The balancing act of robust decision making in complex water resource systems

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Living with Environmental Uncertainty fellowship
EP/R007330/1

Engineering and Physical Sciences Research Council

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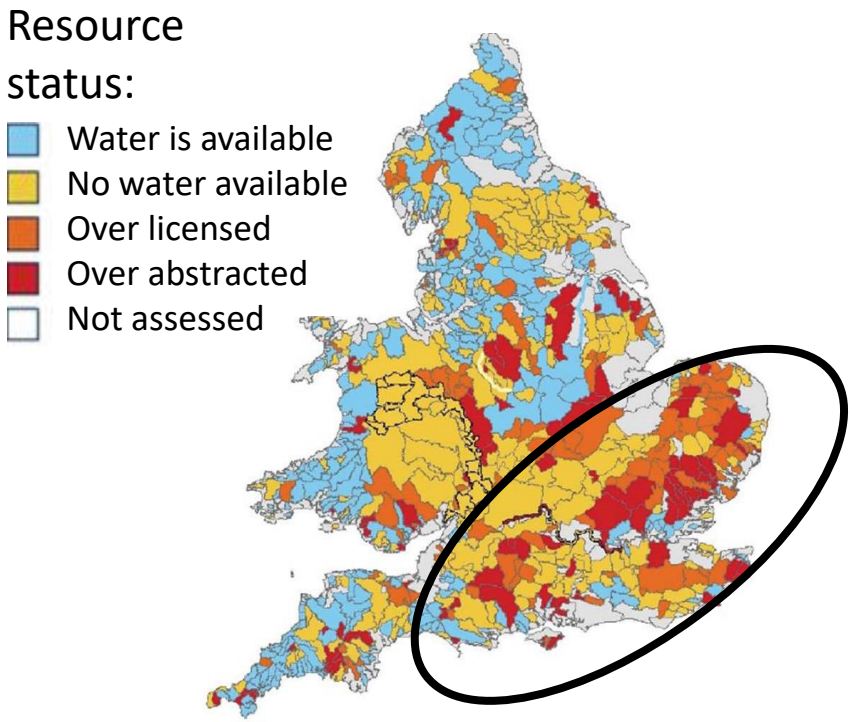
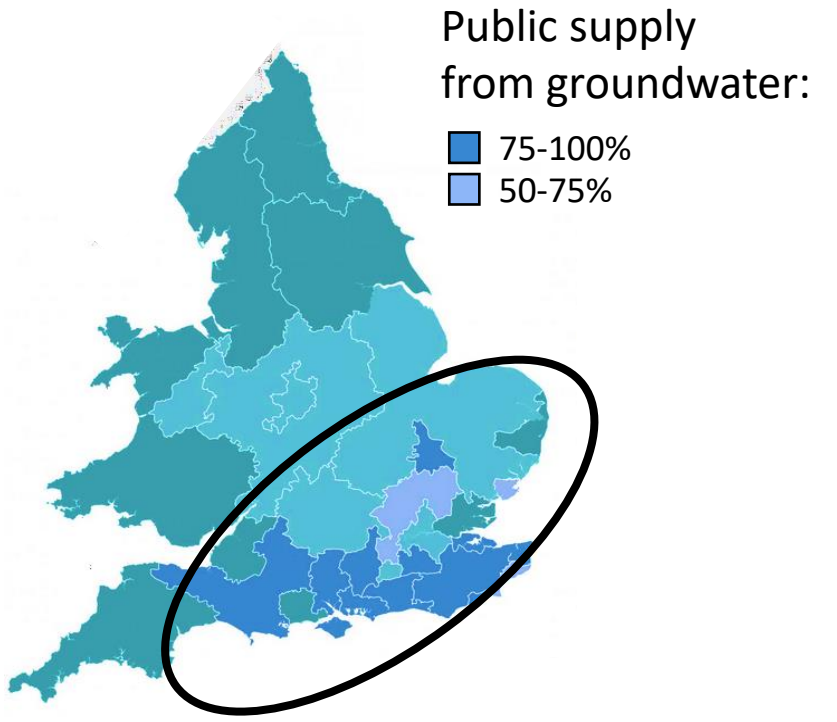
Pressure on groundwater-reliant resource systems in England is increasing



Environment Agency (2008)



British Geological Survey (2021)

