International Association for the
Study of Insurance Economics

Études et Dossiers

Etudes et Dossiers No. 322

M.O.R.E. 20
Seminar of The Geneva Association

The Role of Risk Management and Insurance in the Leisure Industry

16 – 17 November 2006
Madrid

February 2007

Working Paper Series of
The Geneva Association

The Geneva Association - General Secretariat - 53, route de Malagnou - CH-1208 Geneva
Tel.: +41-22-707 66 00 - Fax: +41-22-736 75 36 - secretariat@genevaassociation.org - www.genevaassociation.org

The Geneva Association Working Paper Series “Études et Dossiers” appear at irregular intervals about 10 - 12 times per year. Distribution is limited.

The “Études et Dossiers” are the working paper series of The Geneva Association. These documents present intermediary or final results of conference proceedings, special reports and research done by The Geneva Association. As they contain work in progress or summaries of conference presentations, the material must not be cited without the express consent of the author in question.

Layout & Distribution: Valéria Kozakova

Geo-Risks and the Leisure Industry

Peter Hoeppe

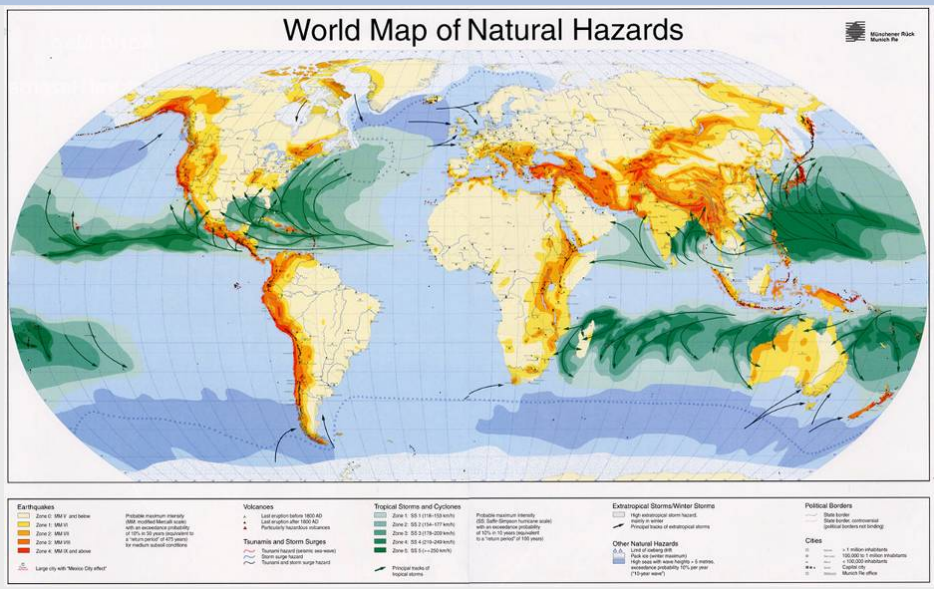
Geo Risks Research Department of Munich Re - Analyses of natural disasters since 1974

2 GEO-colleagues in Princeton

2 GEO-colleagues in Hongkong

Development of Image and Service Products

Münchener Rück
Munich Re Group



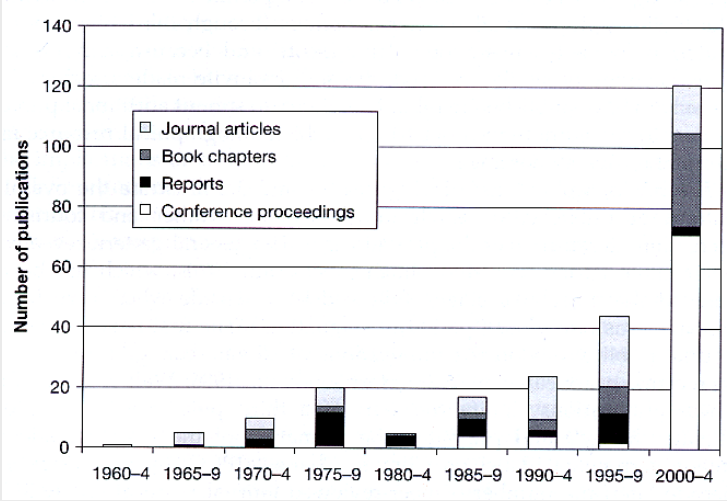
Specific Vulnerability of the Leisure Industry in Respect to Geo Risks (Natural Disasters)

