Climate Change

Policy developments and Role of Future Research

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Outline

- 2007
- Climate Change in Europe and Czech Republic
  - Past
  - Future
- Policy Response: Mitigation and Adaptation
- Mitigation in Czech Republic
- Adaptation in Czech Republic
- Future Research Needs

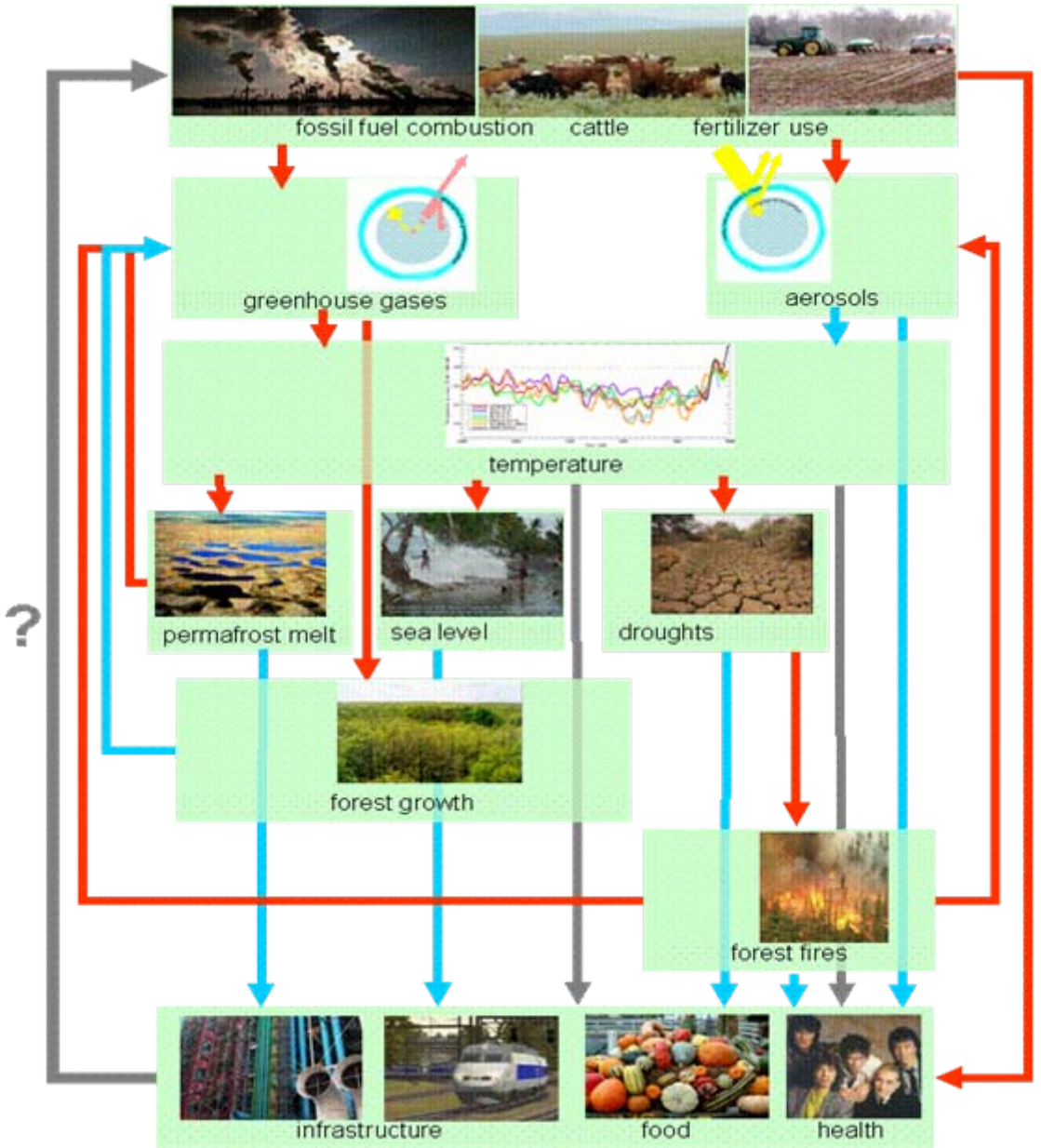
Outline

- **2007: The year the climate for Climate Change changed**

- The warm winter of 2006-2007
- The 4th Assessment Report of the IPCC 
- Al Gore and Hollywood
- The Nobel Prize for Peace
- The JRC PESETA* study on costs of climate change
- The EU Council Decision
- The Bali Conference UNFCCC

* Projection of Economic impacts of climate change in Sectors of the European Union based on boTtom-up Analysis

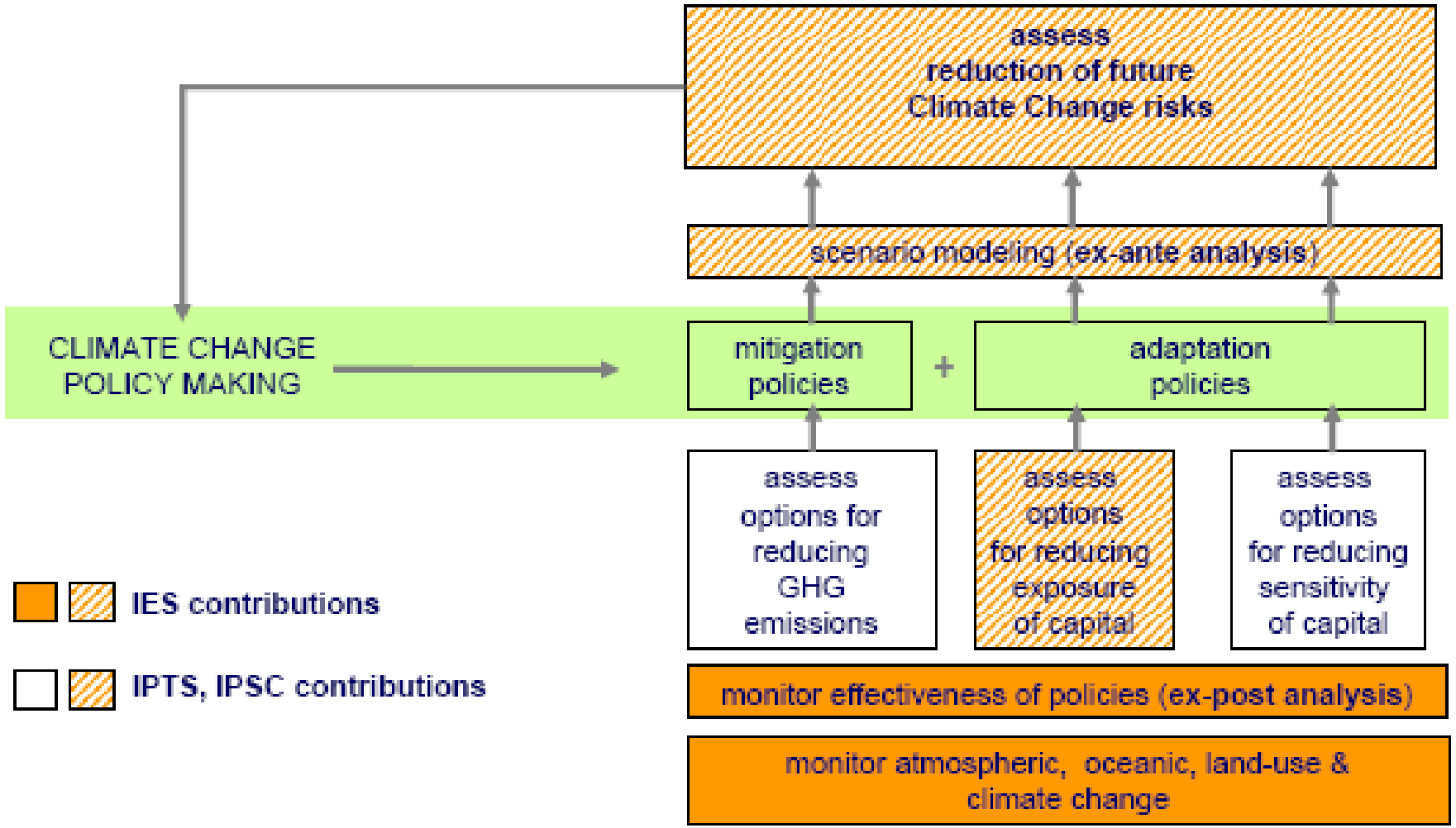
Cascade of Climate Change Impacts



CLIMATE CHANGE: A consistent picture

from the upcoming EEA-JRC-WHO Report on Climate Change Impacts in Europe 2008

FP7 Climate Change Research Strategy



Focus on mitigation and adaptation, integrated monitoring programs and integrated assessments addressing the European and global perspective

JRC ongoing activities

1

MITIGATION

GHG emission reduction technologies LCA (emissions, cost)

- End-use energy efficiency
- PV, renewable H2, biofuels
- Nuclear fission
- Agricultural soils and forest management (incl. deforestation)

