Webinar: Economic Instruments for Resilient River Basin Management

Water pricing designed to internalize environmental externalities and enhance the resilience of aquatic ecosystems
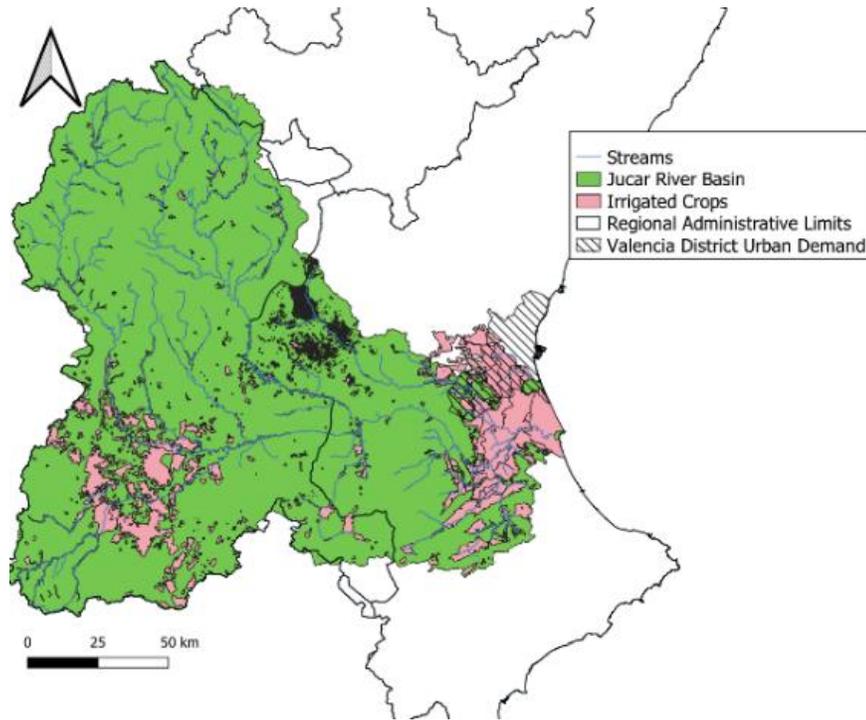
26 February 2026

Background – Spanish case study
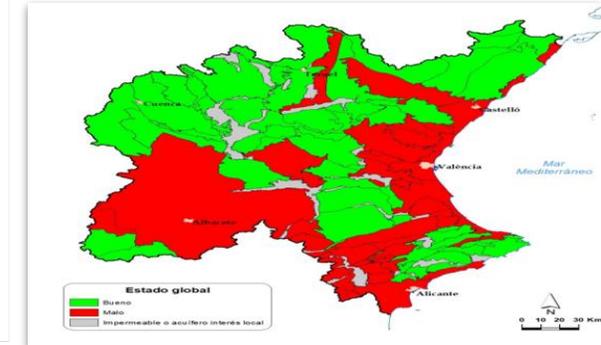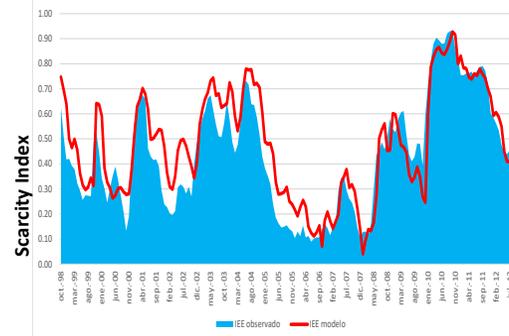
Jucar River Basin: 22.000 km^2

Legend:
- Streams
- Jucar River Basin
- Irrigated Crops
- Regional Administrative Limits
- Valencia District Urban Demand

Surface water withdrawals: **1.602 Mm^3**

Groundwater withdrawals: **1.367 Mm^3**

Sectors: Agricultural 2.439 Mm^3(**80%**);
Urban 489 Mm^3; Industrial 134 Mm^3

ENVIRONMENTAL PRESSURES

✓ Ecosystems below ecological thresholds

✓ Chronic groundwater depletion

✓ Agricultural pollution (nitrates, phytosanitary products)

