Sustainable hydropower in Austria

best practice solutions for complex multidimensional problems

Hydropeaking Mitigation in Heavily Modified Water Bodies

The SuREmMa+ evaluation method as a basis to define the good ecological potential

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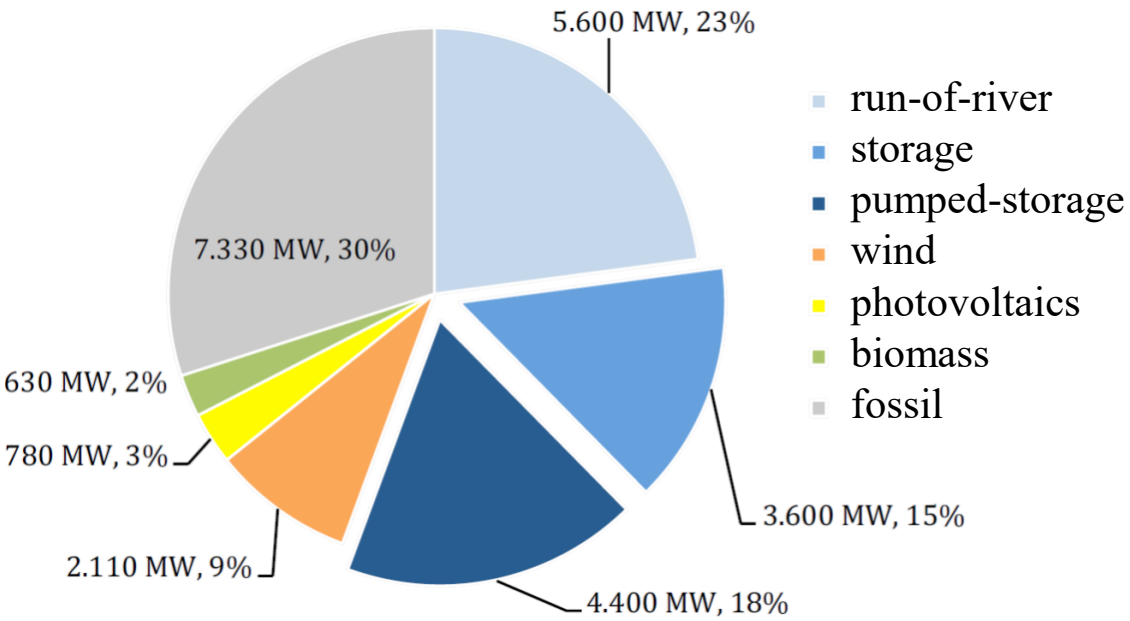
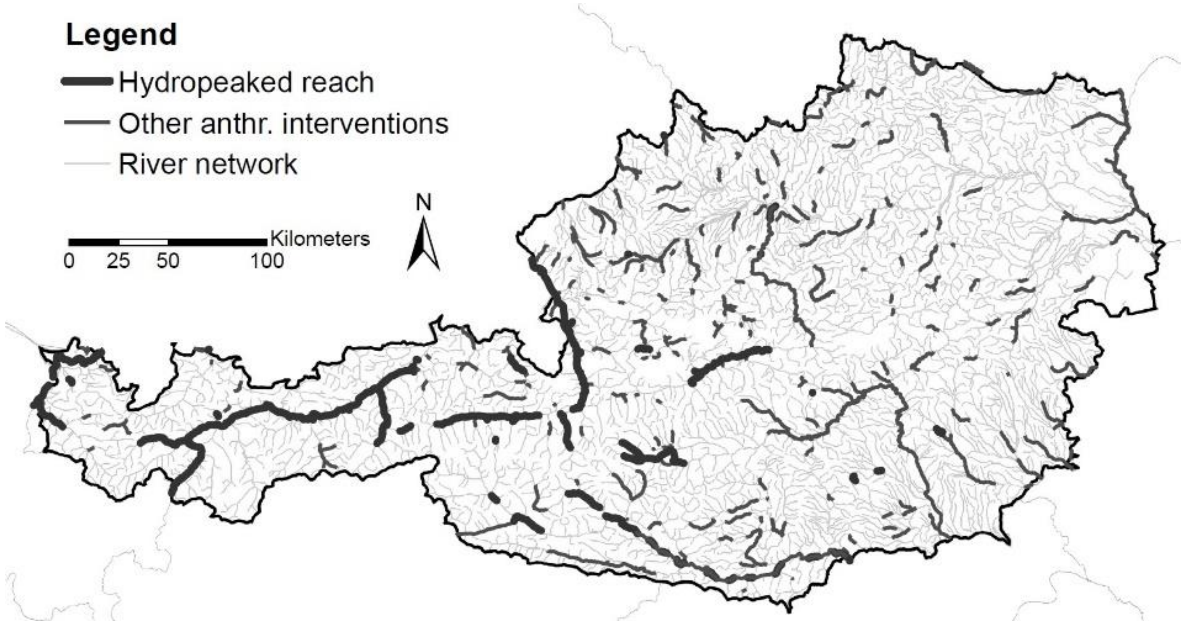
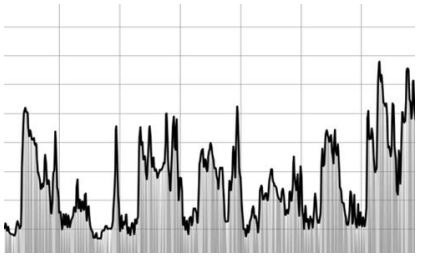
Status Quo energy resources in Austria

