



# Climate Change - Disaster Risks & Reduction Strategies



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*Challenges of the European  
Safety*

*Prague, 6. 4. 2009*



# Presentation outline

**Climate change - detection and outlooks**

**Impacts, vulnerabilities**

**Safety risks**

**Risk dimensions**

**Reduction strategies**

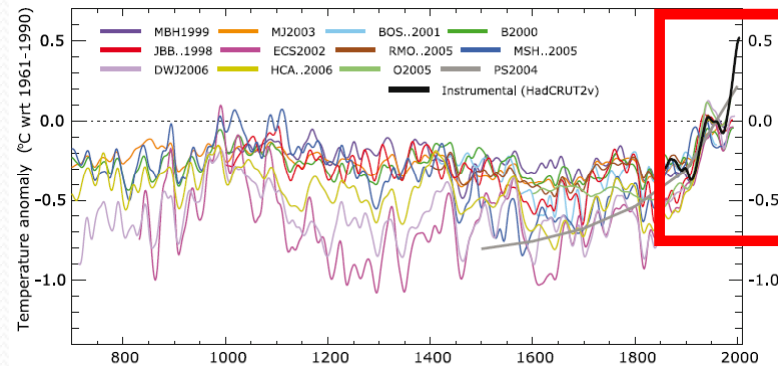
# Climate change

*“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 mean sea level.”*

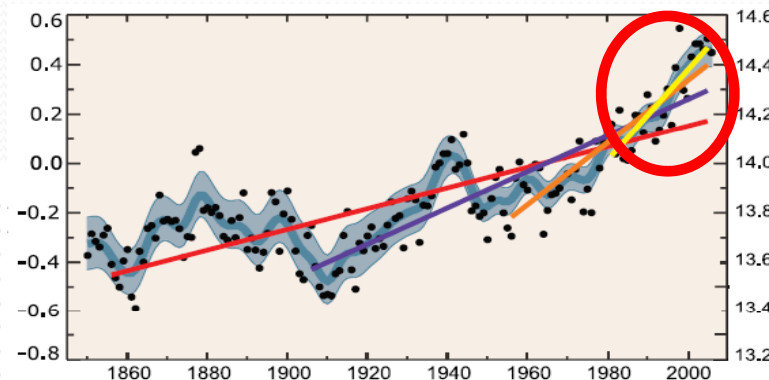
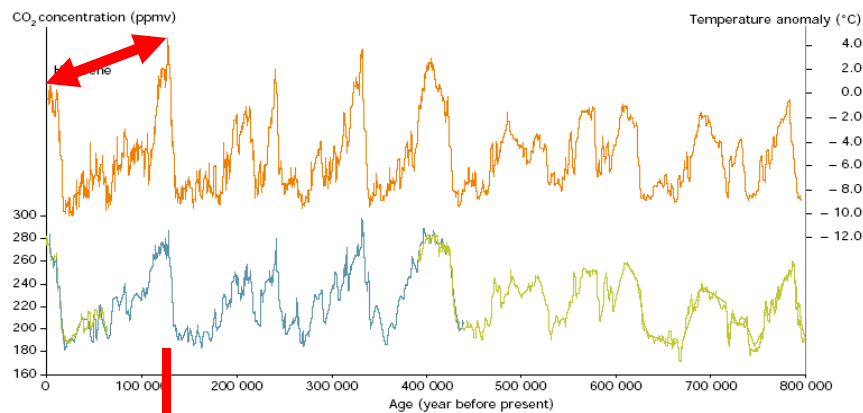
4th IPCC Assessment Report 2007  
<http://www.ipcc.ch>

