

GLOWA-ELBE



The **Elbe region** is one of the **largest** and **driest** river basins in **Europe**. Due to its comparatively **low precipitation** and the high probability of its further reduction in the coming decades, the basin appears to be vulnerable to expected climate change. Interactions between social and climatic change affects both water quantity and water quality, thus studies and assessments to predict future water availability play a key role in developing sustainable management strategies in the region.

FACTS of the Elbe River Basin

- ❖ **Area:** 148.268 km²
one of the largest river basin in Central Europe
- ❖ **Length:** 1.091 km
- ❖ **Altitude difference:** 1.384 m
- ❖ **Around 25m** people live in the river basin, around 18m in the German part
- ❖ **Water availability** is the second lowest in Europe (680 m³ per capita and year)
- ❖ **Supplies 80%** of water demands in the eastern German part
- ❖ **Water quality classification** II-III (critical load)
- ❖ **Large tributaries:** Moldau/Vltava (28.090 km²), Saale (24.167 km²), Havel (23.860 km²), Spree (9.793 km²)

Socio economic change scenarios

Two macroeconomic scenarios 'Globalization' (A1) and 'Differentiation' (B2), which are linked to the IPCC scenarios, are combined with two strategic approaches, 'Conventional environmental policy' (0) and 'Strengthened environmental policy' (+) to provide four frameworks of development (A1⁰, A1⁺, B2⁰, B2⁺).

Globalization (A1):

- ❖ High rate of economic growth
- ❖ Continued large share of global trade for Germany, increasing share for Czech Republic
- ❖ Increase in efficiency
- ❖ Significant rise in employment
- ❖ Above average increase of population in urban regions

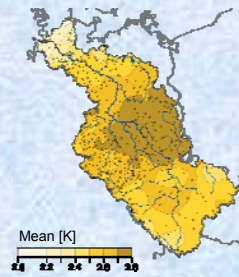
Differentiation (B2):

- ❖ Lower growth in world trade than in A1
- ❖ Declining share of global trade for Germany, slight increase for Czech Republic
- ❖ Decline in employment
- ❖ Strong decrease in rural population
- ❖ Regionally differentiated increase in employment and population (concentrated on the three metropolitan regions Berlin, Prague and Hamburg)

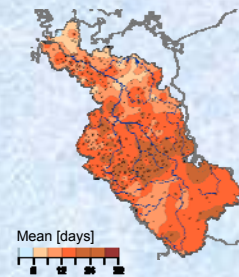
Climate change scenarios

We expect temperature in the Elbe river basin to rise by about 2°C in the next 50 years. This warming will cause the climatic water balance to decrease sharply. At the same time the number of days per year without rainfall will increase, indicating a greater risk of long drought periods. (Orlowsky 2008, PIK)

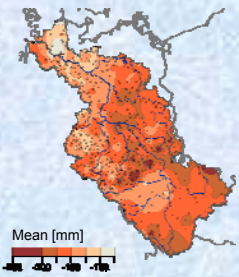
Change of annual mean temperature 2046/2055 - 1951/2003



Change of number of days without precipitation 2046/2055 - 1951/2003



Change of climatic water balance 2046/2055 - 1951/2003



Simulated impacts on socio economy, water availability, and water quality

Change of demographic and economic parameters in Germany under different scenarios (Gornig, Blazejczak 2008, DIW)

	2004	2020		2020/2004	
		Globalization	Differentiation	Globalization	Differentiation
Population 10 ⁶ persons	82,5	84,0	83,4	0,1	0,1
Labour force 10 ⁶ persons	42,7	46,2	45,9	0,4	0,4
Persons employed 10 ⁶ persons	38,8	44,5	42,9	0,8	0,6
Unemployed 10 ⁶ persons	3,9	1,7	3,0		
Unemployment rate, percent	9,2	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

Elbe flood in 2002

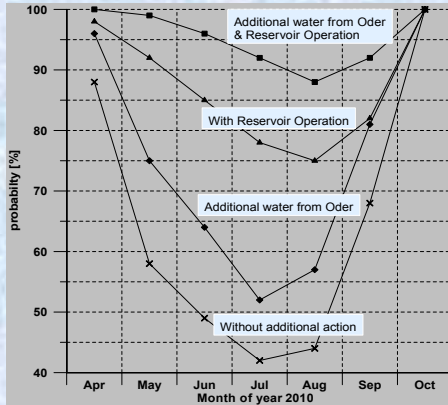


Drought in summer 2003



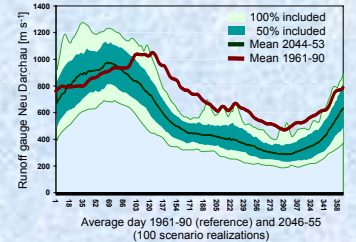
Management options

Effects of different management strategies in the sub-basin Spree-Havel, probability of reaching the minimum run off level at the gauge "Große Tränke" (Kaltfoten 2003, DHI-WASY GmbH)

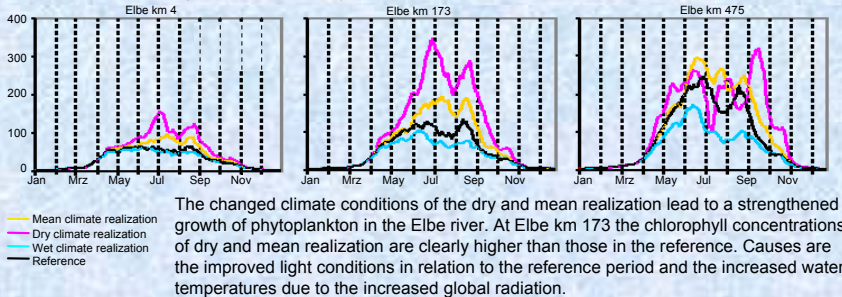


River runoff including climate uncertainty (Hattermann 2007, PIK)

The one hundred realizations of the climate until 2055 as created by the regional climate model STAR were taken as boundary conditions to simulate future runoff in the Elbe basin. In brown the observed discharge at the gauge Neu Darchau gauge (long term daily average) and in dark green colors the result for the scenario period (long term daily average, 100 realizations). Particularly striking is the strong signal to lower flow conditions in summer under scenario conditions.



Change of chlorophyll-a concentrations in three Elbe river reaches under different climate scenarios (Quiel 2008, BfG)



The changed climate conditions of the dry and mean realization lead to a strengthened growth of phytoplankton in the Elbe river. At Elbe km 173 the chlorophyll concentrations of dry and mean realization are clearly higher than those in the reference. Causes are the improved light conditions in relation to the reference period and the increased water temperatures due to the increased global radiation.

Regulation by dams and reservoirs



Accelerated flooding of post mining areas



Irrigation of agricultural land



Discussion with stakeholder



Finding solutions