Münchener Rück
Munich Re Group

- Leisure industry is very much outdoor oriented (tourism, sports, fun parks)
- Leisure industry concentrates on coastlines (beaches, yachting), which are most vulnerable to natural disasters
- Weather characteristics can be chances but also risks for the leisure industry, if they change
- Extreme weather events affect leisure industry to a special degree

Numbers of scientific publications on climate-weather and tourism-recreation

Münchener Rück
Munich Re Group



Source: TOURISM; RECREATION AND CLIMATE CHANGE, Edited by C. Michael Hall and James Higham, 2005, p. 46

The economic importance of travel and tourism

Münchener Rück
Munich Re Group

In 2006 travel and tourism is expected to generate:

- US$ 6,477 billion of economic activity
- 10.3% of total GDP
- 234 million jobs or 8.7% of total employment

Source: World Travel and Tourism Council, 2006

Sources and types of natural disasters

Münchener Rück
Munich Re Group

Extraterrestrial: Meteorites

Geophysical (terrestrial): earthquakes, volcano eruptions, tsunamis

Atmospheric (weather related): windstorms, floods, hailstorms, lightning, avalanches, mudslides

Sources and types of natural disasters

Münchener Rück
Munich Re Group

Extraterrestrial: Meteorites

- The probability, that a 100 m object hits the earth is about once in 10,000 years, for a 300 m object once in 50,000 years
- Low probability high impact!
- No location safe!

The Tsunami of 26 December 2004

Münchener Rück
Munich Re Group

> 200,000 victims
ca. 2.7 million homeless
Economic loss about US$ 10 bn
Insured loss about US$ 1 bn
Largest natural catastrophe since earthquake in Tangshan 1976
Largest tsunami event in the documented history (fourth largest earth quake)

The Tsunami of 26 December 2004

Münchener Rück
Munich Re Group

After the great tsunami strong decreases of tourist stays in affected areas

On Maldives (photo), however, tourism in 2006 already has topped the figures before the tsunami already.

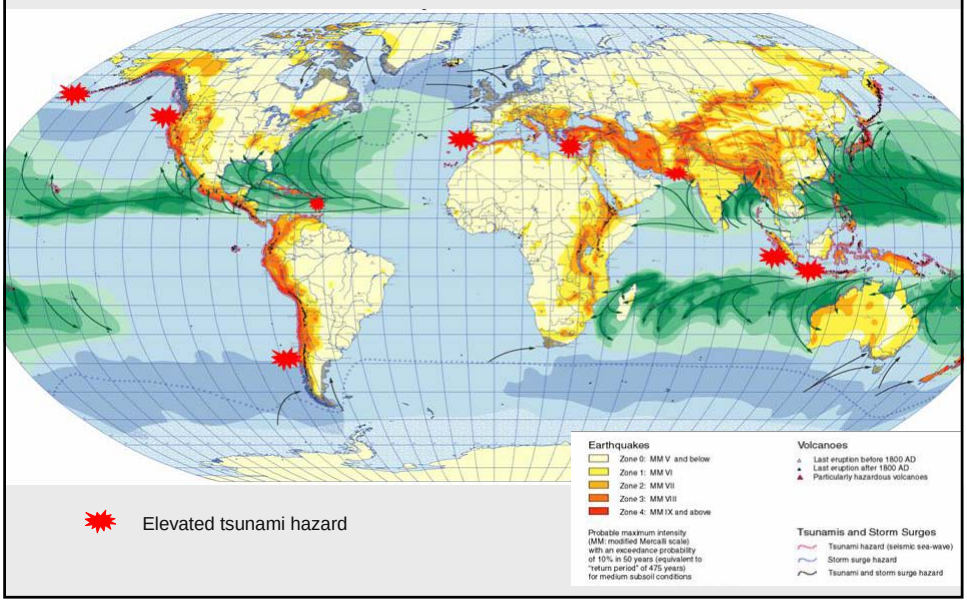
Great tsunamis in history
Frequency about 3 per century

Münchener Rück
Munich Re Group

Year	Source region	EQ magnitude	# victims
1700	US Pac NW	9	?
1707	Nankaido/Japan	8.4	4,900
1755	S Portugal	8.7	30,000
1833	Central Sumatra	9.2	Several thousand
1868	N Chile/S Peru	8.5	5,000
1883	Krakatau	Volcanic eruption	36,400
1896	Sanriku/Japan	7.6	27,122
1946	Aleutians	8.6	173 (on Hawaii)
1960	S Chile	9.5	3,000
1964	Alaska	9.2	122
2004	N Sumatra	9.0	>200,000

Tsunami scenarios

Münchener Rück
Munich Re Group



Elevated tsunami hazard

Volcano eruptions

Münchener Rück
Munich Re Group

Large eruptions in history:

26,500 years ago: Taupo volcano in New Zealand

35,000 years ago: Campi Flegrei at Naples

74,000 years ago: Toba-eruption on Sumatra

630,000 years ago: Yellowstone eruption

Probability of such an eruption about once in 50,000 years. Such eruptions have catastrophic global climatic effects for many years

Smaller events:

Tambora (Indonesia) 1815 followed by a year without summer

Laki-Gigar (Iceland) 1783

Probability 10-50% in the next 100 years

Weather disasters

Münchener Rück
Munich Re Group

The last years have brought records in weather disasters in respect to:

- Intensities
- Frequencies
- Damages and losses

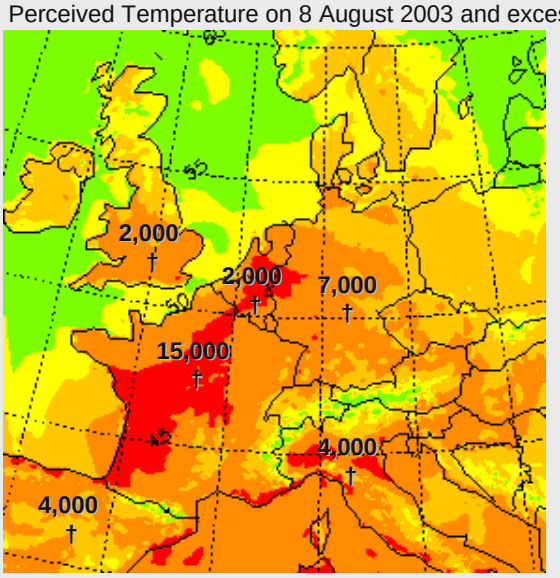
Dresden, August 2002
Economic losses of total event: €16 bn
Insured losses: € 3.4 bn

Münchener Rück
Munich Re Group

Heat wave of 2003, the largest humanitarian natural catastrophe in Europe for centuries

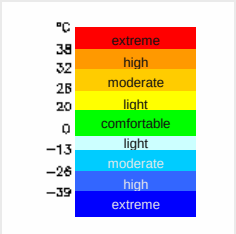
Münchener Rück
Munich Re Group

Perceived Temperature on 8 August 2003 and excess mortality



Source: German Weather Service, 2004

Heat stress



Cold stress

UTC
13:00

2004: 1st Hurricane in South Atlantic

Münchener Rück
Munich Re Group

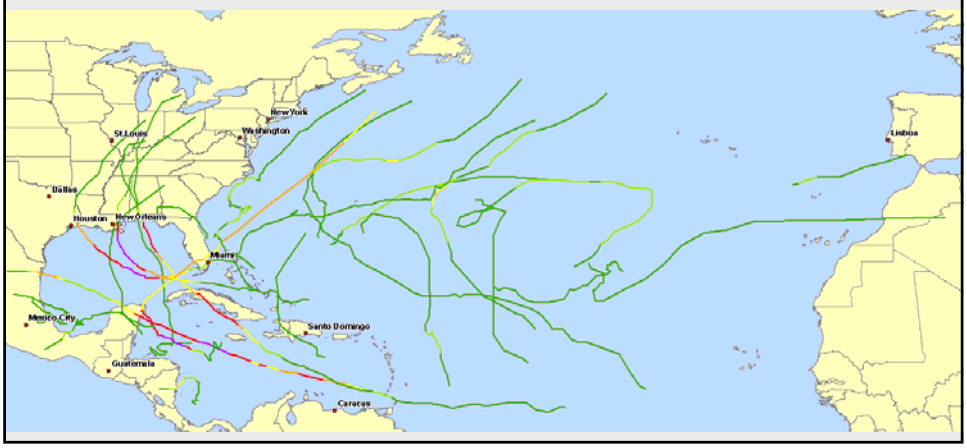
Hurricane Catarina off the Coast of Brazil, March 2004

Source: Image courtesy of Earth Sciences and Image Analysis Laboratory, NASA Johnson Space Center, Bild-Nummer ISS008-E-19646. http://eol.jsc.nasa.gov

The hurricane year 2005
The strongest, 4th and 6th strongest in one season

Münchener Rück
Munich Re Group

Never before since the beginning of records (1850) have so many named tropical storms occurred in the North Atlantic basin in one season:
27, of which 15 with hurricane strength
(old absolute record 21 in 1933, respectively 12 in 1969).



