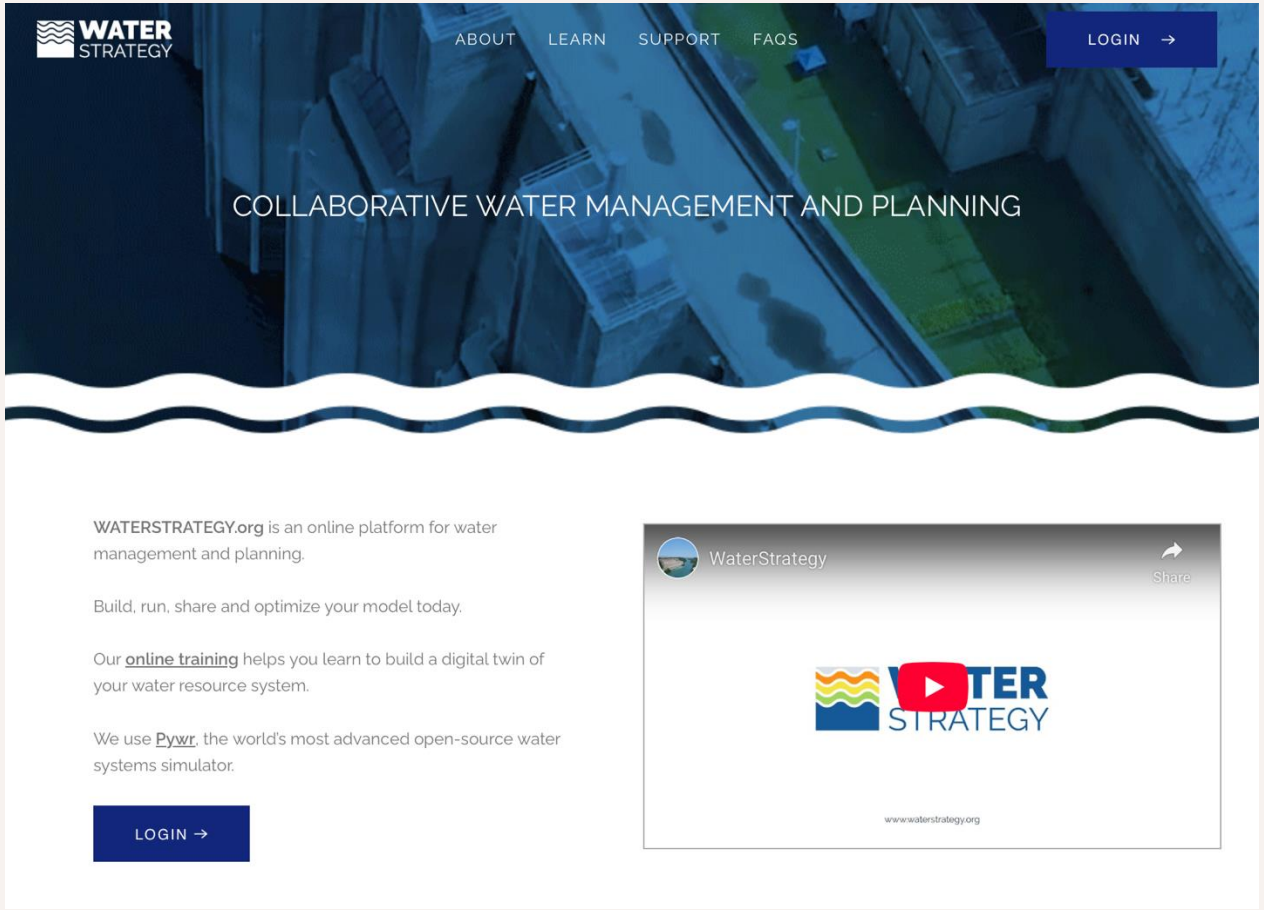
WaterStrategy.org

Nexsys analytics

WATER STRATEGY

WaterStrategy.org

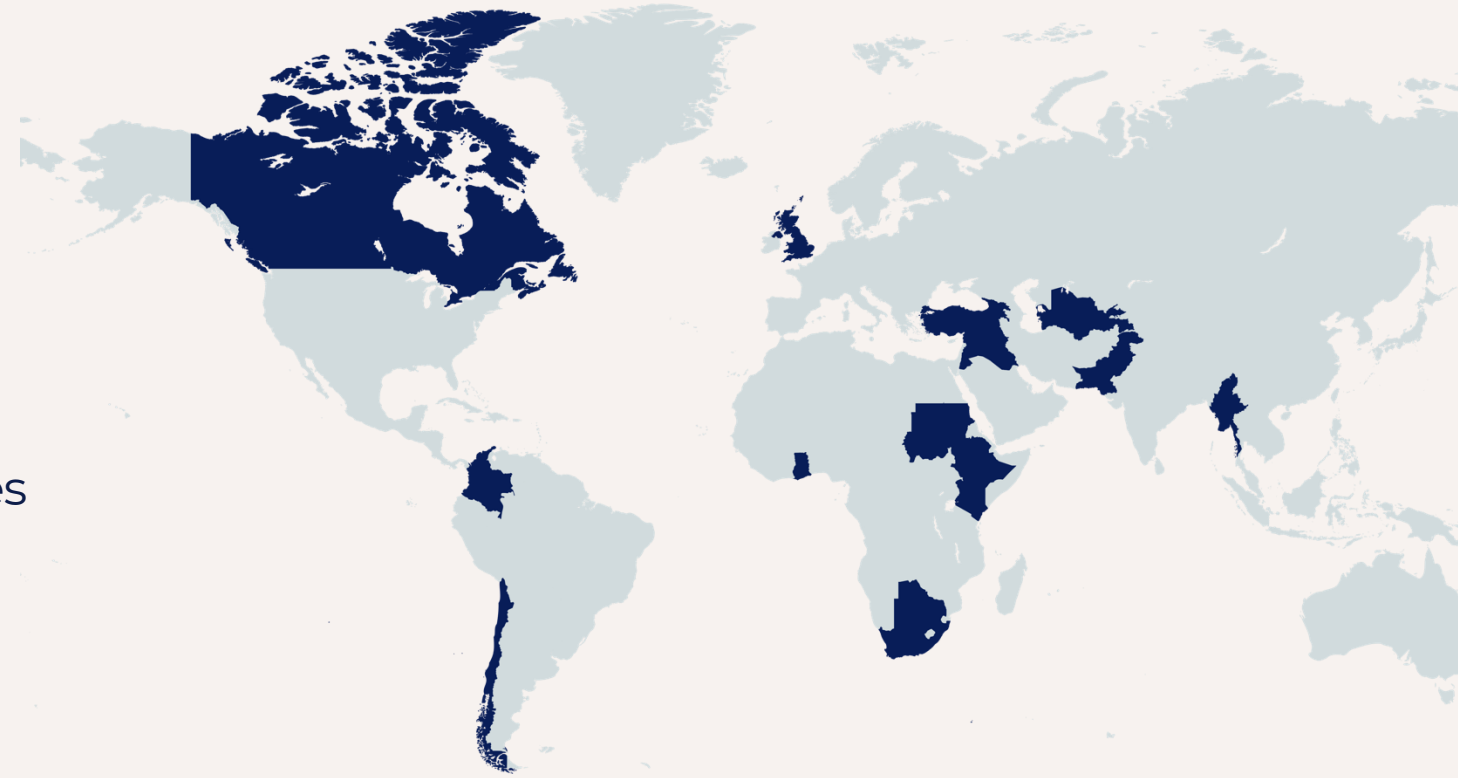
- WaterStrategy is an online modelling and decision-making platform
- Allows creating and running models on the cloud using Pywr and other model “engines’
- Web-based interface does not require installation of any software packages
- Supports many objective optimisation as well as least-cost planning (e.g. EBSD)



WaterStrategy.org

WATER STRATEGY

- 8 years in development
- £1.1m invested
- Applied in over 20 countries
- Used in over 34 consultancy projects worldwide
- Licenced by 4 English water companies and the Environment Agency
- Over 1400 users globally



Current clients:

