



Singapore Reinsurance Market VS Natural Catastrophes

5th General Insurance Conference
Singapore Actuarial Society

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Topics

- General Insurance Industry: underlying exposure
- Natural Catastrophes: perils
- Natural Catastrophes: modeling
- Natural Catastrophes: ERM and strategy

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General Insurance Industry

➤ Singapore Versus Worldwide

(**G**ross **W**ritten **P**remium in billions SGD)

	Worldwide	Singapore	Share
Direct Business	2'500	3.5	0.15%
Reinsurance Inwards	220	5.5	2.5%

Take away: High Reinsurance Inwards

General Insurance Industry

➤ Total current **GWP** of Singapore General Insurance Industry (excl. captives) = 9 bn SGD.

➤ Split General Insurers - Reinsurers :

5 bn - 4 bn

➤ Split Direct Business - Reinsurance Inwards:

3.5 bn - 5.5 bn

➤ Split Onshore - Offshore:

3.5 bn - 5.5 bn

Take away: 60% GWP is Offshore (~ aboard)

General Insurance Industry

➤ Singapore GI GWP increase since 2007:

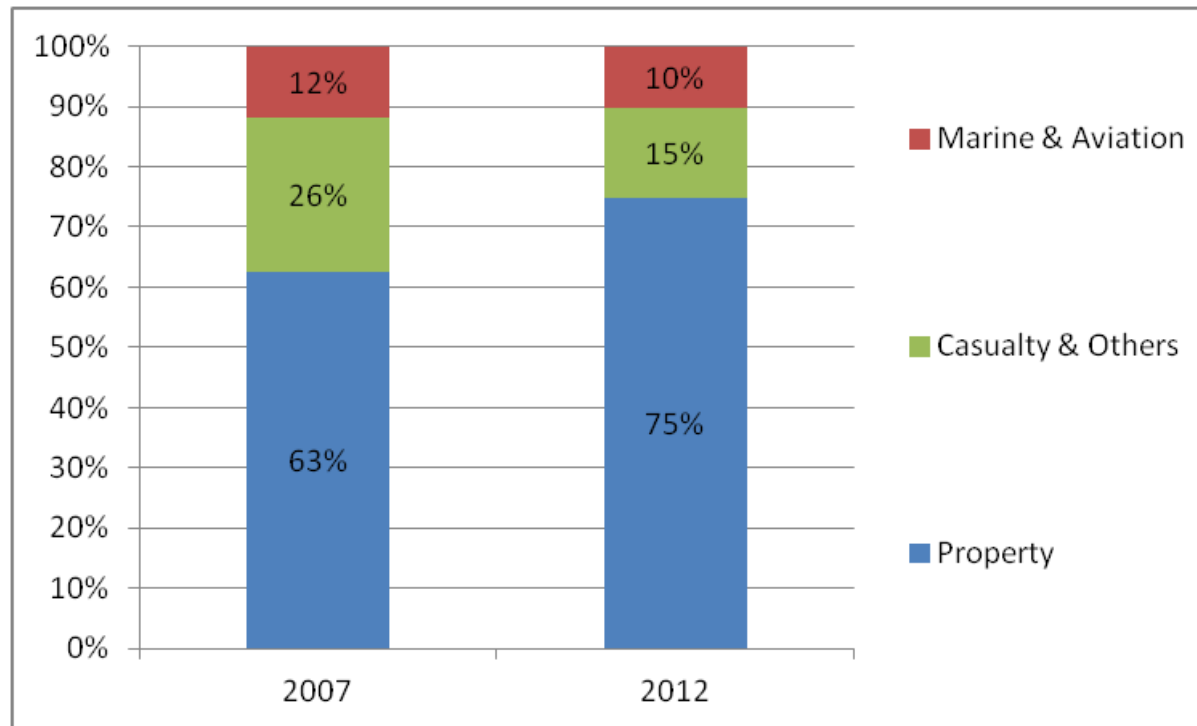
Total	Direct Business	Reins. Inwards	Onshore	Offshore
+65%	+60%	+70%	+30%	+100%

Take away: most of the increase since 2007 is from Offshore business

Source: SRA-MAS

General Insurance Industry

➤ LOB Split - Offshore Reinsurance Inwards (GWP):

