Tsunami Risk: Perspective of Insurance/Reinsurance Industry

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November 2024

Aon Executive Briefing

U.S. Earthquake Risk

Four Things You Need to Know about U.S. Earthquake Risk

1 Earthquake Risk is Highest in the Following Regions:

- West Coast & Western Mountain Range
- Southern Coast of Alaska
- Southern and Mid-Western United States
- Big Island of Hawaii

2 Earthquake Protection Gap is Significant Due to:

- Low awareness of the threat posed by earthquakes
- Cost of insurance
- Lack of significant damage causing events in the recent past

3 Scope of Earthquake Losses Extend Beyond Ground Shaking:

- **Tsunamis,** Earthquake-induced liquefaction, landslides, sprinkler leakage, and fires
- Aftershocks
- Business-interruption related losses

4 Enforcement of Building Codes is Key towards Mitigating Earthquake Risk:

- Adequately reinforced buildings can withstand earthquakes better
- Retrofitting of existing building stock can also improve performance

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Economic and Insured Losses from Recent Major Events Involving Tsunami

Economic Impact of Recent Major Events Involving Tsunamis

Combined loss due to earthquake and tsunami, adjusted to 2024 USD

Earthquake events involving tsunamis can lead to significant economic losses; the disparity between the economic and insured losses points to a large protection gap

Event	Year	Economic Loss ($)	Insured Loss ($)
Great Tohoku, Japan	2011	330 billion	49 billion
Indian Ocean Earthquake and Tsunami	2004	30.6 billion	3.7 billion
Sulawesi Earthquake and Tsunami	2018	2 billion	98 million

Source: Catastrophe Insights, Aon

Impact of the Indian Ocean earthquake and tsunami in Banda Aceh, Indonesia, where only a few structures remained standing. Source: Hokkaido University, Yuichi Nishimura

Economic Impact of Recent Major Events Involving Tsunamis

Recent events highlight the low insurance penetration for tsunami coverage; fully insured disaster survivors recover faster and more completely than the un- and under-insured

The low penetration of insurance in the areas impacted by the 2004 Great Indian Ocean Tsunami was not because of unavailability of tsunami insurance. In general, it was readily available.

- For buildings, contents and business interruption, tsunami coverage is generally an automatic inclusion with either earthquake cover or flood coverage, which are generally voluntary additions to fire coverage
- In Asian countries, fire coverage is common for larger commercial and industrial properties, and only a relatively small proportion of these properties also purchase earthquake and/or flood insurance
- Residential properties and small business tend to only purchase fire insurance if subject to a bank mortgage requirement, and almost never purchase earthquake and/or flood insurance

The New York Times

Areas hit by tsunami had limited insurance

Jan. 4, 2005

SINGAPORE — HSBC Insurance Asia, United Insurance India and other Asian insurance companies will probably incur smaller losses from the region's devastating tsunamis than from other natural disasters in 2004 because of the limited coverage held by many of the victims, Standard & Poor's said on Monday.

An estimated 150,000 people in 12 countries in Asia and Africa died after an earthquake on Dec. 26 triggered giant waves across the Indian Ocean.

"There is no immediate impact on the insurance companies" that Standard & Poor's rates in Thailand, Malaysia, Singapore, India, Hong Kong and Taiwan, S&P said.

S&P rates 87 insurance companies in the region, including Hong Leong Assurance in Malaysia, Thai Commercial Insurance and AXA Insurance Singapore.

Insurance losses are as yet unknown, given the widespread damage, the credit rating concern said. The market estimate that claims will total less than $10 billion is "significantly lower" than the expected economic losses, it said.

This also would be considerably lower than the estimated $27 billion of insured damages from the four hurricanes that struck the Caribbean and the southeastern United States last August and September. Swiss Reinsurance of Zurich, the world's second-largest reinsurance company, released the $27 billion estimate of insured losses on Dec. 16. Those storms left more than 3,000 people dead.

Source: George R Walker (2005): "Some reflections on the insurance aspects of tsunami damage."

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Learnings From Recent Major Events Involving Tsunami

Substantial reduction in tsunami-risk post Tohoku

Population movement and improved tsunami defenses led to a significant reduction in tsunami risk post the Tohoku event

1

Demographic Change

- **Significant reduction in population and exposure** in the high fatality Tohoku tsunami area
- **Up to 33% reduction in population** in the impacted areas due to the combined impact of earthquake and tsunami*

2

Improved Tsunami Defenses

Substantial improved tsunami defenses:

- **New seawalls, up to 15 m high in some areas**, built after the tsunami
- **Evacuation facilities** built in many tsunami-exposed low-lying regions

Source: May Aye Thiri (2017). “Social vulnerability and environmental migration: The case of Miyagi Prefecture after the Great East Japan Earthquake:

3

Tsunami Insurance

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Tsunami insurance in the United States

Tsunami insurance coverage in the United States is provided under the flood insurance policies; earthquake insurance policies don’t provide tsunami coverage

Or

Private Flood Insurance Market

Or

other Earthquake Insurance Coverage

Tsunami insurance in the United States

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- National Flood Insurance Program (NFIP) was formed in 1968, and has evolved since then
- Maximum insurance coverage is capped through an act of congress:
  - $250,000 for building coverage
  - $100,000 for contents
- Deductible of $2500
- Limited options for additional coverage
- Pricing is based on Risk Rating programs

Private Flood Insurance Market

- Coverage provided by private flood insurance carriers must be at least as broad as NFIP
- Flood insurance is available in excess of NFIP's maximum coverage limits
- Customized options for additional coverage
- A range of deductible options, from $1,000-$10,000
- Pricing is based on data intensive models

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Tsunami insurance in the United States

Improved science and fidelity of simulation models used to model tsunami risk can help towards accurate pricing of tsunami insurance rates

