Leibniz-Zentrum für Agrarlandschaftsforschung (ZALF) e.V.

Leibniz-Centre for Agricultural Landscape Research (ZALF) e. V.

Ad-hoc-Expertengruppe „Wassermengenmanagement“ der IKSE

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The Water Balance of large Wetlands in the Elbe Lowland – Impacts of Climate Change and Possibilities for Adaptation

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Bundesministerium für Bildung und Forschung

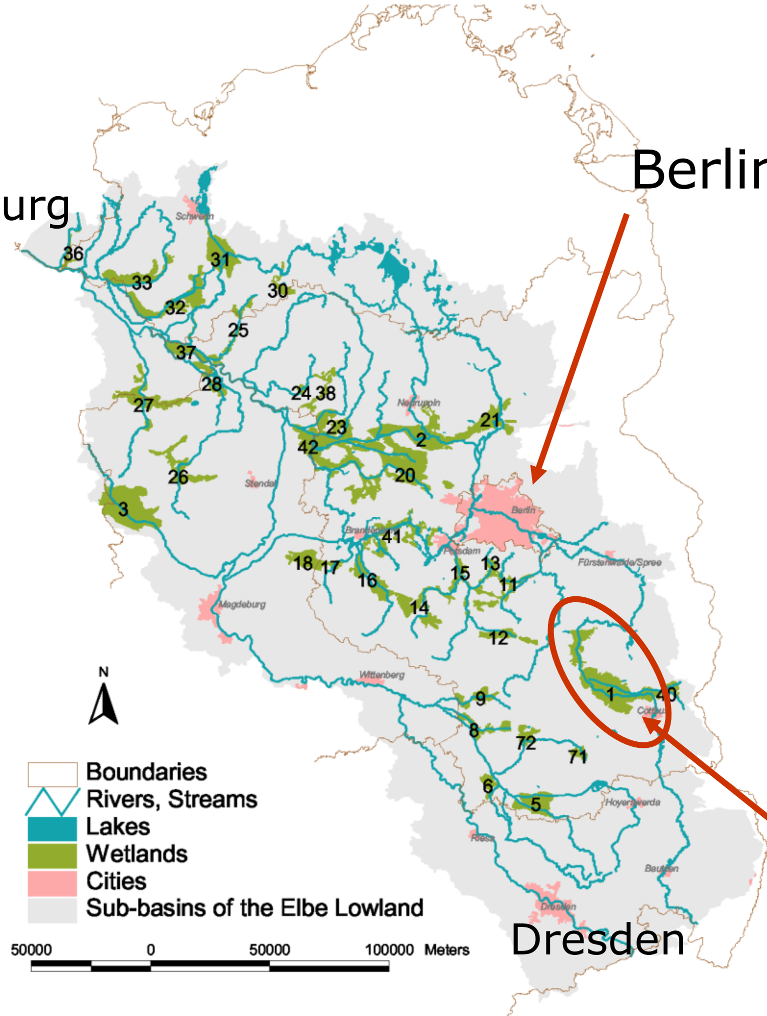
GLOWA ELBE

INKA BB KLIMAWANDEL UND INNOVATION

Large wetlands in the Elbe Lowland

“Wetlands” in the north-eastern German Lowlands – agricultural land use with water management systems

Study region Elbe-Lowland with large wetlands



- Elbe Basin 148,000 km²
- Elbe Lowland ~50,000 km²
- 35 selected wetlands selection criterias:
  - area >1,000 ha,
  - active water management systems
- Area of selected wetlands ~3,840 km² (~1,400 km² fens)

Big areas with ground water levels near below surface in the Elbe-Lowland - “wetlands” – GLOWA-Elbe research project

Basic models and data flow in GLOWA-Elbe

Global Climate Model
(ECHAM5, MPI Hamburg)

Regional Climate Model
(STAR, PIK Potsdam)

Hydrological Model
(SWIM, PIK Potsdam)

Water Resources Management in the Basin
(WBalMo Elbe, DHI-WASY/BTU Cottbus)

Water Resources Management in the Wetland
(WBalMo Elbe, ZALF Müncheberg)

EET – Elbe-Expert-Toolbox

Boundary conditions & baseline scenarios

Investigation period: 2003-2052

- 100 realisations for every of the 50 years
- Results are divided in 5-year-periods

