{MC}_{Cat} + \mathrm{MC}_{Cat}{}^2}$$

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Regulatory Requirements: an APRA example

- Regulatory focus on catastrophe risk has increased significantly in recent times.
  - ownership and understanding of cat risk management resides with the insurer
  - non modelled perils and components
  - methodology, data and assumptions
  - sensitivity of results

- *These points lead to more intensive scrutinisation that may require catastrophe modelling to be augmented with additional data or assumptions to address any concerns or non modelled elements*

- APRA are not unique in these concerns, with other regulatory regimes and rating agencies taking a similar stance
- Solvency II also pushing in the same direction
- Asia looking to others for best practice

GPS 116: Catastrophe models

It is common practice for an insurer to use computer-based modelling techniques, developed either in-house or by external providers, to estimate likely losses under different catastrophe scenarios. If an insurer uses such a model, the model must be conceptually sound and capable of consistently producing realistic calculations.

An insurer must be able to demonstrate:

(a) that the model has been **researched** and **tested**;

(b) that the insurer has taken measures to ensure that the data used to estimate its losses is sufficiently consistent, accurate and complete, and there is appropriate documentation of any estimates of data used; and

(c) **an understanding of the model used** in estimating losses, including;

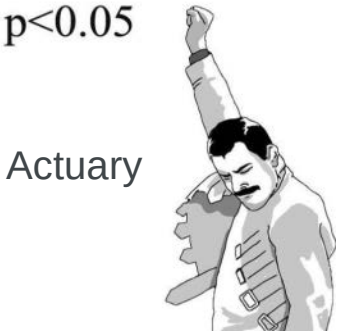
(i) perils and elements that are not included in the model;

(ii) assumptions and any estimates used in the modelling process; and

(iii) the **sensitivity of the model outputs** as a result of the factors in (i) and (ii).

Current Catastrophe Risk Management Practices – What is yours?

- Do you know if your company currently does Catastrophe Modelling?
- If it does, do you know who is in charge/who is taking responsibility for it?
- How is it done, what are the issues/limitations of the analysis?
- Are the limitations accounted for in any analysis and communicated to stakeholders?



- As actuaries we are obligated by our responsibility to our company that we do our best as professionals to ensure its solvency, which means being aware of possible sources of risk and disruption

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Catastrophe Risk and Modelling

- What are the sources of uncertainty and potential limitations

Stochastic Event Module	Hazard Module	Vulnerability Module	Financial Analysis Module
			
Database of stochastic EQ/TY events	EQ intensity/TY at each risk	Damage ratio of TSI	Losses on different Re/insurance structure
• Local, regional or global data? • How long? *similar across models*	• Resolution • Secondary perils *methodology might vary*	• Local application • Experience based • Available coverages *most challenging*	• Support for local conditions • Demand Surge *standardised*

- *What about non-property lines?*

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Challenges in Catastrophe Risk Assessment in Asia

Nature of typical insured portfolio – law of large numbers

- In some cases, smaller portfolios of high valued risks – higher potential volatility

Low insurance penetration, specialist portfolios

- Access to and lack of loss experience
- Typhoon Haiyan is a typical example

Access to development data

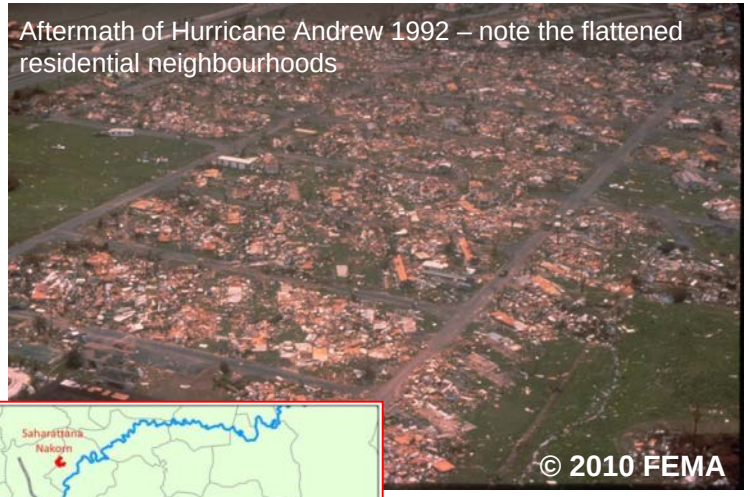
- Difficult to access required data - thus reliance on lower resolution or regional data

