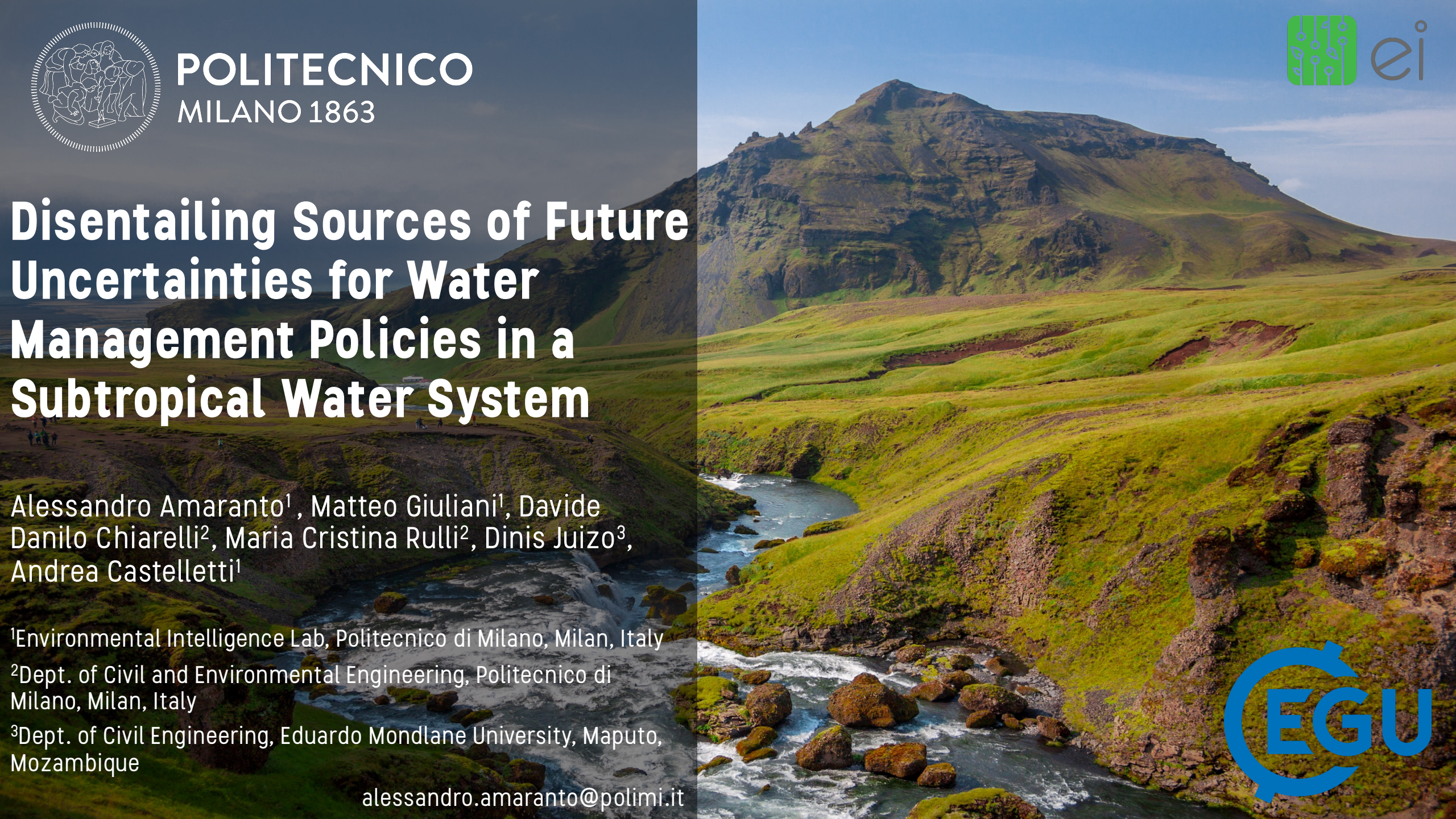

Disentailing Sources of Future Uncertainties for Water Management Policies in a Subtropical Water System

