Conference on Climate Change and Official Statistics

Oslo, Norway, 14-16 April 2008

Impacts of climate change in Europe

André Jol

European Environment Agency

Above +2ºC impacts will be large

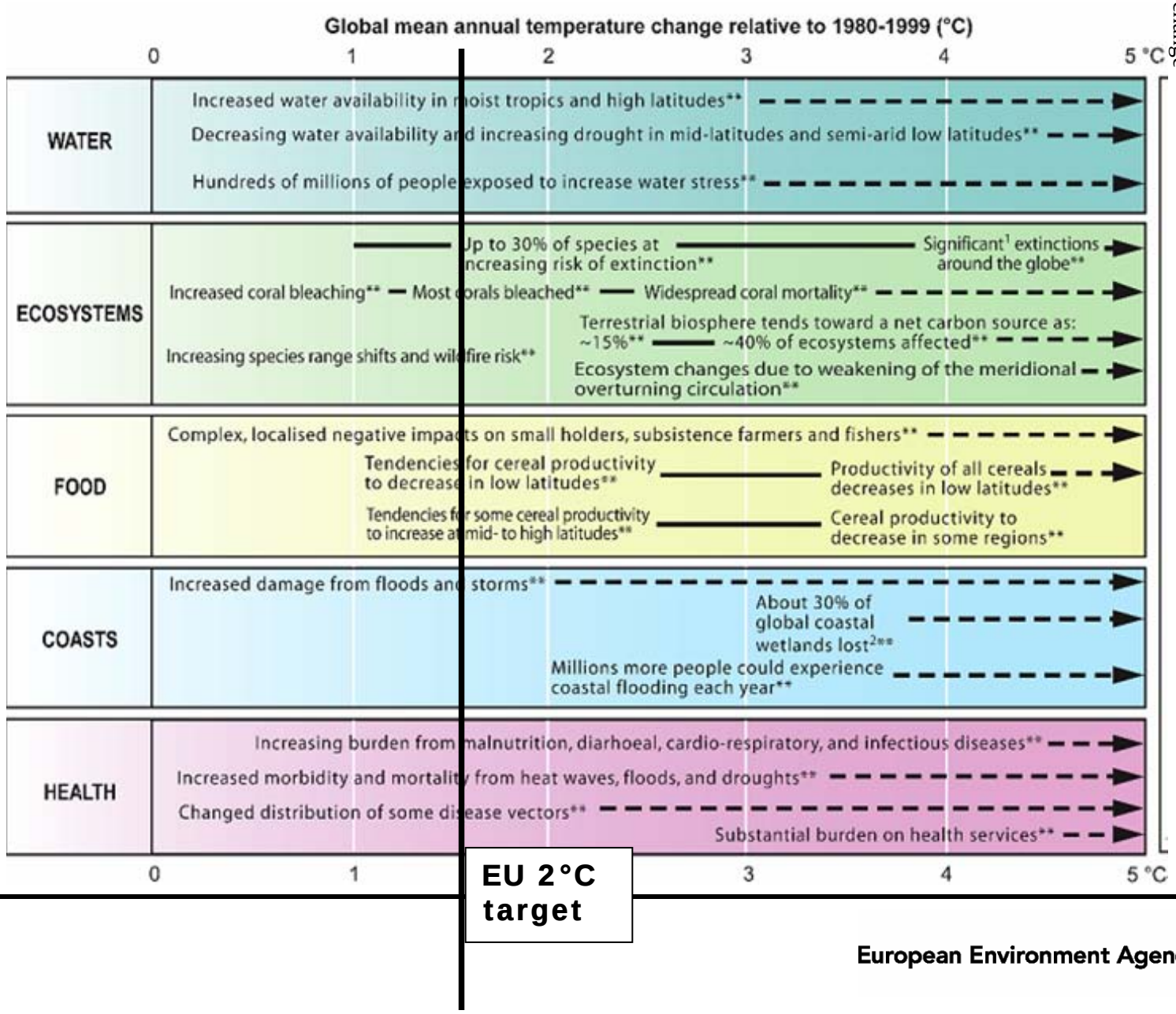
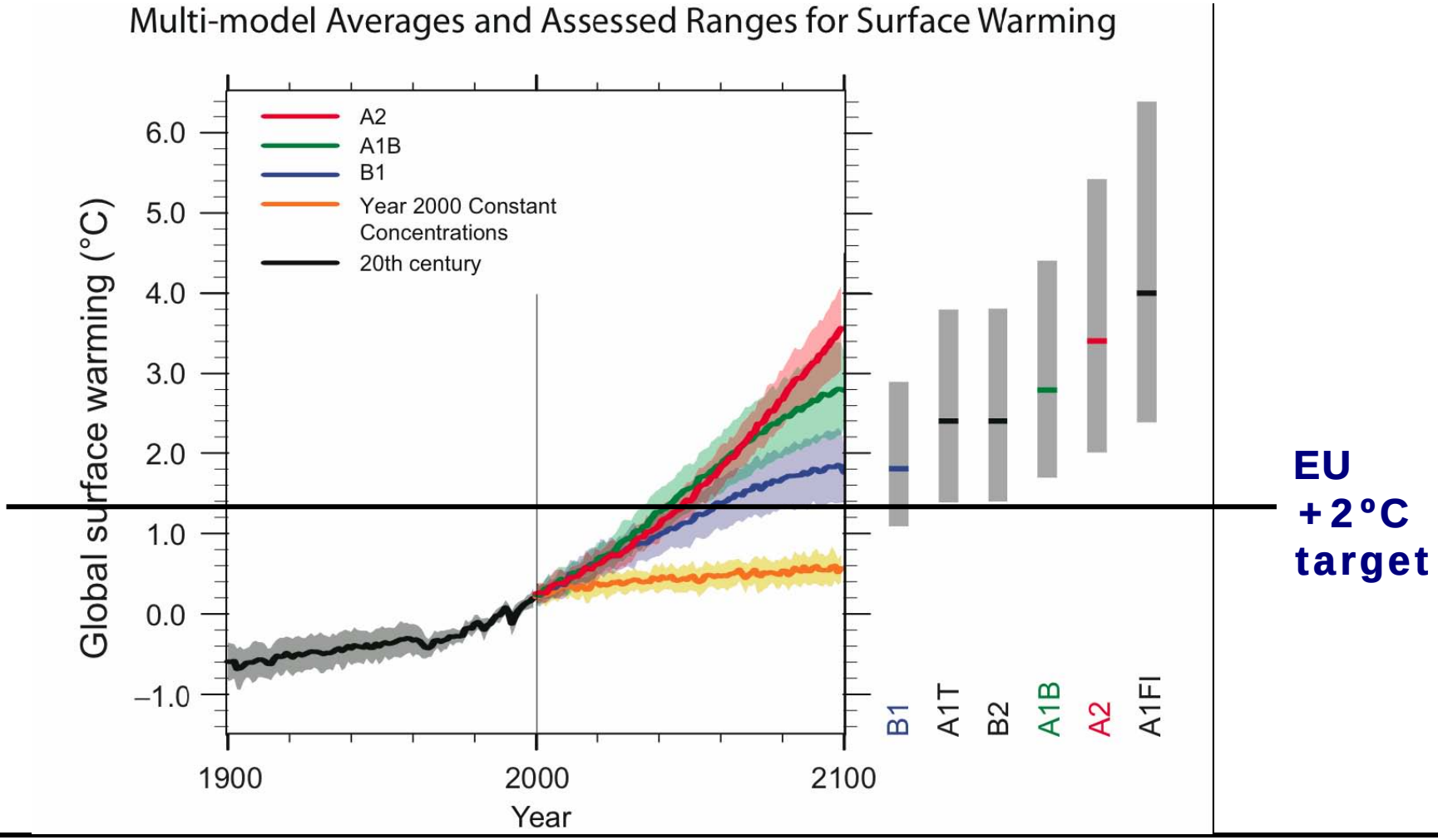


Figure 3: Key impacts as a function of increasing global average temperature change[1]

1Above 1980-1999 levels. To express the change relative to the period 1850-1899, IPCC WG II adds 0.5 degrees C

Substantial global GHG emission reduction is needed as well as adaptation



Source: IPCC fourth assessment, 2007 (full uncertainty range for temperature increase is 1.1-6.4°C)

