Financial Risks of Natural Hazards: The Role of Climate Change and the Response of Insurers

Joint Seminar of the University of Innsbruck and the Innsbruck Center for Natural Hazard Management (alps)

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Climate change: not really a new topic...

MR-Publication Flood / Inundation (August 1973)

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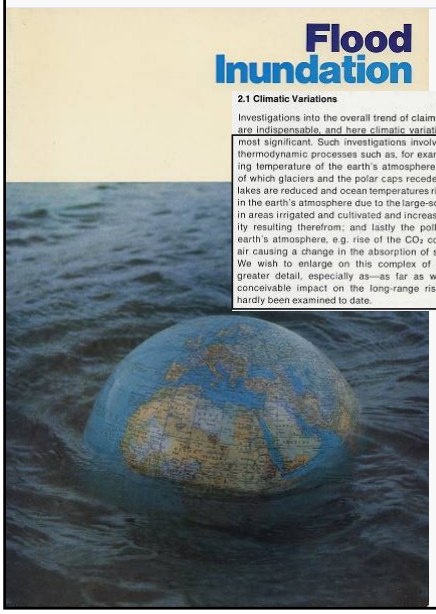

2.1 Climatic Variations

Investigations into the overall trend of claims experience are indispensable, and here climatic variations become most significant. Such investigations involve a study of thermodynamic processes such as, for example, the rising temperature of the earth's atmosphere (as a result of which glaciers and the polar caps recede, surfaces of lakes are reduced and ocean temperatures rise); changes in the earth's atmosphere due to the large-scale increase in areas irrigated and cultivated and increases in humidity resulting therefrom; and lastly the pollution of the earth's atmosphere, e.g. rise of the CO_2 content of the air causing a change in the absorption of solar energy. We wish to enlarge on this complex of problems in greater detail, especially as—as far as we know—its conceivable impact on the long-range risk trend has hardly been examined to date.

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Climate change –
Potential impacts on the insurance industry

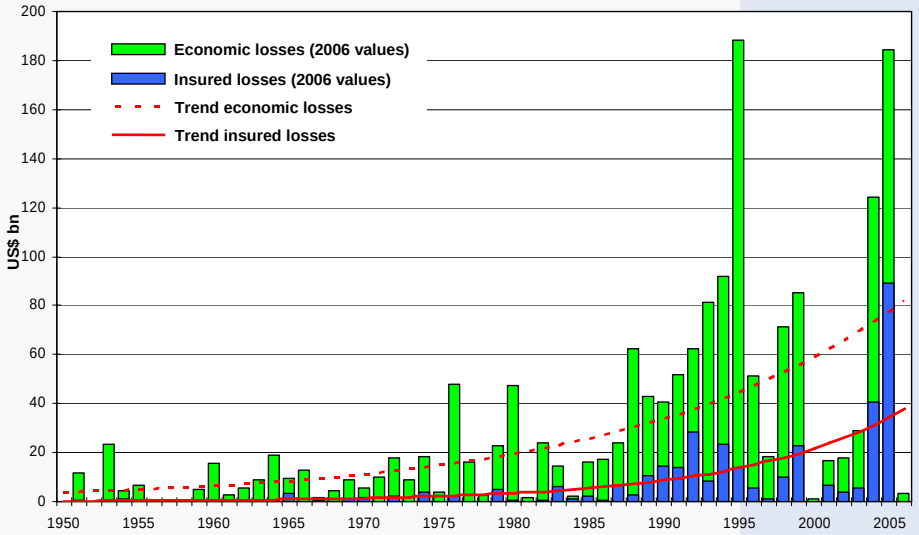
Content

- Natural catastrophes: Loss statistics
- Climate change: Impact on Weather Risks
- Risk modeling: Hazard, vulnerability, probability of loss
- Consequences for the insurance industry