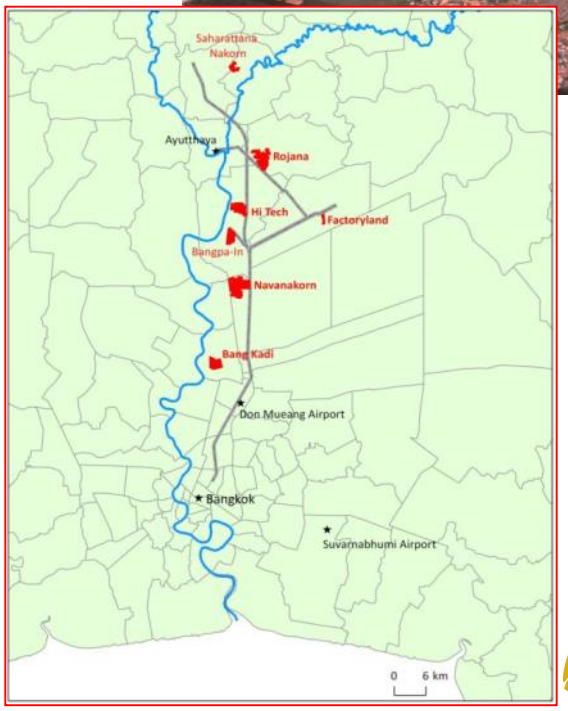
Historically US centric development with catastrophe modelling

- Recently changing with recognition of local needs

Modelled perils can give rise to large losses

- Surge, fire following, tsunami etc.
- Exasperated by all points above





Red areas: industrial estates

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Dynamic Cat Model Landscape for APAC

Continual investment in Asia from Catastrophe Model Vendors in recent times. All model vendors now have local offices in Asia. Many of the secondary perils (precipitation, flooding, storm surge, tsunami) are now addressed.

Catastrophe Model Availability, number of models available from global providers

Country	Perils Covered		
	EQ	WS	FL
Australia	3	3	
China	3	3	1
Hong Kong	3	3	
India	3	2	
Indonesia	3		1
Japan	4	4	
New Zealand	3	1	
Philippines	4	3	
Singapore	4		
South Korea	1	4	
Taiwan	3	4	
Thailand	4	2	1
Vietnam	3	2	1
Macau	3	3	
Malaysia	3	2	1
Pakistan	2	1	
Guam	1	3	