✓ Persistent imbalance between supply and demand

L'ALBUFERA

The Jucar RB – Climate change as a risk multiplier

Climate change scenarios

Control period (1970-2000)
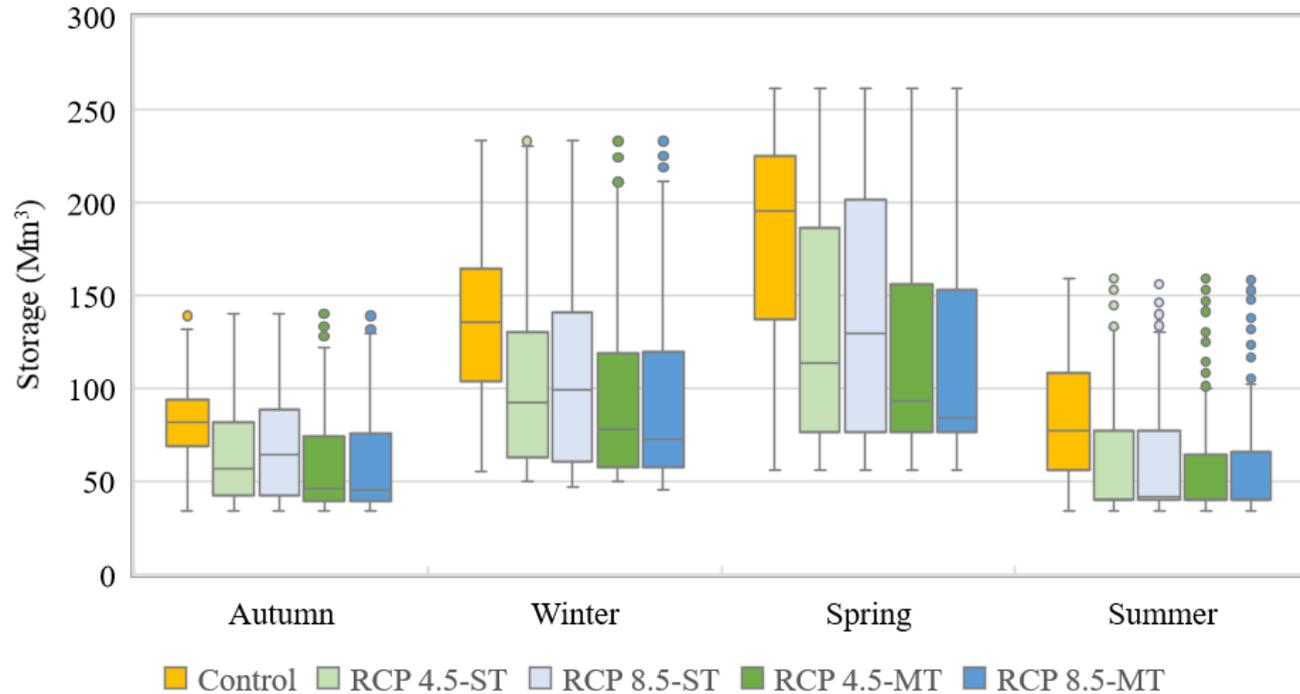
- Total water storage predicted variation ranges from **-27% to -60%** depending on the season and climate change scenario

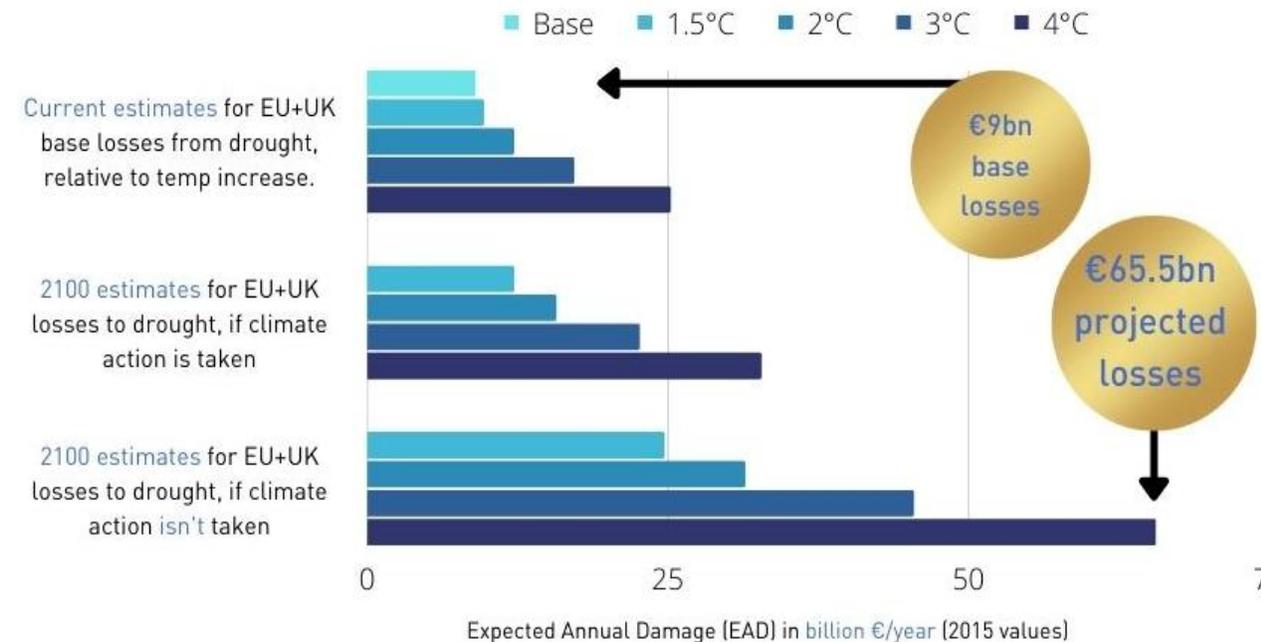**Challenge**: Developing **robust adaptation pathways** in such a **deep uncertainty** context.