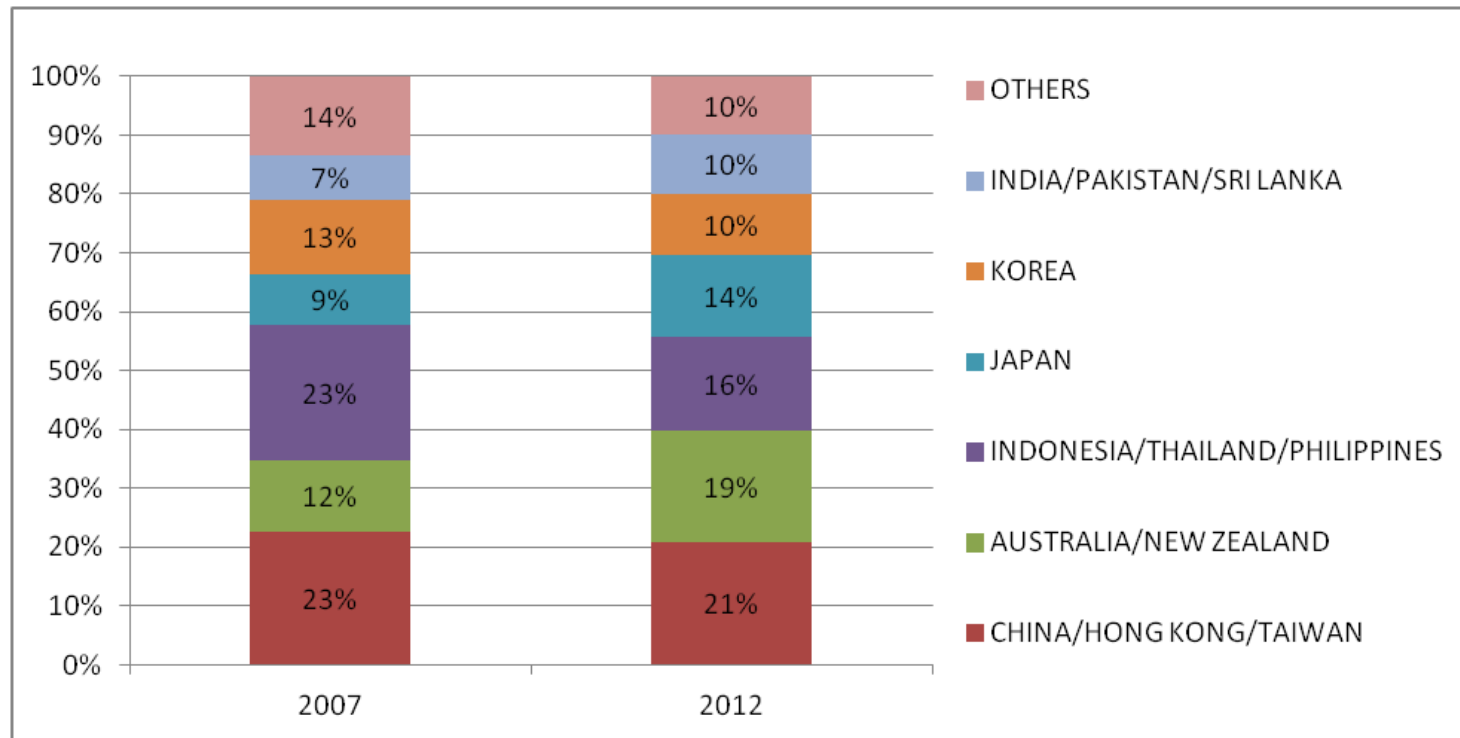


Take away: Mostly Property.

More than 40% of the total Gross Premium Written by Singapore GII is Offshore Property .

General Insurance Industry

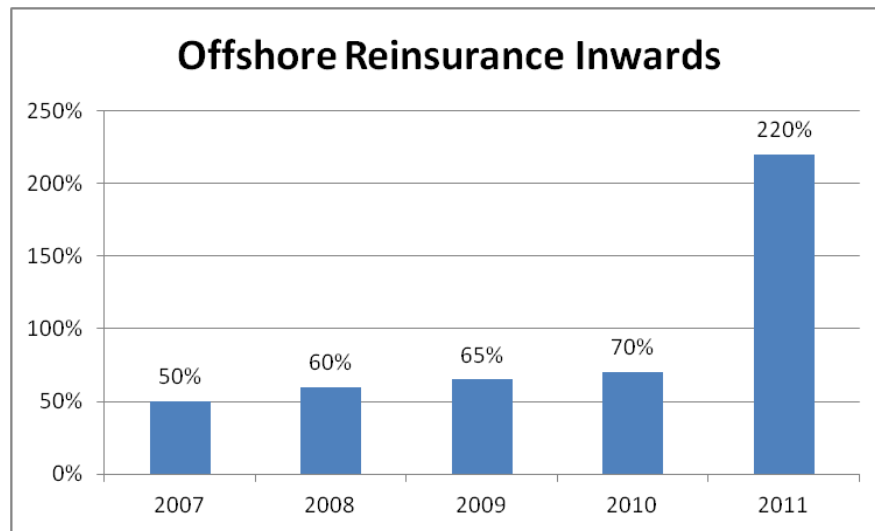
➤ Country split - Offshore Reinsurance Inwards (GWP):



Take away: Mostly APAC (>> 90%). Low portion from SEA. Highly Nat Cat Exposed.

General Insurance Industry

➤ Loss Ratios



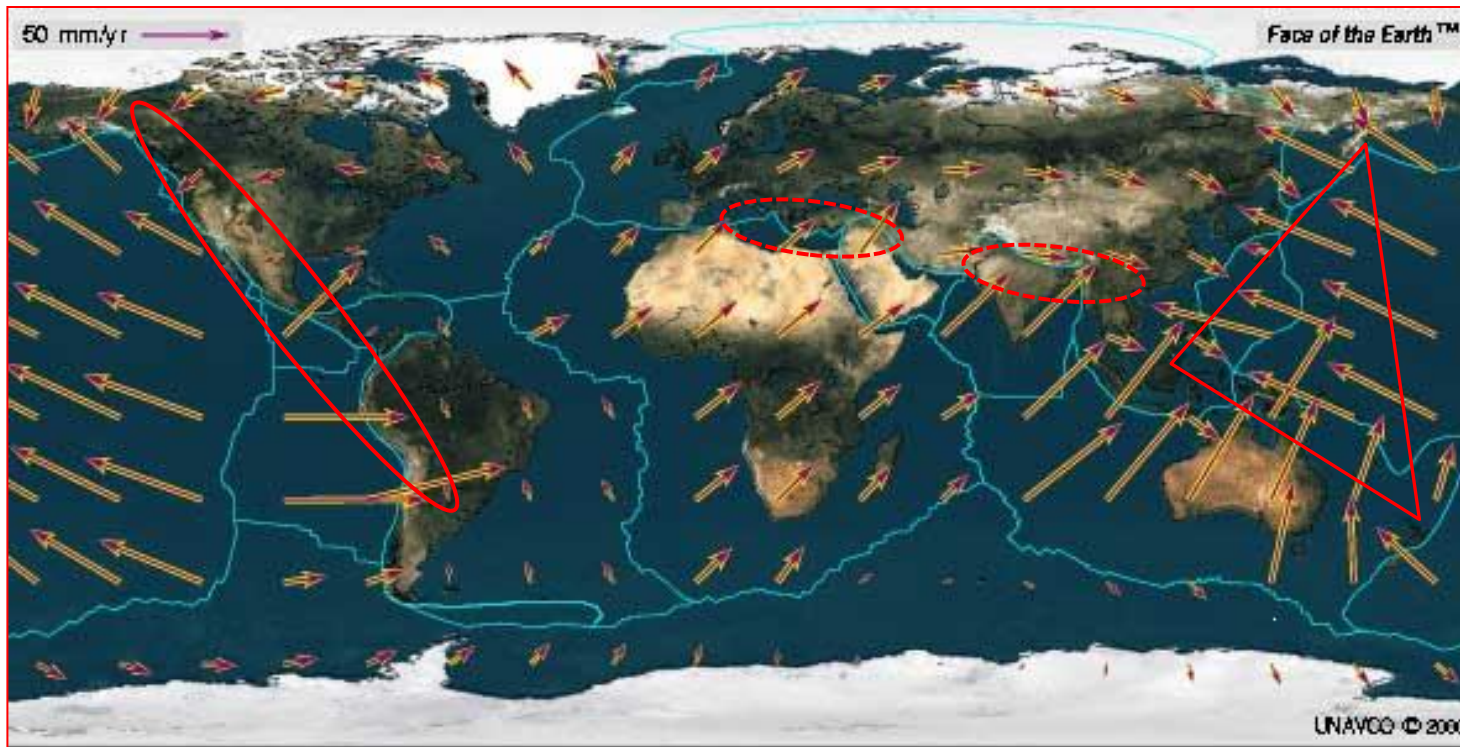
Take away: 55% of GI GWP is offshore Reinsurance Inwards. 2011 bad LR of this sub segment was generated by a series of Natural Catastrophes (EQs in NZ & Japan + Floods in Thailand & Australia).