- Assess co-benefits, synergies (AP, energy security, …)
- Contribute to future phases of the European Climate Change Programme
- Use JRC work on Sustainable Energy, Transport & Agriculture

2

ADAPTATION

- Exposure and sensitivity to extreme weather, floods, droughts, fires
- Exposure to increased air pollution and diseases in a warmer climate
- Loss of carbon from soils and other stocks
- Regional development and reducing exposure
- Change in water quality

JRC ongoing activities

3

SCENARIO MODELING

- Links between socio-economic change and atmospheric and land-use change (deforestation)
- Provide consistent GHG & other gas emissions
- Study alternative scenarios (effect of policies)
- Down-scaling of climate charge scenarios for EU impact studies
- Develop damage curves

4

MONITORING & VERIFICATION

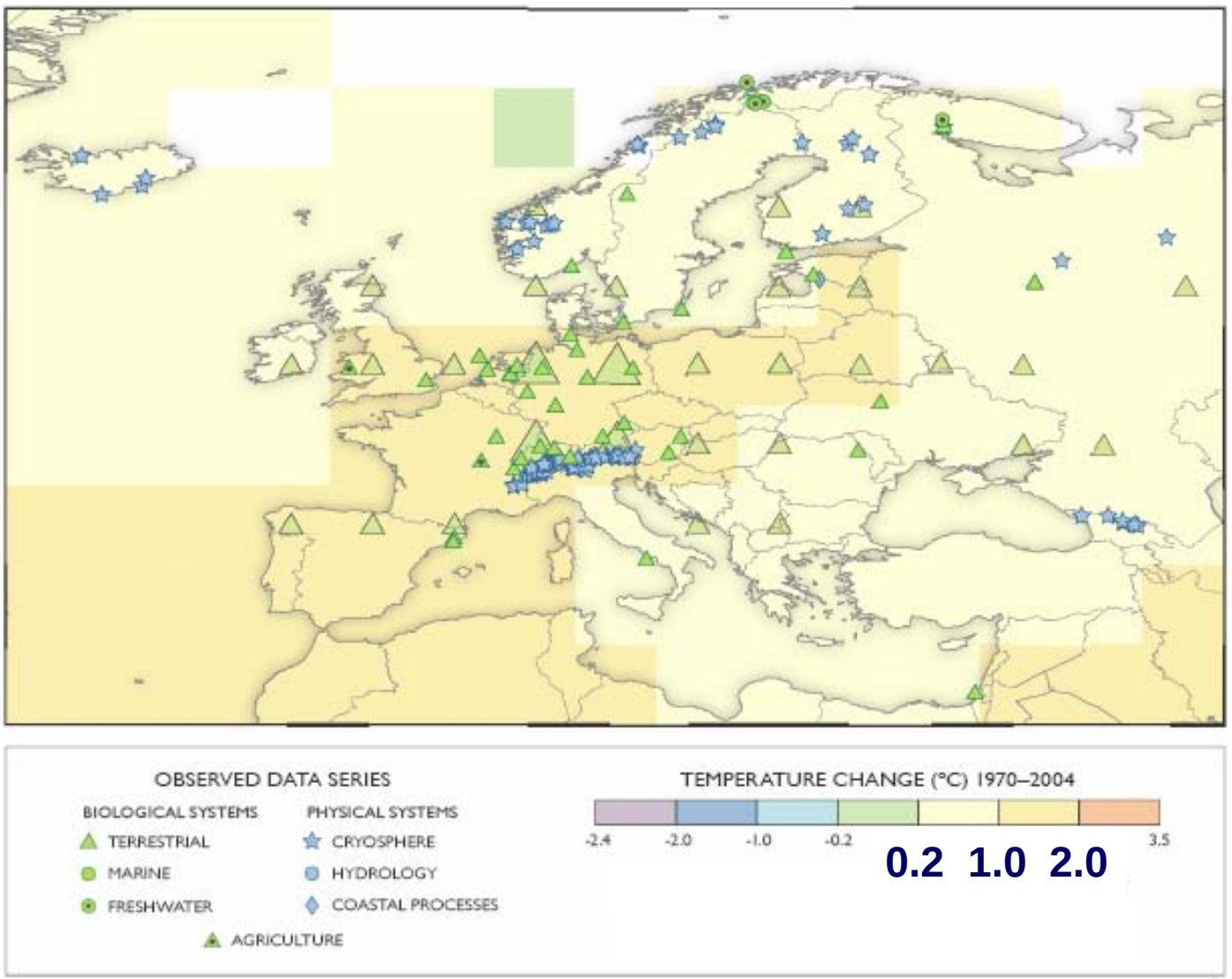
- EU GHG Inventory System
- Develop/promote EU and world-wide monitoring systems for emissions
- Contribute to Global Climate Observing System
- Monitor the effect of policies on EU business

5

STAKEHOLDER INVOLVEMENT

- Study science/society/policy interfaces
- Enhance stakeholder involvement
- Assess behavioral changes

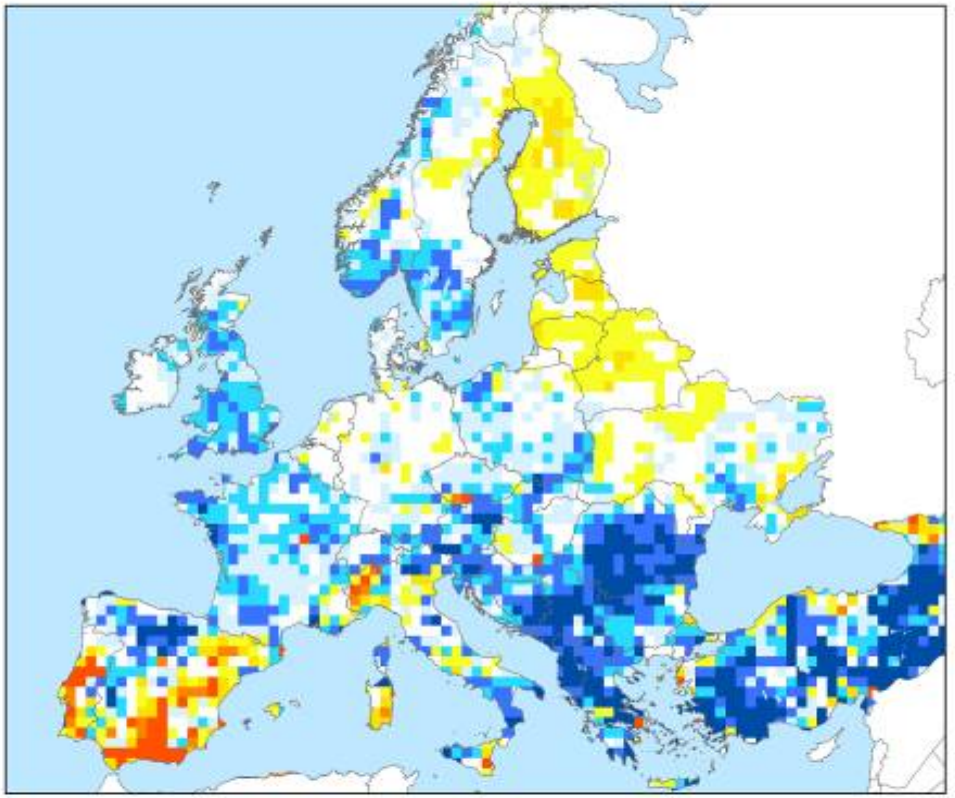
Observed climate change



Source: IPCC 4AR 2007

Trends in observed weather data 1996-2007 versus 1982-1993

Dry spell



Differences in dry spell duration between 1996-2007 and 1982-1993 based on average values

