Final conference
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Dynamic models in the AIST catchment to assess effectiveness of NSWRMs in mitigating sand accumulation

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Aist catchment overview

Sand accumulation issue

Measures tested

Models implemented

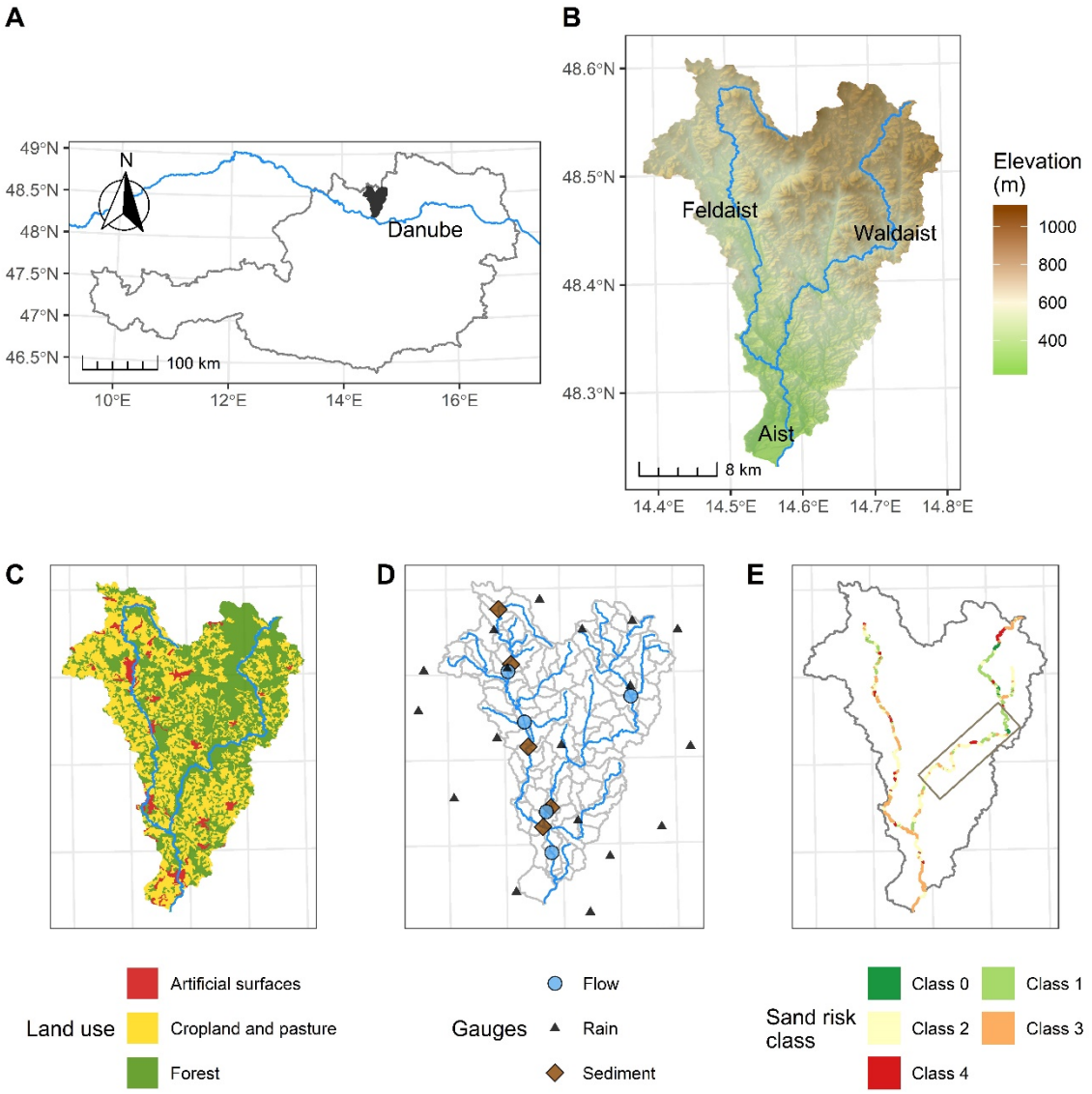
Main results

Discussion

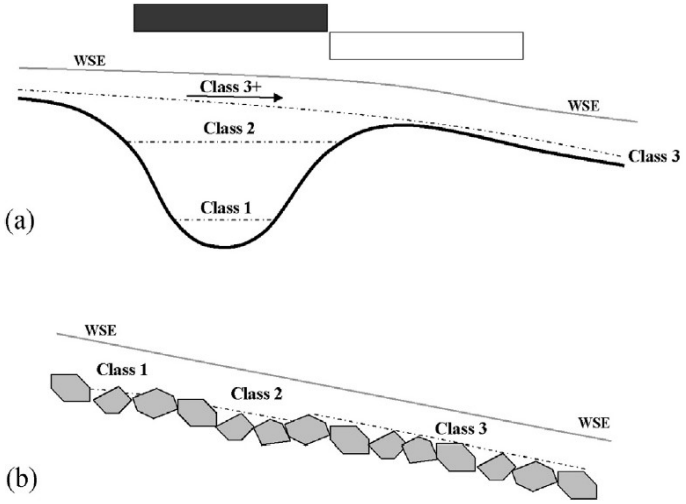
Conclusions

AIST CATCHMENT OVERVIEW

- Northern Austria
- Upper Danube catchment
