



LESSONS LEARNT FROM CHILE EARTHQUAKE AND SIMILAR EVENTS

7th May 2014 Athens

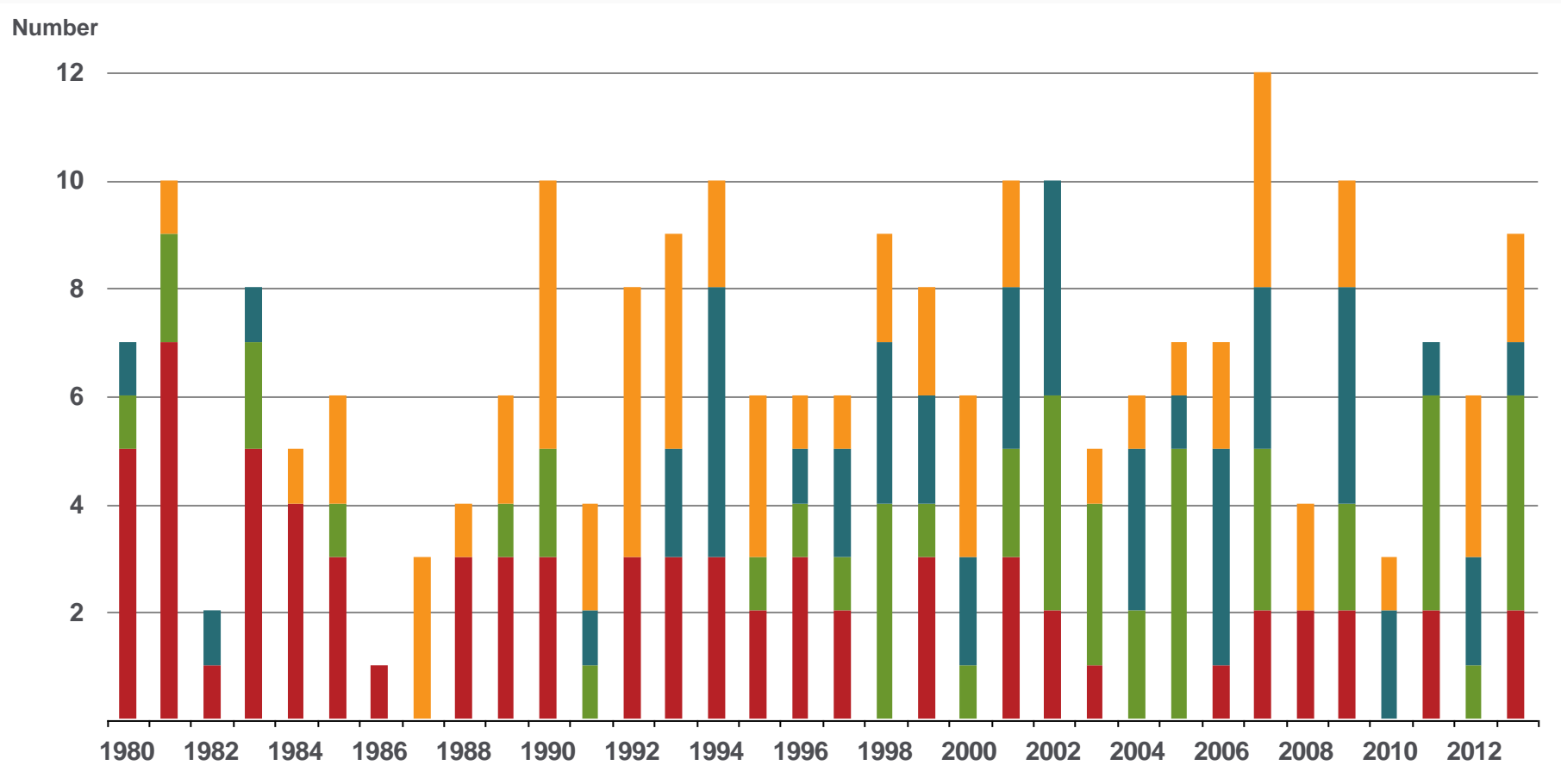
Andreas Vossberg, Senior Underwriter

What are the reasons?

- Rise in population
- Concentration of people and values in large mega-cities
2015: more than 500 cities with more than 1m inhabitants
2005: ~420 cities
- Settlement in and industrialization of extremely exposed regions, infrastructure extends into coastal regions
- Susceptibility of modern societies and technologies to natural hazard
- Better standards of living
- Climate change
- Increasing weather variability