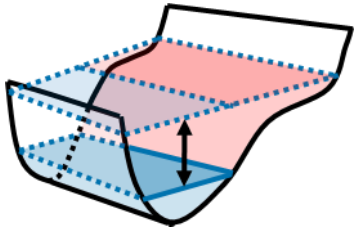


- Around 1/3 of the electricity production depends on storage and pumped-storage power plants (Neubarth, 2017).
- Power plant operations lead to artificial short term flow fluctuations in rivers.

Hydro peaking causes one of the most important environmental impacts on running water ecosystems in Austria

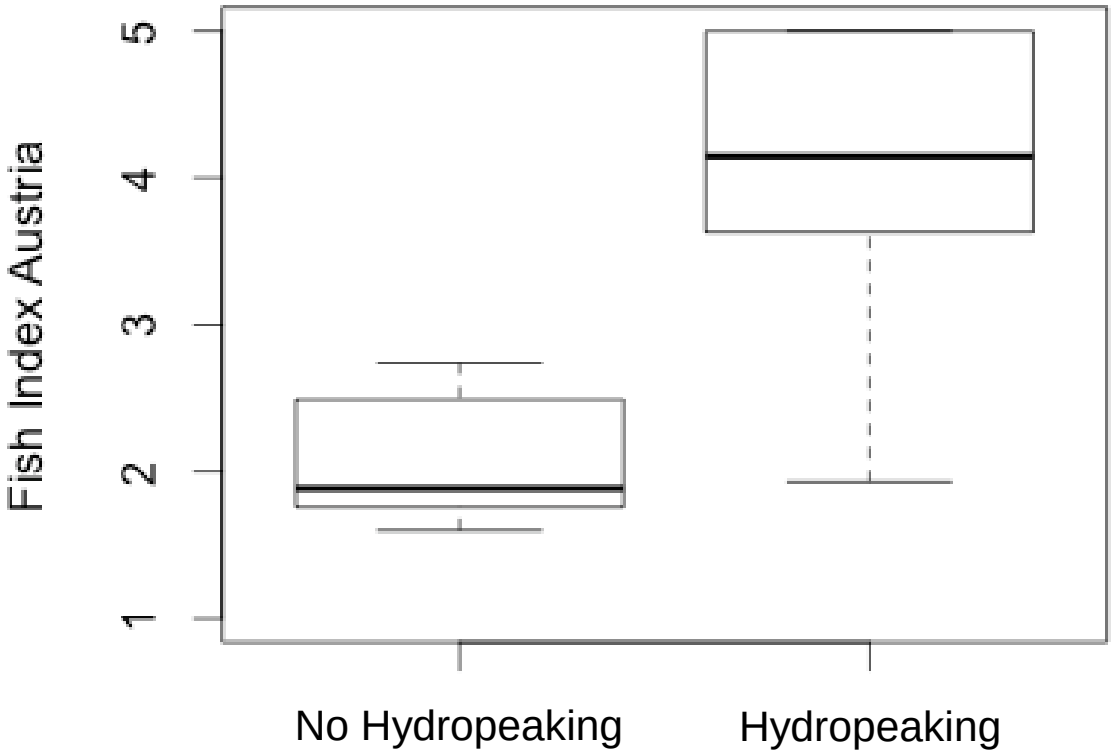






- More than 800 km river stretches are affected by hydropeaking (caused by high- head storage power schemes). Most is designated as Heavily Modified Water Bodies.
- At least 3000 km river stretches are affected by other anthropogenic changes (caused by “Schwellbetrieb”, run-off-river power plants…)
- Short term flow fluctuations and its ecological impacts are probably a more widespread problem than assumed!

