

A blurred horizontal image of a wide river, likely the Rhine, with a city skyline visible in the distance under a bright sky.

CHR Spring Seminar

Socio-Economic influences on the discharge of the River Rhine

Hans Moser, Federal Institute of Hydrology

A blurred horizontal image of a wide river, likely the Rhine, with a city skyline visible in the distance under a bright sky.

Several CHR-KHR Colloquia

Bregenz, April 2005, Extrem Floods

Würzburg, September 2007, Low Flow and Droughts

Alkmaar, Mai 2010, Advances in Flood Forecasting

Bonn, October 2010, RheinBlick 2050

The word *seminar* is derived from the Latin word *seminarium*, meaning "seed plot"

Second Order Knowledge (Peter Bieri)

Specifically, this means:

- awareness of the validity of our knowledge;
- awareness of the limits and uncertainties, especially in numerical modelling;
- awareness of the origin and genesis of our knowledge;
- source criticism and source honesty;
- awareness of the tentativeness and diversity of our knowledge;
- awareness of its relevance to practical application

Knowledge of the system...

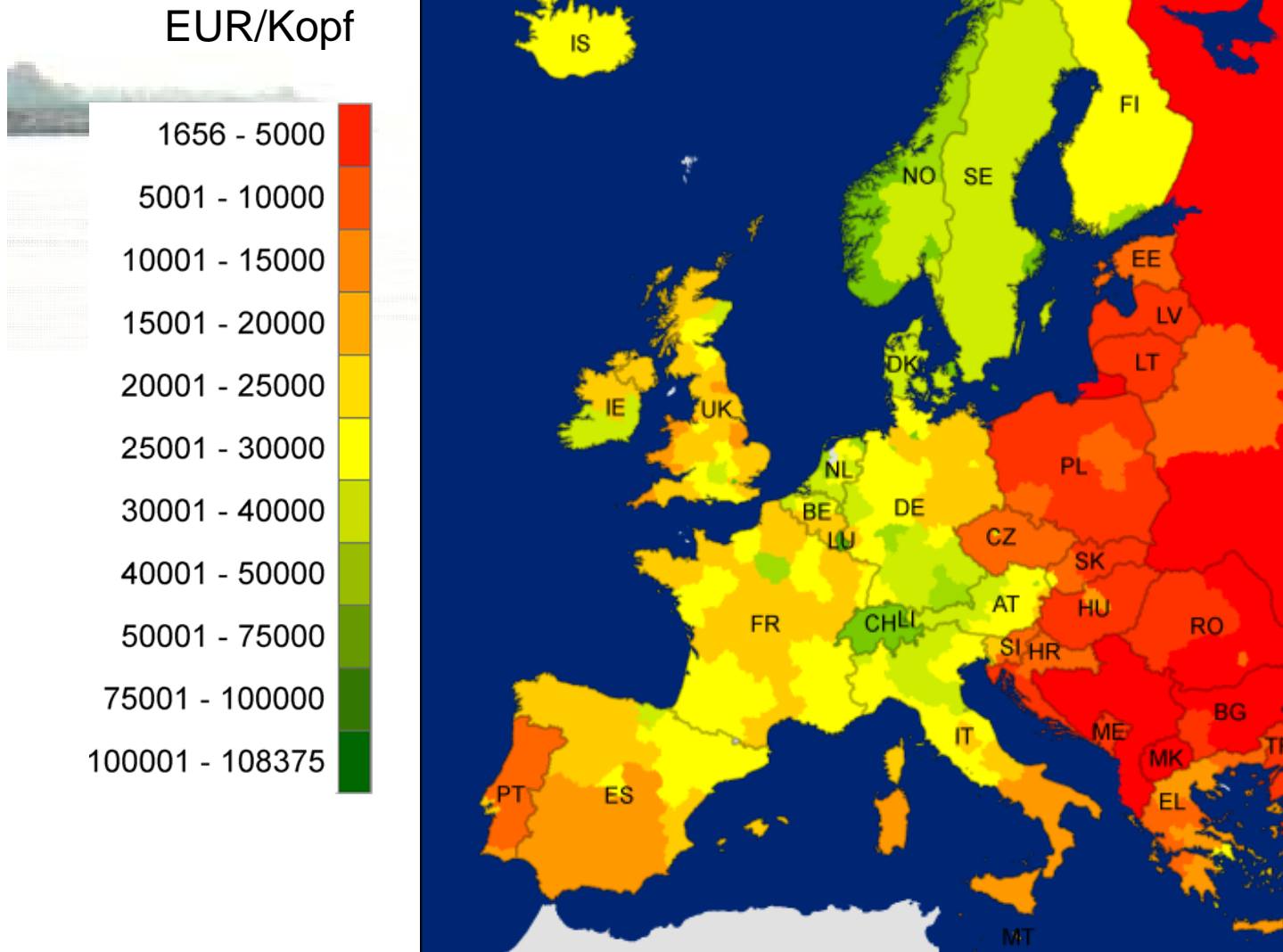


Manatees are deaf, not dumb !

... must be exhaustive !