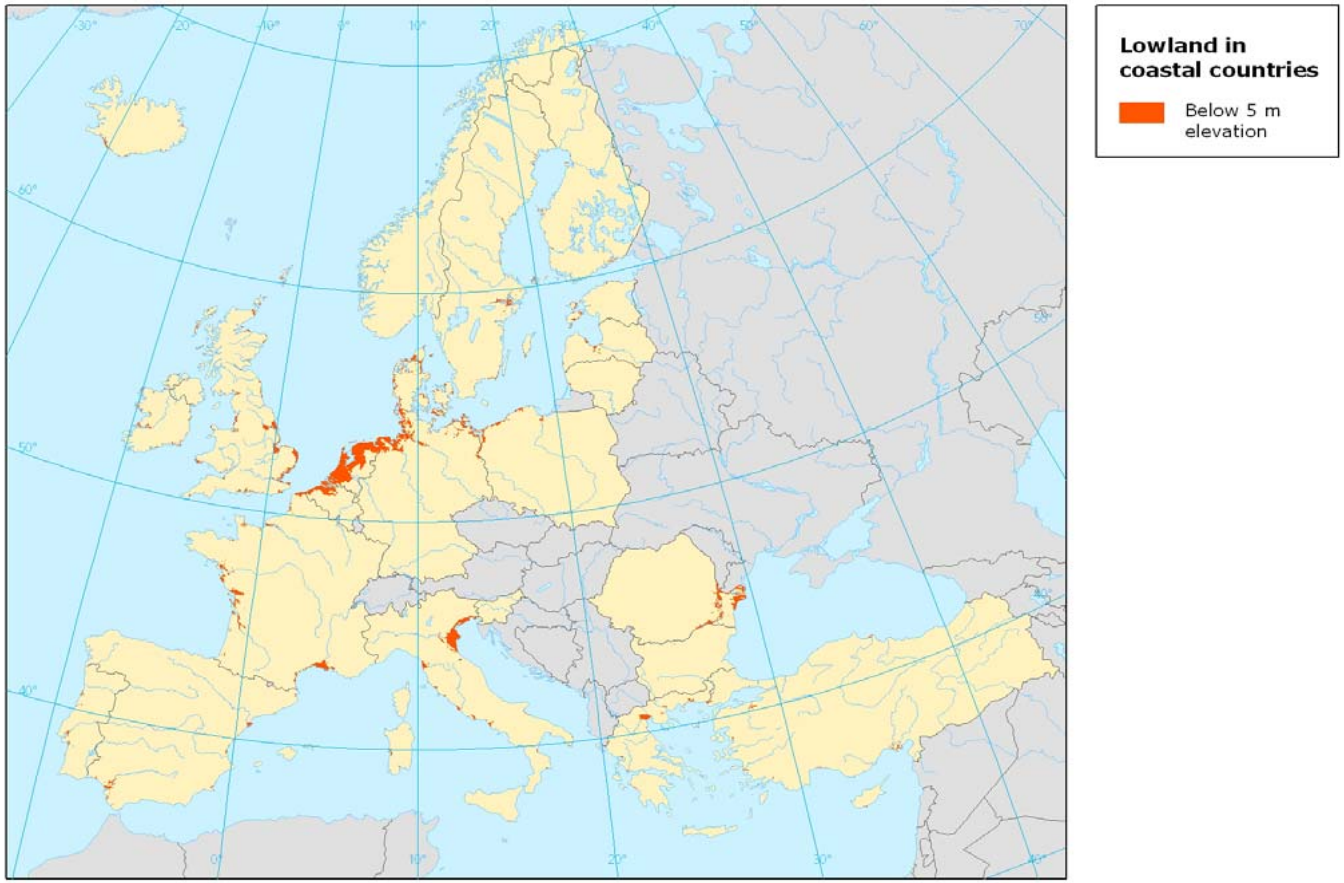
European Environment Agency

Why is adaptation important ?

- Climate change cannot be totally avoided
- Anticipatory adaptation can be more effective and less costly than “retrofitting” or “emergency adaptation”
- Climate change may be more rapid and pronounced than currently known
- Immediate benefits from adaptation to current climate variability and extreme events
- Avoid maladaptive policies and practices

Coastal zones

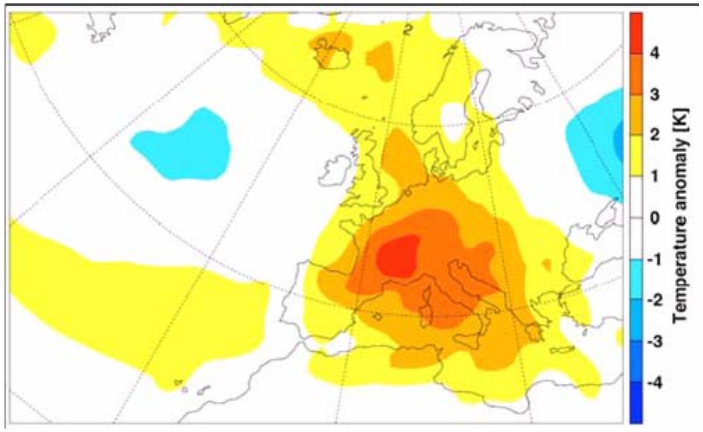
- Sea level is projected to rise for centuries (0.2-0.6 m by 2100)
- Future increase in storm frequency and intensity (uncertainties)
- 9% of all European coastal zones is below 5 m elevation potentially vulnerable to sea level rise and related inundations and the exposed population in the main coastal European cities is expected to increase
- Coastal zone ecosystems are threatened

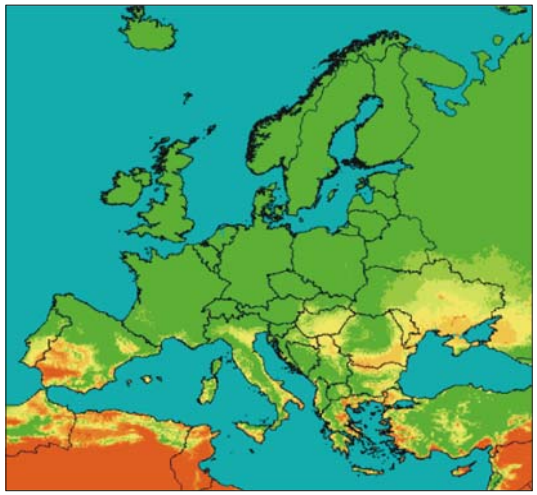


Source: IPCC, 2007; EEA, 2006

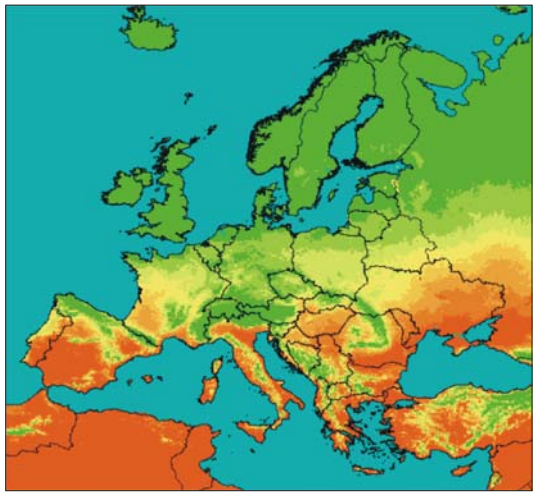
European temperature extremes

- Cold extremes are less frequent, the frequency of hot days has almost tripled between 1880 and 2005 and the number of warm extremes doubled
- Heat waves and droughts will increase in frequency, intensity and duration, the number of cold and frost extremes will further decrease
- By 2050 every other summer could be as hot as 2003

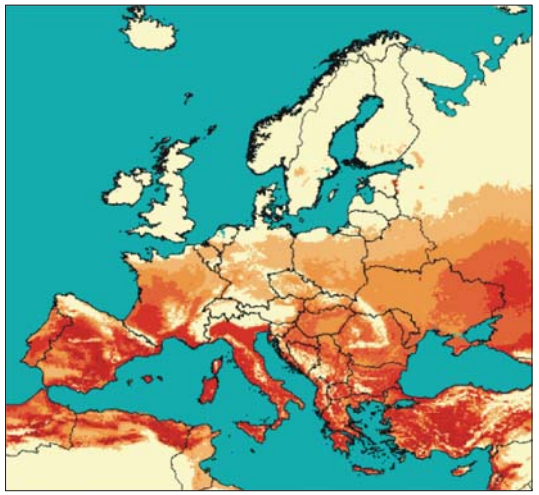




Tropical Nights, average 1961-1990 for June, July and August



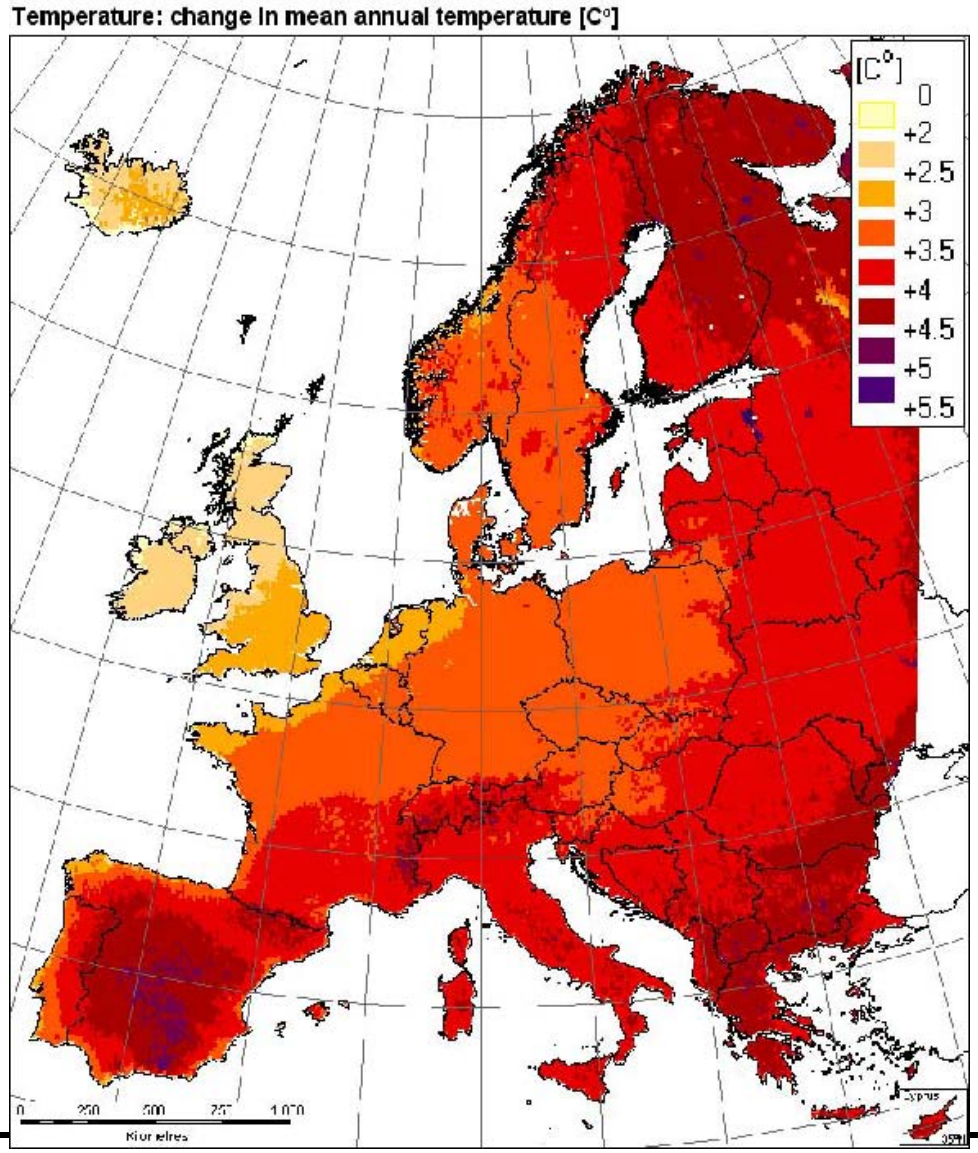
Tropical Nights, average 2071-2100 for June, July and August