General Insurance Industry

Summary:

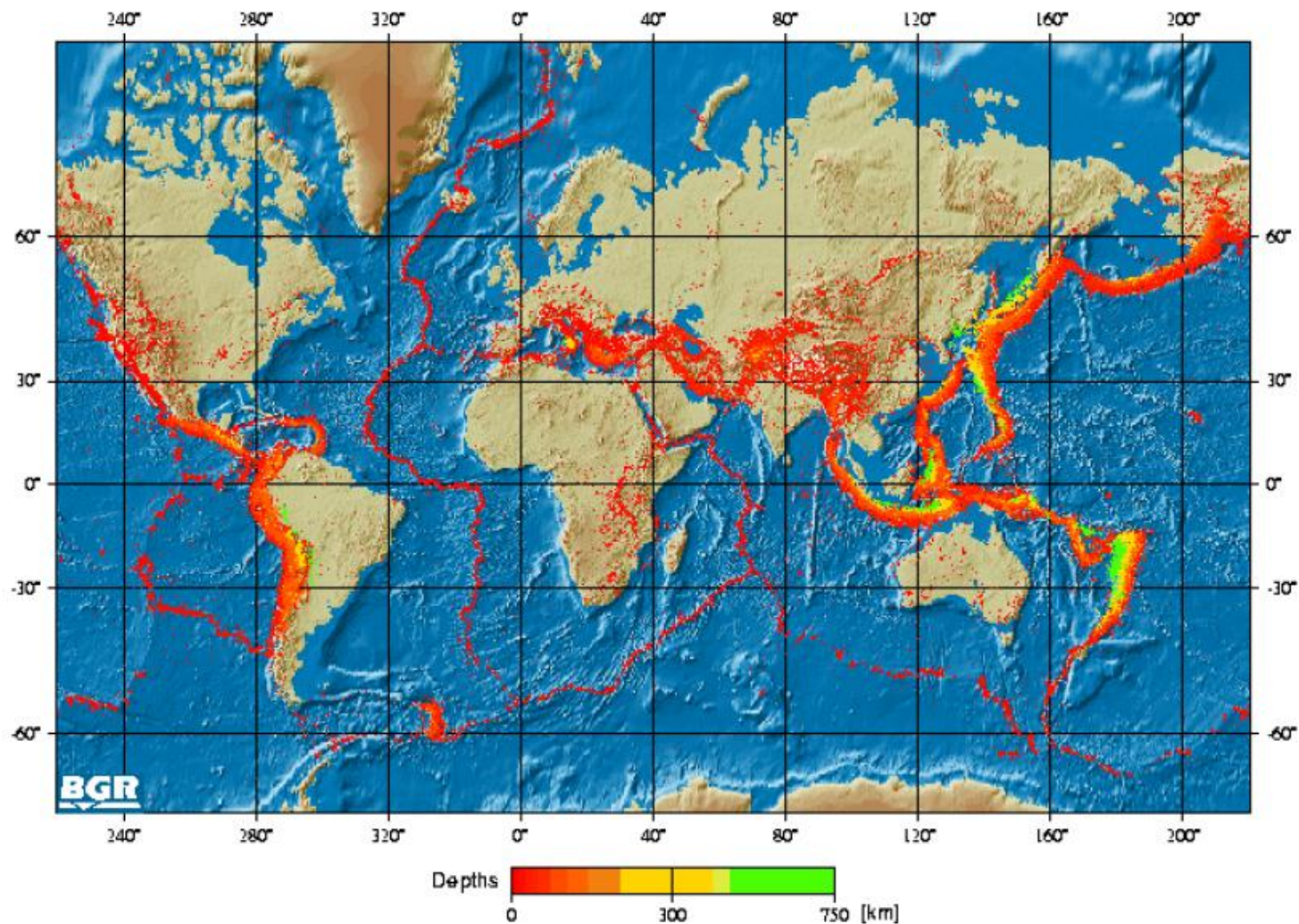
- Singapore collects 2.5% of Worldwide Reinsurance GWP.
 - Past 5 years: 75% of GI GWP increase is from Offshore.
 - Nowadays 60% of GI GWP is Offshore, mostly Property and heavily exposed to APAC Natural Catastrophes.
 - Industry's 2011 very high LR was generated by a series of Natural Catastrophes not foreseen (frequency & severity).
- ➔ Singapore is seen as being not exposed to Natural Catastrophes but our industry is a lot.**

