Current practice in including climate change in river basins and water resource assessments - an overview

EurAqua Conference October 2008: How can climate change be incorporated in river basin management plans under the WFD?

Peter Kristensen

European Environment Agency

Low-flow - upper Danube (Passau – 76 000 km2)

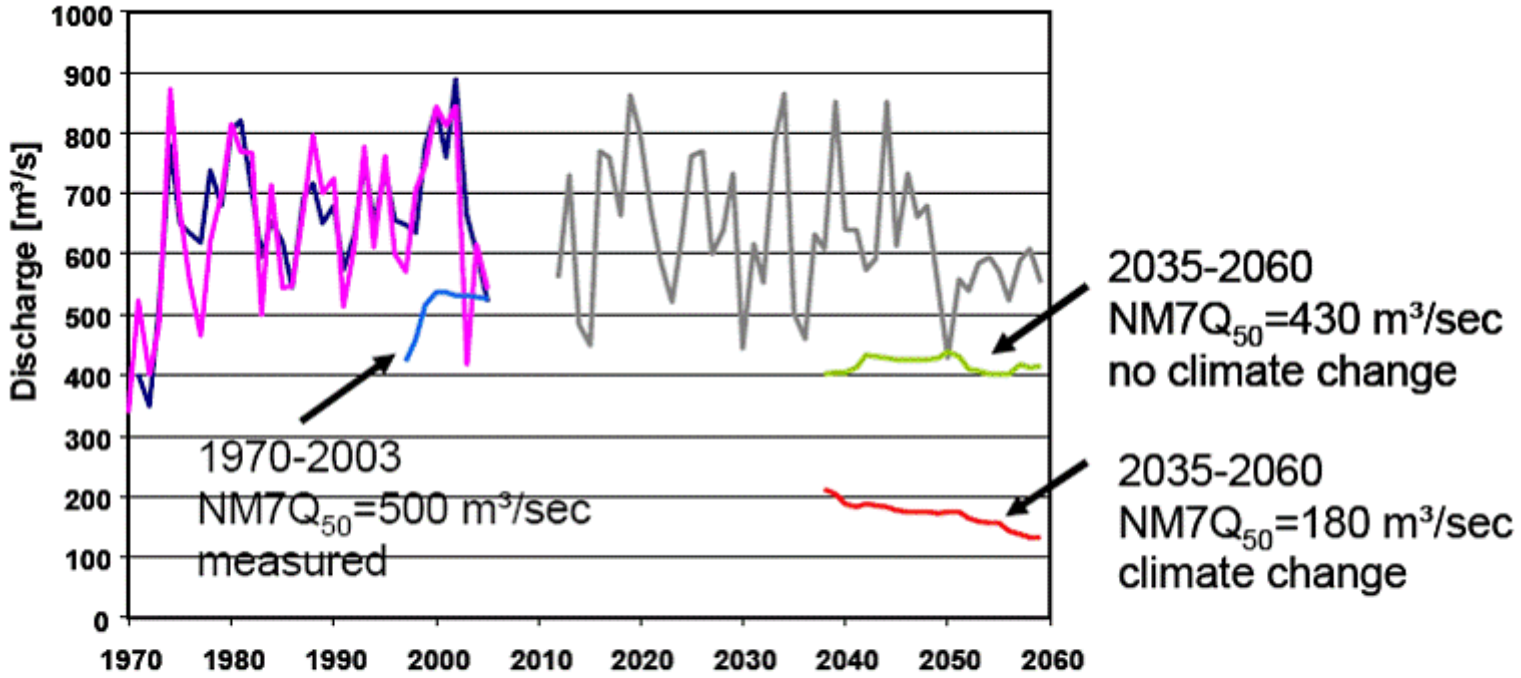
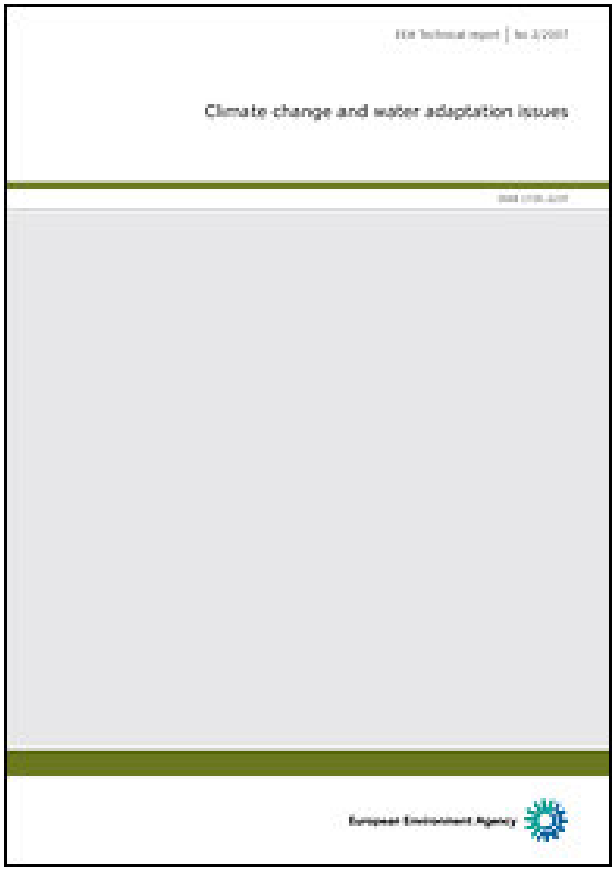


