



Models and Strategies for a Sustainable River Basin Management



Frank Wechsung, PIK



- 1. GLOWA-Elbe: Two Topics for One Basin in Three Phases**
2. Principal Approach
3. Challenges for GLOWA-Elbe
4. Product Line
5. Our Invitation to You

1. GLOWA-Elbe: ...



General Objective:

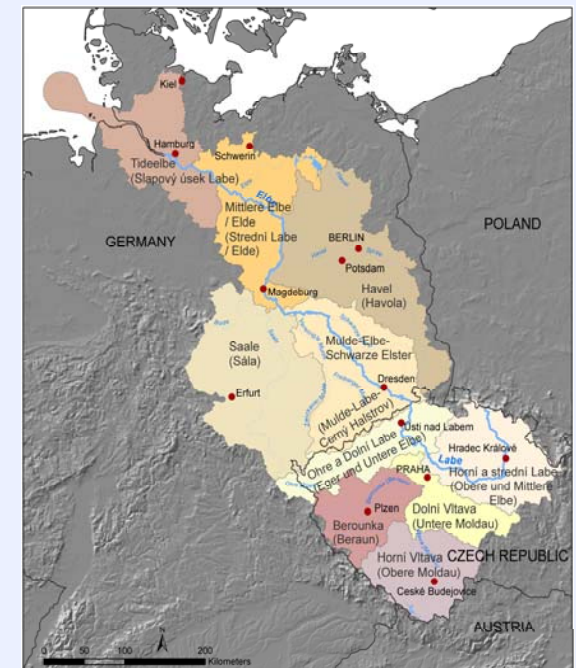
Adjustment of water management strategies to global change

Topics:

- Surface water quality
- Surface water quantity

Phases:

1. 2000-2003 Exploration of the basin
2. 2004-2007 Solutions for the basin
3. 2007-2010 Transfer of Tools (confirmed by BMBF)
involving Czech partners and institutions



1. Two Topics for One Basin in Three Phases

2. Principal Approach

3. Challenges for GLOWA-Elbe

4. Product Line

5. Our Invitation to You

2. Principal Approach



1

Scenario

2

Indicators & criteria

3

Impact

4

Evaluation

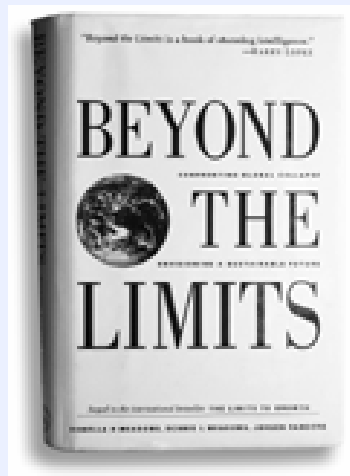
Addressing Society Deficits

- Perception
- Evaluation
- Objectivity

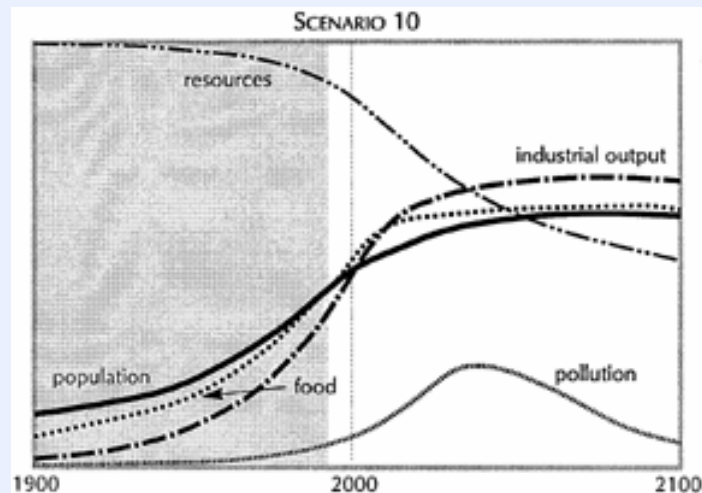
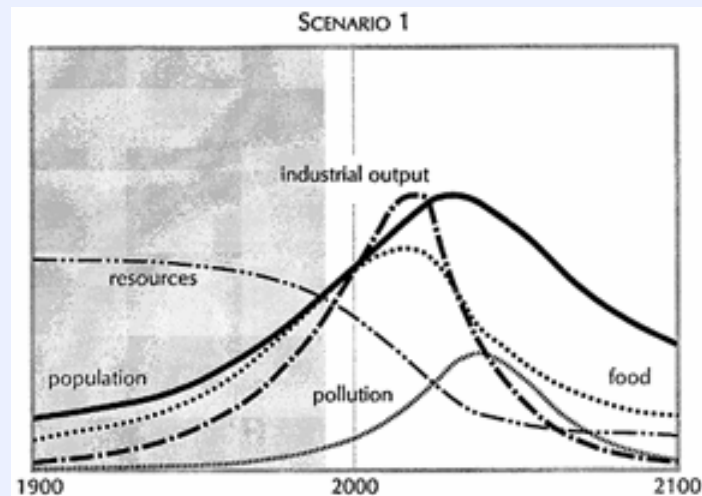
for Sustainable Development

1. GLOWA-Elbe: Two Topics for One Basin in Three Phases
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3. **Challenges for GLOWA-Elbe**
4. Product Line
5. Our Invitation to You

3. Challenges ... – Beyond the limits



by
Donella H.
Meadows,
Dennis L.
Meadows, and
Jorgen Randers



3. Challenges ... - Uncertainty



Beside others ...

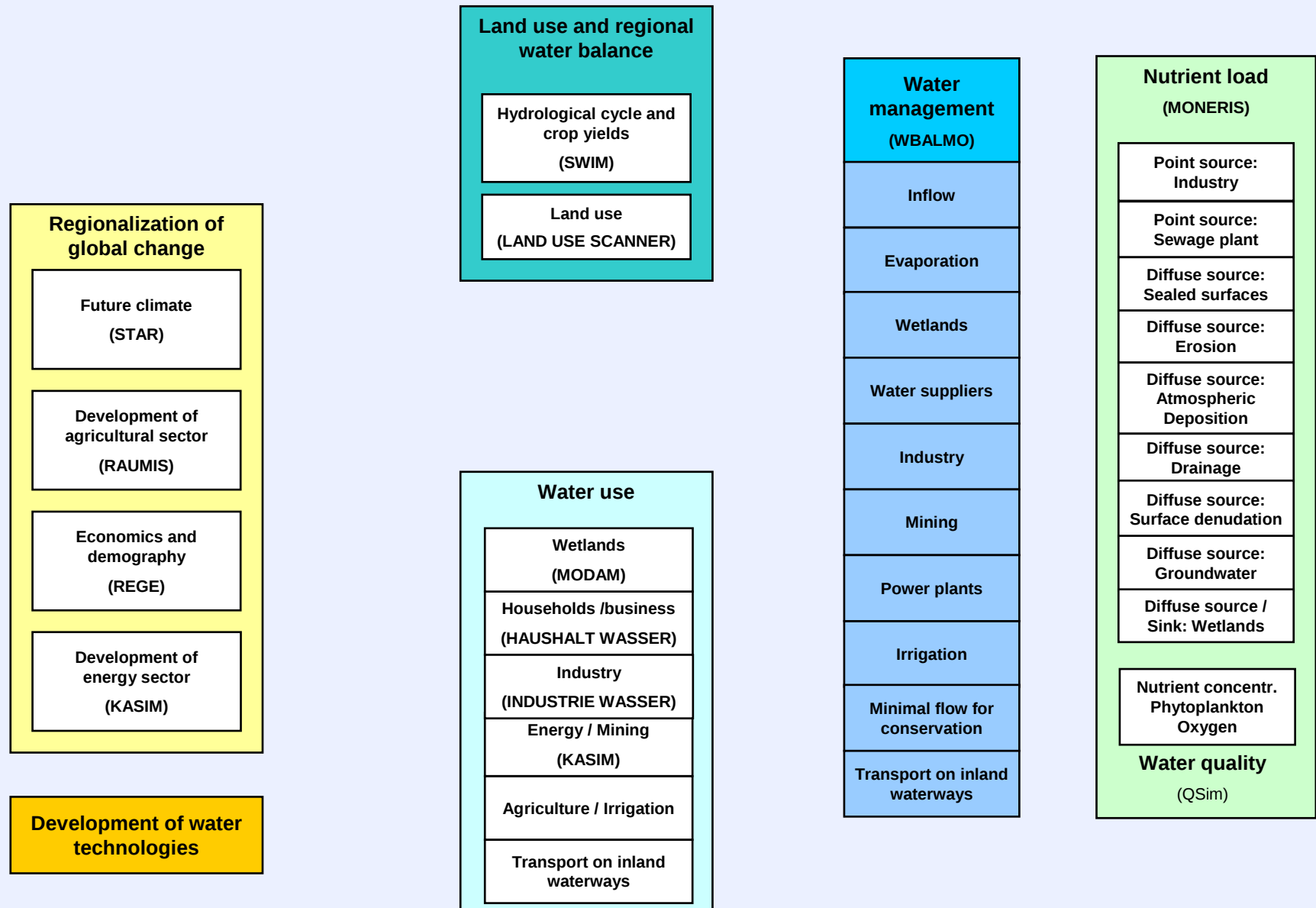
- ‚Wet‘ or ‚Dry‘ climate change ?
- Discounting of future benefits ?