Environment Agency

WRE WATER RESOURCES EAST

United Utilities

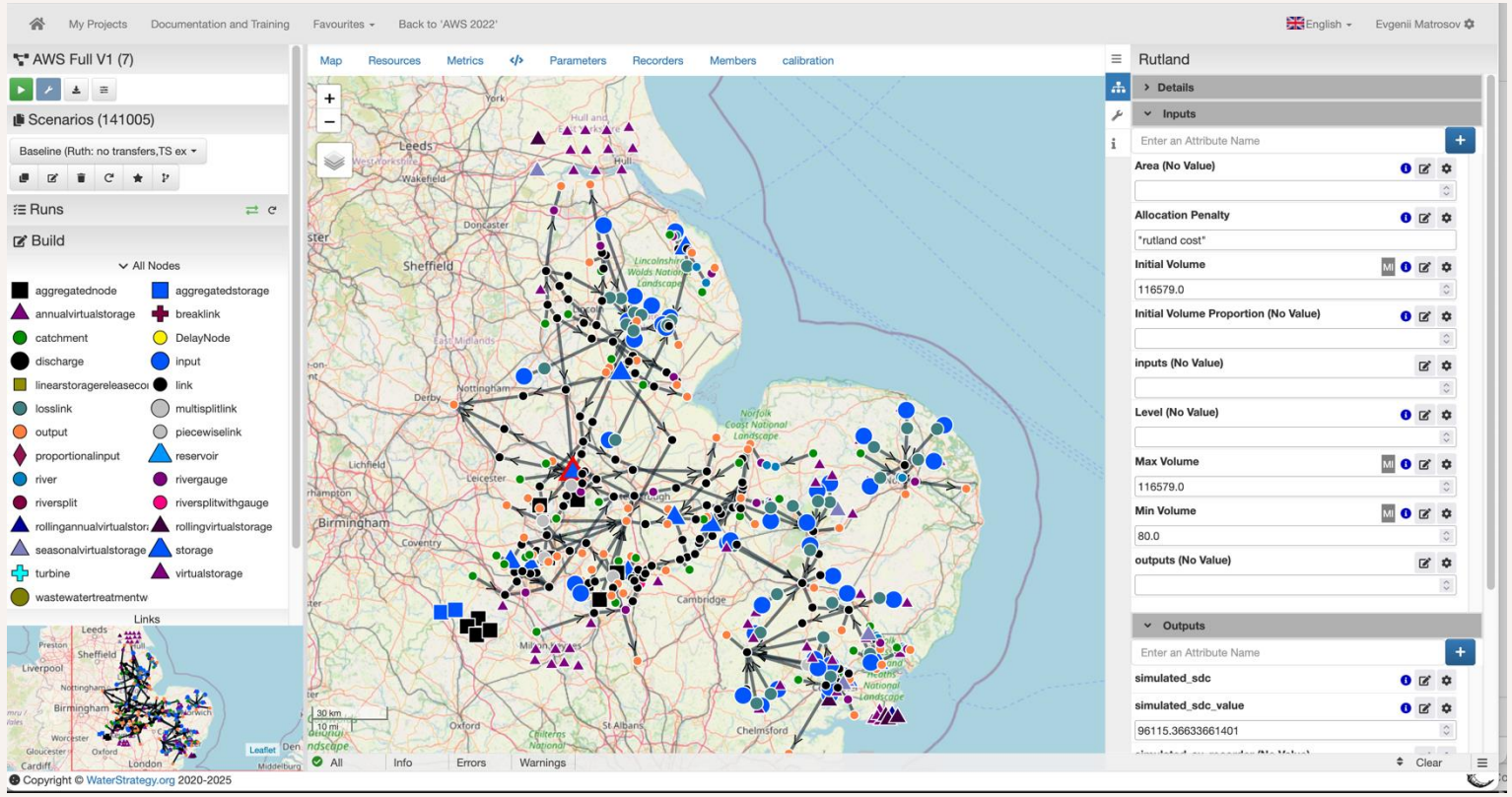
Affinity Water

anglianwater

THE WORLD BANK

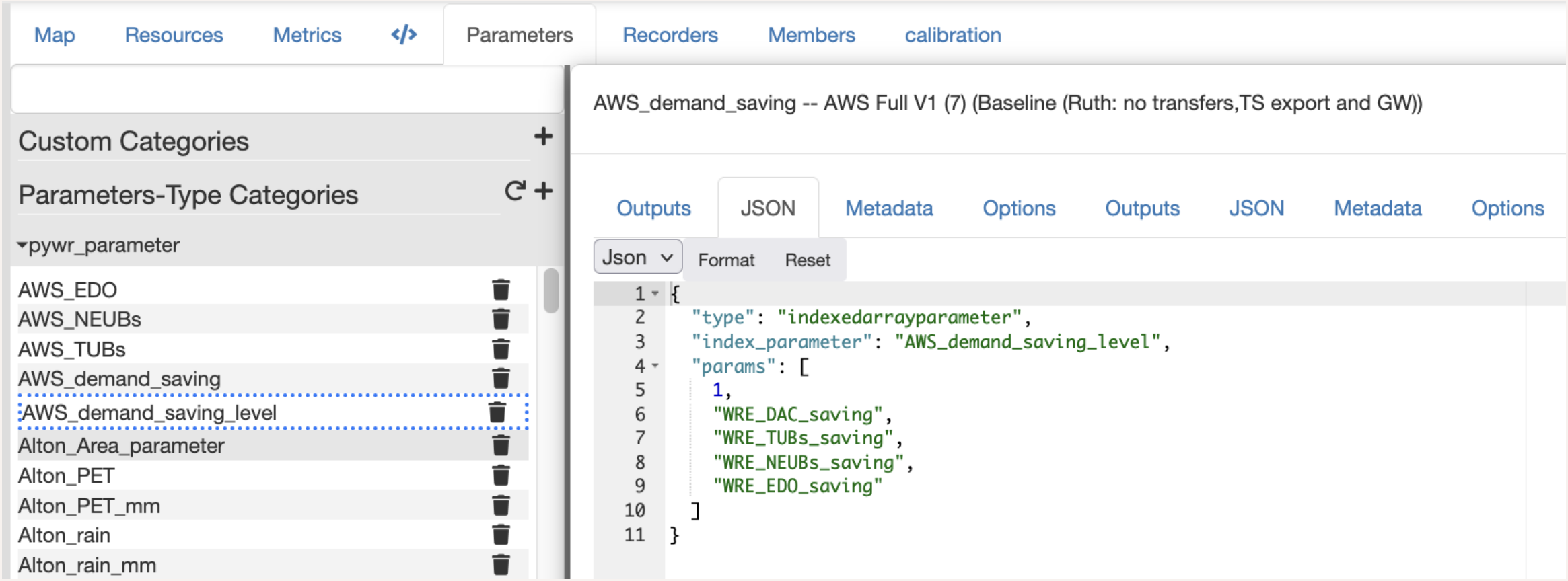
Pywr Interface

- Allows **building** and **running** Pywr models on the regional, water company and catchment scale