Change in Days of Tropical Nights from Control To Scenario Period, for June, July and August

Sources: KNMI, ENSEMBLES project 2008; Schär, 2004

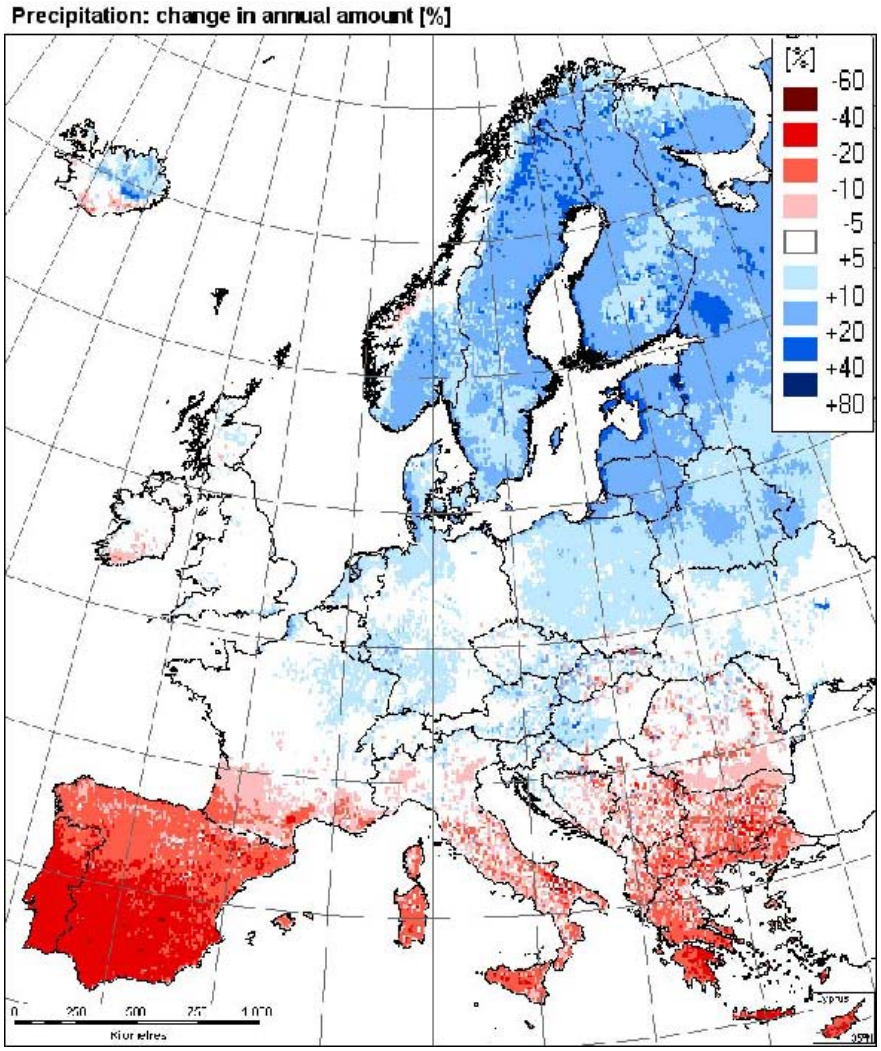
European temperature projected to increase most in north and south (Mediterranean)

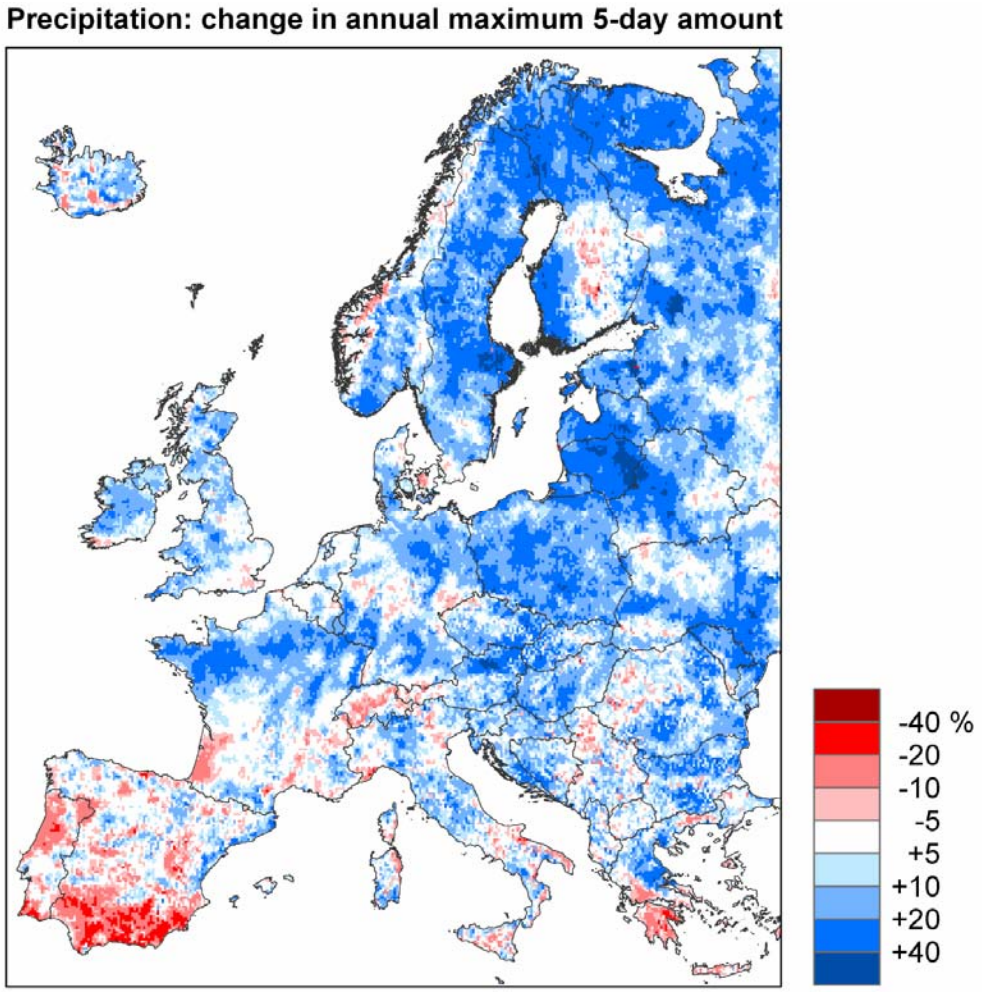


Source: PESETA project, PRUDENCE; IPCC SRES A2 high emission scenario (change mean annual temperature 2071-2100 relative to 1961-1990)

European Environment Agency

Precipitation projected to increase in northern, decrease in southern Europe; more frequent droughts and floods likely

