

UNIVERSITY OF MANCHESTER, BARNES WALLIS BUILDING
HYBRID EVENT
5 JULY 2022
09:00 - 17:00 BST



DAFNI CONFERENCE 2022

UNIVERSITY OF MANCHESTER : 5 JULY 2022

ENVIRONMENTAL IMPACTS

How DAFNI's platform is supporting water modelling in the UK

Dr Jonny Wilson Water Resources Modelling Lead The Environment Agency



SPEAKER: Dr Jonny Wilson

Water Resources Modelling Lead, Environment Agency How DAFNI's platform is supporting water modelling in the UK

Booking: https://dafni.ac.uk/conference-2022/



Science and Technology Facilities Council



Engineering and Physical Sciences Research Council



How DAFNI's platform is supporting national water resource modelling in England

Jonathan Wilson



Project team



- Haydn Johnson
- Claire Beloe
- Jonathan Dennis



- Jim Hall
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- Olivia Becher
- Tom Russell



Gemma Coxon





- Jonathan Wilson
- Emily Fallon
- Jonathan Robertson
- Forough Jafary



• Tom Gowland

Background – policy

NATIONAL INFRASTRUCTURE COMMISSION

Preparing for a drier future England's water infrastructure needs



Policy paper Meeting our future water needs: a national framework for water resources – accessible summary

Published 16 March 2020

Environment Agency

Increasing resilience to drought

So that restrictions such as rota cuts and standpipes will be needed no more than once every 500 years on average by the 2030s.

National Infrastructure Strategy



2020

2018





RAPID – gated process

Gated process for potential strategic regional water resource solutions





Environment



Strategic Solutions













NSSM Project

Aims:

- Give regulators an independent and shared view of the benefits, dependencies and risks of strategic solutions
- National scale holistic view & trade-offs between solutions

Approach:

- Different way of looking at the problem top down vs bottom up
- The national modelling **does not replace** the detailed company, solution and regional models
- Working collaboratively and transparently with water companies and solution teams to achieve appropriate system and solution representation







Why a national water resources model?



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Why a national water resources model?



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100 km

National System Simulation Model (NSSM)



Water Resource model of England and Wales (WREW)

- 90% of England and Wales's population and public water use:
- 80 catchments; 70 WRZs; 16 water utility companies;
- All resources > 2Ml/day, and key transfers and assets;
- Some smaller sources & demand zones amalgamated or removed





NSSM – results

The project has been carried out in two phases.

Results from phase 2 show that:

- The solutions act to increase the drought resilience (reduce the probability of water use restrictions or a deficit occurring) for key areas of water stress in the East and South East of England
- The strategic solutions can maintain resilience in the face of additional pressure from:
 - o More ambitious environmental protection
 - Risk of not achieving targets for reducing consumption & leakage by 2050
 - $\circ~$ More severe climate change
- There are no notable impacts on donor and recipient areas, except for supply from the Minworth WTW reuse solution, during rare large-scale droughts, which might impact on water availability for other users on the Lower Trent.



Murgatroyd. et al., submitted



Role of DAFNI – virtual workspace



Role of DAFNI – virtual workspace



Role of DAFNI – streamlining workflows

Running multiple replicates:

Weather@home2 dataset contains:

- 100 x 30-year (2020-2050) near future ensemble
- 100 x 30-year (2070-2100) far future ensemble

Batch mode in DAFNI helps overcome this :

WATHNET system file *	Dataset	
	WREW_FF_2050DI_2050SR4_RP_	
	Path on disk: inputs	
WATHNET nodal file *	Dataset	
	WREW_FF_2050DI_2050SR4	
	Path on disk: inputs	
Batch file	Dataset	
	batch-test-1	
	Path on disk: inputs	



6b WAT

Role of DAFNI – streamlining workflows

#	Scenario Name	Solutions	PWS Demand	Env Destination	w@h ensemble	
Main Scenario						
1	Regional Plan Comparison	Regional Reconciliation	Regional Plan – FP @2050	Regional Plan	Near Future	
Sensitivity Scenarios						
2	High ambition environmental destination	Regional Reconciliation	Regional Plan – FP @2050	Enhanced	Near Future	
3	High PWS demand	Regional Reconciliation	Regional Plan – FP @2050 with 50% leakage & PCC	Regional Plan	Near Future	
4	Climate Change	Regional Reconciliation	Regional Plan – FP @2050	Regional Plan	Far Future	
Stress Test Scenarios						
5	GUC removed	Regional Reconciliation - GUC	Regional Plan – FP @2050	Regional Plan	Near Future	
6	SESRO removed	Regional Reconciliation - SESRO	Regional Plan – FP @2050	Regional Plan	Near Future	
7	STT Supported Removed	Regional Reconciliation – support for STT	Regional Plan – FP @2050	Regional Plan	Near Future	
8	STT Unsupported Removed	Regional Reconciliation – unsupported component of STT	Regional Plan – FP @2050	Regional Plan	Near Future	
9	SLR Removed	Regional Reconciliation - SLR	Regional Plan – FP @2050	Regional Plan	Near Future	









Role of DAFNI – end-to-end solution



Role of DAFNI – end-to-end solution



DAFNI – visualisation & stakeholder engagement

• Post processing scripts in place to explore model outputs:



Next steps

NSSM:

- Phase 3 explore the drought resilience of different combinations of solutions & further work investigating the impact of widespread severe droughts.
- Combining NSSM results with costs and environmental risks/benefits to get an complete independent view on solutions

Future:

- Incorporate additional variables to optimise (e.g. carbon cost, environmental flow levels) multi-objective optimisation
- Include scenarios for other sector demands
- Synergies with other modelling projects e.g. flooding
- Regulators' WR modelling strategy

DAFNI:

- Develop post-processing of outputs for different stakeholders
- 2 Explore integration with other models on DAFNI



Thank You