Natural Disasters and Climate Change

2005, a Year of Weather Extremes

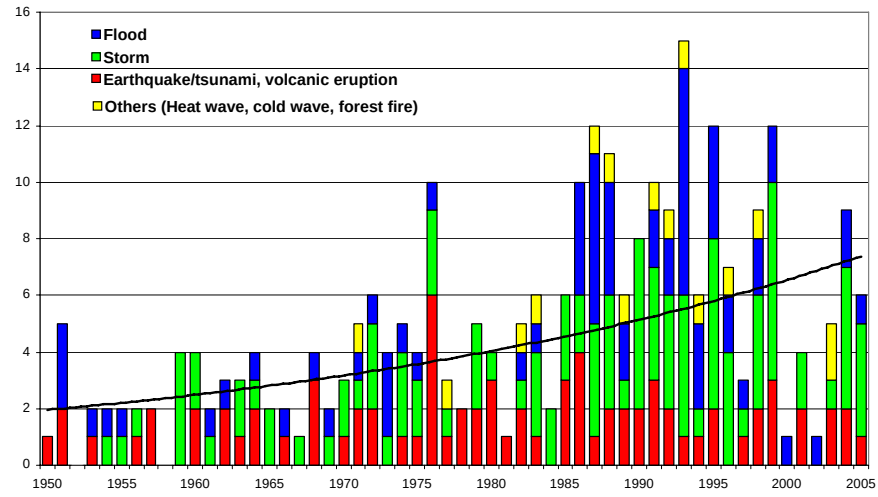
Münchener Rück
Munich Re Group

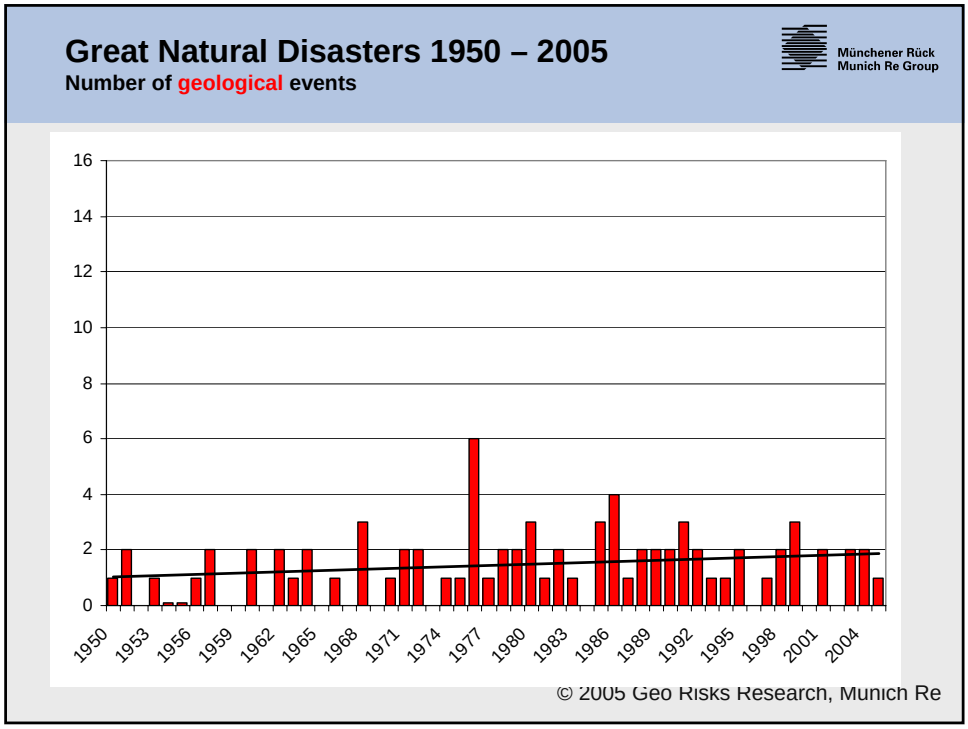
July/August: Flooding in India (1.150 fatalities)		944 mm rainfall within 24 hours, highest ever in India
Economic losses (US$ m):	5.000	
Insured losses (US$ m):	770	
August: Flooding in the Alps (1.150 fatalities)		For Switzerland the most expensive natural catastrophe ever
Economic losses (US$ m):	3.000 (CH 2.100)	
Insured losses (US$ m):	1.700 (CH 1.500)	
25.-30.8 Hurricane Katrina, USA (1.322 fatalities)		6th strongest hurricane, largest losses of a single event
Economic losses (US$ m):	125.000	
Insured losses (US$ m):	60.000 (NFIP included)	
21.-24.10 Hurricane Wilma: Mexico, USA, Caribbean		Hurricane Wilma was the strongest hurricane since the beginning of measurements
Economic losses (US$ m):	16.000	
Insured losses (US$ m):	10.000	
9.10 Hurricane Vince: easterly North Atlantic, Madeira		Hurricanes in a region without hurricane risk
27.11 Tropical Storm Delta		

