Understanding and Managing the Growing Risk from Natural Catastrophes in Asia

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Agenda

- Summary of Asia's Insured Losses to Natural Catastrophe (Nat-Cat)
- Understanding Major Natural Catastrophe Risks in Asia
- Natural Catastrophe Risk in China
- Estimating "What if" Scenarios for Historical Events
- Overview of Managing Catastrophe Risk using Catastrophe Models

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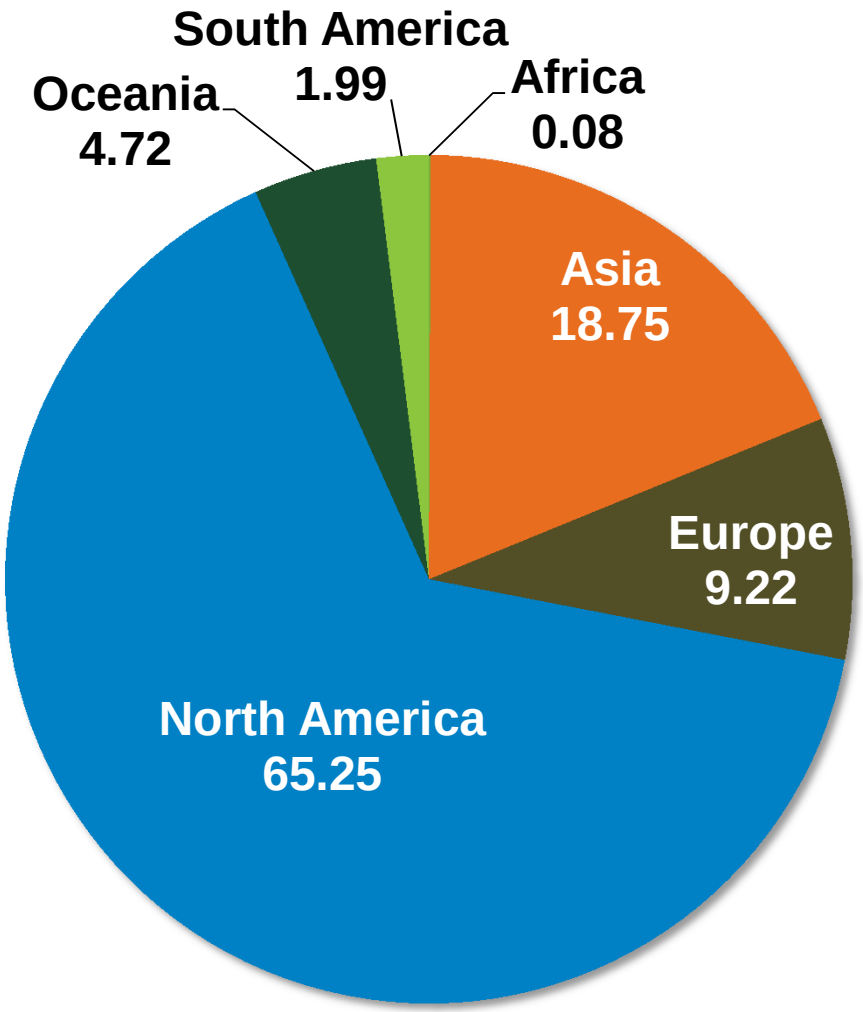
Distribution of Global Insured Losses by Continent from 2000 Through 2011



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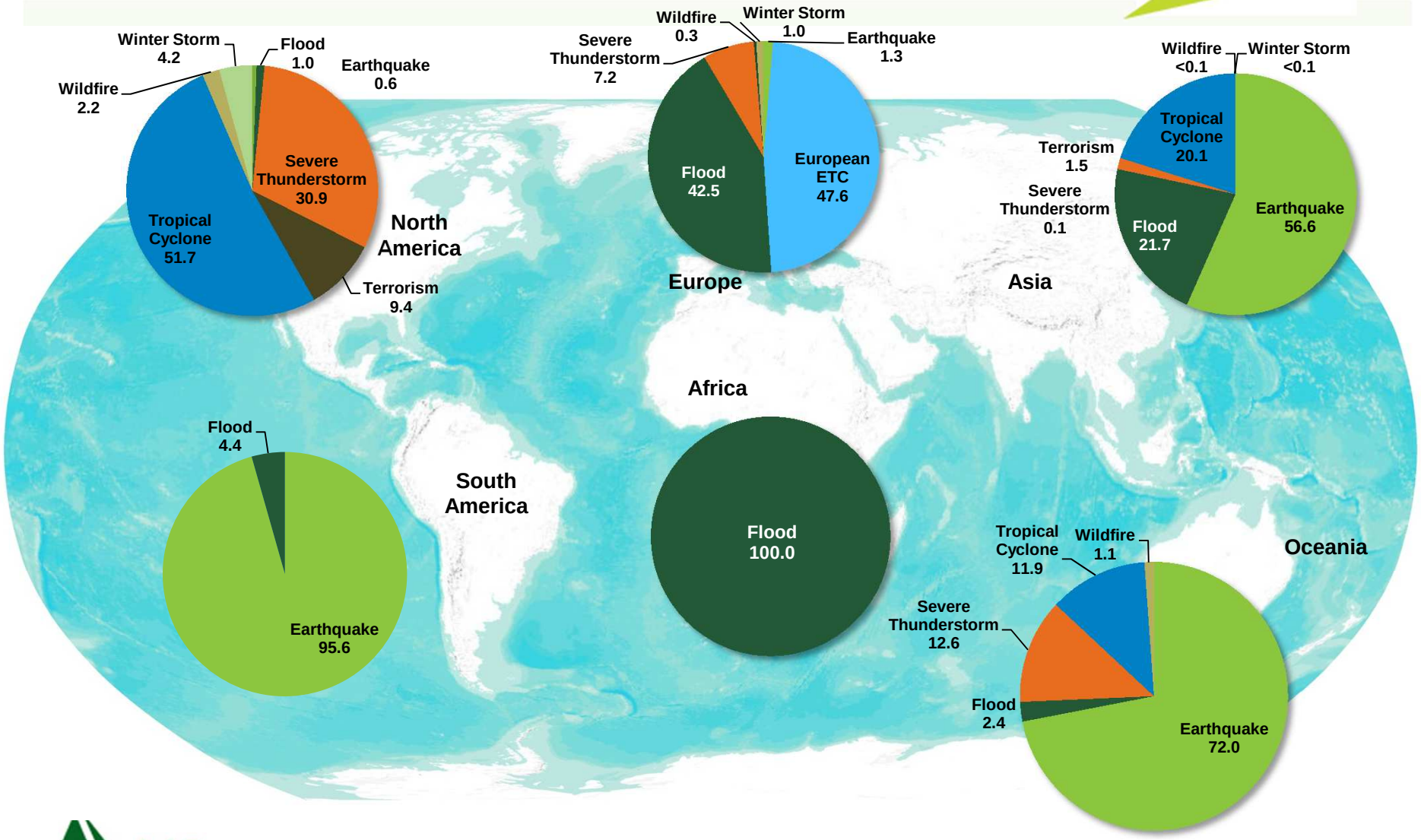
Distribution of Insured Losses by Continent and by Peril From 2000 Through 2011



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Hazard and Exposure Information is Needed to Understand and Manage the Risk

- Hazard
  - Types
  - Intensity and Frequency
  - Location & Probability: Past and Future
- Exposure
  - Location
  - Type
  - Value
  - Mitigation?