Fig.7: Development of the 50-years return period NM7Q low-flow condition at gauge Achleiten; blue = determined from measurements, green = no climate change, red = average from realisation 1-12 from Fug.6

Source: GLOWA-Danube – Mauser et al. 2008:

http://ksh.fgg.uni-lj.si/bled2008/cd_2008/03_Global%20climate%20change%20and%20hydrological%20processes/060_Mauser.pdf

EEA 2007: Climate change and water adaptation issues



This report aims to

- evaluate the implications of the need to adapt to climate change for water resource policy and regulation across Europe,
- assess the strengths and weaknesses of current policies and regulations, and
- describe progress and activities in European countries.

The report is available at

http://reports.eea.europa.eu/technical_report_2007_2/en

Briefing http://reports.eea.europa.eu/briefing_2007_1/en

Impacts of Europe's changing climate - 2008 indicator-based assessment

Indicator-based assessment

- Past trends
- Projections

Indicators

Water quantity

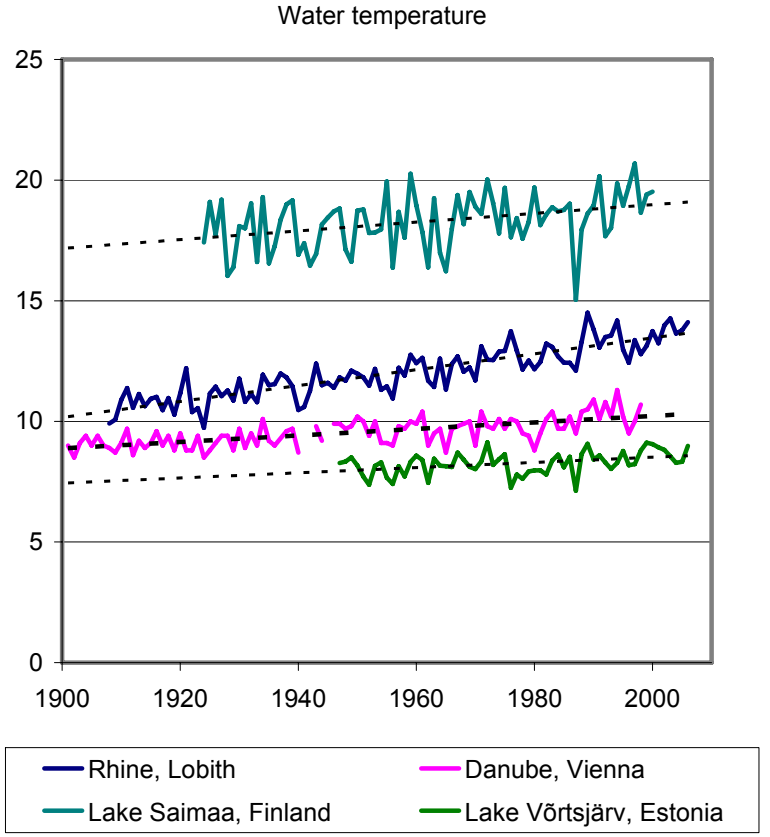
- River Discharge (Stream-Flow)
- Water demand
- Floods
- Droughts & water scarcity – Low flow
- *Hydropower and power plants*
- *Cooling water*
- Groundwater – aquifer recharge