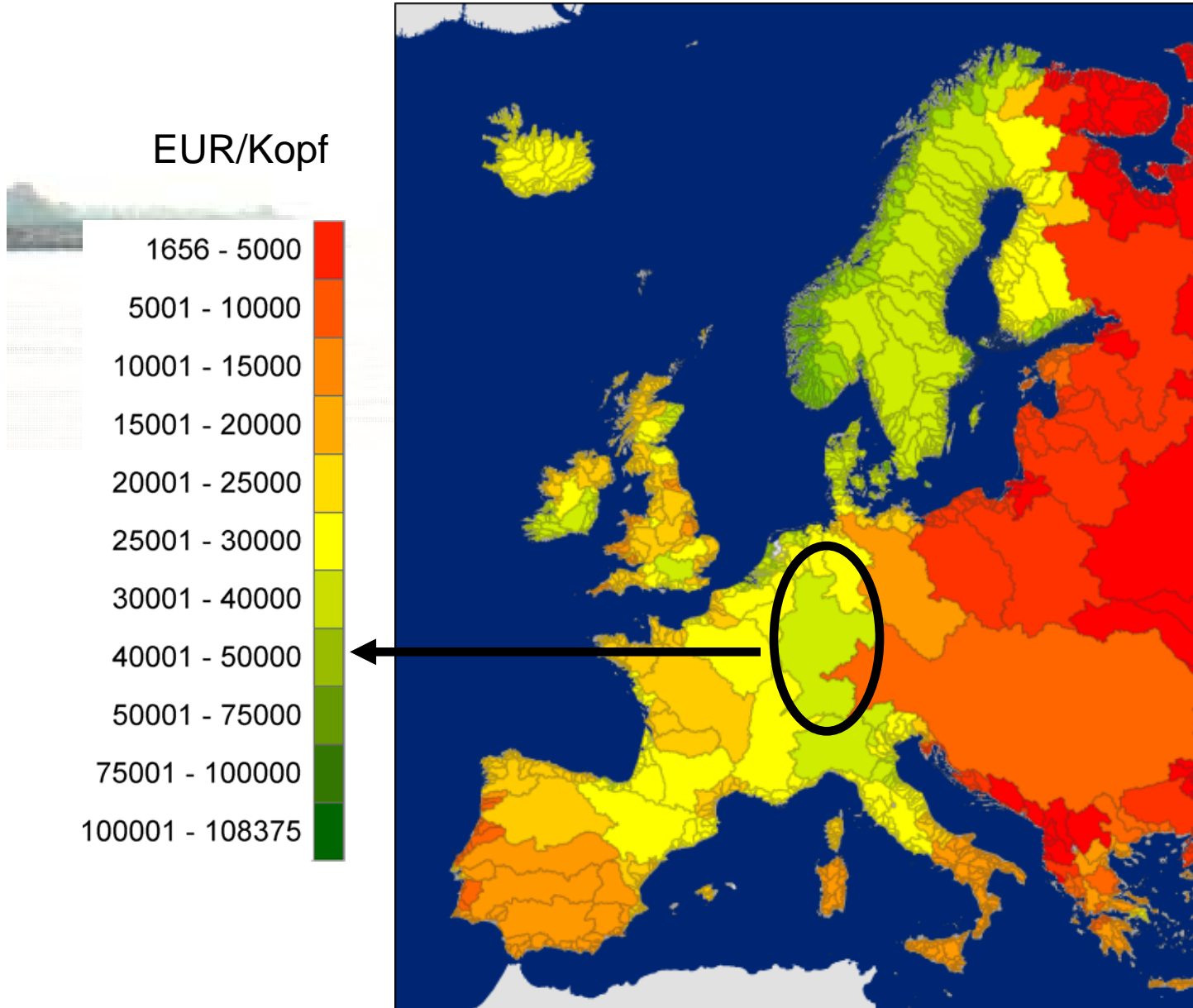


GDP per capita (2010), NUTS 2 Regions



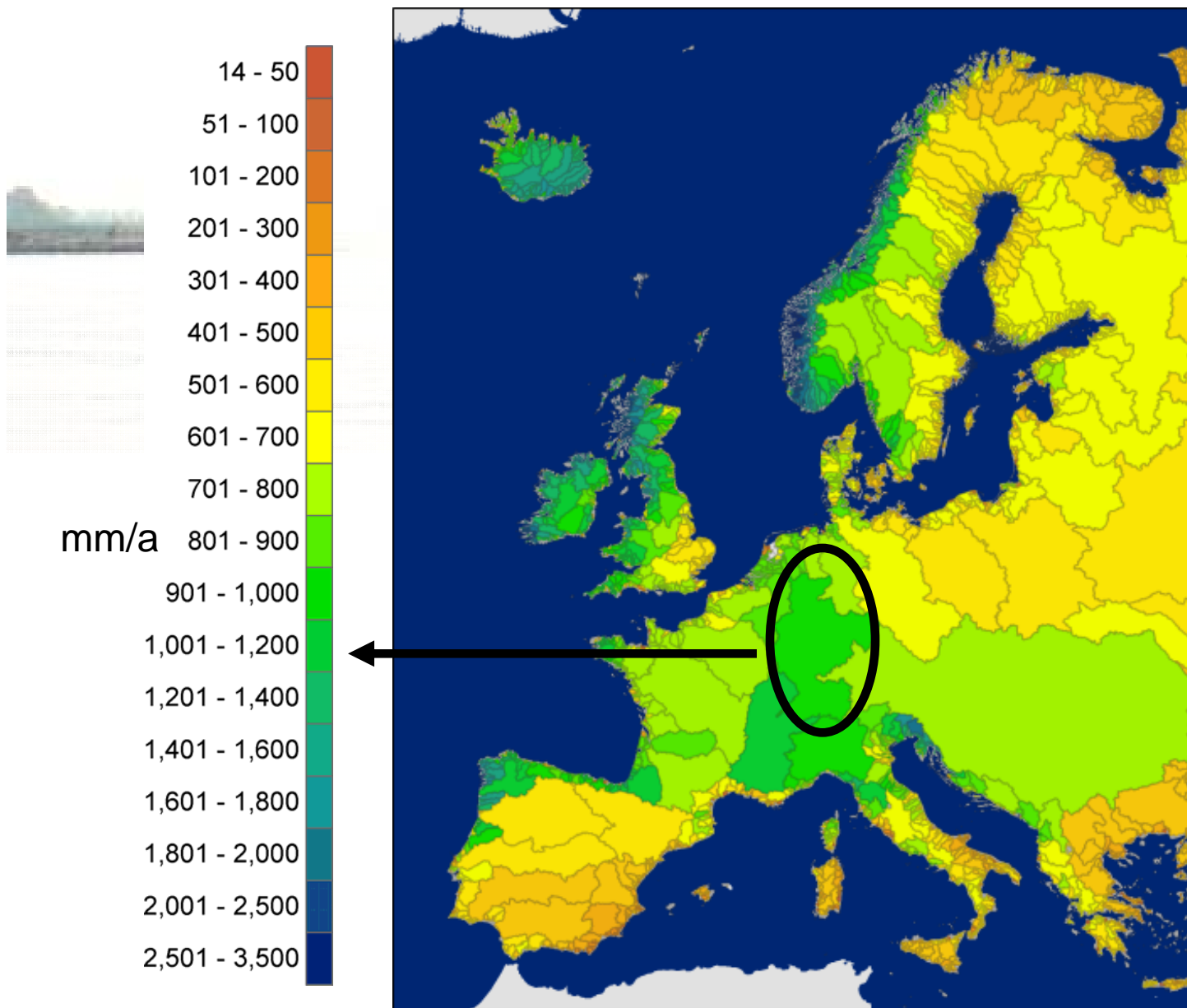
Data source: EUROSTAT

GDP per capita (2010), catchments