Indicates where there is a new or revised model for 2016/17

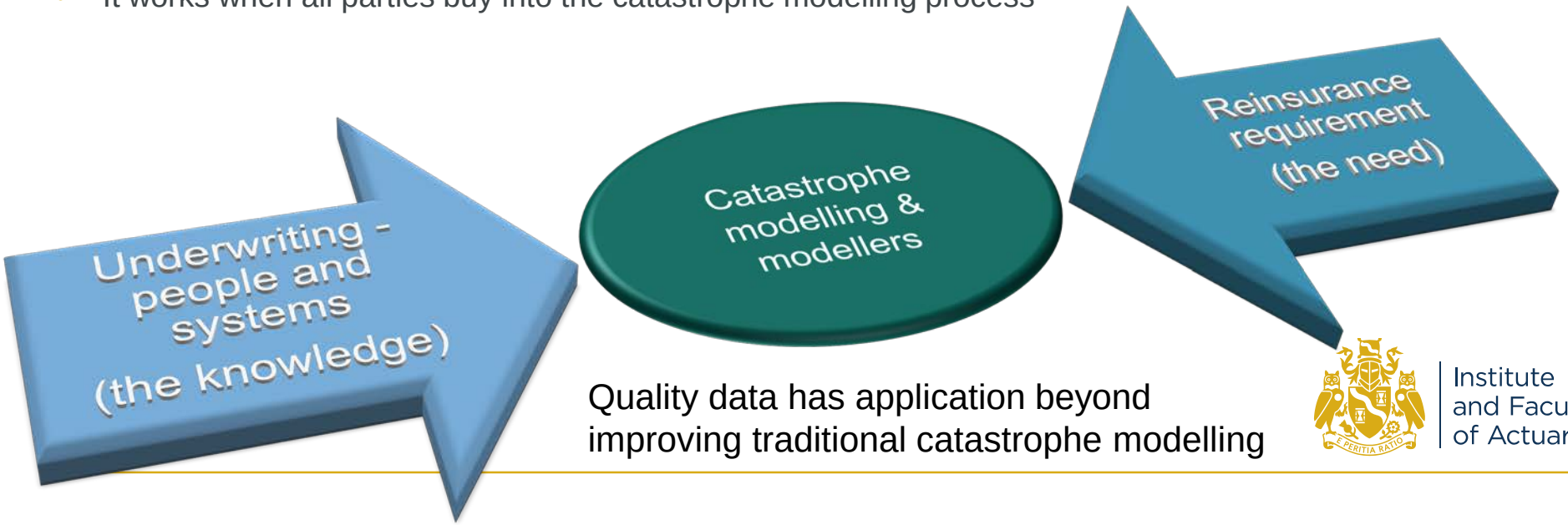
Data is key

Importance and impact of data remains poorly understood or addressed

"All discussions of catastrophic exposure management begin with the accuracy and availability of the exposure data. The most sophisticated, complex catastrophe modeling systems cannot estimate an insurer's losses if the insurer cannot identify what insurance coverages have been written and where those risks are located."

- Source: Measuring and Managing Catastrophe Risk (1995) Kozlowski &Mathewson, CAS.

- The modelling landscape within APAC has seen an increase in sophistication and scope of models
- External pressure from catastrophe events and regulatory agencies has also put a higher focus on data
- It works when all parties buy into the catastrophe modelling process