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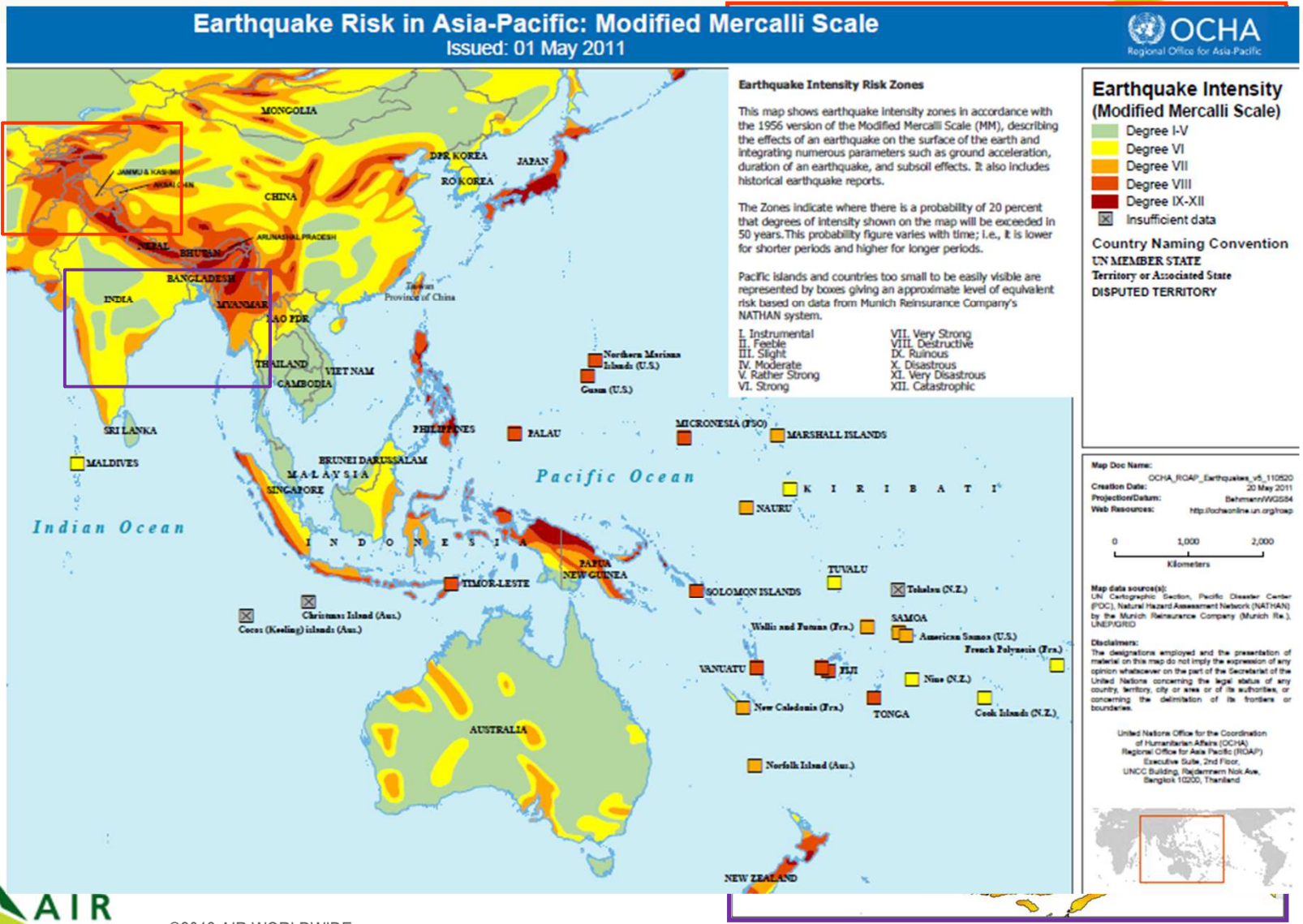
Natural Catastrophe Risk in Asia: Earthquake



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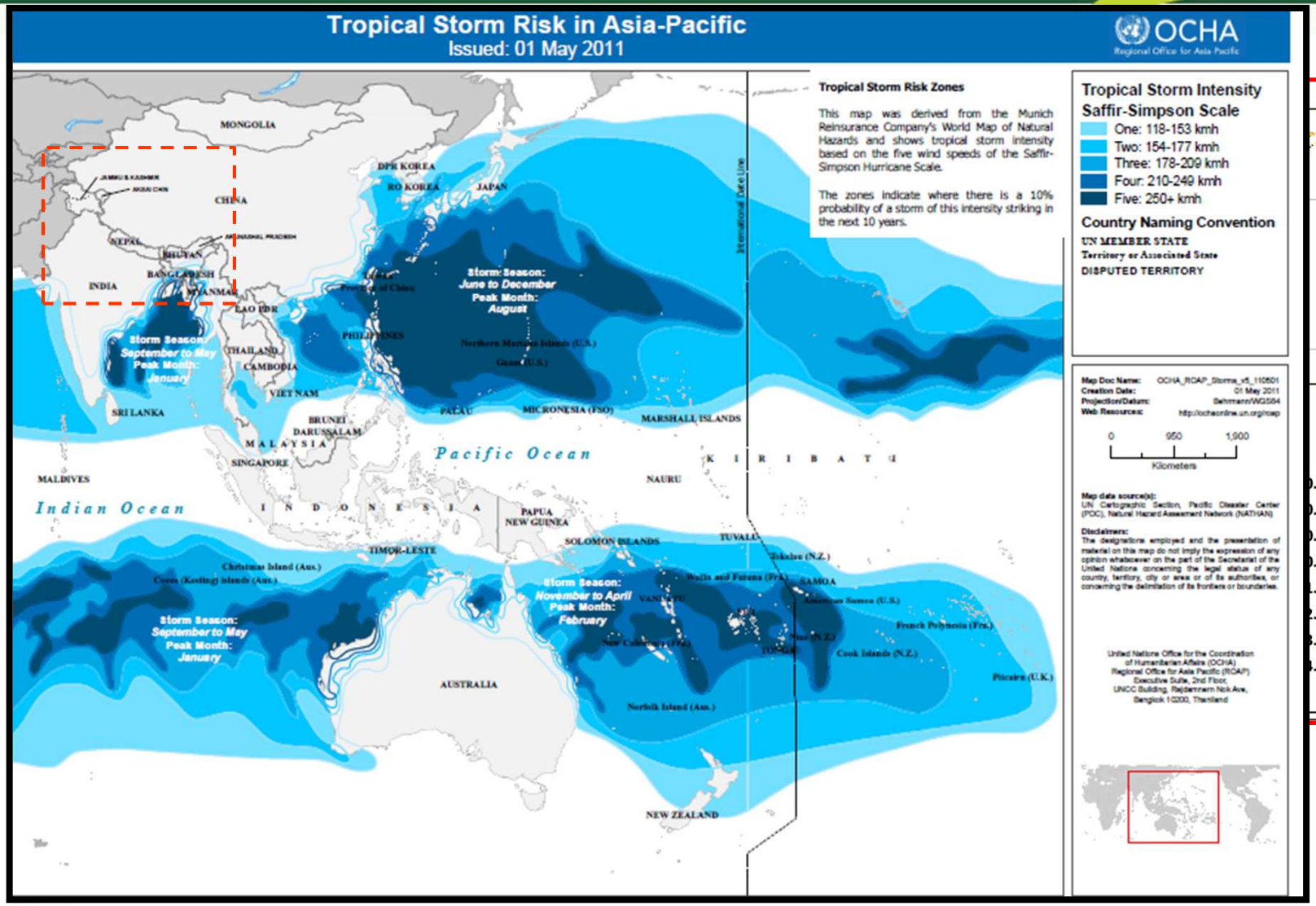
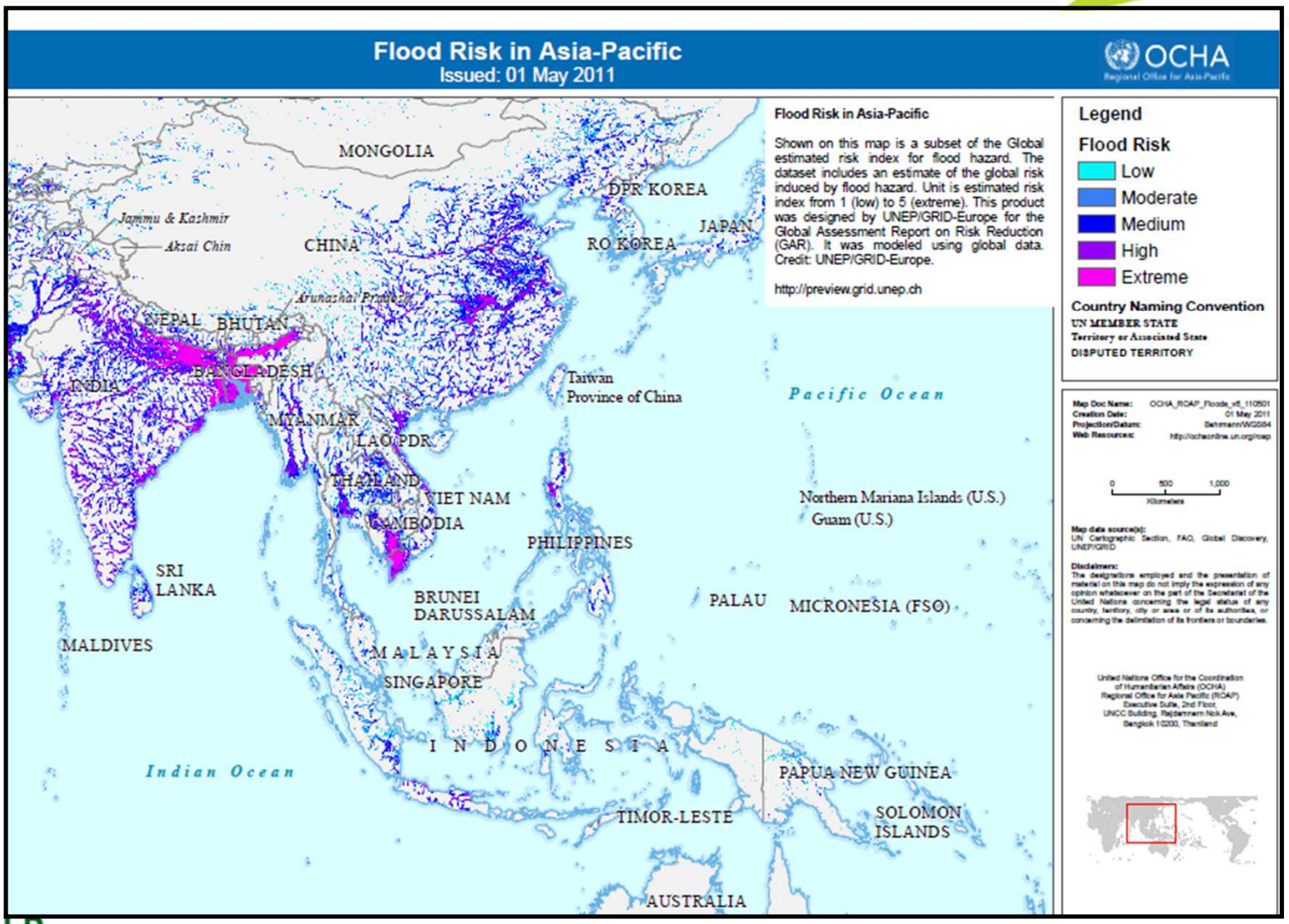
Natural Catastrophe Risk in Asia: Tropical Cyclone