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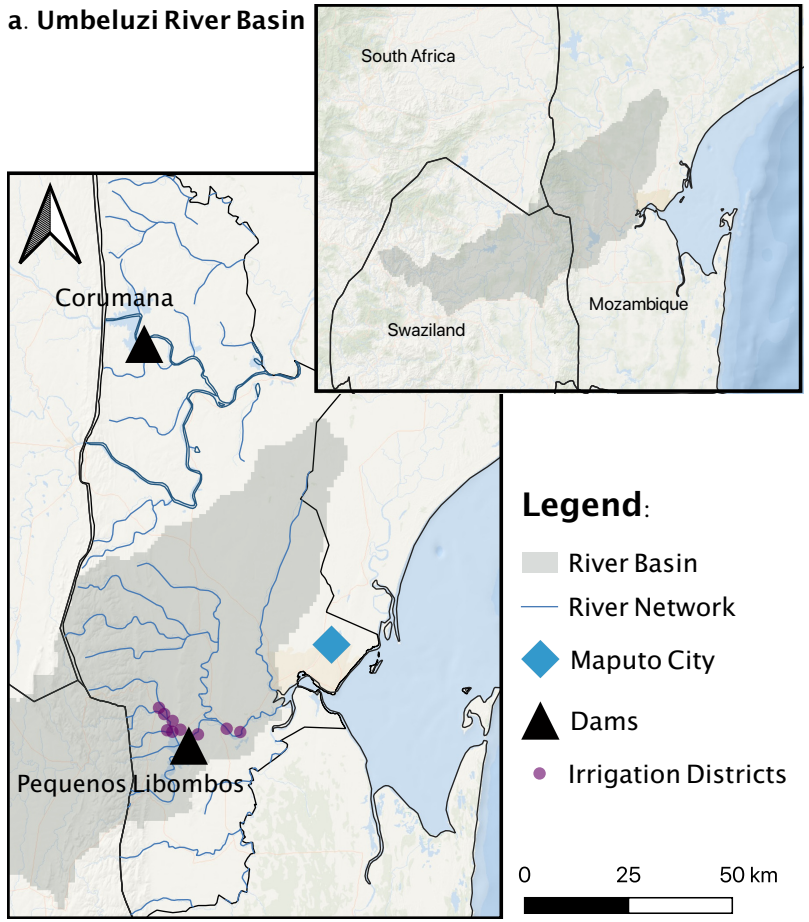