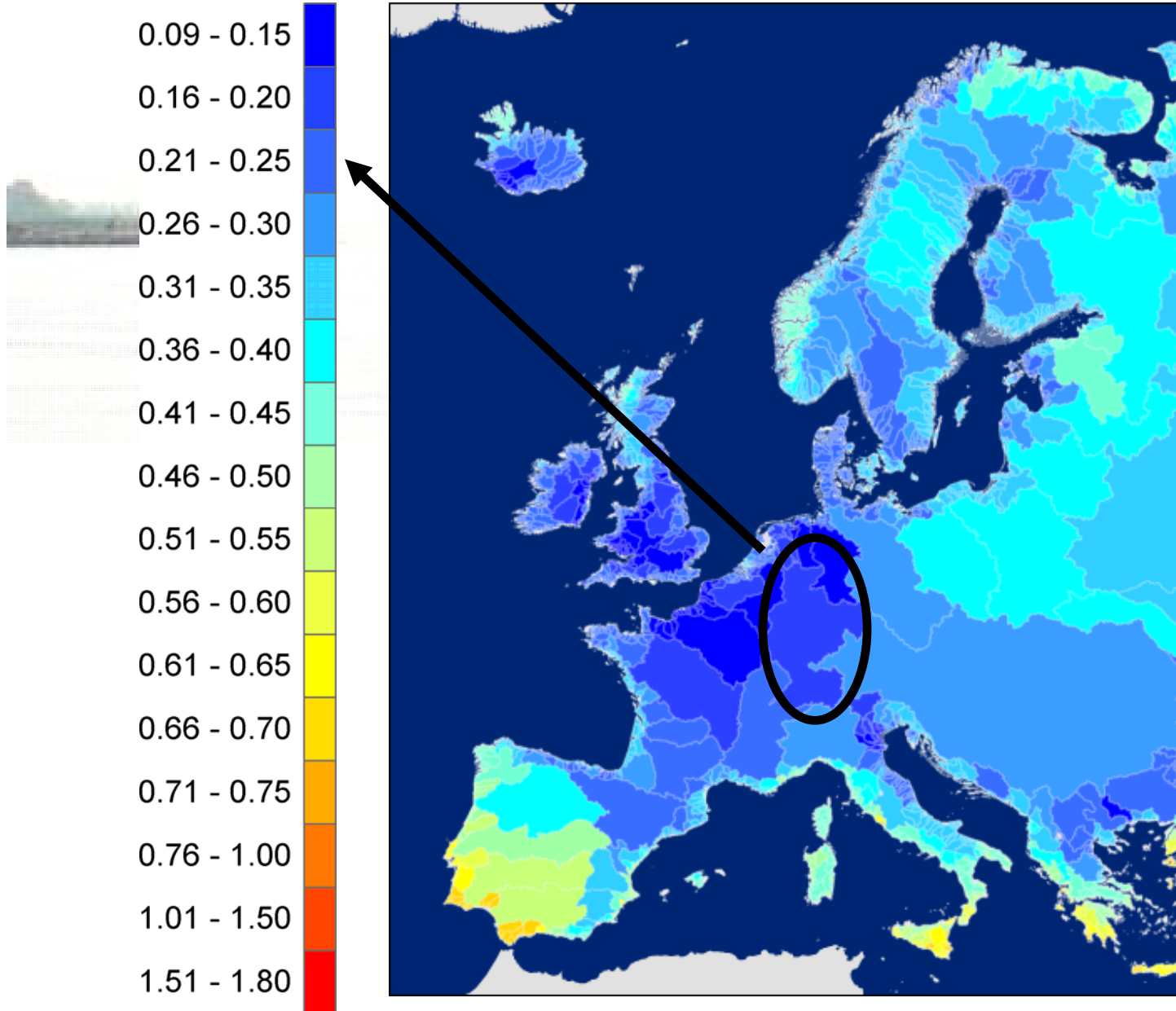
Data source: EUROSTAT

Annual precipitation amount (1981-2010), catchments



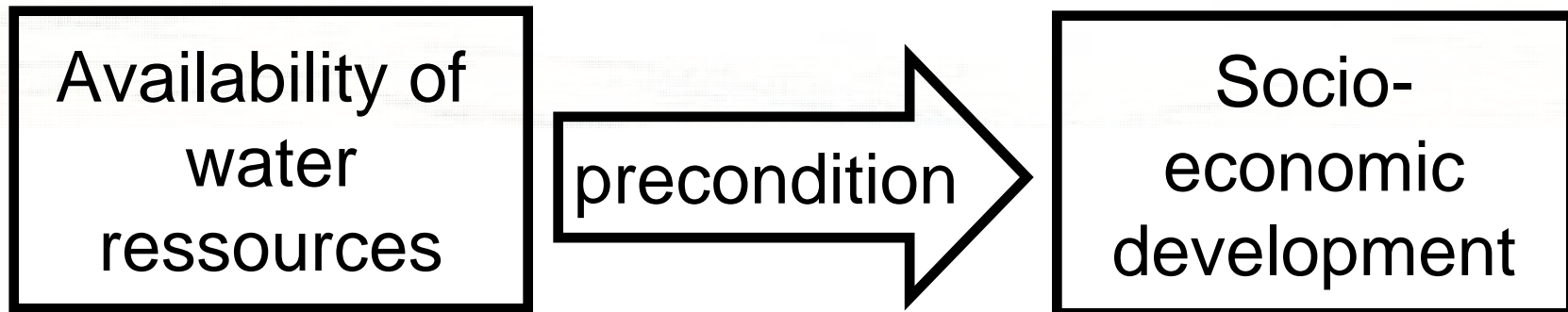
Data source: EOBS-8.0 (KNMI)