Natural Catastrophes: EQ

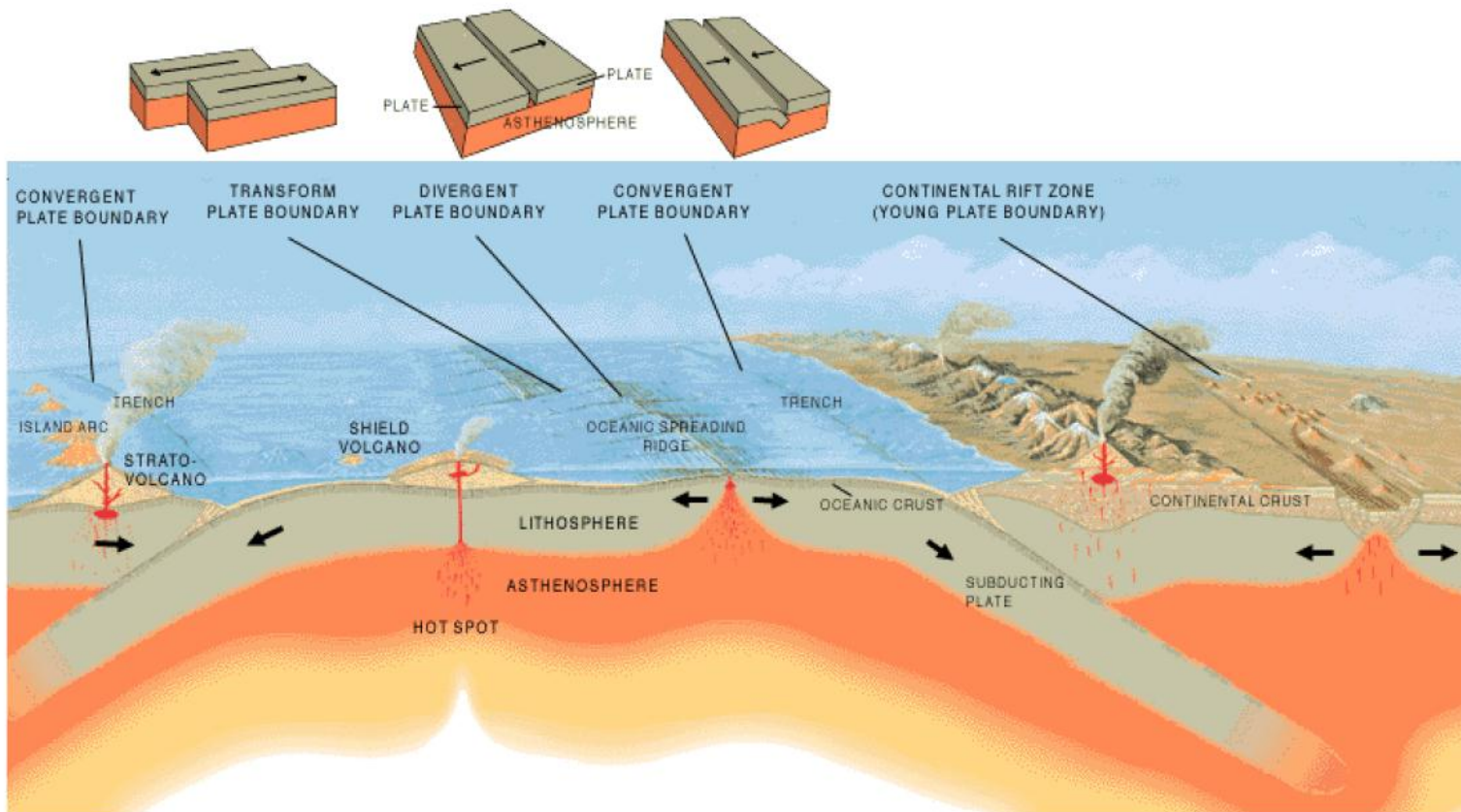


- EQ generated at the intersections of tectonic plates.
- EQ intensity linked to the speed of the plates.
- APAC is one of the two most exposed regions