Water quality and biodiversity

- Lake and river temperature
- Lake and river ice coverage
- Freshwater quality
  - Phenology
  - Northward movement
  - Bluegreen algae

Indicator: Lake and river temperature

- Higher air temperatures lead to higher water temperatures.
- During last century the water temperature of European rivers and lakes has increased by 1-3 °C



EEA activities 2009 and beyond

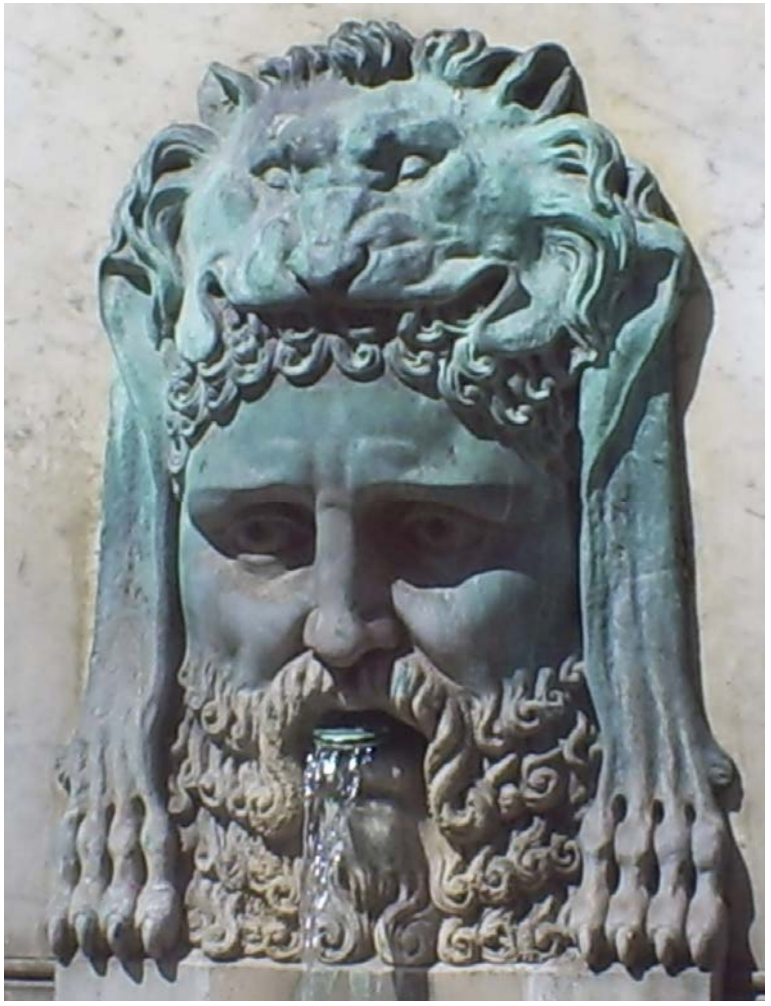
- Sections on: *Climate change impacts on water* in the next EEA State of the Environment report (SOER2010)
- Support the WFD Strategic Steering Group on climate change and water including
  - Contribute to guideline on how to handle climate change and water in the 2nd/3rd RBMPs (EEA coordinating chapter on adaptation measures)
- Report on **good** practice measures for climate change adaptation in river basins

EU water policies and climate change

- Water Framework Directive (WFD) does not explicitly address climate change, but CC and adaptation will have to be taken into account in future River Basin Management Plans.
- Green paper on adaptation; living with climate change (Green paper – July 2007)
- White paper on adaptation (early 2009)
- Floods Directive 2007. Climate change adaptation will be considered in the first implementation cycle, starting in 2011 with the preliminary flood risk assessment.
- Communication on Water Scarcity and Drought (July 2007)

Water Framework Directive and climate change

While the main text of the Water Framework Directive (WFD) does not explicitly address climate change, it is well-suited to handle the long-term implications of climate change with its step-wise and cyclical approach.