Dry spell = Maximum count of consecutive dry days

Difference between the two periods expressed in days

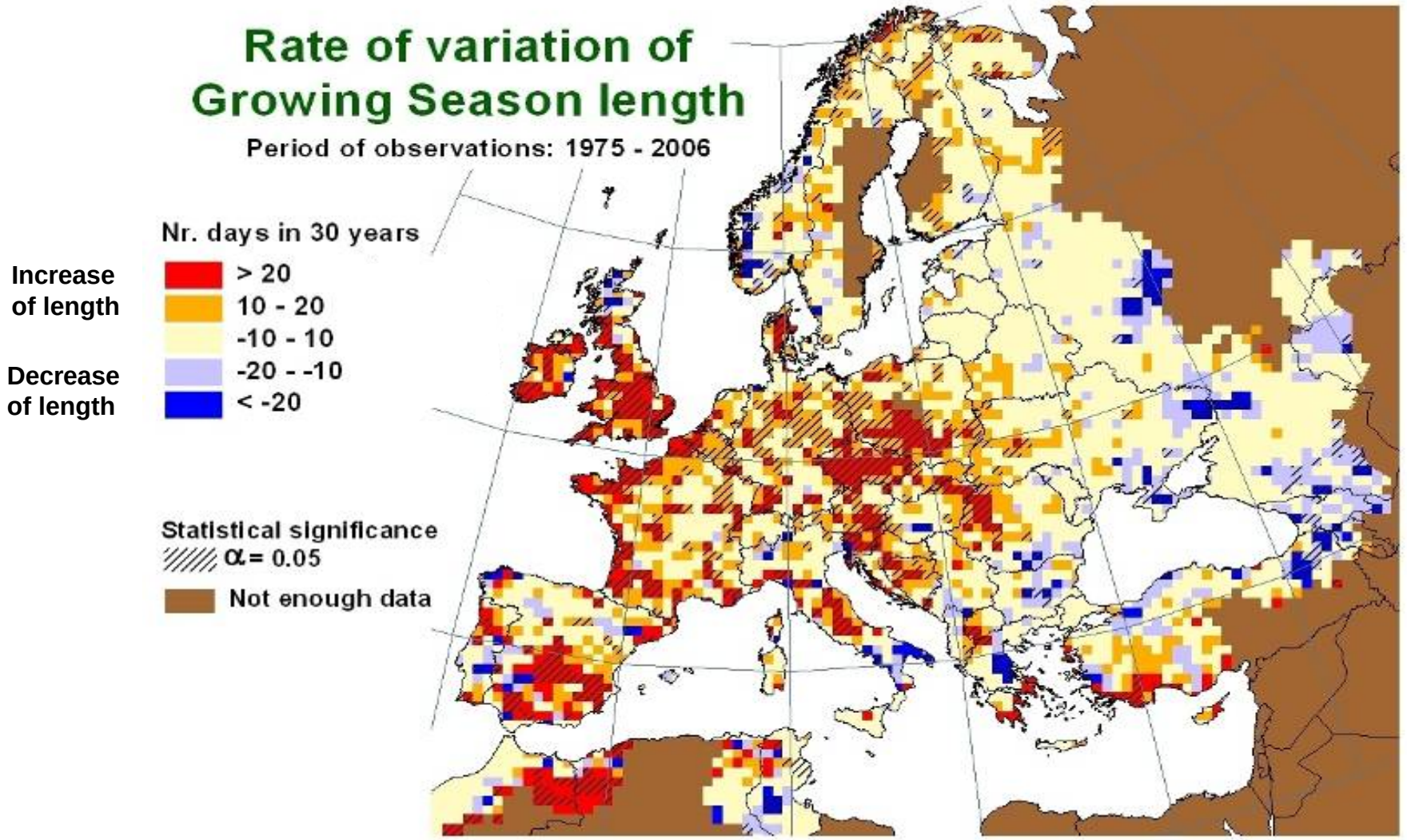
2 - 4	-3 - -2
5 - 8	-5 - -4
9 - 10	-9 - -6
11 - 30	< -10
	no change

The indicator provides the longest dry period.
The duration of the longest dry spell has decreases almost everywhere except in Spain (except the North-West) and Portugal. Given that cumulated rainfall is almost stable in those areas, this indicator shows that rainfall has become more erratic in the Iberian Peninsula.

Source: MARS meteorological data base (JRC-IPSC)

Source: JRC MARS Archive

Observed impact: Growing season



Source: JRC MARS Archive

Past extreme river floods in Czech Rep.

- **Floods in July 1997 (Morava, Odra and Upper Labe)**
  - 50 people died, 5400 damaged houses, evacuation of 10,000 persons, destruction of 1850 km of roads and 950 km of rail tracks, destruction of 48 road bridges and of 26 railroad bridges, damages on structures on 800 km of rivers, total damage ~ 62.6 billions of CZK (2.5 billion Euro)
- **Flash flood of July 1998 (Orlice)**
  - 6 people died, hundreds of flooded or damaged constructions, 18 heavily damaged or destroyed road bridges, tens of damaged crossings over smaller rivers, tens of industrial and agricultural structures flooded, 60 km of damaged water courses, total damage ~ 2 billions CZK (81 million Euro)
- **Floods in August 2002 (Vltava, Elbe and Danube)**
  - 16 people died, 100 towns and villages were fully flooded, 350 towns and villages were partly flooded, 1.6 million people were affected, 220.000 people were evacuated from their houses, total losses ~ 70 billion CZK (2.9 billion Euro)
- **Floods in spring 2006 (Morava, Elbe)**
  - 8 people died, several towns were evacuated, total losses ~ 5 billion CZK (200 million Euro)

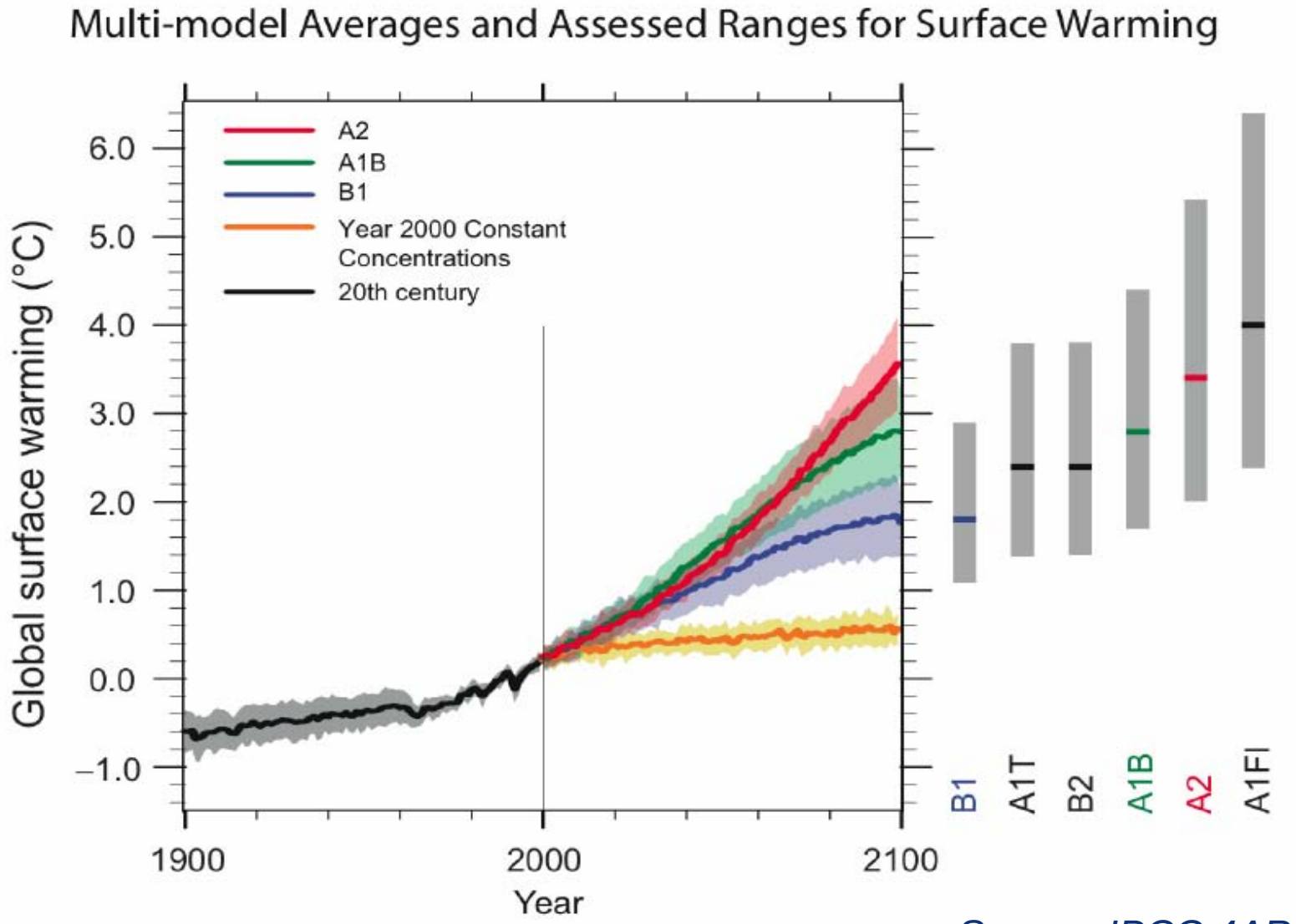
Note: Although the occurrence of these floods cannot be attributed to climate change they may be an indication of what may be expected under climate change

Observed climate change in Czech Rep.