The Externality Problem: Why Current Water Pricing Fails

Pricing Gap

✓ Undervaluation

✓ Environmental Costs:

✓ Infrastructure Investment Gap

✓ Policy constraints

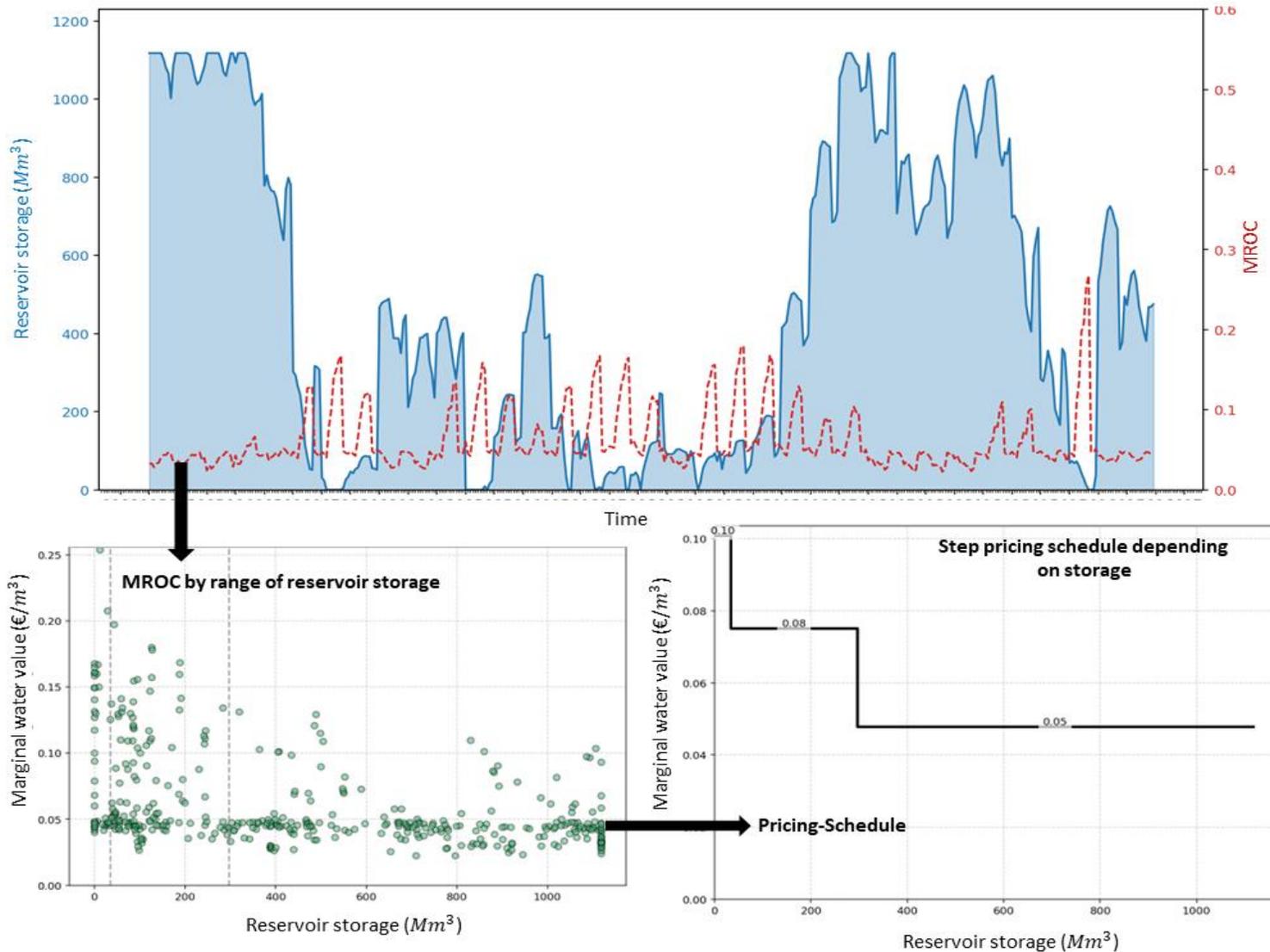➡ **Environmental degradation and resource depletion are not economically internalized.**

Potential cost of drought to EU and UK economies

The EU and UK loose an estimated €9bn a year to drought. A rise of 4 degrees Celsius would take that above €17bn; by the year 2100, this could balloon to almost €65.5bn.

Legend: Base · 1.5°C · 2°C · 3°C · 4°C

Current estimates for EU+UK base losses from drought, relative to temp increase.

2100 estimates for EU+UK losses to drought, if climate action is taken

2100 estimates for EU+UK losses to drought, if climate action isn't taken

€9bn base losses

€65.5bn projected losses

Expected Annual Damage (EAD) in billion €/year (2015 values)

Source: Increased economic drought impacts in Europe with anthropogenic warming, Nature, 2021.