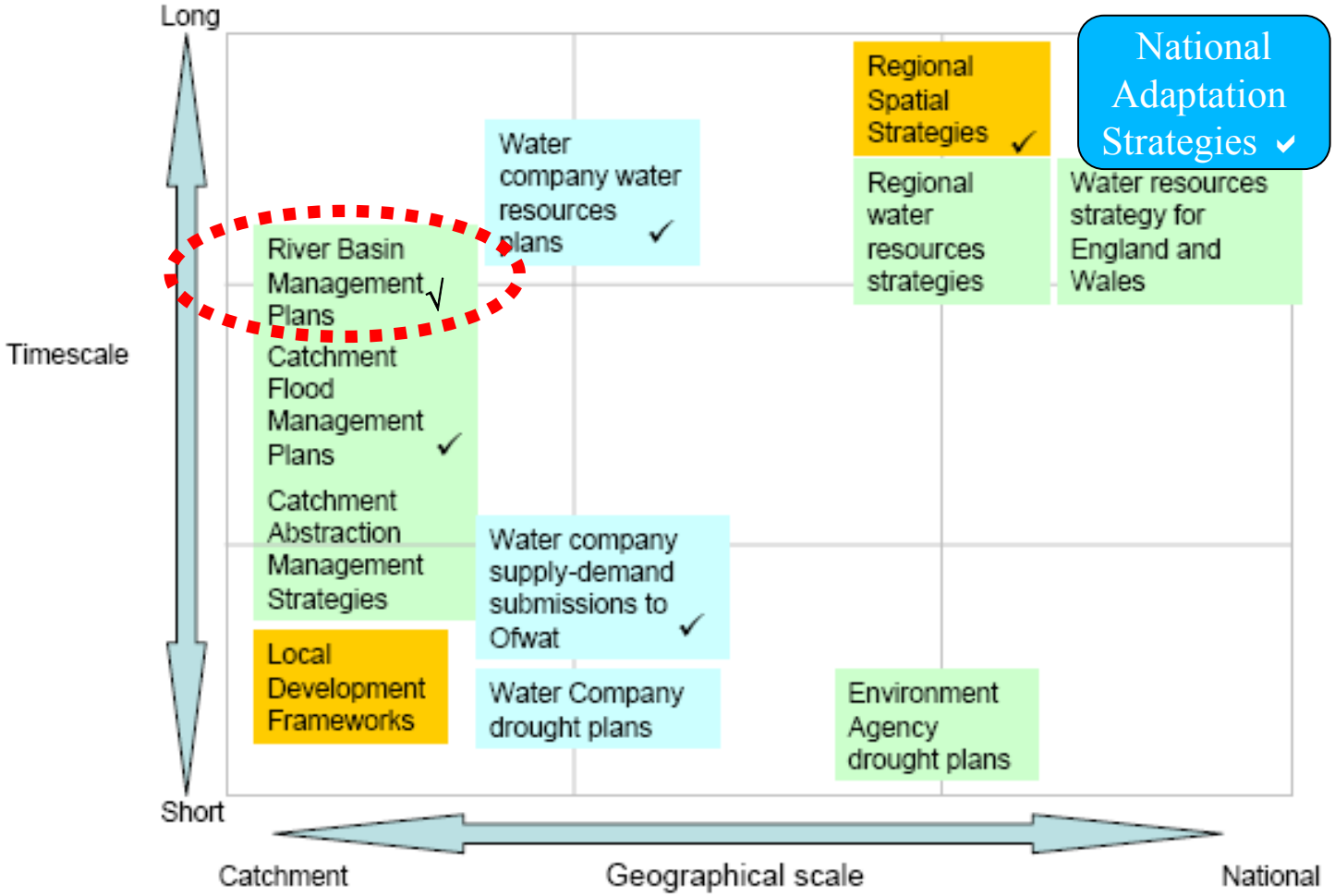


Figure 1-2 **Planning activities relevant to water resources management (adapted from Environment Agency, 2001) and those that include a consideration of climate change (✓)**