- Feldaist: tillage, pasture
- Waldaist: forestry, pasture



SAND ACCUMULATION ISSUE



Hauer 2015 - Limnologica

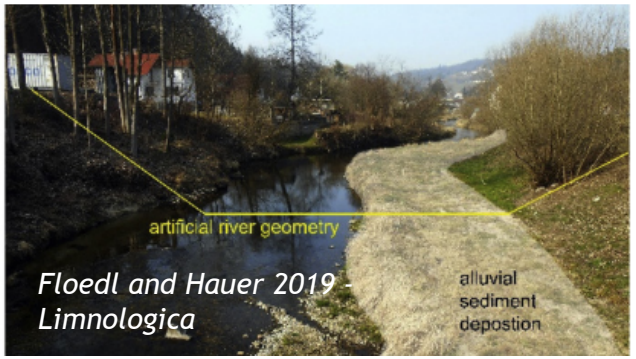
- Coarse sand to fine gravel
- Bedrock weathering, land use
- River bed aggradation
- Ecological impacts: Freshwater Pearl Mussel

TYPES OF MEASURES TESTED

Stakeholders interaction:

1) Sediment/water retention ponds
- Sediments trapping
- Water storage

2) Hydromorphological improvements
- Increase substrate heterogeneity
- Slow high flows