Loss events in Greece 1980 – 2013

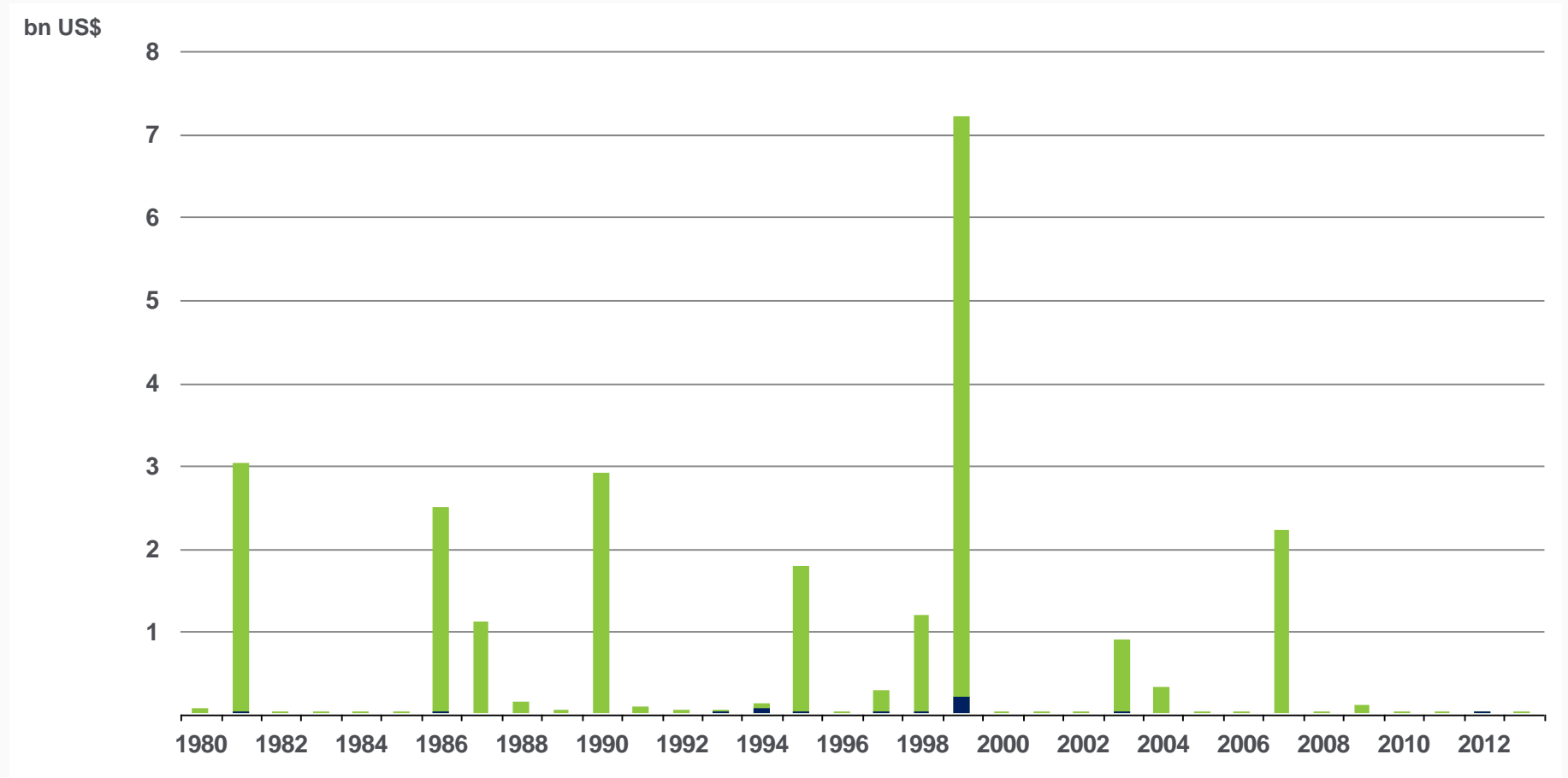
Number of events



- **Geophysical events**
 (Earthquake, tsunami, volcanic activity)
- **Meteorological events**
 (Tropical storm, extratropical storm, convective storm, local storm)
- **Hydrological events**
 (Flood, mass movement)
- **Climatological events**
 (Extreme temperature, drought, forest fire)

Loss events in Greece 1980 – 2013

Overall and insured losses



 Overall losses (in 2013 values)*

 Insured losses (in 2013 values)*

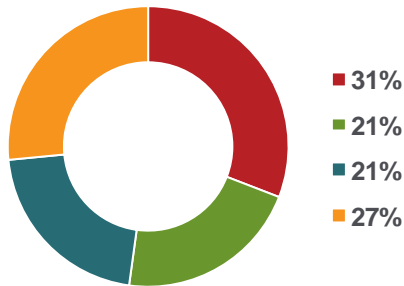
*Losses adjusted to inflation based on country CPI

Loss events in Greece 1980 – 2013

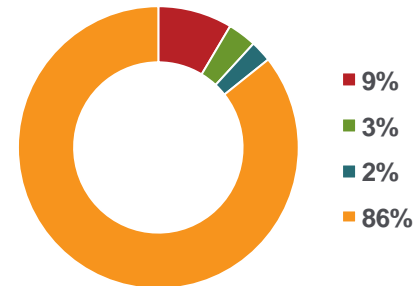
Percentage distribution



230 Loss events

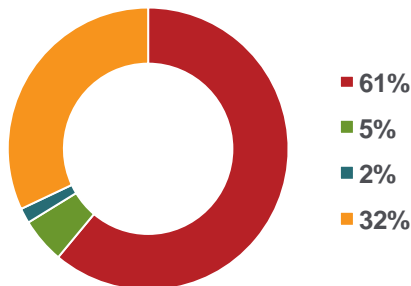


2,600 Fatalities*



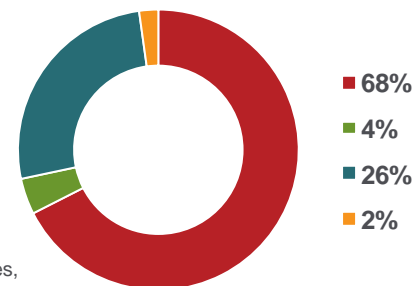
*Number of fatalities without famine

Overall losses** US\$ 24bn



**Losses in 2013 values, adjusted to inflation based on country CPI

Insured losses** US\$ 0.35bn



**Losses in 2013 values, adjusted to inflation based on country CPI

■ Geophysical events
(Earthquake, tsunami, volcanic activity)

■ Meteorological events
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■ Hydrological events
(Flood, mass movement)

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(Extreme temperature, drought, forest fire)

Significant loss events in Greece 1980 – 2013

10 costliest events ordered by overall losses

Date	Event	Affected area	Overall losses in US\$ m original values	Insured losses in US\$ m original values	Fatalities
7.9.1999	Earthquake	Athens (Plaka), Menidi, Metamorphosi, Ano Liossia, Zefiri, Thrakomakedones, Aspropyrgos	4,200	120	143
23.8-5.9.2007	Wildfires	Peloponnese, Messinia, Kalamata, Artemida, Laconia, Sparta, Ilia, Olympia, Pirgos; Korfu	2,000		67
January - October 1990	Drought	Almost entire country	1,300		
24-25.2.1981	Earthquake	Corinth, Boeotia, Phokida, Euboea, Perakhora, Loutraki, Megara, Thivai, Athens, Piraeus	900	5	20
13.9.1986	Earthquake	Peloponnes, esp. Kalamata, Eleochori, Verga, Poliani, Aris, Artemisia, Nedousa	745	5	20
June - August 1998	Forest fires, heat wave	Athens, Mount Pendeli, Chalkidiki, Larissa, Volos, Lamia, Tripoli, Ioannina, Evia, Salamina, Viotia	675	4	14
15.6.1995	Earthquake	Gulf of Corinth, Aeghion, Eratini, Corinth, Patrai, Pirgos	660	0,25	26
January - February 2003	Winter storm, floods	Achaia, Ileia, Fthiotida, Delphi, Larissa, Spilia, Peloponnese	600	10	
13.5.1995	Earthquake	Kosani, Grewena	450		
4.3.1987	Winter damage, snowstorms	Almost entire country, esp. Athens, Yannina, Soufli, Rhodes	350		48

Source: Munich Re, NatCatSERVICE, 2014

27F

**Chile
27 Feb. 2010**

**Earthquake of magnitude
8.8 Richter
+
tsunami**

Casualties: ~ 500

**Insured loss: US\$ 8bn
Economic loss: US\$ 30bn**



Dichato



Port of Talcahuano: Combined Effects of Earthquake and Tsunami





Insufficient armoring steel

27F: Building in the town of Concepción. EQ resistant norms were not applied.

27F: Santiago Airport

Subsoil conditions amplified EQ waves
Flexible structure: Resisted well
Internal elements: Damaged to a large extent.

Photos: Crawford Chile-Graham Miller Ltda.