Natural Catastrophe Risk in Asia: Flood



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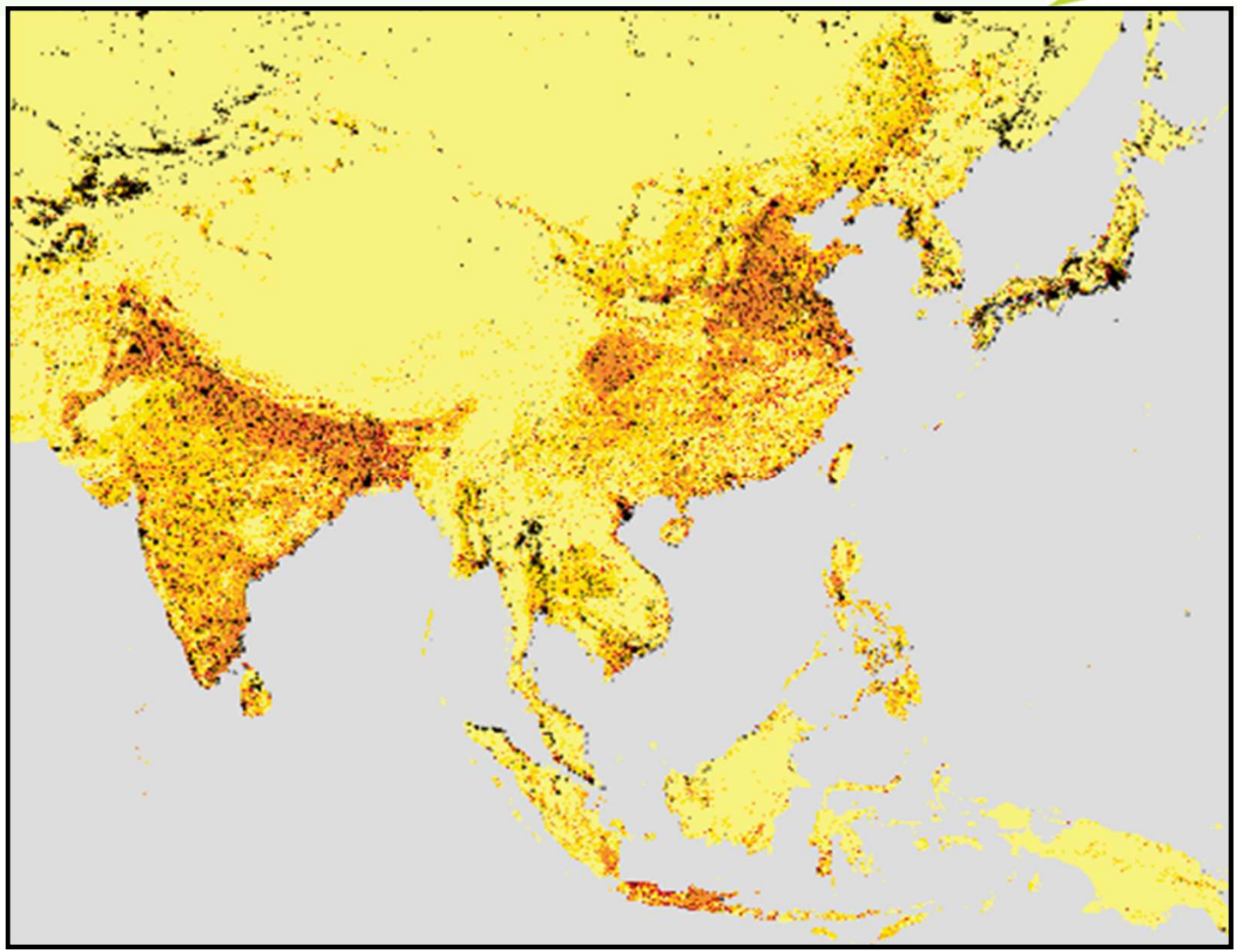
Population Density and Urban Areas in Asia