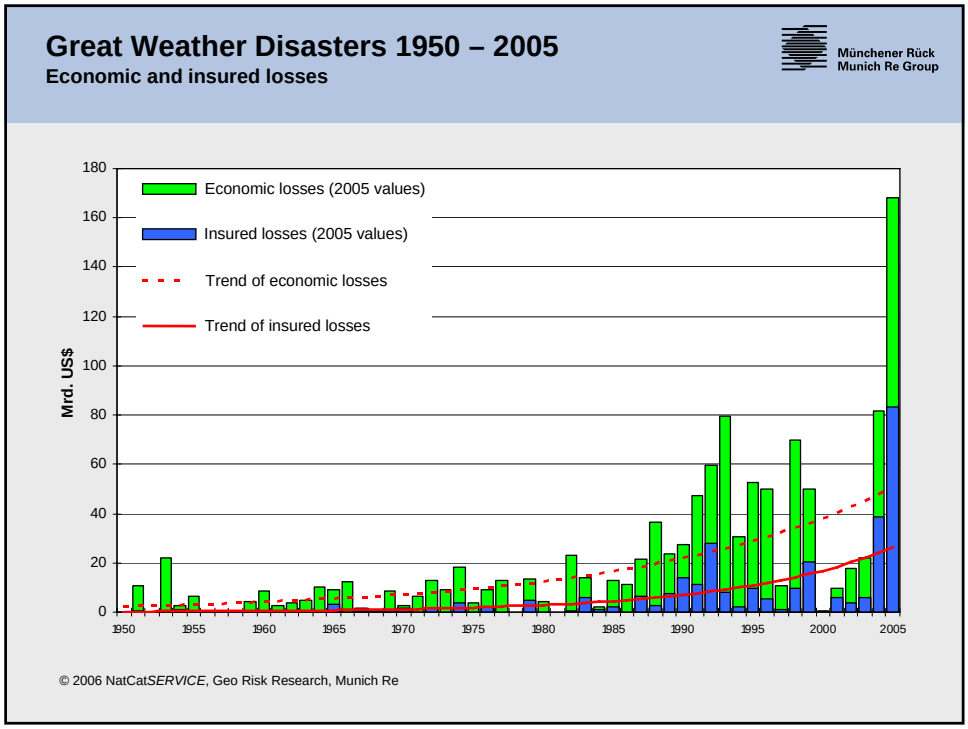
Great Natural Disasters 1950 – 2005

Number of events

Münchener Rück
Munich Re Group



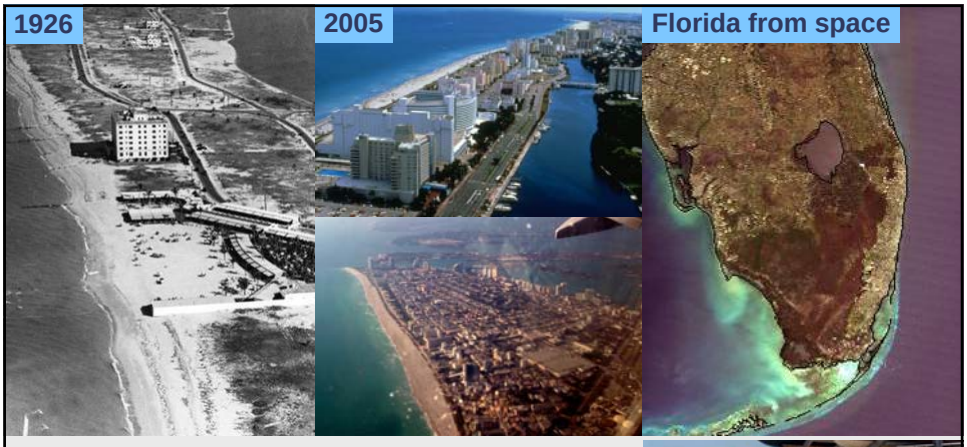

Great Natural Disasters 1950 – 2005
Number of geological events
Münchener Rück
Munich Re Group
16
14
12
10
8
6
4
2
0
1950
1953
1956
1959
1962
1965
1968
1971
1974
1977
1980
1983
1986
1989
1992
1995
1998
2001
2004
© 2005 Geo Risks Research, Munich Re


