Natural Catastrophes and Climate Change: Predictable Risk?

Ewa Drwal,
Zurich Insurance Company, Natural Catastrophe Modeling
SAV Conference, Thun, August 29, 2008

Agenda

- Science
- Methodology
- Zurich Approach

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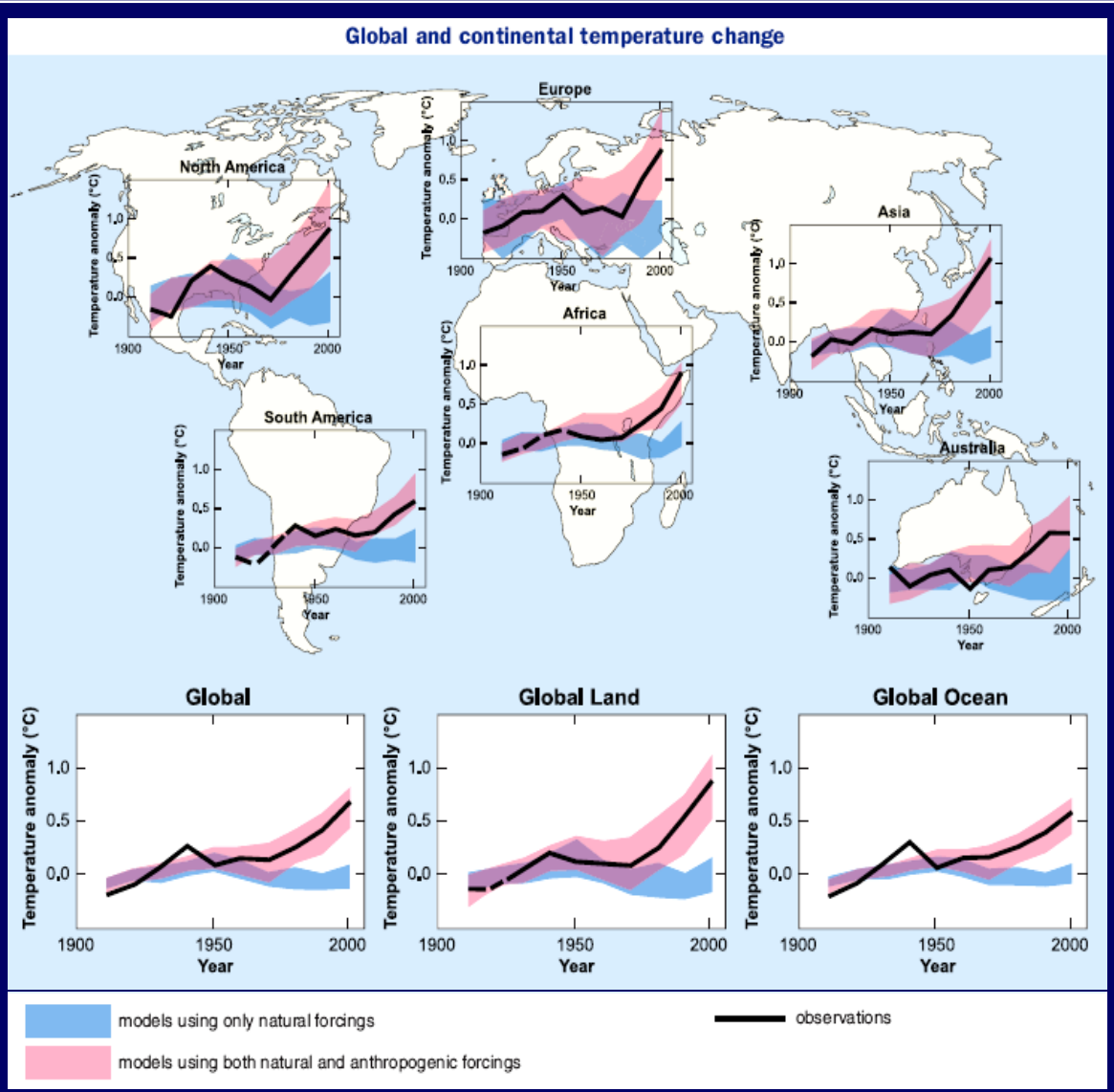
Climate Change is Unambiguous

"Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level."