SOURCE: GRID, UNEP

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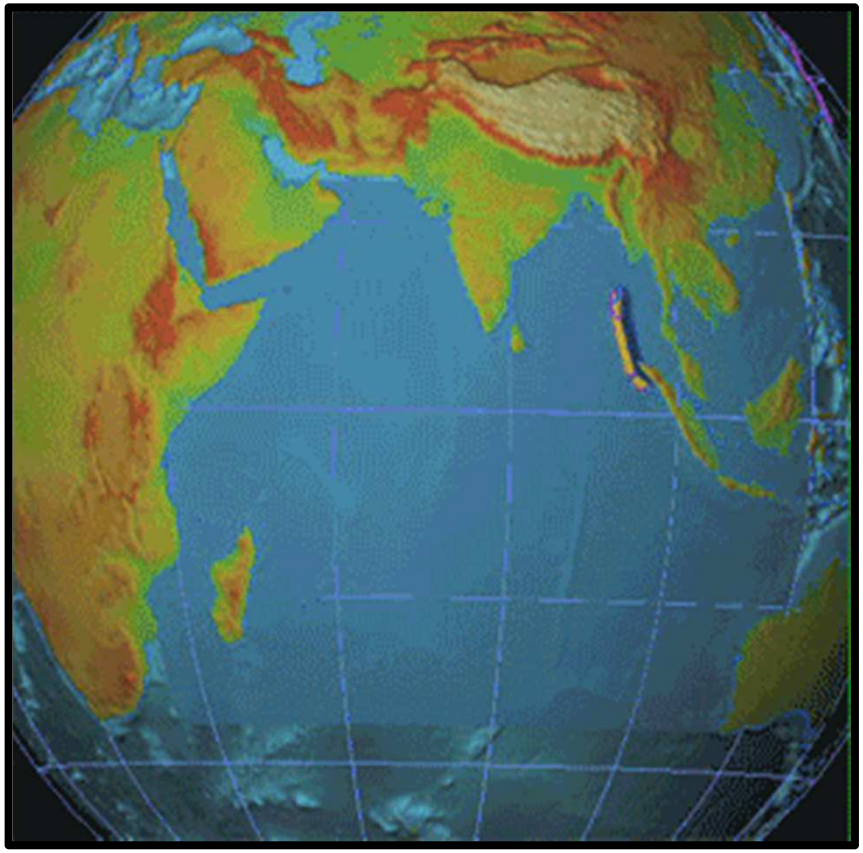
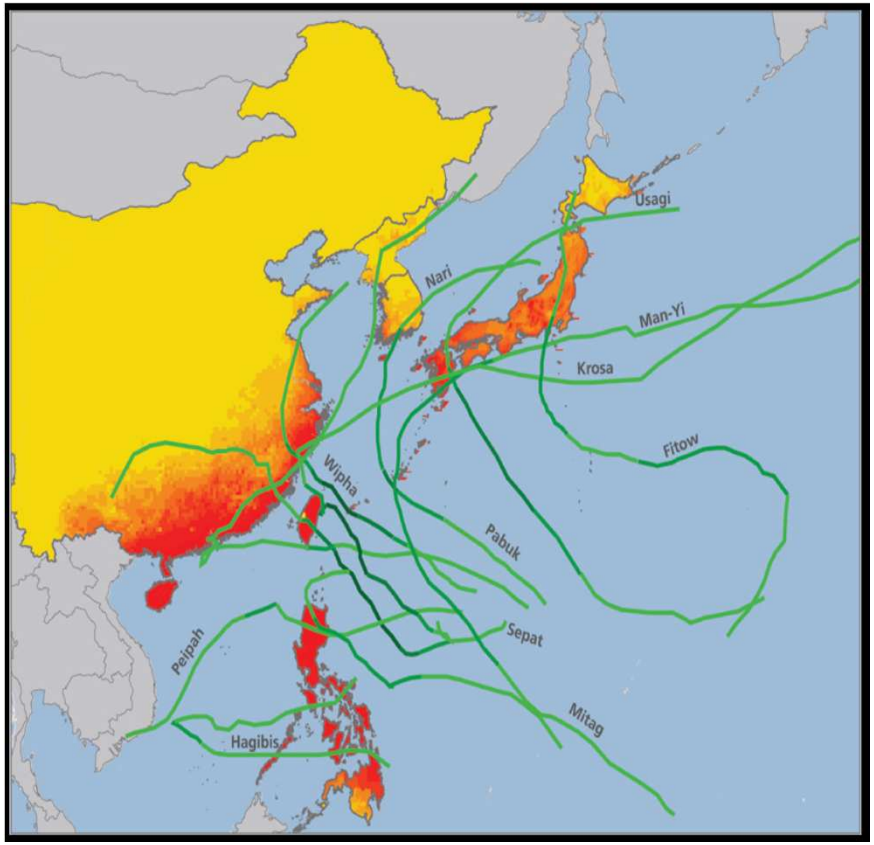
Understanding of Correlated Risk is Important to Better Manage the Exposures Across Several Countries





Source: Wikipedia

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Understanding the Natural Catastrophe Risks in China

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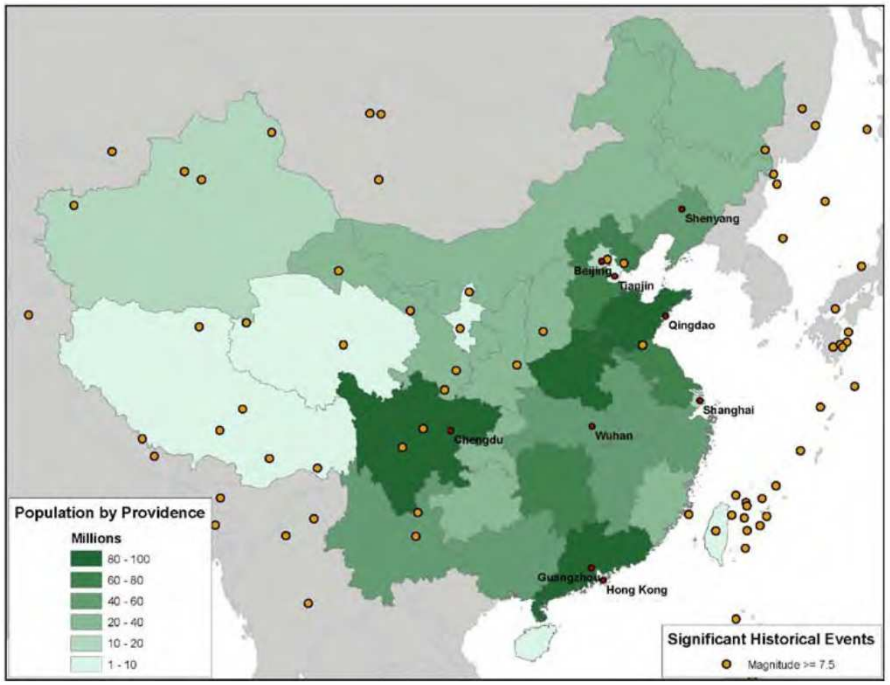
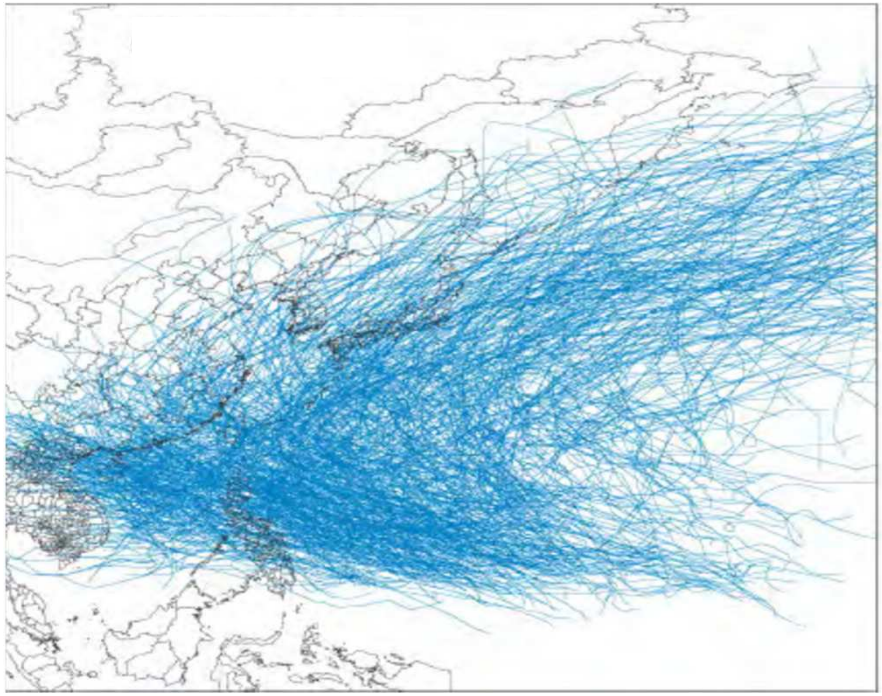
Significant Historical Earthquakes and Typhoon Events Impacting China