Intra annual precipitation variability (1981-2010), catchments



Data source: EOBS-8.0 (KNMI)

Determinants of development in the River Rhine Basin

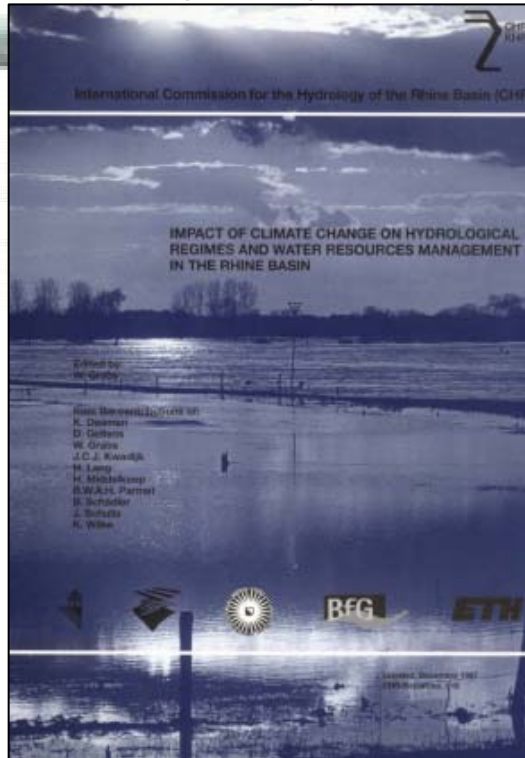


→ CHR projects on discharge regime and climate change

„Climate Change“ Reports of CHR



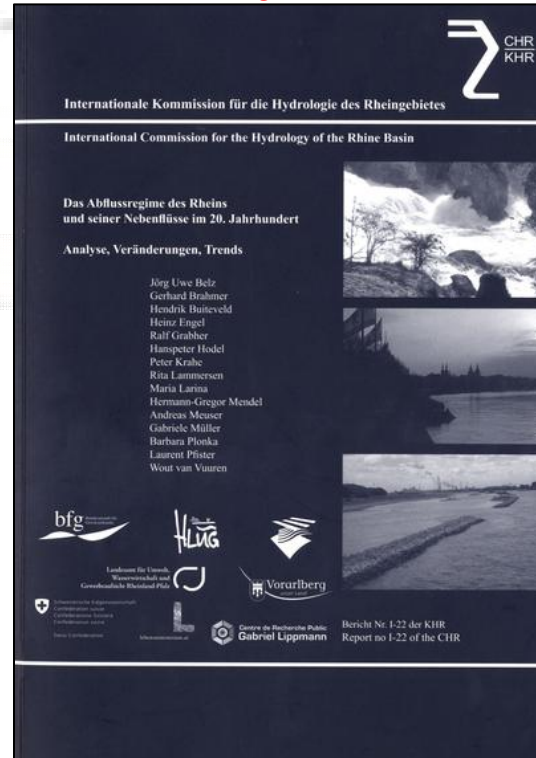
First CC impacts report



CHR report I-16
Grabs et al. (1996)

Impact of climate change on hydrological regimes and water resources management in the Rhine basin

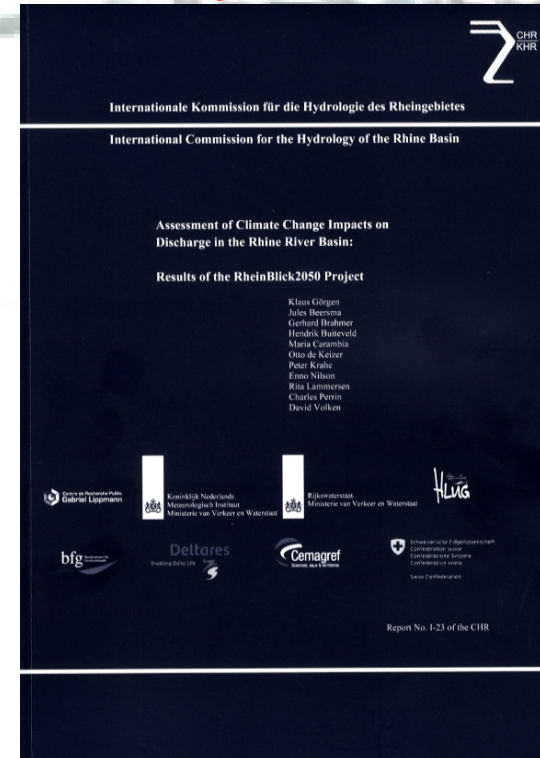
Observed changes



CHR report I-22
Belz et al. (2007)

Das Abflussregime des Rheins und seiner Nebenflüsse im 20. Jahrhundert - Analyse, Veränderungen, Trends

Future changes / RheinBlick2050



CHR report I-23
Görgen et al. (2010)

Assessment of Climate Change Impacts on Discharge in the Rhine River Basin: Results of the RheinBlick2050 project

Milestones



→ CHR 2010

<http://www.chr-khr.org>
CHR Report I-23
Internationale Kommission für die Hydrologie des Rheingebiets
International Commission for the Hydrology of the Rhine Basin

Assessment of Climate Change Impacts on Discharge in the Rhine River Basin:
Results of the RheinBlick2050 Project

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See also the RheinBlick2050 Project Group page for further contributors and members.