- **Existing** models can be imported from Pywr JSON
- Pywr JSON files can be **exported** from interface
- Ability to upload H5, Excel and CSV datafiles
- Allows for downloading Pywr output files



Pywr Interface

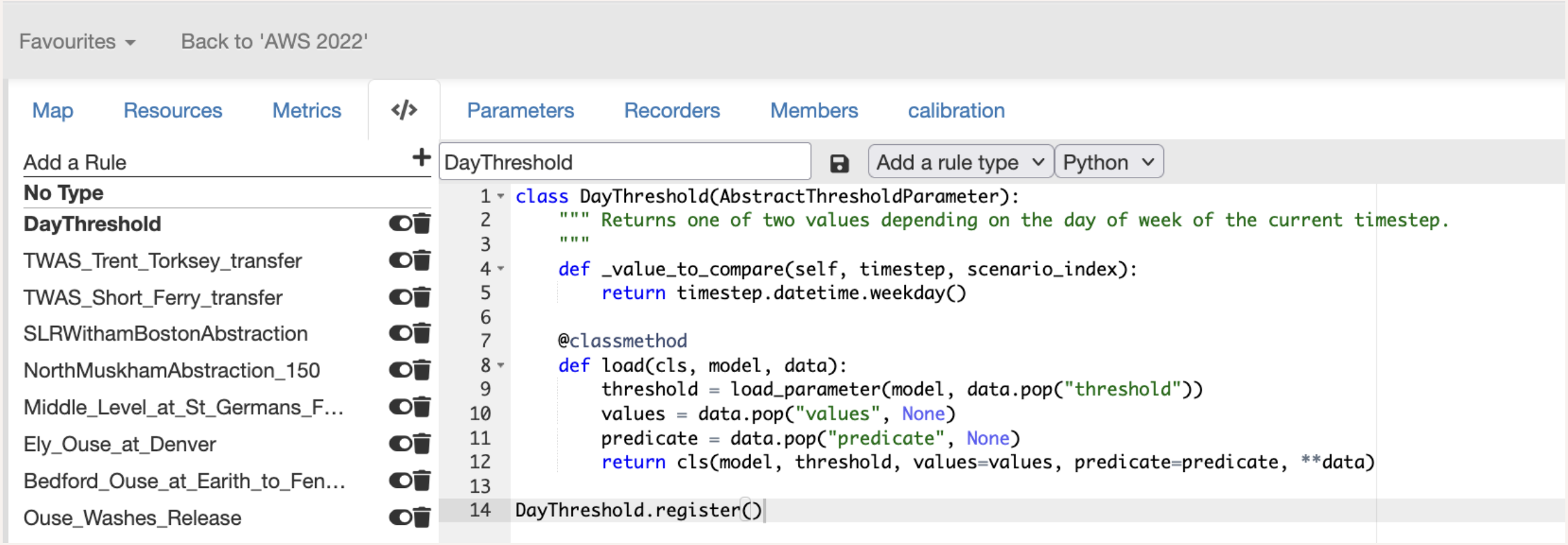
Pywr **parameters** and **recorders** defined in bespoke tabs