Natural catastrophes: Loss statistics

Great Natural Disasters 1950 – 2006

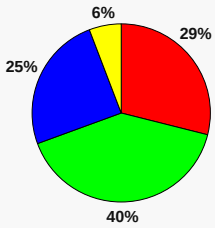
Economic and insured losses worldwide



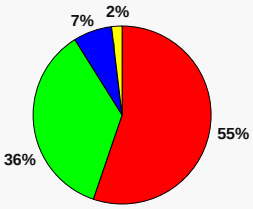
Great Natural Disasters 1950 - 2006

Percentage distribution worldwide

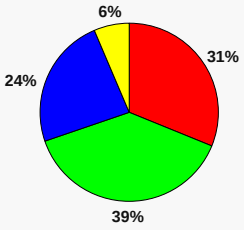
Number of events: 277



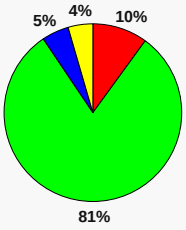
Deaths: 1.75 Million



Economic losses: US$ 1,700bn*



Insured losses: US$ 340bn*



Geological events

Earthquake, tsunami, volcanic eruption

Weather related events

Storm

Flood

Temperature extremes

*2006 values

Great Natural Disasters 2005

Date	Country/Region	Event	Fatalities	Economic losses (US$ m)	Insured
July-August	India	Floods	1,150	5 000	770
August	USA	Hurricane Katrina	1,300	125,000	60,000
September	USA	Hurricane Rita	10	15,000	10,000
October	Central America. USA	Hurricane Stan	800	3,000	100
October	Pakistan. India	Earthquake	88,000	5,200	5
October	Mexico. USA	Hurricane Wilma	42	18,000	12,000

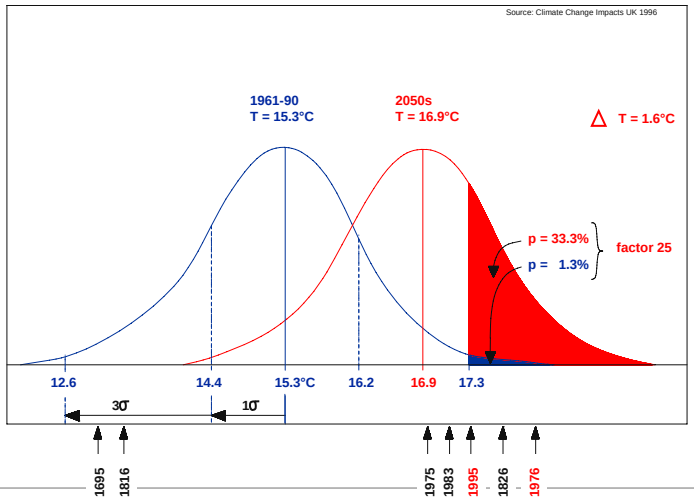
Climate change:
Impact on Weather Risks

IPCC assessment climate change and extreme weather events (2 February, 2007)

Table SPM-1. Recent trends, assessment of human influence on the trend, and projections for extreme weather events for which there is an observed late 20th century trend. {Tables 3.7, 3.8, 9.4, Sections 3.8, 5.5, 9.7, 11.2-11.9}

Phenomenon[a] and direction of trend	Likelihood that trend occurred in late 20th century (typically post 1960)	Likelihood of a human contribution to observed trend [b]	Likelihood of future trends based on projections for 21st century using SRES scenarios
Warmer and more frequent hot days and nights over most land areas	*Very likely*[d]	*Likely (nights)*[e]	*Virtually certain*[e]
Warm spells / heat waves. Frequency increases over most land areas	*Likely*	*More likely than not*[f]	*Very likely*
Heavy precipitation events. Frequency (or proportion of total rainfall from heavy falls) increases over most areas	*Likely*	*More likely than not*[f]	*Very likely*
Area affected by droughts increases	*Likely* in many regions since 1970s	*More likely than not*	*Likely*
Intense tropical cyclone activity increases	*Likely* in some regions since 1970	*More likely than not*[f]	*Likely*
extreme high sea level (excludes tsunamis) [g]	*Likely*	*More likely than not*[c, h]	*Likely*[i]

Increasing probabilities of extremes

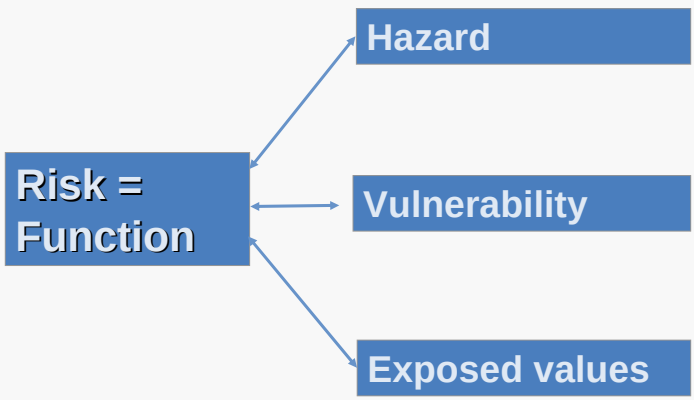


Example:

Summer temperatures in central England

Risk modeling: Hazard, vulnerability, probability of loss

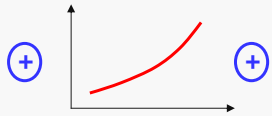
Principle of risk modeling



From hazard to risk

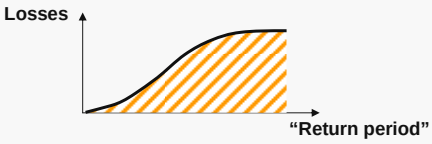
Hazard wind field set

Munich Re vulnerability function/damage sensitivity



Individual portfolio/ liability data

Risk curve

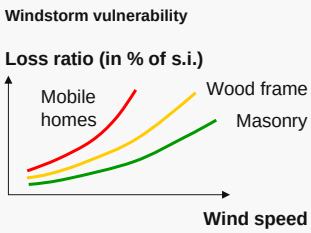


From hazard to risk:

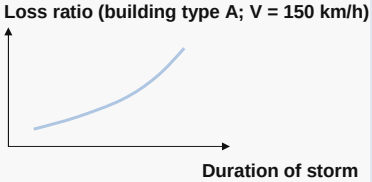
Parameters influencing the damage

Vulnerability I

– Wind speed/pressure



– Duration, gusts



From hazard to risk:

Vulnerability II

Introduction of loadings for non-modeled hazards

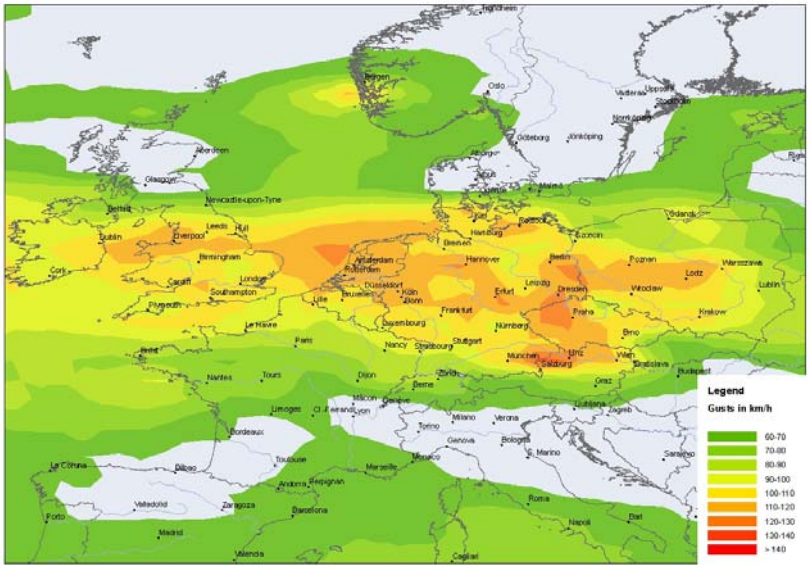
- Inland flood (and storm surge)
- Theft/looting
- Arson
- Contamination

Introduction of loadings for loss amplification

- Demand surge
- Claims inflation
- Repair-cost-delay inflation
- Coverage erosion

Consequences for the insurance industry

New Loss Experiences: Winter Storm Kyrill (2007)