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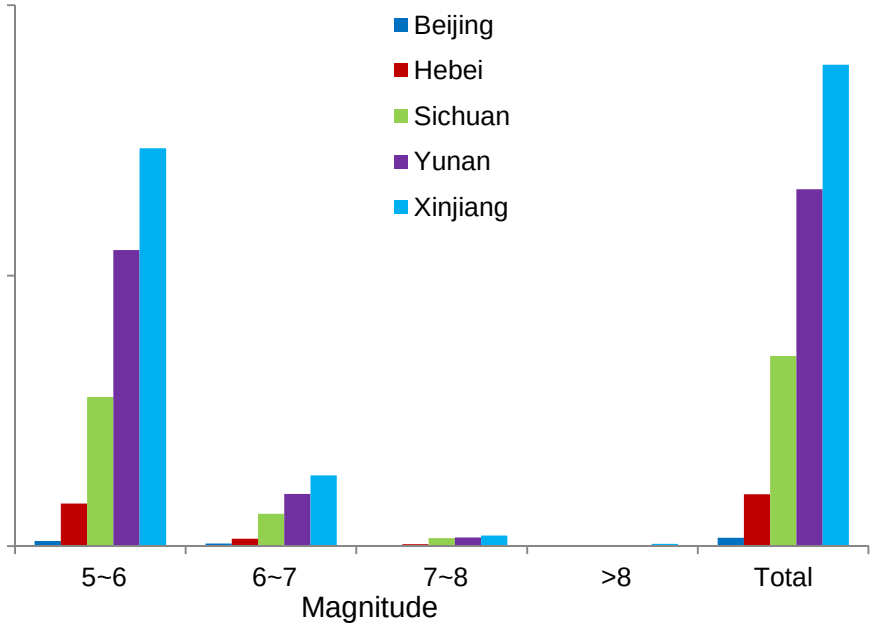
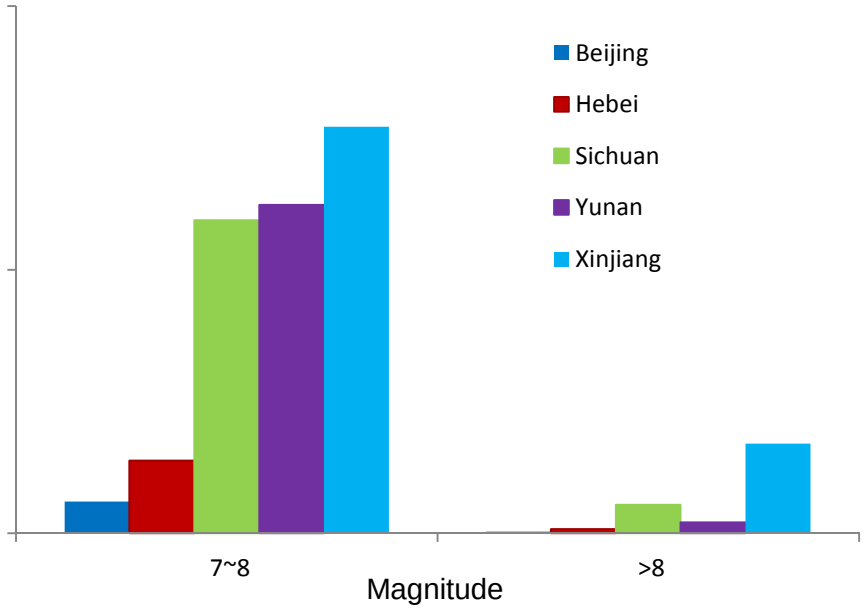
Xinjiang Province Has the Highest Frequency of Earthquake Including M7 and Higher Earthquakes

Annual Frequency



Annual Frequency



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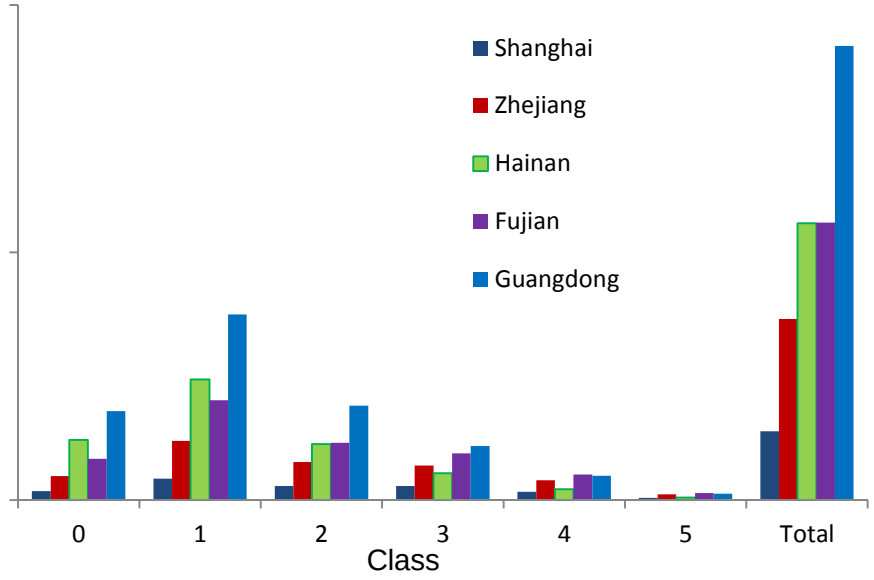
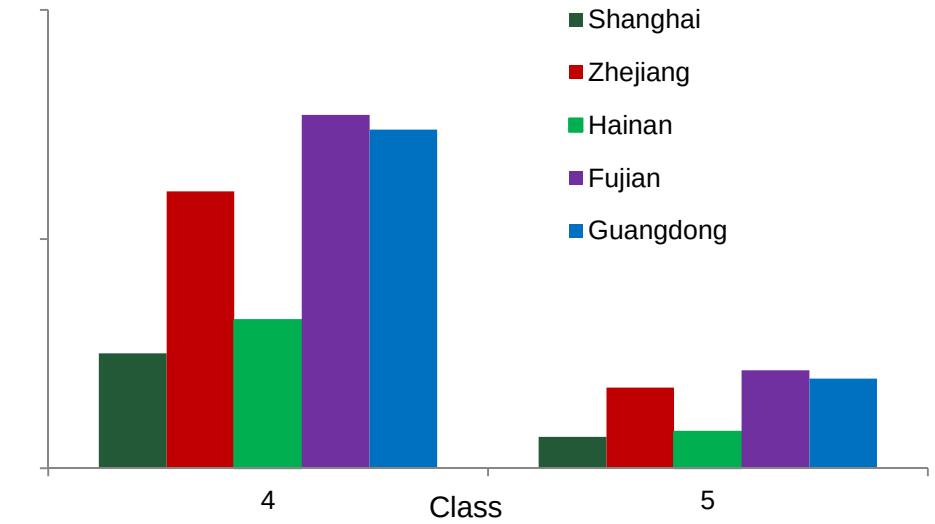
Guangdong Has Highest Frequency of Typhoon
Fujian Province Has Highest Frequency of Severe Typhoon