# Historical temperature change

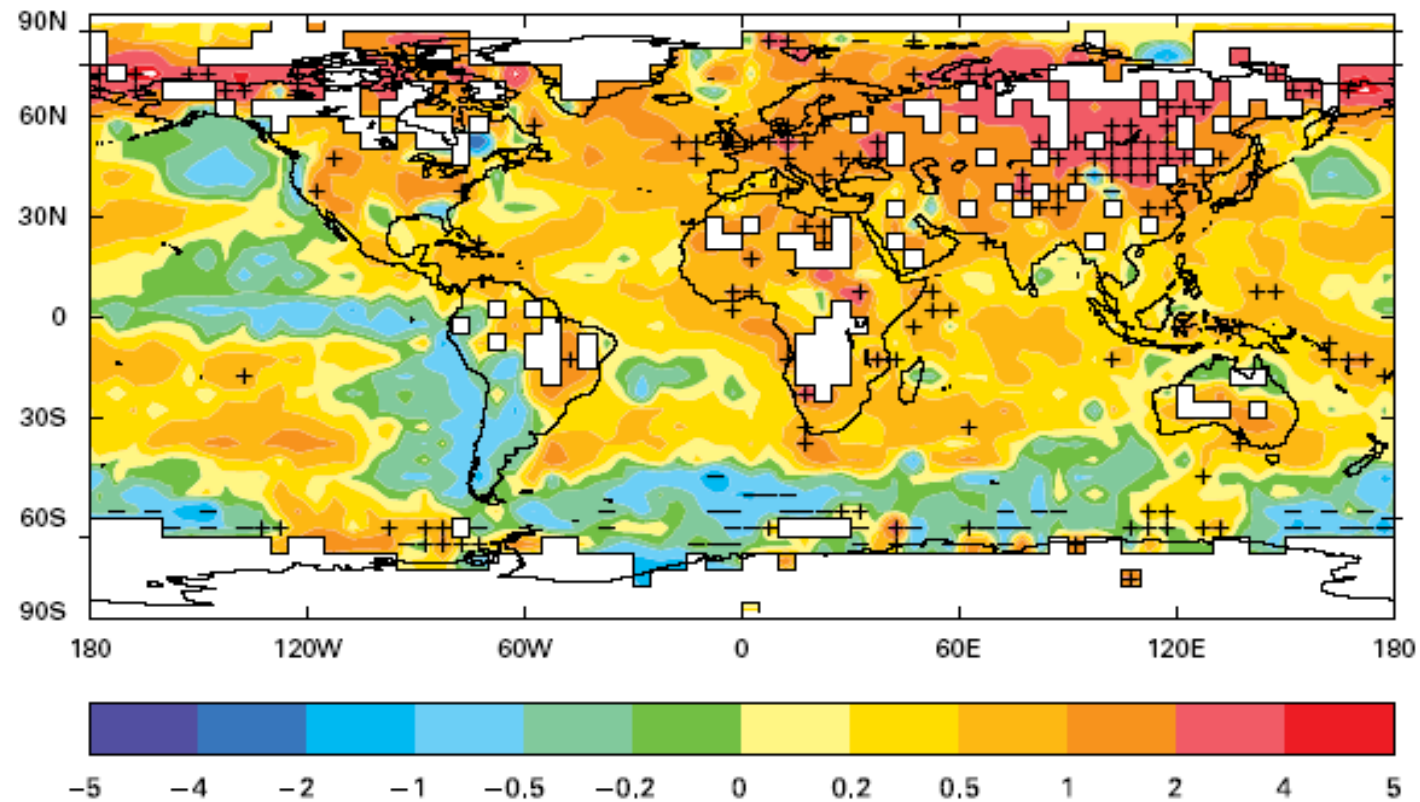
- Temperature course relatively stable in last century
  - 9. – 14. cent. – slightly warmer
  - 16. – 19. cent. - slightly colder
  - **20. cent. - significantly warmer**
- strong and **rapid** temperature rise in last 20-30 years
- **TRENDS**



1998  
2005  
2002  
2008  
2003  
2006  
2004  
2007  
2001  
1997



# Temperature change in 20. century



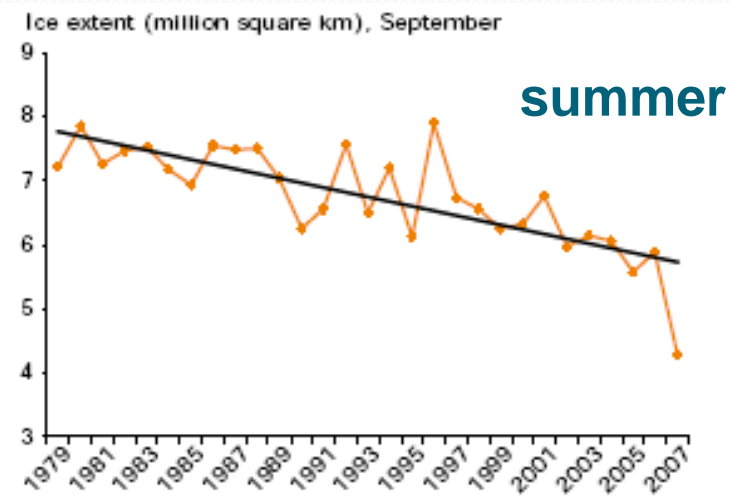
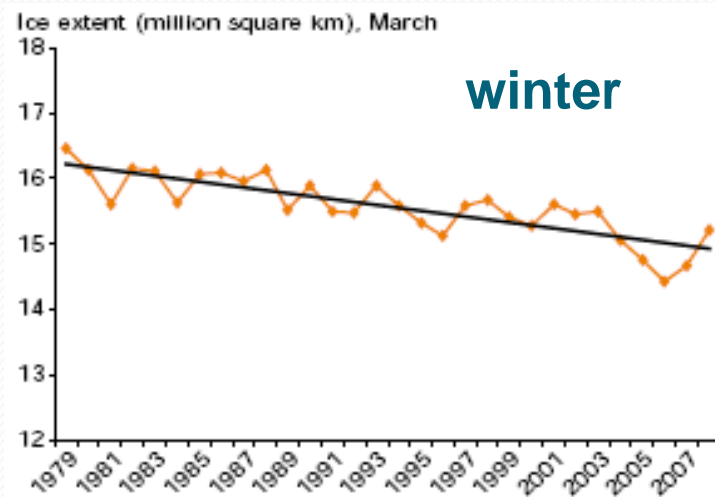
temperature changes in the last 25 yrs

global	~ 0,4 °C
N-hemisphere	~ 0,6 °C
S-hemisphere	~ 0,3 °C
Arctic	~ 1,5 °C
tropical	~ 0,4 °C