Great Weather Disasters 1950 – 2005
Economic and insured losses
Münchener Rück
Munich Re Group
Economic losses (2005 values)
Insured losses (2005 values)
Trend of economic losses
Trend of insured losses
Mrd. US$
180
160
140
120
100
80
60
40
20
0
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
© 2006 NatCatSERVICE, Geo Risk Research, Munich Re

Reasons for globally increasing losses due to natural disasters

Münchener Rück
Munich Re Group

- Rise in population
- Better standard of living
- Concentration of people and values in large conurbations
- Settlement in and industrialization of extremely exposed regions



Florida -Trends

Population			Tourists	
1920:		100,000	1920:	-
1950:		3,000,000	1970:	5,000,000
2000:		15,000,000	1995:	45,000,000
2005:		18,000,000	2005:	86,000,000
2025:	ca.	25,000,000	2025:	?

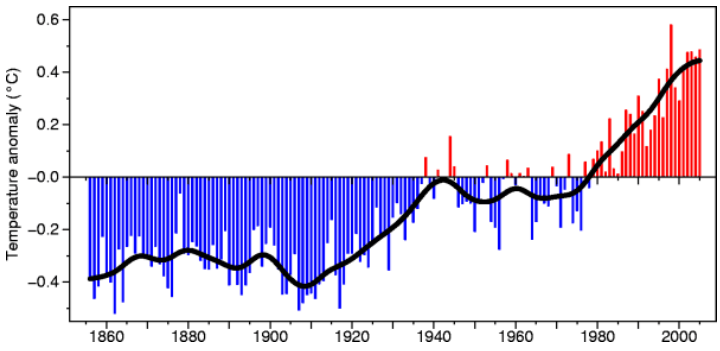
Reasons for globally increasing losses due to natural disasters

Münchener Rück
Munich Re Group

- Rise in population
- Better standard of living
- Concentration of people and values in large conurbations
- Settlement in and industrialization of extremely exposed regions
- Susceptibility of modern societies and technologies to natural hazards
- Increasing insurance density
- Change in environmental conditions - Climate Change

Global Mean Temperature, 1856 – 2005 Deviations from Mean 1961-1990

Münchener Rück
Munich Re Group



2005: +0,47°C above the 1961-1990 annual mean.

Source: CRU, UK (2006), compilation acc. to WMO

The hottest years since 1856

Global mean air temperature near the ground
The last 11 years (1995-2005), with the exception of 1996, have been the warmest years on record.

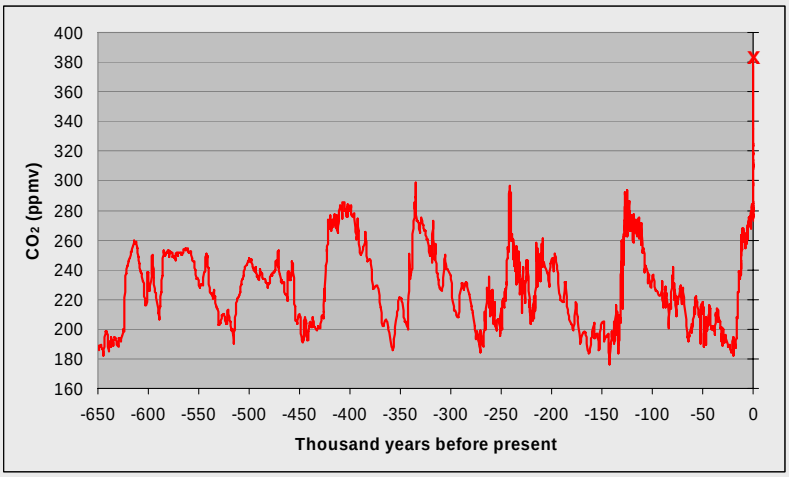
1. **1998**
2. **2005**
3. **2002**
4. **2003**
5. **2004**
6. **2001**
7. **1997**
8. **1995**
9. **2000**
10. **1999**

(Source: WMO, Geneva, 2006)