(typical between 3 and 5%, Nordhaus 0.1 %)

→ Adaptation strategies have to be beneficial in the near future under current and future climate

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- 4. Product Line**
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4. Product line – Boxes of the modelling system



4. Product line – Regionalisation of global change



Regionalization of global change

Future climate
(STAR)

Development of
agricultural sector
(RAUMIS)

Economics and
demography
(REGE)

Development of
energy sector
(KASIM)

Development of water
technologies

Land use and regional water balance

Hydrological cycle and
crop yields
(SWIM)

Land use
(LAND USE SCANNER)

Water use

Wetlands
(MODAM)

Households /business
(HAUSHALT WASSER)

Industry
(INDUSTRIE WASSER)

Energy / Mining
(KASIM)

Agriculture / Irrigation

Transport on inland
waterways

Water management (WBALMO)

Inflow

Evaporation

Wetlands

Water suppliers

Industry

Mining

Power plants

Irrigation

Minimal flow for
conservation

Transport on inland
waterways

Nutrient load (MONERIS)

Point source:
Industry

Point source:
Sewage plant

Diffuse source:
Sealed surfaces

Diffuse source:
Erosion

Diffuse source:
Atmospheric
Deposition

Diffuse source:
Drainage

Diffuse source:
Surface denudation

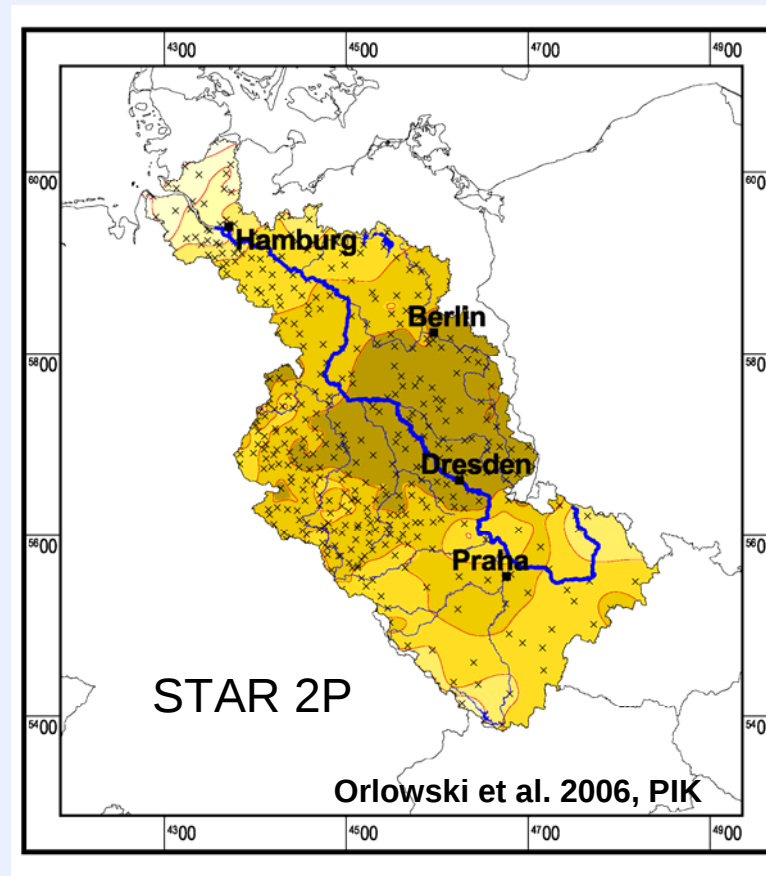
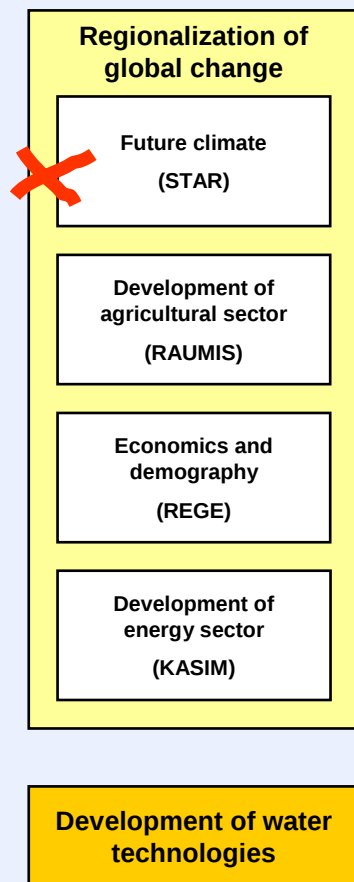
Diffuse source:
Groundwater

Diffuse source /
Sink: Wetlands

Nutrient concentr.
Phytoplankton
Oxygen

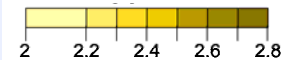
Water quality
(QSim)

4. Product line – Climate – Elbe STAR2P



Change in mean yearly temperature [K°]

2046/55-1951/2003



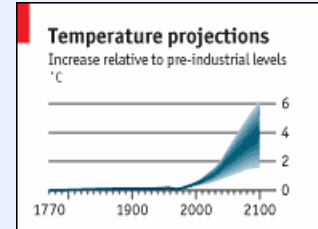
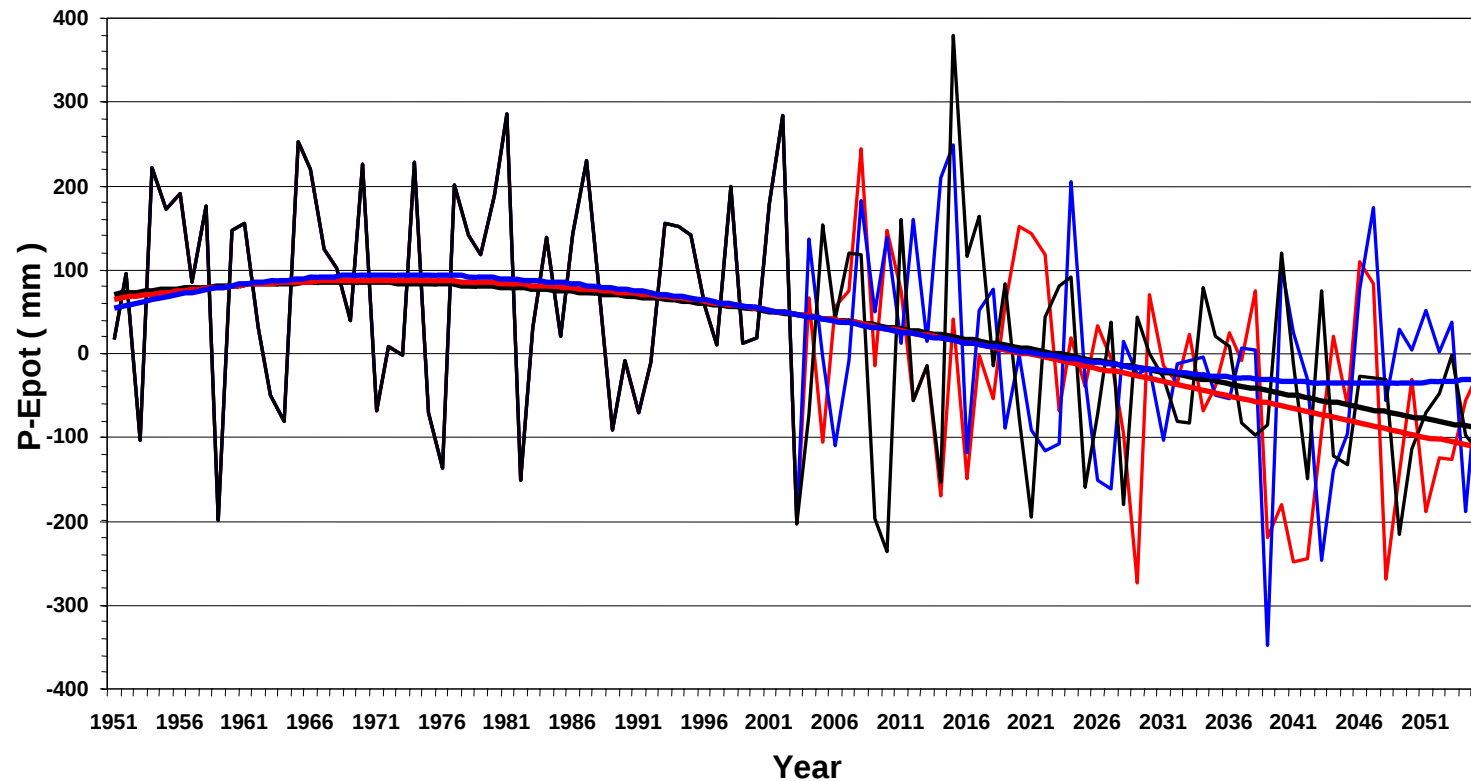
(831 German and Czech stations)

Meteorologische Sta

4. Product line – Climate – Elbe STAR2P



Yearly mean of the climatic water balance (P-Epot) for the Elbe basin, 1951 - 2055
Three of hundred realisations: **Dry**, Median, **Wet**

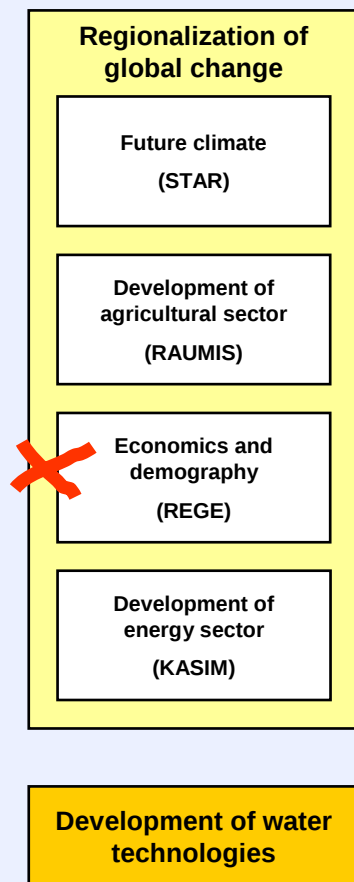


Werner et al. 2006, PIK

4. Product line – Climate – Elbe REGE

**A1: Globalisation,
,open society‘**

**B2: Regionalisation
,niche society‘**



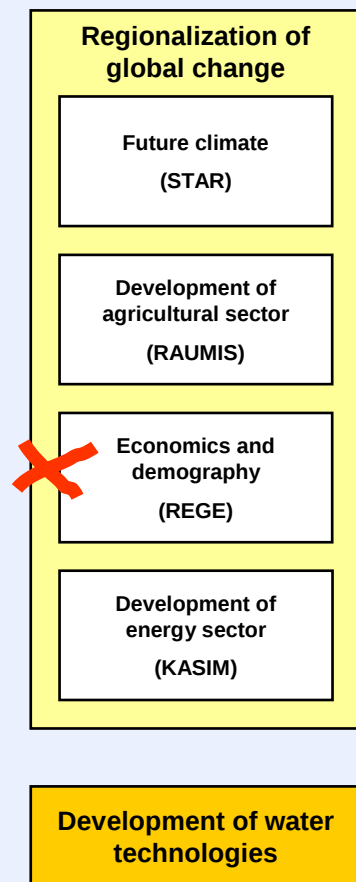
Germany J. Blazejczak et al. 2006, DIW	2004	2020		2020/2004	
		A1	B2	A1	B2
		in Pct per year			
Population 10^6 Persons	82,5	84,0	83,4	0,1	0,1
Labour Force 10^6 Persons	43,3	46,2	45,9	0,4	0,4
Persons Employed 10^6 Persons	38,9	44,5	42,9	0,8	0,6
Unemployed 10^6 Persons	4,4	1,7	3,0		
Unemployment Rate Percent	10,1	3,8	6,6		
GDP Volume in 10^9	2110,3	2897,0	2677,9	2,0	1,5
Productivity in 10^3 per person	54,3	65,1	62,4	1,1	0,9