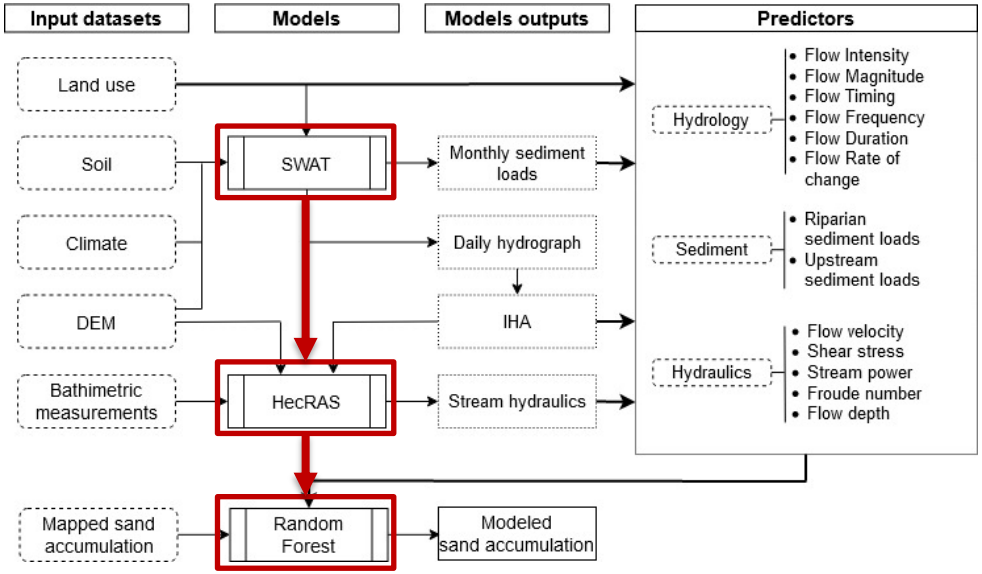


3) Vegetated filter strips
- Sediments trapping

MODELS IMPLEMENTED

1. SWAT: catchment hydrology and sediment generation
2. HEC-RAS: reach hydraulics
3. Random Forest: sand accumulation in stream

Models connection: Eco-Hydrological Modeling Cascade

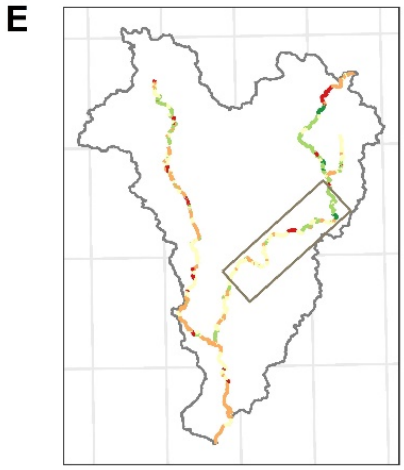


Baldan et al., 2020 - Science of the Total Environment

MODELS IMPLEMENTED

1. SWAT: catchment hydrology
2. HEC-RAS: reach hydraulics
3. Random Forest: sand accumulation

Sand accumulation model: predict sand risk class (50 m resolution)