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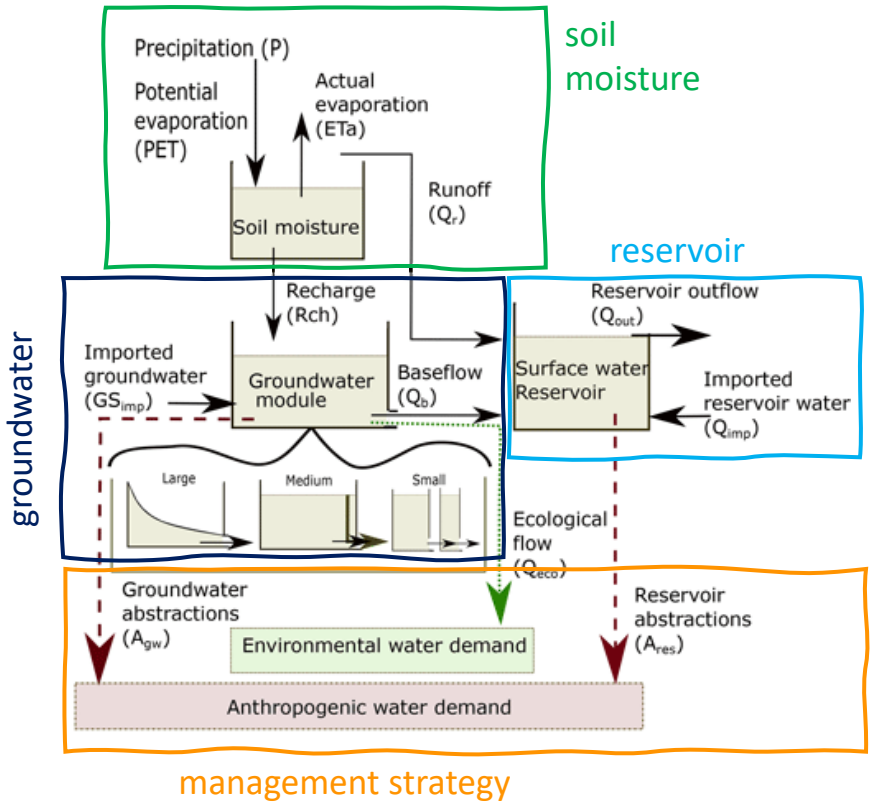
In previous work, we developed a parsimonious model of surface-groundwater interactions for appraisal of conjunctive use strategies



- Parsimonious approach
- Enables computationally-extensive tasks, e.g.

  --- screening and optimization of CU strategies
  --- uncertainty & sensitivity analysis

- Application to “idealised” (GB) system
- Demonstrates potential of CU for drought mitigation

(Wendt et al., 2021 *NHESS*)

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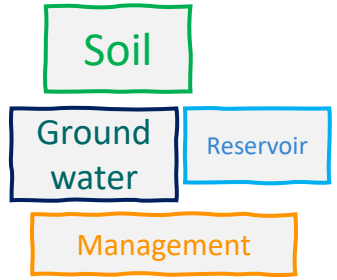
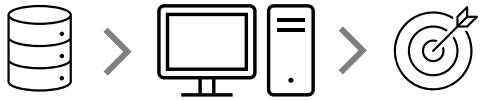
We have now systematically evaluated the model with a Global Sensitivity Analysis

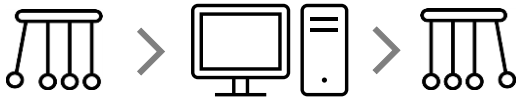


"Data-based" evaluation:



Fit-to-data: are model outputs consistent with observations?

"Response-based" evaluation:



Is the model input-output response "as expected"?

(Wagener et al., 2022 *WIREs-CC*)

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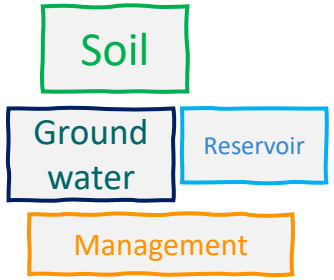

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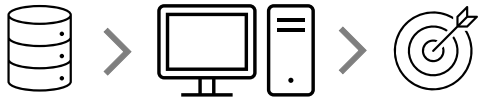

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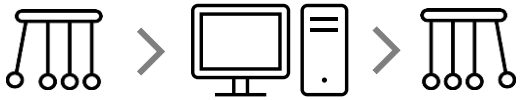