IPCC Report 2007

- Increasing global air und sea surface temperatures
- Rising global average sea level
- Widespread melting of snow and ice

A Warming World

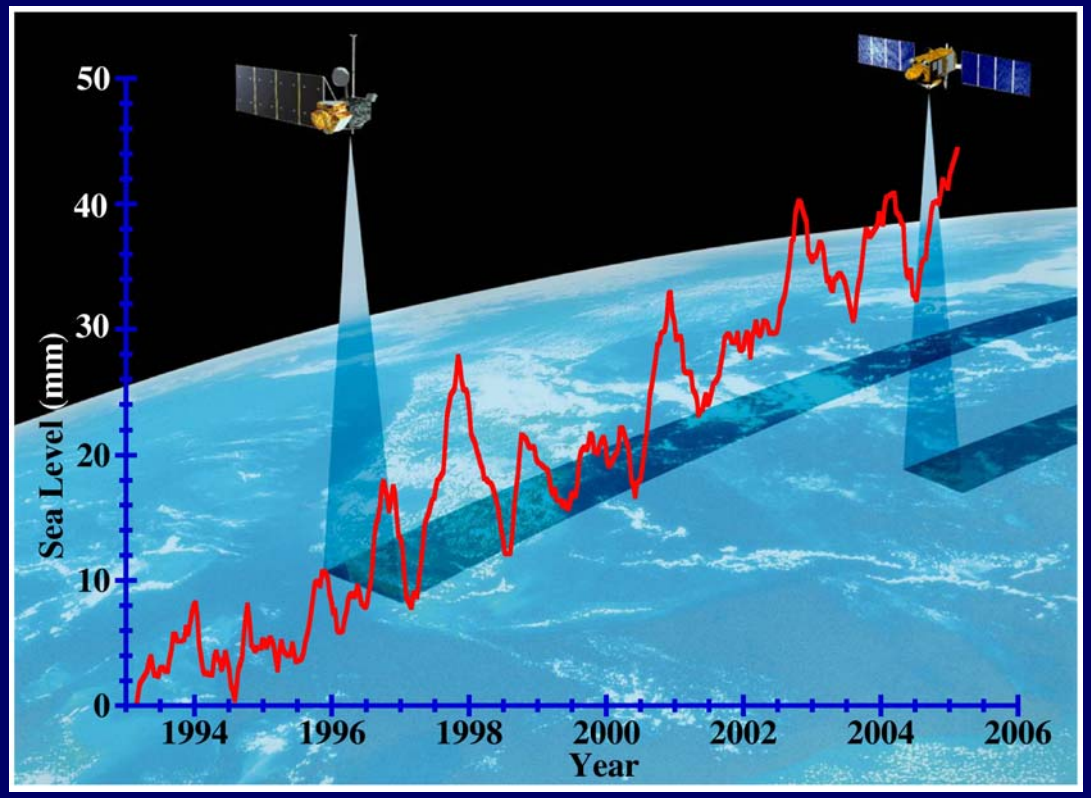


- Temperature increase is widespread over the globe and is greater at higher northern latitudes
- Land regions have warmed faster than the oceans
- Winter months have warmed faster than summer months
- Rapid warming trend over the past 30 years - the average surface temperature has increase by about 0.6 °C
- The Earth's surface is currently warming at a rate of about 0.2 °C / decade