Annual Frequency



Annual Frequency



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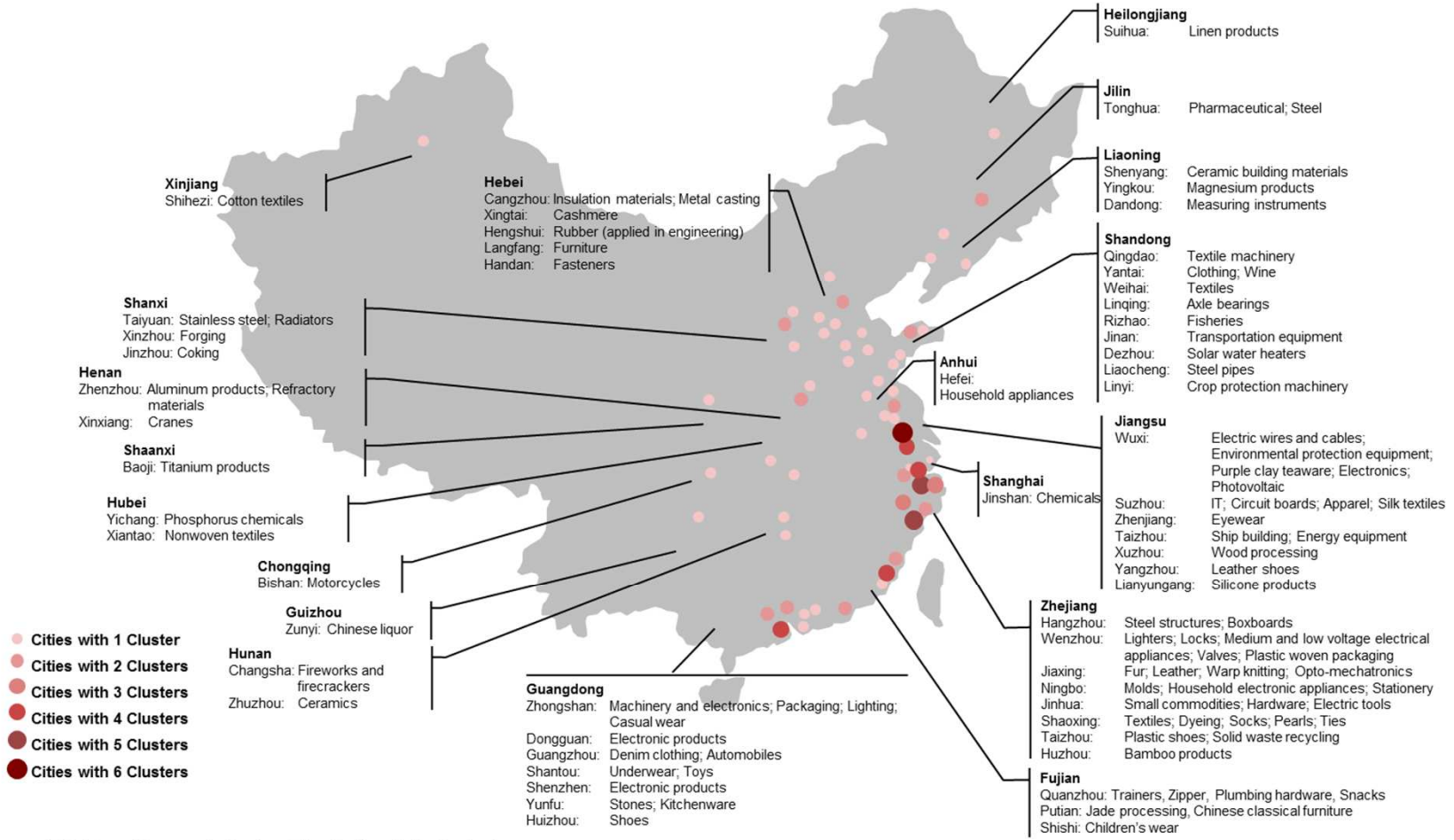
For a Better Management of Risk, it is Necessary to Understand the Concentrated Risk in a Country



Source: Li & Fung Research Centre; The Beijing Axis Analysis

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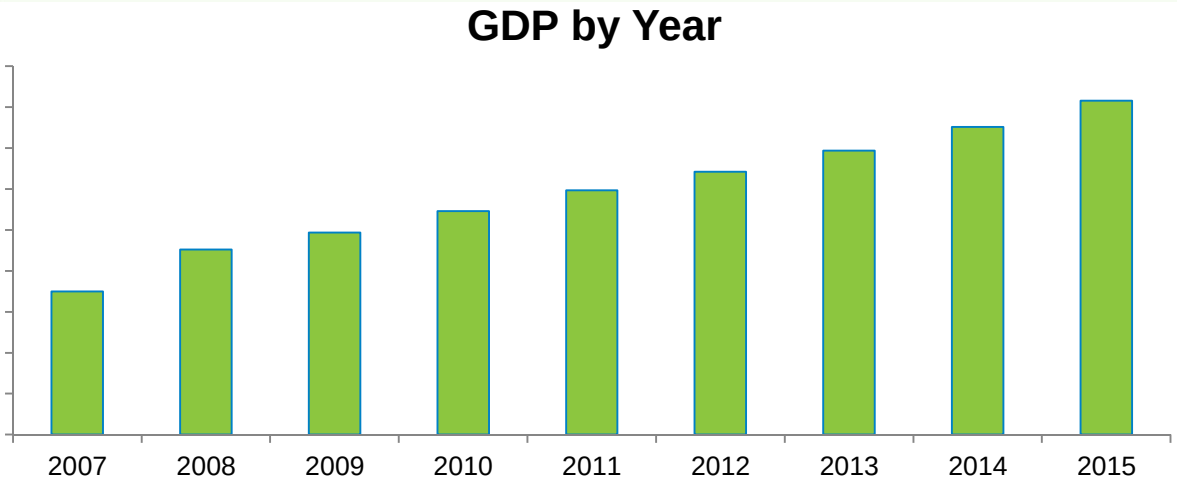
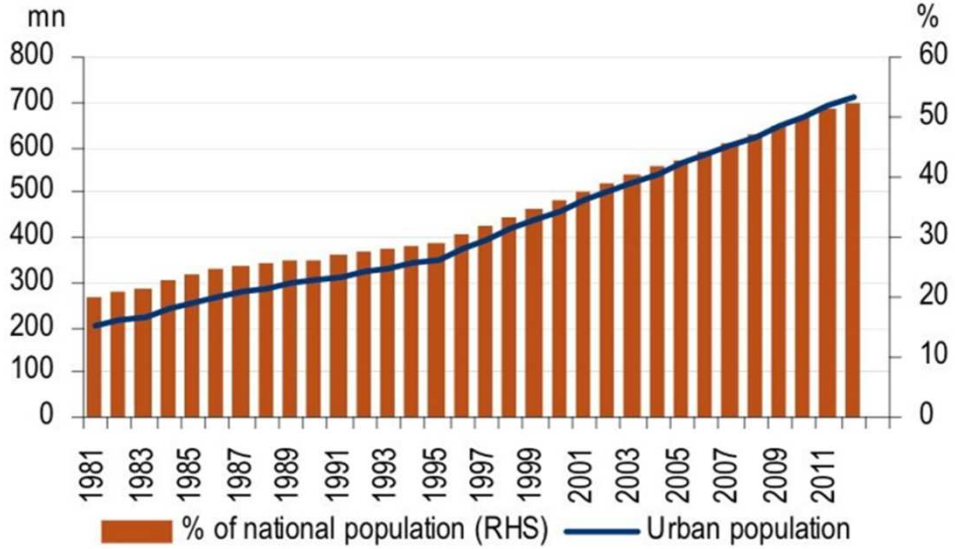
China Insured Losses Would Increase Due to Fast Economic Growth and Urbanization





Source: CEIC, BofA Merrill Lynch Global Research

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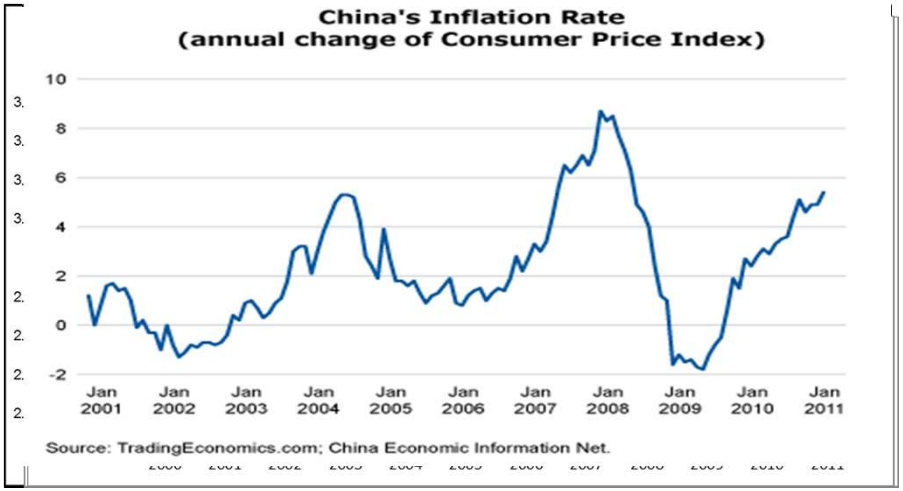
Industry Losses Needs to be Trended to Estimate the "What if" Scenarios Losses for Historical Events

- Trending of Historical Events
  - **Exposure Change**
  - **Wealth Change**
  - **Price Change**
  - **Insurance Penetration**



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Mitigation is an Important Aspect to be Considered when Estimating the Risk

- Mitigation Measures Can Significantly Reduce the Risk
  - Thailand Floods
  - Japan Tsunami
  - Taiwan Flood Management
  - Japan Flood Management

Current Status

Flood Dyke Construction Plan: soft loan facilities by government saving bank has been set up (in the amount of 15,000 million baht) for affected industrial estates

	Saharattana-Nakorn	Rojjana	Baan-Wah (Hi-Tech)	Bang Pa-in	Nawa nakorn	Bang Kadee	Factory Land
Types	In the designing process	Earth dyke with concrete plate	Earth dyke	Earth dyke and concrete dyke	Compacted earth-concrete dyke	Earth-filled concrete dyke	Concrete sheet pile
Height from sea level (Metre)	6.50	6.05	5.40	6.00	5.50	5.00	5.50
Investment (Mil Baht)	240	2,030	350	700	540	580	700
Duration of Construction	5 months (Apr - 31 Aug 2012)	8 months (16 Feb -30 Sep 2012)	6 months (1 Mar - 30 Aug 2012)	Soil dam (Jul 2012) Concrete dam (May 2013)	7 months (15 Feb - 31 Aug 2012)	7 months (10 Feb – 30 Aug 2012)	-

Source: summarized by NESDB

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Other Perils Should be Considered when Estimating the Natural Catastrophe Risk

- Winter Storm
- Volcanoes
- Tsunami
- .
- .