CO_2 concentration in the atmosphere

of the past 650,000 years from Antarctic ice core data

Münchener Rück
Munich Re Group



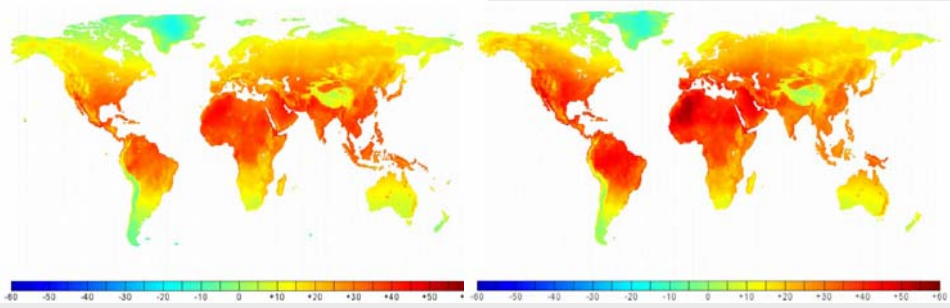
2005:
381 ppmv CO_2

Source: Messungen an Eisbohrkernen: Siegenthaler et al., Science 310, 1313-1317, (2005). Etheridge et al., J. Geophys. Res. 101, 4115-4128 (1996). Petit et al., Nature 399, 429-436 (1999). Fischer et al., Science 283, 1712-1714 (1999). Indermühle et al., Geophys. Res. Lett. 27, 735-738, (2000). Monnin et al., Earth Planet. Sci. Lett. 224, 45-54, (2004). Monnin et al., Science 291, 112-114, (2001). Direkte atmosphärische Messungen: Keeling and Whorf. The Carbon Dioxide Research Group, Scripps Institution of Oceanography (SIO), University of California, La Jolla, California USA 92093-0444.

Climate Change: risks for tourism
Increased heat discomfort in tourism destinations

Münchener Rück
Munich Re Group

Monthly mean values of Perceived Temperature (PET) for 1961-1990 and 2070-2099 (modeled with HadCM3)



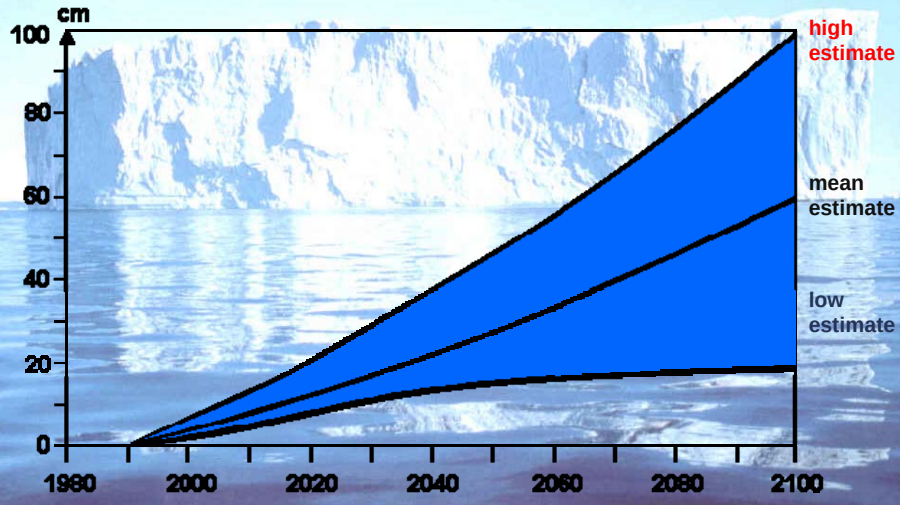
PET 1961-1990 for July

PET 2070-2099 for July

Source: Matzarakis, Tourism and Hospitality Planning & Development, 3, 99-115, 2006

Climate Change: risks for tourism
Sea level rise will endanger small island resorts

Münchener Rück
Munich Re Group



Climate Change: risks for tourism
Increased wildfire hazard

Münchener Rück
Munich Re Group

US study shows increase in wildfire activity since the 1970s in good association with higher spring (earlier snowmelt) and summer temperatures –
larger frequency and longer duration of wildfires

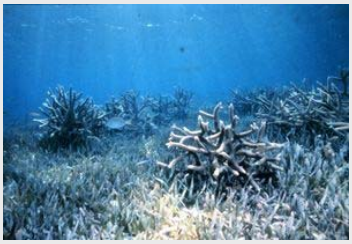
Source: Westerling et al., Science, 313, 940-943, 2006

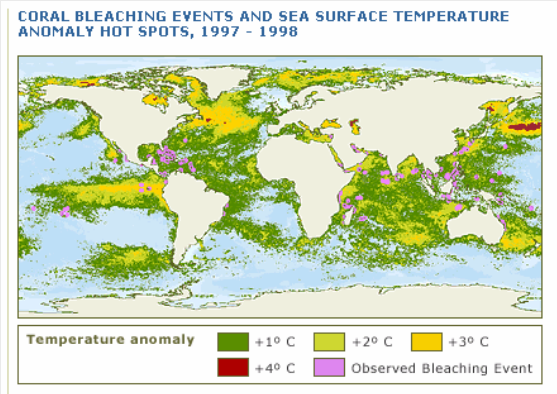
Climate Change: risks for tourism
Coral bleaching