Czech Rep.	2004	2020		2020/2004	
		A1	B2	A1	B2
		in Pct per year			
Population 10^6 Persons	10,2	10,4	9,9	0,1	-0,2
Labour Force 10^6 Persons	5,1	5,4	5,0	0,3	-0,1
Persons Employed 10^6 Persons	4,7	5,2	4,7	0,7	-0,1
Unemployed 10^6 Persons	0,4	0,2	0,4		
Unemployment Rate Percent	8,3	3,1	7,4		
GDP Volume in 10^9 CZK	2467,6	4914,6	3663,2	4,4	2,5
Productivity in 10^3 CZK per person	524,4	940,8	784,9	3,7	2,6

4. Product line – Climate – Elbe REGE



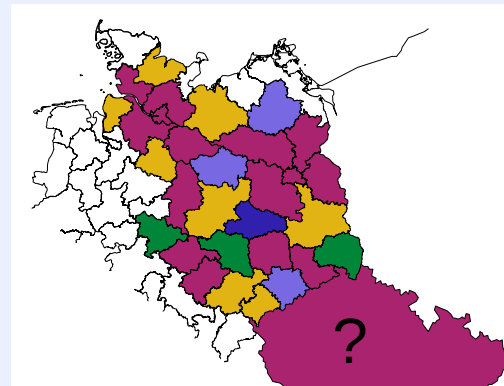
Regional Employment 2004 – 2020



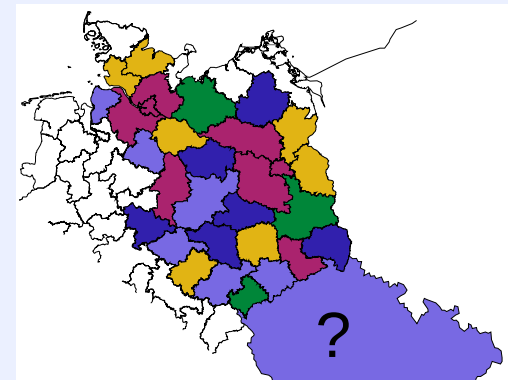
A1: Globalisation, 'open society'

B2: Regionalisation, 'niche society'

Changes in Percent



J. Blazejczak et al. 2006, DIW



4. Product line – Climate – Elbe IKARUS KASIM

Regionalization of global change

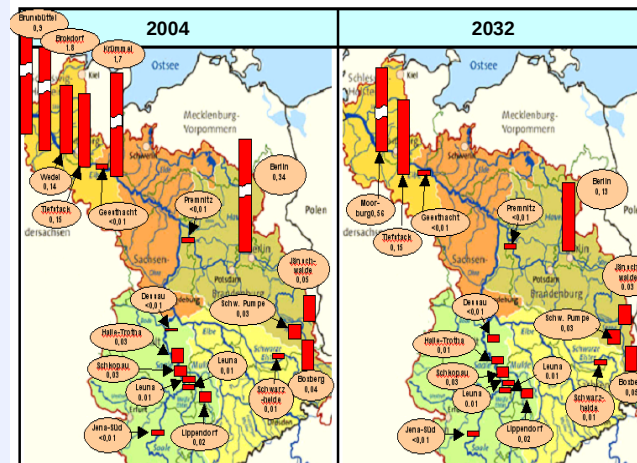
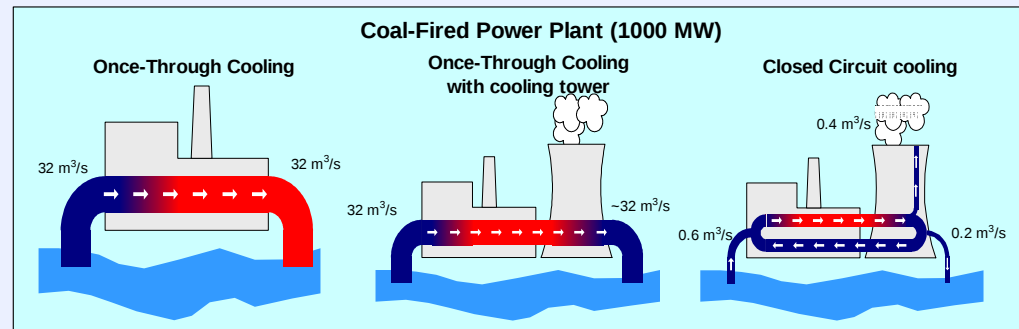
Future climate
(STAR)

Development of
agricultural sector
(RAUMIS)

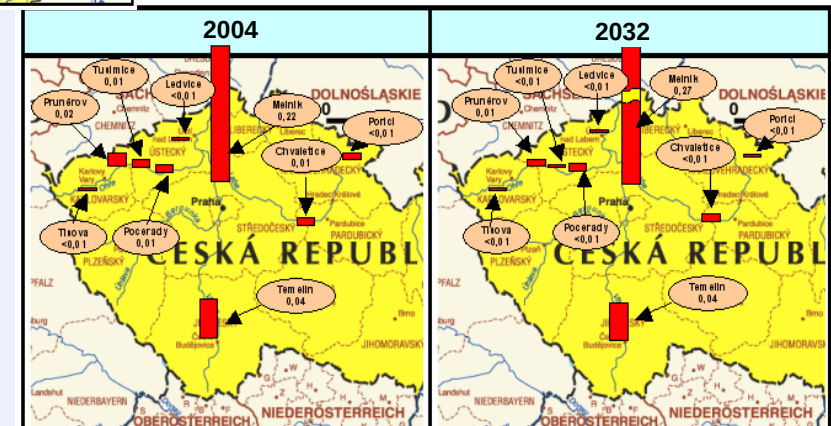
Economics and
demography
(REGE)

X Development of
energy sector
(KASIM)

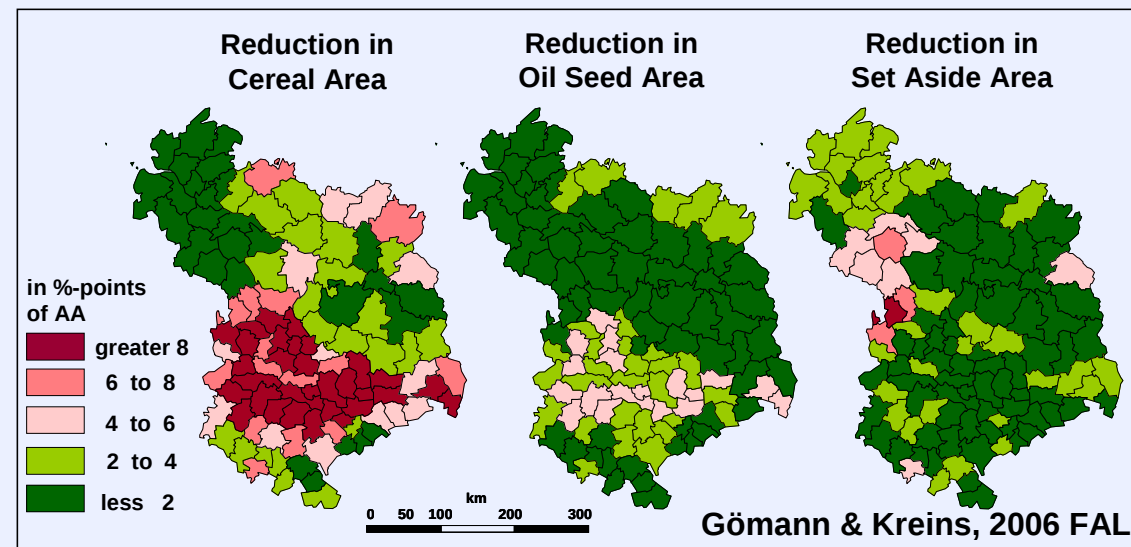
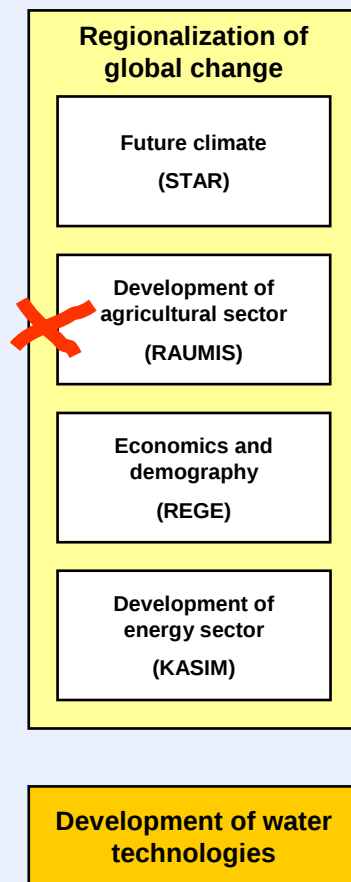
Development of water
technologies



