April 2022

International Institute for Applied Systems Analysis
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Distinguishing and analysing regional water stress in two Austrian regions using participatory modelling

umweltbundesamt

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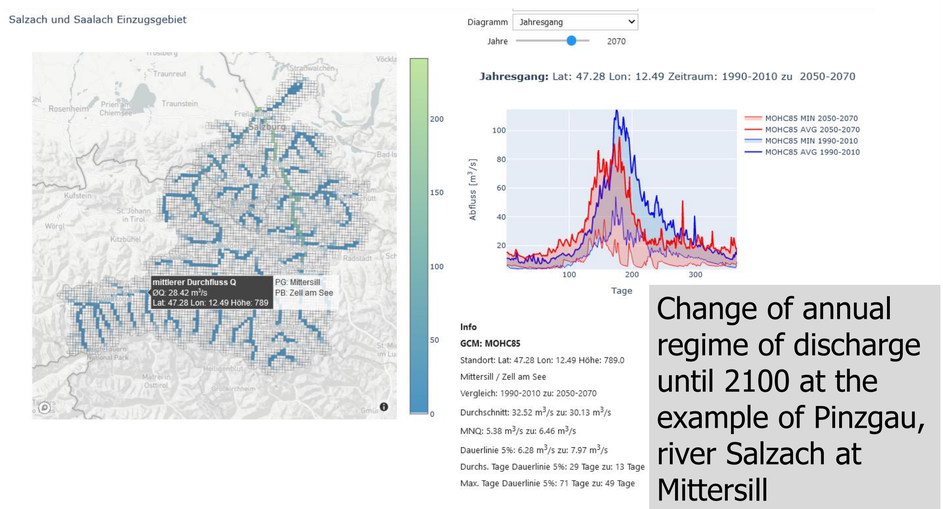
Project description

- In Austria, increase in demand as well as climate change might create local and seasonal hot-spots of water stress.
- It is thus important to understand the status quo and future development of these phenomena to identify potential areas of tension.
- WaterStressAT assesses water availability and demand in two Austrian case studies under a set of regional development and climate change scenarios.

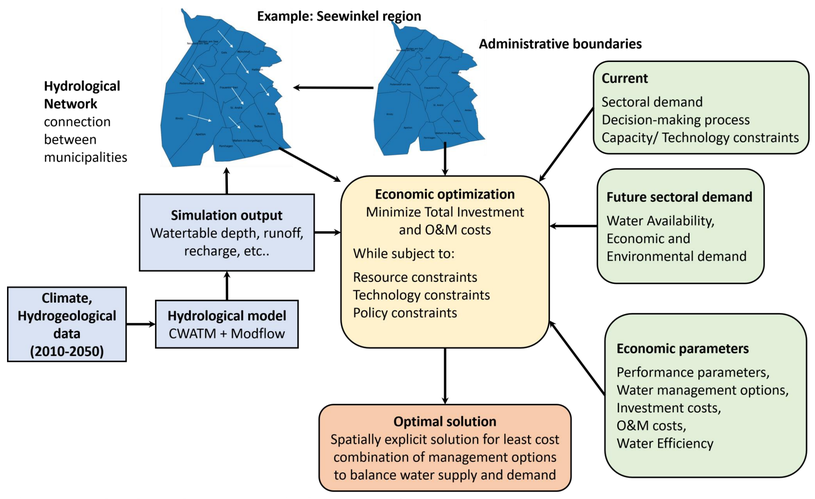
Quantitative data integration

CWATM Community water model downscaled for Seewinkel and Pinzgau regions (Burek et al. 2020)



Change of annual regime of discharge until 2100 at the example of Pinzgau, river Salzach at Mittersill

ECHO Hydro-economic model downscaled to Seewinkel region (Kahil et al. 2019)



The optimization model identifies:

- optimal transition pathways to ensure economic benefit and water security
- management options to mitigate climate risks and water stress
- potential benefits of cooperative and predictive decision-making

Hydro-economic model

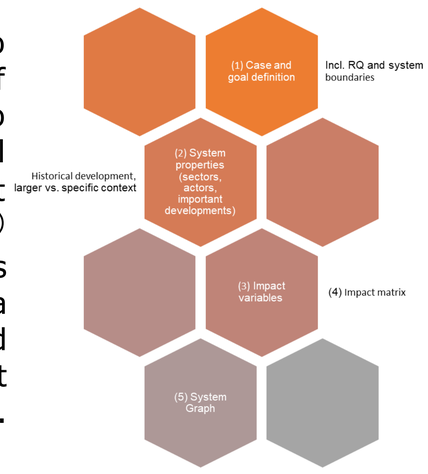
Transdisciplinary core team meetings and stakeholder workshops