Sources: IPCC Report 2007, NASA research

Increase Sea Level

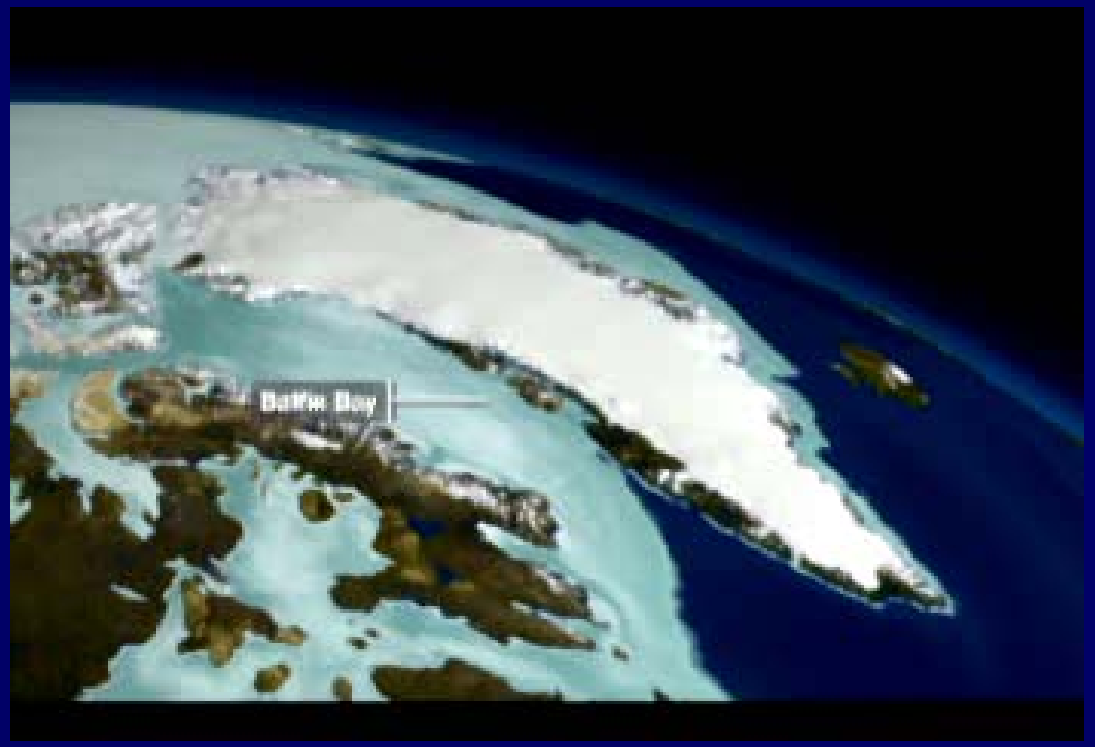
- Rising sea level is consistent with warming patterns
- Rate of global average sea level rise has increased from 1.8mm/yr to 3.1mm/yr from 1961 to 1993 with a contribution from thermal expansion, melting glaciers and ice caps, and the polar ice sheets
- Projected sea level rise at the end of the 21st Century will be 18-59 cm (IPCC report)



Observed rate of sea level increase year over year, in millimetres; Source: NASA

Melting of Snow and Ice

- Observed decreases in snow and ice extent are also consistent with global warming
- Satellite data since 1978 show that annual average Arctic sea ice extent has shrunk by 2.7 % per decade
- Mountain glaciers and snow cover on average have declined in both hemispheres