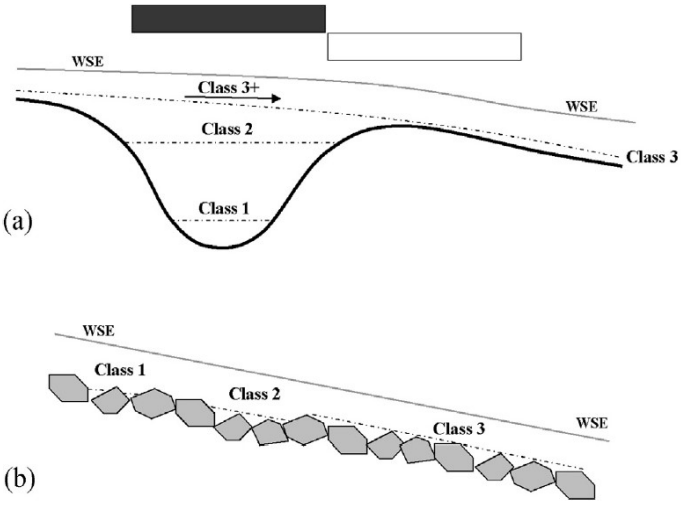


Class 0: no risk

…

Class 3: high risk

Class 3+: very high risk



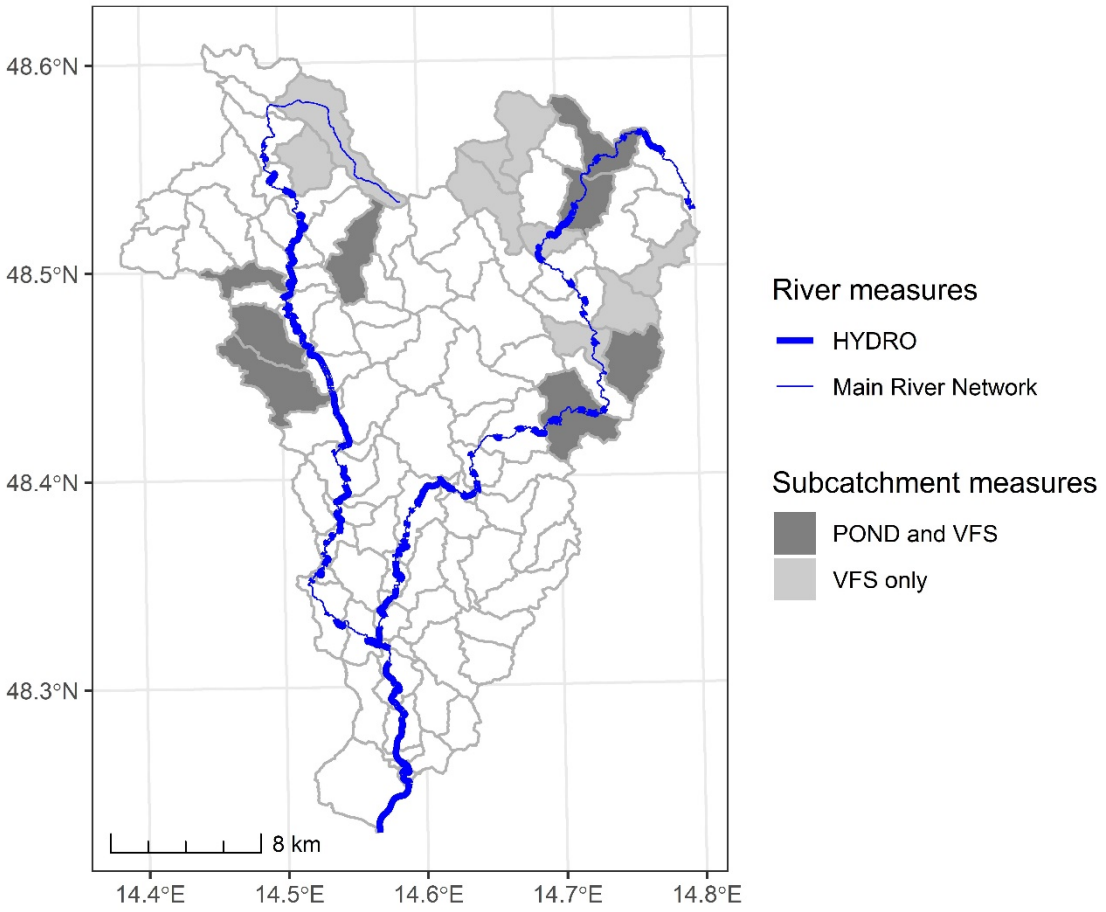
Hauer 2015 - Limnologica

MEASURES TESTED: SITING

Sediments hotspots (SWAT):

- vegetated filter strips (88 % sediment production)
- sediment/water ponds (50 % sediment production)