Summary

- Increase in annual mean temperature of around 1.5° C in past 35 years
- Wetter climate (more floods, less droughts)
- Impacts on ecosystems/agriculture:
  - Growing season length has increased by 30 days over the past 30 years
  - Increased yields of maize
- Extreme floods cannot (yet) be attributed to climate change

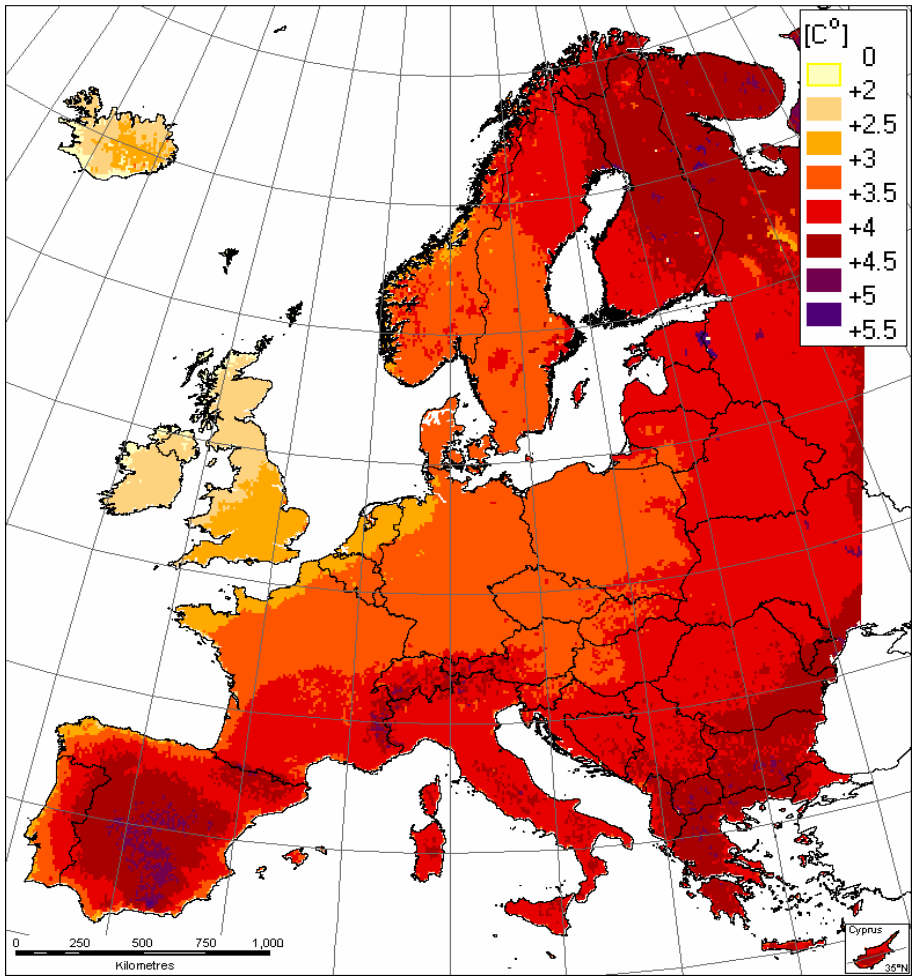
Future Global Climate Change



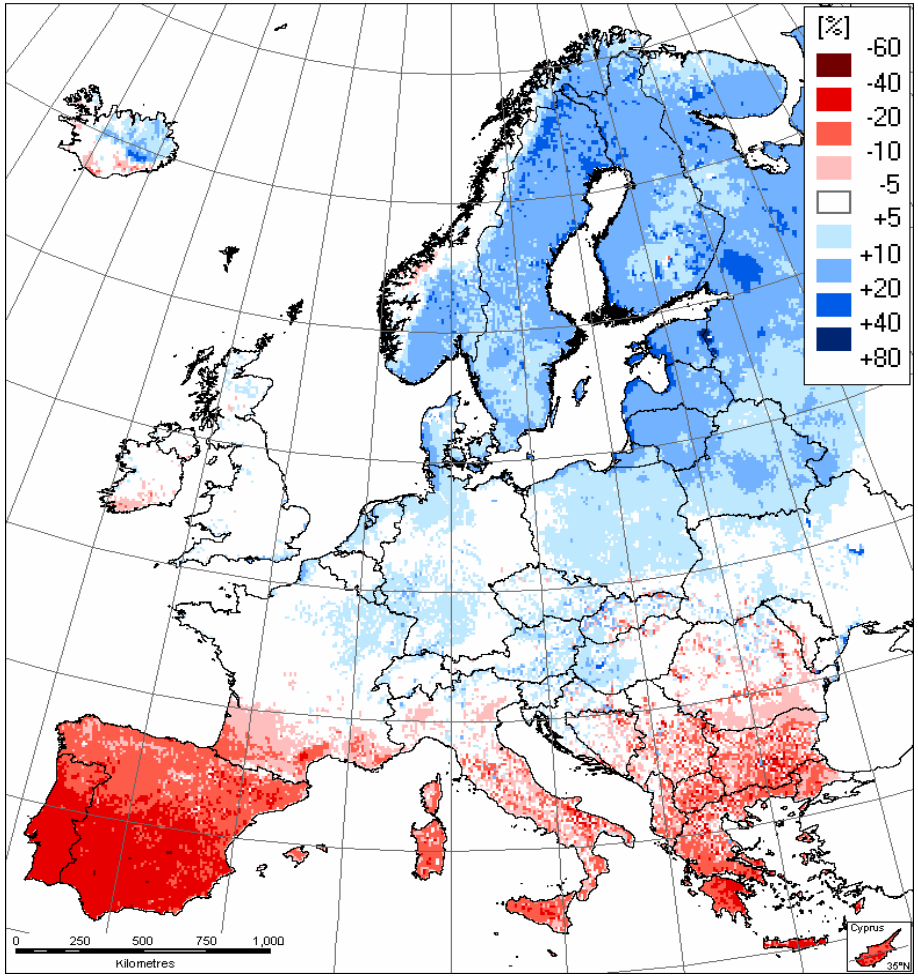
Source: IPCC 4AR

Future climate

Change in annual temperature (°C)



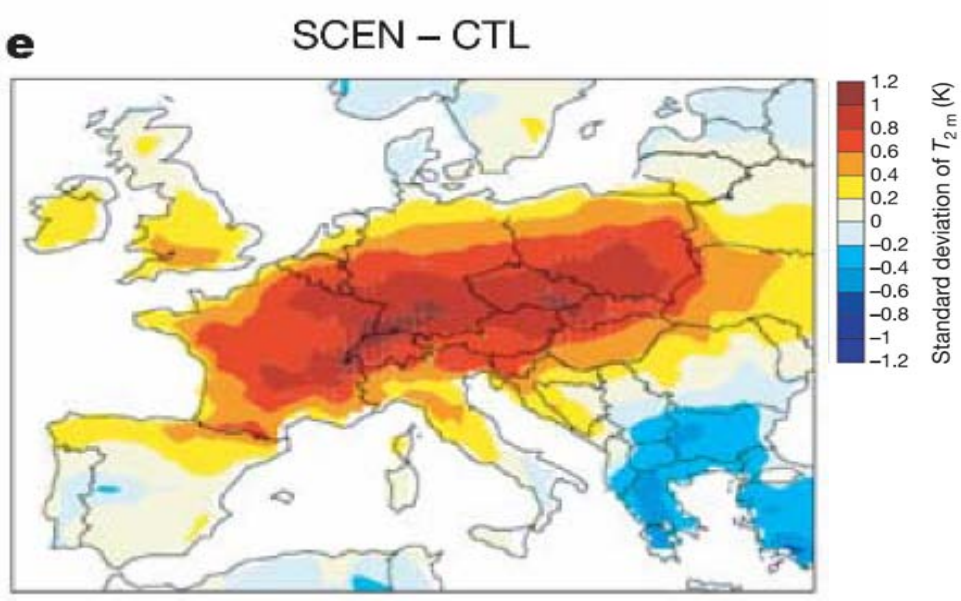
Change in annual precipitation amount (%)

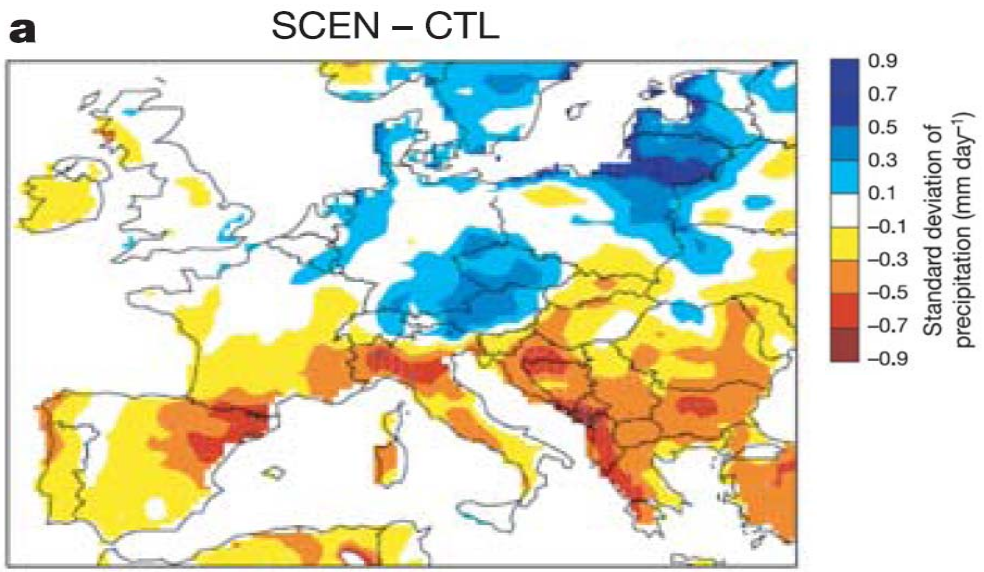


Changes by end of this century compared to end previous century (A2 scenario)