Report No. I-23 of the CHR
© 2010, CHR
ISSN 078-90-7090-35-1

→ ICPR 2011

<http://www.icpr.org>
ICPR Report 188

Study of Scenarios for the Discharge Regime of the Rhine
state: April 2011

Internationale Kommission zum Schutz des Rheins
Commission Internationale pour la Protection du Rhin
Internationale Commissie ter Bescherming van de Rijn

Report No. 188

→ Conference of Rhine Ministers 2013

2013 Ministerial Declaration
Internationale Kommission zum Schutz des Rheins
Commission Internationale pour la Protection du Rhin
Internationale Commissie ter Bescherming van de Rijn

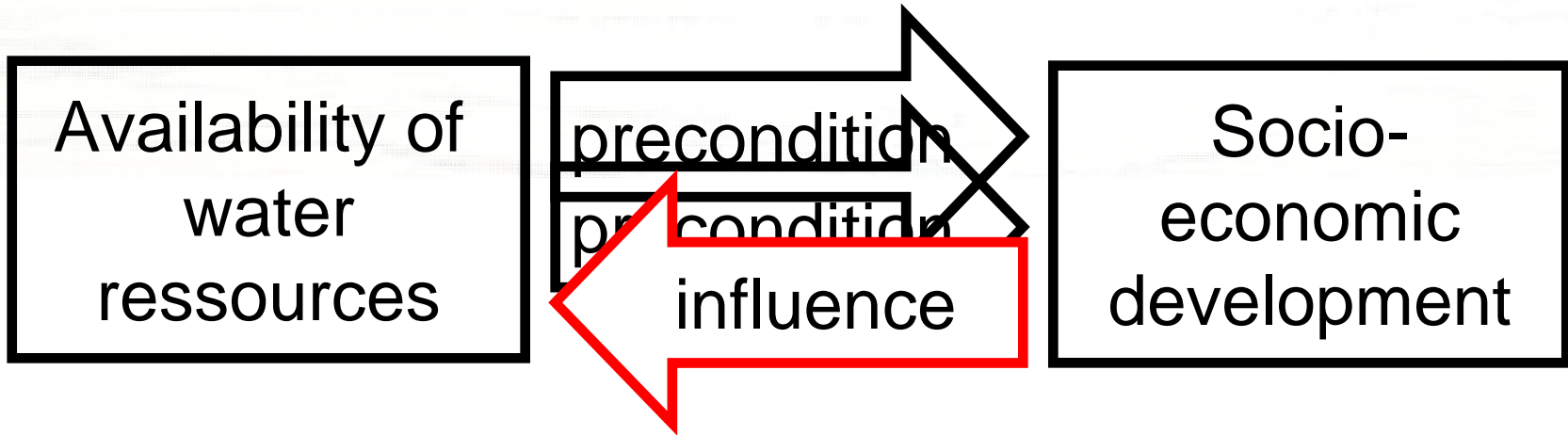
<http://www.icpr.org>
Conferences of ministers

15th Conference of Rhine Ministers
Communiqué of Ministers
28th October 2013, Basel

2013 EN Ministerial Declaration 1

Next: "The Ministers and the Representative of the European Commission ask the ICPR to draft a preliminary ICPR climate adaptation strategy for the Rhine [...]" (no. 41a in the communiqué of Ministers)

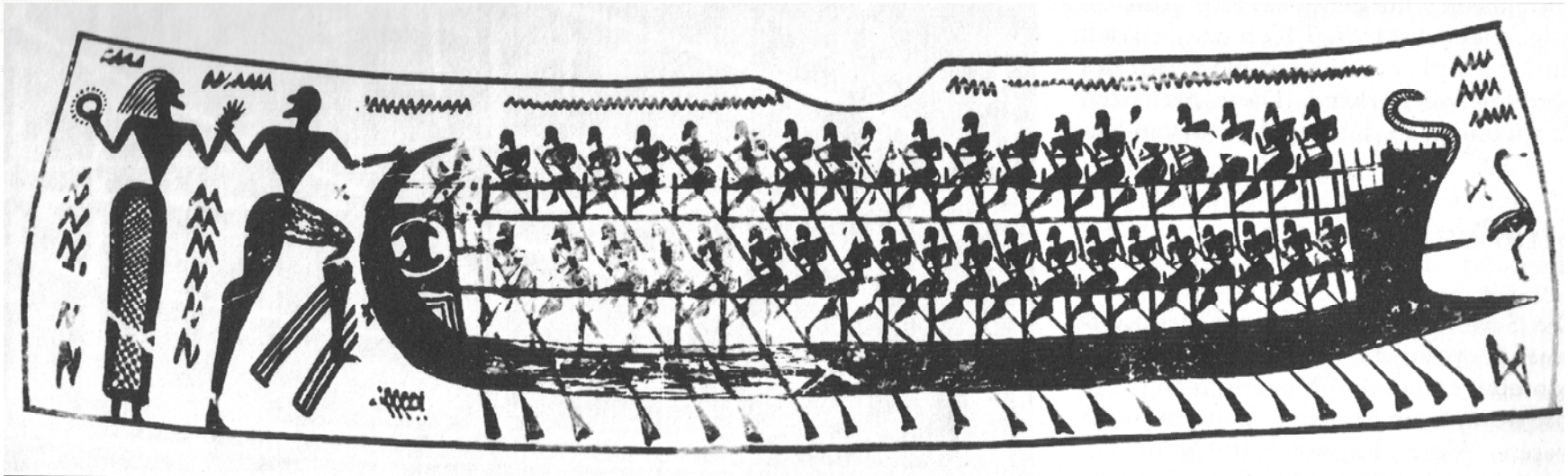
Determinants of development in the River Rhine Basin



→ CHR projects on discharge regime and climate change

← CHR spring seminar 2014

Was ist eigentlich ein Problem ?



Quelle: Karl Schefold, Frühgriechische Sagenbilder, Hirmer Verlag München 1964

Was ist eigentlich ein Problem ?



Dorthin möcht' ich, wo waldiger Küstenvorsprung,
Von Wogen umspült, sich hebt,
unter Sunions hohen Fels,
heilige Stadt Athen,
Dich von ferne zu grüßen!