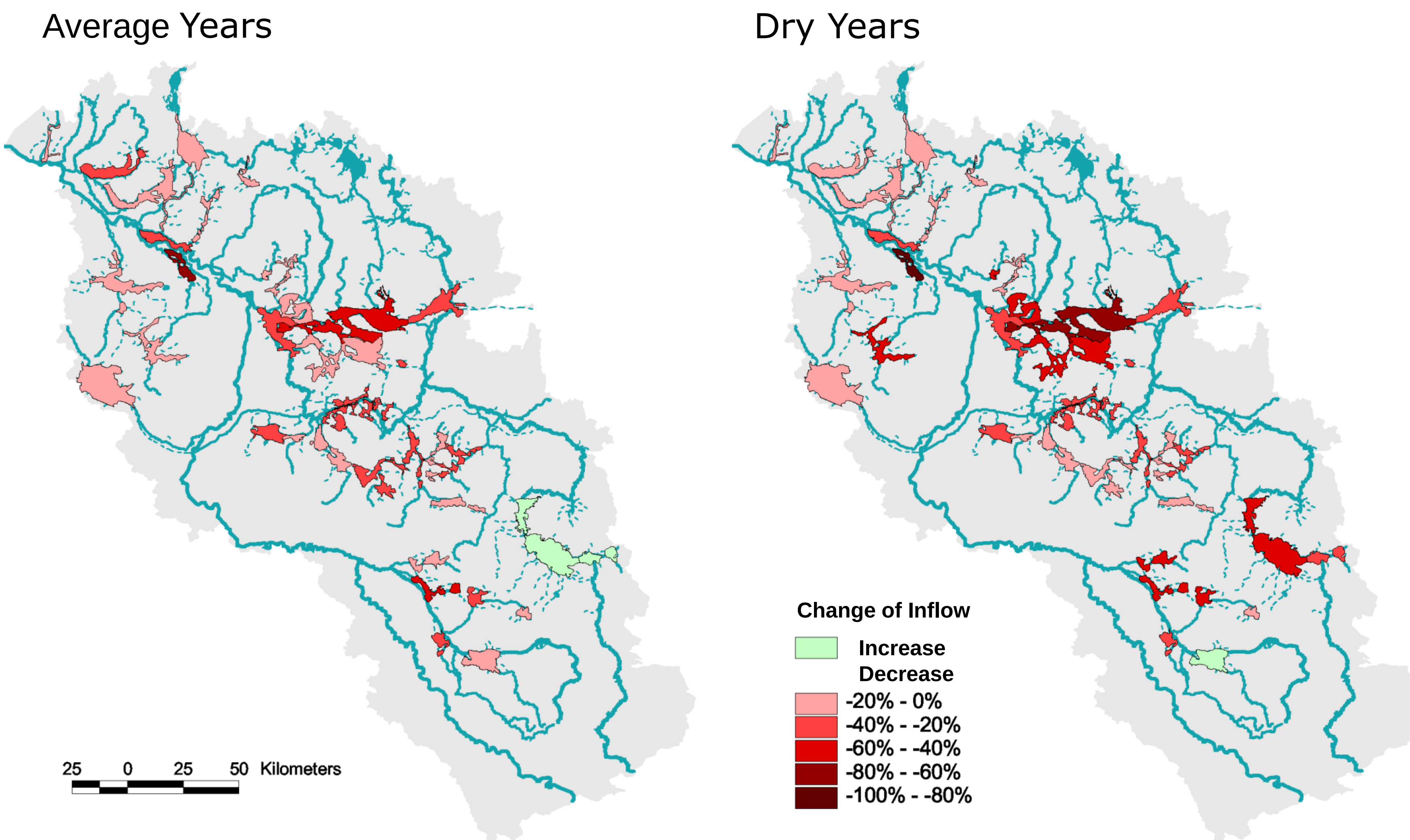
Changed climate conditions (IPCC scenario A1B):

- Temperature increasing by 2.4 K up to 2050
- Increasing potential evapotranspiration and decreasing precipitation, especially in the summer months

Combined with two socioeconomic storylines:

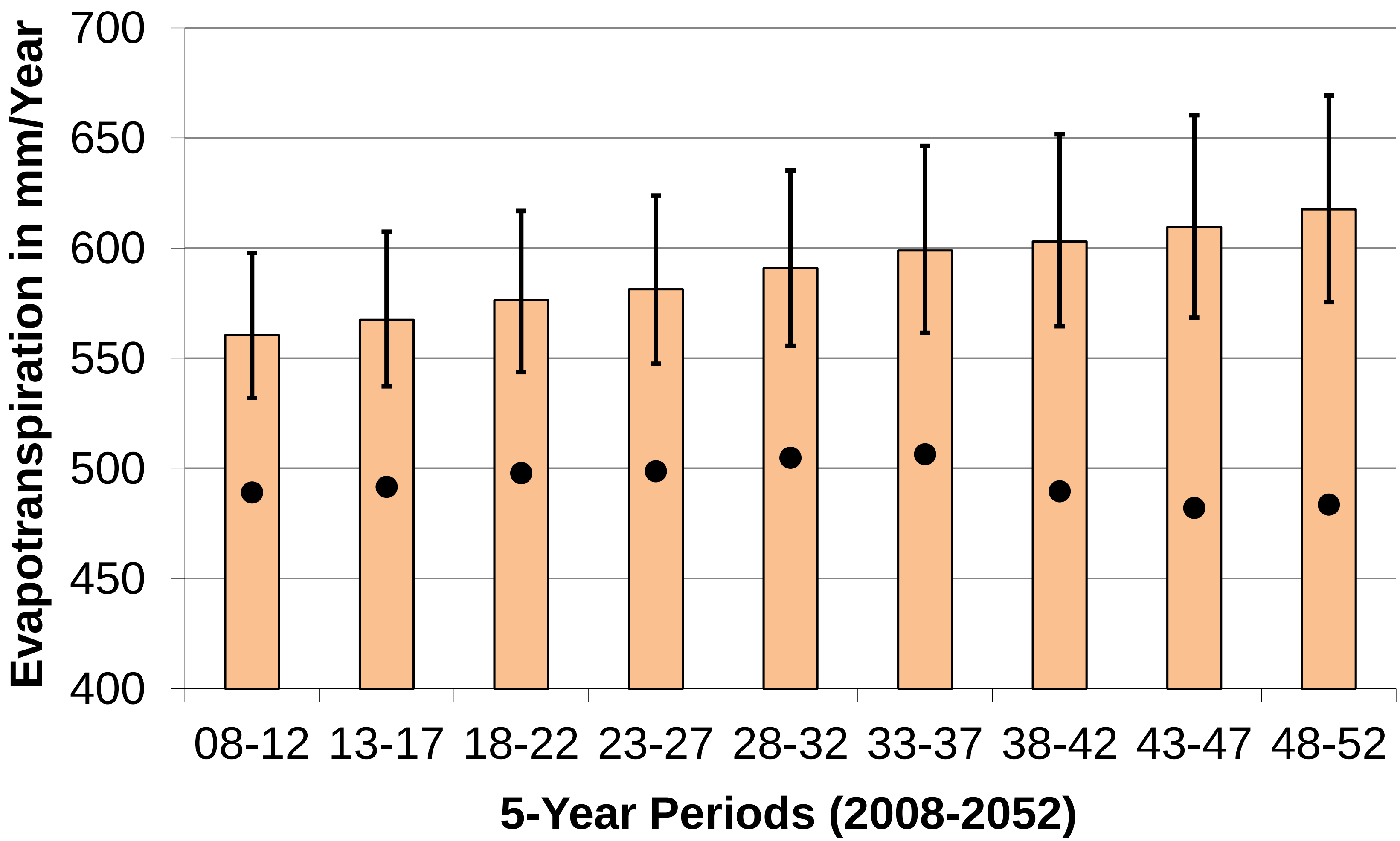
- Globalisation – $\mathbf{A1^0}$
- Differentiation – $\mathbf{B2^+}$