Source: JRC PESETA study (http://peseta.jrc.es)

Future climate variability





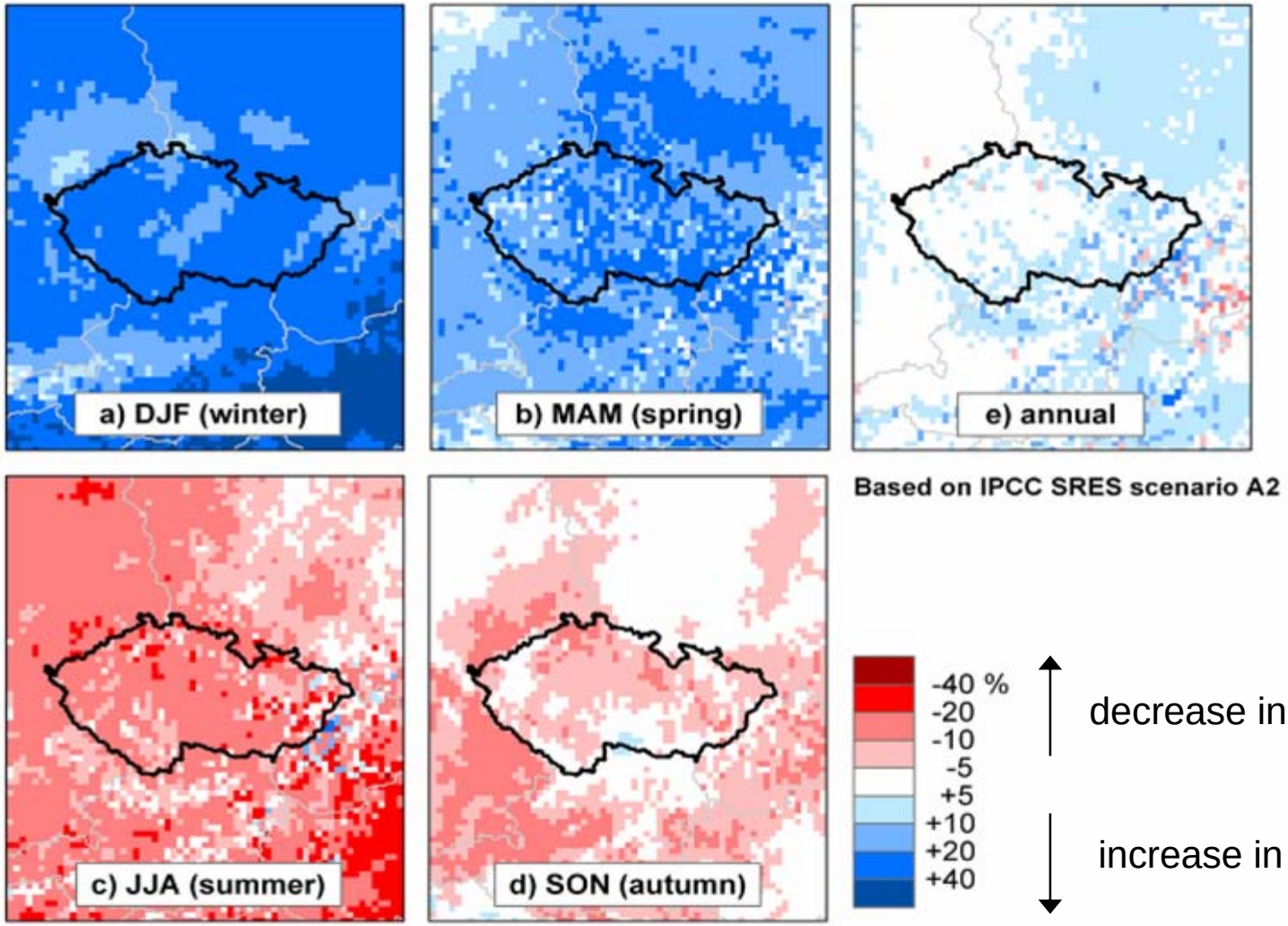
Change in
Inter-annual temperature variability
by end of century
A2 scenario

Change in
Inter-annual precipitation variability
by end of century
A2 scenario

Source: Seneviratne, et al, Nature 2006

Future precipitation

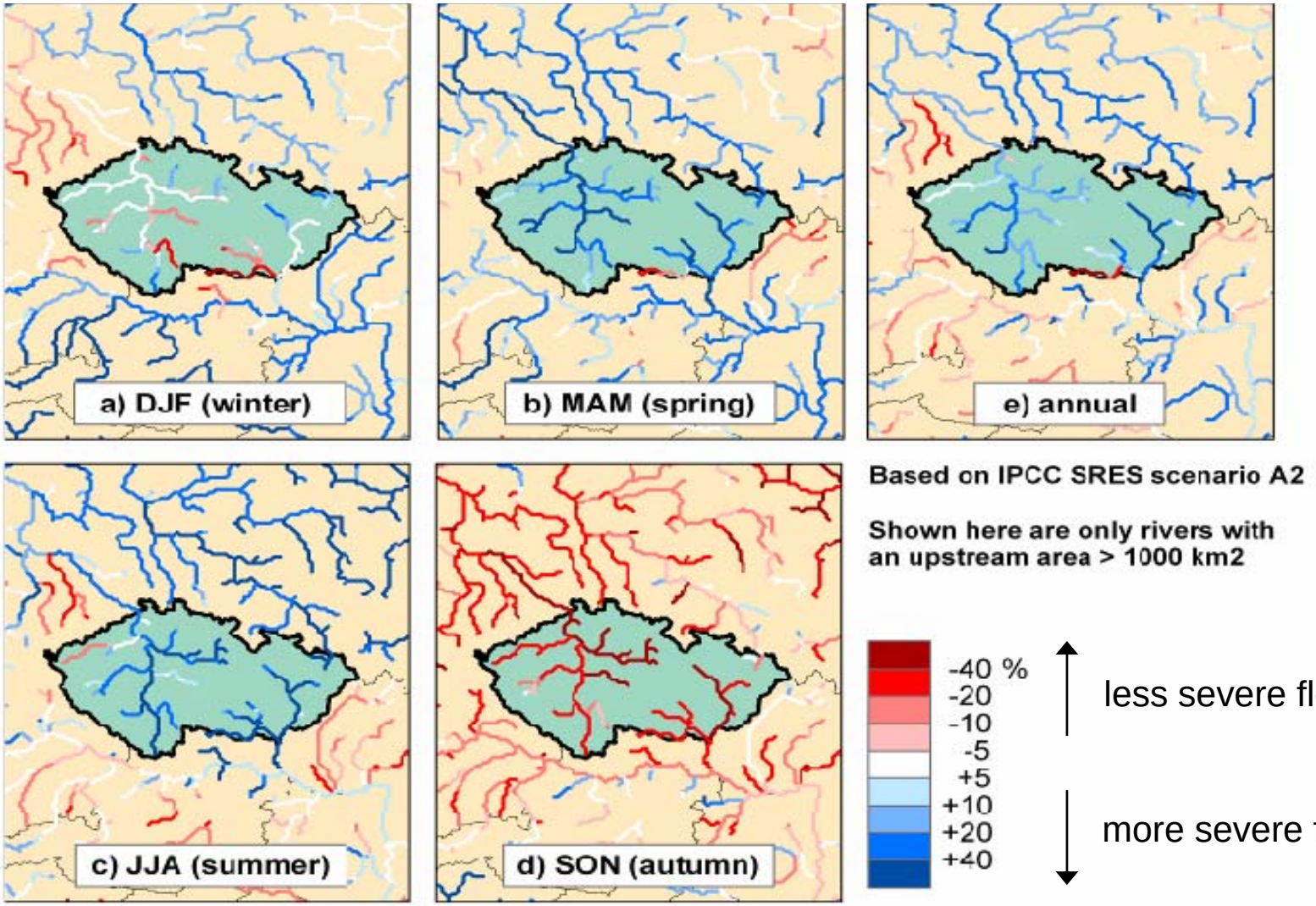
Change in **mean precipitation** in Czech Rep. (between 1961-1990 and 2071-2100)



Source: JRC, 2008

Future floods

Change in **river floods (100 yrs)** in Czech Rep. (between 1961-1990 and 2071-2100)