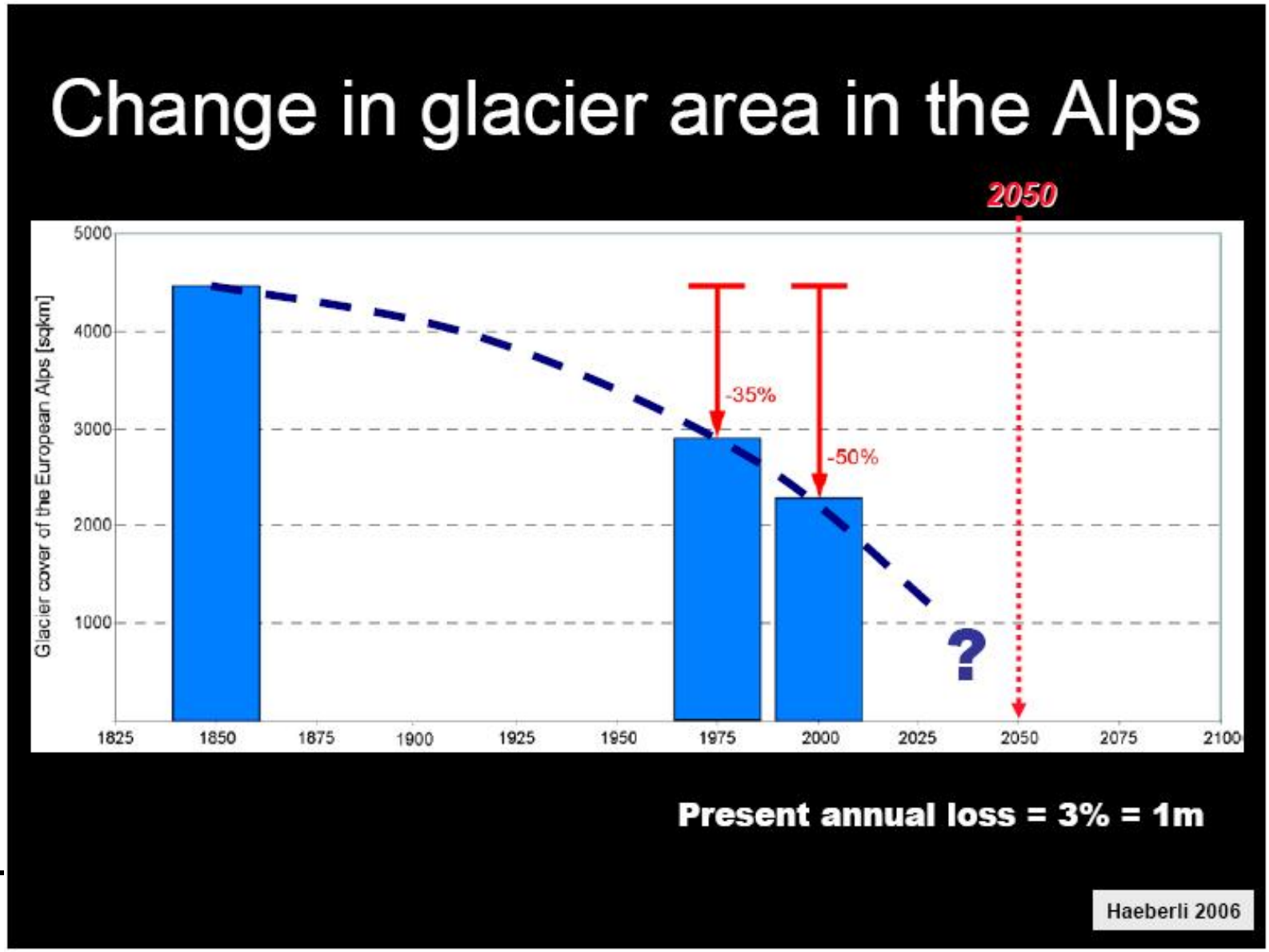




Source: PESETA project, PRUDENCE; IPCC SRES A2 high emission scenario (change 2071-2100 relative to 1961-1990)

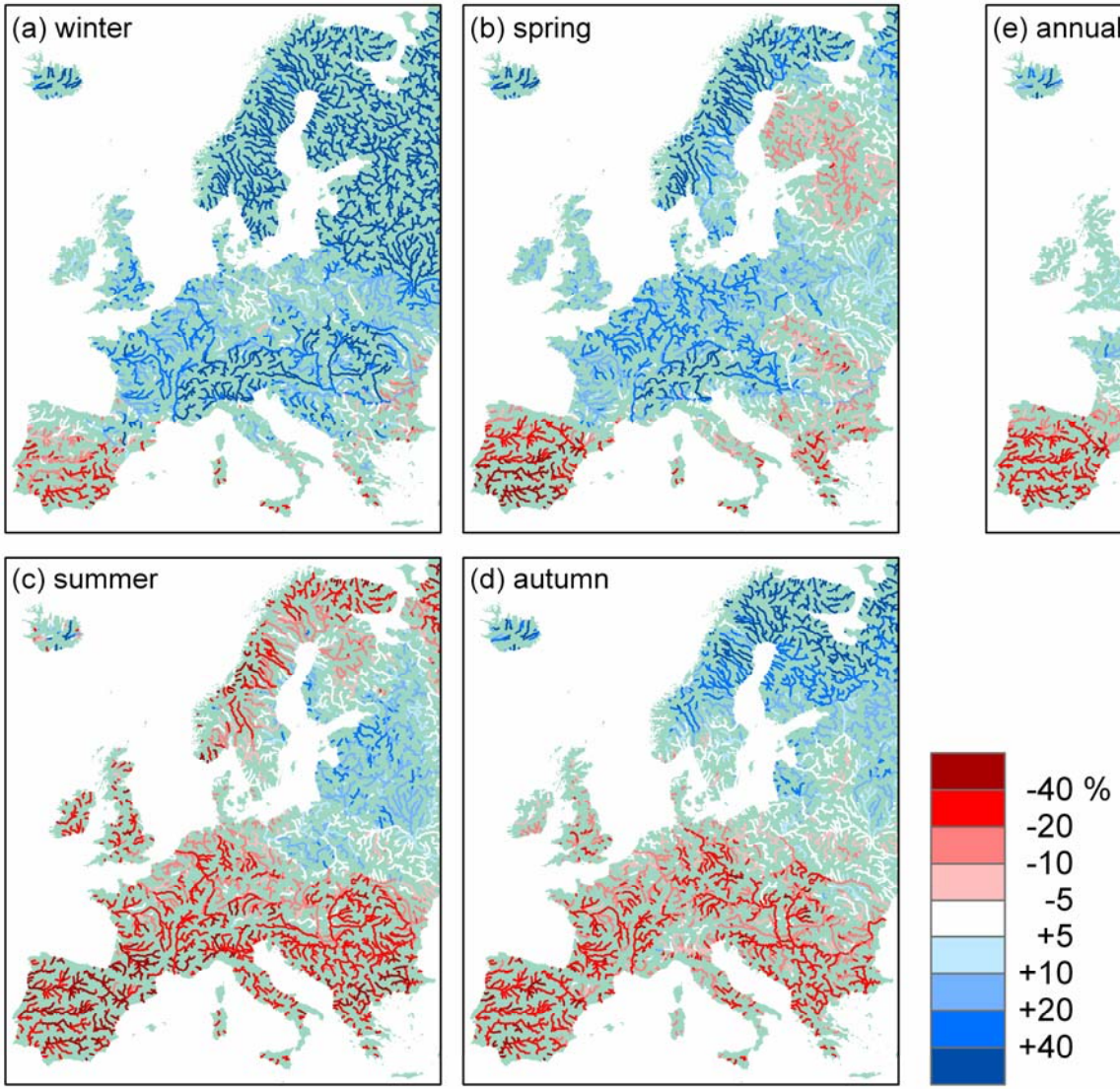
European Environment Agency

Glaciers lost 50% of mass between 1850 and 2000, projected to further reduce



River flow changes

- Annual river flow is projected to decrease in southern Europe and increase in northern Europe
- Summer flows will decrease and winter/spring flows will increase in most parts of Europe