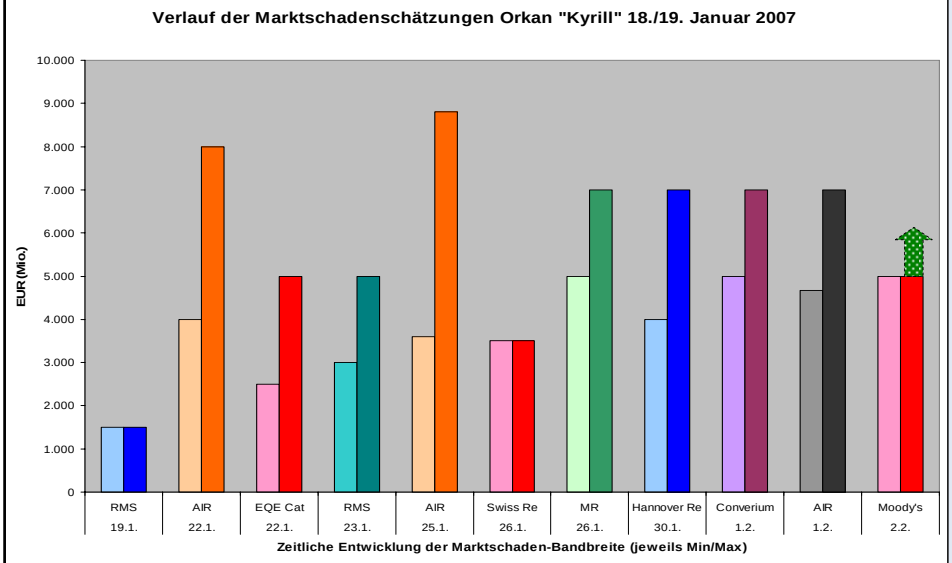
Simulation durch GeoRisikoForschung, Munich Re

Winterstorm Kyrill (2007)

Loss Estimates for New ALERT Event Set

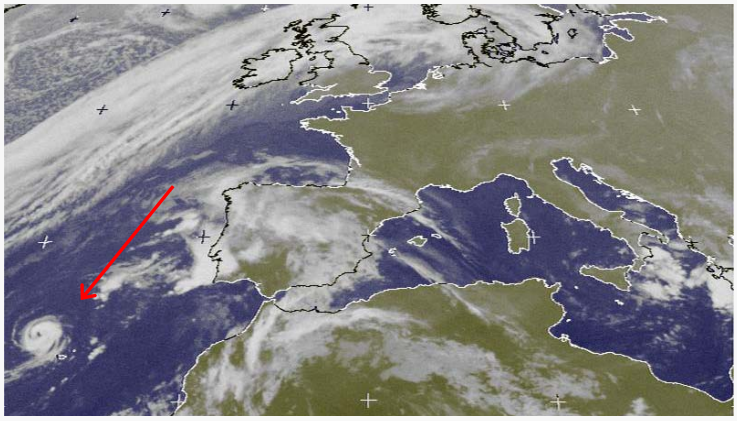
Country	Range of Loss Estimates (€ millions)		
Austria	412	-	610
Belgium	98	-	161
Denmark	4	-	7
France	156	-	248
Germany	2,284	-	3,395
Ireland	69	-	104
Luxembourg	4	-	6
Netherlands	255	-	406
Norway	0	-	0
Sweden	1	-	2
Switzerland	15	-	26
United Kingdom	1,386	-	2,030
Event Total	**4,666**	**-**	**6,995**

Winter Storm Kyrill – Loss estimates



Quelle: NatCatSERVICE,GeoRisikoForschung, Munich Re

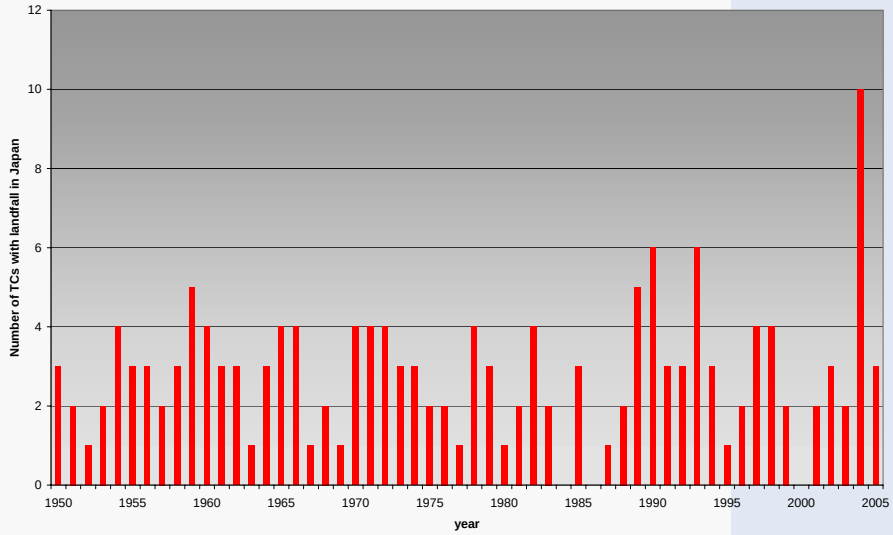
New risks
Example: Hurricane Vince, 2005