Source: JRC, 2008

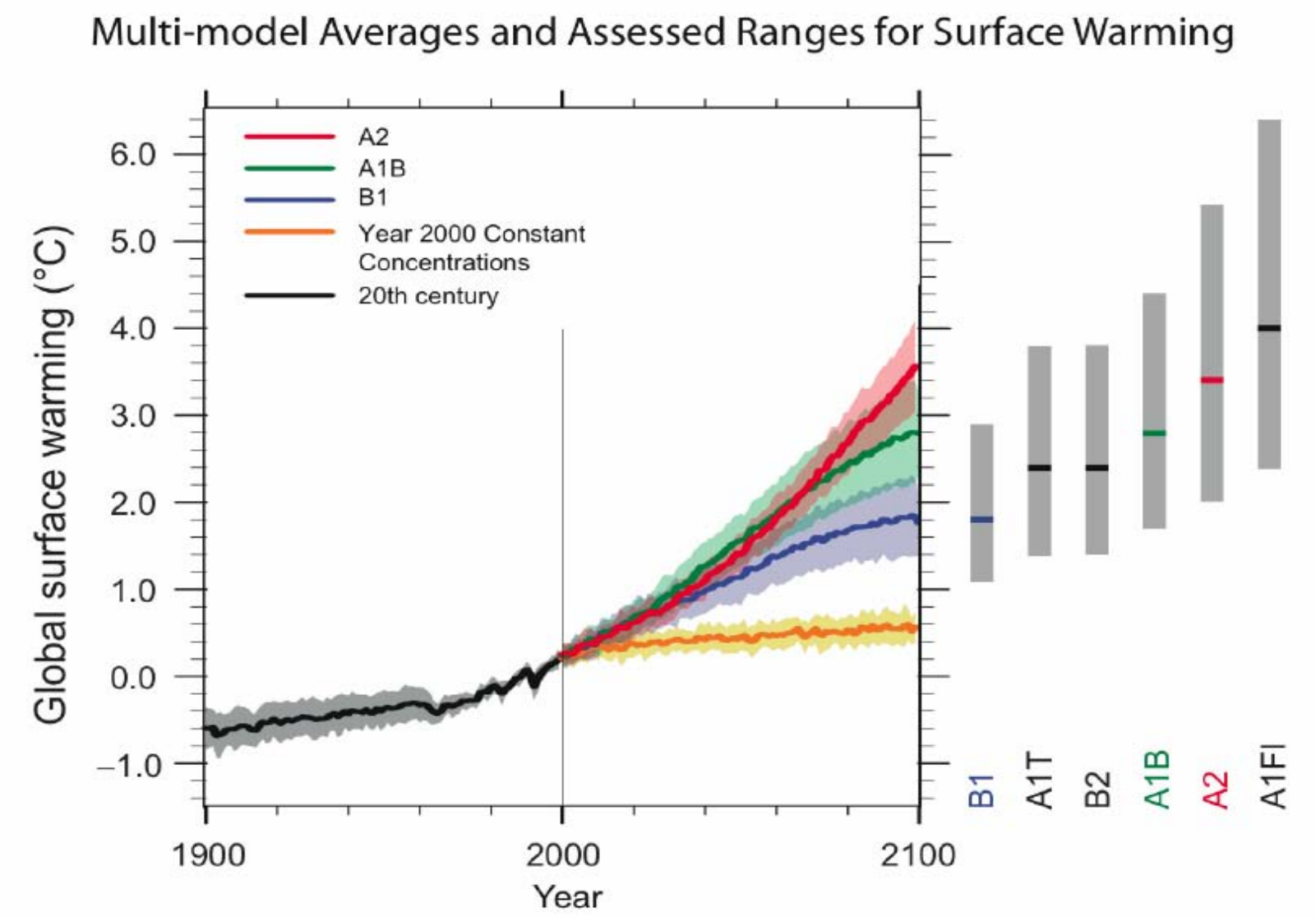
Future climate change in Czech Rep.

Summary

- Temperature increase with an additional ~ 3 degrees by the end of the century under a BAU* scenario (A2)
- No changes in annual *average* precipitation
- Increase in *inter-annual* variability of temperature and precipitation
- Relevant changes in *seasonal* precipitation
  - Impacts on river flow, floods, drought, irrigation demand, agriculture

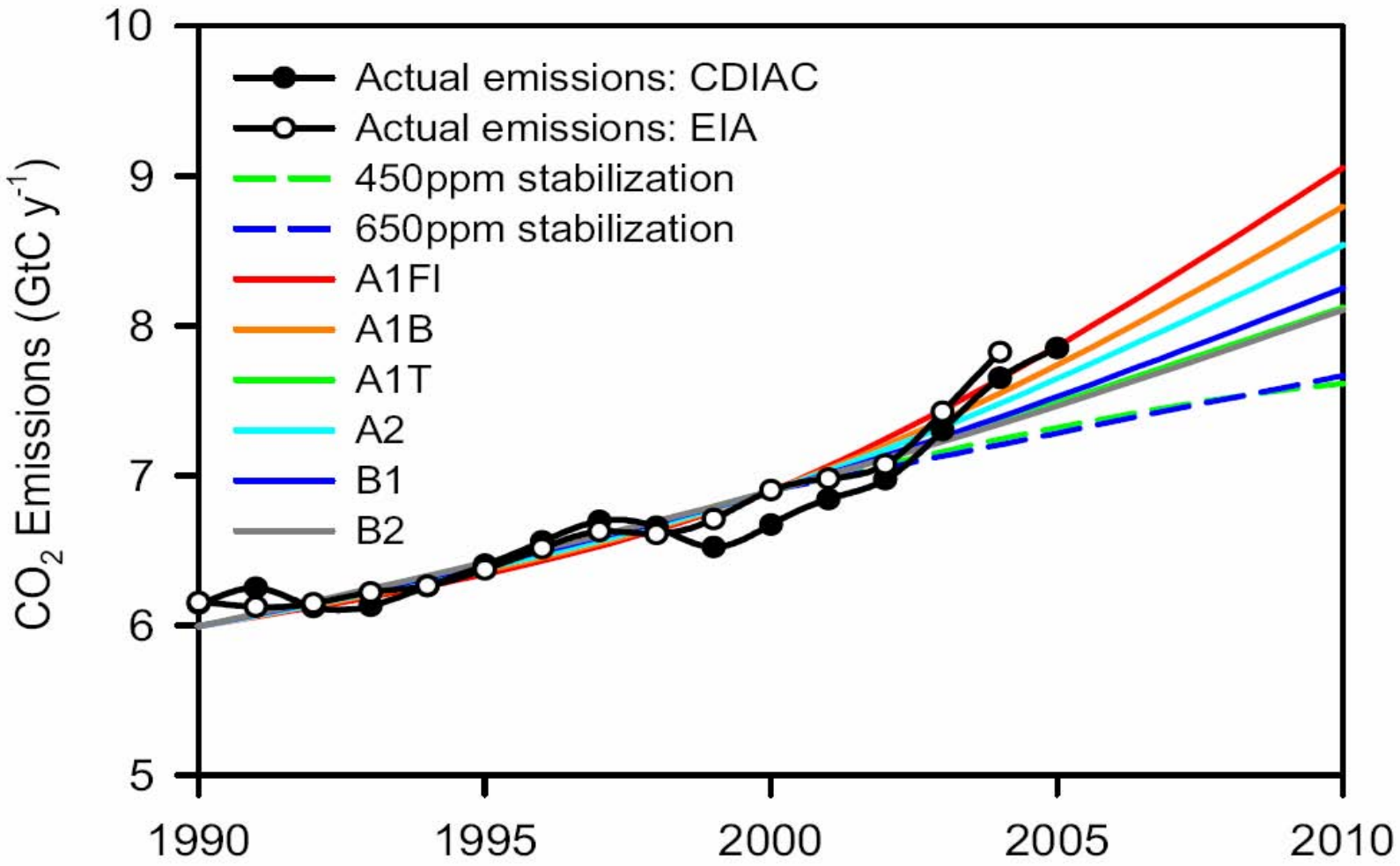
* “Business-as-usual”

Future global climate change



Source: IPCC 4AR

Future global climate change



CDIAC: Carbon Dioxide Information Analysis Centre
EIA: Environmental Investigation Agency

Source: Raupach et al., PNAS, 2007

Climate Change Policy

- Climate Change policy aims at reducing the risk of climate change effects at the *least cost* and *largest equity* among states
- Climate Change policy = Mitigation + Adaptation
  - Less mitigation now, more adaptation later