Scarcity-Responsive Tariff Design

RETOUCH NEXUS

Dynamic water pricing

The combination of surface and groundwater pricing policies promotes conjunctive use in aquifers, as the decreasing block tariff for surface water and the increasing block tariff for groundwater imply that pumping is discouraged when surface water is abundant and, conversely, is promoted during periods of surface water scarcity.
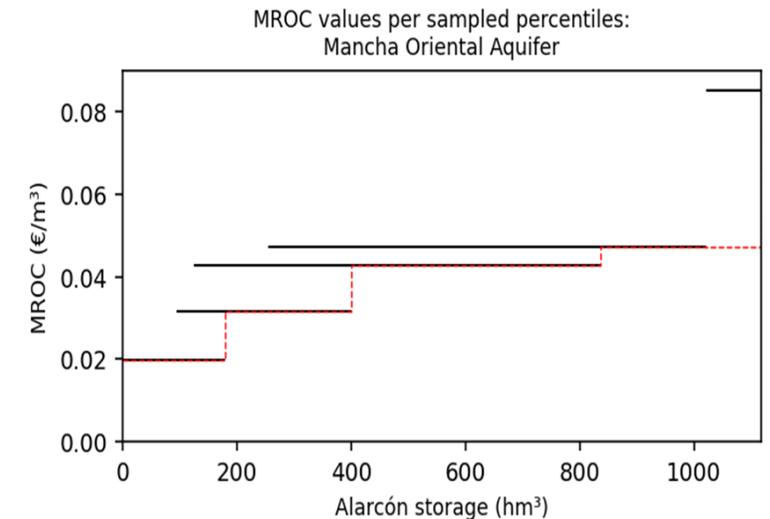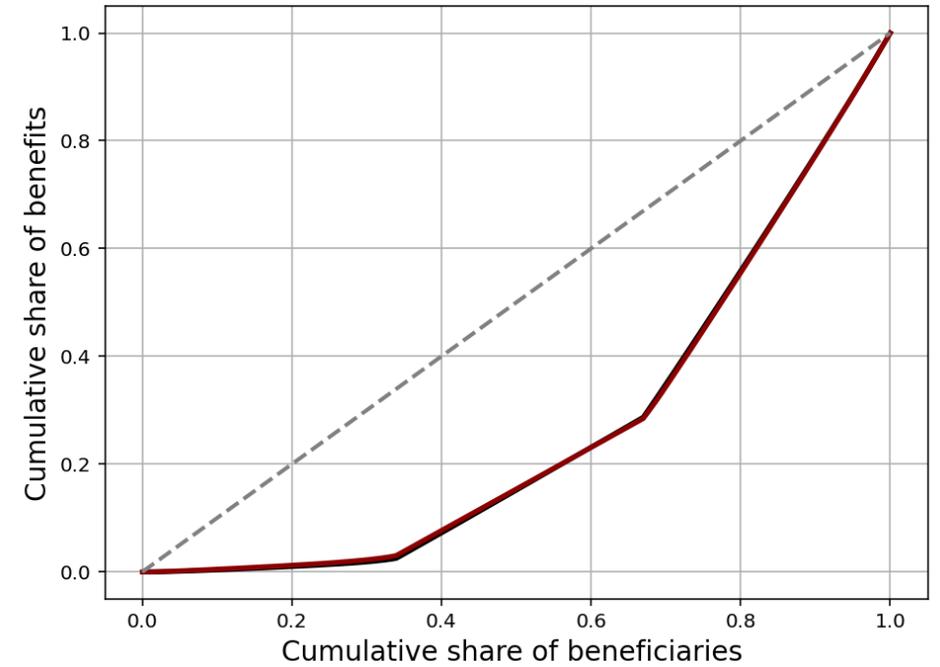
Results – Impact of Scarcity-Responsive Tariffs