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Catastrophe Models are Used to Understand and Manage the Risk

- Due to the low frequency of severe catastrophes, traditional methods that rely on company claims data may not be a good predictor of possible losses
- The constantly changing landscape of exposure data limits the usefulness of past loss experience
  - New properties continue to be built in areas of high hazard
  - Building materials and designs change
  - New structures may be more or less vulnerable to catastrophic events than old ones
- Models should capture potential losses *before they occur* to ensure they provide an objective and stable view of risk over time

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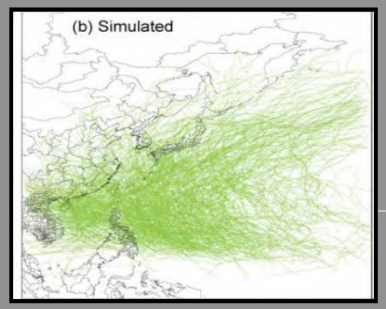
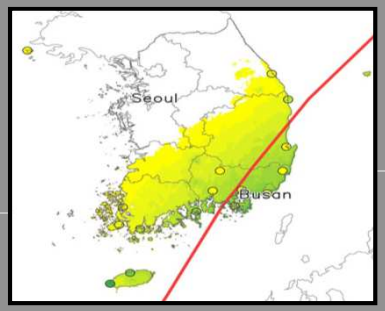
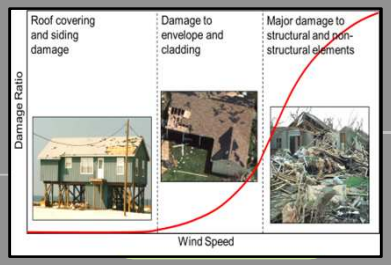
What are Catastrophe Models?

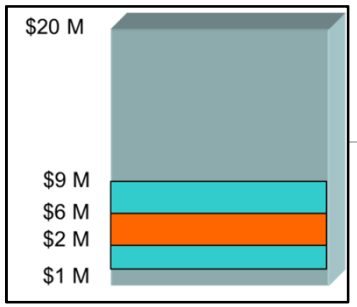
HAZARD





ENGINEERING





FINANCIAL

Probability	Ground Up Loss	Gross Loss	Net Loss
0.22	0	0	0
0.01	500	0	0
0.01	1000	0	0
0.01	1500	500	0
0.01	2000	1000	0
0.01	2500	1500	500
0.01	3000	2000	1000
0.03	3500	2500	1500

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Validation and Evaluation of Catastrophe Models is Mutually Beneficial

- Similarity to current market pricing
- Comparison to actual event losses ✓
- Industry and company level loss validation ✓✓
- Component-level validation ✓✓

Own the risk.™

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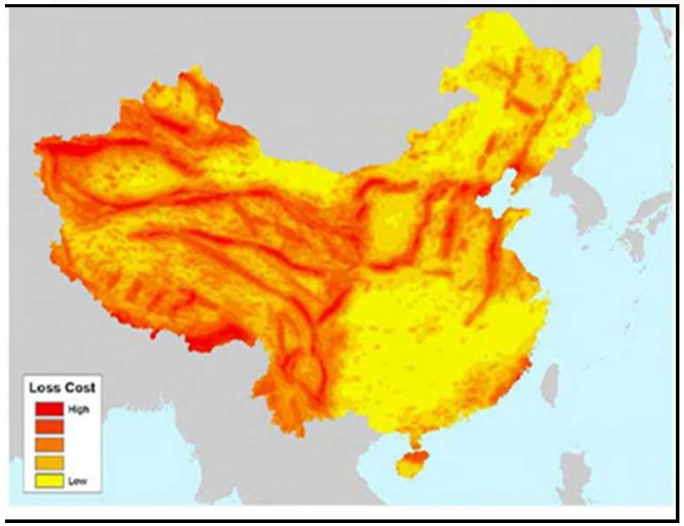
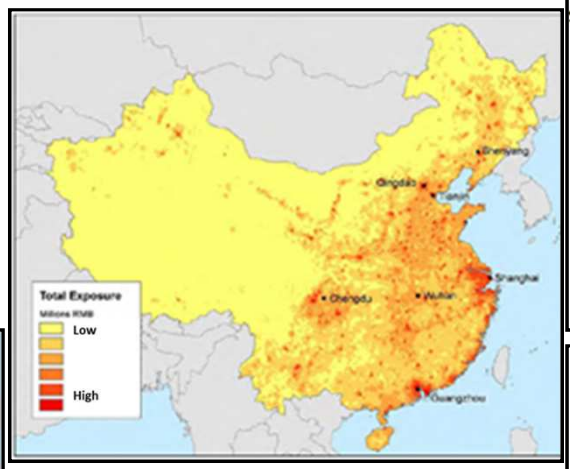
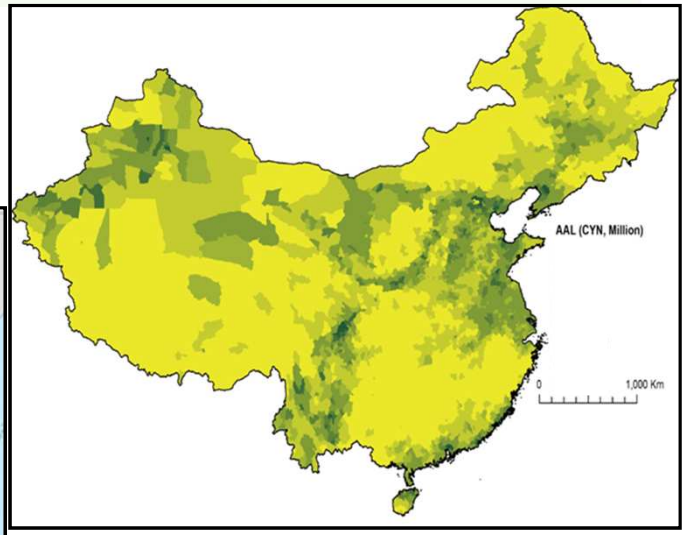
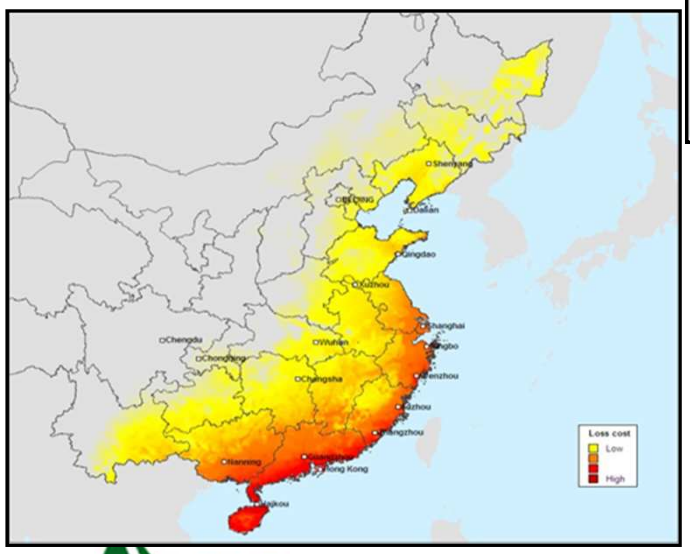
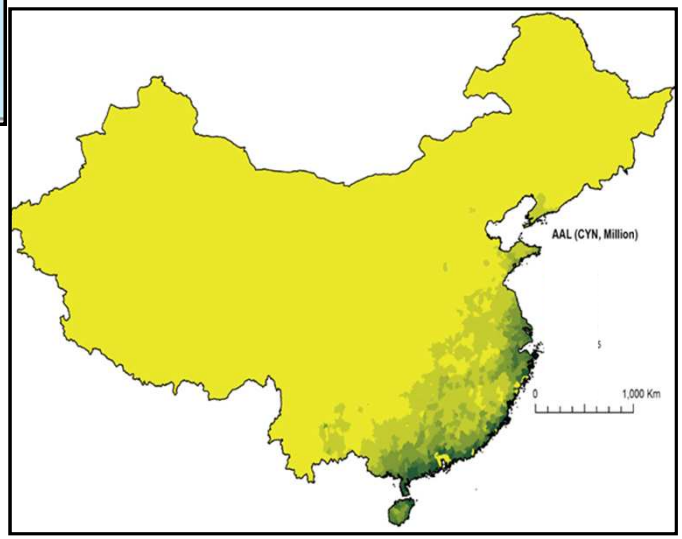
Hazard And Exposure Information is Used to Estimate the Risk