Reaches in bad hydromorphological status: in-stream improvements



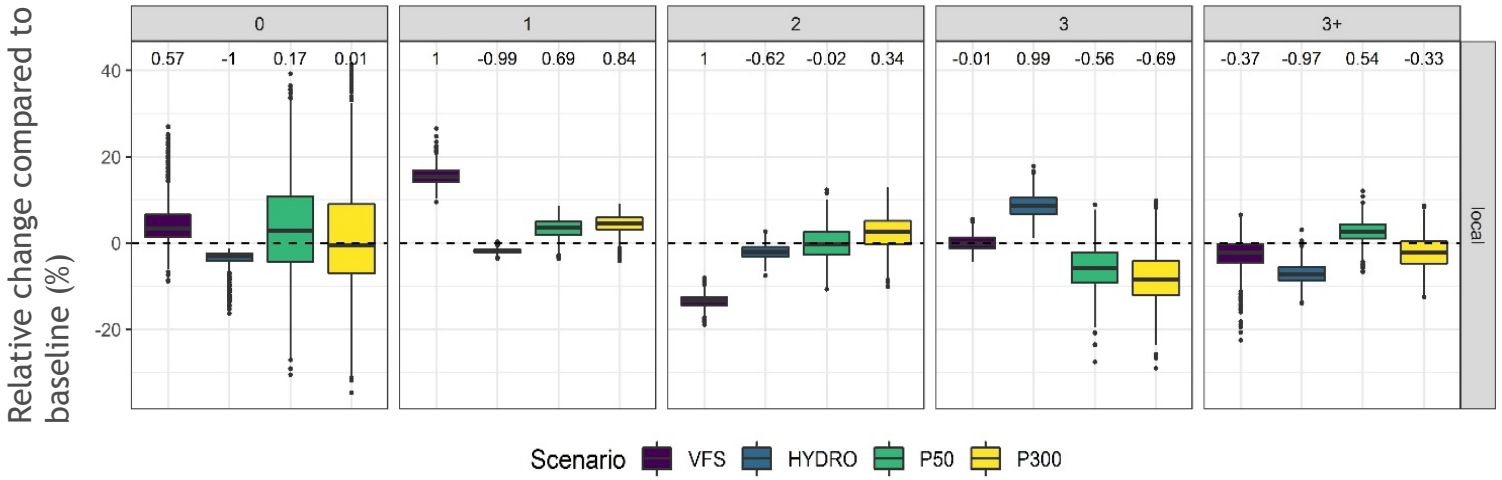
MEASURES TESTED: ASSESSMENT STRATEGY

Workflow:

- SWAT implementation
- Changes propagated
- Sand accumulation modelled (river network: 280 km)
- Scenario analysis
    1. Vegetated filter strips VFS
    2. Hydromorphological improvements HYDRO
    3. Sediment ponds P50
    4. Water ponds P300

Comparison with baseline: change in river network extent that is occupied by sand risk class

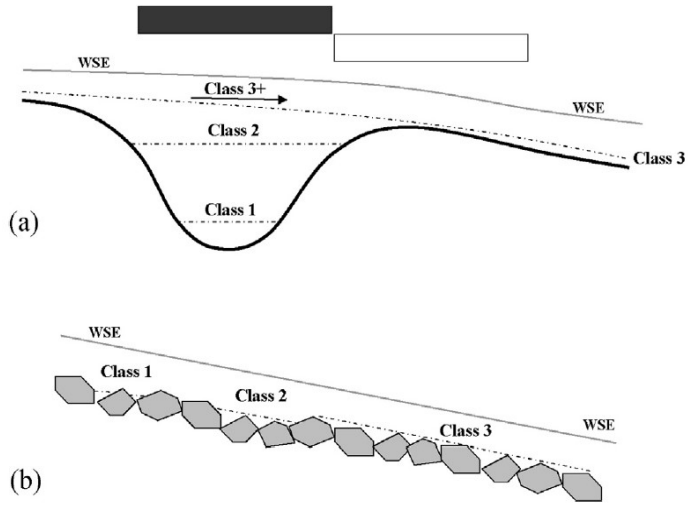
EFFECTS OF MEASURES ON SAND ACCUMULATION



NOTE: Boxplots represent uncertainty in the forecast

Observations:

- HYDRO effective on class 3+
- P50, P300 effective on class 3
- VFS effective on class 0, 1, and 2