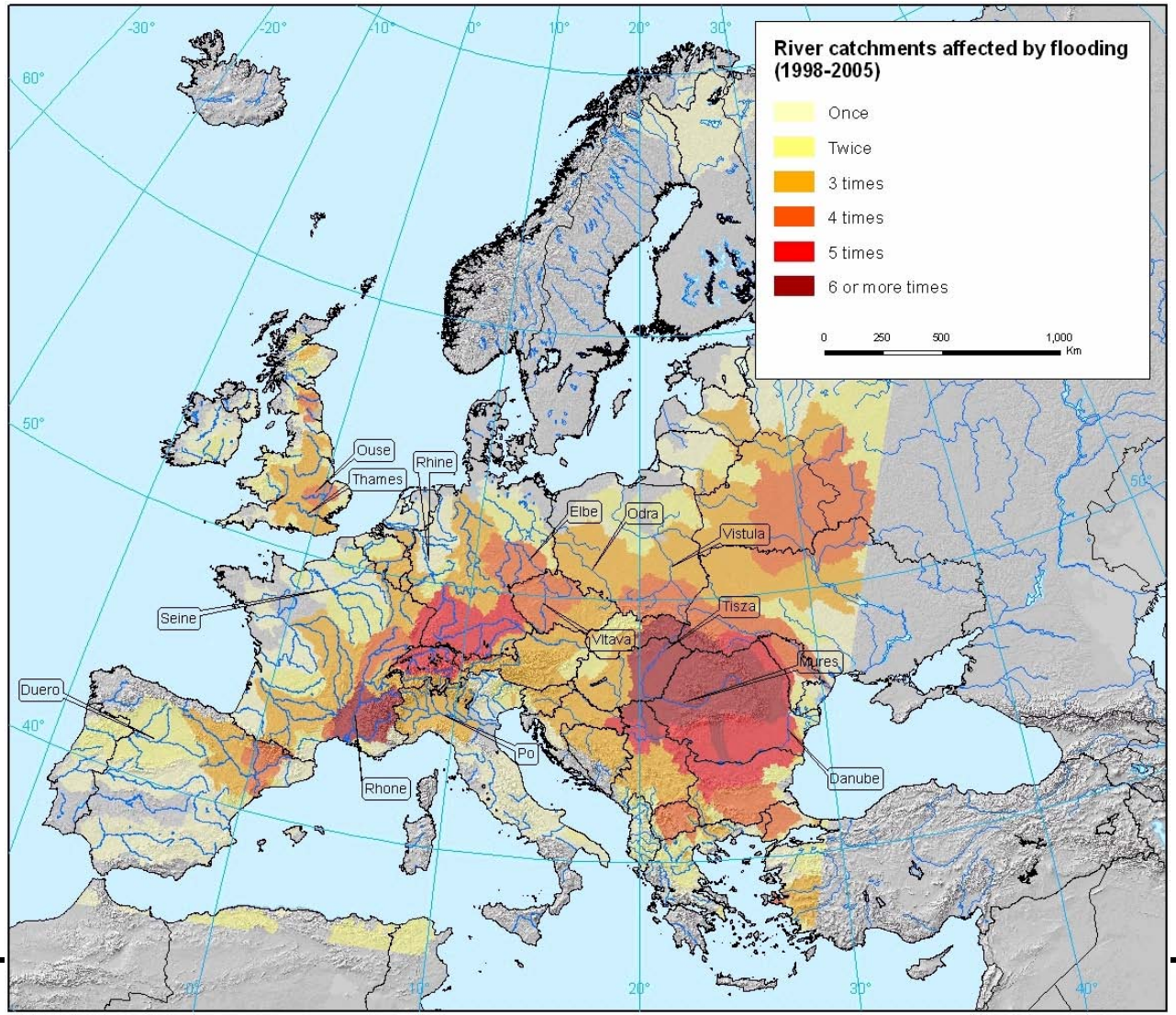


Source: JRC, 2008

Agency

River flooding events 1998-2005

- About 100 (river) floods: more than 700 fatalities, a million people affected and 25 billion EUR in insured economic losses

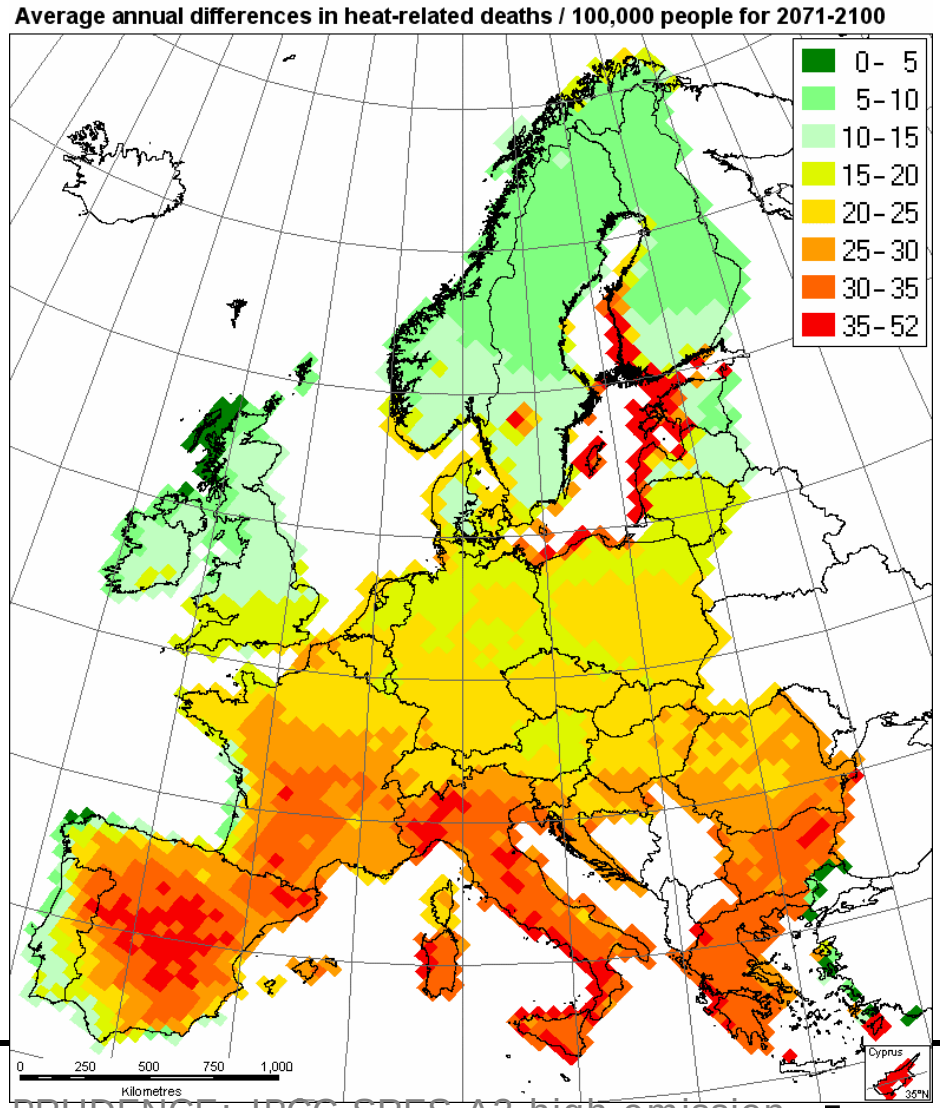


European Environment Agency

Data-source: EEA, 2006

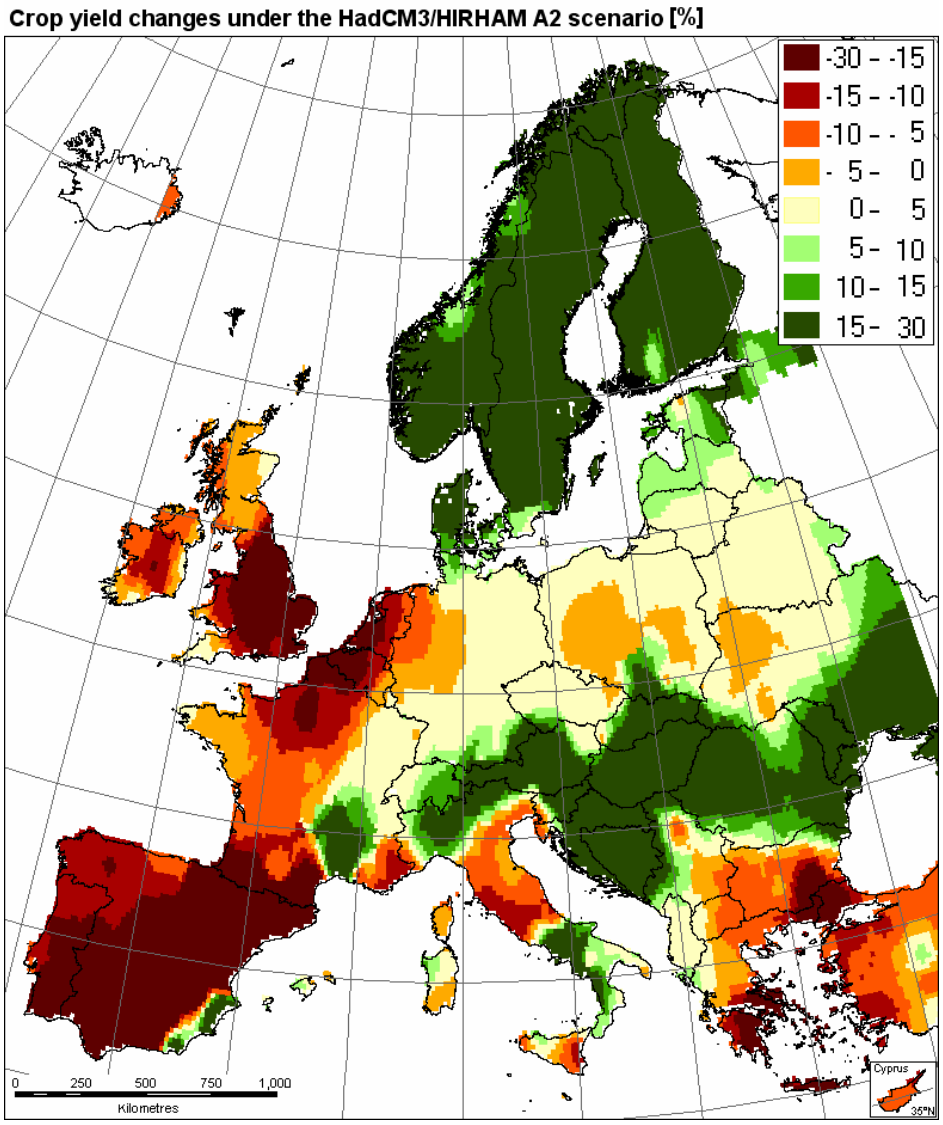
Projected increase in heat-related deaths in Southern Europe