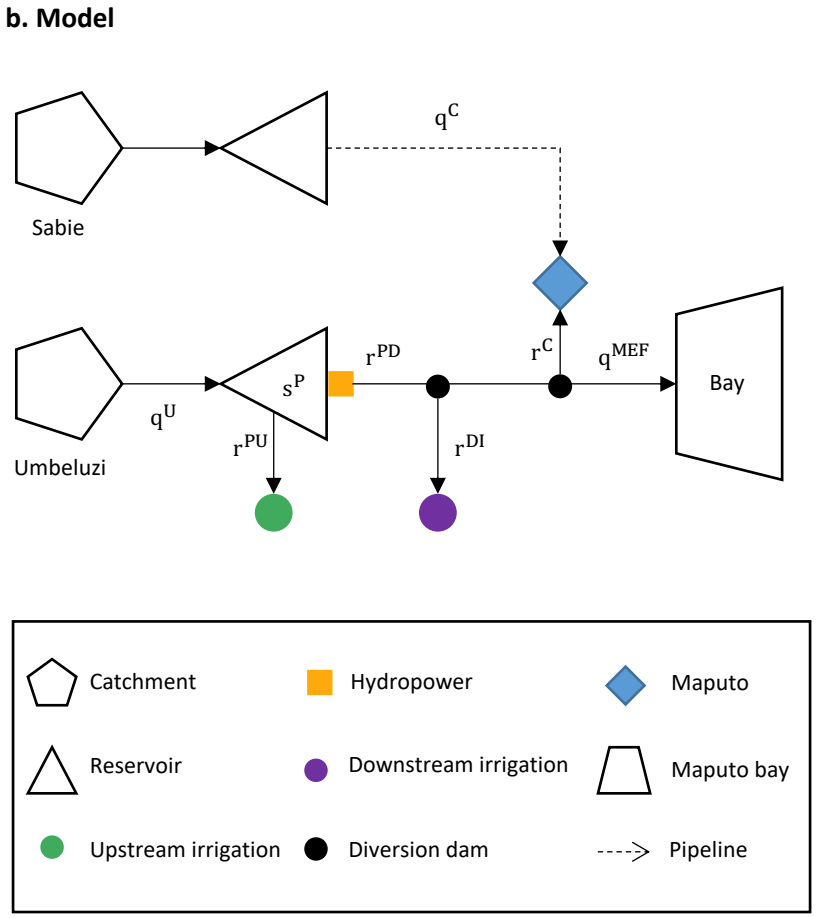
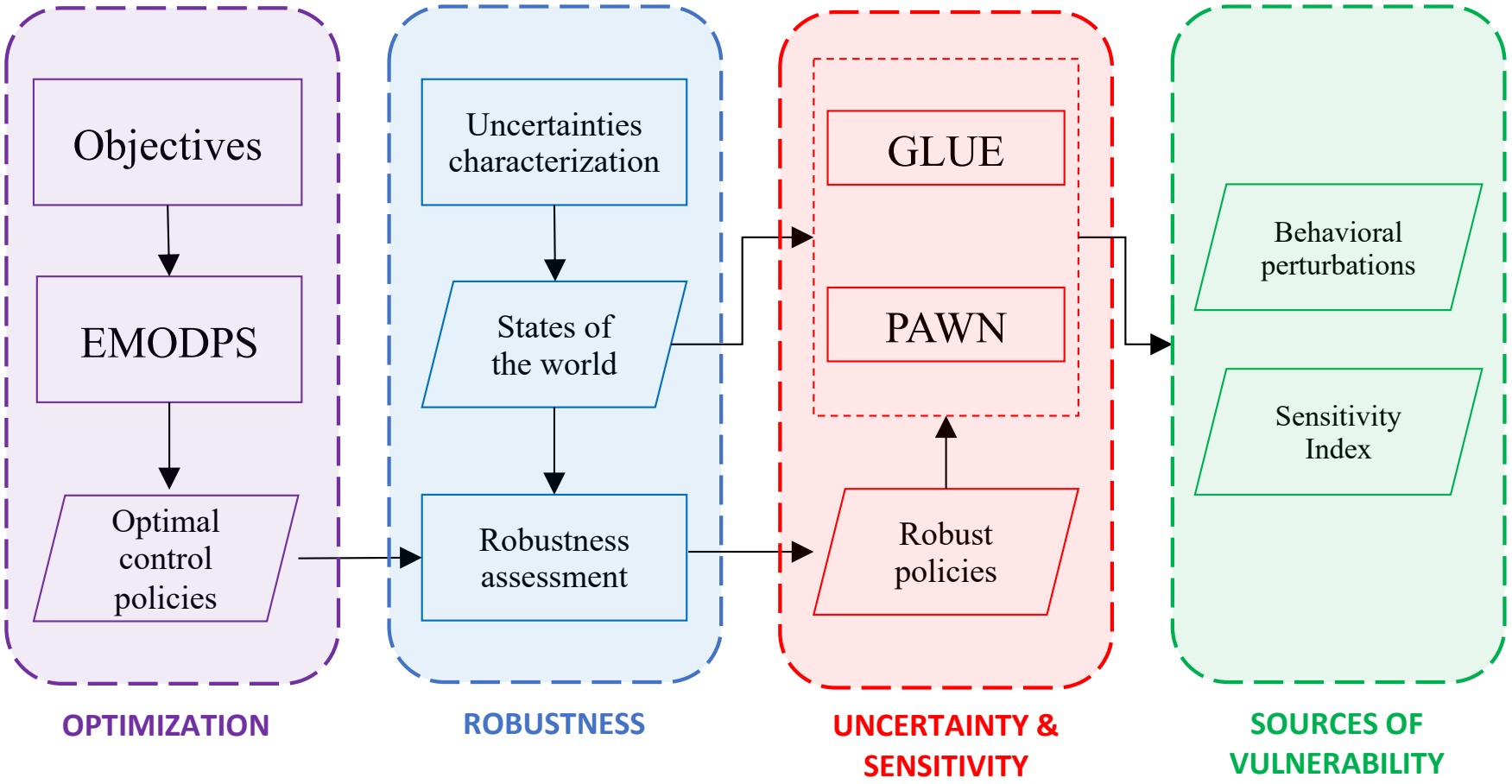
Case Study Description