Natural Catastrophes: EQ



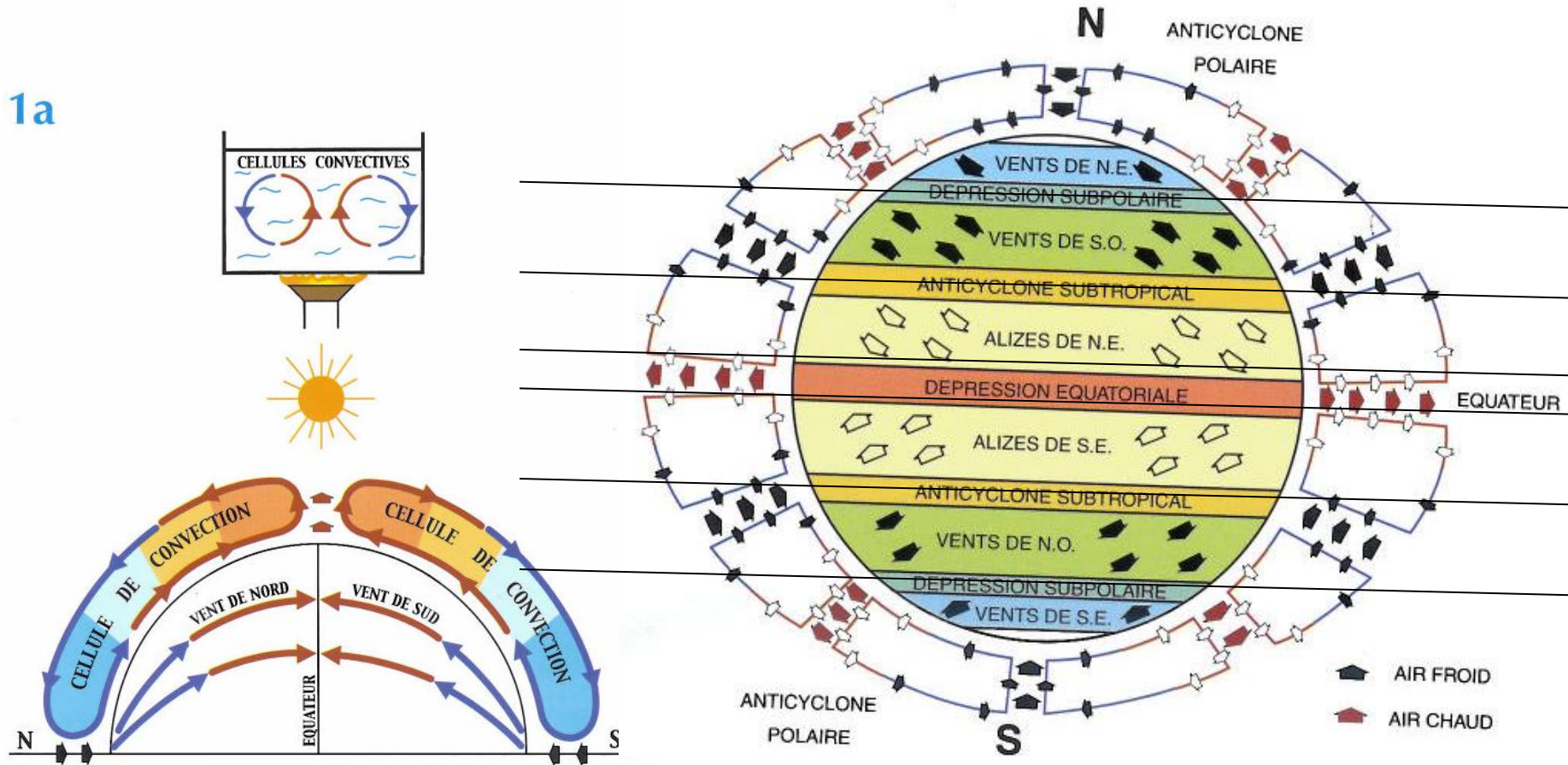
Natural Catastrophes: EQ



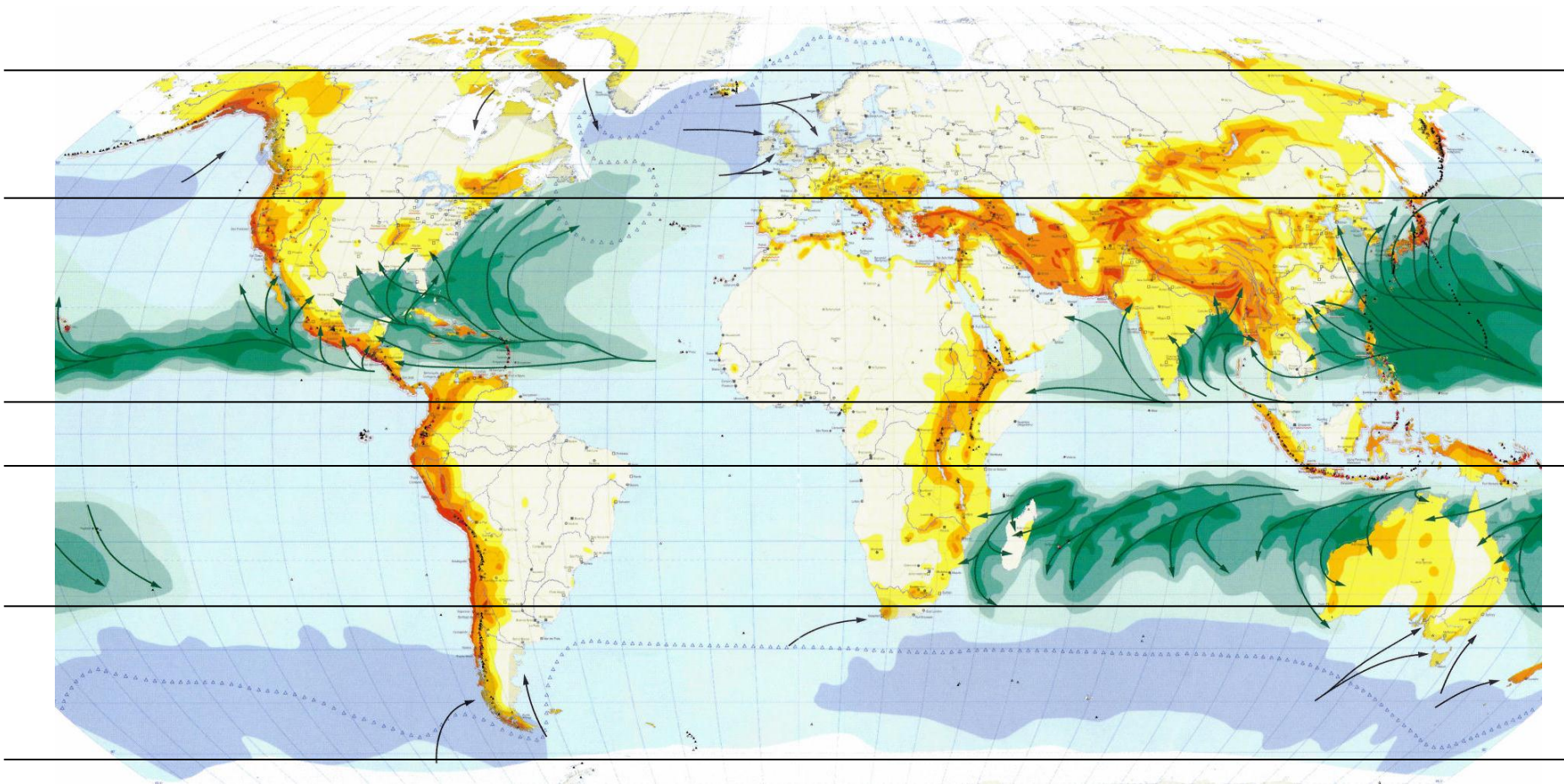
Underground EQ: shock waves on ground depends on type, magnitude and depth of EQ, on layers and type of soil up to the surface.

Natural Catastrophes: Wind

1a



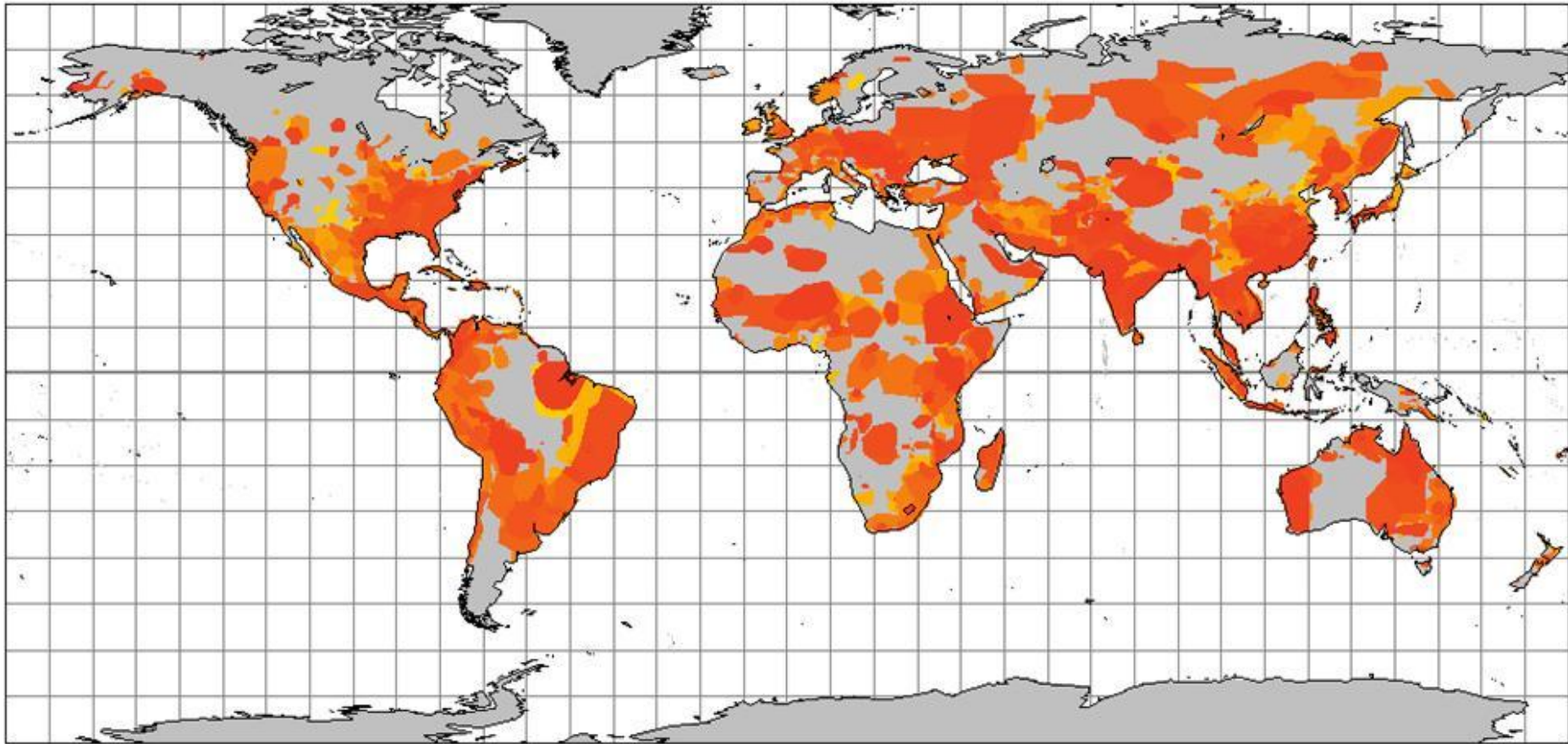
Natural Catastrophes: Wind



- APAC is again one of the two most exposed regions

Natural Catastrophes: Flood

1985 - 2006



- Flood is a worldwide concern: no region is safe

Natural Catastrophes: (un)knowns

Uncertainty of modelled Perils (known)

- Most Popular Nat Cat Modelling softwares are still at their yearly ages and are continuously evolving.
- The parameters behind these softwares are mostly theoretical, not all consequences of a Peril are generated and they are improving a lot after observation of major Nat Cat events.