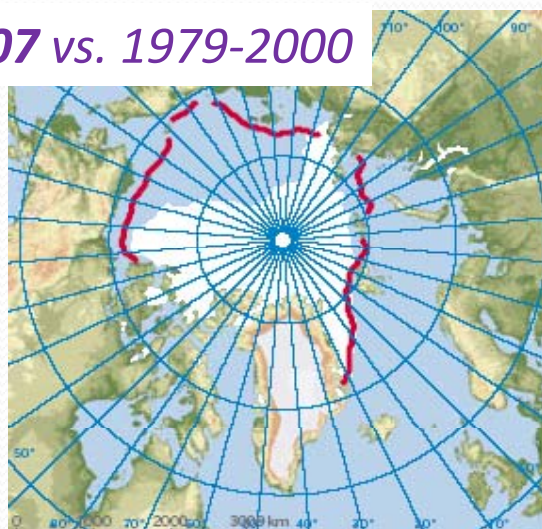
IPCC (2007)



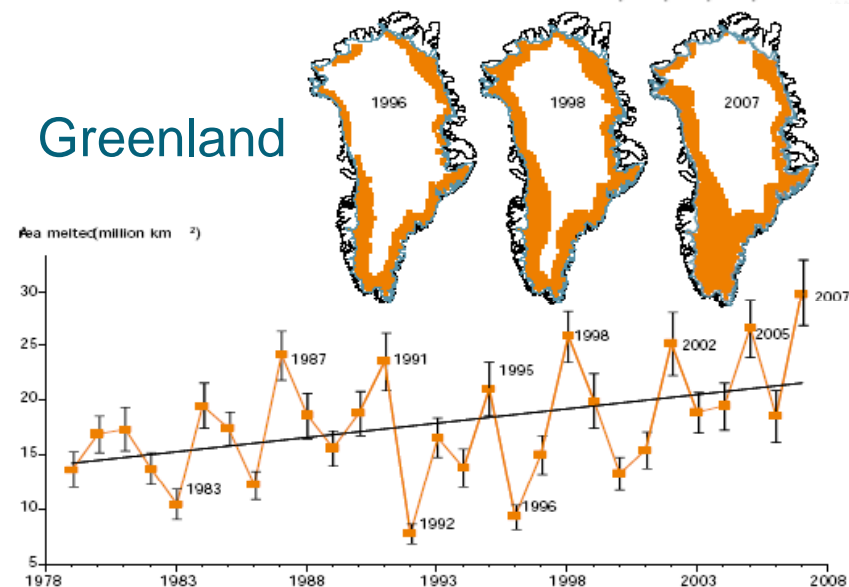
# Arctic



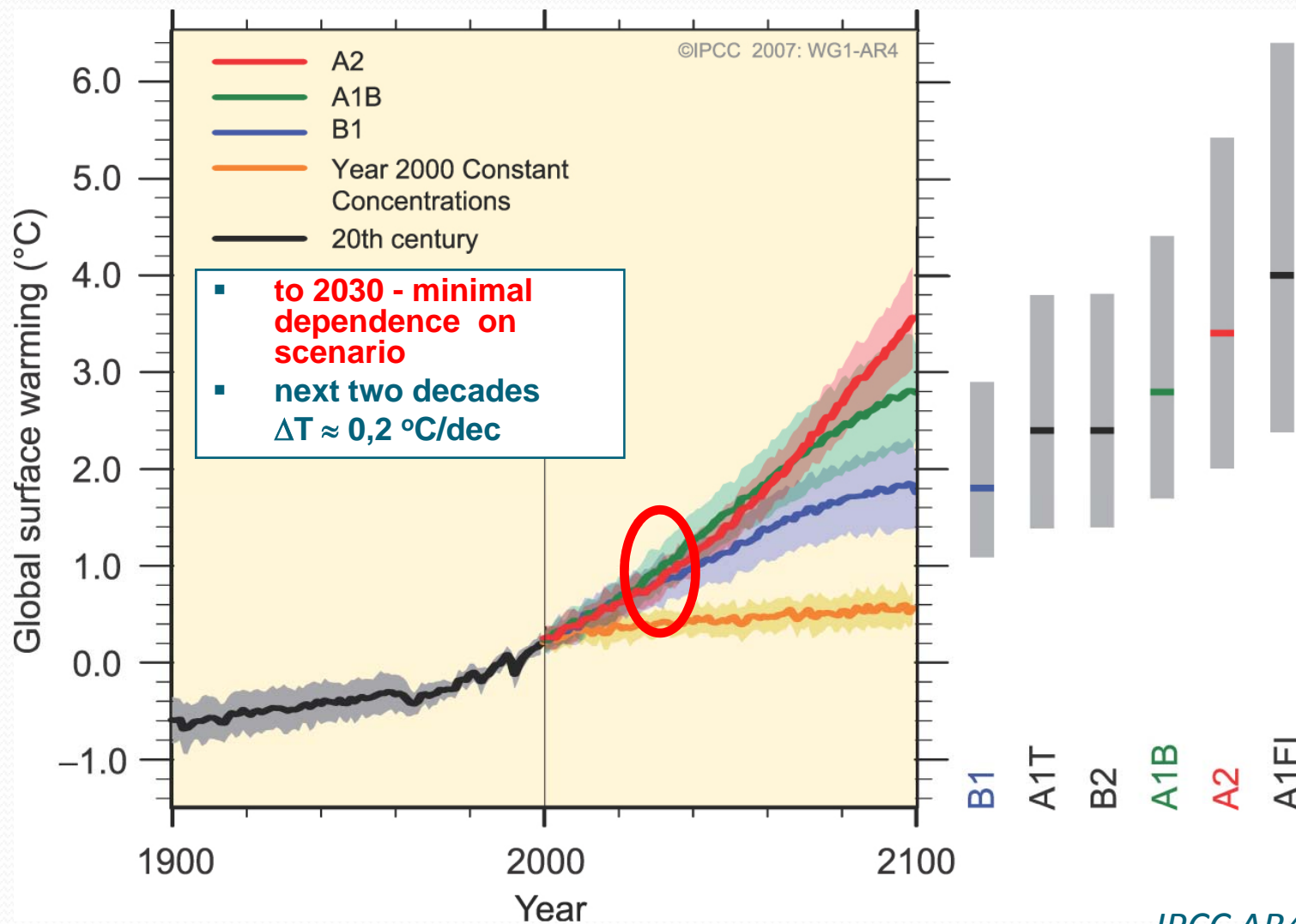
2007 vs. 1979-2000



## Greenland



# Temperature projection

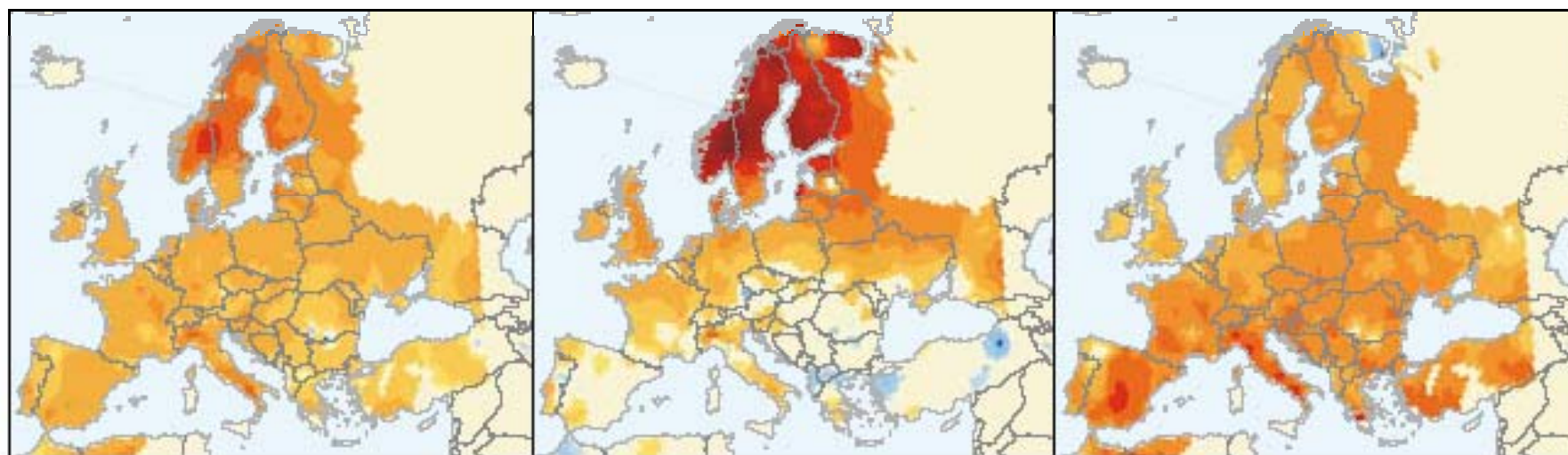