Quality data has application beyond improving traditional catastrophe modelling

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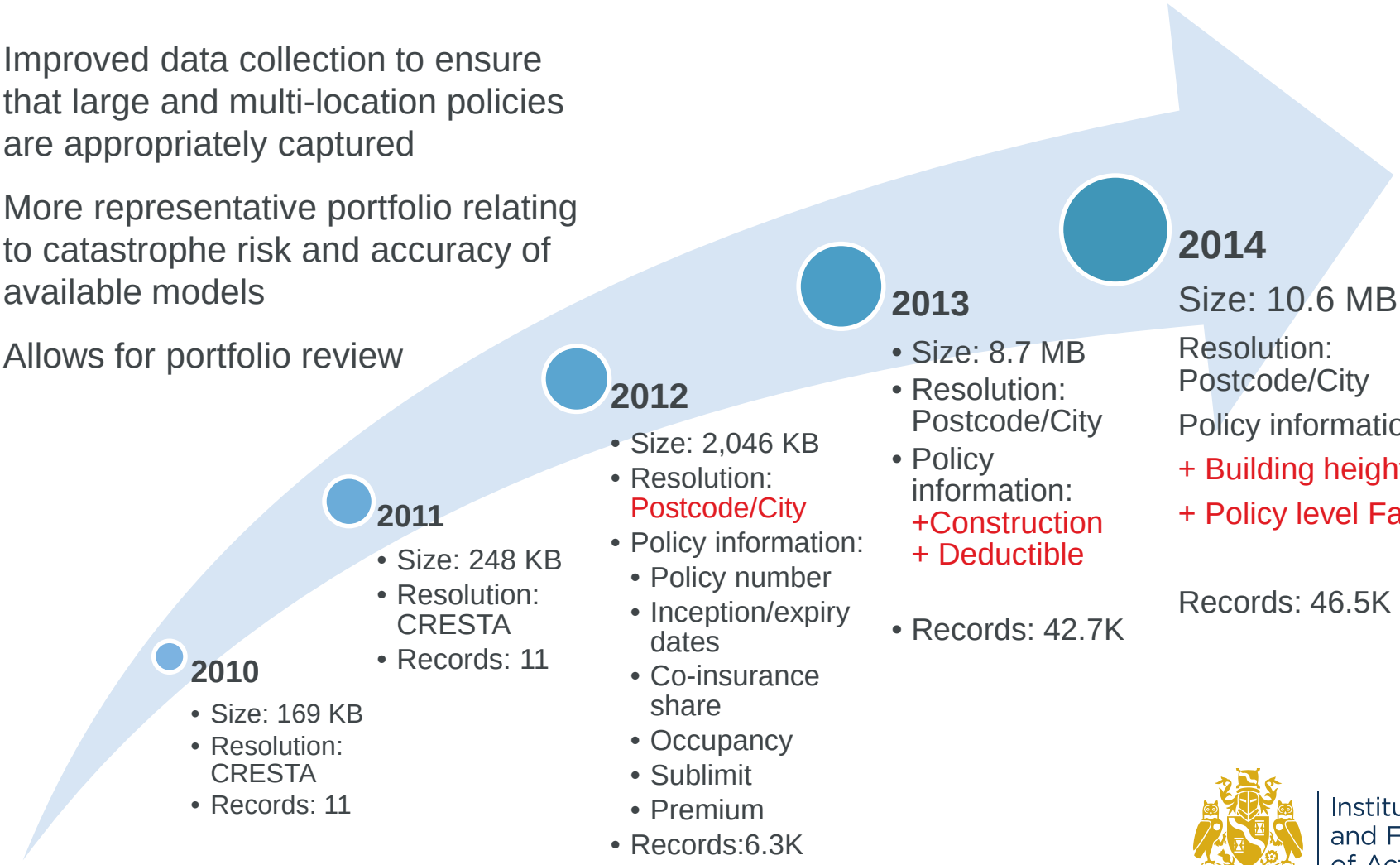
Data Improvement

Korea example

- Improved data collection to ensure that large and multi-location policies are appropriately captured
- More representative portfolio relating to catastrophe risk and accuracy of available models
- Allows for portfolio review