Water pricing efficiency
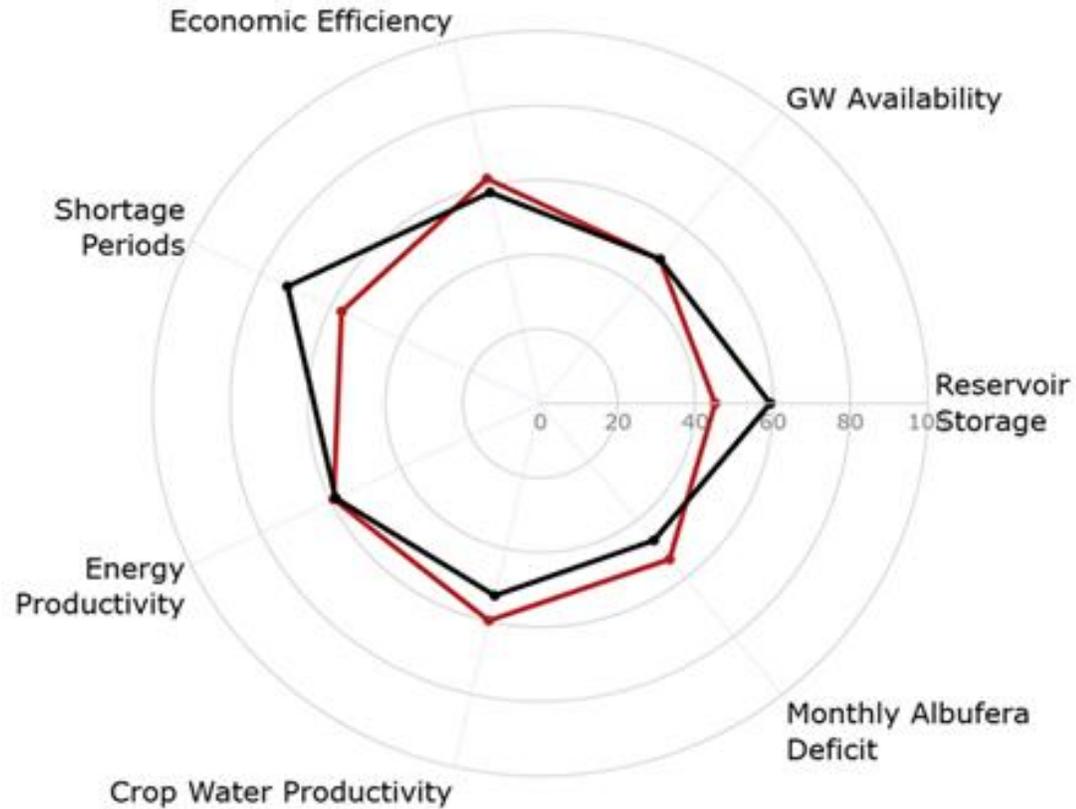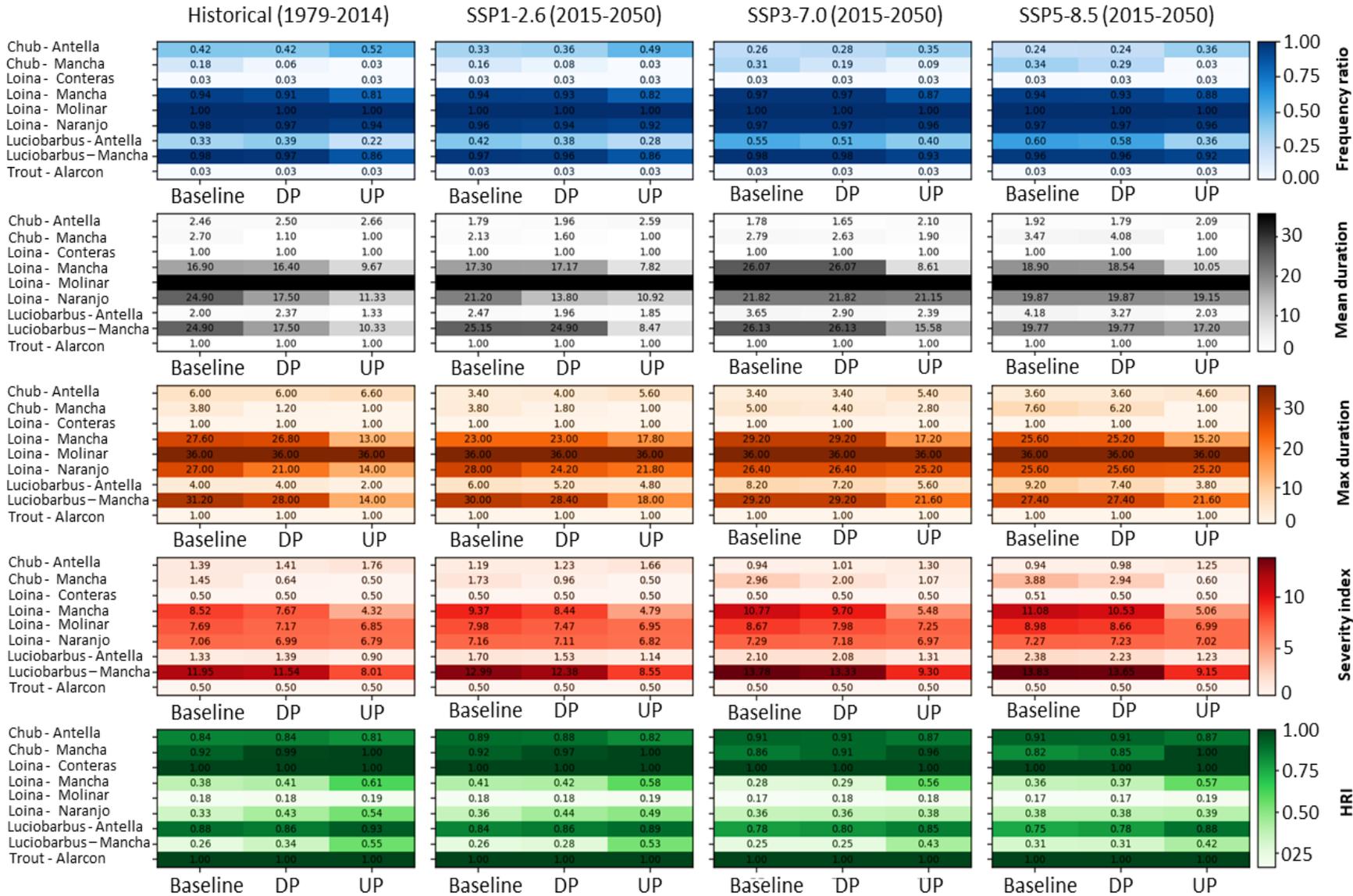
Water pricing equity