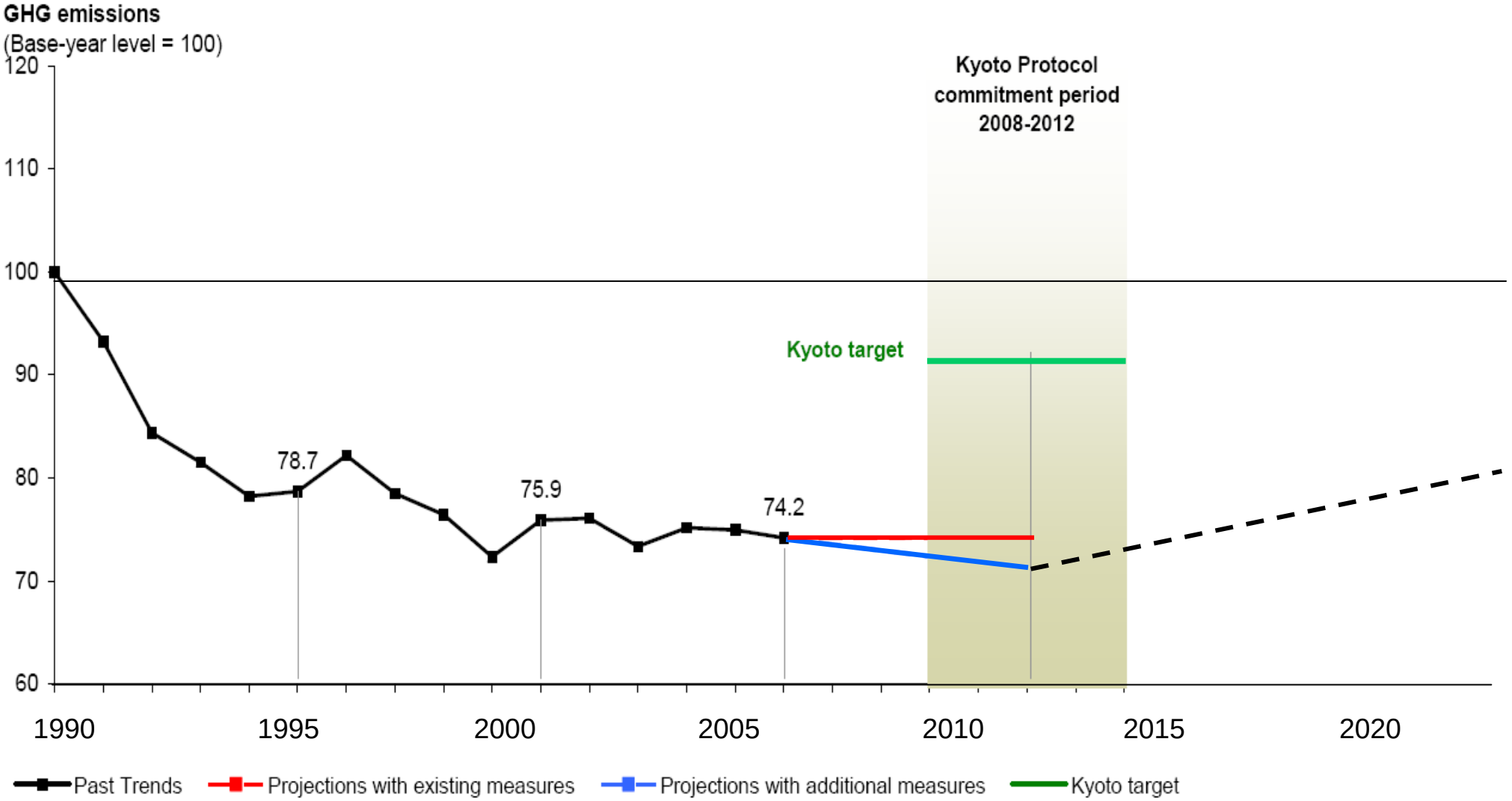
    = The expensive option (Stern, IPCC)
  - Mitigation now, less adaptation later

    = The cheapest option (Stern, IPCC)
- EU two degrees target (1996)
- Climate Change policy = Opportunity to modernize society !

Mitigation targets for Czech Rep.

- Target of Czech Rep. under the Kyoto Protocol is to reduce GHG emissions by 8 % by 2012, compared to 1990
- 20% reduction by 2020 for EU Member States (Council Decision March 2007)
- This EU target will be implemented through a mixture of Emission Trading for the energy sector and energy intensive industries + binding targets for remaining sectors
  - Proposed target for Czech Rep. for remaining sectors is a maximum 9% increase in emissions between 2005 and 2020. (Burden sharing not yet agreed)

GhG emissions in Czech Rep.



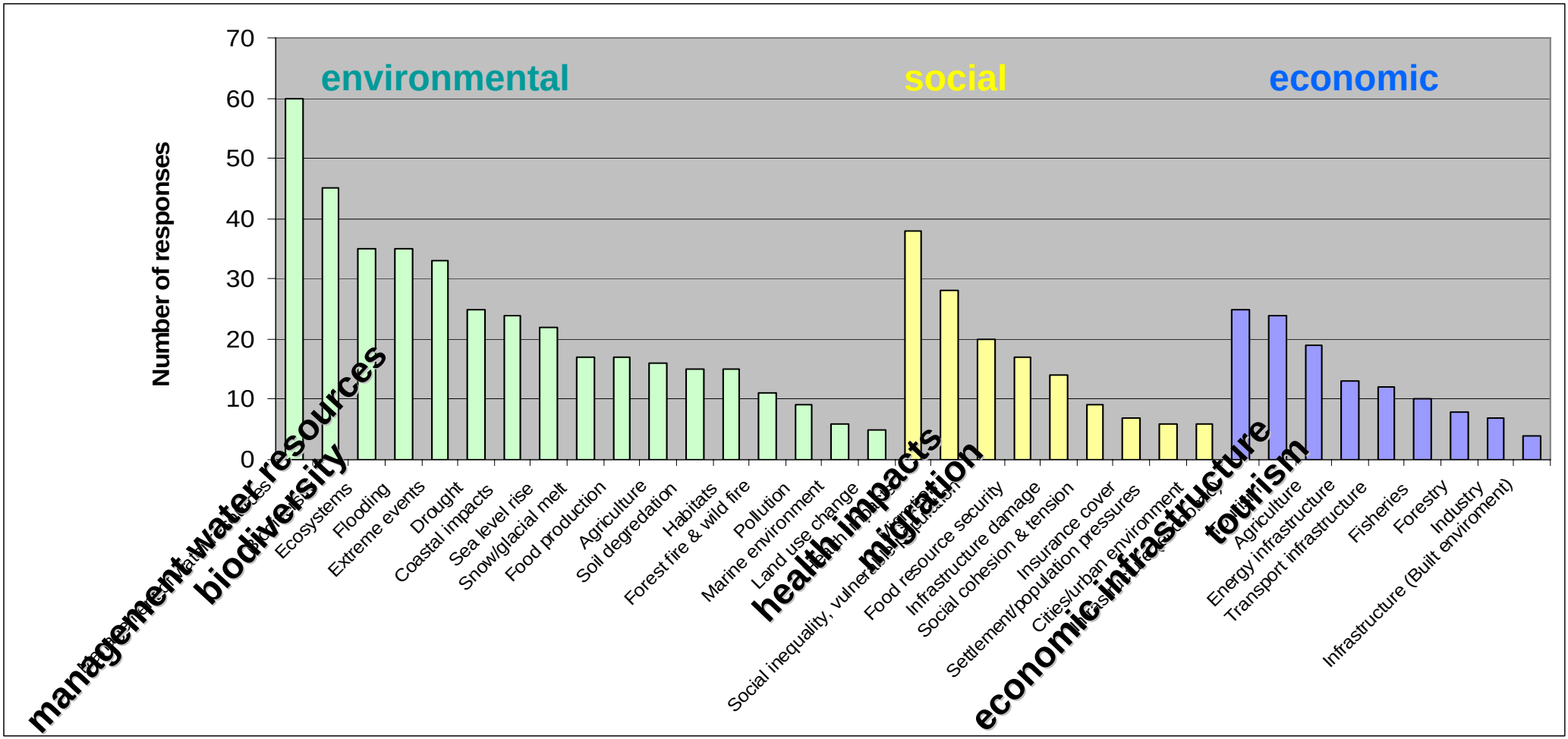
Source: DG ENV. EU GhG Inventory System (EEA, JRC, Eurostat)

Adaptation

- Adaptation is basically a local issue
- Is there a role for Community action?
- Commissions *Green Paper* on Adaptation
  - Integrate adaptation in Community policies and Community funding schemes
    - "Climate Proofing" CAP, Structural Funds, Cohesion Funds, …
  - Integrate adaptation in EU external action
    - Development aid
  - More research
  - Involve European society, businesses