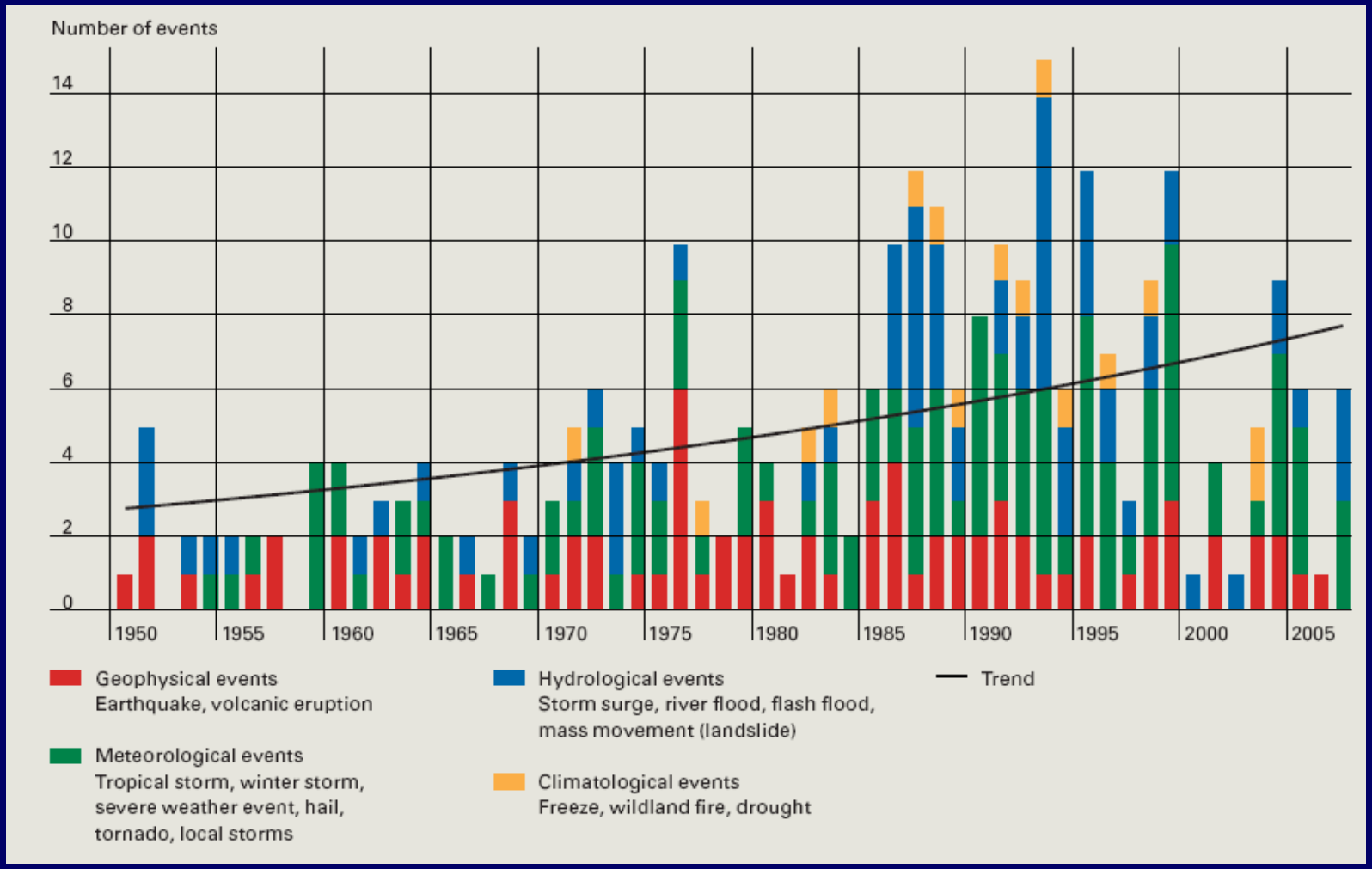
Retreat of Jakobshavn Isbrae glacier, Greenland; Source: NASA

Trends in Extreme Weather and Climate Events

Extreme Weather Events and Trend	Likelihood	Major Projected Impacts
Frequency of heat waves and hot extremes increases over most land areas	Very likely	Wildfires. Increased water demand. Water quality problems.
Heavy precipitation events increase over most areas	Very likely	Damage to crops. Soil erosion. Flash floods. Landslides. Subsidence. Mudslides.
Area affected by droughts increases	Likely	Land degradation. Wildfires. Losses in agriculture (crops and livestock).
Intense tropical cyclone activity increases	Likely	Disruption by floods and extreme winds. Damage to coast and coral riffs.
Extreme high sea level	Likely	Increase of losses due to severe floods and sea surge. Increased costs of coastal protection and land-use relocation
Changes in wind, precipitation and temperature patterns	Likely	Increase of losses due to extreme weather events