Vögele & Markewitz 2006, FZ Jülich

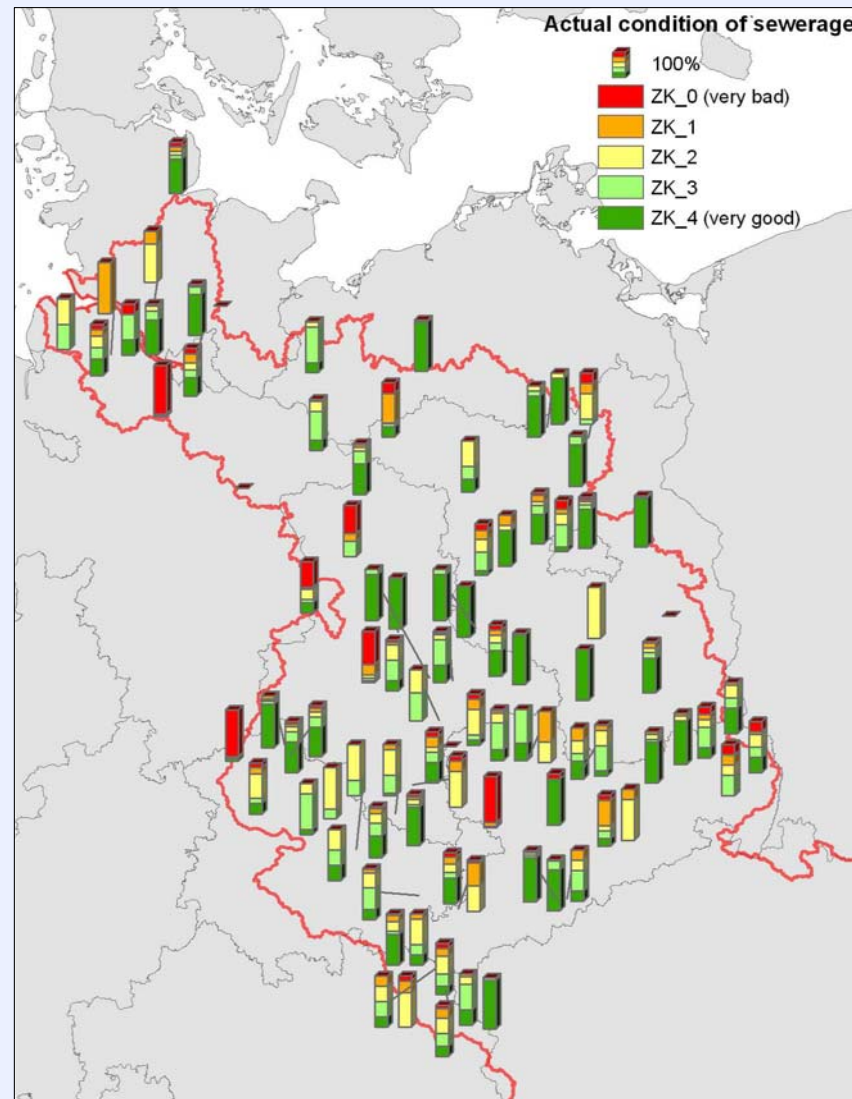
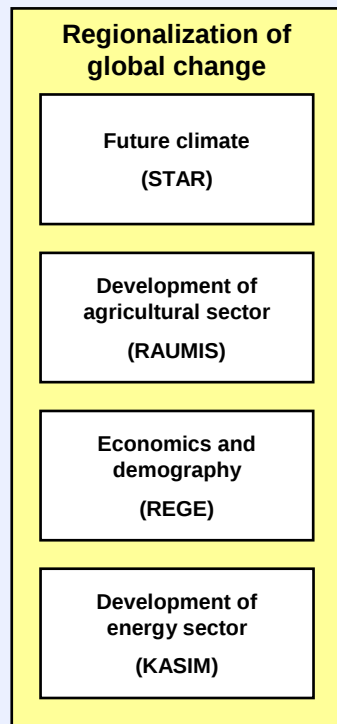


4. Product line – Climate – Elbe RAUMIS



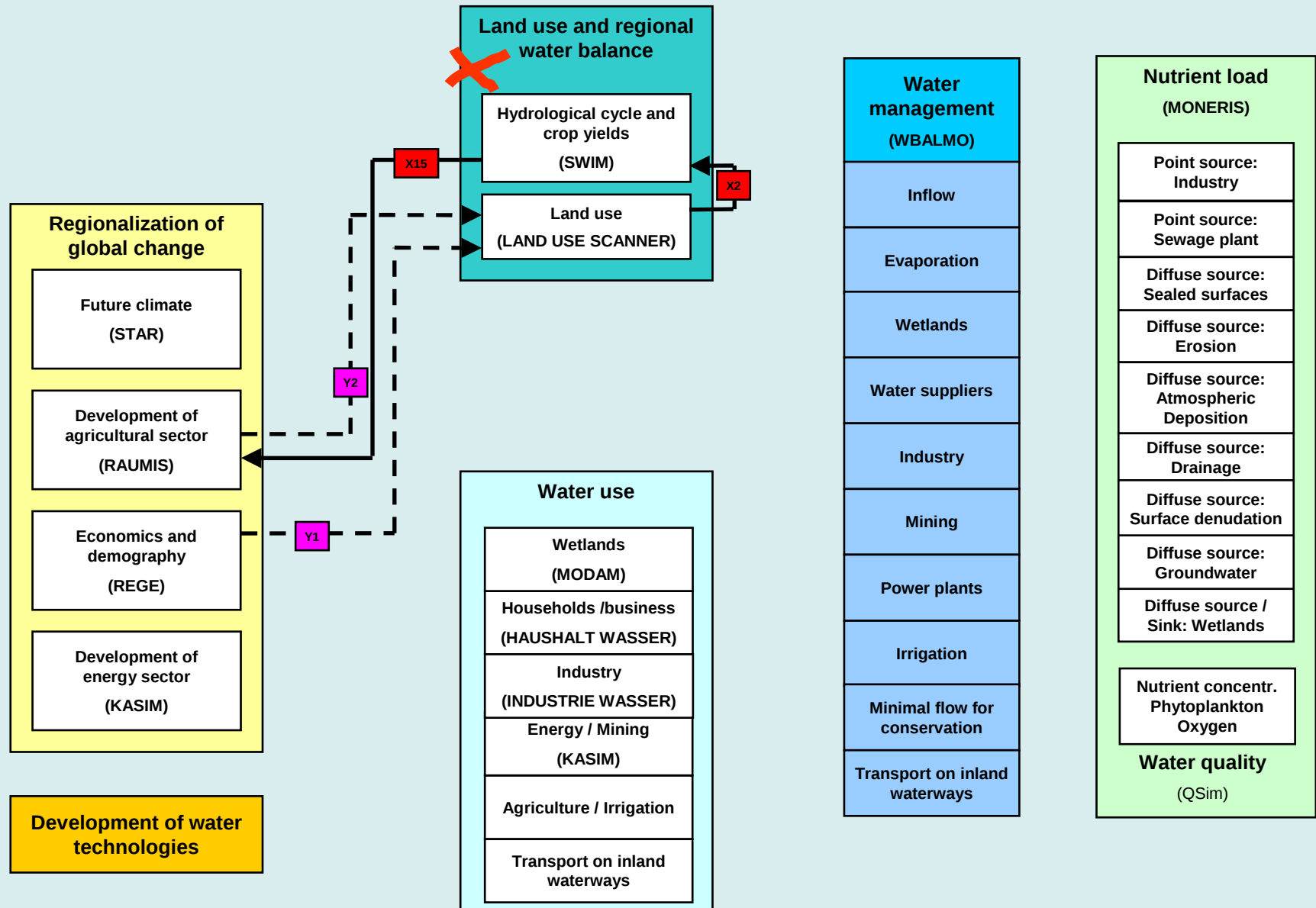
Impact of Germany's renewable Energy law

4. Product line – Climate – Water technologies



Walz et al. 2006, ISI

4. Product line – Land use and regional water balance



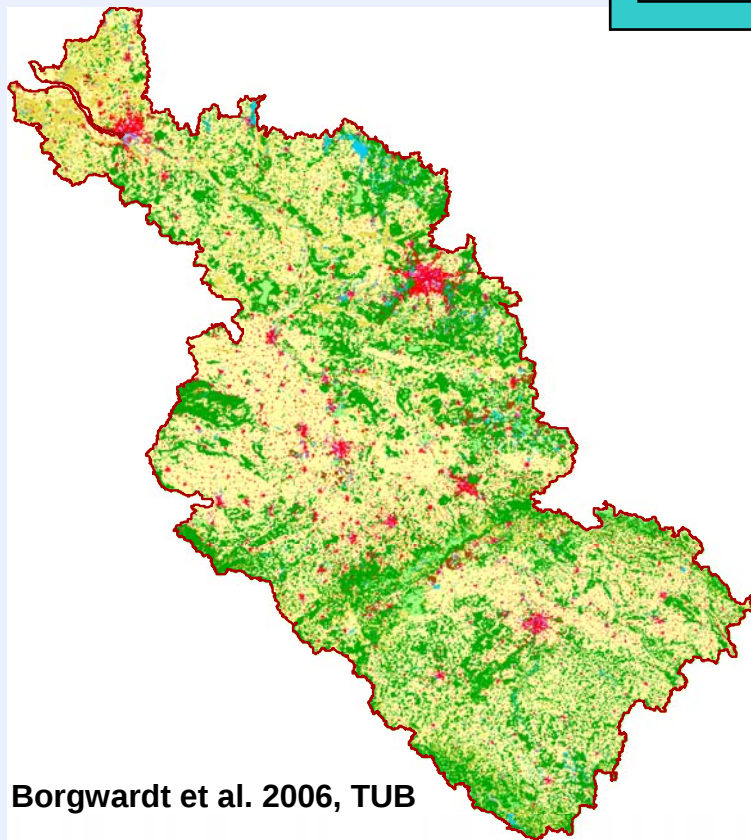
4. Product line – Elbe - Land use scanner



Land use and regional water balance

Hydrological cycle and crop yields
(SWIM)

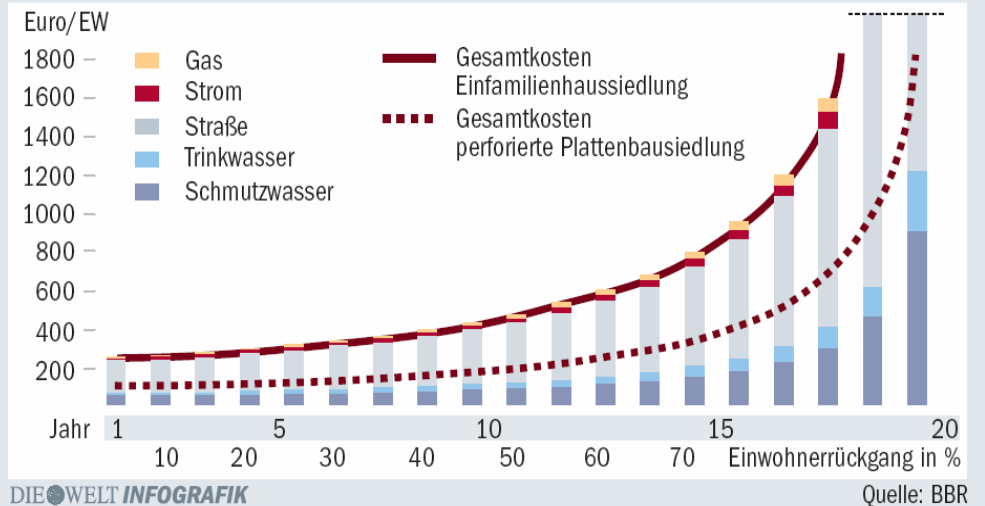
 Land use
(LAND USE SCANNER)