Change of Inflow to Wetlands up to 2050



Change of Inflow to Wetlands in July between 2010 and 2050, Scenario A1⁰

Increase of the Evapotranspiraton

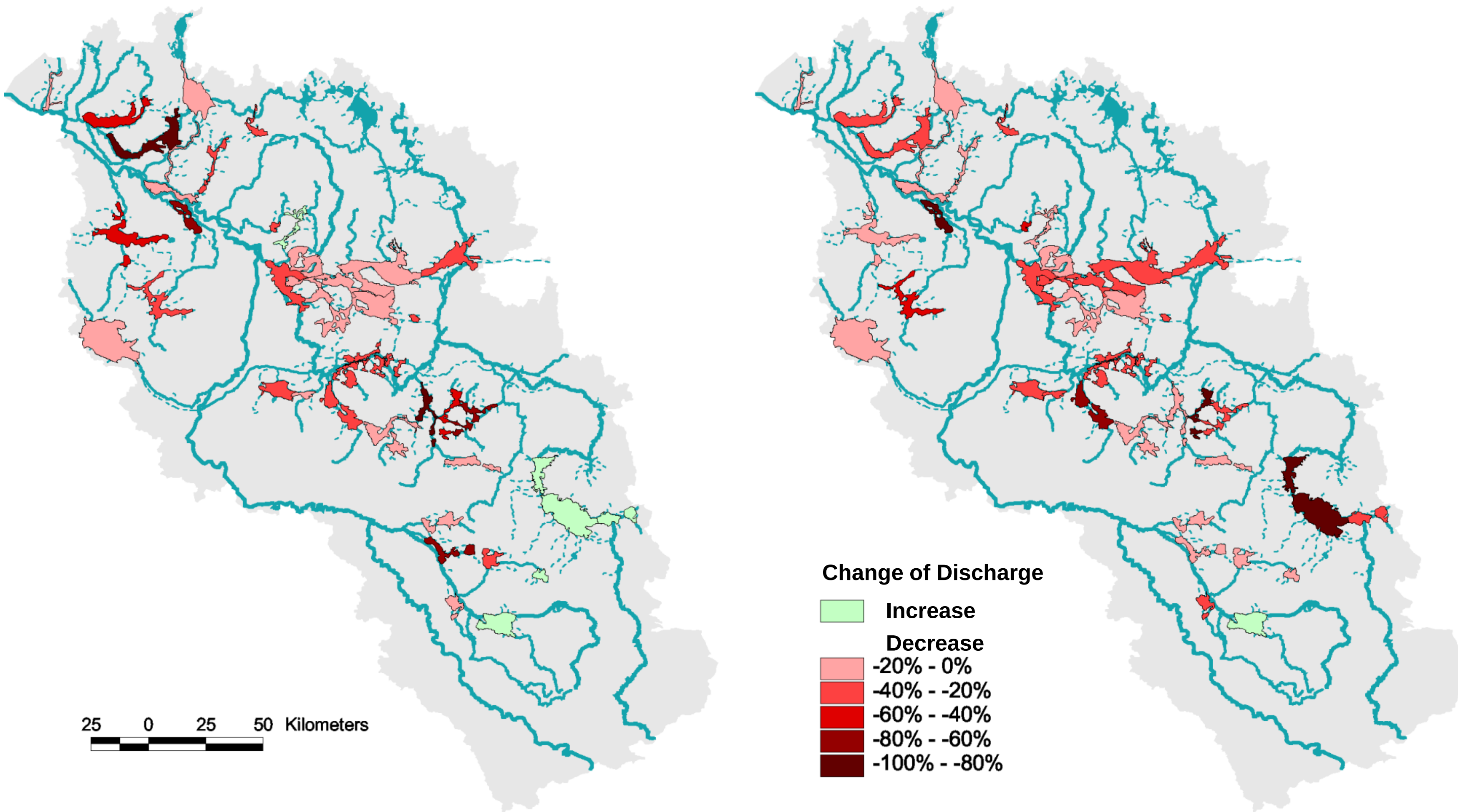


Annual evapotranspiration of the 35 wetlands in the Elbe-Lowland, bars – average of all median values with range, dots – minimum of 5. percentile value, scenario A1[0]