# Temperature – Europe 1976-2006

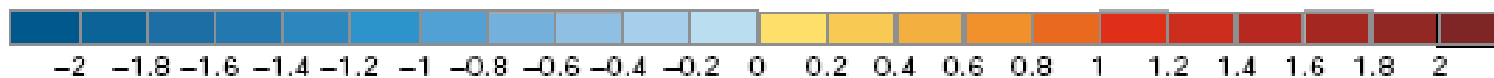
year

winter

summer



°C per decade





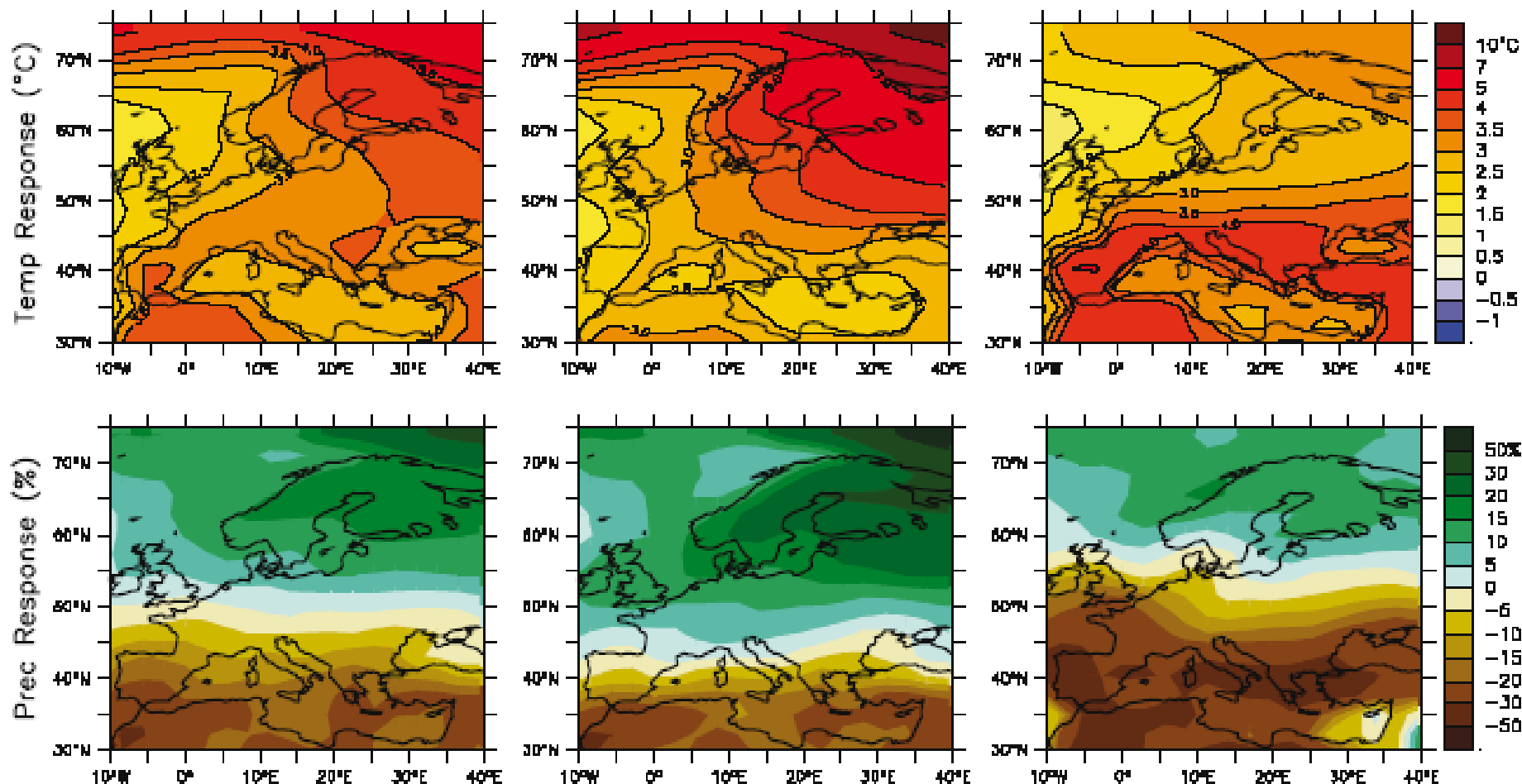
# Temperature & Precipitation – Europe

(A1B scenario) 1980-1999 vs. 2080-2099

year

winter

summer



EEA (2008)