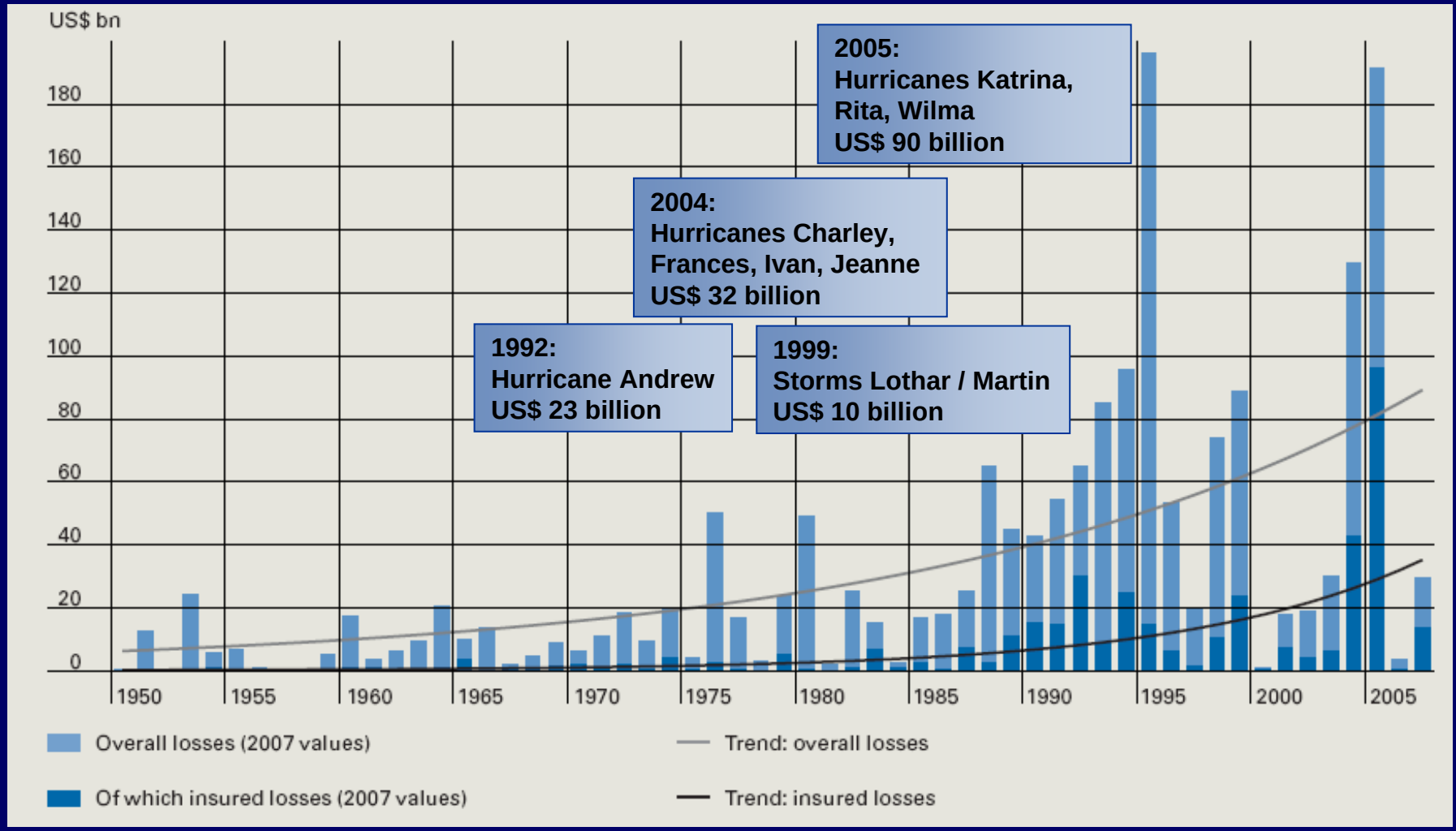
Source: IPCC Report 2007

Natural Catastrophes: Increasing Frequency, Severity and Cost – Long Term Trend?



Source: Munich Re

Natural Catastrophes: Increasing Frequency, Severity and Cost – Long Term Trend?