Pywr Interface

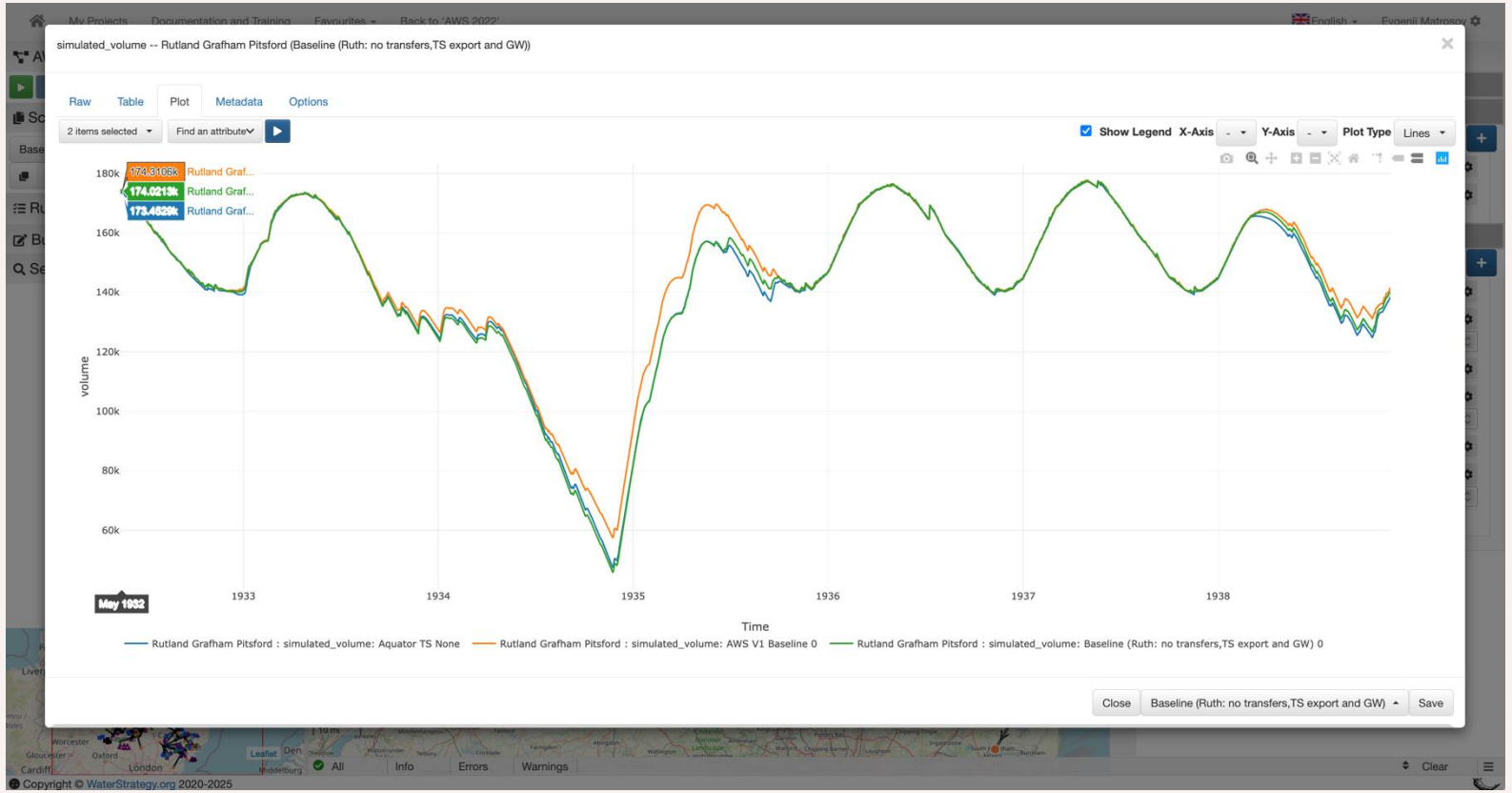
WATER STRATEGY

Supports writing **custom parameters** and **recorders** using Python



Pywr Interface

- Allows for defining, running and **visualising** multiple scenarios
- Scenario comparison tools to **analyse** system performance
- In-built tools to **run** Deployable Output analyses