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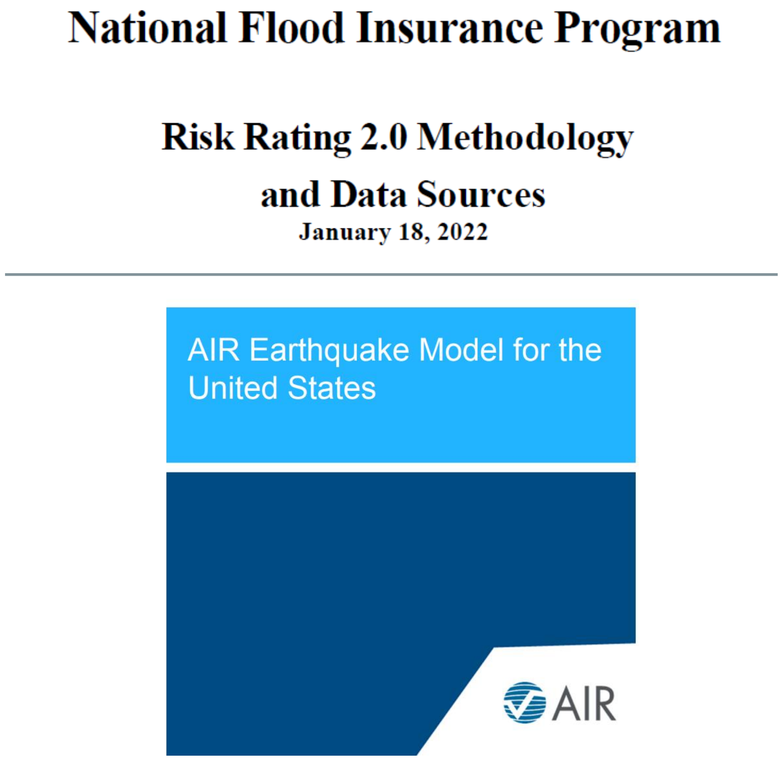

- The tsunami insurance rates are sensitive to the underlying methodology / data sources
- Risk Rating 2.0 Methodology is based on Mapping Data Integration (MDI) model, which leverages Geoscience Australia Data, and the Verisk (formerly “AIR”) US Earthquake Model
- Verisk is the only catastrophe model vendor with a probabilistic tsunami model, however, there are potential gaps in the underlying methodology (resolution of the model, lack of recent major events for loss calibration)
- Risk Rating 3.0 Methodology augments the existing data sources with ASCE data to better capture tsunami risk

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Tsunami insurance in the United States

Improved understanding of tsunami hazard is the key towards improved assessment of tsunami risk

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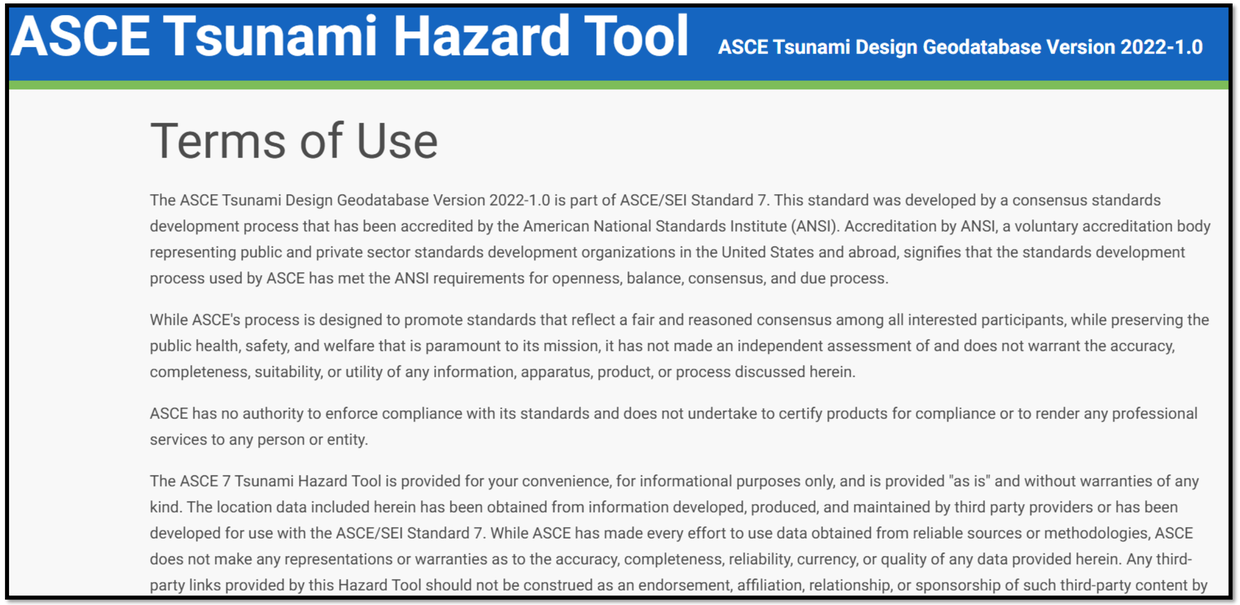

- **Experts in the (re)insurance industry seem to opine that :**
  - Going deeper into developing a better understanding of tsunami hazard, at a fine resolution, is of paramount importance
  - High fidelity vulnerability models are crucial for demonstrating actuarial rigor in the risk assessment process
  - Ability to view the event in “real-time” is a very desirable feature

- **Different use cases can have different criteria for communicating tsunami risk:**
  - Best estimates of stochastic / average annual losses > Inclined towards avoiding a conservative estimate of loss
  - Risk communicating audience looking to build capabilities > Inclined towards demonstrating “extreme” scenarios

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Questions / Discussion

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