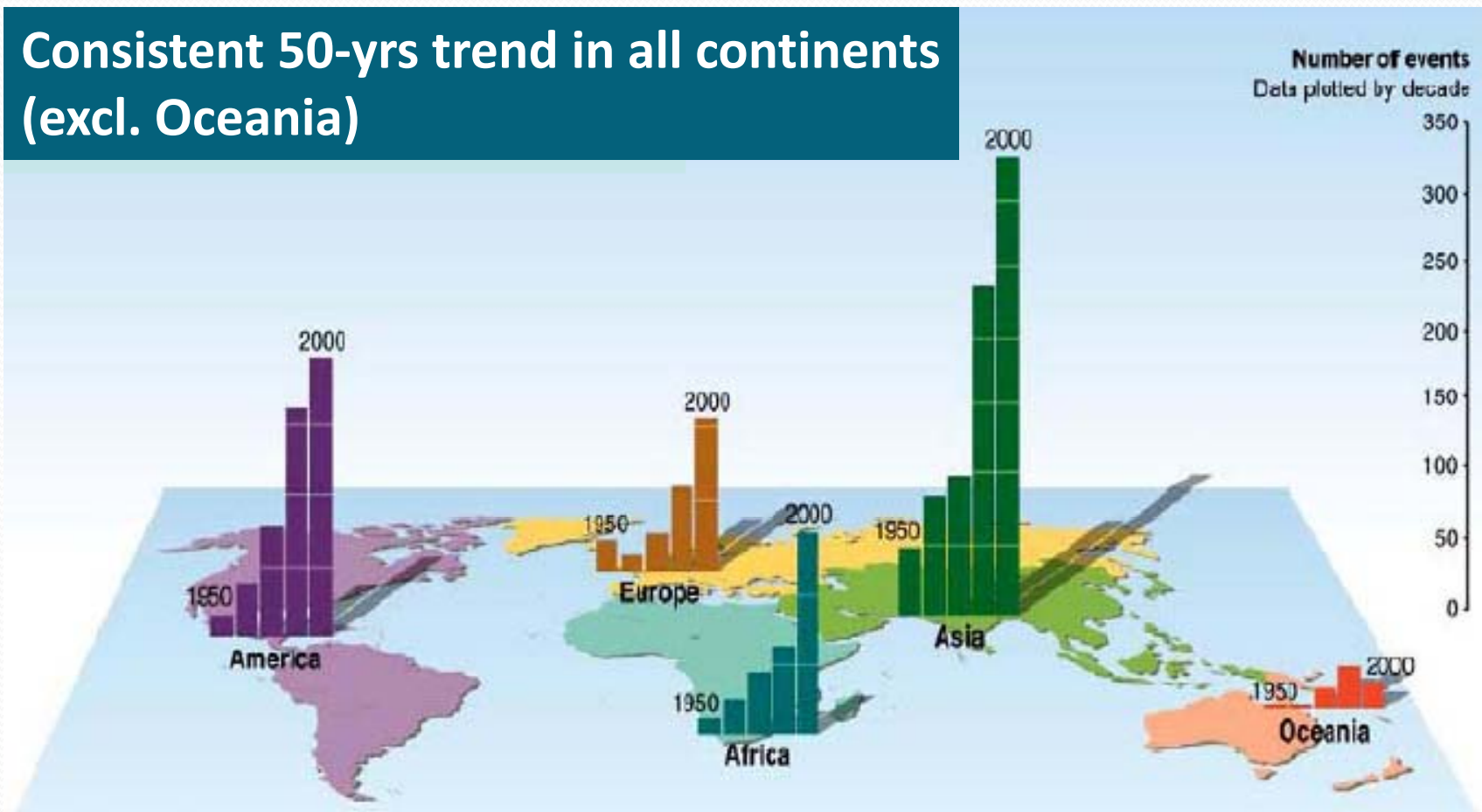
# Temperature change impacts

- ✓ **Temperature is only the indicator of climate change**
- ✓ **Average temperature change**
  - 0,74 °C/100 yrs (world) or 1,2 °C/100 years (Europe)
  - “Nothing” for human feelings
  - **To much for climate system and ecosystems**
- ✓ **Importance of rapid temperature rise**