Source: Wade et al. 2006
http://www.futuredrought.org.uk/SR682%20Climate%20change%20final%20report_r2.pdf

Climate change and water in WFD
Common Implementation Stategy (CIS)

- WFD CIS workshop on River Basin Management Plans & Climate Change, Bonn 20-21 November 2007
- WFD Strategic Steering Group on climate change and water (Meetings September 2007; January and September 2008).
- Main activities
  - Discuss on how climate change could be included in first river basin management plans
  - Guideline on how to include climate change impacts in subsequent RBMPs

Climate change in first river basin management plans
(outcome of Bonn workshop and SSG CC & water)

In 2009 countries to finalise first river basin management plans (RBMPs)

It is recommended that a chapter on climate change is established in the first RBMPs (national and international plans), aiming at:

- Facilitating the public consultation
- Improving general awareness of all actors for climate change trends and impacts
- Paving the way for more climate change related actions in 2nd/3rd cycle
- Allowing for incorporating international, national and regional information on predictions in a descriptive way (with reference to the used models and methodology)

- **Contents of such a chapter could be:**
  - Summary of existing knowledge on climate change trends and scenarios
  - Identifying the main impacts, also on other sectors.
  - Outlook on future steps for incorporating climate change impacts into the planning process with a view to ensuring the adaptiveness of the programmes of measures

SSG Climate change and water – questionaire spring 2008 on CC in first RBMPs

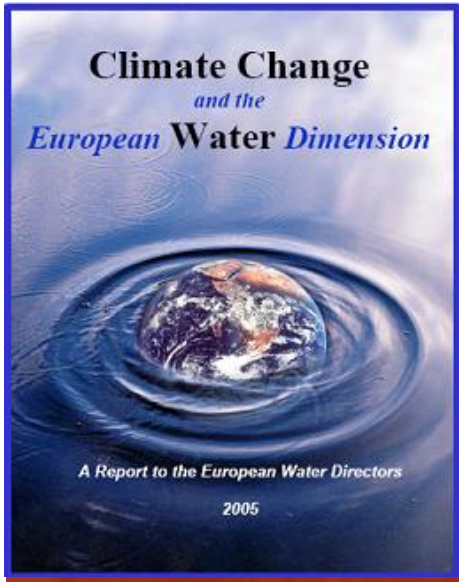
- Response from 16 countries
- Question 1: Specific national or regional studies on CC relevant to River Basin Planning: 15 yes – 1 no
- Question 2: Issue of CC reported in 1st RBMP? 12 yes – 4 un-decided
- Question 3: Climate check of Program of Measures (PoMs)? 8 yes – 3 no & 5 un-decided/unclear

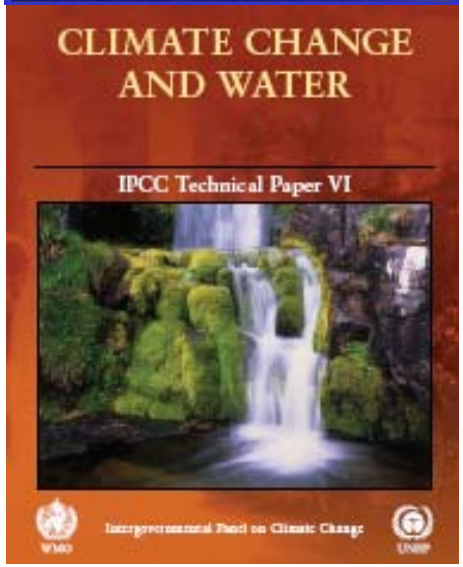
Climate change in the 2nd and 3rd WFD cycle