Change of discharge downstream the wetlands

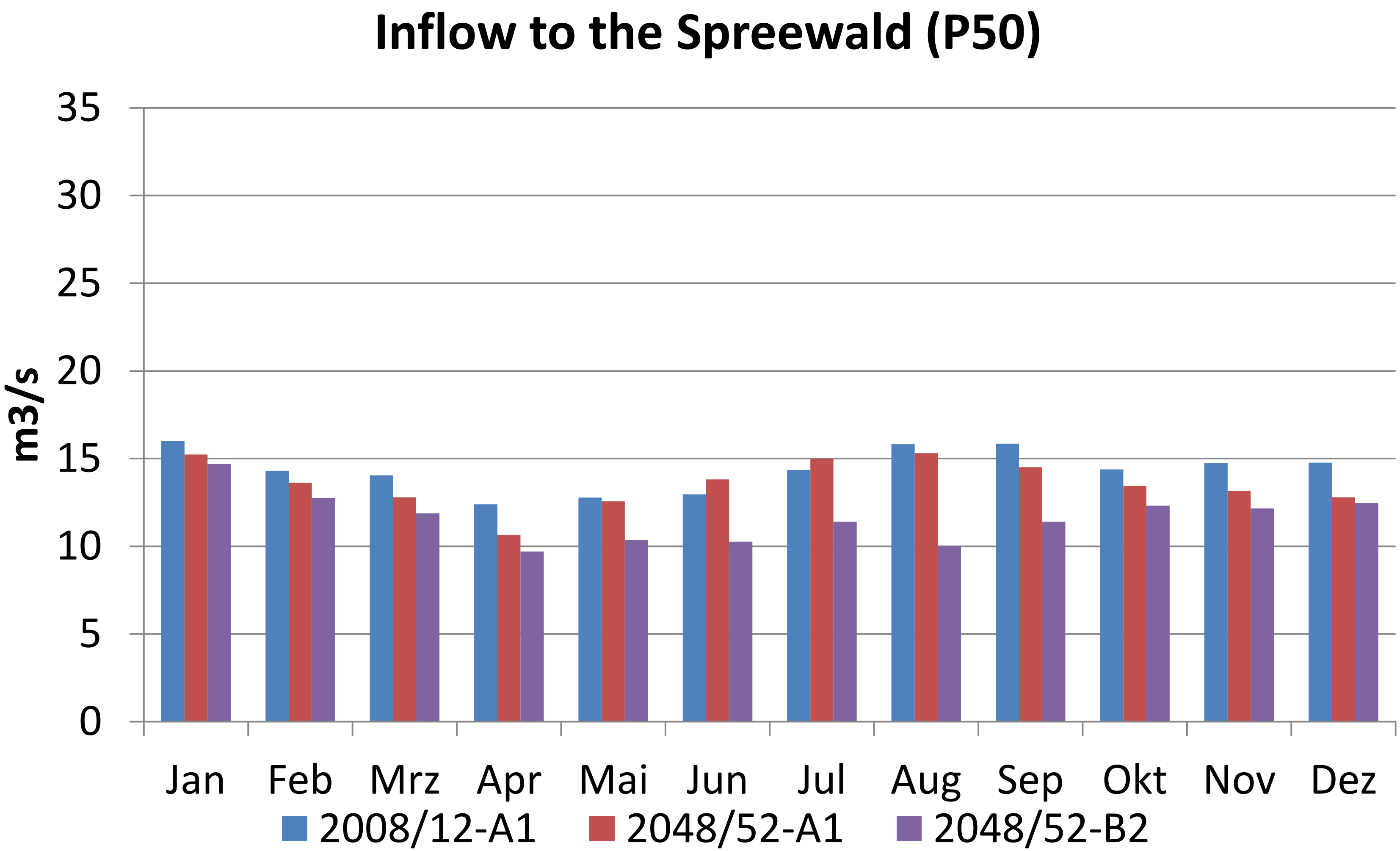
Average Years

Dry Years



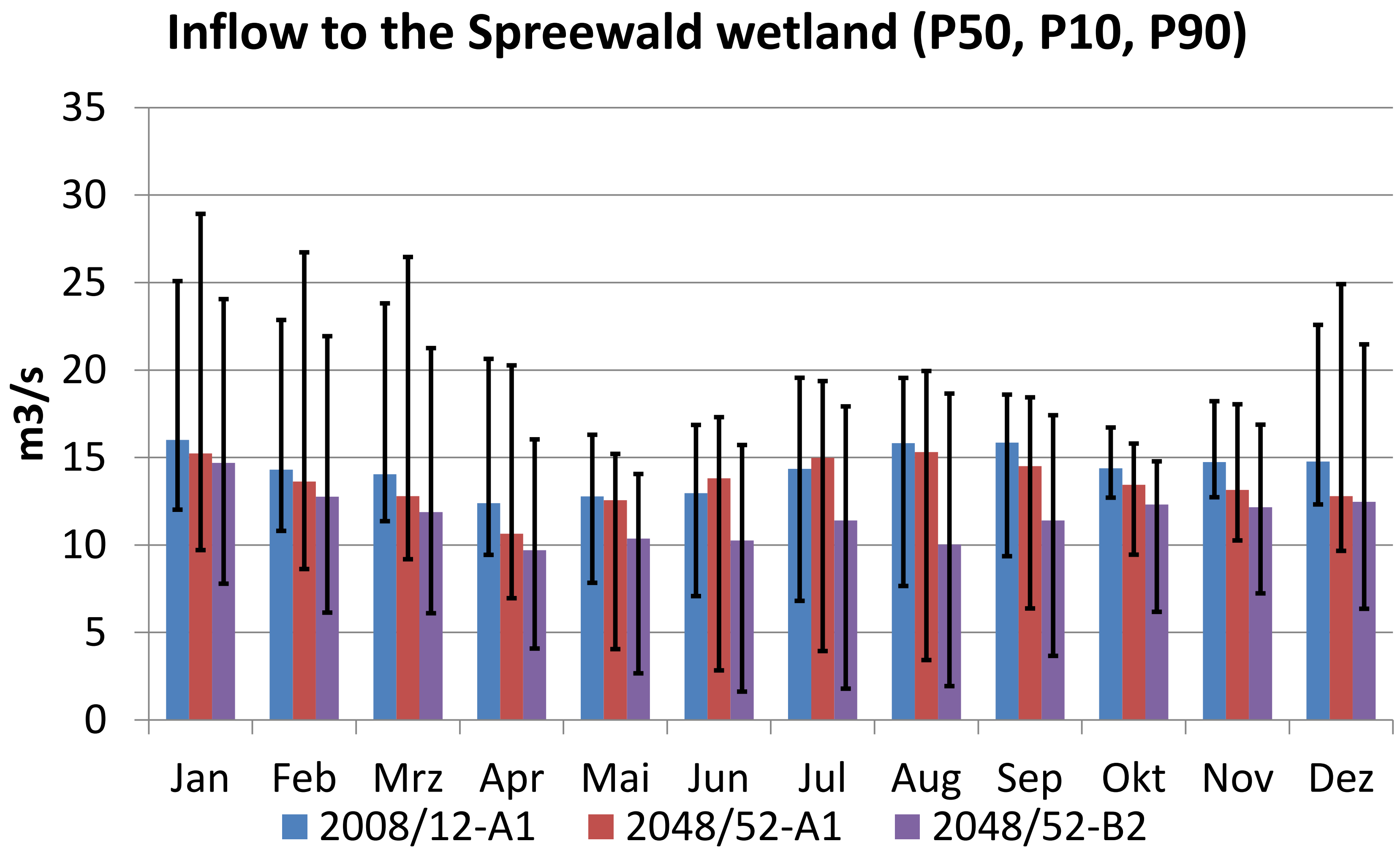
Change of discharge downstream the wetlands in