Source: Munich Re

2007 Again Confirmed the Long-Term Trend

Source: Munich Re

Great natural catastrophes 2007

No.	Date	Region	Loss event	Fatalities	Overall losses (US$ m)	Insured losses (US$ m)
5	18.1.	Europe	Winter Storm Kyrill	49	10,000	5,800
16	4–8.6.	Oman	Cyclone Gonu	70	3,900	650
20	June	United Kingdom	Floods	4	4,000	3,000
27	July	United Kingdom	Floods	1	4,000	3,000
45	November	Mexico	Floods	22	2,500	350
47	15–17.11.	Bangladesh	Cyclone Sidr	3,360	3,700	

Windstorm Kyrill January 2007

"As a result of climate change, the 21st century will bring a distinct increase in annual loss ratios due to winter storms in many countries of Europe. Kyrill cannot be classified as an isolated or exceptional case."

Munich Re, Topics Geo 2007

Photos: dpa, Focus

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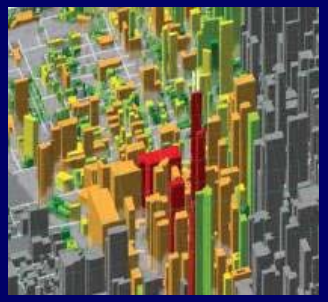
Natural Catastrophes and Climate Change: How Do We Manage Going Forward?

'Noah's Ark' - colored drawing, Gutenberg Bible 1570, source: www.worlwideflood.com

Current Catastrophe Models:
Exposure x Hazard x Vulnerability = Risk

Exposure



Value distribution

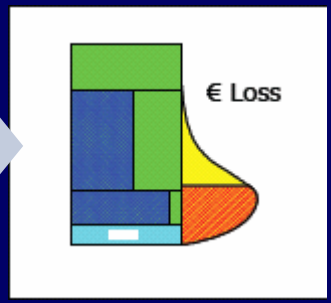
Hazard

- Based on historic data and scientific research defines a range of potential events in terms of their physical parameters and probability of occurrence
- Describes local intensity of hazard

Vulnerability

- Extend of damage at a given intensity
- Based on various characteristics of the insured object (e.g. construction, age and height, occupancy type)

Financial Structure



- Applies the damage against the insurance and reinsurance structures to determine the financial losses

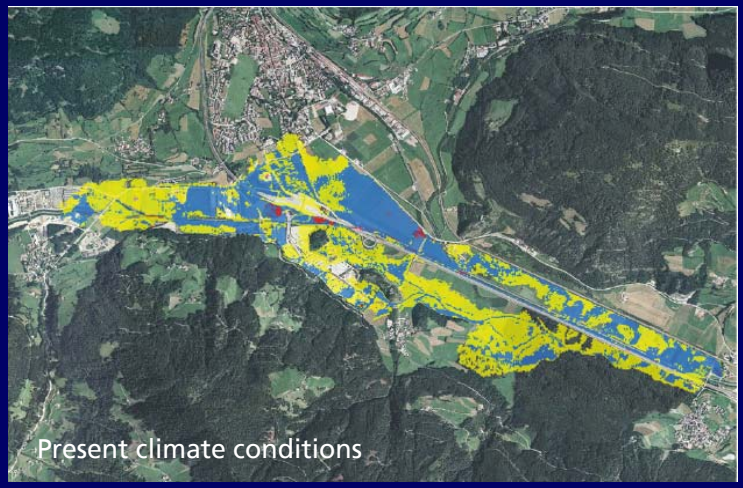
Climate Change: Implications for Modeling