Qualitative systems mapping

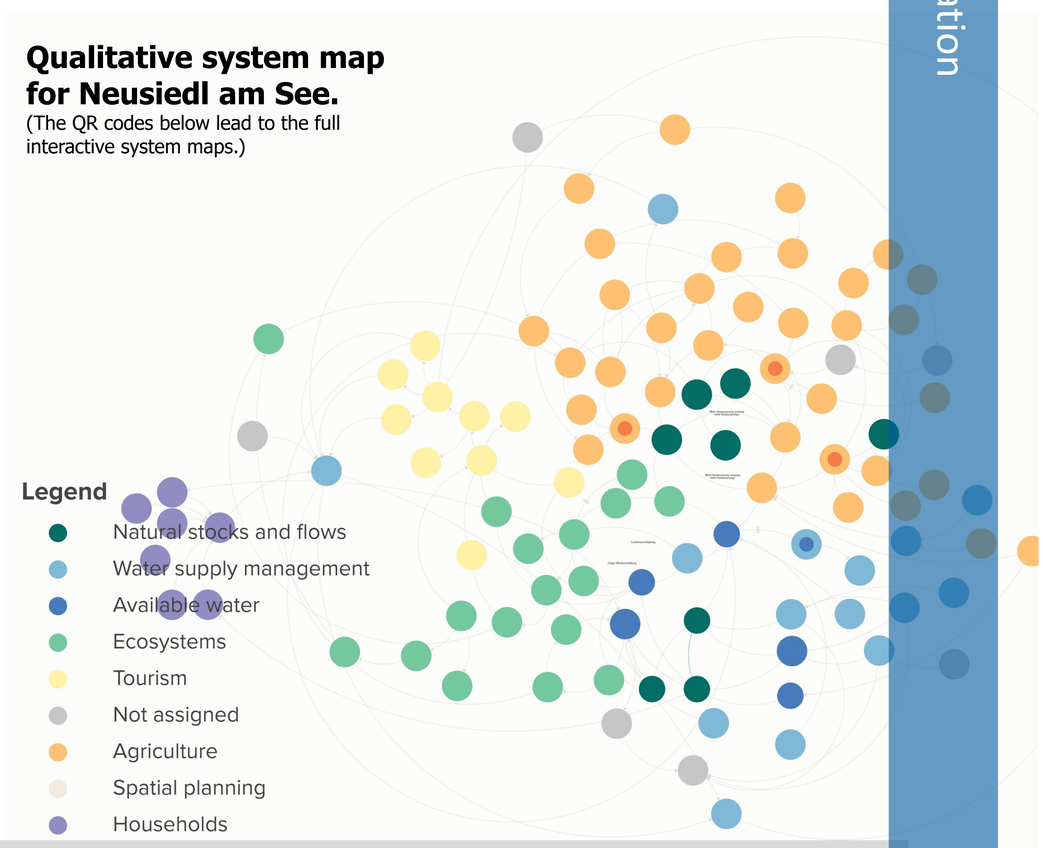
Formative Scenario Analysis

FSA is a scientific technique to construct well-defined sets of assumptions to gain insight into a case and its potential development
(Scholz and Tiedje 2001)

We use Qualitative Systems Mapping as a data integration tool broadly and specific to collect impact variables for the FSA.



Qualitative system map for Neusiedl am See.
(The QR codes below lead to the full interactive system maps.)



- Qualitative system maps (QSM) integrate several system visualization tools drawing mainly from causal loop diagrams (CLD) and concept models.
- QSM are a tool for knowledge integration and communication throughout a model.
- They serve as baselines for various specific analyses, such as scenario design (see FSA) or designing full CLDs or SD models.

Qualitative data integration

Case study Pinzgau (Central Austria)

Alpine environment dominated by grassland areas, mostly used for livestock farming, and forests.

Tourism important source of income, with plans to further expand.

Shifts in the distribution of precipitation and more frequent precipitation extremes may lead to more droughts and floods

This may impact drinking water supply and small scale hydro power in the region.

Case study Neusiedl/See (Eastern Austria)

Originally a floodplain with valuable nature conservation areas such as lakes and fens, large areas were drained in the past for land cultivation.

Recently, groundwater levels reached critical lows, with negative effects on agriculture, ecosystems, and tourism.

Managing agricultural irrigation needs and potentially transforming agricultural practices require intervention not only at farm level.

co-designed options for future water (demand) management

References:
Scholz, Roland W., and Olaf Tietje. *Embedded Case Study Methods: Integrating Quantitative and Qualitative Knowledge*. Thousand Oaks, Calif: Sage Publications, 2002.
Kahil, T., Parkinson, S., Satoh, Y., Greve, P., Burek, P., Veldkamp, T. I. E., et al. (2018). A continental-scale hydroeconomic model for integrating water-energy-land nexus solutions. *Water Resources Research*, 54, 7511– 7533.
Burek, P., Satoh, Y., Kahil, T., Tang, T., Greve, P., Smilovic, M., Guillaumot, L., Zhao, F., and Wada, Y.: Development of the Community Water Model (CWatM v1.04) – a high-resolution hydrological model for global and regional assessment of integrated water resources management, Geosci. Model Dev., 13, 3267–3298, https://doi.org/10.5194/gmd-13-3267-2020, 2020

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