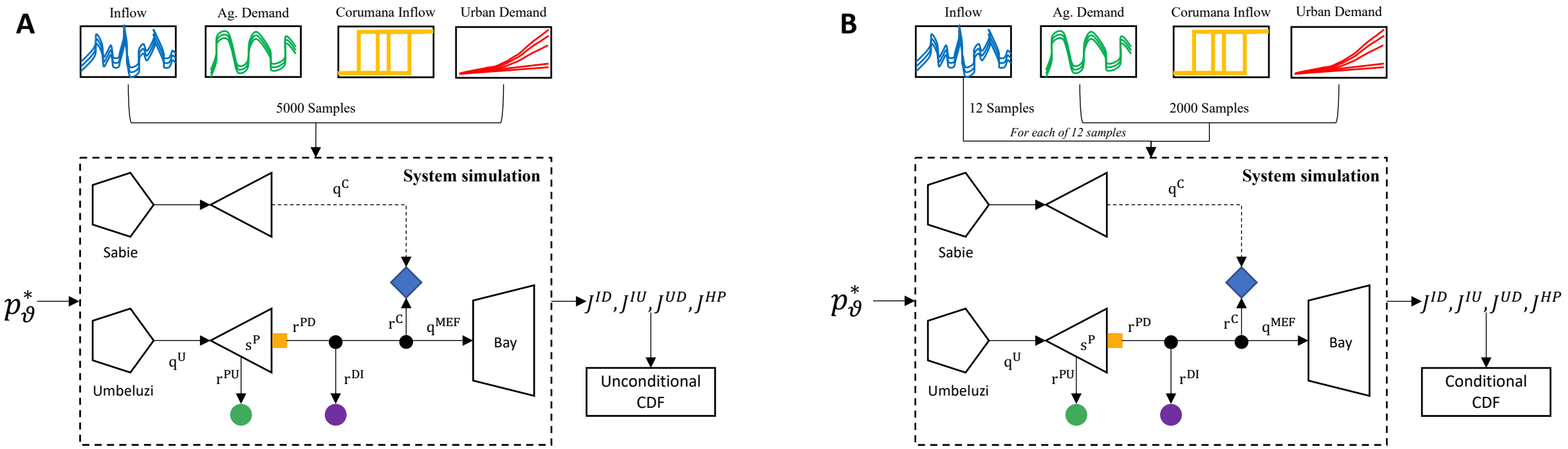
Study area

Methods and Tools



Methodological flowchart

Methods and tools



Sensitivity Analysis conceptual framework. A- Unconditional objective function distribution and; B- Conditional objective function distribution

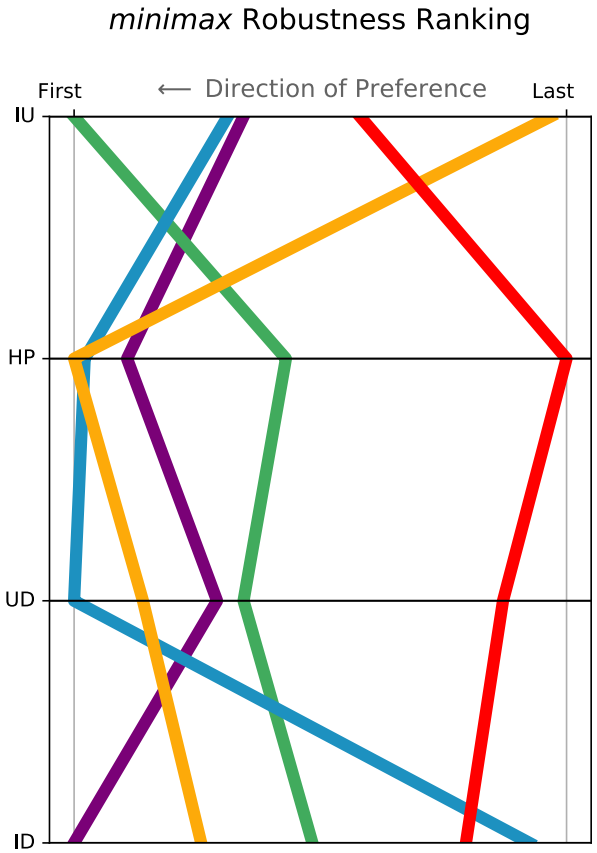
$$KS(x_i) = \max_{(y)} \left| F_y(y) - F_{y|x_i}(y|x_i) \right|$$