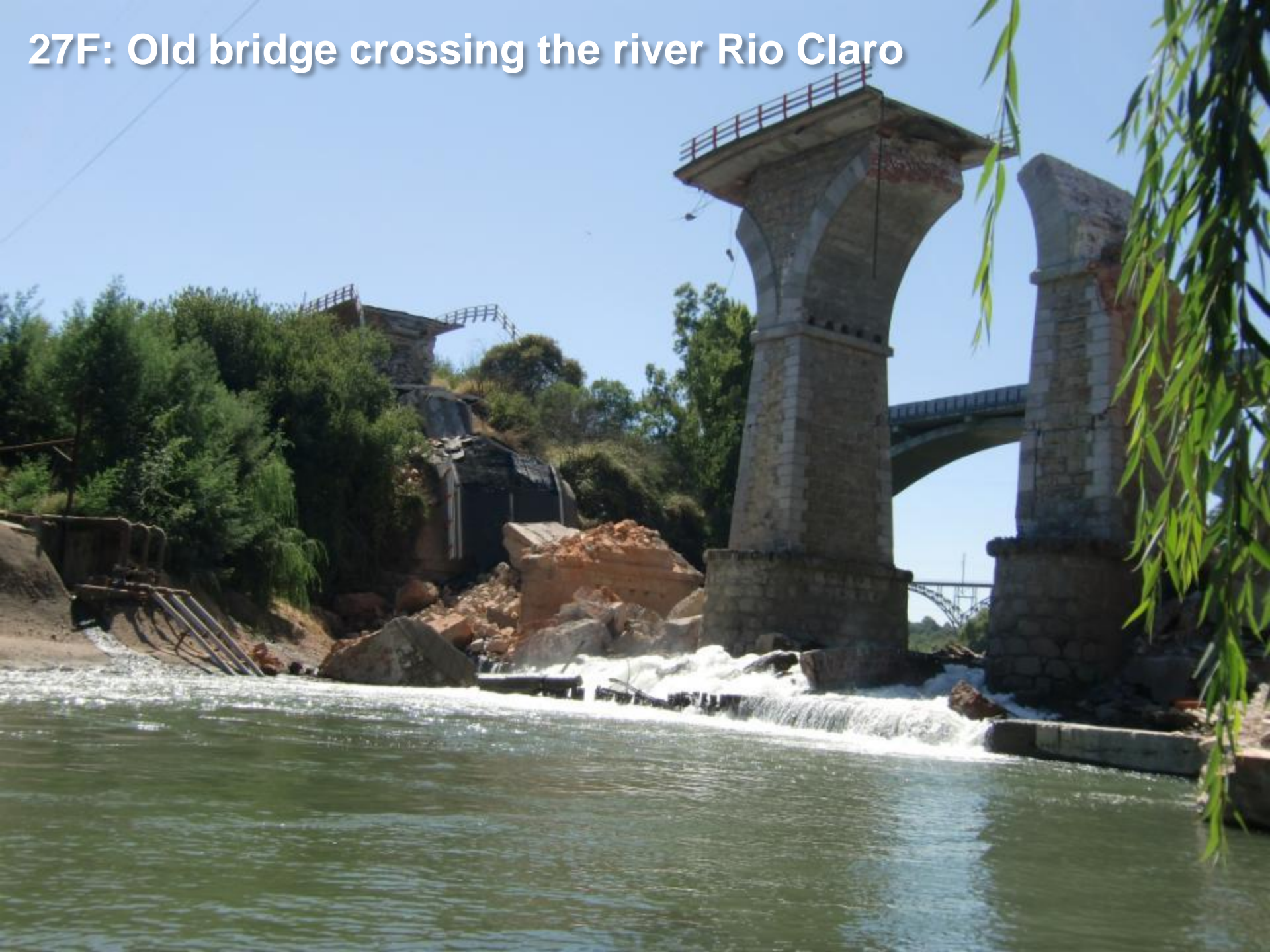
27F: Motorway Vespucio Norte, Santiago

Critical subsoil



Foto: Faraggi Global Risk,
Loss Adjusters

27F: Old bridge crossing the river Rio Claro

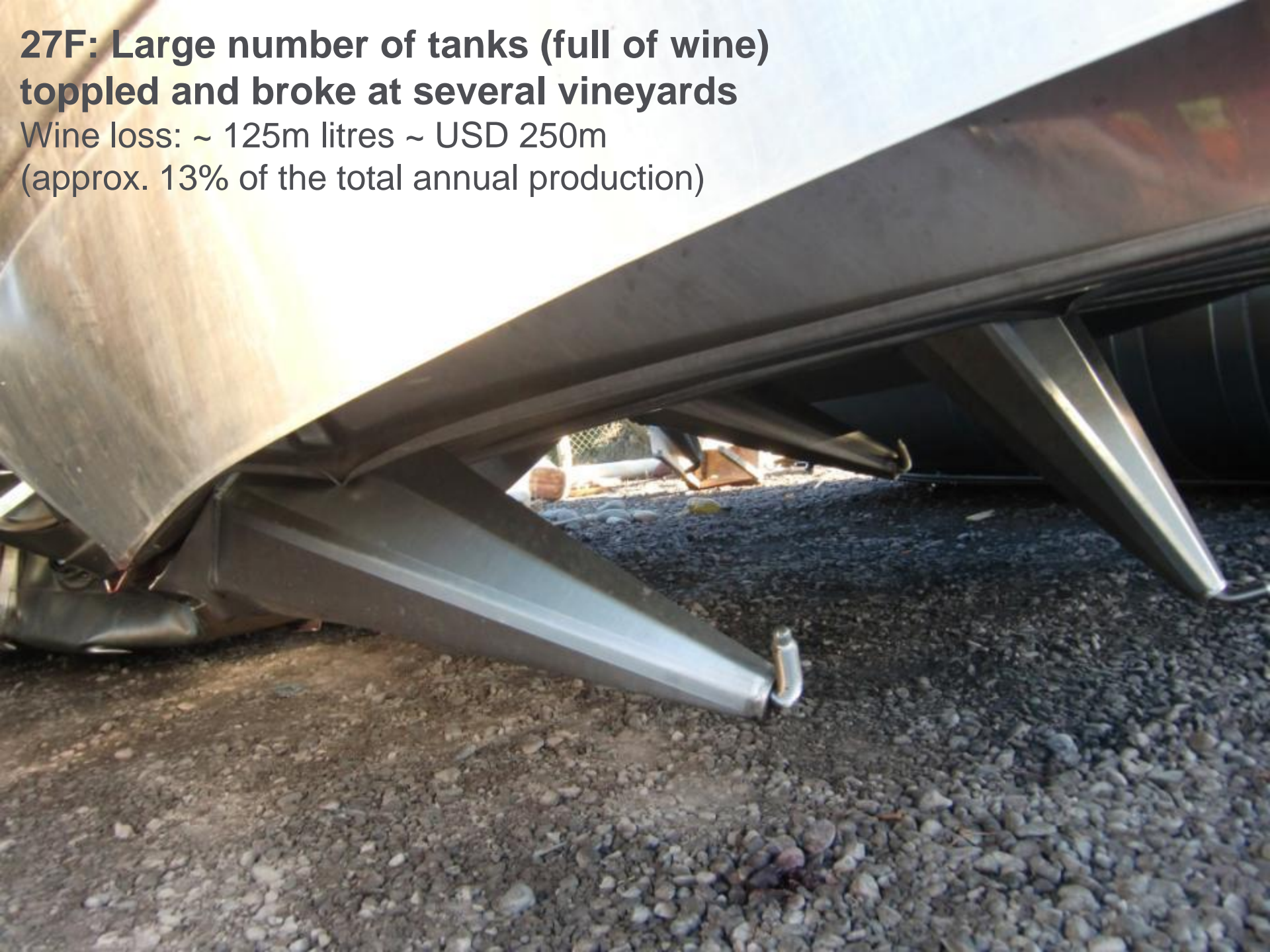




**27F: Vineyard
Design of steel tanks for wine did
not consider EQ exposure**

**27F: Large number of tanks (full of wine)
toppled and broke at several vineyards**

Wine loss: ~ 125m litres ~ USD 250m
(approx. 13% of the total annual production)