γενοίμαν, ἔν' ὑλᾶεν ἔπεστι πόντου
| πρόβλημ' ἀλίκλυστον, ἄ-
| κραν ὑπὸ πλάκα Σουνίου,
| τὰς ἱερὰς ὅπως
προσείποιμεν Ἀθάνας.

Quelle: Sophokles Werke, „Rasender Ajas“, Verlag Wilhelm Engelmann Leipzig 1851

Was ist eigentlich ein Problem ?



O wär ich, wo waldreich überm Meere das
Vorgebirg, [*πρόβλημα*] das umwogte, ragt
unter Sunions hohem Fels,
daß wir die heil'ge Stadt Athen
wieder begrüßten.

Quelle: Roland Reuß, „Ende der Hypnose“, Stroemfeld Verlag Frankfurt am Main 2012

Today



- Session 1: Background: natural water resources in the past, present, and future
- Session 2: Scenarios: development and use
- Session 3: Sectors: Energy, Industry, Domestic water demand
- Session 4: Sectors: Agriculture, Forestry, Shipping, and Econological functions
- Dinner at Hotel Schwärzler

Tomorrow



- Session 5:
 - Keynote on data and modeling aspects
 - Summary of sessions 1-4
 - Going forward: Knowledge gaps, future initiatives/projects



RheinBlick2050

Assessment of regional climate change impacts on discharge in the Rhine River Basin

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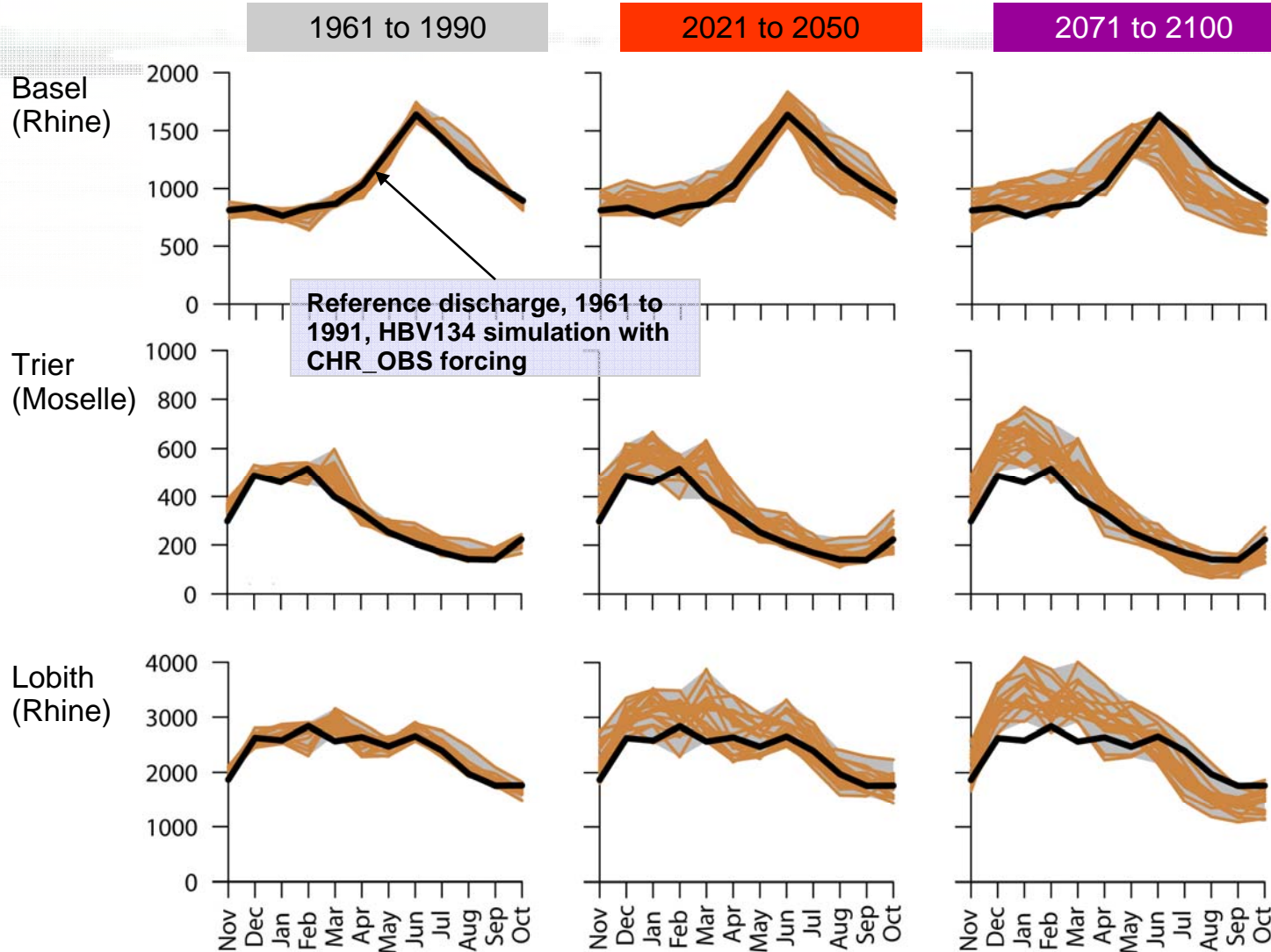
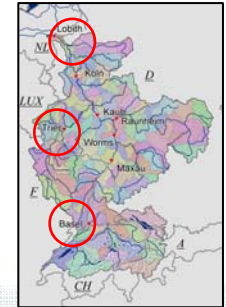
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D. Volken  Schweizerische Eidgenossenschaft
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Discharge Regime