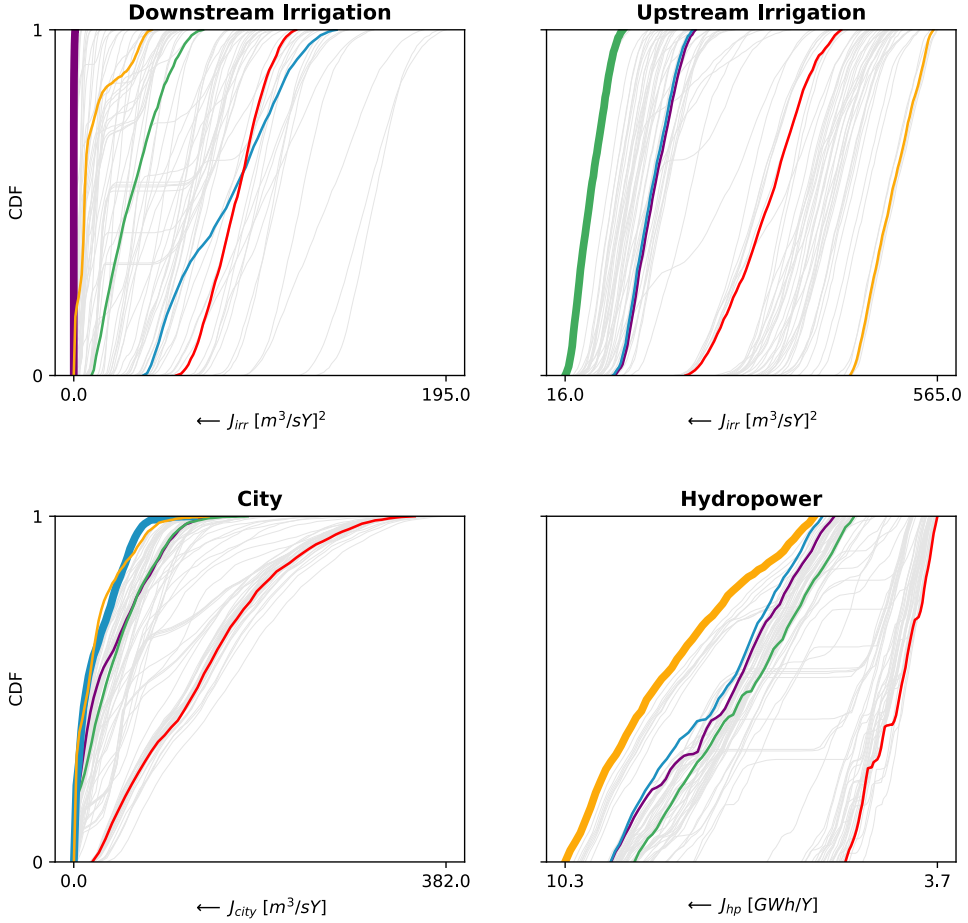
$$S_i = \max_{(x_i)} [KS(x_i)]$$

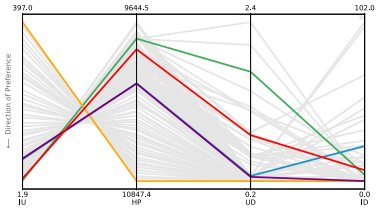
Numerical results

Robustness: Probabilistic tradeoffs

Left panel: Ranking of the best control policy according to each stakeholder, together with where such policy would fall when ranked according to the other stakeholders. Right panel: Cumulative distributions for the four objectives considering the most robust alternatives for each stakeholder.