27F - Response of the Chilean insurance market

Problems in the immediate aftermath of the event

- Weakness of the infrastructure in the affected area aggravated the situation
 - Utilities (electricity, water, telephones/communication network incl. cell phones) interrupted for several days
 - Damaged roads, fallen bridges, i.e. difficult access
 - Hotel capacities largely reduced
- Curfew limited the mobility during the initial weeks
- Employees of industrial companies did not go to work for several days in order to stay with their families.
- Lack of manpower and of construction material retarded the beginning of loss minimisation measures and of repair works.

27F - Response of the Chilean insurance market

Problems related to the loss adjusting process

- Chilean law requires full settlement of claims affecting private lines within a timeframe of 3 months from the date of the loss notification.
- Chilean law allows adjustment only to locally authorised loss adjusting companies
- Mass losses at private buildings/apartment (mortgage insurance)
 - Multiple loss notifications from the insured, the broker or the bank
 - One building/several owners/different insurance policies
 - Difficulty to decide on demolition vs. repair
- “Public Adjusters” who work for the insured and raise expectation of higher indemnifications

27F: Response of the Chilean insurance market

Role of the loss adjusters

- Number of loss notifications vs. available local loss adjusters
- International support required for large complex losses
- After 4 – 6 weeks the loss adjusters managed to drastically increase their capacity in terms of manpower, office space, office equipment and could start to work efficiently
- Due to the very large number of claims the loss adjusters could not comply entirely with requested settlement period. A general postponement was agreed
- By the end of 2010 the vast majority of the householders claims could be settled

27F: Response of the Chilean insurance market

(Source: Superintendencia de Valores y Seguros, Chile – SVS)

Homeowners	31 Aug. 2010	28 Feb. 2011
Number of claims notifications:	190,199	189,491
Liquidated claims:	156,242	188,478
Closed claims (paid or to be paid):	105,694	125,904
Not indemnifiable (e.g. below deductibles):	46,336	62,574
Paid indemnification:		USD 1.291 bn
Commercial / Industrial	31 Aug. 2010	28 Feb. 2011
Number of claims notifications:	31,866	31,811
Liquidated claims:	16,970	28,294
Closed claims (paid or to be paid):	8,793	15,666
Not indemnifiable (e.g. below deductibles):	7,298	12,152
Paid indemnification:		USD 3.365 bn
Total	31 Aug. 2010	28 Feb. 2011
Paid indemnification:	USD 2.190 bn	USD 4.656 bn

27F: Response of the Chilean insurance market Contingency plans

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- In general, all insurance companies as well as loss adjusters and brokers responded very quickly and acted pro-actively.
 - Basically all of them had a contingency plan with a major or minor degree of elaboration.
 - However each of these plans was focused on their own activities of the own organization. A coordinated action of the market had not been pre-agreed.

Recommendation

- To work out at a market level with the local insurers' association master contingency plan, for the coordination of the several parties involved in order to ensure the effectiveness of the loss adjustment processes.

27F: Mass Claims

Impact of deductible


Regulations in Chile

Deductibles are regulated for residential and commercial risks as follows:

- Residential risks: 1% of sum insured, min. UF 25 (approx. USD 1.000)
- Commercial risks: 2% of sum insured, min. UF 50 (approx. USD 2.000)

Consequences

Homeowners started complaining against the height of the deductibles and this turned out to be a political issue. The Superintendency (SVS) asked the insurance industry to withdraw the deductibles.

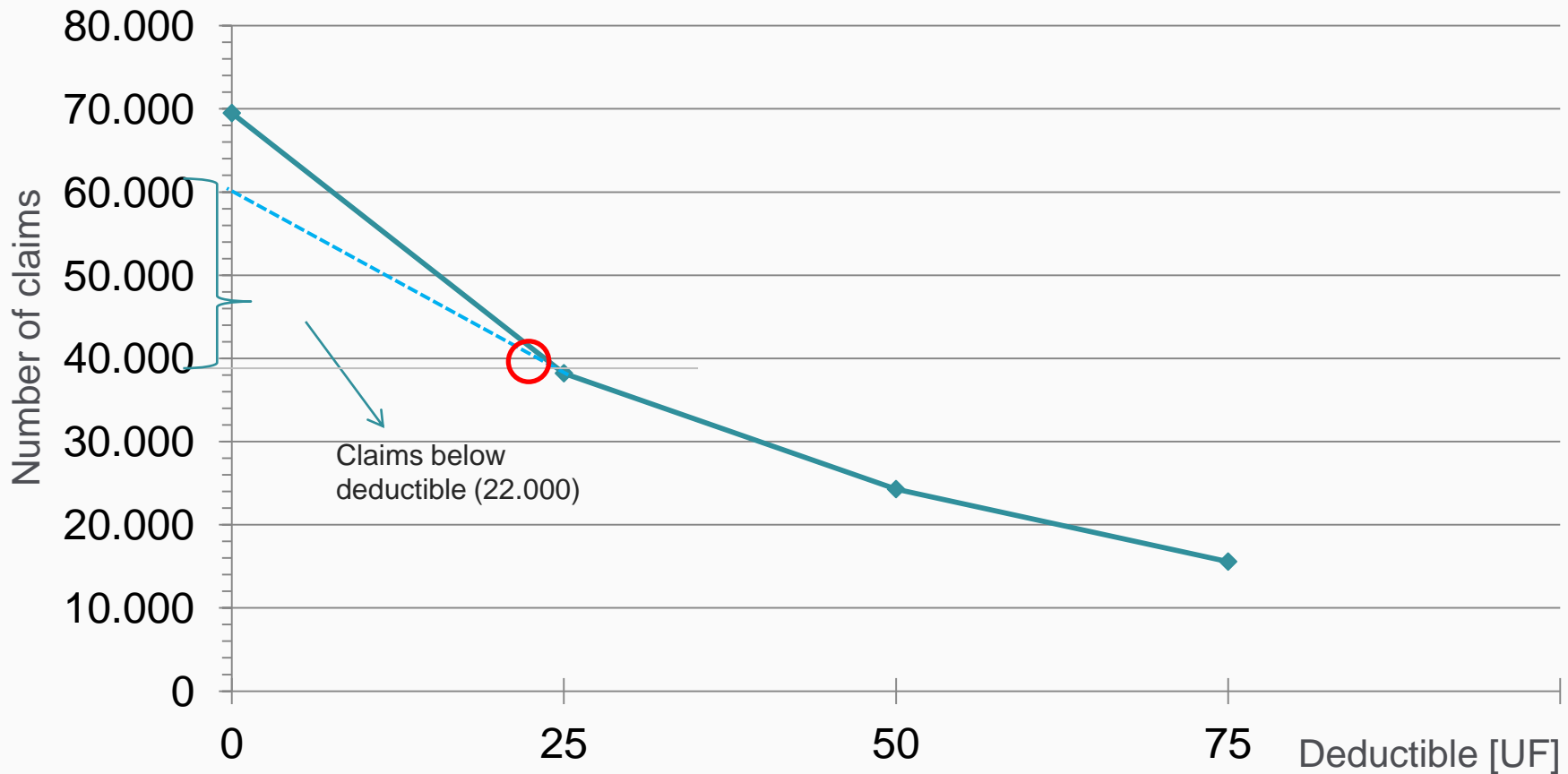
The insurance industry did not accept and explained why deductibles are absolutely needed in case of NatCat.  **Price issue (amongst others)**