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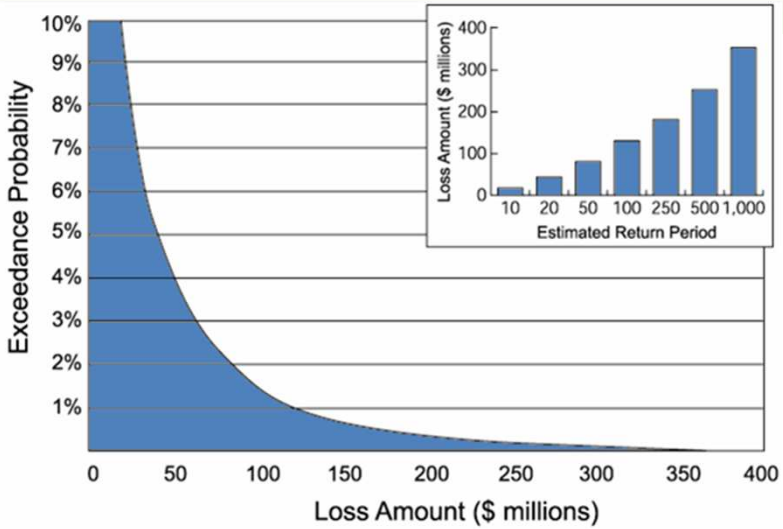
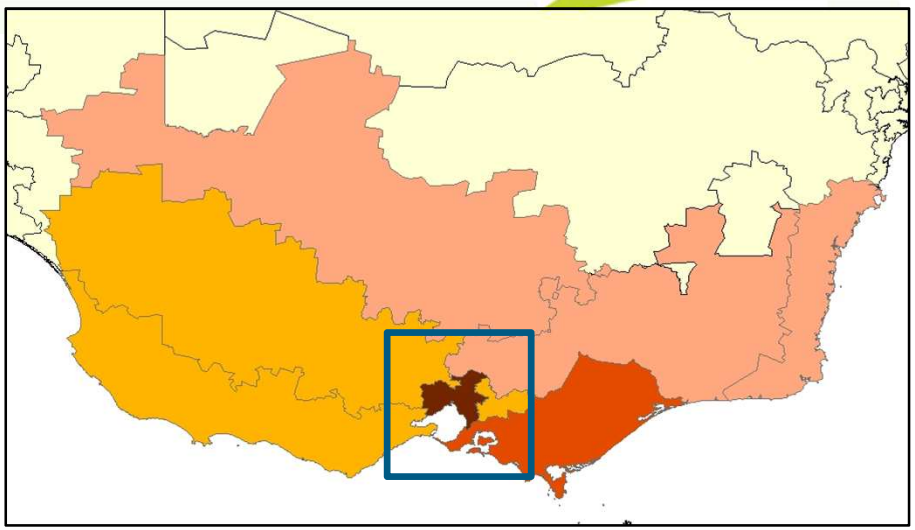
Catastrophe Models Provide a Wide Range of Outputs





Event	Year	Contract Loss	Event Info
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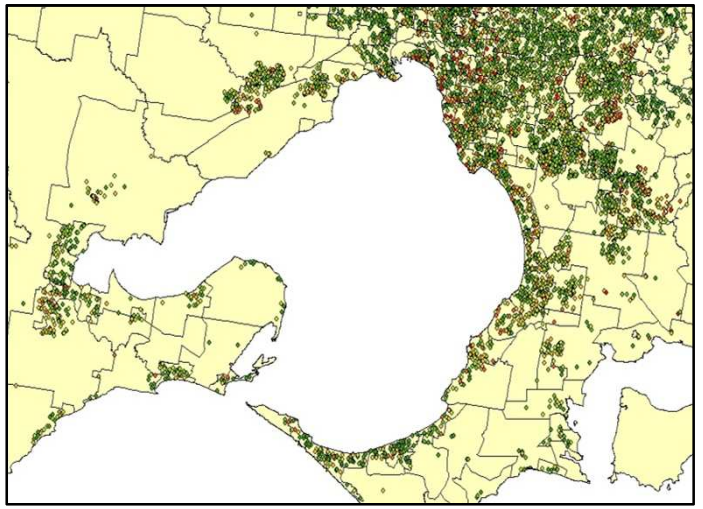
20,557	9052	592,880,889	M51: Mw=6.56; MArea=AS ; Depth (km)=14.2; Loc=0; Lon=144.733002°; Lat=-37.995998°
19,171	8502	578,047,306	M51: Mw=7.49; MArea=AS ; Depth (km)=17.9; Loc=1; Lon=146.115005°; Lat=-37.647999°
17,452	7696	479,595,614	M51: Mw=5.99; MArea=AS ; Depth (km)=9.1; Loc=1; Lon=145.216003°; Lat=-37.823002°
9,247	3695	356,975,527	M51: Mw=5.85; MArea=AS ; Depth (km)=3.6; Loc=1; Lon=145.248001°; Lat=-37.862999°;
8,399	3325	223,729,772	M51: Mw=7.30; MArea=AS ; Depth (km)=25.9; Loc=1; Lon=146.509003°; Lat=-37.930000°



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Significant Percentage of the Natural Catastrophe Related Losses Can be Estimated Using Catastrophe Models

Source: AIR -Worldwide

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All Models Are Not Equal: An Example of Flood Modelling

	Pros	Cons
Historic event footprints	- Understandable - Discrete	- Deterministic and unable to predict future large losses
Actuarial or based on trending historical losses	- Simple - Inexpensive	- Need a large sample of past losses - Weakness of trending assumptions
Return period flood maps (e.g., FEMA maps in U.S.)	- Estimates risk at location - Easy to apply to underwriting and accumulation	- Not event-driven - Cannot provide you event loss
Probabilistic models based on river gauging station data	- Based on trended historical gauge data - Derived event footprints	- Hazard is partially physical - Physical data requirements high
Event-based fully probabilistic model developed from precipitation and runoff models	- Scientifically most advanced	- Length of time to deliver - Physical data requirements are high - Computational requirements high

Natural Catastrophe Risk in Asia is Growing and Needs a Better Understanding and Management

- Insurance exposure is significantly growing in Asia.

  'Emerging Asia' countries, will double their market share from 8% to 16%- Munich Re, 2013

- Major growth in urban centers, which can be exposed to high catastrophe risk
- Proper understanding of exposure and risk is necessary for more efficient risk management
- Natural catastrophe risk in a country can include range of perils
- Insurance pricing needs a balanced approach
- Catastrophe models can be used as risk management tools
- Catastrophe model are as good as the data into it; public/private partnership shall be encouraged to collect highest quality data in the region

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