- ✓ **Rapid temperature increase affects **physical climate system energy balance** and consecutively all its components**
- ✓ **Remarkable rise of extreme weather events occurrence in all world regions**



# Floods

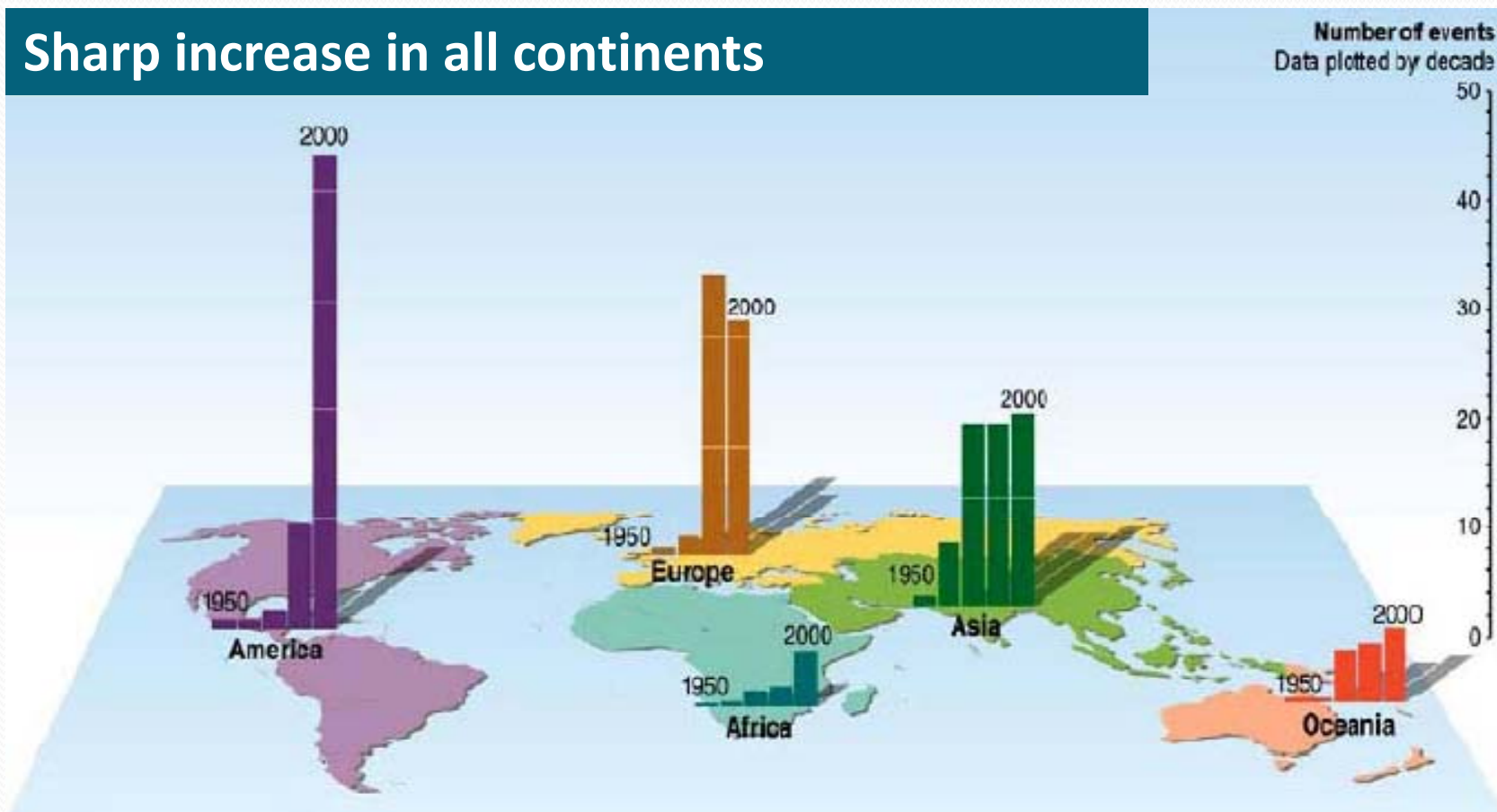
**Consistent 50-yrs trend in all continents  
(excl. Oceania)**