27F: Mass Claims

Impact of deductibles on a residential risks portfolio (example)

Number of Claims vs. Deductible [UF]

UF 1 = approx. USD 40

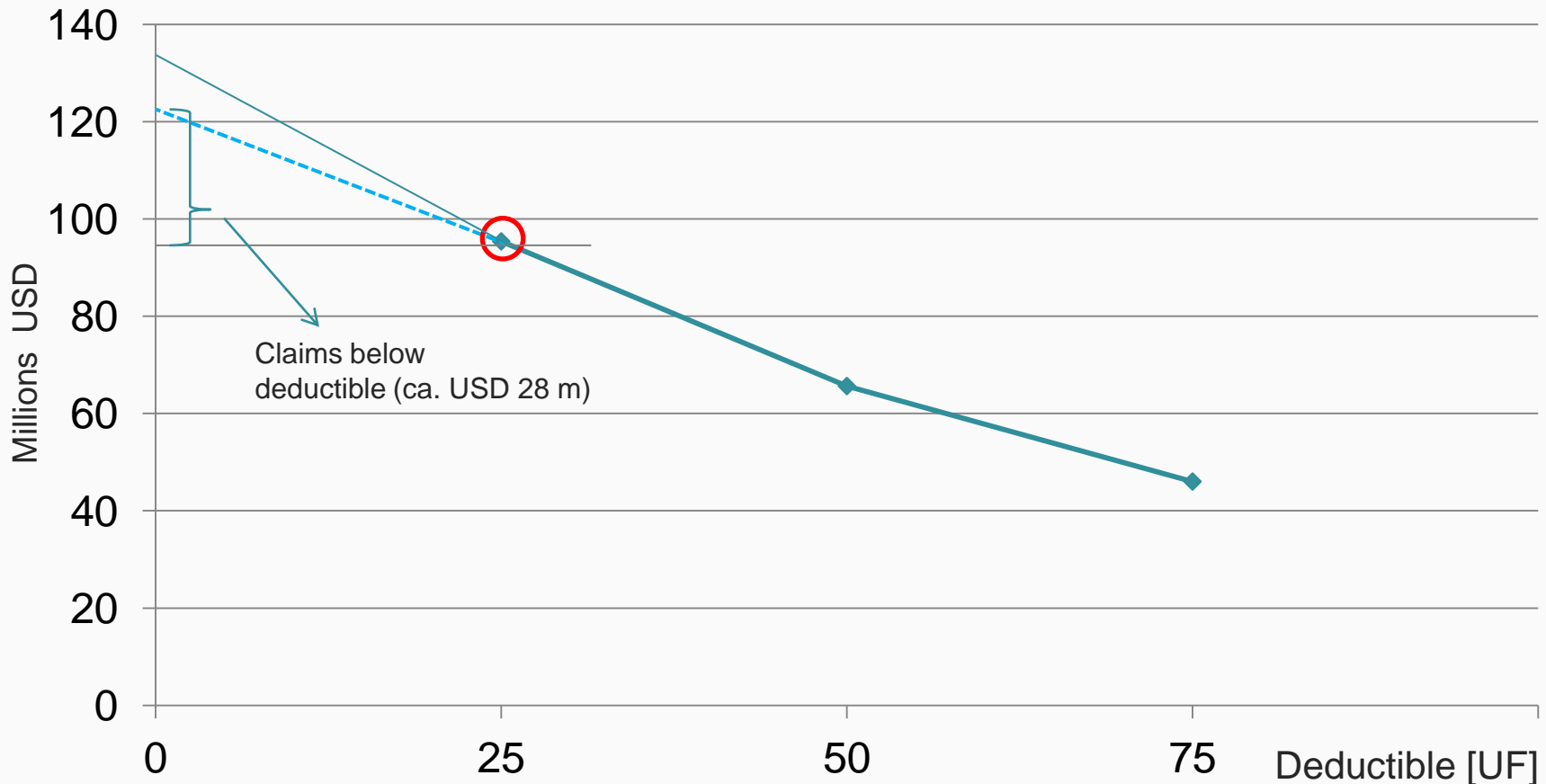


27F: Mass claims

Impact of deductibles on a residential risks portfolio (example)

Indemnity 100% [USD] vs Deductible [UF]

UF 1 = approx. USD 40



27F: Lessons learnt regarding design and building codes

- In general: **Sound and solid design** of the vast majority of modern buildings, i.e. the ones which were insured
- Cause of major failures of individual buildings mainly related to **non-adherence to building codes**.
- Very large wave frequency spectrum of the EQ. Long distance, low frequency waves were not expected and were not foreseen by local building codes
- In certain areas the **critical subsoil conditions** were not adequately considered in the design of buildings and roads
- Behaviour of **non-structural elements** not considered in existing norms

Consequence:

Chilean norms / building codes being in part revised at the moment



11 March 2011

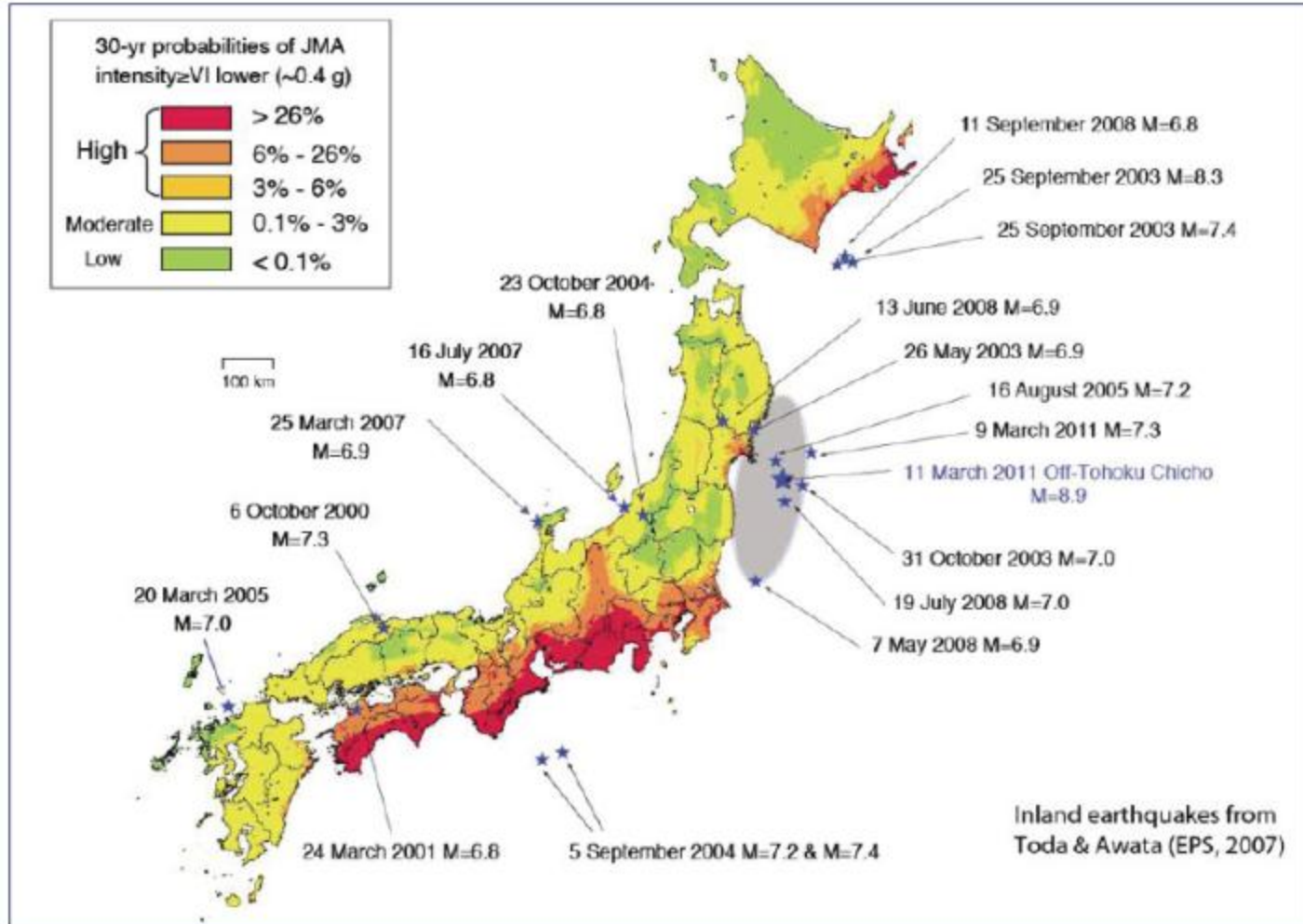
**Earthquake of magnitude
9.0 Richter
+
Tsunami**

Extreme duration 120 sec.

Casualties: ~ 20,000

**Insured loss: US\$ 36bn
Economic loss: US\$ 210bn**

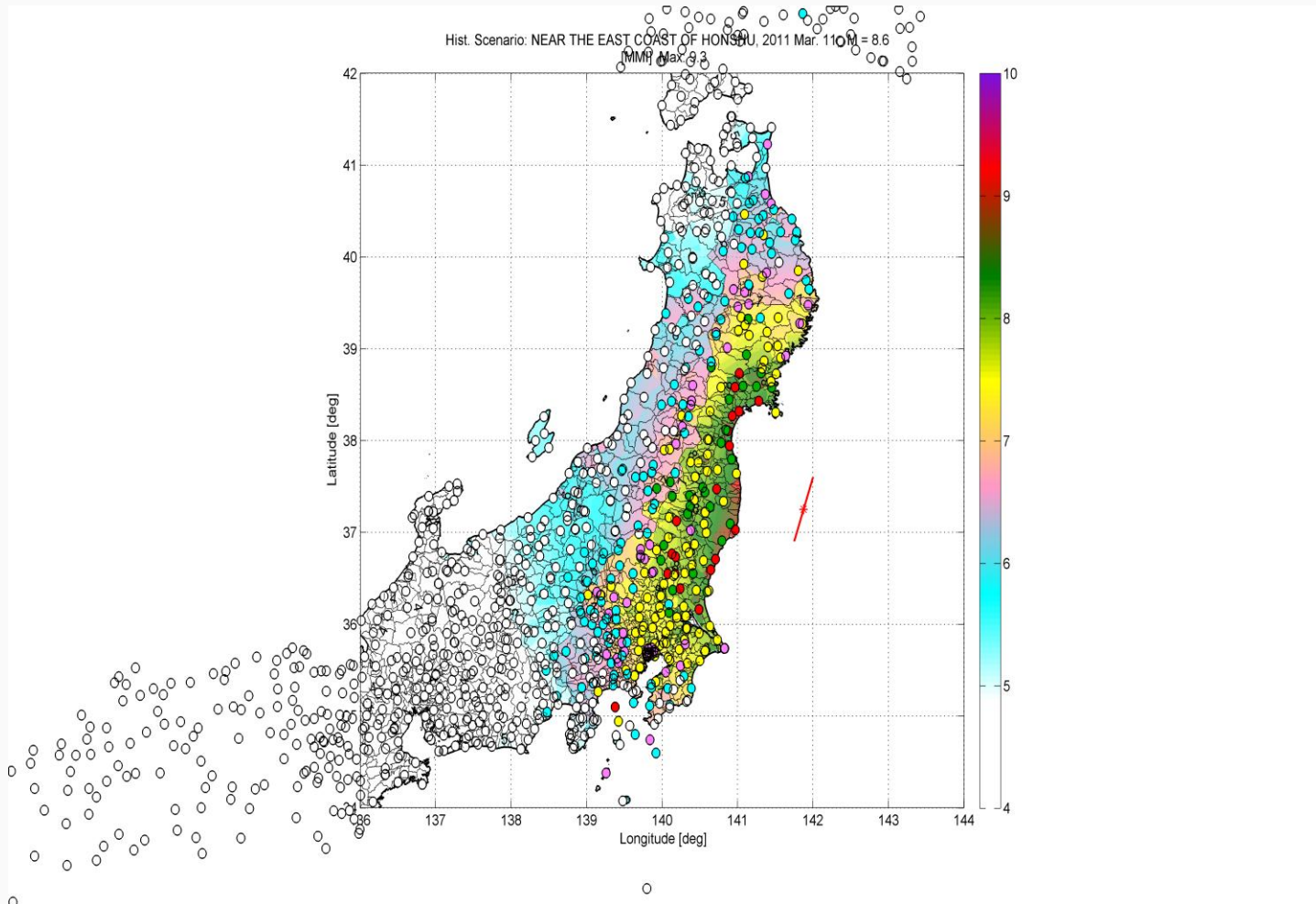
Correct identification of the seismic hazard?