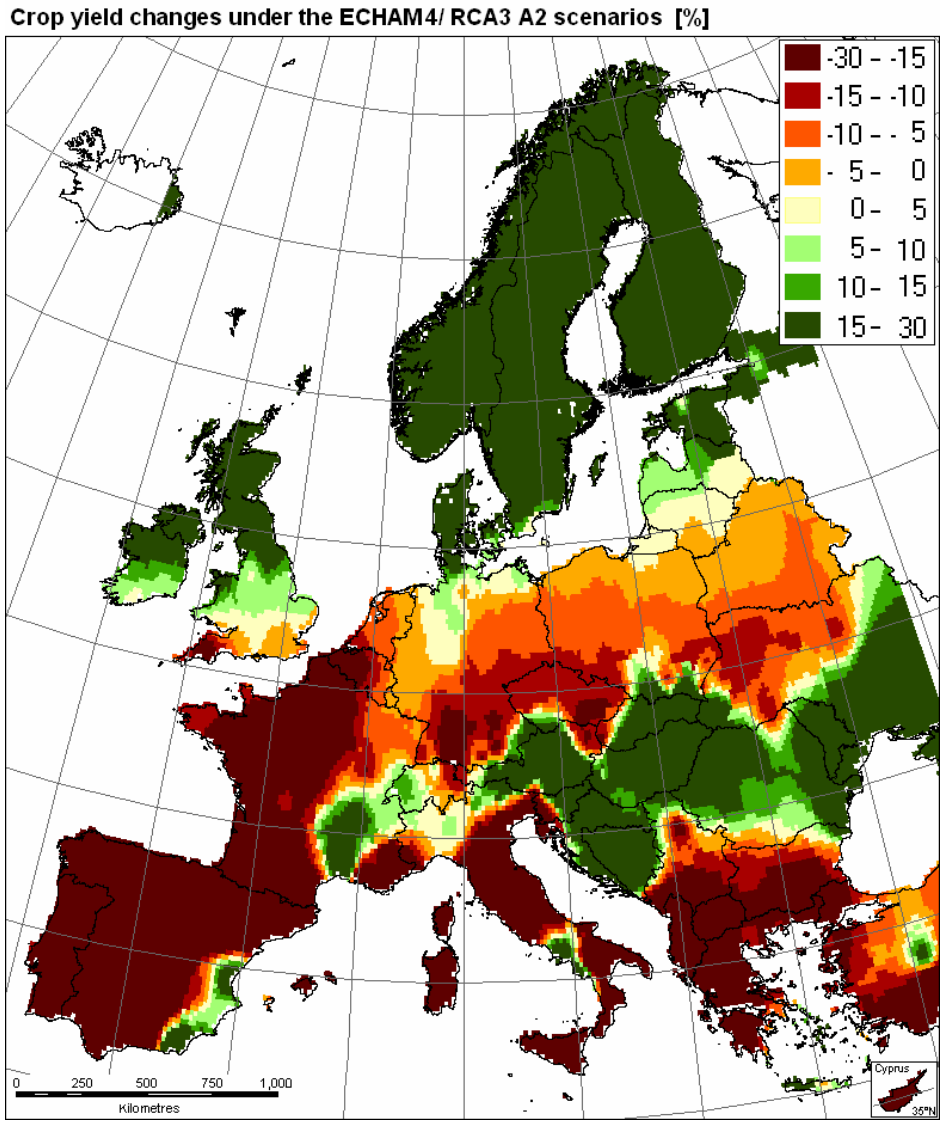
- Hot summer of 2003 resulted in more than 70,000 excess deaths (12 countries)
- 86,000 excess deaths per year are projected in the EU at a global mean temperature increase of 3°C (A2 scenario) without adaptation



Source: PESETA project, PRUDENCE; IPCC SRES A2 high emission scenario (change mean 2071-2100 relative to 1961-1990)

Projected crop yield decrease in Southern Europe, increase in Northern Europe (2 models)



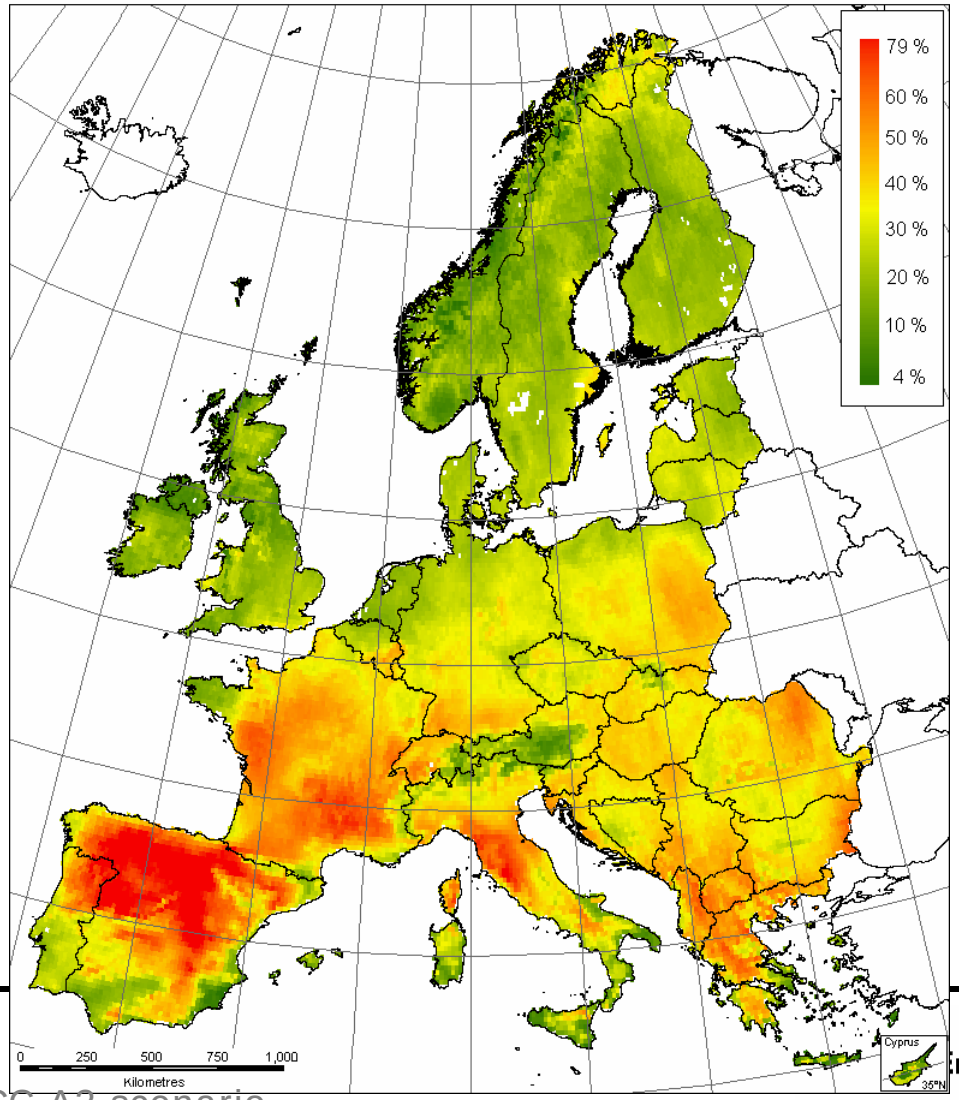


Source: PESETA project, PRUDENCE; IPCC SRES A2 high emission scenario (change mean 2071-2100 relative to 1961-1990)

Projected local extinction of plants in Southern Europe

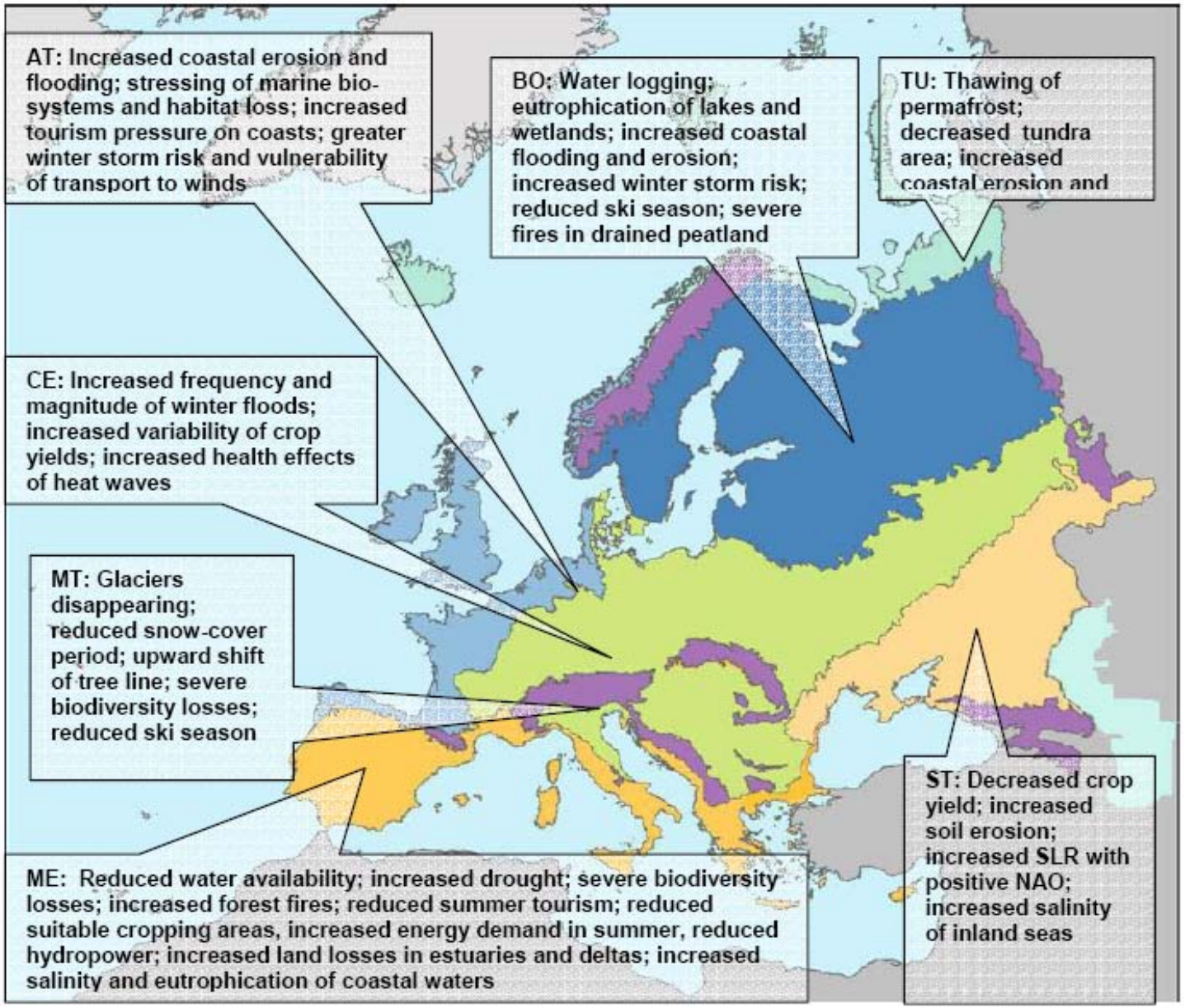
- By the late 21st Century, distributions of European plant species are projected to have shifted several hundred kilometres to the north and 60% of mountain plant species may face extinction. The rate of change will exceed the ability of many species to adapt.