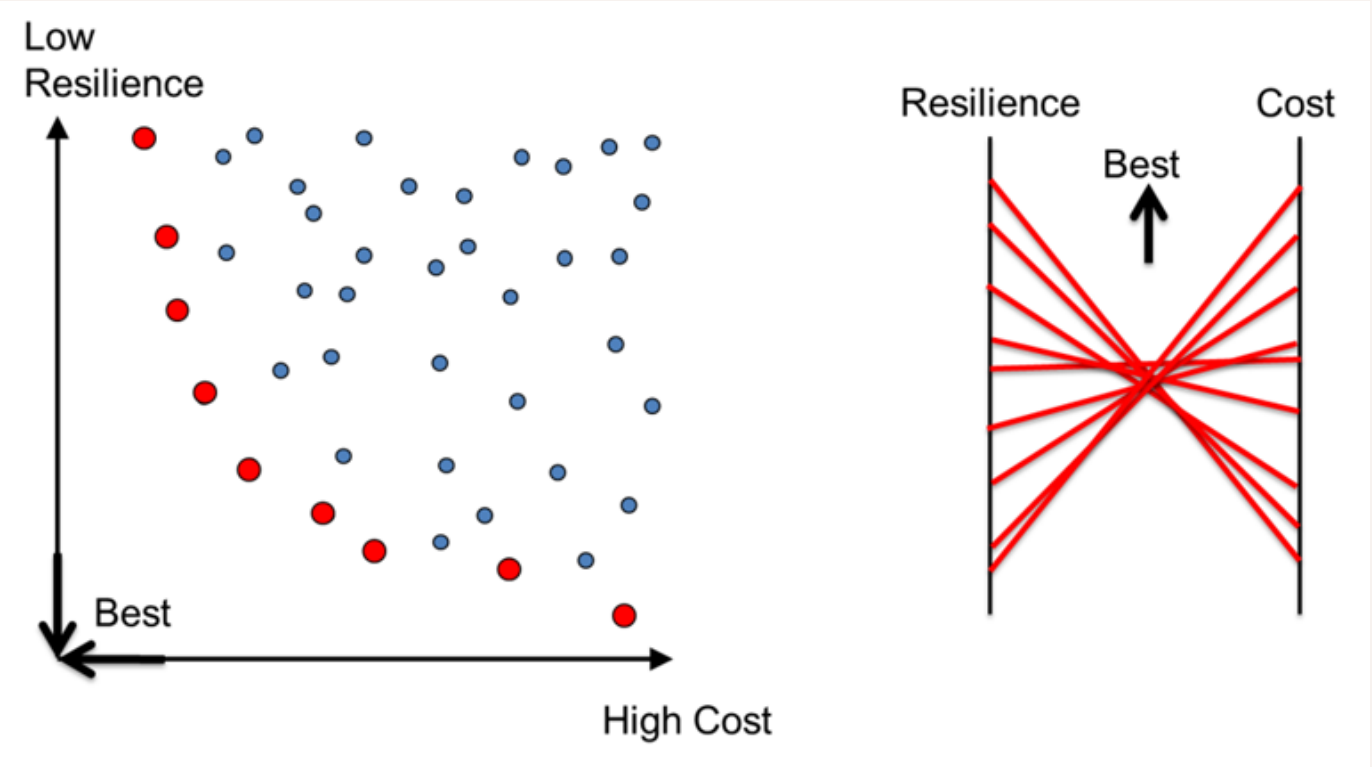


Many-Objective Evolutionary Optimisation

Cloud-based many-objective optimisation workflow

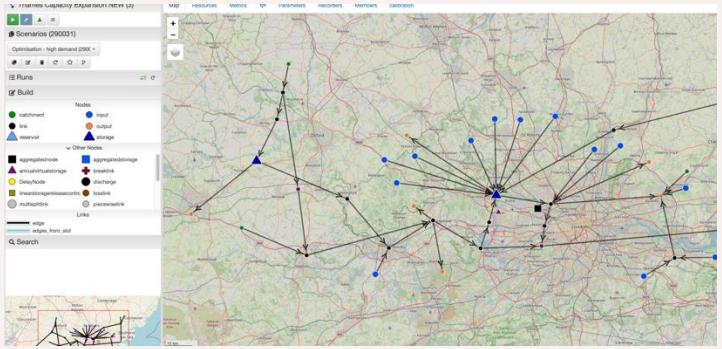
WATER STRATEGY

- WaterStrategy allows for formulating, running and visualising the outputs of many objective optimisations on the cloud
- Optimisations can be run on 1 or many computational cores without the need for high performance clusters

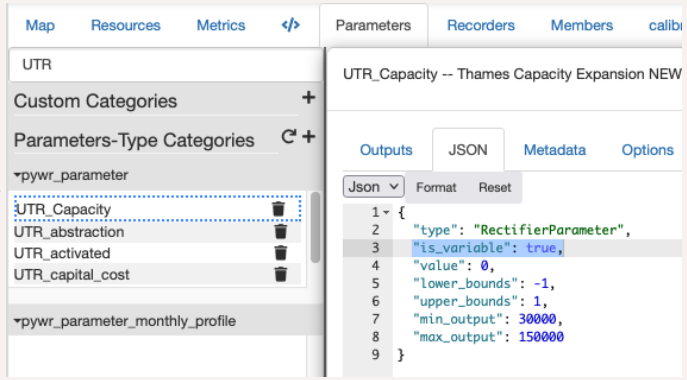


Example performance in two metrics visualised in a scatter plot (left) and parallel axis plot (right)

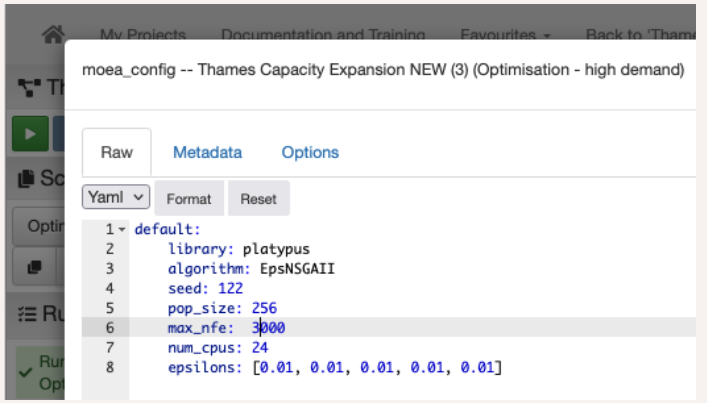
Model **built** using or uploaded into interface