Ecological consequences
Effect on fish assemblages



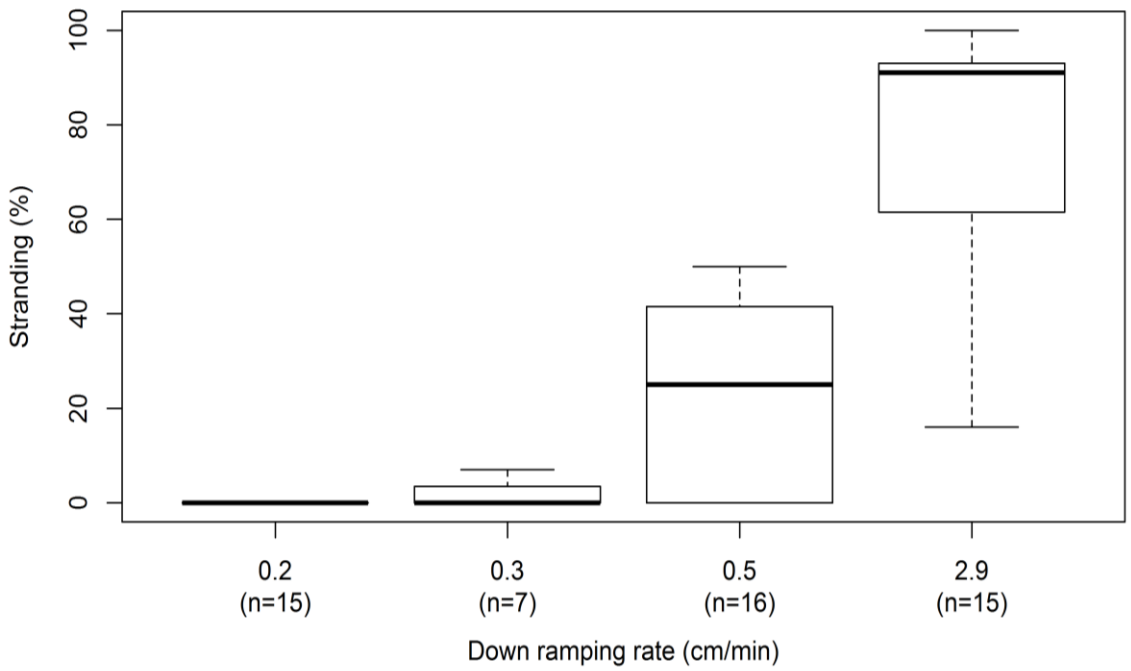
- Low biomass and abundances
- Missing species
- Disturbed population structure

Potential ecological impacts

- Hydropeaking intensity and frequency in Austrian rivers is monitored by hydrograph curves.
- Especially gravel bar habitats are affected by artificial flow fluctuations.
- Organism vulnerability is investigated by drift and stranding experiments (HyTEC)