Most severe earthquakes in the decade before 2011 occurred outside the highest exposed regions

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- Not all potential faults are included in the model
 - Seismicity model and maximum magnitudes are highly correlated with historic seismicity
 - No known historic event with a magnitude > 8.5 in Tohoku region, only events with magnitudes up to magnitude 7.5 in southern region
 - Discrepancy with geodetic strain data was not resolved
 - Similar tsunami in Sendai area 869 AD.
 - Re- evaluation of seismicity model

Footprint Tohoku earthquake









南浜村土木

93

南浜村土木



Source: Reuters

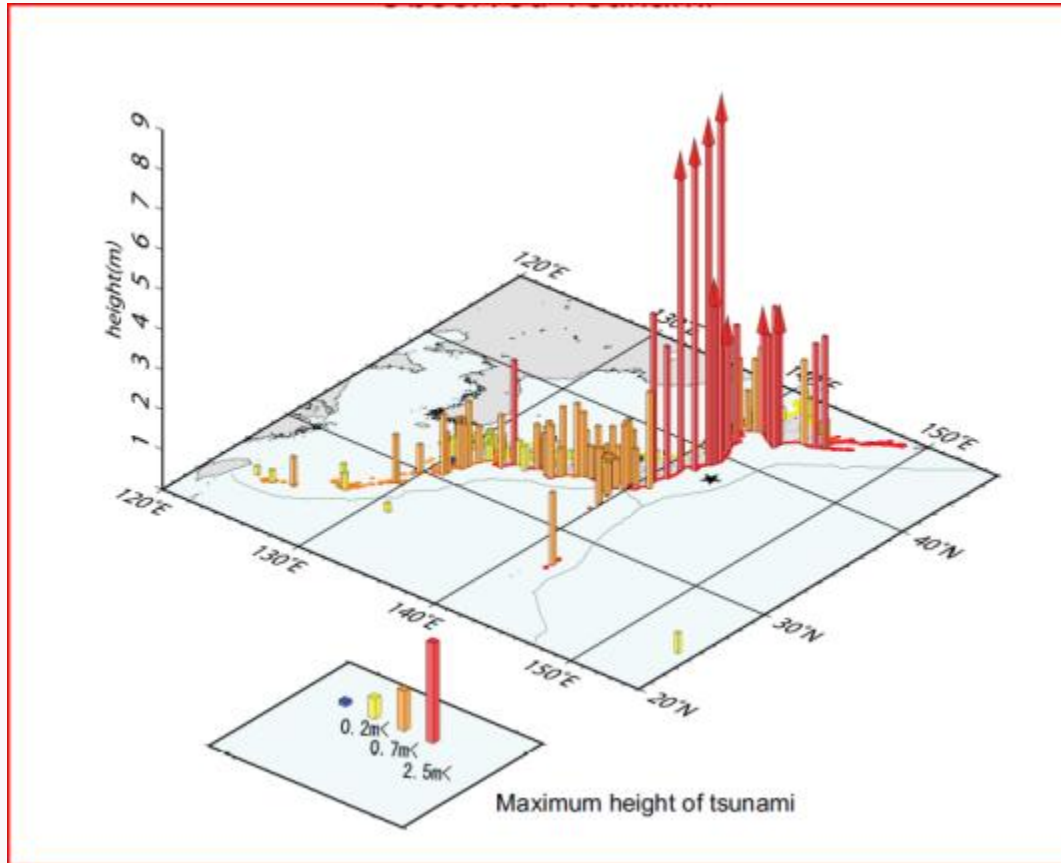


Source: Reuters



Source: Reuters

Measured tsunami heights



Source: Japan Meteorological Agency

869 : Big tsunami also affecting the Sendai region

1611: Magnitude Mw ~ 8.1 ; Max. Runup: ~ 20 m

1896: Magnitude Mw ~ 8.5 ; Max. Runup: ~ 38 m

1933: Magnitude Mw ~ 8.4 ; Max. Runup: ~ 29 m

2011: Magnitude Mw = 9.0 ; Max. Runup: ~ 38 m





ASIA SYMPHONY
五洲丸









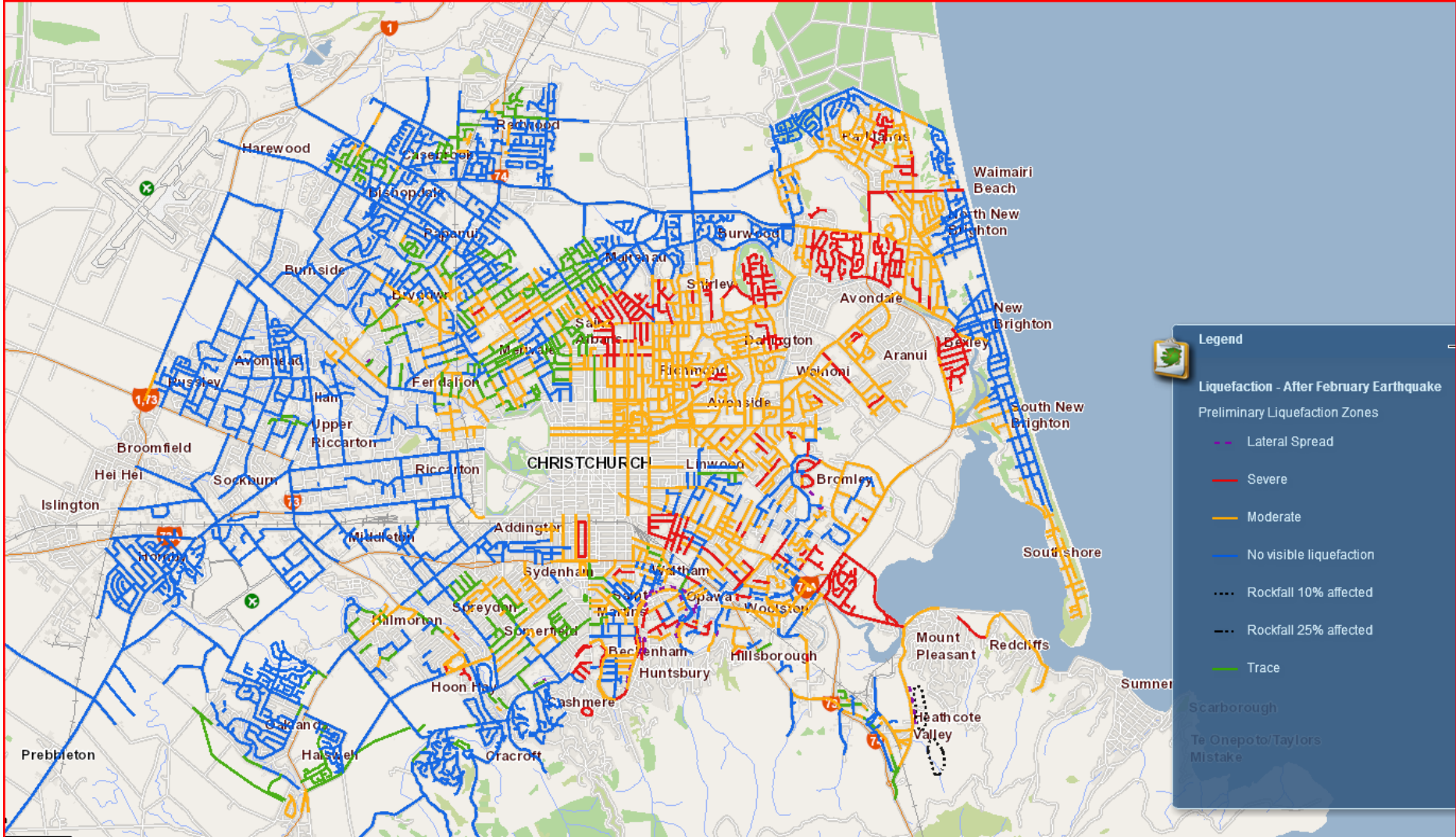
22 Feb. 2011

**Earthquake of magnitude
6.3 Richter**

Casualties: ~ 200

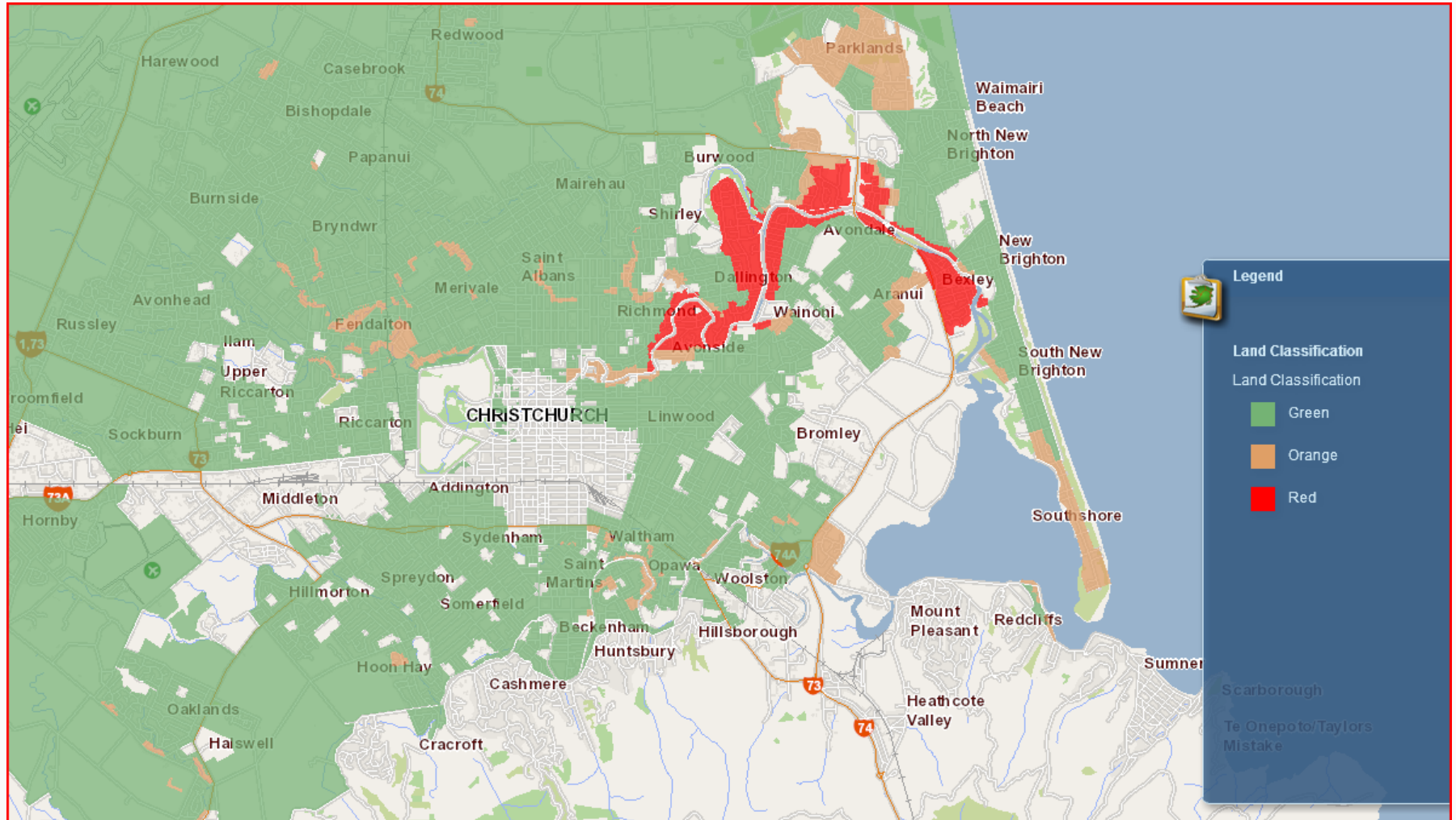
**Insured loss: US\$ 16bn
Economical loss: US\$ 23bn**

Liquefaction in Christchurch



Source: EQC

Land classification



Source: EQC

Liquefaction









Liquefaction and foundation problems

Building code requirement and building performance

Access restriction



- The Grand Chancellor Hotel
- Deconstruction
- Business interruption

-
1. Markets must be well prepared to handle up to several hundred thousand claims. Are there contingency plans, incl. admission of foreign loss adjusters?