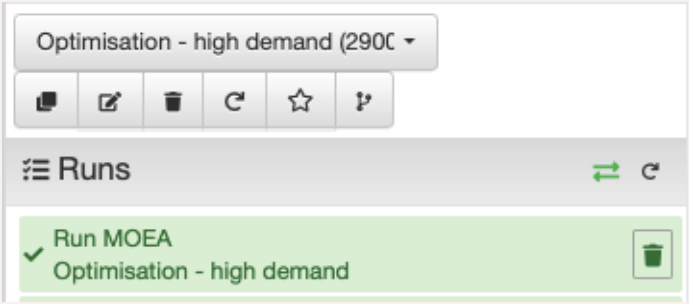
Decision variables, objectives, constraints **defined**



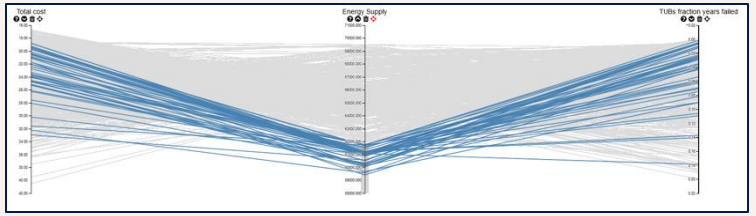
Optimisation **configured**



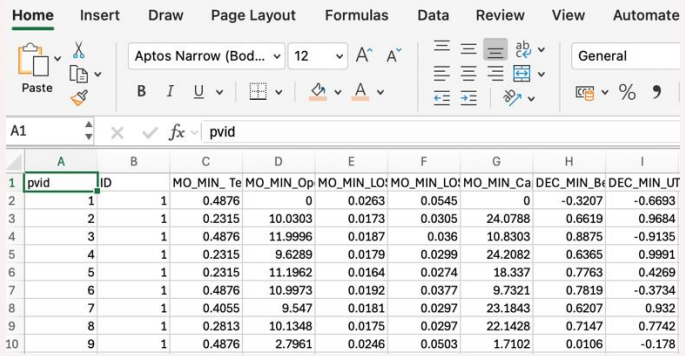
Optimisation **launched** on the cloud



Interactive parallel plot (Polyvis) made **available online**



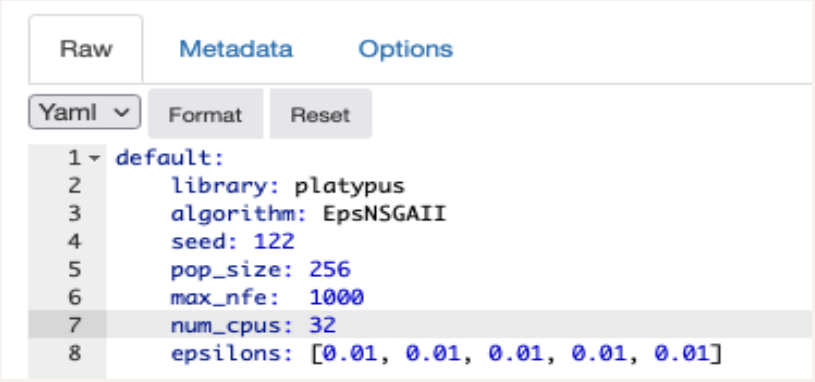
Optimisation outputs can be **downloaded** for further processing



	A	B	C	D	E	F	G	H	I
1	pvid	ID	MO_MIN_ Te	MO_MIN_Op	MO_MIN_LO	MO_MIN_LO	MO_MIN_Ca	DEC_MIN_Be	DEC_MIN_UT
2	1	1	0.4876	0	0.0263	0.0545	0	-0.3207	-0.6693
3	2	1	0.2315	10.0303	0.0173	0.0305	24.0788	0.6619	0.9684
4	3	1	0.4876	11.9996	0.0187	0.036	10.8303	0.8875	-0.9135
5	4	1	0.2315	9.6289	0.0179	0.0299	24.2082	0.6365	0.9991
6	5	1	0.2315	11.1962	0.0164	0.0274	18.337	0.7763	0.4269
7	6	1	0.4876	10.9973	0.0192	0.0377	9.7321	0.7819	-0.3734
8	7	1	0.4055	9.547	0.0181	0.0297	23.1843	0.6207	0.932
9	8	1	0.2813	10.1348	0.0175	0.0297	22.1428	0.7147	0.7742
10	9	1	0.4876	2.7961	0.0246	0.0503	1.7102	0.0106	-0.178