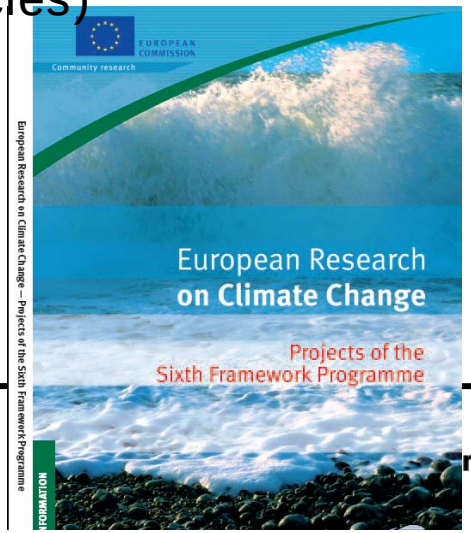
- In the subsequent cycles, the Programme of Measures needs to be made climate resilient as a default and firmly based on scientific evidence, notwithstanding the fact that knowledge and new data are constantly evolving.
- Ensuring compatibility between Programmes of Measures and adaptation concerns is particularly important in the case of measures that involve long-term investments, such as large infrastructure projects.
- For these RBMPs, incorporating climate change could include:
  - Improving the information basis,
  - Iterative climate-checking of the measures,
  - Considering broader water management issues related to climate change (e.g. related to land use, or water demand/supply management),
  - Improving of monitoring to detect climate change impacts
  - Exploring potential needs for adjustment of reference conditions/type changes of water bodies.
- Guidance on Climate change & water (2nd & 3rd RBMPs) - to be drafted and discussed in 2009
  - **Working title: How to adapt to climate change with regard to water issues and EU water legislation**

Much information is available I

- JRC (Eisenreich S. Ed.) 2005: Climate Change and the European Water Dimension.
- IPCC 2007: Fourth Assessment Reports WGI & WGII – Water sections & European chapter
- IPCC 2008: Technical report on water
- 5, 6 FP research projects: EUROLIMPACS; CLIME; SCENES; CECILIA, WATCH, FLOODSITE; many more
- 7 FP research projects: e.g ACQWA (Assessment of climate change and impacts on the quantity and quality of water); ClimateWater (Bridging the gap between adaptation strategies of climate change impacts and European water policies)







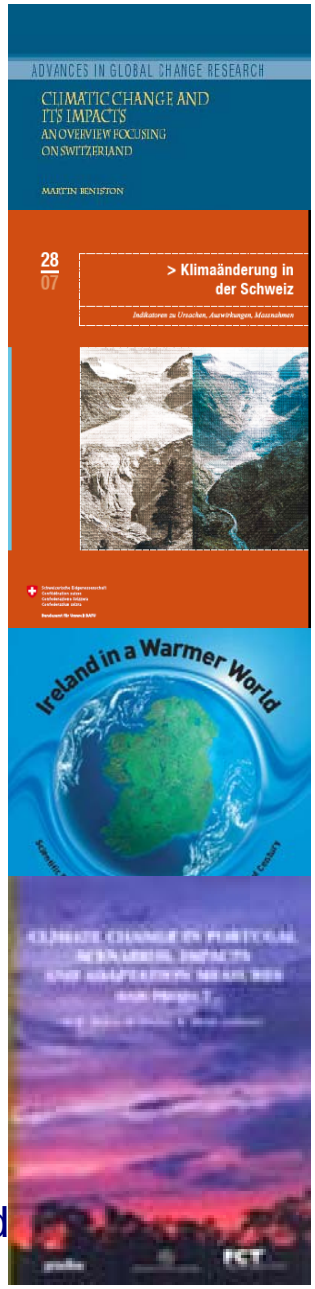
Much information is available II

National climate change assessments and adaptation studies

- CH OcCC Bericht Klimaänderung und die Schweiz 2050 (2007) www
- EA 2007: Irelands water at risk www
- The effects of climate change in the Netherlands www
- SIAM project - Climate Change in Portugal: Scenarios, Impacts, and Adaptation Measures www
- Climate change adaptation for hydrology and water resources. FINADAPT Working Paper 6,