Borgwardt et al. 2006, TUB

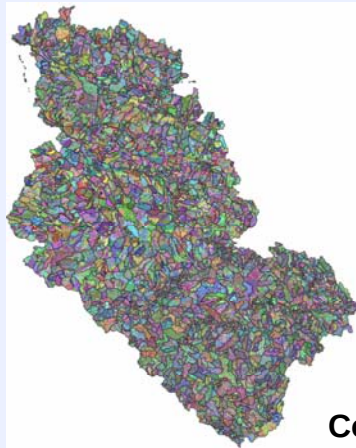
Infrastrukturkosten

in Euro je Einwohner

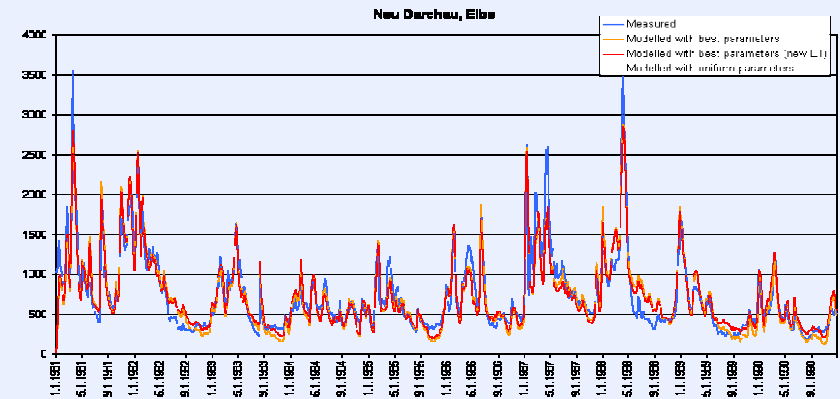
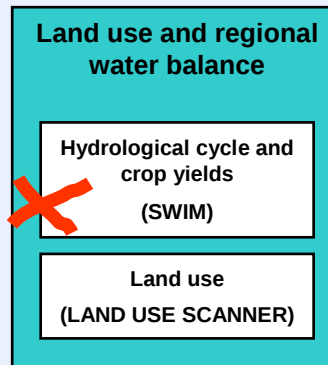


Die Welt, 7.12.2006, S. 24

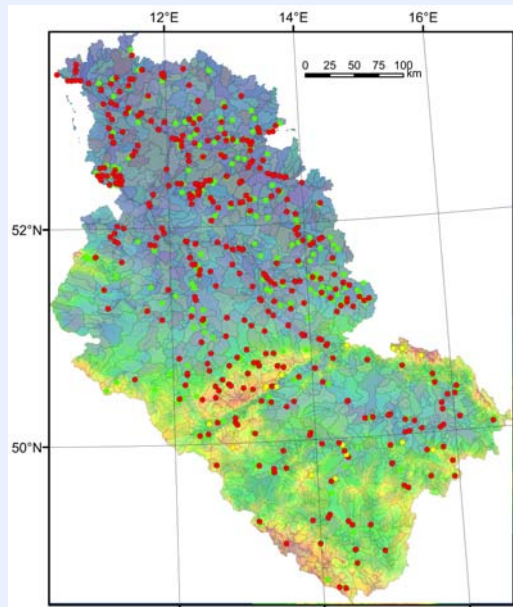
4. Product line – Elbe SWAT $\equiv$ SWIM



Conradt et al. 2006, PIK



Hattermann et al. 2006, PIK



Land use classes

(CORINE)

Soil types

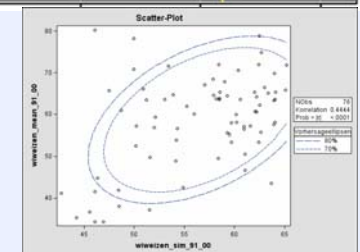
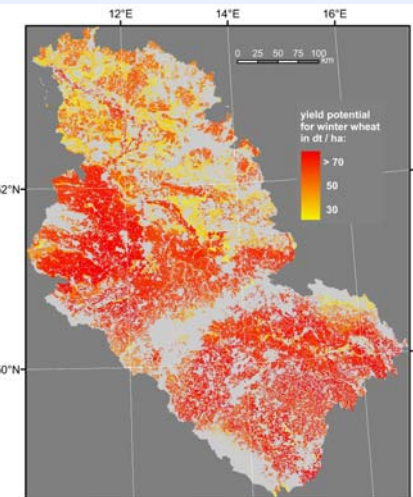
50 German + 20 Czech (map based on BÜK 1000 and Němeček et al. 2005 homogenized by Conradt and Hesse 2006)

Hydrotopes

15

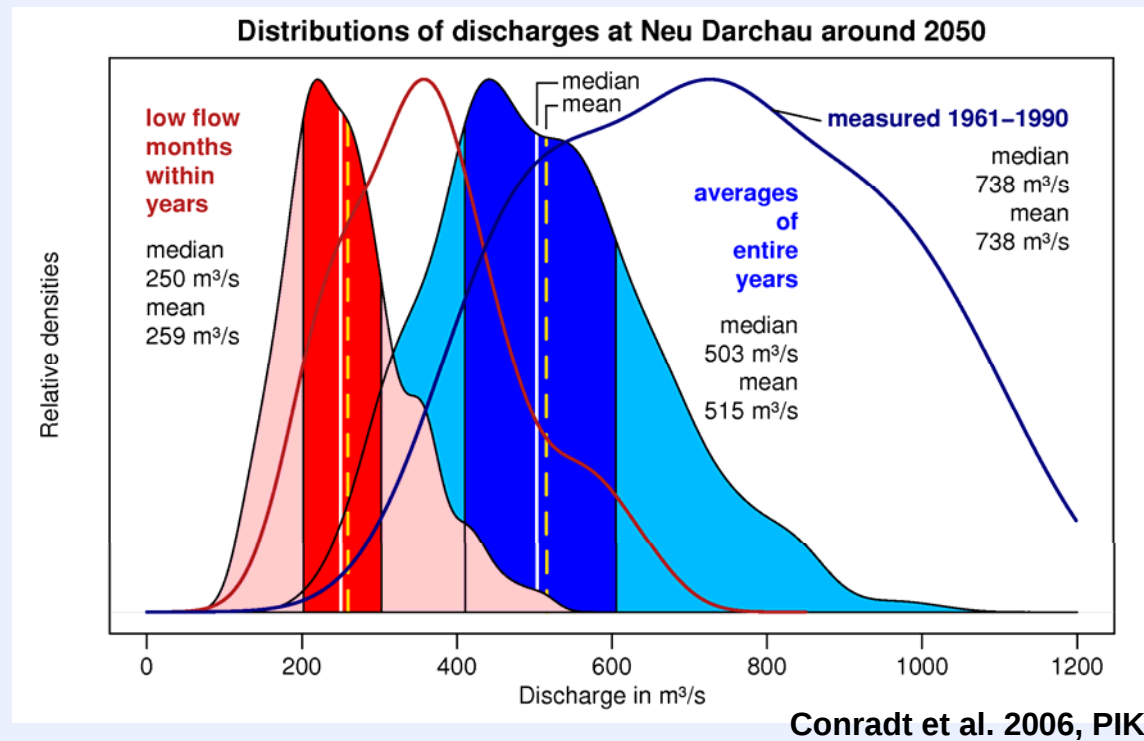
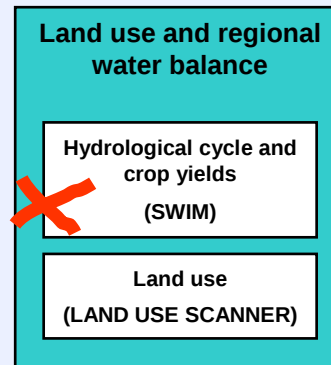
70

42708



The simulation area with 2255 subbasins and data transfer points for the coupling with WBaMo.

4. Product line – Elbe SWAT $\equiv$ SWIM



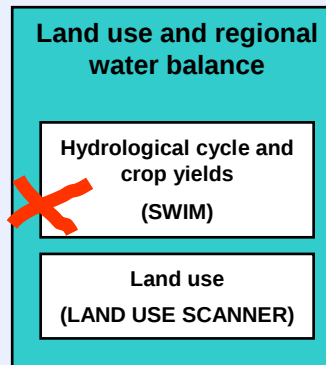
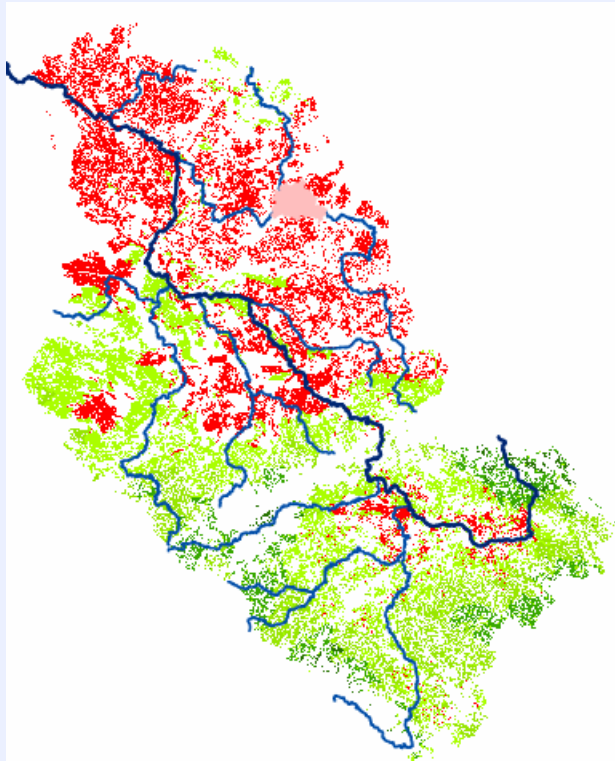
2047-2053