*Millenium Ecosystems Assessment, 2005*

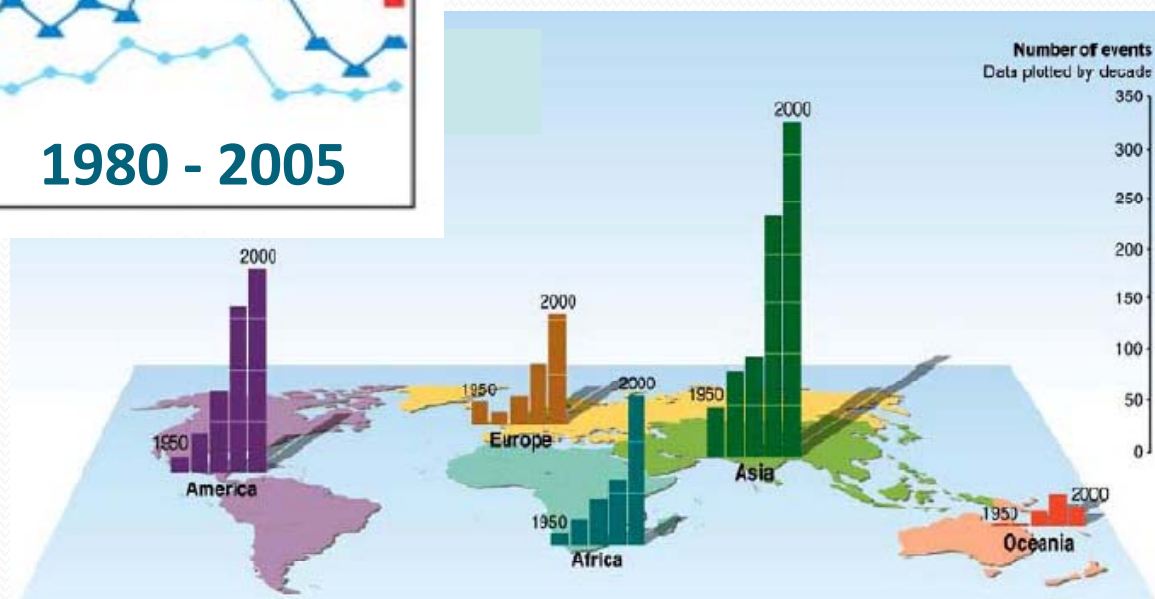
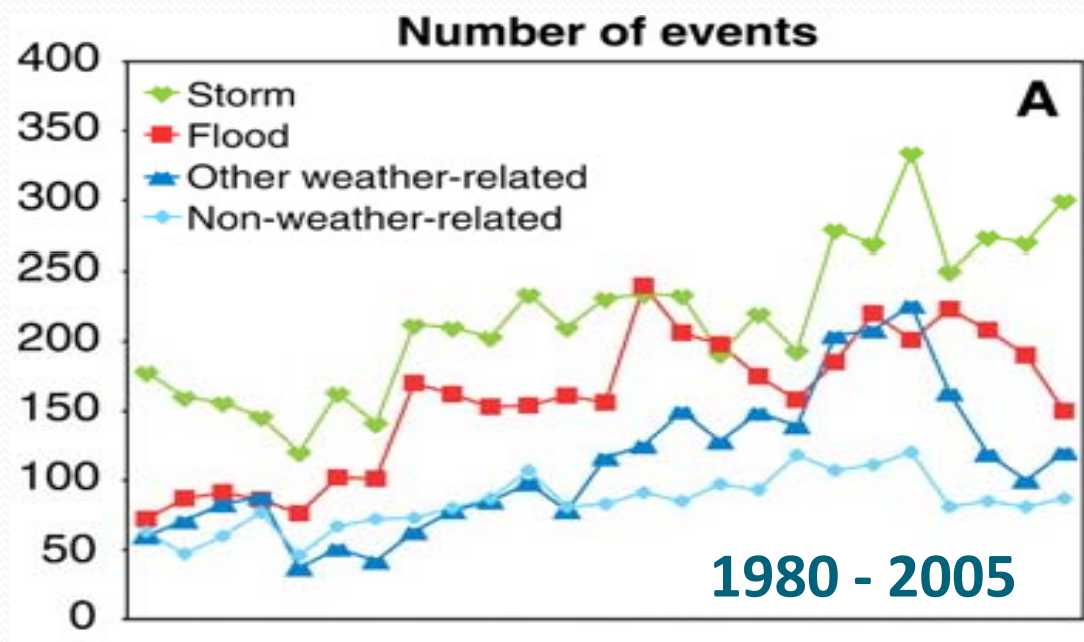
# Wild forest fires