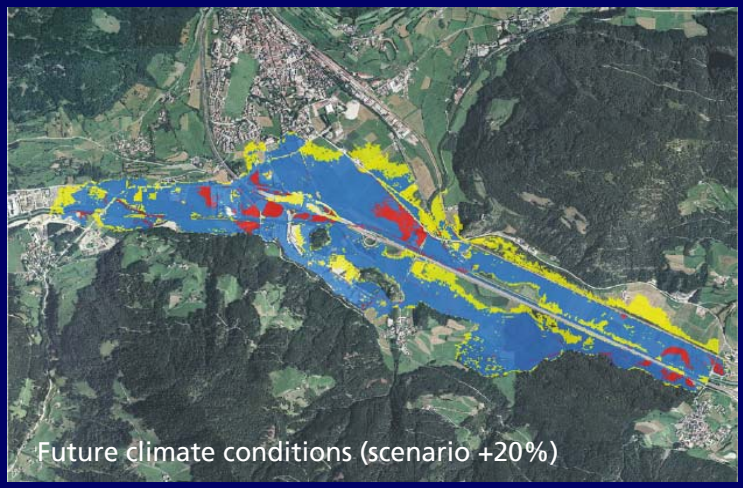
- Historic catastrophe models assumed ‘static view of hazard’ but the climate system is not static
- Future climate models need to consider climate change and imply ‘dynamic view of hazard’
- Questions and challenges for catastrophe modeling as a tool to understand and explore future risk
  - Identify the key climatic drivers of the hazard
  - What future trends (from 10-100yrs perspective) can we expect according to climate physics and modeling?
  - Global and regional effects of a shifting climate
  - Potential changes in exposure and vulnerability
  - Enhancement of hazard module to explore impact of climate change in mid- and long-term perspective (e.g. hurricane activity, flood patterns)
  - Application of numerical climate models (e.g. NCAR) to supplement statistical analysis of historic data

Climate Change: Implications for Modeling Example Flood

Flood zones scenarios Bolzen, Vipiteno/Sterzing basin, South Tyrol

- Climatic impacts
  - Increase of daily mean temperatures in summer and winter
  - Increase of mean sum of precipitation in winter
  - Increase of intensity and frequency of short extreme rainfall events in summer and autumn
- Extent of the blue hazard zone increased significantly
- Flood risks with a low intensity (yellow zone) may be exposed to blue hazard zones in the future
- Expected damages of a flood event with a return period of 200 years increased up to 117% for scenario +20%





Flood depths 0 to 0.5m Flood depths 0.5 to 2m Flood depths > 2m

Source: Staffler, Impacts of climate change on flood hazard zone mapping, 2008

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Zurich's response to climate change (1)

"By tackling this issue with the disciplined, global approach that Zurich has become famous for – and by centering it on the risks our customers face – I am confident that we can make a difference – for our customers, our employees and ourselves."

James Schiro, January 2008

Climate change is happening, relevant and urgent. Zurich recognizes, as a leader, its responsibility to customers, stakeholders and society and will actively address the climate change challenges by:

- Developing new and adaptive market-based solutions to meet and mitigate the risks faced by its customers and their desire to support society's sustainability goal
- Working in partnership with stakeholders to create and share knowledge on climate risks and their impact
- Leveraging its global understanding and capabilities to manage the local and cross-border impact of climate change
- Acting responsibly to manage its carbon footprint and its potential climate-related insurance and investment risk

Zurich's response to climate change (2)

Climate Change
International Advisory Council

- Consisting of internal functional leaders and external advisors directly reporting to Zurich's Group Management on strategic and operational issues associated with climate change
- Tony Blair, former UK Prime Minister, appointed to advise and collaborate with Zurich on its Climate Initiative
- Professor Dr. Ulrike Lohmann, ETH, identified as scientific advisor

Climate Change Office within the Global Underwriting Function

- Understanding of climate related risks and applying across all Zurich's businesses

New and Adaptive Market-Based Solutions

- Alternative Energy (solar and wind power, hydropower, biomass, geothermal)
- Motor: discounts for Hybrid Vehicles
- Green Wrap: Green Building Projects
- Water Supply: Water Re-Use / Storm Water Run-Off Coverage

Conclusions

- Climate change is unambiguous and evident from observations
- Climate change forces a dynamic view of hazard and exposure
  - Climate system is not static
  - … and neither should be the way we manage risk
- Individuals and companies can respond, and can make a difference
- It's not just stopping, but responding, and eliminating or mitigating risk to our customers