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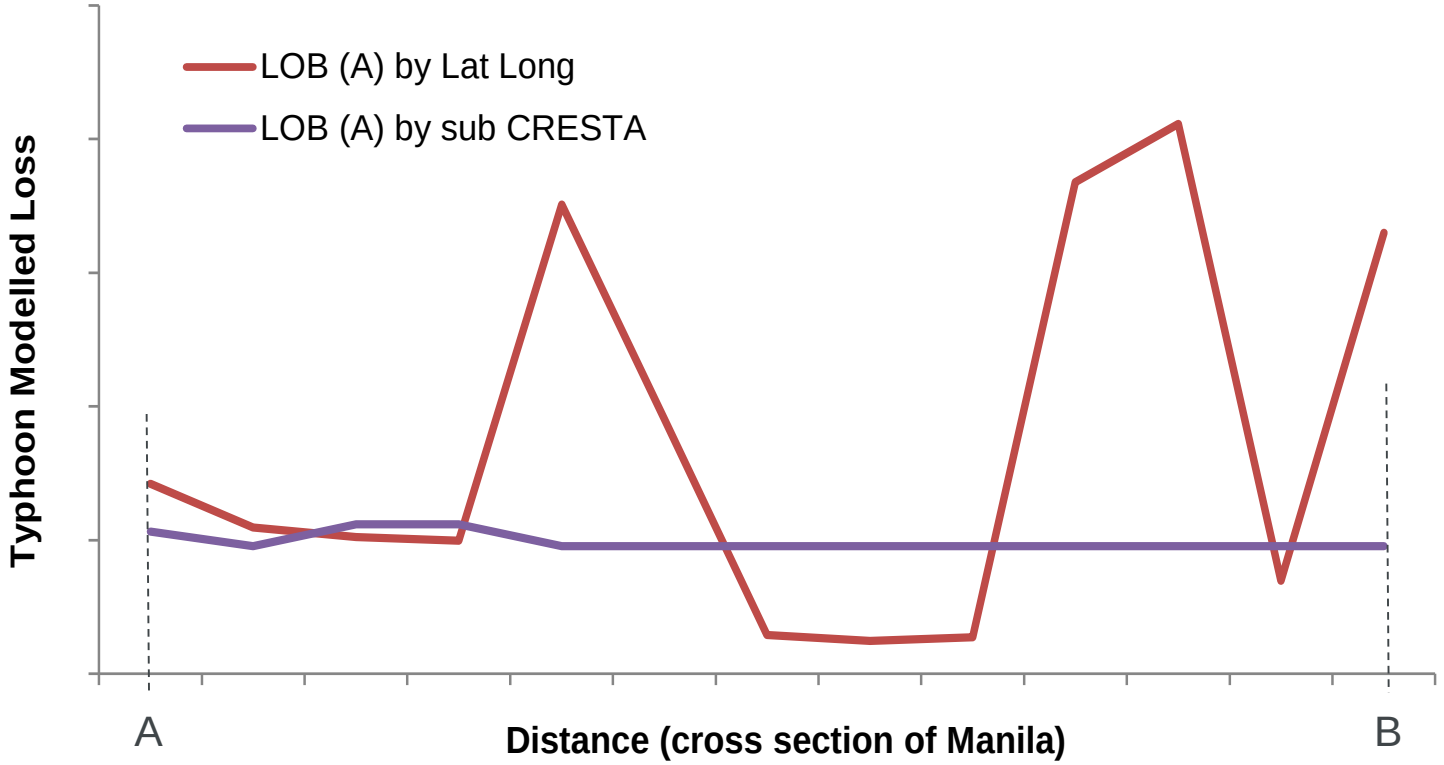
Simple Data Improvement Example

- There are other factors that can have a significant impact to volatility, but they are not unknown



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Challenges in loss estimation