Green Paper on Adaptation

Public Consultation 2007: Areas of concern of > 200 stakeholders



Future research needs

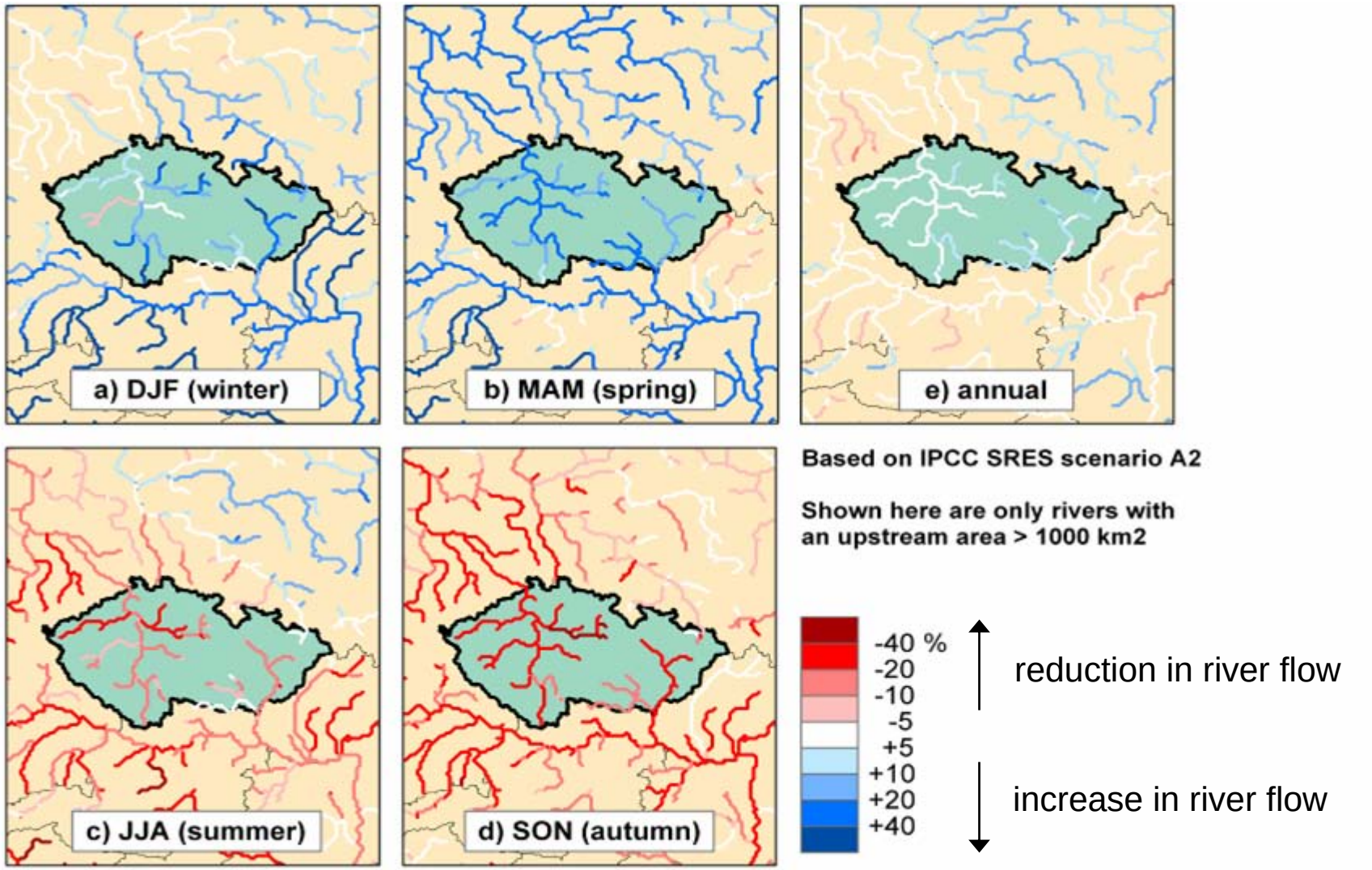
- More integration of natural, socio-economic sciences
  - Climate research = Sustainability research
- How to integrate Mitigation and Adaptation
  - Synergies, trade-offs
- Regional/Local climate impact studies
  - Small countries (Czech Rep., the Netherlands, …), individual cities!
- Cost Benefit Analysis
  - Costs of climate impacts, value of ecosystems
  - Cost of adaptation measures
- Collaborations with JRC possible
  - JRC makes available its expertise
  - JRC can learn from local knowledge and expertise

Thank you!

http://ies.jrc.ec.europa.eu

Future fresh water availability

Change in **mean river flow** in Czech Rep. (between 1961-1990 and 2071-2100)



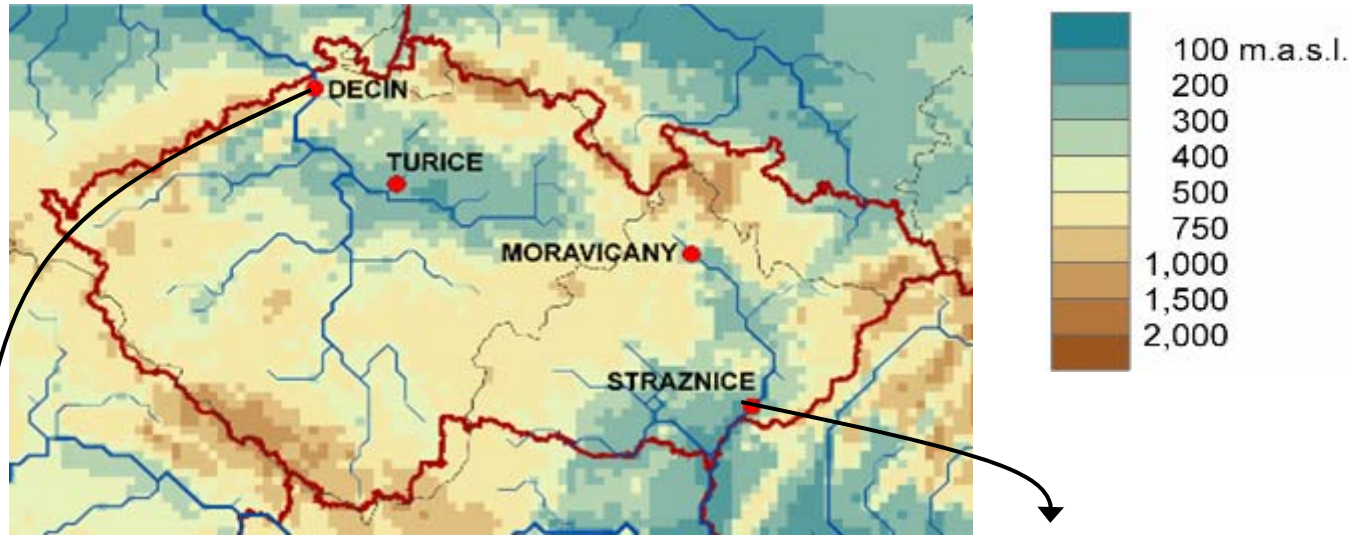
Source: JRC, 2008

Future climate

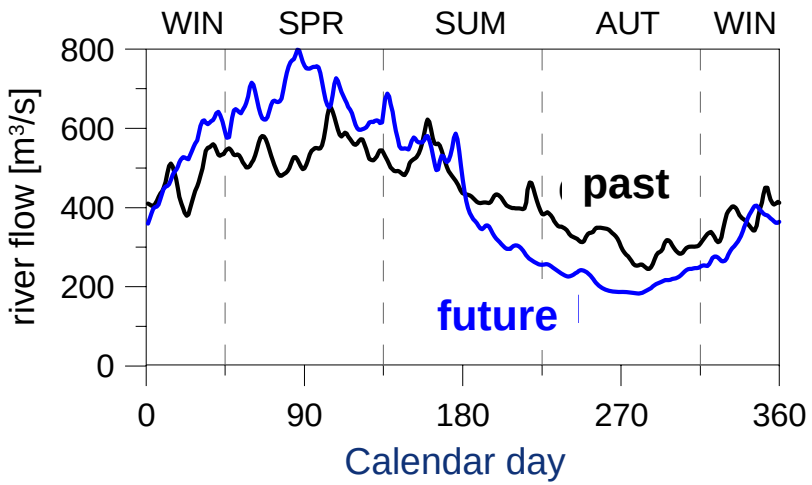
Change of **flow regime** (between 1961-1990 and 2071-2100)

A2 scenario

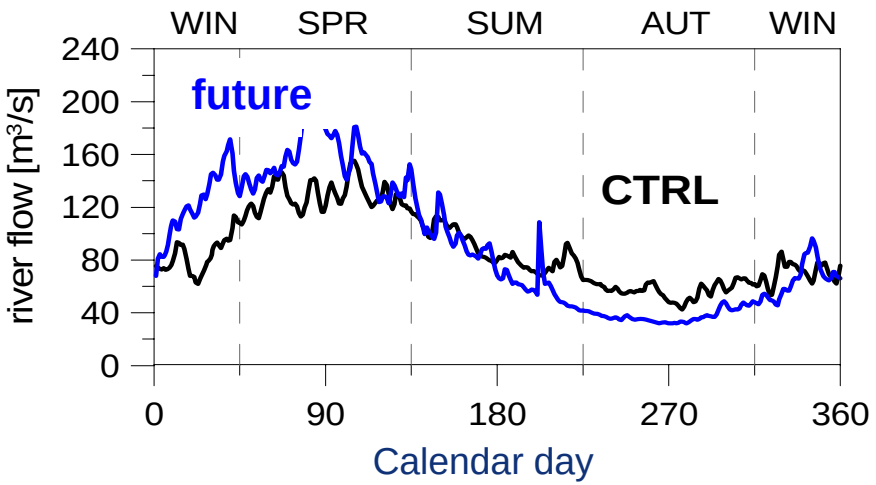
Source: JRC, 2008



River Labe, Decin



River Morava, Straznice



JRC assets

- Build on multi-disciplinary expertise (including policy analysis)
- Stay abreast of scientific developments (through relevant DG-RTD projects)
- R&D linked to policies needs (with threshold in level of detail)
- Promote and contribute to integrated monitoring programs
- European and global perspective
- Promote and be part of a multi-institutional integrated assessment system