Modelled local extinction in plant communities under the A2 HadCM3 climate model by 2080 [%]



Source: ATEAM, 2004, IPCC A2 scenario

Key European vulnerable regions and sectors



Source: IPCC, 2007; EEA, 2004

Examples of national assessments

- Finland: FINADAPT (Assessing the adaptive capacity of the Finnish environment and society under a changing climate)
- Germany: KomPass (Competence Centre on Climate Change Impacts and Adaptation)
- Hungary: VAHAVA Changing (VÁltozás) Impact (HAtás) Response (VÁlaszadás)
- Netherlands: CcSP (Climate Changes Spatial Planning)
- Portugal: SIAM (Scenarios, Impacts and Adaptation Measures)
- Spain: ECCE (Assessment of the Preliminary Impacts in Spain due to Climate Change)
- Sweden: SWECLIM (Swedish Regional Climate Modelling Programme)
- UK: UKCIP (Climate Impact Programme)
- All countries: communications to UNFCCC

Current national adaptation plans and measures

- Preparation of national adaptation strategies: **Denmark**, **Germany, Finland, France, Hungary, Netherlands, Portugal, Slovakia, Spain, UK,, etc**
- Sectoral actions mainly in areas with a long tradition of dealing with climate extremes such as **flood defence, water scarcity and droughts (**focus of EEA 2007 study)
- **Droughts**: new water savings standards; recycling; new infrastructure; desalinisation plants; economic instruments
- **Floods**: emergency responses; improved forecasting; Self-protection and flood awareness; spatial planning and land management; hard and soft engineering

European Adaptation Challenges

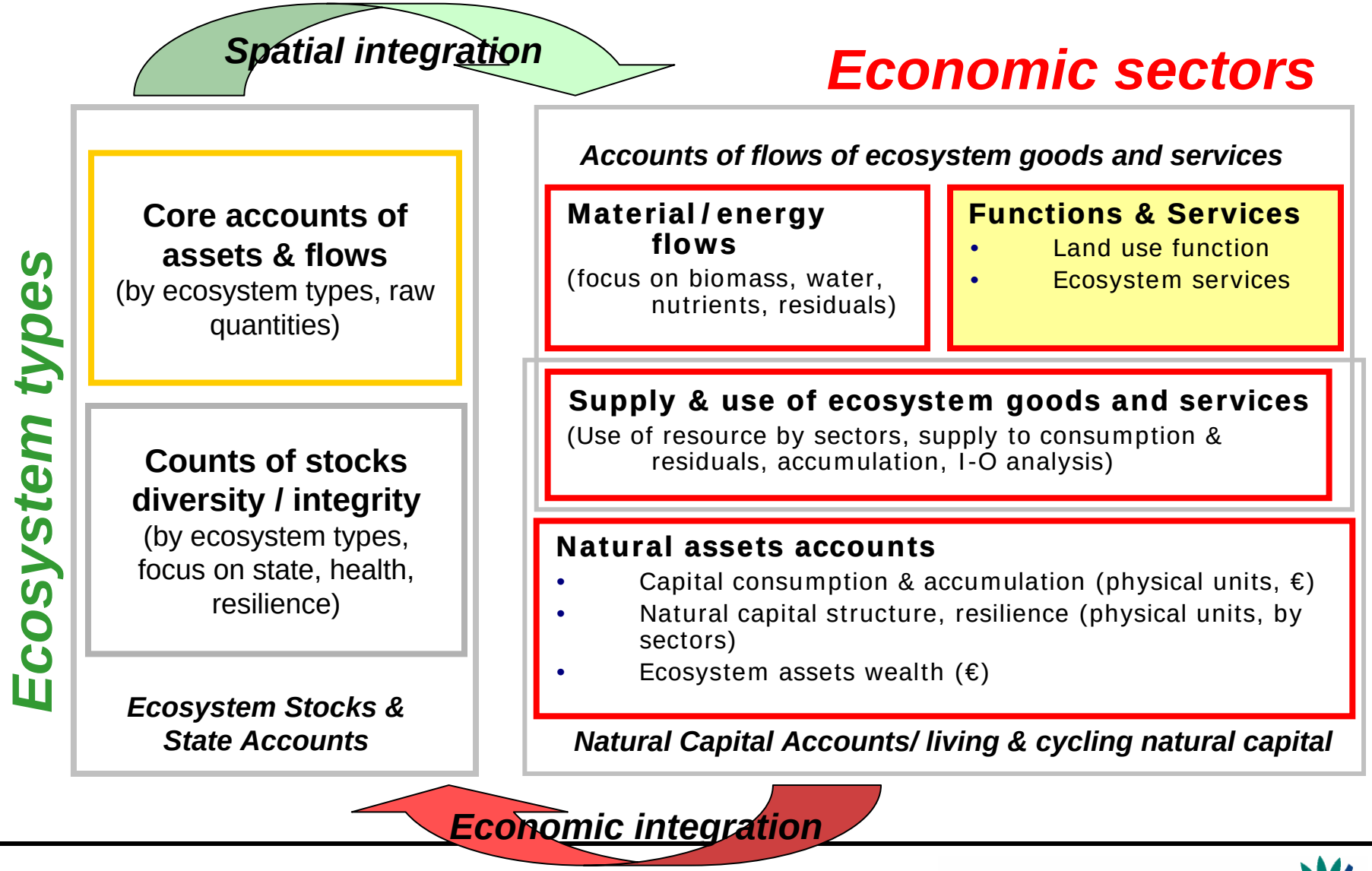
- Climate-proof EU policies and Directives (Agriculture, Industry, Energy, Health, Water, Marine, Ecosystems/Biodiversity, Forestry)
- Integrate adaptation into EU's funding programmes (Structural, Cohesion and Solidarity funds, Agriculture and Rural Development funds)
- Consider new policies, e.g. spatial planning as an integration tool
- Integrate adaptation in EU external relations (developing countries)
- **Enhancing the knowledge base, e.g. regarding regional scale and information on costs**
- Involvement of civil society, business sector organisations and enhanced information exchange
- Exploit opportunities for innovative adaptation technologies

Commission Green Paper, consultation in 2007
White Paper with concrete proposals expected end of 2008

Data and information needs

- Projections of climate change at detailed level (from downscaled climate change models)
- Frequency and intensity of extreme weather events
- Seasonal data (e.g. in agriculture; forestry; water accounts) and projections
- Data across scales, e.g. water balances at river basin level, ecosystem functional units and services
- Economic valuation approaches for accounting ecosystem services in physical and monetary terms
- Information on practical adaptation measures and costs of adaptation

Can ecosystem accounting be used for climate change vulnerability assessments?