July between 2010 and 2050, scenario A1[0]

Inflow to the Spreewald wetland



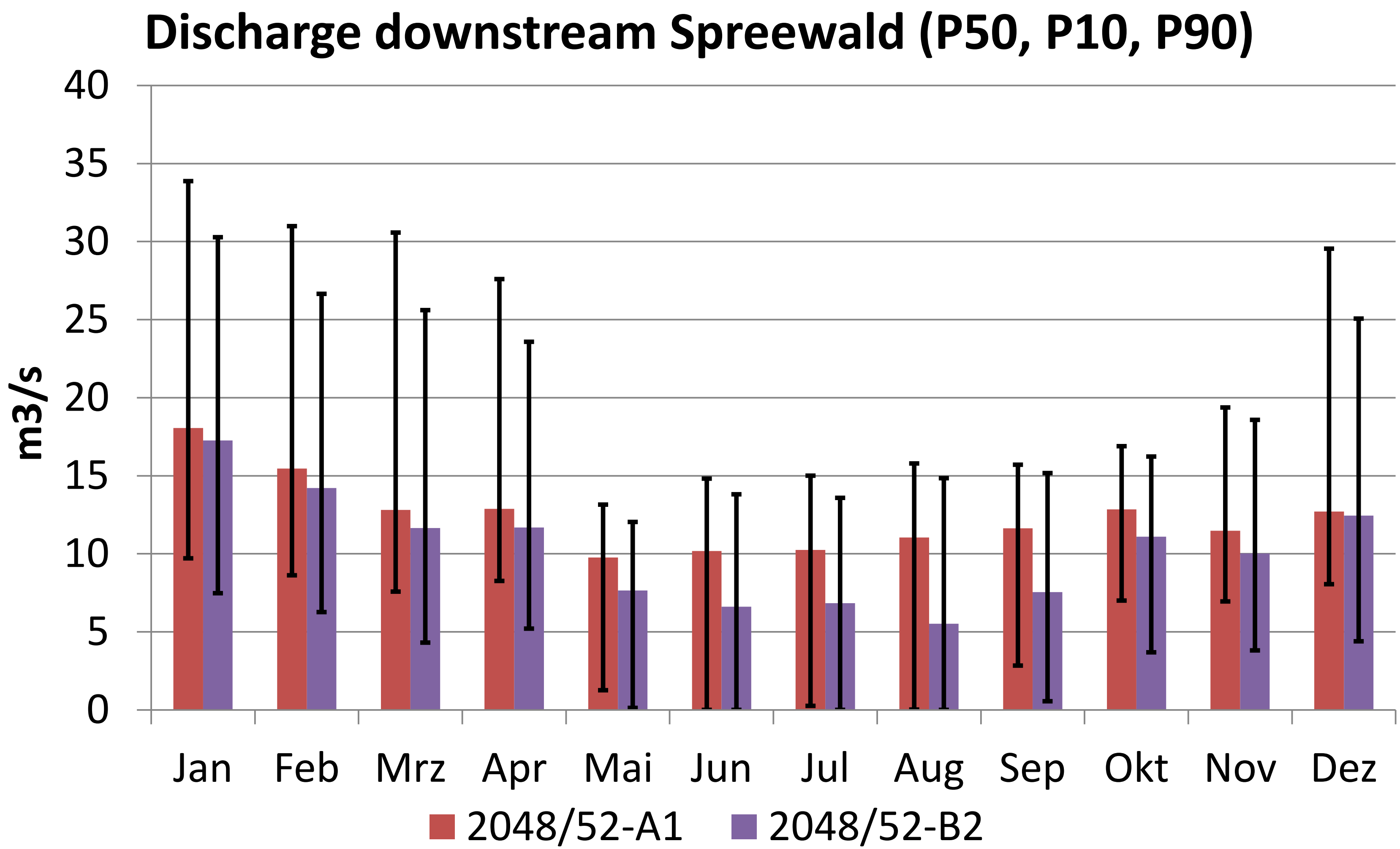
Average years (P50 – 50. percentile), A1 - scenario A1^{0}, B2 - scenario B2^{+}