Vince

a hurricane in a region without a hurricane hazard (eastern North Atlantic, Madeira)

New Event Probabilities
Example: Tropical Cyclones in Japan, 1950-2005

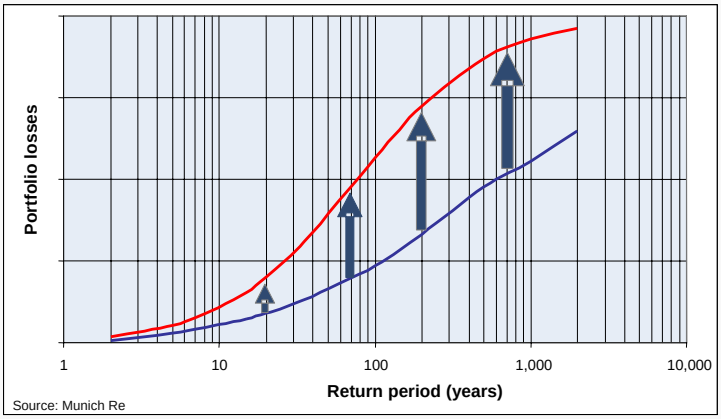


Changing hazard ->

Changing risk ->

Changing loss distribution

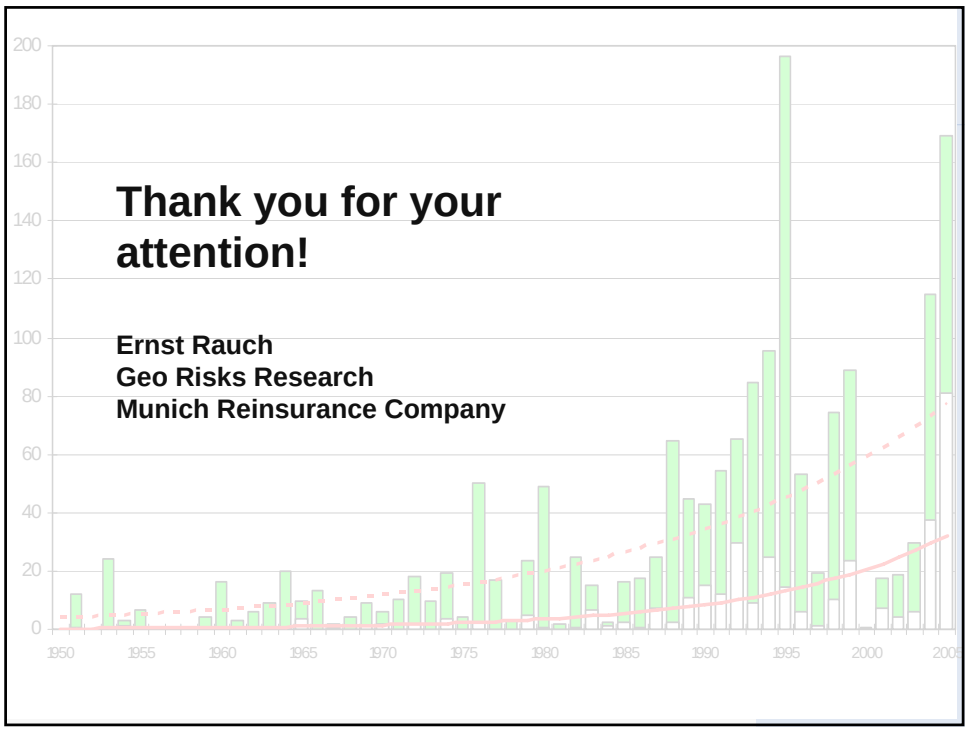
Example: Adjustment of loss distribution (pml curve) as a consequence of changing risk



Source: Munich Re

Options available to the insurance industry to adapt to the changing risk

- Adjusting risk models to changing hazard situation
- Improved accumulation control (reporting of “realistic” exposure figures)
- Improved claims handling (loss adjustment)
- Liability limits and deductibles
- Exclusion of particularly exposed areas
- Reinsurance, retrocession, ART



Thank you for your attention!

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