MQ [m³/s], 30-year long-term monthly mean discharge, annual cycles, Nov-Oct

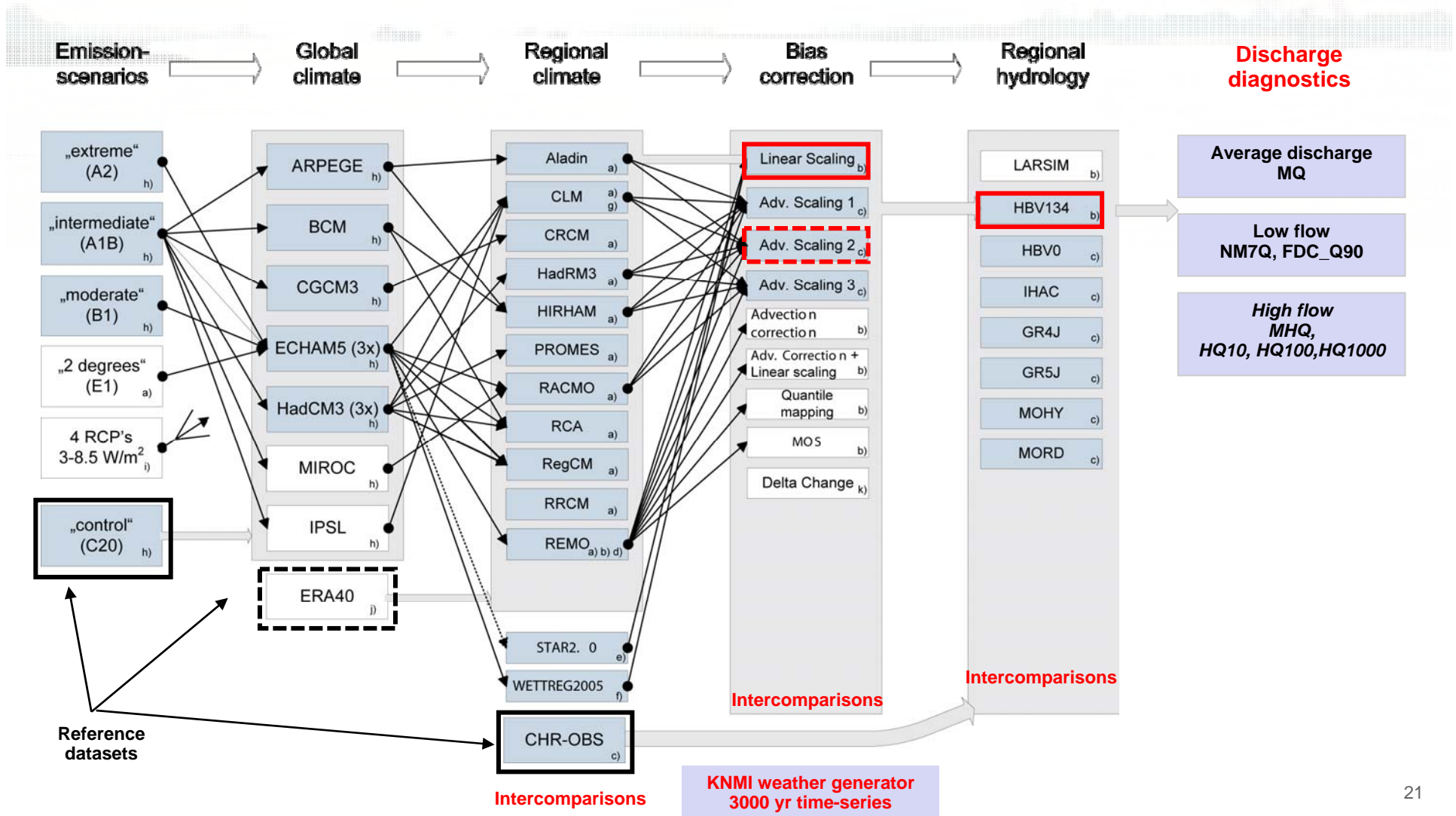


More rainfall in Wi
Less snowcover /
-storage
Shift in regime

Westerly flow
Adv. lows in Wi
More rainfall in Wi
Less rainfall in Su

Combined effects
Clear change signal

Research framework



Discharge Regime

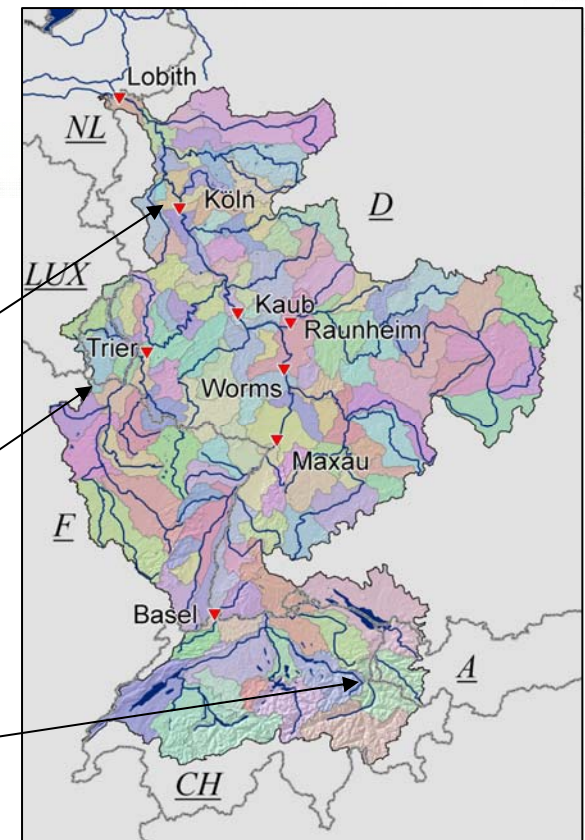
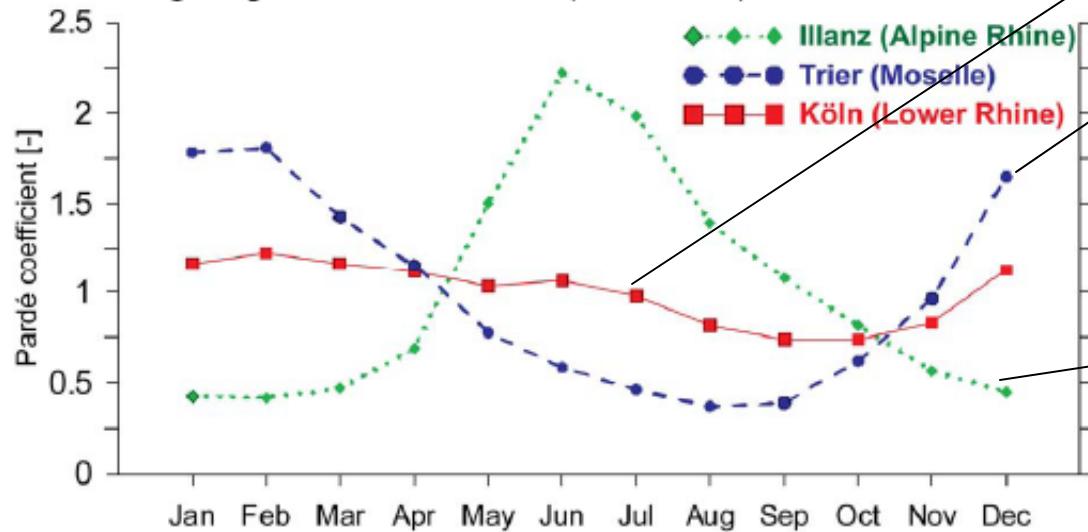