Inflow to the Spreewald wetland



Bar – average years (P50), range - moderate dry (P10) und moderate wet (P90) years,
A1 - scenario $A1^0$, B2 - scenario $B2^+$

Discharge downstream the Spreewald wetland



Bar – average years (P50), range - moderate dry (P10) und moderate wet (P90) years, A1 - scenario A1^0, B2 - scenario B2$^+$

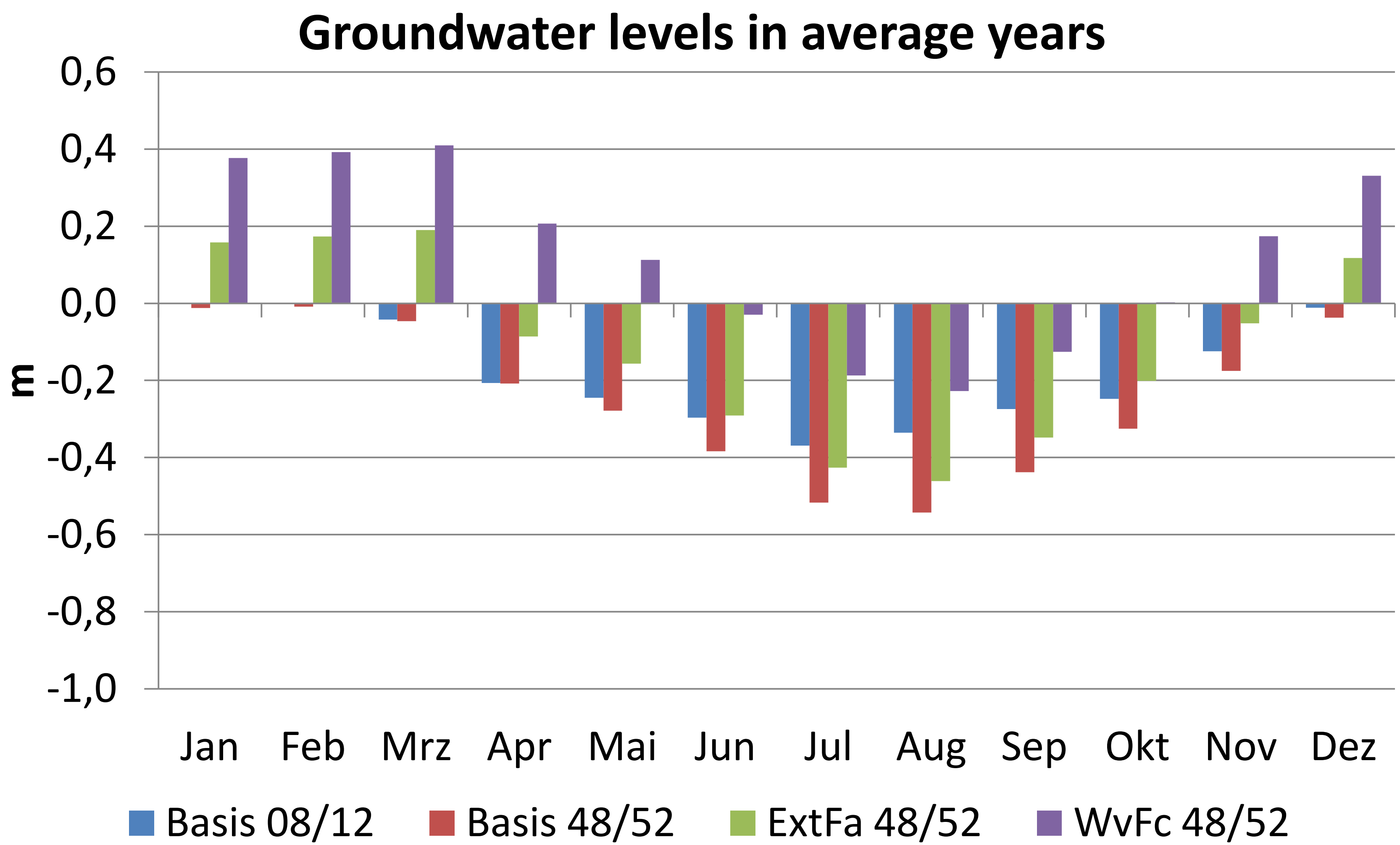
Adaptation options

Improvement of the water storage in the Spreewald wetland:

- Extensification of land use with higher target water levels in winter months – **ExtFa**
- Rewetting of wetland areas with higher target water levels in winter months - **WvFc**

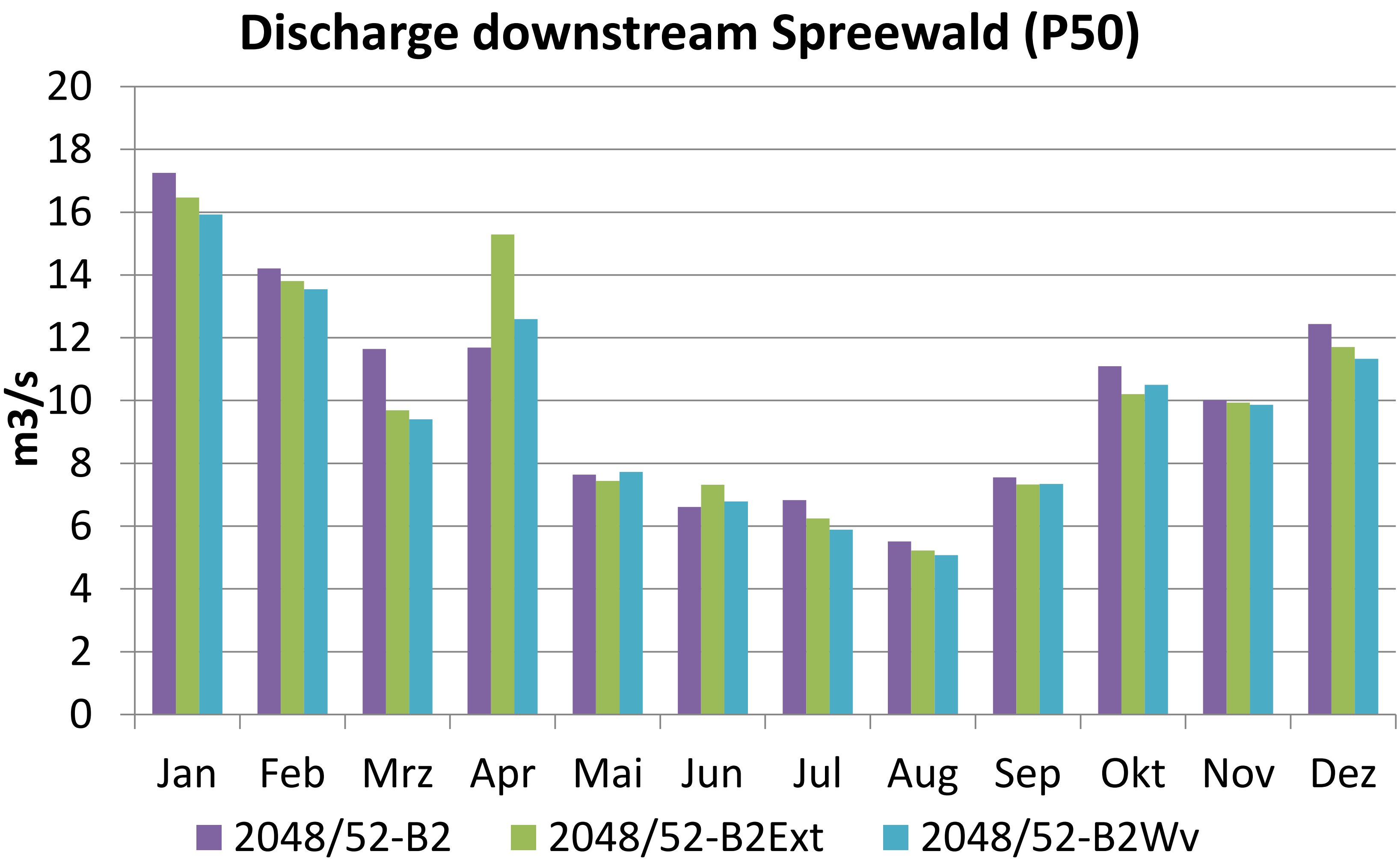
- Water transfer from neighbouring river basins (Oder-Malxe-transfer)
- Change of water distribution within the wetland

Effect on groundwater levels in Spreewald wetland



Average years (P50), groundwater levels are summarised to a fictive level (January 2008/12), Spreewald wetland, B2 - scenario B2^{+}

Effects on discharge downstream Spreewald wetland



Average years (P50), B2 - scenario B2^{+}, B2Ext – scenario B2^{+} with ExtFa, B2Wv – scenario B2^{+} with WvFc

Summary GLOWA-Elbe

- Results indicate different negative impacts of climate change within the Elbe Lowland (most problems occur in regions where we already have a lot of problems today).
- Water management options can help to reduce the impact, but especially in dry summers it will be difficult to compensate the climatic water balance deficit (more effective measures will be necessary).
- Suitability, impact and practicability of different adaption options have to evaluate in the next years (pilot projects).