7 x 100

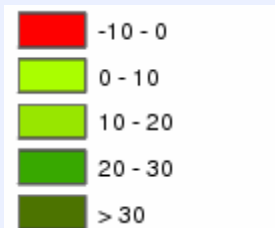
Realisierungen

4. Product line – Elbe SWAT $\equiv$ SWIM

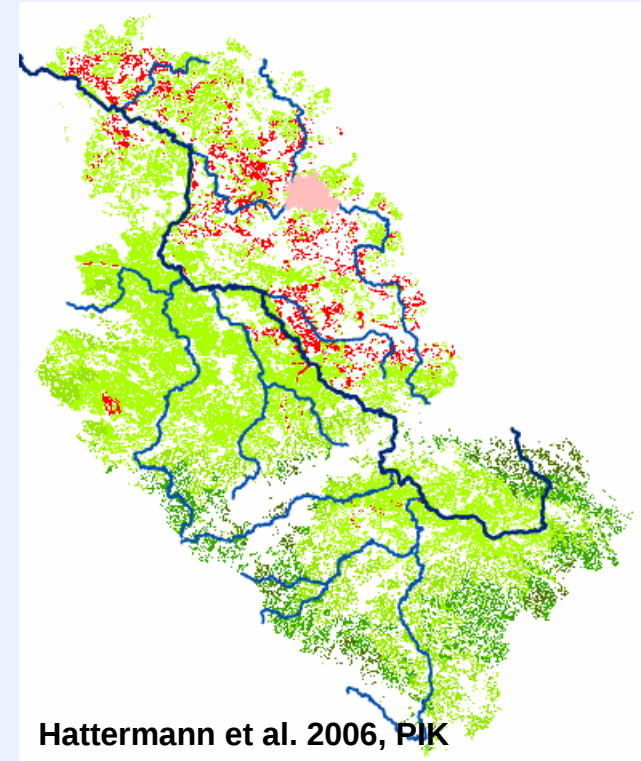
without CO₂ on
Assimilation



[dt/ha]

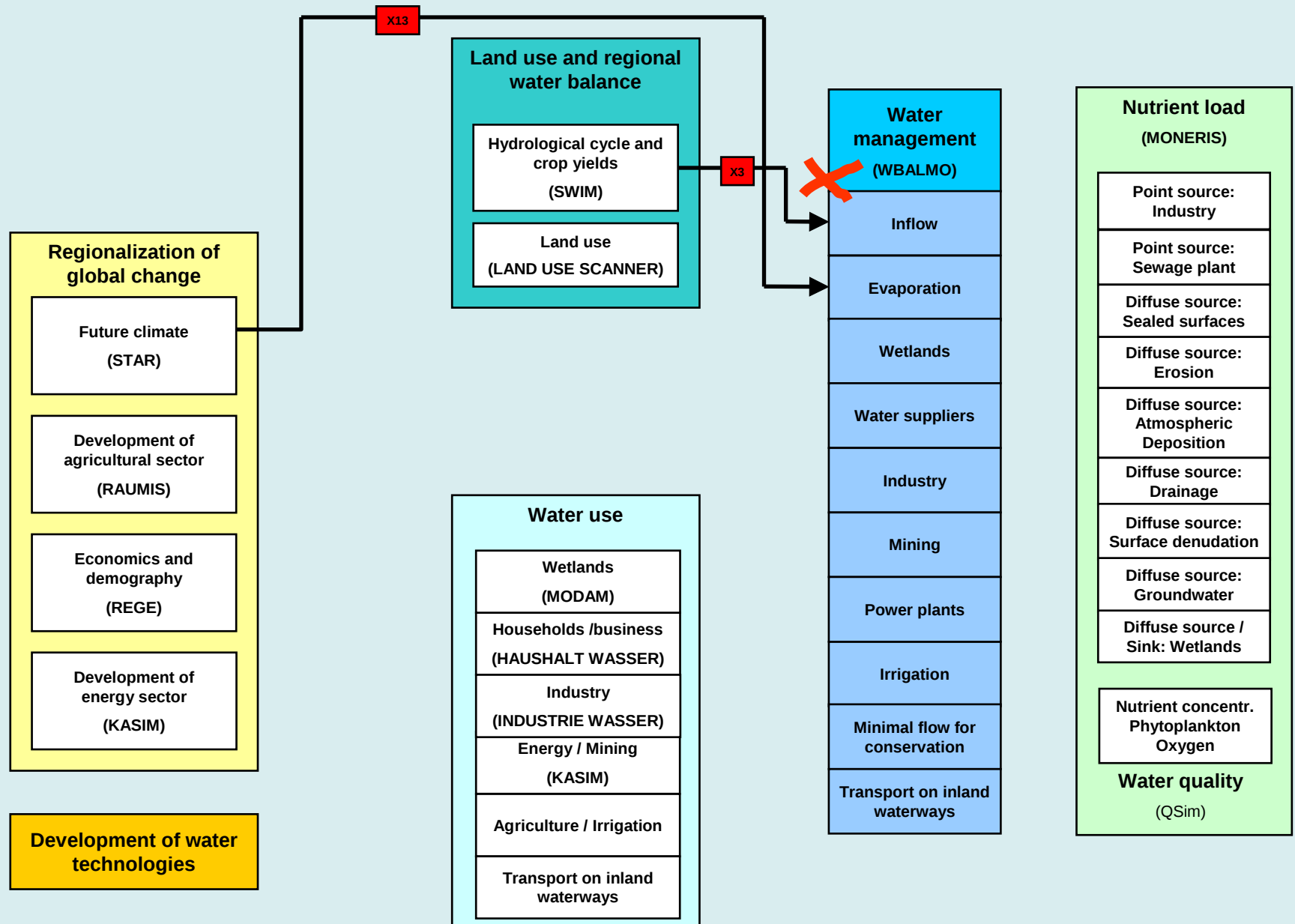


with CO₂ on
Assimilation

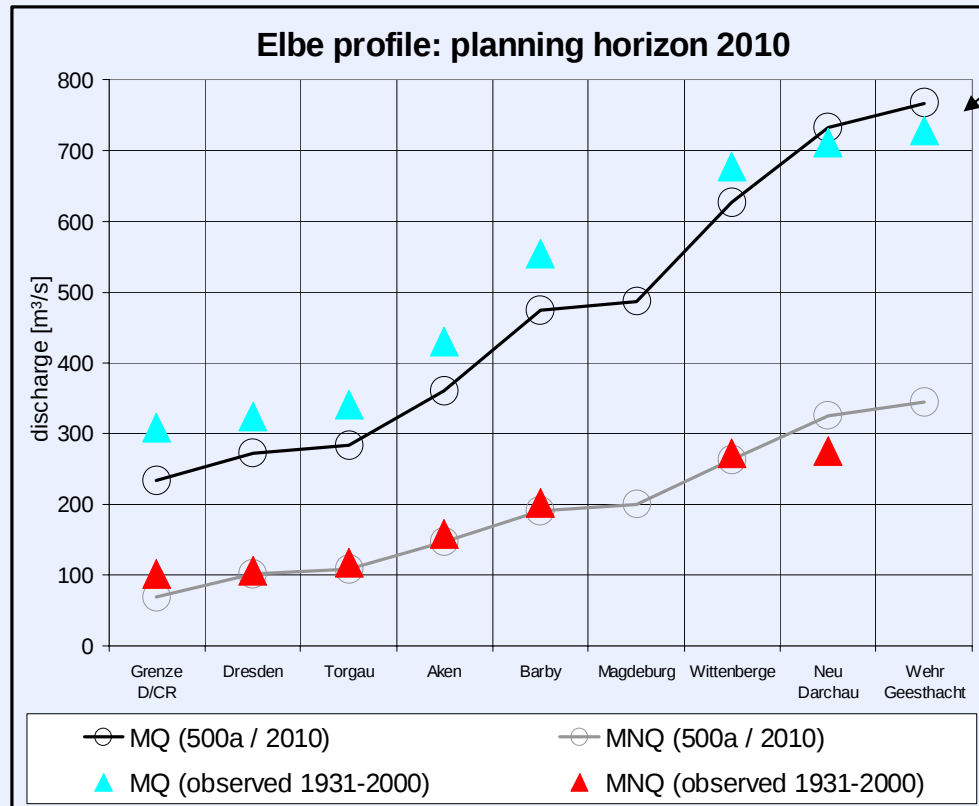


**Change in wheat yields comparing median climate scenario
(2021-30) with recent climate (1961-90)**

4. Product line – Water Management



4. Product line – Elbe - WBaIMo



Kaltofen et al. 2006, WASY

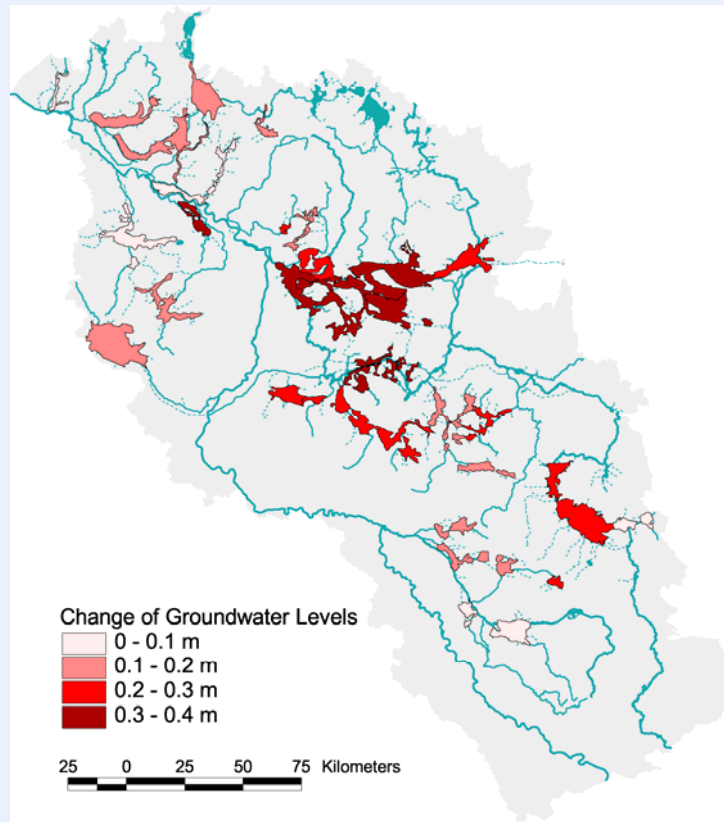
100

Water management (WBALMO)
Inflow
Evaporation
Wetlands
Water suppliers
Industry
Mining
Power plants
Irrigation
Minimal flow for conservation
Transport on inland waterways



User	2586
Reservoirs	114
Balance profiles	1899
Subregions	832

4. Product line – Elbe – WBalMo - Wetlands



Change of off-target GW levels in July from period 1 (2003/07) and 10 (2048/52): (median of the areal average)