 2. Any scenario affecting seriously a capital/key region will paralyze the stricken country for weeks, if not months or years, and may have global consequences e.g. business interruption
 3. Industrial parks as exposure hot spots
 4. Expect the unexpected: Low probability – high consequence events
 - The recurrence period of the Feb 2011 Christchurch earthquake is several thousand years, and yet: it happened
 - Even a 500 years historical record may not be enough
 - How probable are complex event chains?

5. Uncertainties in loss estimates due to public policy decisions regarding reconstruction

- Is the requirement to reconstruct according to upgraded codes indemnifiable (policy wording/political pressure)?
- The case of zones declared as uninhabitable in New Zealand

6. Insure in time!

Why do countries go for an ex-post instead of an ex-ante solution?

Dealing with the impacts

Why ex-post solution?

- Very often **no risk management awareness** („god`s will“)
- Reliance on other governments or **international donor relief** spending
- Fast **changes** on the political scene – no long-term strategy

~~Risk Management~~

Main limiting factor for purchasing risk transfer instruments is low risk management awareness and little know-how.

...why no insurance solution in particular?

- **Little understanding** of „(re-)insurance“ concepts
- **No formal requirements** and economic incentives to purchase insurance
- Perception of **high “initial“ costs**: premiums including high transaction costs („luxury product“)
- **No formal titles to property** of many individuals and firms w/o proof

Extintor



09/03/2010

Seismograph

**Thank you very much
for your attention and
time.**



09/03/2010

Seismograph