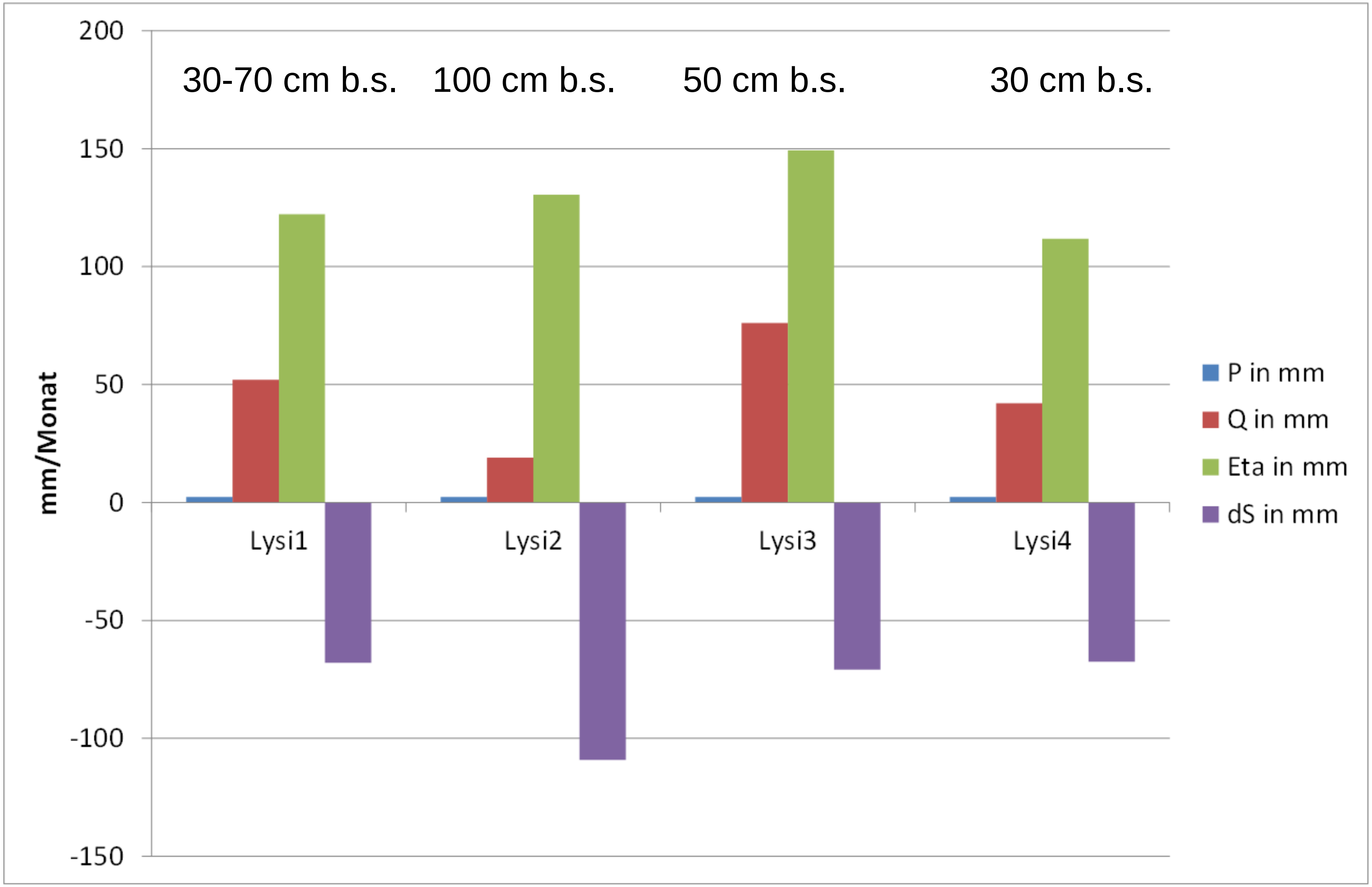
Outlook - BMBF–Project INKA BB, Subproject 20

1. Analyse of the complex impacts of water management options in wetlands on different water balance parameters with lysimeters
2. Pilot project for the development of basics for a flexible water resources management in a part of the Spreewald wetland (1000 ha)

Adaptation options in wetlands to climate change

- Improvement of the water storage in the wetland during winter months by higher target water levels
- Reduction of the water demand in dry periods
- Adaptation of the management of complex drainage and sub-irrigation systems in large wetlands to future challenges (more flexibility, modern information and decision support systems)

Lysimeter results of water balance parameters of different management options in June 2010



P – Precipitation, Q – supply from ditch, Eta – Evapotranspiration, dS – change of water storage

Thank you

Thank you to my colleagues and project partners in GLOWA-Elbe and INKA BB, as well as to the BMBF and federal state authorities for supporting our work.