Dietrich et al. 2006, ZALF

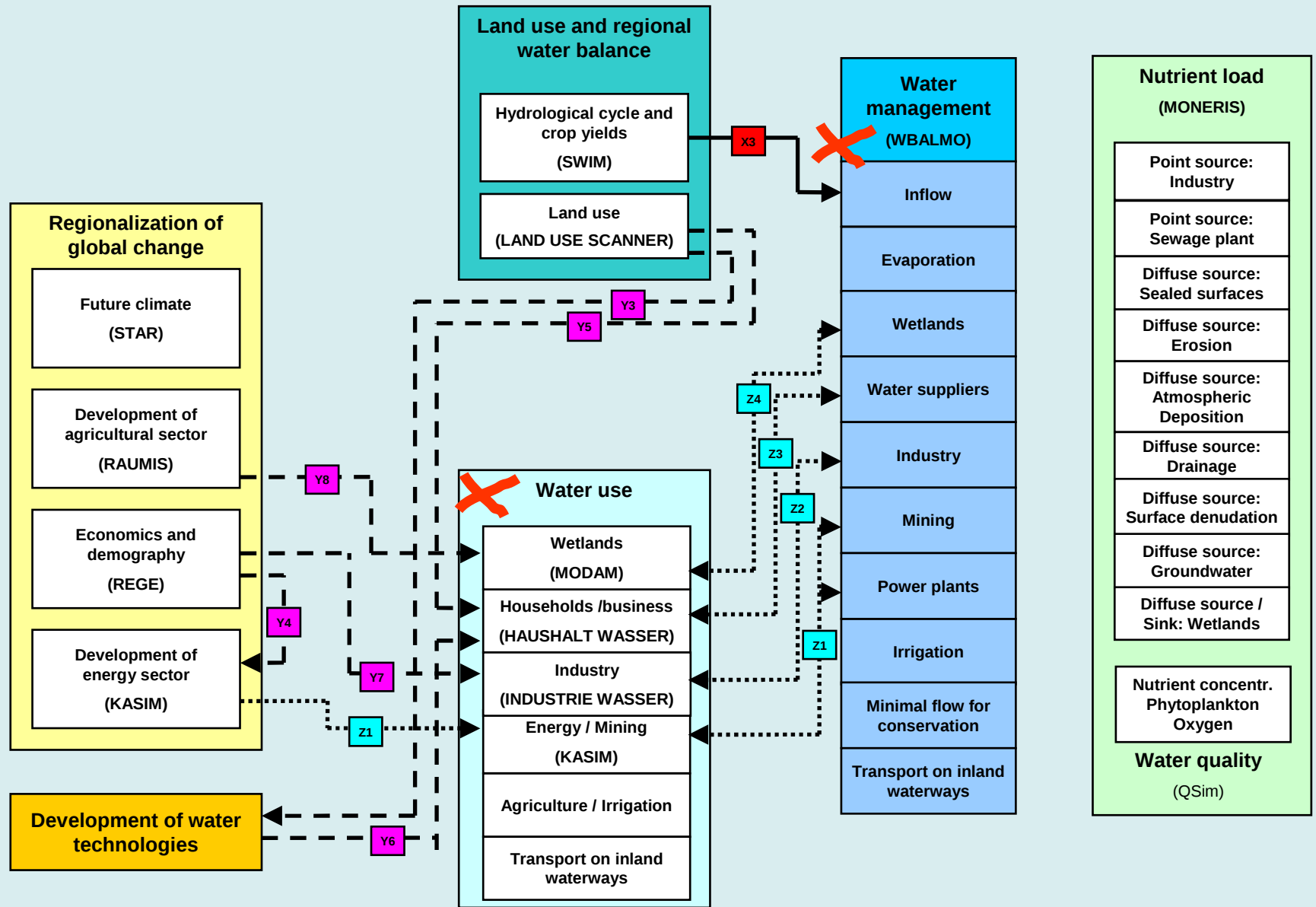
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Water management (WBALMO)
Inflow
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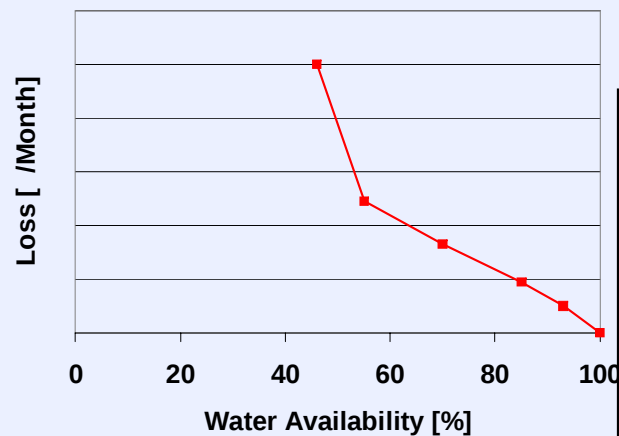
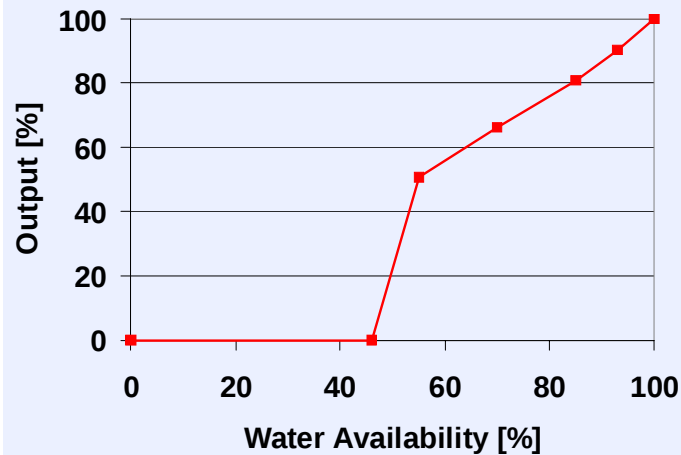


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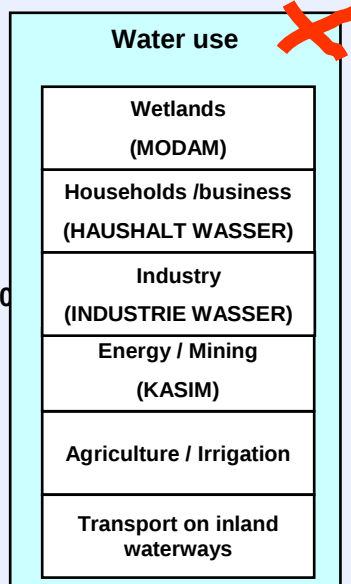
4. Product line – Water Use



4. Product line – Elbe WBalMo + water demand and damage functions



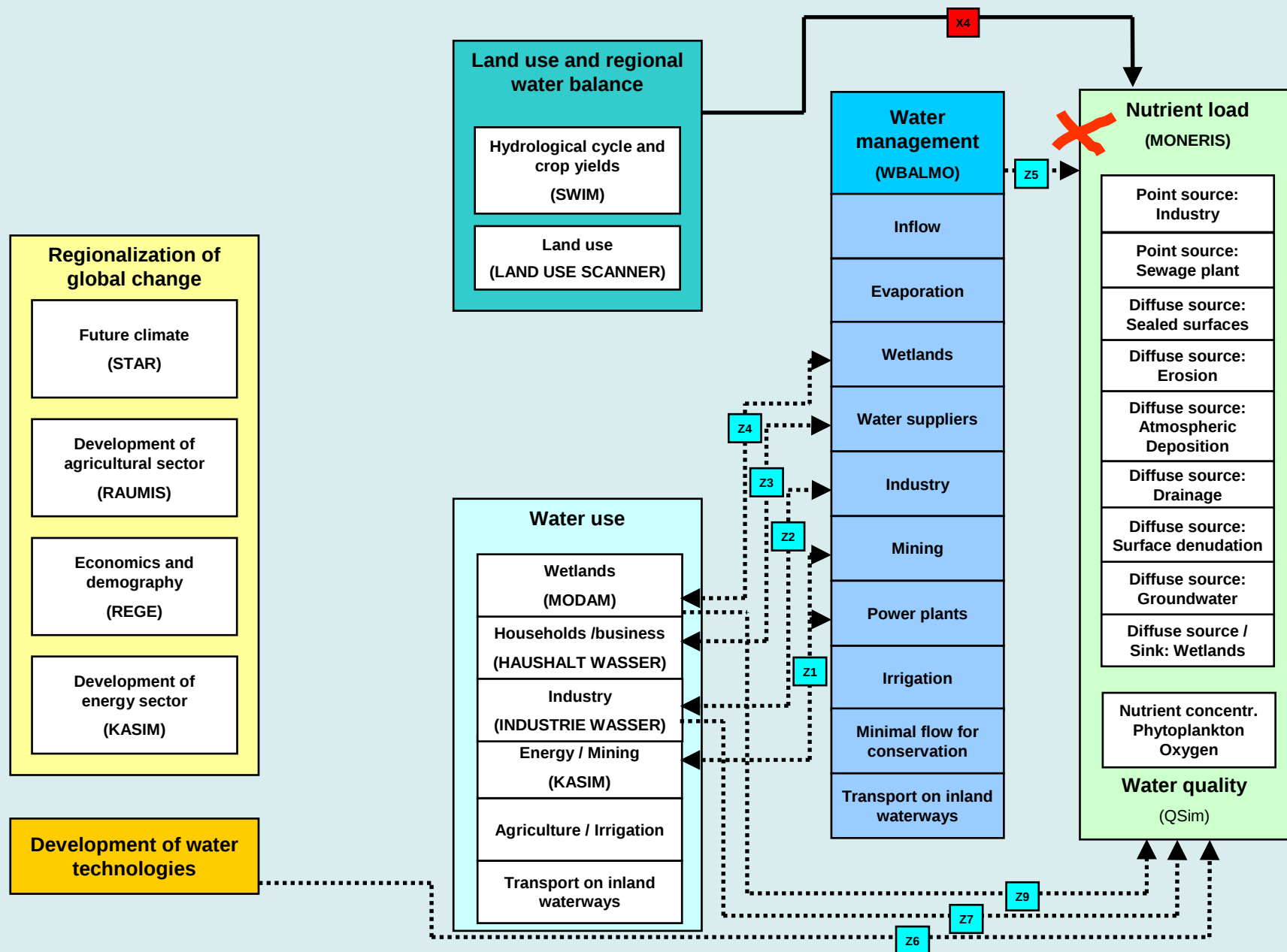
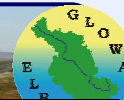
Mutafoglu et al. 2006, TUB