Results – Water Pricing as a Driver of Aquatic Ecosystems' Resilience

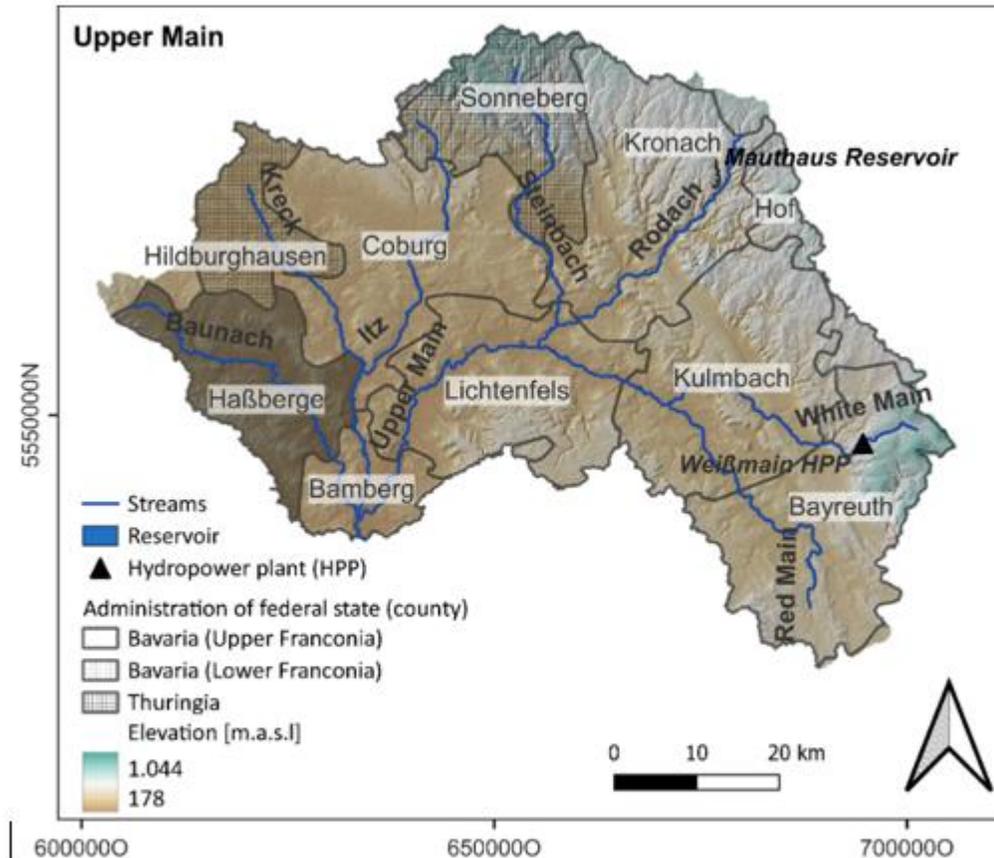# Using Scarcity-Responsive Tariffs: Actionable Takeaways for Basin Managers

RETOUCH NEXUS

TO ACHIEVE

💧 **Reduction in over-abstraction** – mitigates reservoir depletion

🏞 **Groundwater Protection** – promotes conjunctive use

🐟 **Ecosystem resilience** – maintain environmental flows

💸 **Economic efficiency** – minimize unnecessary loss to users

Governance considerations

🔄 Design pricing policies that internalize water scarcity

📄 Define legal authority for variable tariffs; link to water allocation rules

💬 Engage stakeholders early: farmers, urban utilities, hydropower operators

⚖ Integrated planning and include environmental objectives in basin plans;
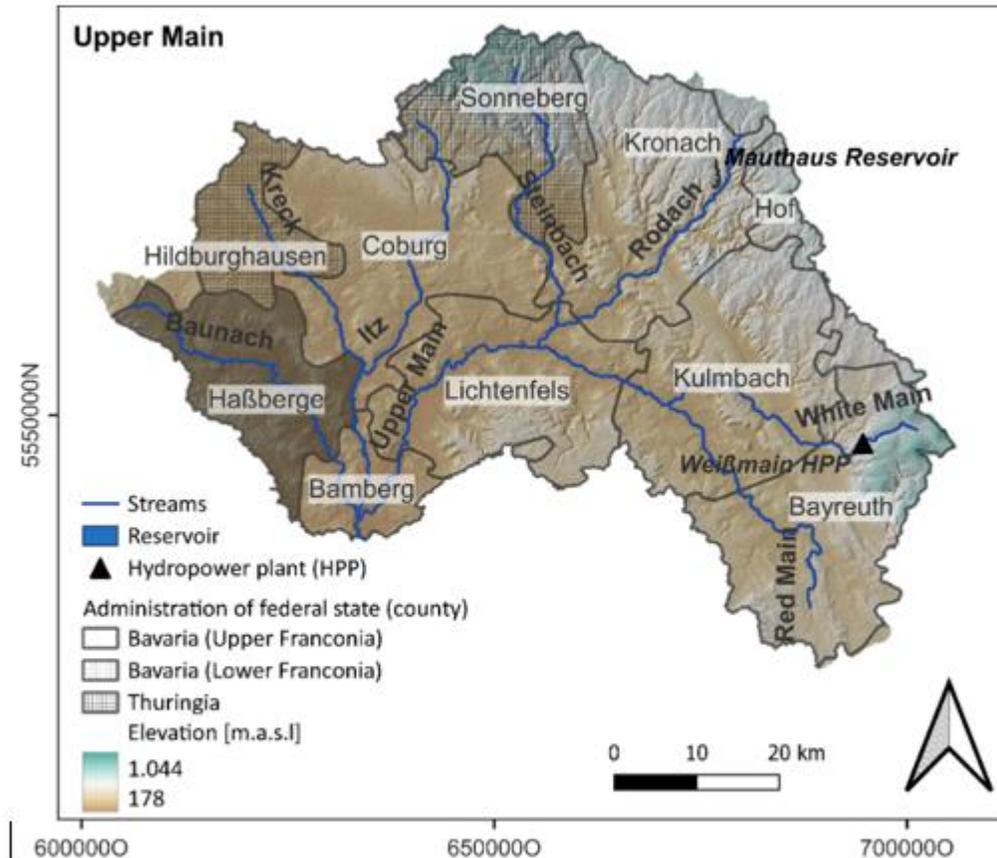
Background – DE case study