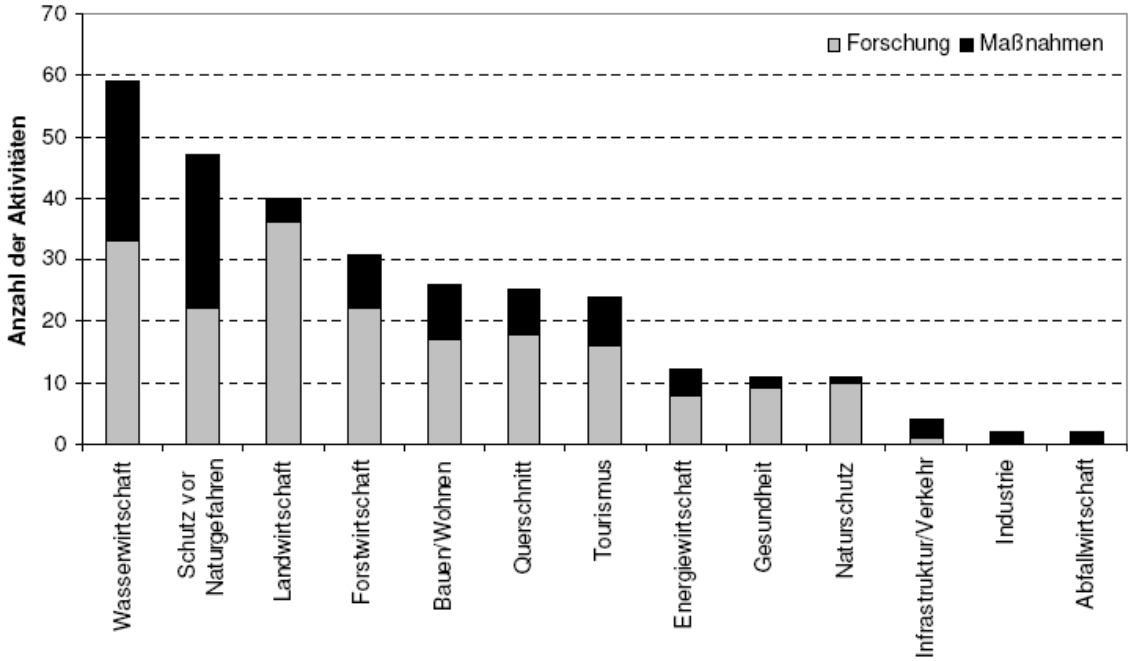
National research activities

- DK CONWOY Consequences of weather and climate changes for marine and freshwater ecosystems www
- DE KLIWA Klimaveränderung und Konsequenzen für die Wasserwirtschaft
- GLOWA-Danube; GLOWA-Elbe; AstroClim; StarClim
- SWECLIM Swedish Regional Climate Modelling Programme
- UK: Climate Change & the Demand for Water (CC:DeW); Defra Cross-Regional Project C: Water; RegIS Project: Simulating the effects of future climate and socio-economic change in East Anglia and North West England



Climate change studies Austria

Abbildung 1: Dokumentierte Anpassungsaktivitäten nach Sektoren



ASTROCLIM: Based on a survey of existing research projects and adaptation measures, the study summarizes the current information on the status of adaptation to climate change in Austria.

Source: Gingrich et al. 2008

http://www.austroclim.at/fileadmin/user_upload/reports/Endbericht_Anpassungsstudie_final.pdf

How can climate change be incorporated in river basin management plans under the WFD?