Un-modelled Perils (unknown known):

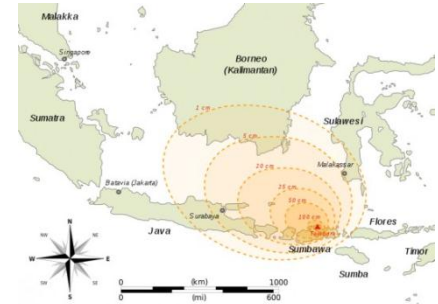
- Their scope of action nowadays is still limited: only few type of Nat Cat and in a limited number of countries are modelled.
- Many known threats are not yet modelled (mostly in emerging countries)

Natural Catastrophes: (un)knowns

Others Perils unknown or poorly known:

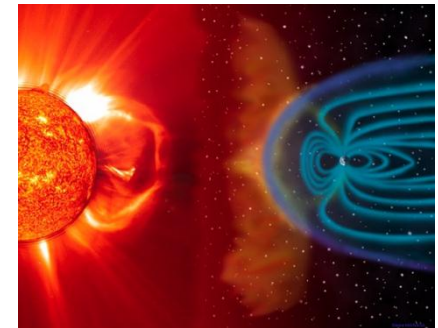
➤ **Volcano:**

In April 1815, Mount Tambora in Indonesia erupted. Greatest eruption in recorded history.



➤ **Solar Geomagnetic Eruption:**

In 1859 the largest ever recorded geomagnetic storms. Global impact at that time on electronic equipment.



➤ **Meteorite:**

In 1908 explosion in Russia (air burst of a meteorite) equivalent to 1000 Hiroshima.



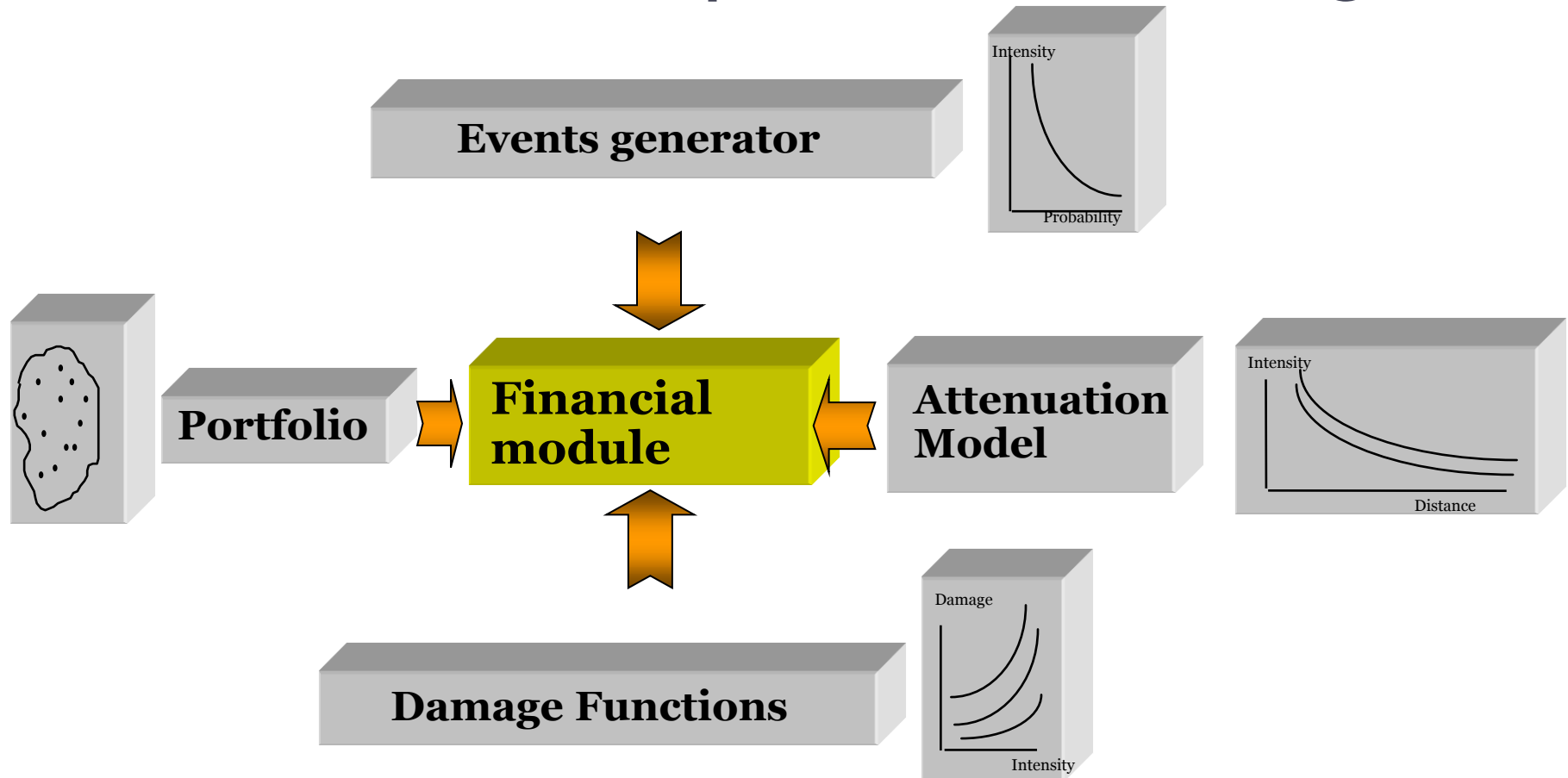
➤

Natural Catastrophes: Measures

Approaches for Pricing ('expectation') and Risk management ('tail'):

- Exposure Modelling (next slide)
 - Deterministic models:
Factors are estimated and applied to volume measures (e.g. premium)
 - Distribution-based models:
Probability distributions for different risks are determined and aggregated
 - Scenario-based models:
A number of scenarios is generated to value the degree of damage for an assumed probability
- ➔ There is no perfect Model, all of them have their pro and cons.
A mix approach is surely the one which make always sense.**