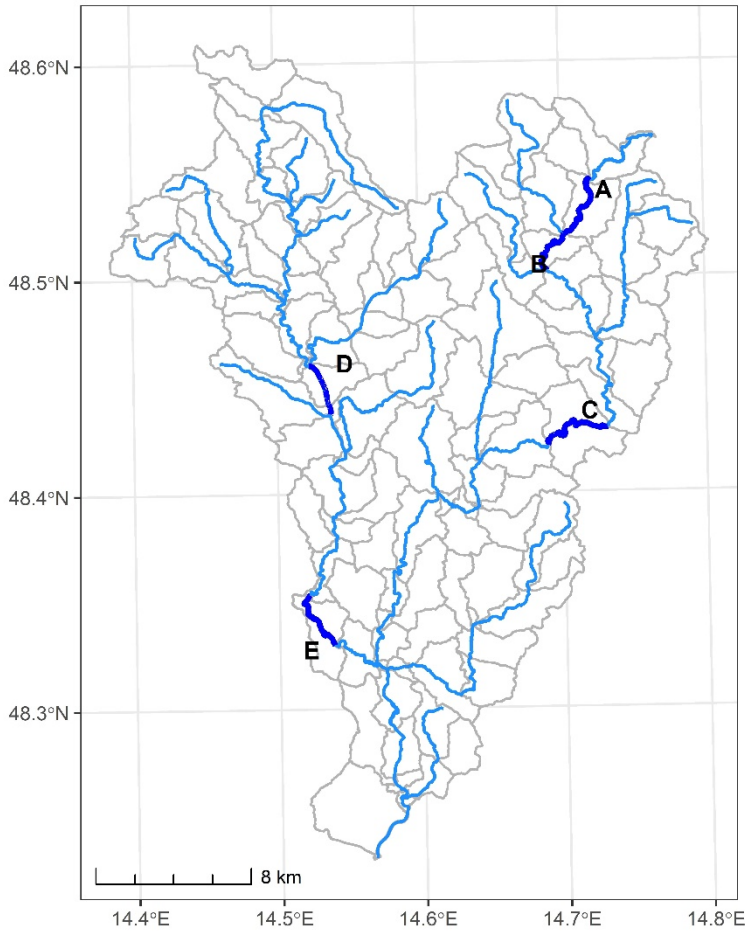


Hauer 2015 - Limnologica

FLEXIBILTIY OF THE MODELS

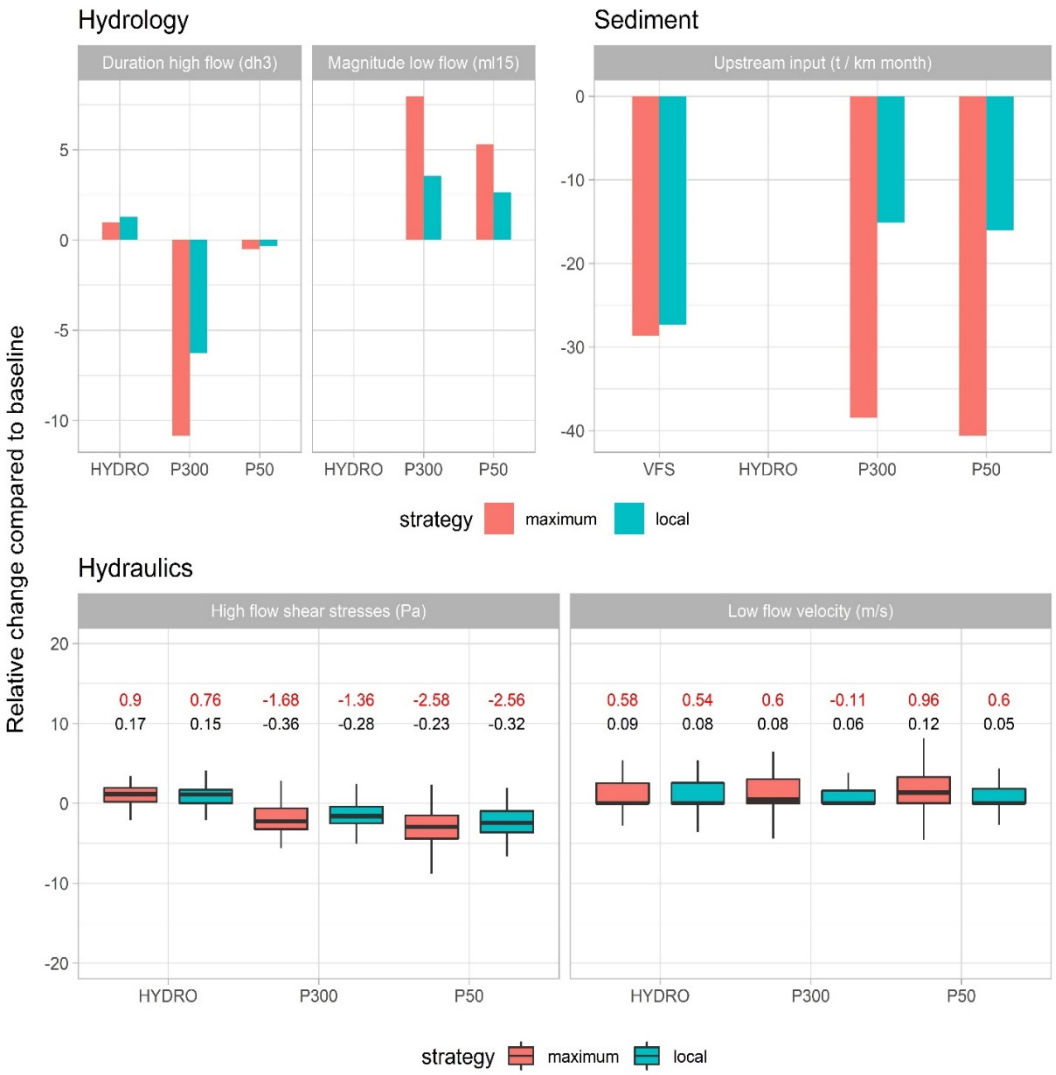
Effects at different spatial scales can be diagnosed:

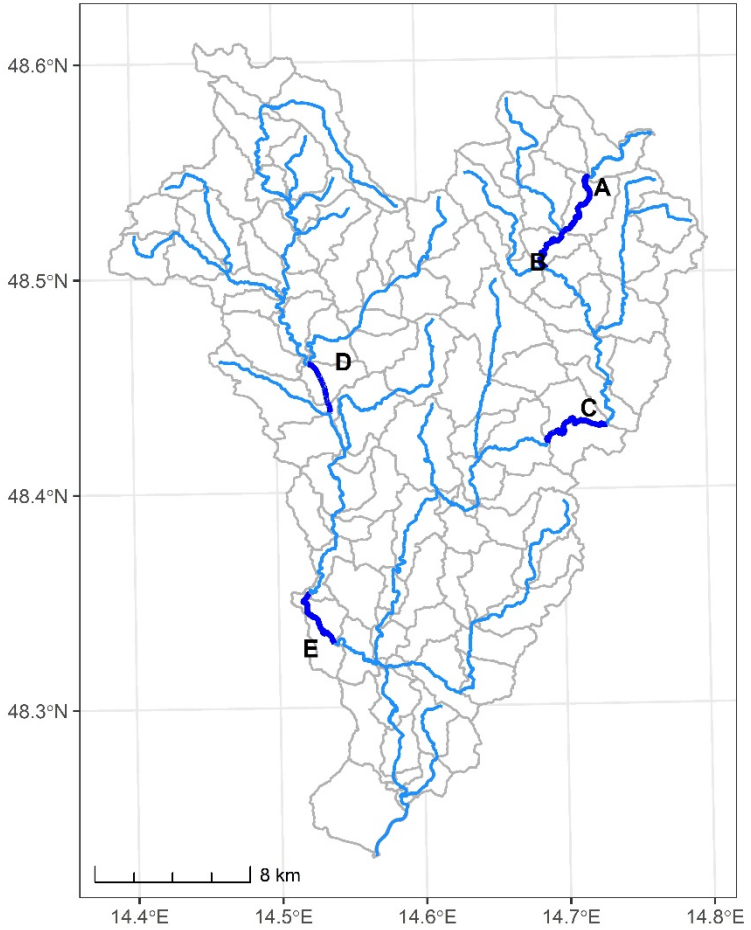
- Changes at the whole catchment
- Changes in target reaches