2011 Tohoku Japan Earthquake example

Earthquake

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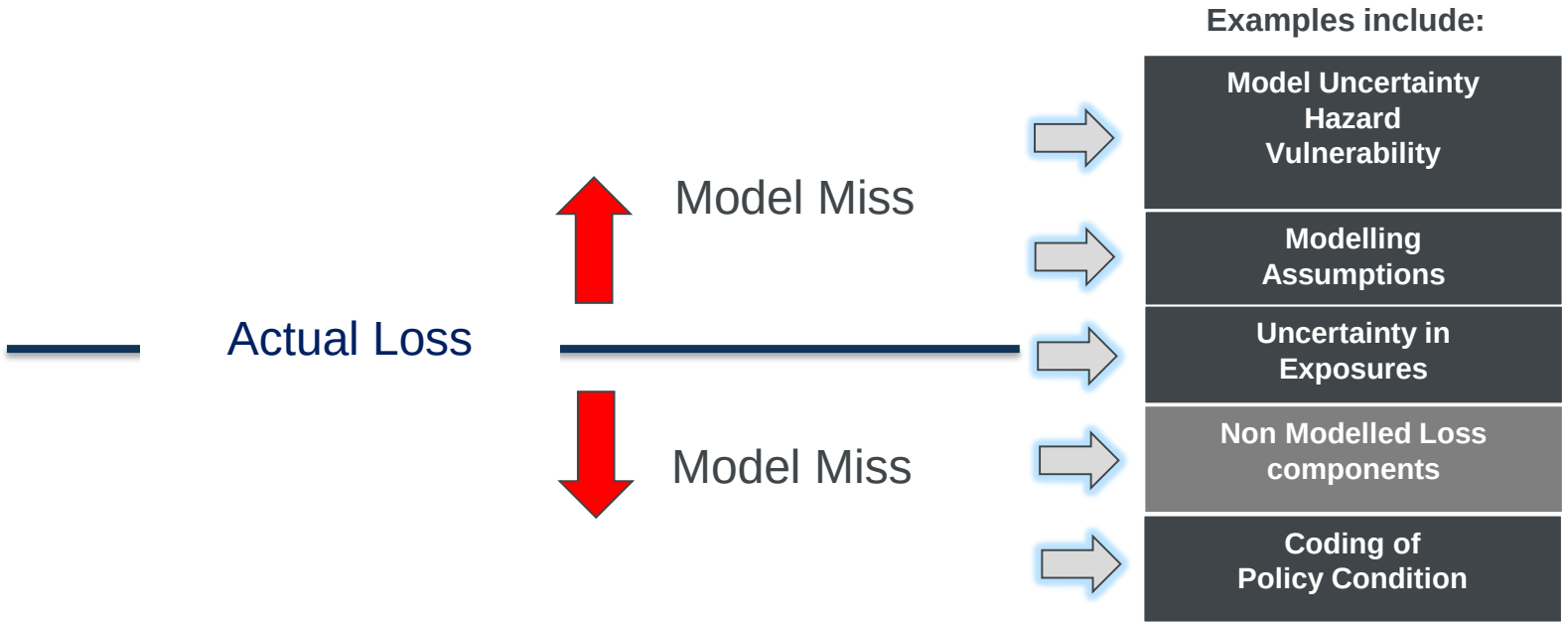
Defining non modelled loss against model miss

- **Model miss** - Difference between actual and modelled loss where **non modelled loss** is a potentially significant contributing component
- Model miss is the uncertainty in the modelling results not underestimation



- Impact of model miss (uncertainty) can be reduced or better quantified through improved understanding, addressing data concerns and reviewing non modelled loss potential

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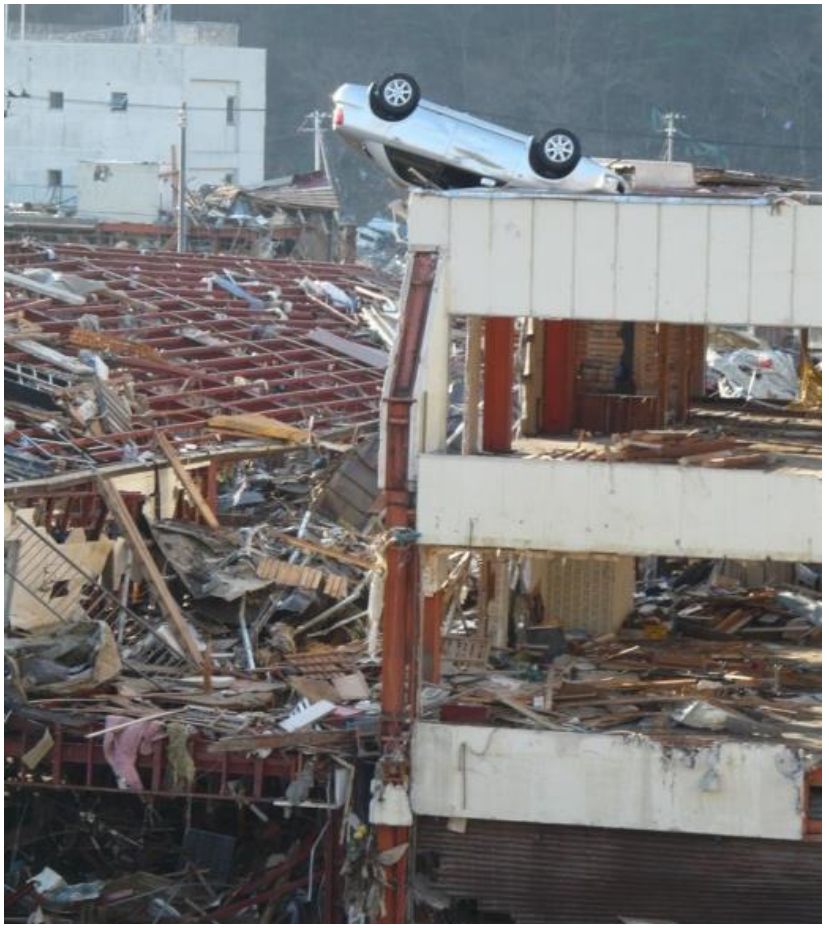
Various methods to account for non modelled components