Natural Cat: Exposure Modeling

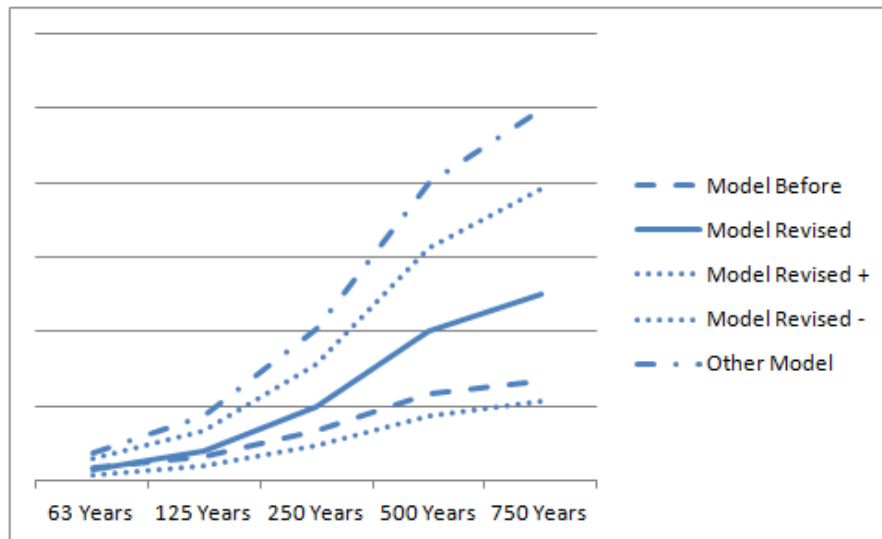


- Similarities of approaches for any Natural Perils modelled.
- EQ Models are based on less observed major events than Winds.
- Flood Models and other Perils (as bushfire) are more recent; constraint: data at street level.

Natural Catastrophes: ERM (quant)

Capital allocation is often driven by a 200 or 250 years event:

- such an event has most of the time never been observed
- calculation is based on data from the last 10-30 years
- non stable output:



Natural Catastrophes: ERM (quant)

➤ **How to stress test the output any Distribution models:**

- sensitivity analysis (changing the parameters/assumptions/functions)
- test of the distribution with real observation at the 80%-90% percentile
- comparison with scenarios done by “experts” (with ground knowledge)

➔ **Focus on modelling error is as important as the modelling itself.**

➤ **Communication: definition of a “PML 200 years”:**

“the **smallest loss** that you can expect every 200 years and for a **given region**”

Natural Catastrophes: ERM (quali)

Risk assessment and mitigation:

1) Process in the organization:

Top Down or/and Bottom Up approaches
(depending on the maturity of the organization)

2) Risk identification:

External/internal, by department, by objective,
by process

3) Risk analysis and evaluation:

Probability & Impact

4) Risk mitigation or treatment:

Take measure to reduce the Probability and/or Impact



Natural Catastrophes: ERM (quali)

/!\ Adverse effect of Risk Mitigation

A measure taken in order to DECREASE a Risk (Probability or Impact wise) can lead to to an INCREASE (Impact or Probability resp.).

“effectiveness can fail miserably”

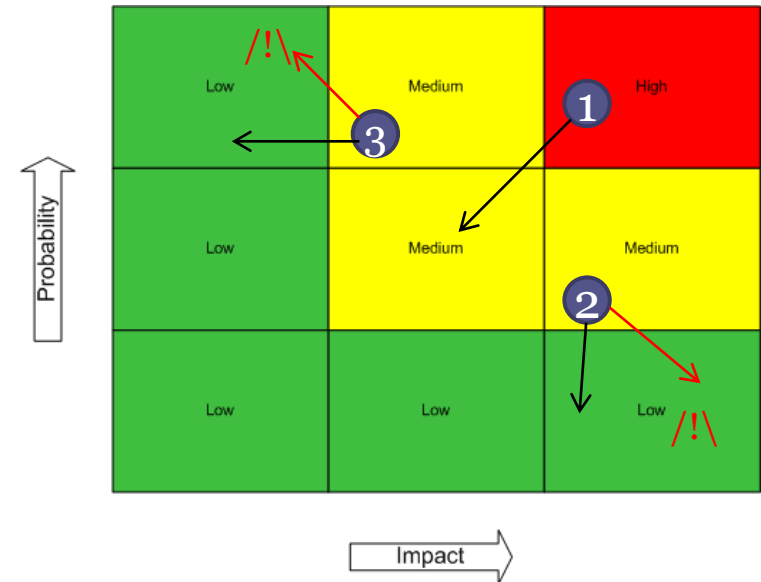


Illustration :

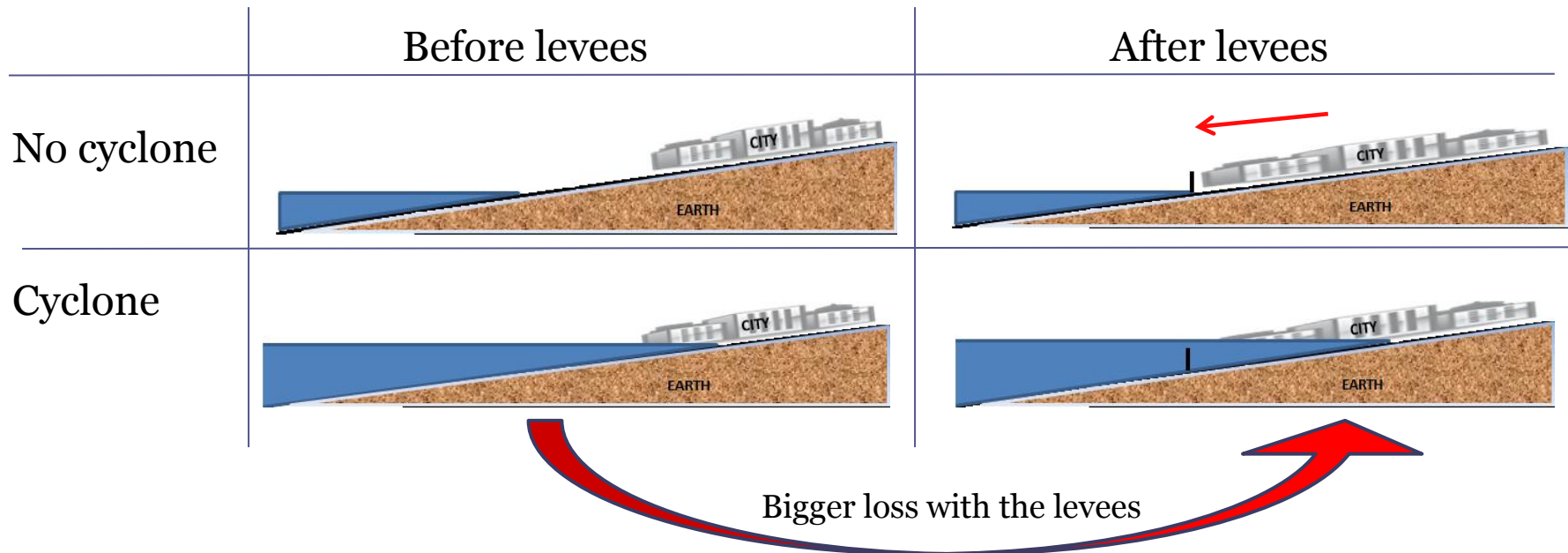
- a process or “barrier” is put in place in order to limit the effect of a risk
- the risk is seen now as controlled, we feel safe and we forget about it
- our exposure to the risk increases since we are not afraid anymore
- the day the process or “barrier” collapses the effects are worse than w/o the process or “barrier”.