Figure 1: Elevation map of the Upper Main River Basin (Source: Scherer, 2024a).

*Regierung von Oberfranken, 2024

~200.000 ha ag land (43..2%)

~134.000 ha cereals (28.8%)

Wheat (48%) Barley (28%)

Background – DE case study

Figure 1: Elevation map of the Upper Main River Basin (Source: Scherer, 2024a).

*Regierung von Oberfranken, 2024

Climate Change

Demand   Supply

How to generate incentives for future water use?

Model – System Dynamics + SFA

Water availability

Water use

Environmental impact

6.

Maximum withdrawal percentage exceeded?

Withdrawal Percentage

What is the shadow price of extracted water?

Cereal Product Scenario Multiplier

Cereal Product Difference

Extra Water Extraction Necessary to Match Baseline

Difference in Revenue
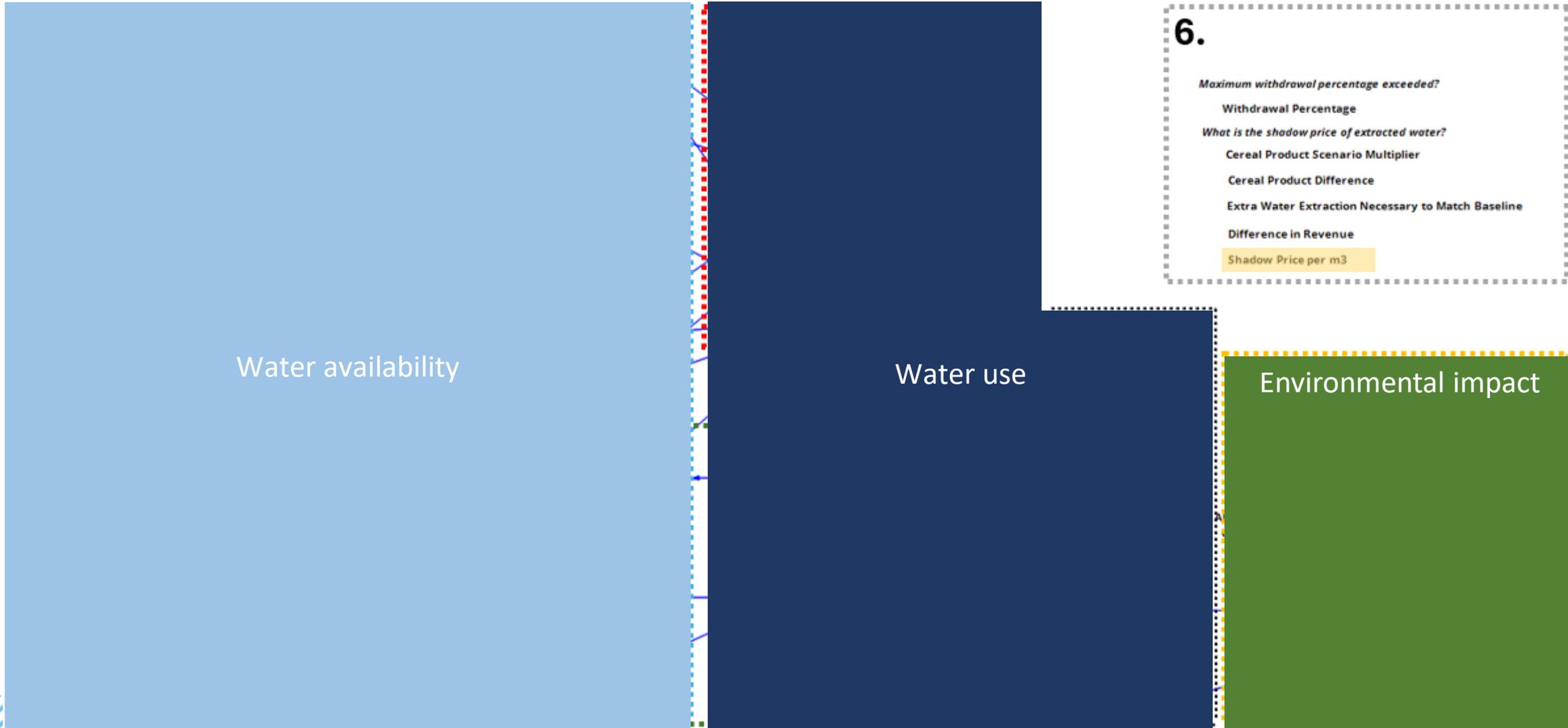
Shadow Price per m3