FLEXIBILTIY OF THE MODELS

Example: changes in reach A



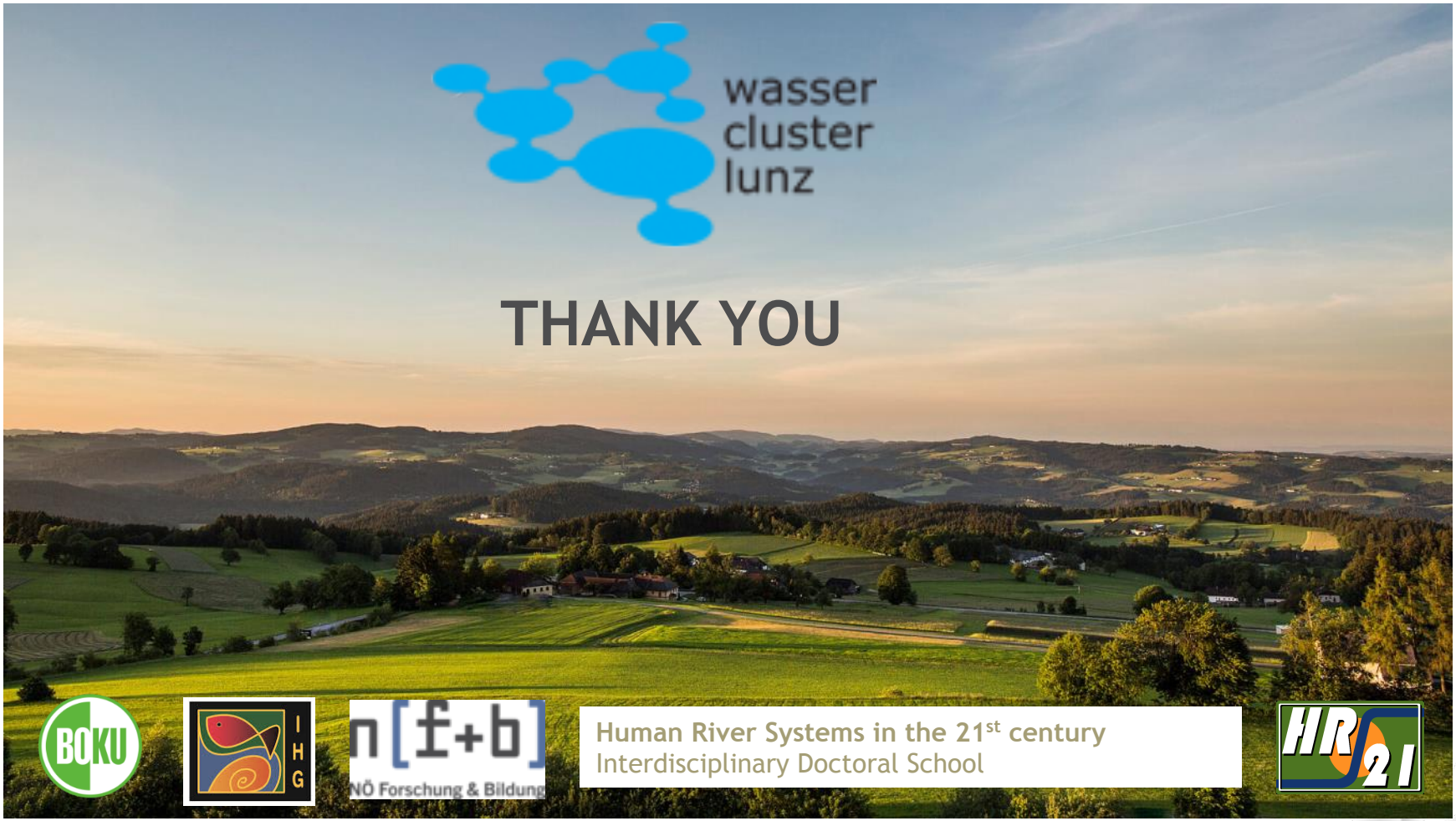


CONCLUSIONS

Dynamic modelling supports decision making:

- Catchment understanding (sediments hotspots)
- Effectiveness is assessed
- The measures ranking depends on the issue to tackle
- Trade-offs in measures choice are highlighted

AIST CATCHMENT



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