Natural Catastrophes: ERM (quali)

/!\ Adverse effect of Risk Mitigation

Example 1: “New-Orleans levees And Cyclone Kathrina”

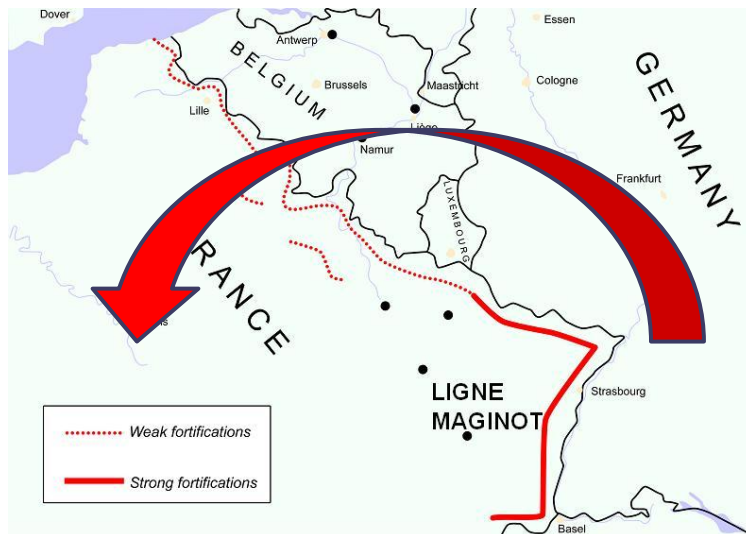
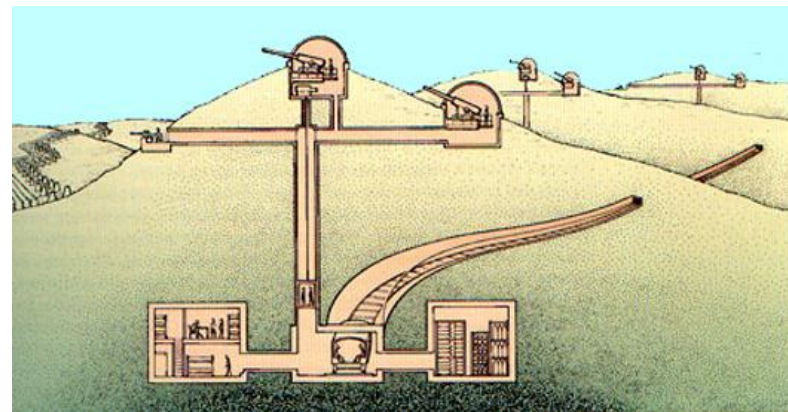
=> Storm surge went over the tops of levees protecting the city.



Natural Catastrophes: ERM (quali)

/!\ Adverse effect of Risk Mitigation

Example 2: “Maginot Line World War II”



French Generals before WWII: “no need tanks or planes to face a German invasion: we are protected by our strong fortifications at the border”

...but only at the border with Germany...France capitulated after 2 weeks of war

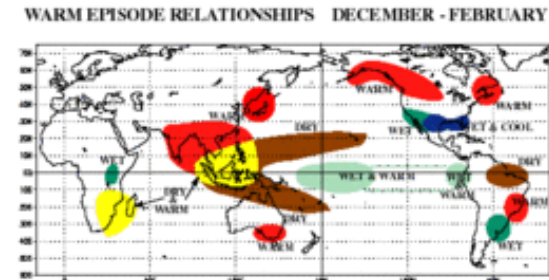
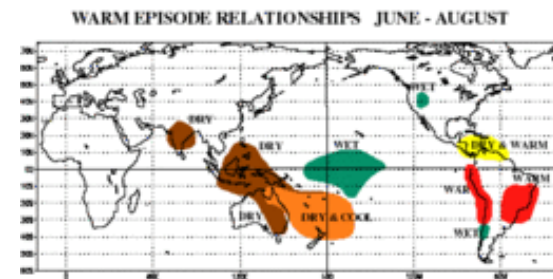
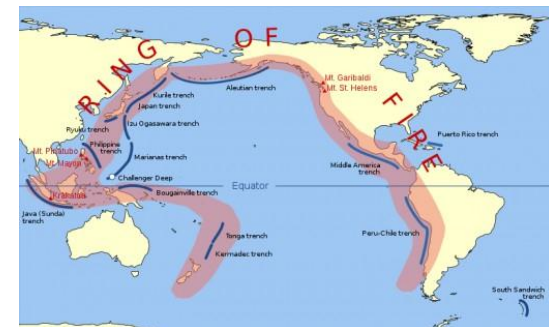
Natural Catastrophes: Strategy

Portfolio modelling under Capital constraint:

A convoluted Loss Distribution which is targeting the best mix portfolio is very arbitrary and sensitive (especially when Nat Cat exposed).

The output of the 'Best Portfolio' can easily and drastically changed as soon as you are changing one of these subjective parameters:

- the measure used and at which percentile
- the selected loss distribution for each Nat Peril
- the correlation between Natural Perils



Natural Catastrophes: Strategy

Property business being core :

- The most important is to manage/follow/control Nat Cat exposure and to leverage as much as possible any Nat Cat acceptances to get business less volatile and less uncertain in terms of profitability.
- Nat Cat profitability is quite unknown on a short term basis and is heavily driven by the worldwide reinsurance cycle with the capital available.
- Solutions:
 - 1) (retro)cede the exposure to a (Re)Insurer or to the Capital market (Cat Bonds)
 - 2) follow closely the market share if the (Re)Insurer is the ultimate carrier of the Nat Cat risks.

Conclusion

- Singapore General Insurance Industry is heavily exposed to Property Offshore business
- This Property Offshore business is highly exposed to Natural Catastrophes (as experienced in 2011 and 2012)
- As an industry and as actuaries: we need to watch several fields related to Nat Cat (uncertainty, ERM, business leverage, risk transfer, strategy, capital available....)