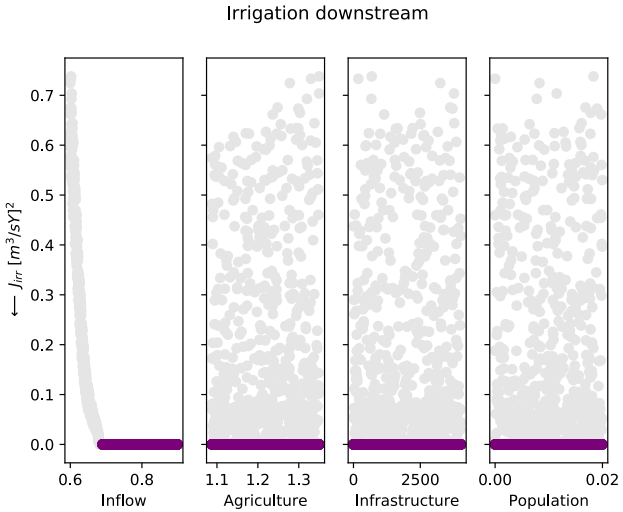


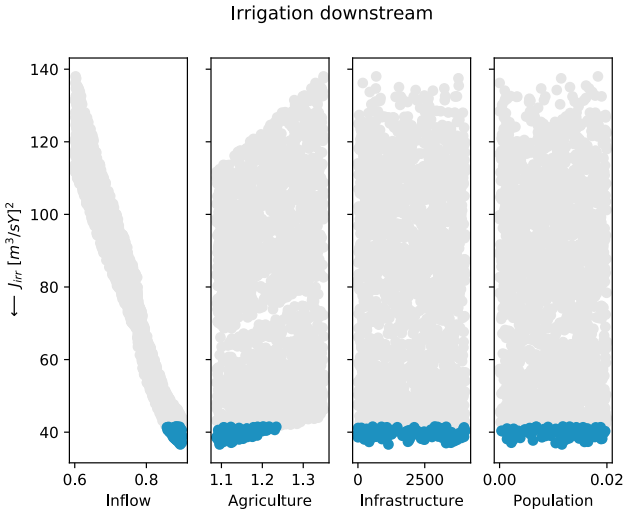
Robustness Best: Downstream Irrigation | Upstream Irrigation | Urban | Hydropower | Not Robust

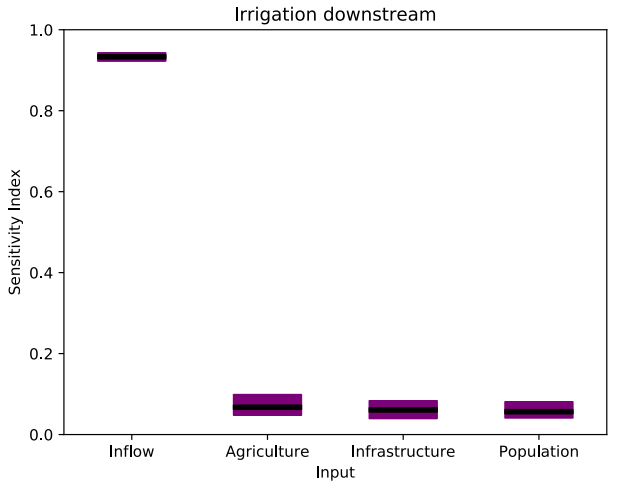
Numerical results

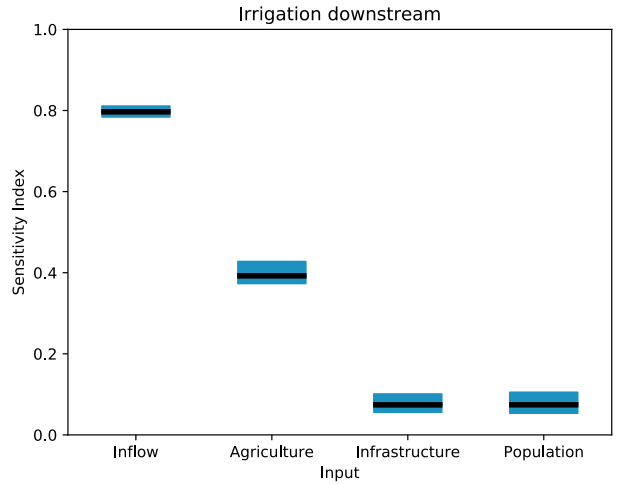
Sensitivity and Uncertainty

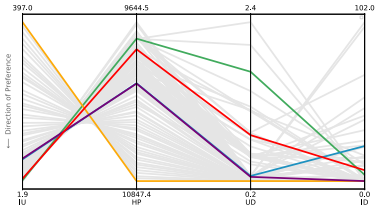
Behavioural perturbations (top panel) and sensitivity index (bottom panel) for downstream irrigation in case of Best Irrigation (left) and Best Urban (right) policy.











Summary and Highlights

1. **Robustness analysis:** how robust management solutions can dramatically improve multi-objective tradeoffs in deeply uncertain conditions.

   Example: How the red non-robust solution, despite being optimal in the current conditions, is largely dominated under deeply uncertain scenarios.

2. **Uncertainty analysis:** how exogenous perturbations unevenly shape system performance across objectives and policies

   Example: downstream irrigation. No deficit is created even for streamflow reductions up to 35% if robust solution is adopted. Possibility of supporting agricultural expansion across deeply uncertain states of the world.

3. **Sensitivity Analysis:** understanding the main sources of vulnerability across policies in a multi-dimensional objective space
   Example: for all the stakeholder analysed, non robust policies have been consistently more vulnerable to social and infrastructural uncertainty sources.