- How can our knowledge (results) be used in evaluating the impacts and vulnerability in river basins?
- Modelling – downscaling (GCM, RCM, Hydological models)
- Uncertainties
- Adaptation to climate change or Take climate change impact into account when evaluating measures

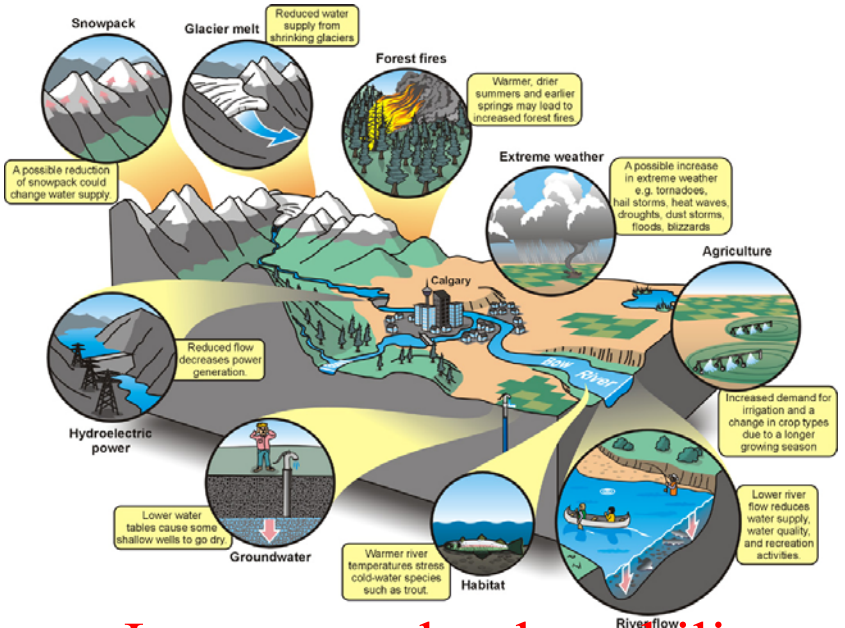
Challenges I

Climate change and water results

Science

Information
Knowledge
Modelling
Uncertainty

River Basin Management Plans



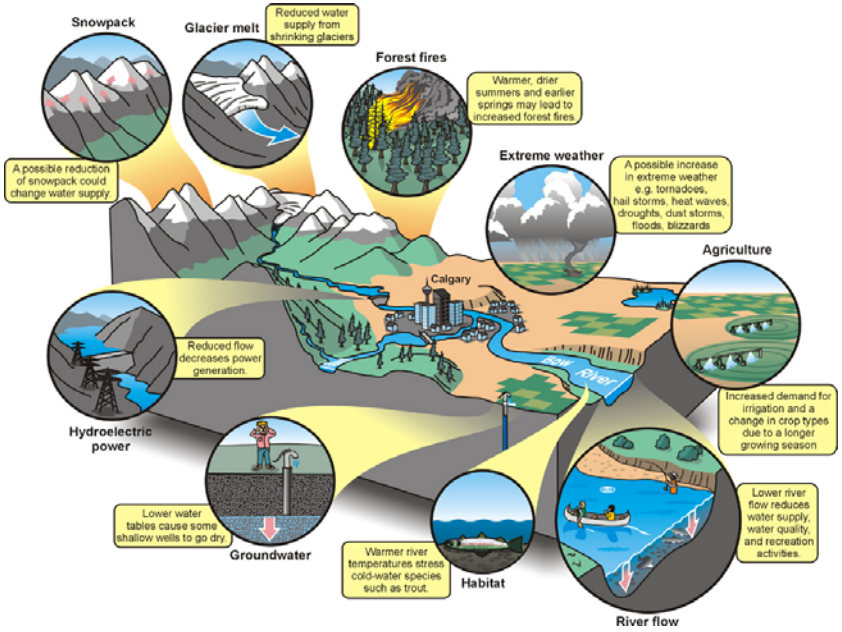
Impacts and vulnerability

Different types of integration

- Spatial & waterbodies
- Impacts (hydrology, temperature)
- Sectors (e.g. hydropower, reservoirs)

Challenges II

Impacts and vulnerability



PoMs (Program of Measures)

Adaptation to climate change

or

Take climate change impact into account in measures

- Water resource management
- Flood risk management
- Drought management plans

Conclusions

- *Water Framework Directive (WFD) is well-suited to handle the long-term implications of climate change with its step-wise and cyclical approach*.
- *Climate change can be included in several steps of the WFD implementation, such as the characterisation, the analysis of pressures and impacts, the economic analysis, monitoring, the design of the programmes of measures and the objective setting process.*