Optimisation Configuration

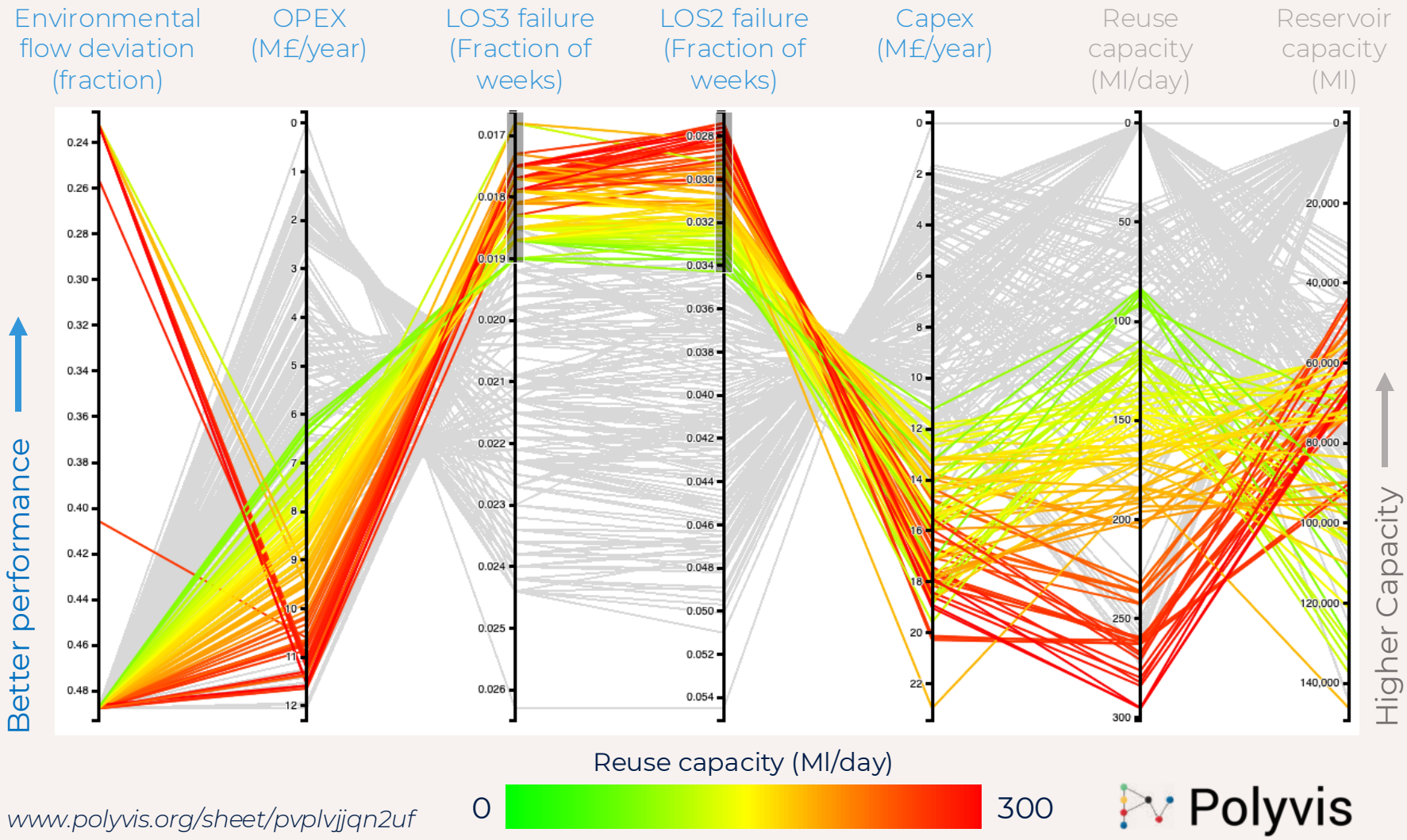
- Decision variables, objectives and constraints defined in editors
- Optimisation configuration defined in a configuration parameter
- Uses open-source MOEA libraries
- Number of computational cores defined by the user
- Optimisation runs on the cloud



Polyvis output to visualise decisions and objectives

WATER STRATEGY

- Link to results in parallel plot format available online after optimisation complete (Polyvis)
- Optimisation results can be downloaded for further analyses offline
- Portfolios solutions can be run in Pywr

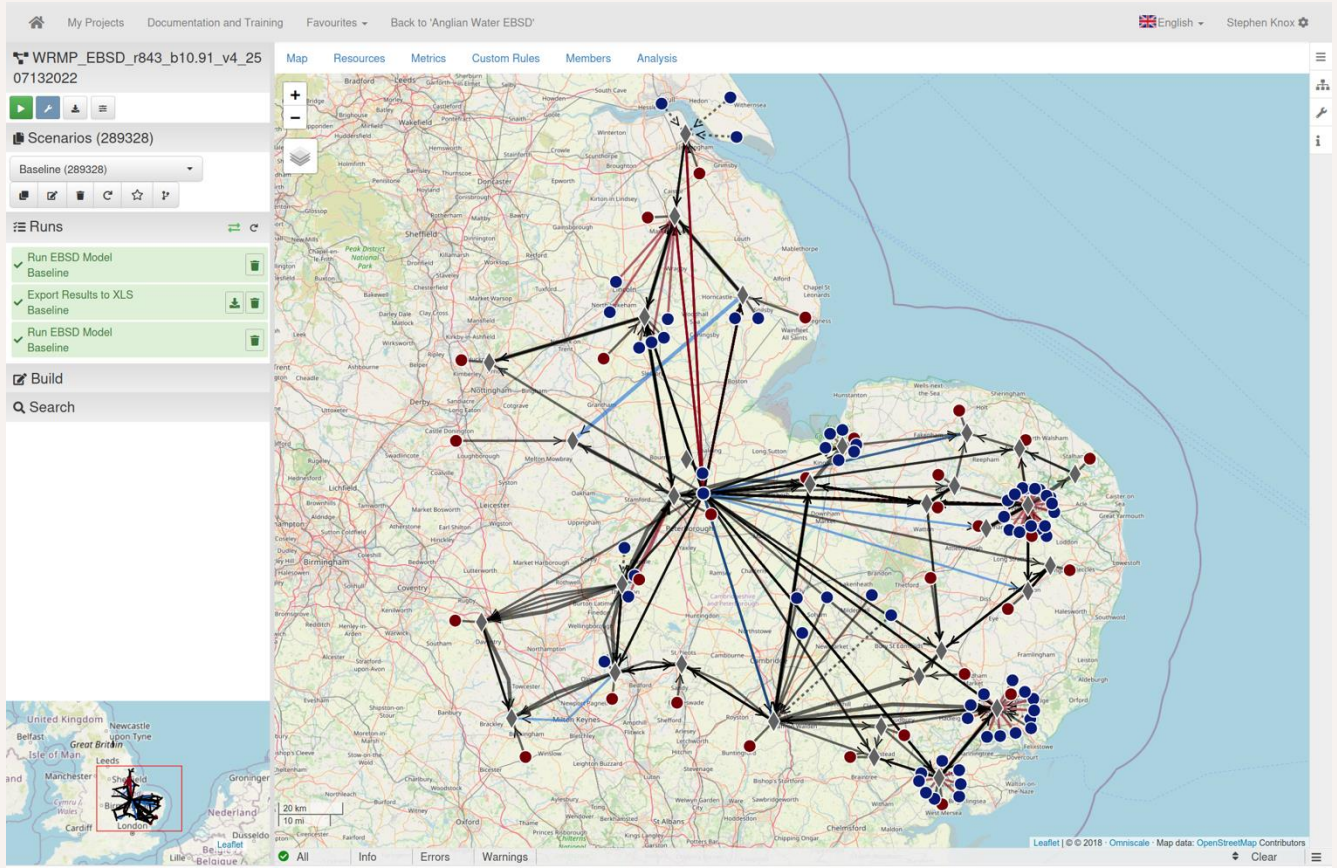


Economics of Balancing Supply and Demand (EBSD)