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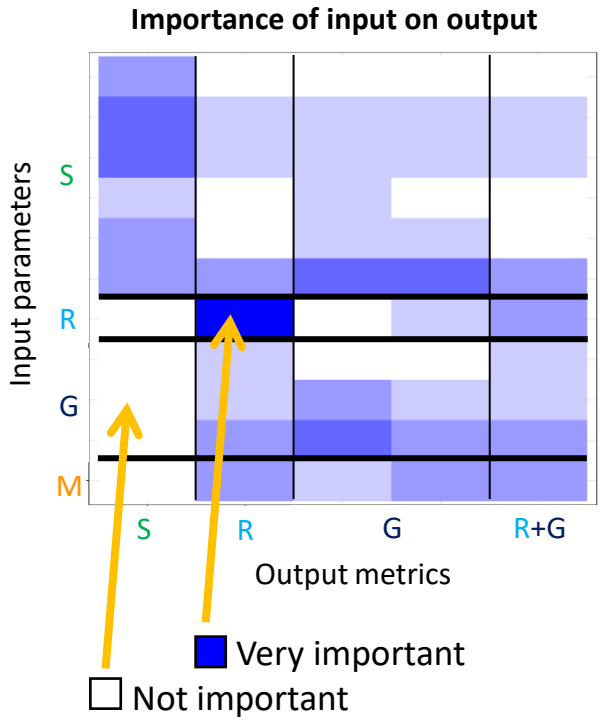

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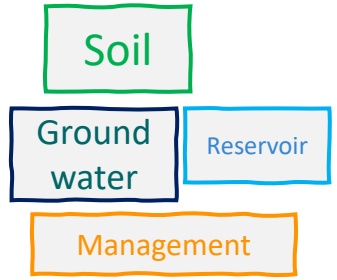

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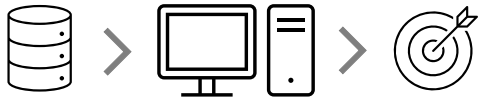

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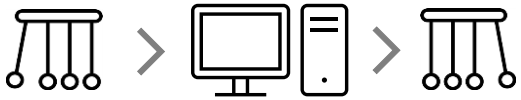

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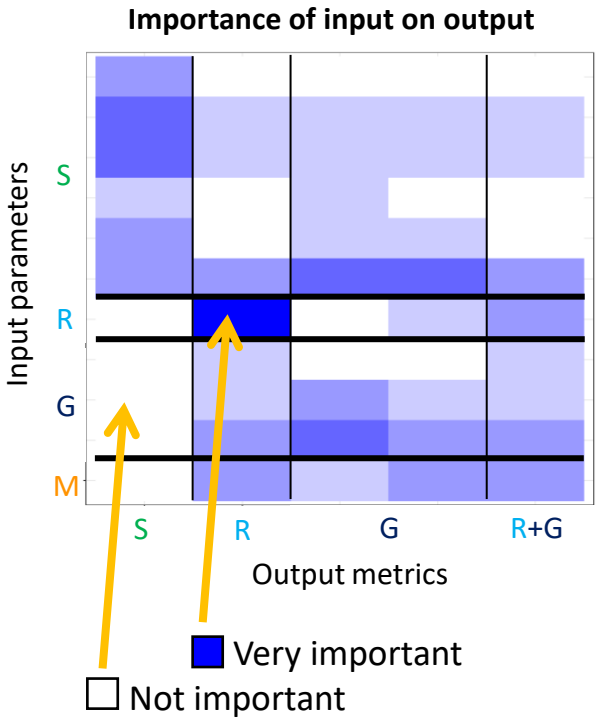
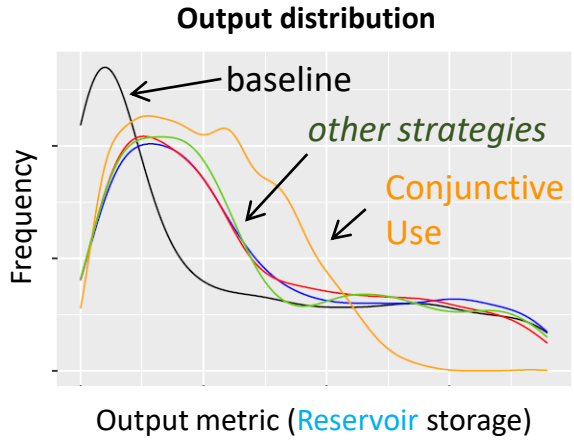


Leverage: *Are model outputs sensitive "enough" to the management strategies?*



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What's next

- Set-up mechanism for "prior" calibration across GB from catchment characteristics (CAMELS-GB)

  -- is it possible?
  -- does it work well?

- Explore potential of conjunctive use to mitigate droughts under present and future climate

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Evaluating integrated water management strategies to inform hydrological drought mitigation

Doris E. Wendt[1,a], John P. Bloomfield[2,★], Anne F. Van Loon[3,★], Margaret Garcia[4], Benedikt Heudorfer[5], Joshua Larsen[1], and David M. Hannah[1]

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On the evaluation of climate change impact models

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