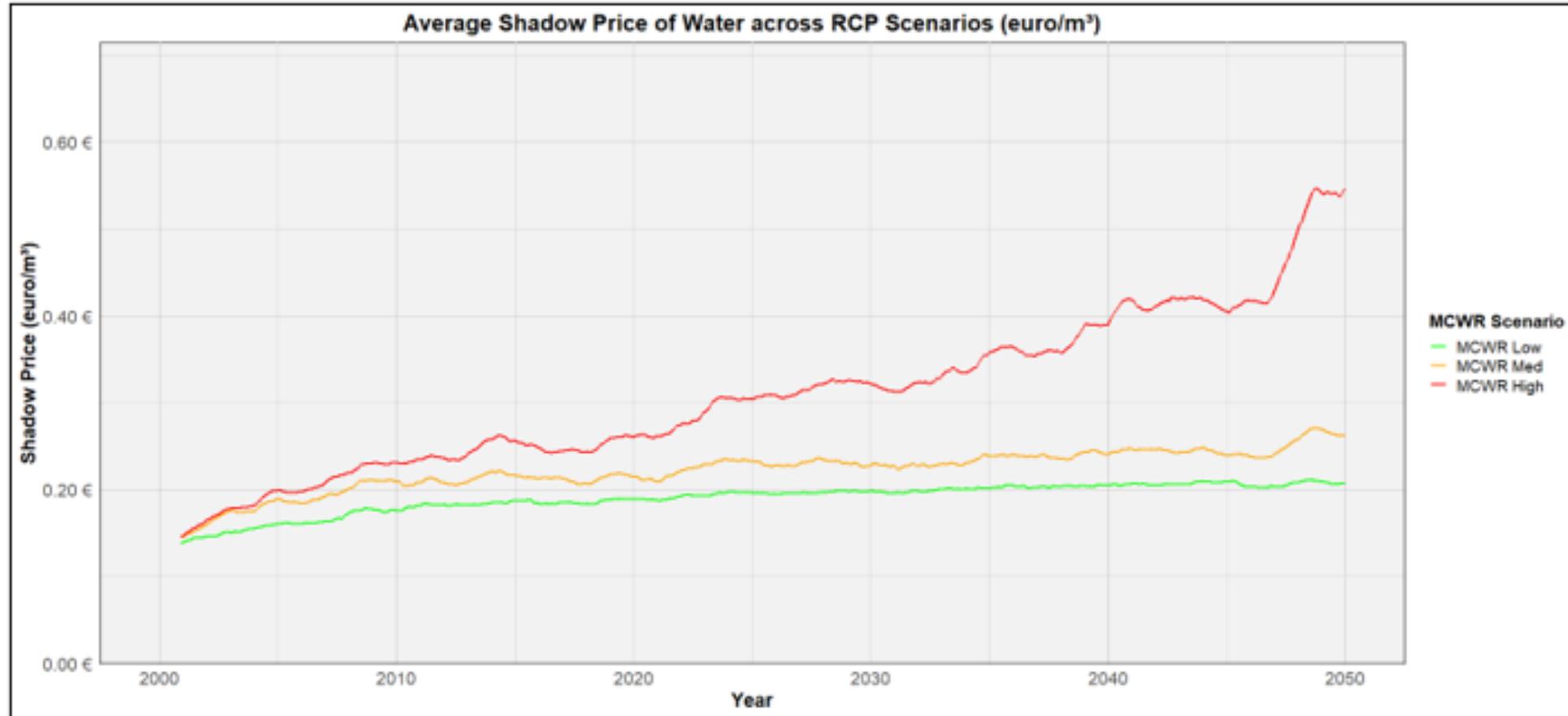# Results – Shadow price of water in agriculture

Figure 8: Shadow price of irrigation water (€/m³) across three MCWR scenarios (Low, Medium, High), averaged across RCP climate pathways, from 2000 to 2050 (Author).

Follow-up

Do you see any opportunity/similarities for „scaling up" and „scaling out" of similar approaches in any of your „case studies"?

(please, write your answer in the chat, with a few details on the specific case)

SCALING OUT (HORIZONTAL) - TO INCREASE IMPACT BY REPLICATING A MODEL IN SIMILAR CONTEXTS, PROVIDING FLEXIBILITY, RESILIENCE, AND COST-EFFECTIVE GROWTH, OFTEN FOCUSING ON SHARED FEATURES.

SCALING UP (VERTICAL) - TO INCREASE THE COVERAGE, SIZE, CAPACITY, SCOPE, OR OUTPUT OF A MODEL TO A WIDER CONTEXT, ESSENTIALLY MAKING IT BIGGER AND MORE EFFECTIVE. IT'S ABOUT GROWING SUBSTANTIALLY, NOT JUST LINEARLY, TO PROVIDE MORE COMPREHENSIVE INSIGHTS.