Sharp increase in all continents



*Millenium Ecosystems Assessment, 2005*

# Extreme weather events



Mills, E., Science (2005), Munich Re  
Millenium Ecosystems Assessment, 2005

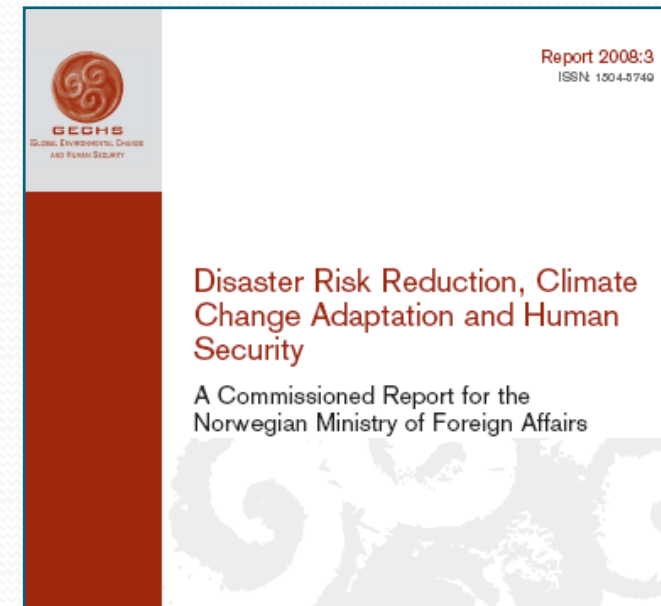


# Ecosystems vulnerability

- Climate change = global problem
- Impacts, vulnerabilities = regional/local problem
- Vulnerability range proportional to
  - Natural resources relations and needs to ecosystem use
  - Natural resources and ecosystems vulnerability
  - Social factors (life standards, governmental subsidies, economic capabilities, social solidarity, etc.... )
- „Concatenation“ of vulnerabilities – transmission of problems
- Space and time differentiation
  - Wealthy countries – lower vulnerability range
  - Poor countries – higher vulnerability range

# Climate change as security risks

- Water resources disputes
- People and property threats by climate related natural disasters
- Costal zones threats and infrastructure damages
- Territory losses and disputes
- Environmental migration
- Energy safety
- Political instability and radicalization
- Pressure on international organizations



IPCC Working Group II Scoping Meeting:  
Possible Special Report on  
“Extreme Events and Disasters: Managing the Risks”

March 23<sup>rd</sup> – 26<sup>th</sup>, 2009

Oslo, Norway

Norwegian Pollution Control Authority (SFT)

Colleen Vogel  
Collette Mortreux

University of Oslo

# Water resources

- Cultivated agriculture areas reduction
- Change of precipitation regimes – general water scarcity (excl. north areas)
- Underground water resources reduction (to 20-30%)
- Food supply reduction (agriculture production, fishery)
- Food prices increase due to rash strategies (e.g. biofuels)
- **Impacts mainly on developing countries and regions with strong demographic pressures**

# Costal zones, infrastructure

- 1/5 world population lives in cost zones area, further population increase
- „Mega-cities“ mostly in river deltas
- Local infrastructure destabilization
  - Sea level rise
  - More frequent natural disasters occurrence and intensity increase
- **Disasters, catastrophes a humanitarian crises**
- **Migration**
- **Pressures on donor states**
- ***East coast of China, India, Pakistan, Bangladesh, Central America, Caribbean,...***

# Territory losses and disputes

- Coast retreat due to sea-level rise
- Losses of all areas or states (small island states)
- Territory disputes, incl. sea areas – international Sea law
- Energy resources combat (polar regions)
- Desertification as source of political instability
  - Territory degradation
  - Migration
  - Territory and border conflicts



# Environmental migration

- **Developing countries**
  - **Poor health conditions**
  - **Unemployment**
  - **Bad social conditions**
- **Internal migration and/or migration between states**
- **2020 estimate: millions of migrants**
- **Conflicts/disputes in transit and final destinations**
- **Hardly defined combination of environmental and social migration**

# Energy safety

- Beside water presumably the most important risk of potential conflicts
- Increased energy resources and energy control “battle”
- Source of political instability
- Huge portion of world fossil fuels resources located in politically not very stable regions and in climate change vulnerable regions
- Situation could be worse
- Nuclear energy support could significantly contribute to increase of energy safety, but it can be linked to another risks

# Safety risk dimensions

## ■ Social

- Reduction of social, economic and environmental losses

## ■ Institutional

- Programs to increase of society and systems resilience and to adaptation capacity increase

## ■ Human

- Climate change impacts on individuals
- Understanding of risk questions

**ADAPTATION MEASURES  
TO CLIMATE CHANGE**



**REDUCTION OF ETREME  
WEATHER EVENTS RISKS**

# Adaptation

- Ability of system to adjust to present **and presumed** climate change, incl. climate variability and extremes to moderate potential damages
- Adaptation capacity depends on
  - Type and magnitude of climatic risk
  - Local, regional and national circumstances
  - Political and economical capabilities
- ***Respect to very high climate system inertia = most efficient and most powerful reaction on risks reduction***

# Risk management strategy

- **Strategy preparation** – vulnerability reduction and adaptation capacity increase, risk mapping, inter-sectoral principles
- **Risks management, monitoring, early warning systems**
- **Learning-by-doing, best knowledge** (positive & negative)
- **Cost, social, environmental analysis**
- **Institutional integration** based on risk types and categories (international...local)
- **Cooperation with science & research**
- **Cooperation with humanitarian and non-governmental organizations**
- **Synergy of risks and mitigation and adaptation strategies**



# Several sentences to the end ...

- **Climate change is reality of present**
- **Human contribution and anthropogenic emissions contribution are evident**
- **Climate change could be security risk even for Europe**  
*(„direct & indirect risks“)*
- **Climate change strategy (policy)**
  - Increasing importance of adaptation measures
  - Economic consequences, energy safety
  - Realistic energy mix
  - Higher endorsements for science, research, incl. development of new technologies
- **COMING GENERATION WILL APPRECIATE OUR**  
**“PRESENT-DAY INVESTMENT”**

# Thank you for your attention