Rhine at Lobith:

160 800 km²

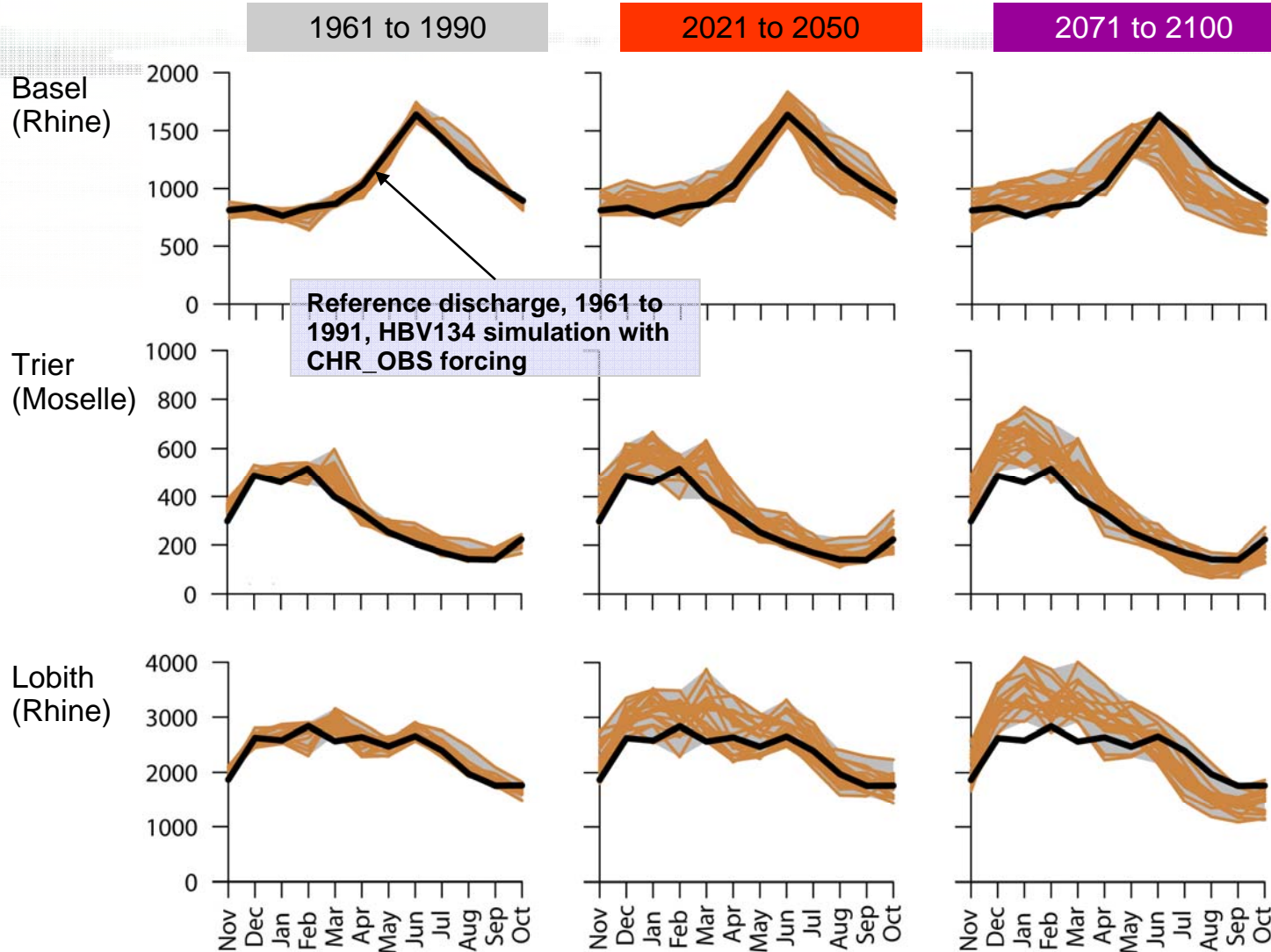
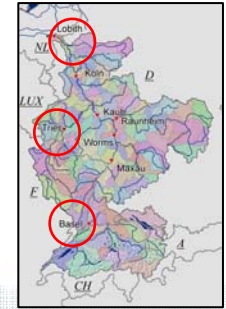
MQ = 2 200 m³/s

Typical discharge regimes of River Rhine (1951-2000)



Discharge Regime

MQ [m³/s], 30-year long-term monthly mean discharge, annual cycles, Nov-Oct



More rainfall in Wi
Less snowcover /
-storage
Shift in regime

Westerly flow
Adv. lows in Wi
More rainfall in Wi
Less rainfall in Su

Combined effects
Clear change signal



Thank you!

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