- Awareness
- Consider if the model already accounts for some level of non modelled elements?
  - What claims experience forms the basis of vulnerability formation or model calibration?
  - Where are the historic events in the scheme of the losses in question?
  - Engage the modelling company to understand more
- Use experience from other regions to apply approximate factors
- Modify or load data to account for additional elements not covered
- Attempt to address individual elements through expert solicitation
- Use scenarios to understand and stress test the potential impact of non modelled elements



Don’t Ignore Your Local Expert

- Models don’t have all the answers
- Access local underwriting knowledge into the risk assessment and decision making process

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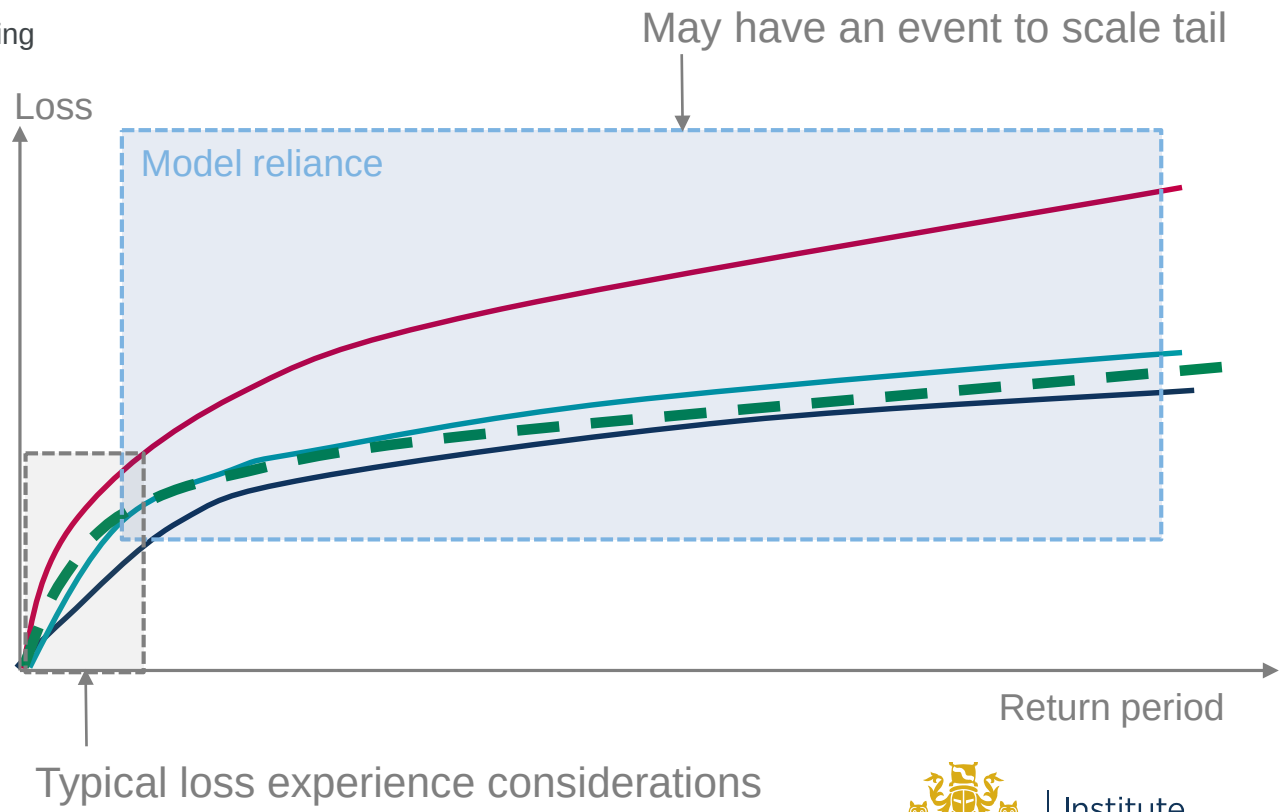
Determining your View of Risk