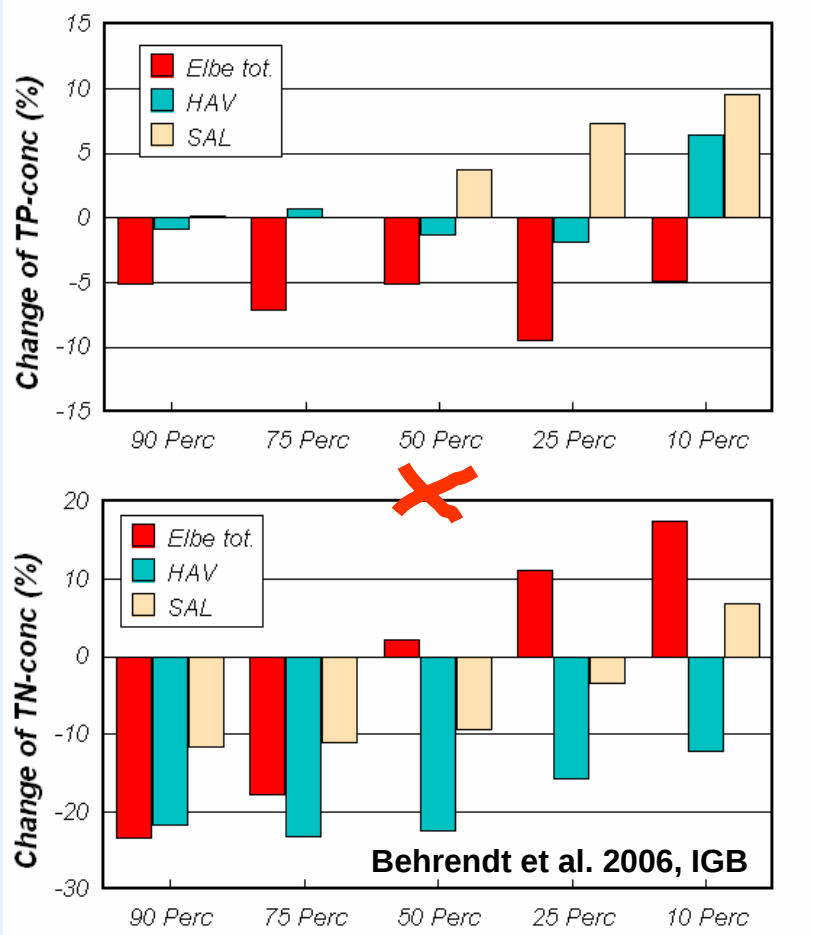
100



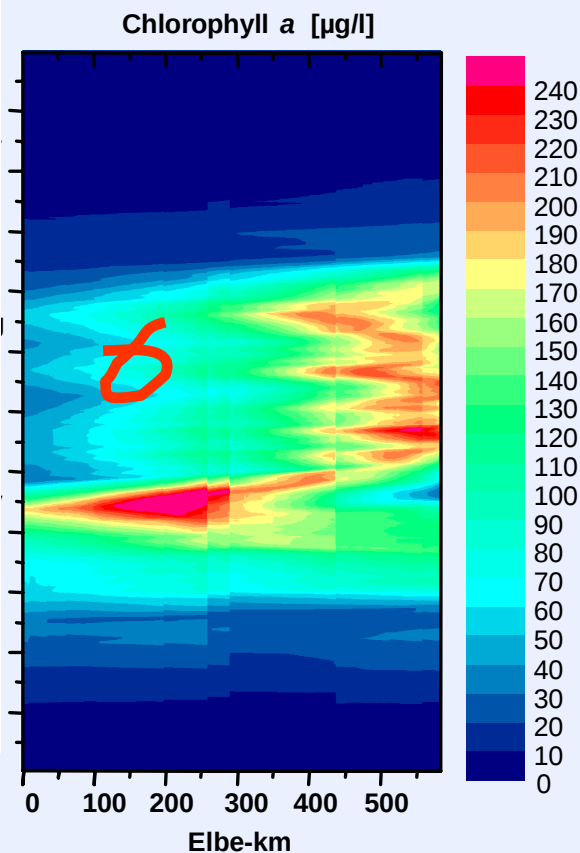
4. Product line – Nutrient load & Water Quality



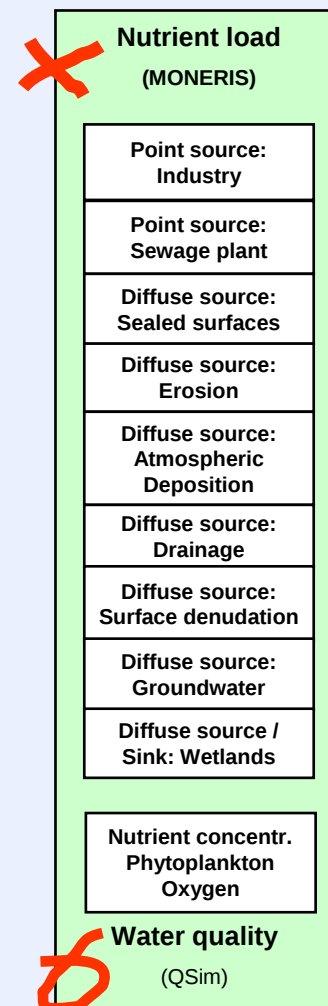
4. Product line – Elbe-Moneris/ Elbe QSIM



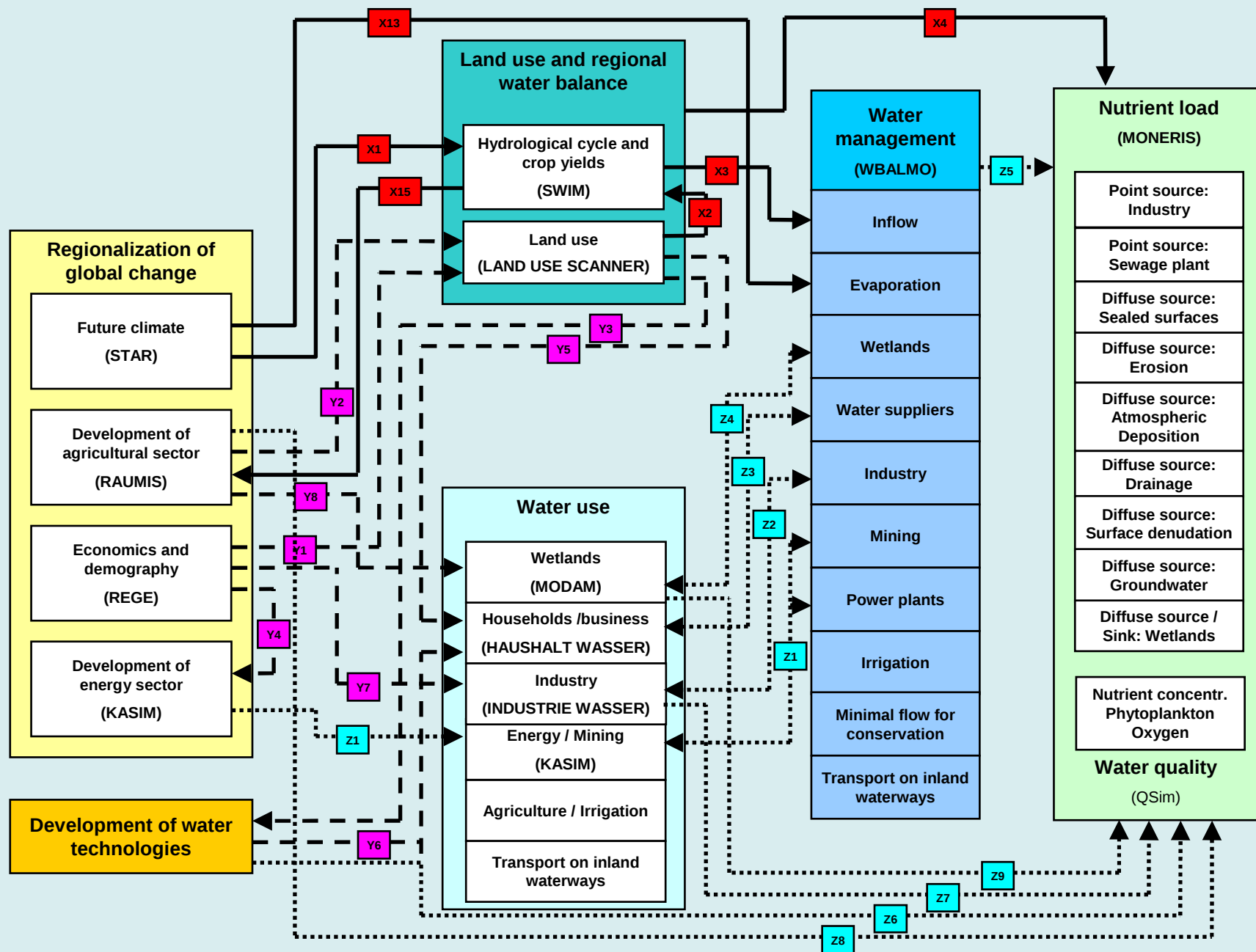
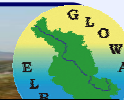
Changes of TP- and TN-concentration in the Elbe, Havel and Saale for discharges corresponding to the 10, 25, 50 75 and 90 Percentile of future discharges at the station Neu Darchau for the period 2025 to 2055.



Spatiotemporal simulation of chlorophyll a concentrations in the Elbe, year 1998 (Schöl et al. 2006, Fischer et al. 2006).



4. Product line – Fully coupled



4. Product line – Management



GLOWA-Elbe

Auswirkungen des globalen Wandels auf Umwelt und Gesellschaft im Elbegebiet



HOME

| Aktivitäten

| Projekt

| Integration

| Modellverbund

| Publikationen

| Glossar



Die Elbe

Kontakt

Projektleitung

Partner

Links

Intern



GLOWA-Elbe Buch



| Übersicht

| Zielsetzung

| Forschungsansatz

| Vorhaben

| Meilensteine

| Berichte



Projektmanagement

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Bei Fragen zu **Datenmanagement und Internet:**

[Ylva Hauf](#)

Telefon: 0331-288 2690
Fax: 0331-288 2695

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- Modelling

Use the (unique) platform opportunity (water frame directive, water management, agriculture, risk assessment), contact modelling groups for cooperation

- Assessment

Question our results, address your questions to us, suggest management alternative



Thank You
for your attention!