Economics of Balancing Supply and Demand (EBSD)

WATER STRATEGY

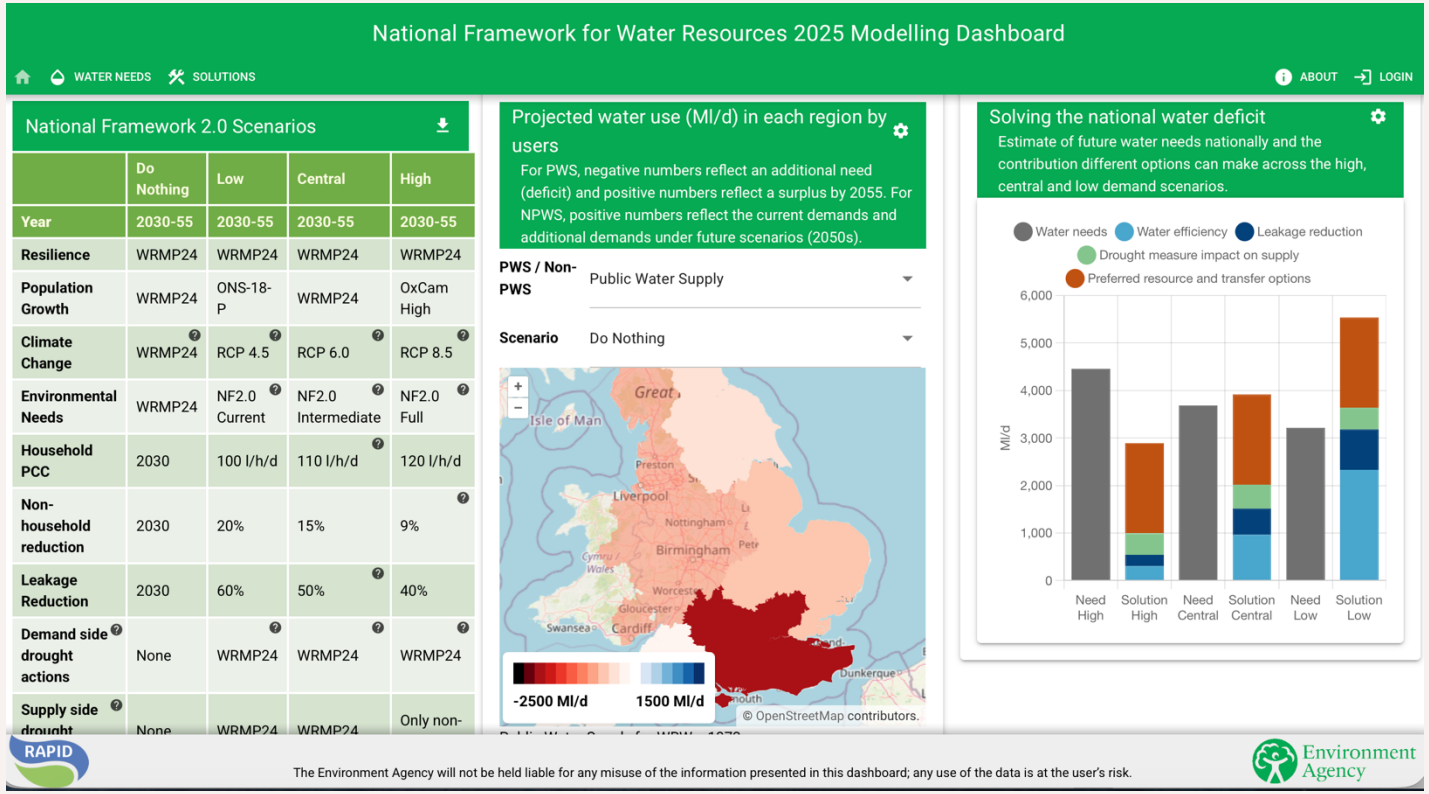
- WaterStrategy supports EBSD modelling
- Least-cost optimisation tool for investment planning
- Selects options (transfers and new supply) to meet supply-demand balance goals, at the least cost
- Schedules option activation
- Exclusivities, dependencies etc.
- Used by 3 UK water companies for their WRMP plans



Custom Dashboards

Bespoke Solutions

- We maintain several publicly accessible platforms, and we can set up bespoke versions of these platforms for clients.
- We have worked with the Environment Agency to develop the web-based interactive modelling dashboard supporting the National Framework for Water Resources 2025
- Dashboards support public and login-based functionality



Next Features to be Released

Adaptive Planning Extension

Integrated AI-driven planning

Soon to be implemented → Adaptive Planning Engine
→ Visualisation Explorer

- Uses AI to explore thousands of possible futures and identify flexible investment options.
- Builds on our research in adaptive planning and multi-criteria optimisation.
- Enables planners to visualise trade-offs, risks, and adaptation pathways through interactive dashboards and maps.

AI-Driven Intelligent Modelling Assistant

Enhancing water modelling

WATER STRATEGY

Soon to be implemented → Integrated AI assistant for model creation

- AI assistant helps users build and check complex water system models.
- Learns from a growing library of real-world calibrated models.
- Suggests system structures, allocation rules, and validation checks.
- Explains model results and trade-offs in plain language to support better decisions.

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