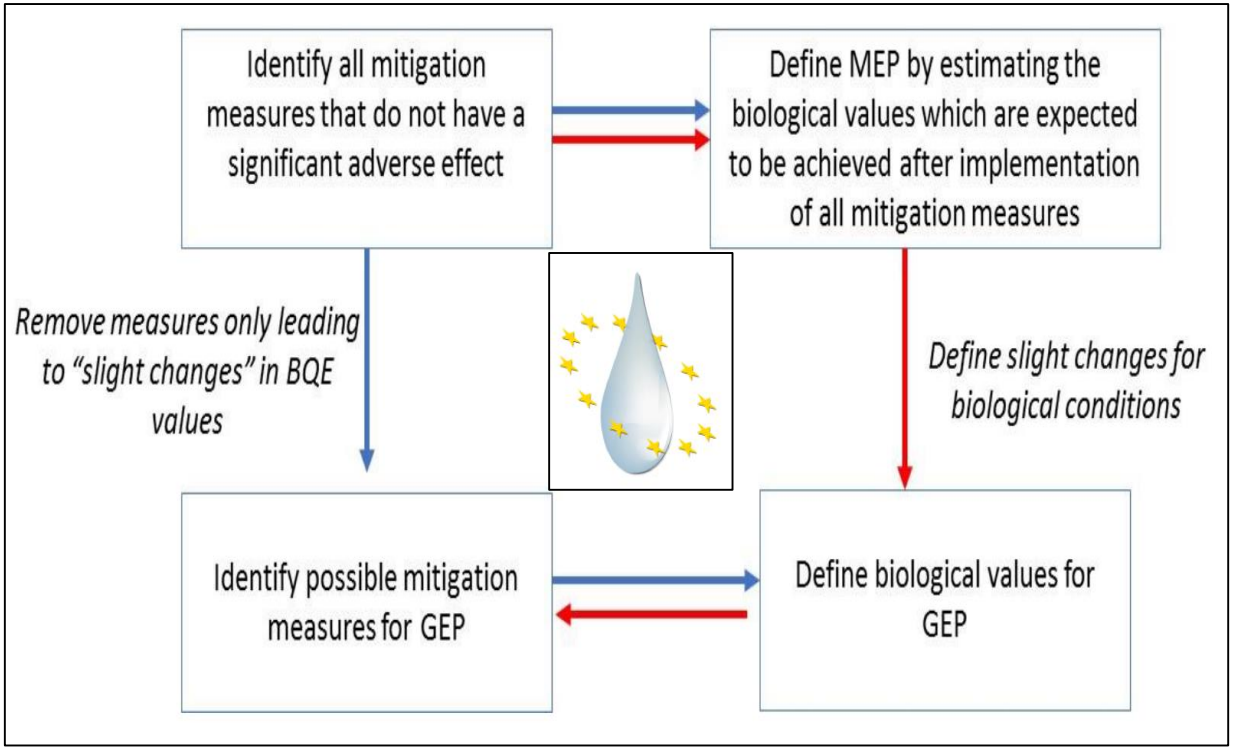
…experimental results…

example stranding-rate of larval grayling after one hydro peaking event with different down ramping rates



- Species- and stage-specific organism vulnerability!
- Increased mortality rates due to anthropogenic drift and stranding of bentic invertebrates and fish, if water level fluctuations exceed critical intensity ranges.

Legal framework



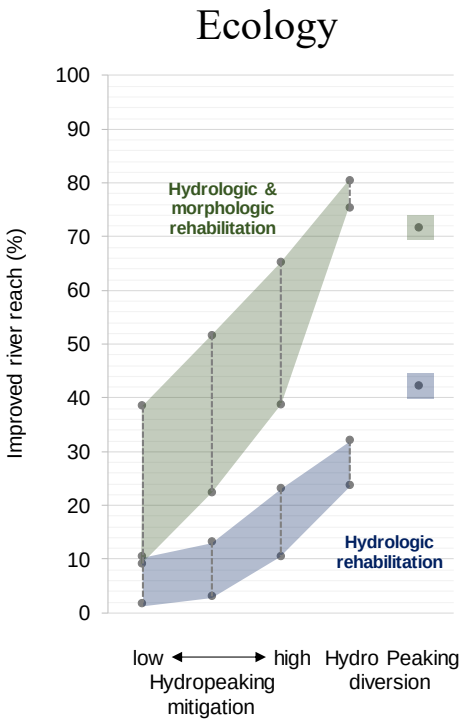
Mitigation measures:

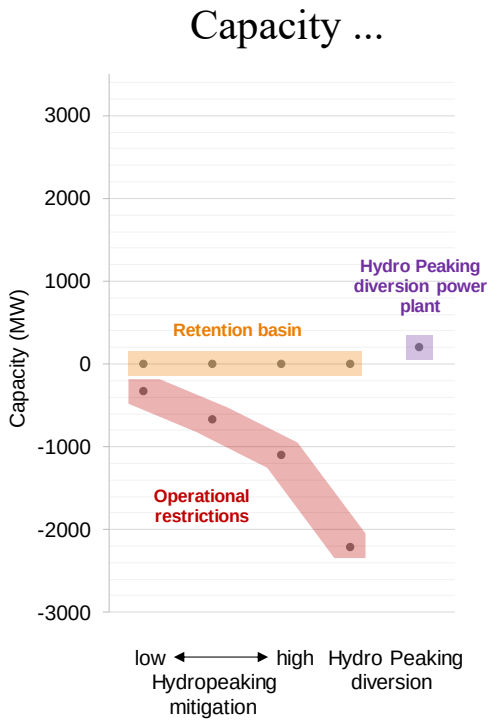
- Operational restrictions
- Compensation basins
- Diversion power plants
- Morphological measures

In order to define the Good Ecological Potential it is crucial to assess ecological benefits AND the potential impacts on water use.

(European Comission, 2020)

SuREmMa+ assessment method





Assessment of:

Ecological benefits

- River stretches with decreased stranding/drift risk

Impacts on use

- Decrease of available flexible power plant capacity
- Effects on CO_2 production
- Costs

The SuREmMa+ assessment method allows to evaluate mitigation measures nationwide and in a standardized way in order to define the catchment-specific Good Ecological Potential (Greimel *et al.,* 2021).

…ongoing

Goals:

- Provide an integrative communication platform
- Deliver key findings for a nationwide hydropeaking guideline for Austria
- Stepwise implementation of mitigation measures with adaptive management