Ecosystem Accounting Framework

- **Stocks & flows**
  - Spatial systems:
    - **land cover** (units, zones, landscape types)
    - river reaches, rivers, catchments
    - coastal systems
  - Biomass, Productivity (NPP/NEP), Carbon Storage
  - Nutrients (N,P)
  - Water
  - Species
  - Other…
- System interactions
- Services
- Values

➔ **Basic ecosystem stock flows accounts**

Ecosystem Accounting Framework

- Stocks & flows
- **System interactions**, integrity & health
  - Spatial interactions (ecotones, distributions, composition / scales)
  - Components interactions
    - Spatial & temporal interactions (water stress, species dynamics…)
    - Bio-chemical-physical cycles
  - Human interactions
    - Re-structuring, over-harvesting/over-extraction, deposition of residuals and force-feeding, introduction of species – use of land and the natural capital
  - Health – Ecosystem Distress Syndrome
- Services
- Values

Ecosystem Accounting framework

- Stocks & flows
- System interactions
- **Ecosystem Services**
  - Input/output to/from production, MEFA
  - Extracted or harvested products
  - Final services to population (non-market, collective or individual)
- Values

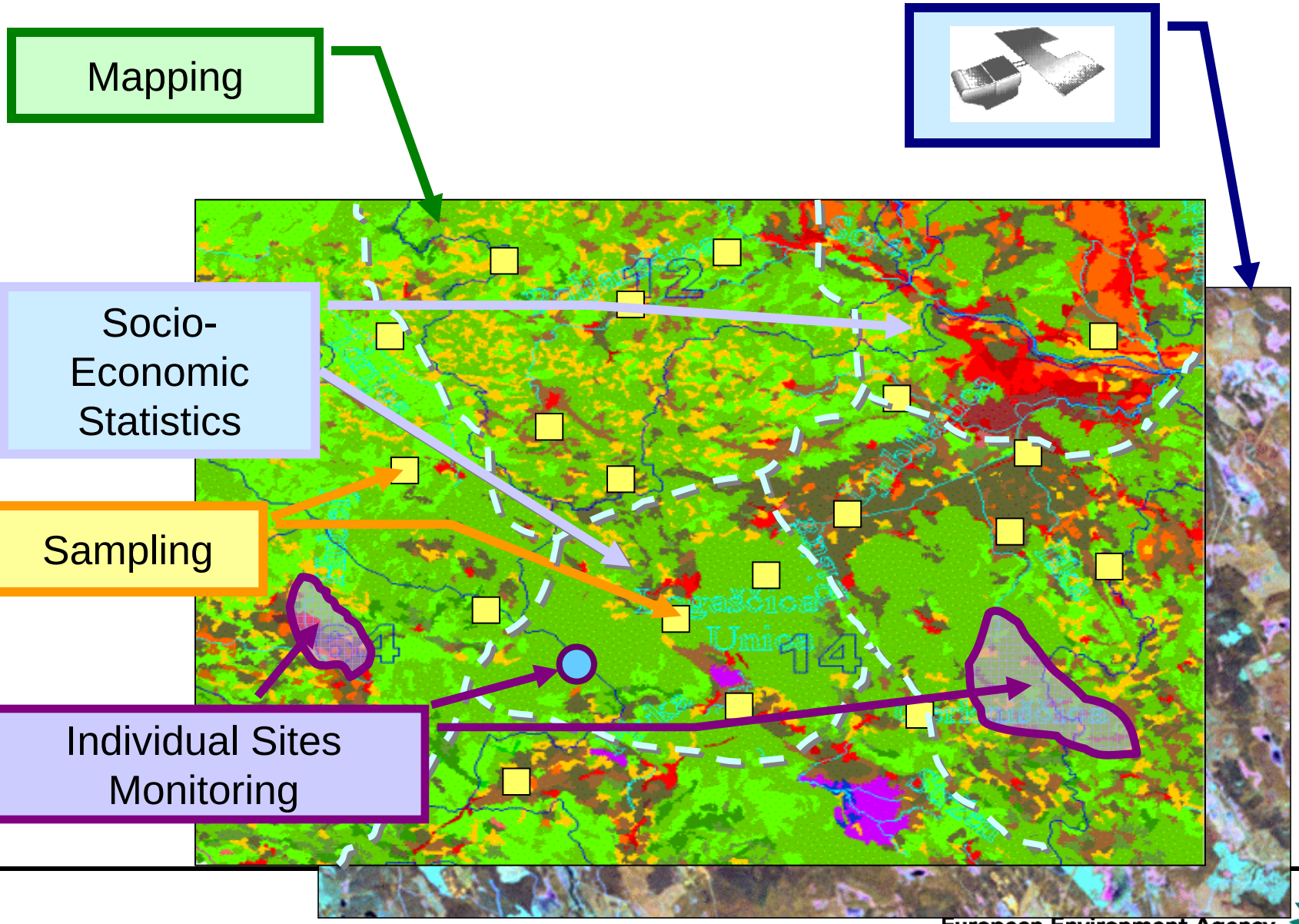
Ecosystem Accounting framework

- Stocks & flows
- System interactions
- Services
- **Values**
  - Primary goods and ecosystem based market services
  - End use, collective & individual non market services & IDP
  - Additional maintenance/restoration costs & FCGS
  - Inclusive Wealth

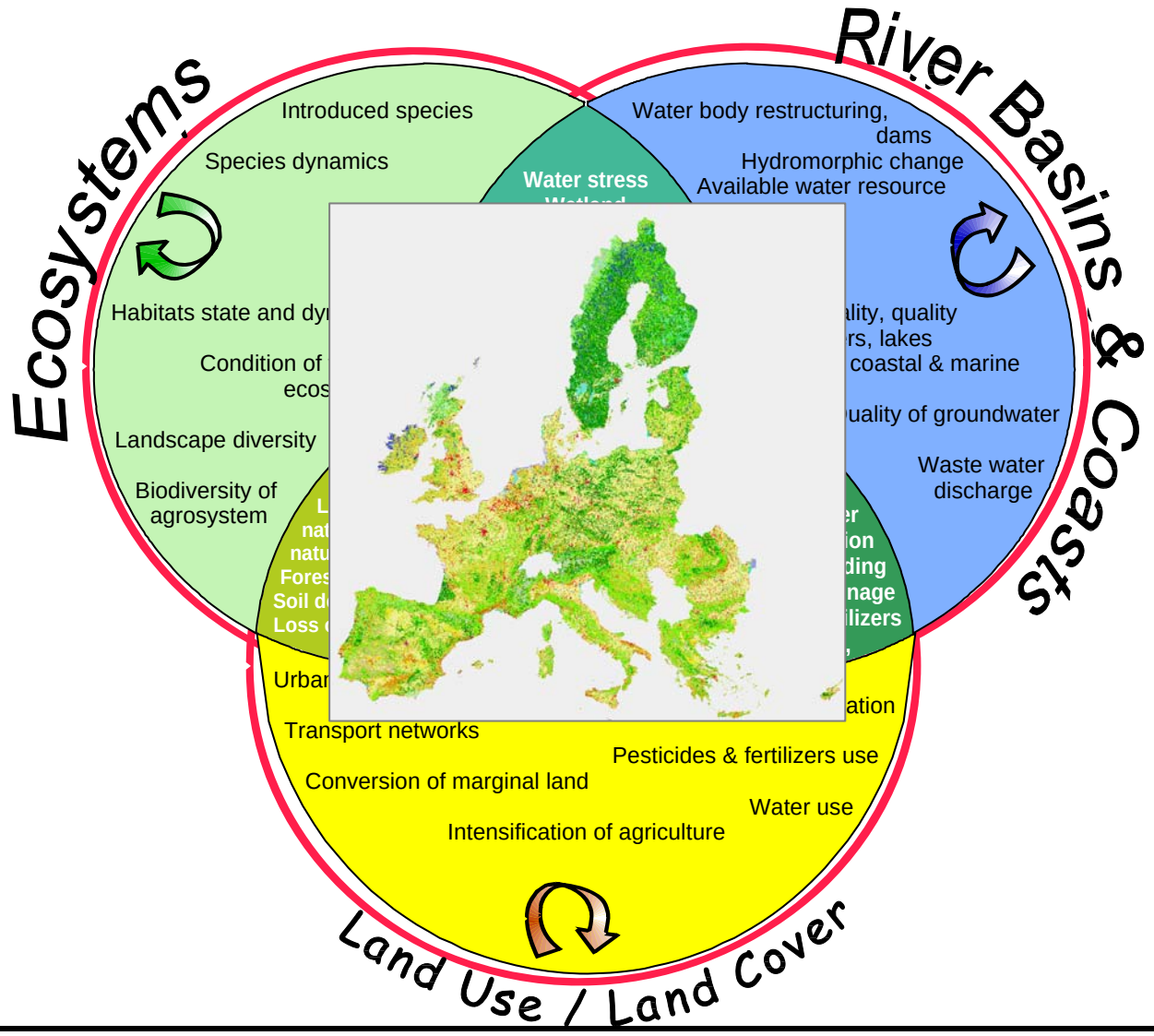
Integration…

- Thematic integration:
  - environmental themes (interactions, ecosystem resilience)
  - environment-economy (ecosystem goods & services, natural capital)
  - environment-human health
- Spatial integration:
  - analytical units
  - spatial distribution, neighbourhoods
  - nested scales, natural systems, decision levels
- Time integration:
  - change, time series,
  - infra-annual variability
  - now-casting, modelling
- Data assimilation:
  - heterogeneous monitoring data and statistics
  - stratification(s), fuzzy logic and probabilities
- Reporting:
  - reporting units (administrative, hydrological, bio-geographical, zonal (e.g. coasts, rural landscape…)
  - current policies vs. trends assessment…

Spatial Integration of Environmental & Socio-Economic Data Collection



Platform for Integrated Spatial Assessment



European Environment Agency

Summary and conclusions

- For **climate change impacts, vulnerability and adaptation** strategies and policies are emerging and **new data** with more details in time and space are needed
- This requires a **joint effort** by environmental agencies and statistical institutes as well as businesses, and the meteorological and research community, at national, European and global level
- EEA works together with Eurostat and member countries to **strengthen the links between environment and economic statistics** (ecosystem accounting)
- **Report on climate change impact indicators due in Sep 2008**, jointly with European Commission Joint Research Centre (JRC) and WHO Europe
- Development of a **clearinghouse** on climate change impacts, vulnerability and adaptation in collaboration with the European Commission (DG Environment)