Münchener Rück
Munich Re Group

Warming sea water leads to production of toxic substances of algae ->
formation of white coating of corals,
continued phases of coral bleaching lead to death of corals ->
no attractiveness for diving tourism anymore

Tourism to the Great Barrier Reef supports a $AUS 1.5 billion industry (Source: UNEP-FI, 2006)





Source: World Resources Institute,
http://earthtrends.wri.org/maps_spatial/maps_detail_static.php?map_select=207&theme=3

Climate Change: risks for tourism
Lack of fresh water

Münchener Rück
Munich Re Group

Climate models predict much less precipitation e.g. in the Mediterranean

Climate Change: risks for tourism
Jelly fish spread

Münchener Rück
Munich Re Group

Many species of jelly fish spread, when the water is warmer than average like in the Mediterranean in summer 2006

Source of photo: Miketsukunibito (copyright free)

Climate Change: risks for tourism
Spread of infectious diseases

Münchener Rück
Munich Re Group

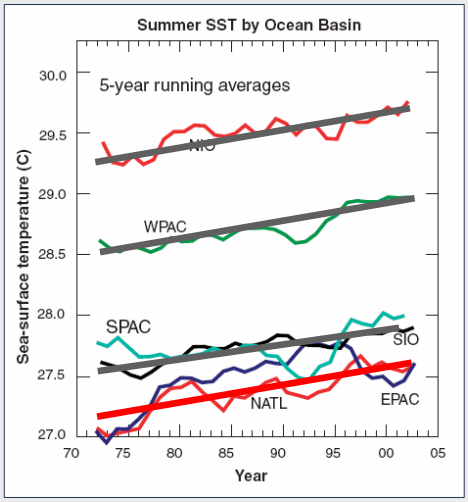
Climate change (esp. increases in air and water temperatures) affects conditions for viruses and bacteria and their vectors (insects, rodents)

Especially for tropical infectious diseases like malaria or dengue fever higher temperatures are favorable for their vectors

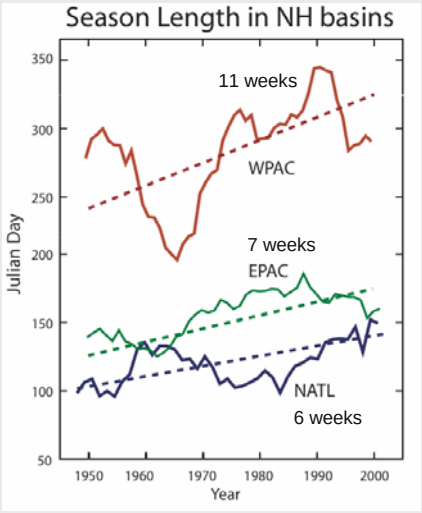
Increased climate variability and extreme weather events destabilize the balance between vectors and their predators →
clusters of diseases transferred by mosquitoes or rodents may occur

Climate Change: risks for tourism
Prolonged tropical storm season

Münchener Rück
Munich Re Group



Source: Webster et al. (2005), Science Vol. 309.



Source: J. Curry, P.J.Webster, presentation provided for Hohenkammer Workshop, May 2006

Climate Change: risks for air travel

Münchener Rück
Munich Re Group

Air travel contributes increasing amounts of CO_2

Ratio of air travel on total CO_2 emissions:

1990: 3%

2004: 8%

Forecast: doubling until 2015

CO_2 emissions will get a price tag in the future also for transport, making air travel much more expensive

Tourism and Insurance of Effects of Natural Catastrophes

Münchener Rück
Munich Re Group





▪ Absence of Tourists	→ Loss of Revenues-Coverage
▪ Damaged Property	→ Traditional Property-Coverage
▪ Damaged Infrastructure	→ Cover for Government
▪ Lower expenditure of tourists due to bad weather	→ Loss of Revenues-Coverage
▪ Special care for tourists on the spot	→ Repatriation Insurance
▪ Liability claims of Tourists	→ Traditional Liability Cover

Conclusions

Münchener Rück
Munich Re Group

The leisure industry has a high exposure to natural disaster

Due to the preferred locations of leisure parks and tourism destinations at or close to the coasts they have a high exposure to wind storms, storm surge and tsunamis

There is no doubt anymore that climate is changing – there is more and more scientific evidence for causal links to increasing frequencies and intensities of natural catastrophes

Climate change creates and increases risks for the leisure industry in many locations

The leisure insurance industry has to adapt to the changing risks

The expertise in insurance industry in nat cat risk assessment can help to manage these risks