- Variable experience of companies using vendor catastrophe models to determine View of Risk:
  - Selection of preferred model
  - Weighting multi-model results
  - Selection of base model and adjusting
- Basis for decision will vary
  - Access to Models
  - Experience
  - Model Evaluation
  - Fit for purpose
- Examples of adjustment
  - Non-modelled perils
  - Non-modelled exposures
  - Loss experience versus model view



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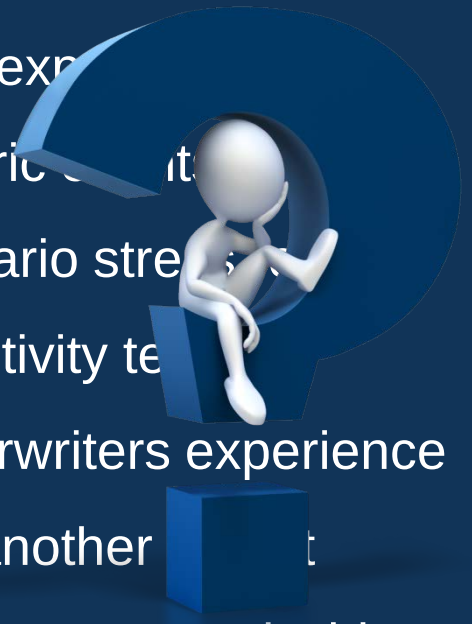
Dealing with Catastrophe Risk Today

Challenges

- Modelled Coverages
- Non-Modelled perils
- Adoption of a single cat model within a company
- Access to supporting material or experience
- PML higher than largest risk retention
- Cat Cost
- Clash

Solutions

- Reasonableness test
- Loss exp
- Historic
- Scenario stre
- Sensitivity te
- Underwriters experience
- Ask another
- Conferences and white paper



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What is not on your radar?

600 million
Hiroshima Bombs = Tohoku Quake Energy

x2 growth in claims staff after Canterbury Quakes

7.1%
drop in Dow Jones index on 12th September 2001

49 million
Barrels of oil spilt during Deepwater Horizon

65 of 77
Thai provinces inundated in 2011

422,000
New Yorkers estimated with PTSD due to 9/11

2 x UK
area under 1cm of ash after Tambora 1815 Eruption

>30%
Population killed by Black Death in 1300's

101
Tsunami evacuation sites inundated during Tohoku event

67%
drop in Carnival Corp profit 1 year after Costa Concordia

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What are the Next Steps for Working Party

- We want to hear from you
  - Local, Regional Challenges
  - Key issues within your market
  - Data challenges
  - Our immediate focus is on Nat-Cat Risk
- How will the working party engage you
  - Survey
  - One-on-one
  - Continuous Feedback
  - Industry events

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Who we are

Members

- **Sie Liang LAU (Chair, Singapore); slau@scor.com**
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- Lyon CHEU (Singapore)
- Paul WEE (Malaysia)
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