

Dr Brian Matthews

DAFNI Project Lead, Scientific Computing Department,

Science and Technology Facilities Council





Engineering and Physical Sciences Research Council











DAFNI Launch event: 5th July 2021

Ottoline Leyser



Gordon Masterton



Kathryn Brown





https://dafni.ac.uk/conference2021-output/



















Where has DAFNI come from?

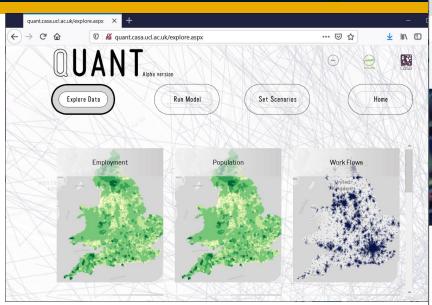








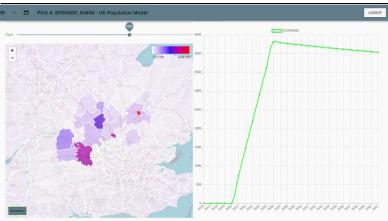
World-leading research



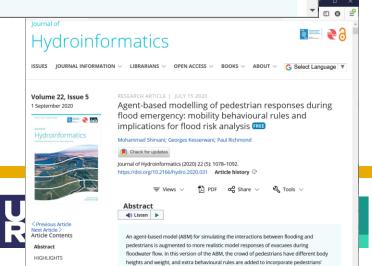


NISMOD is the world's first national Infrastructure system-of-systems

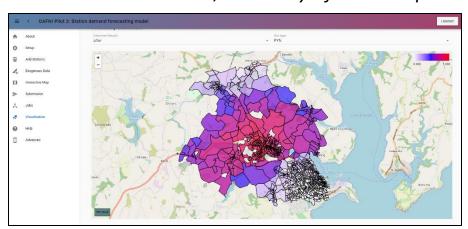
modelling platform

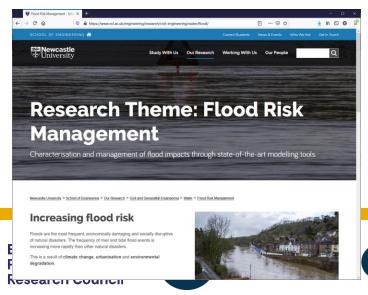


SIMIM, University of Leeds



Station demand model, University of Southampton







DAFNI as a Community Hub

- A Place for deploying and sharing data and models
 - A secure repository for national infrastructure data and models
- A Place to support collaborations and combining applications
 - A collaborative platform to research multi-system models of infrastructure
- A Place as a legacy
 - A place to make data and models available for the long-term









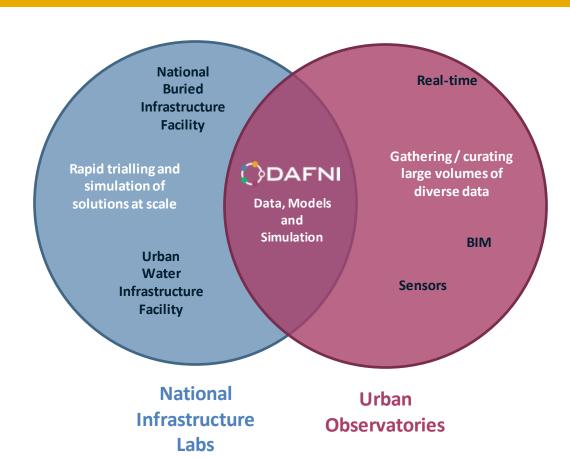


Data and Analytics Facilities for National Infrastructure

Providing a computing platform for research into decision making for national infrastructure

£8M investment 2017-2021 under the UK Collaboratorium for Research on Infrastructure and Cities

Towards Partnerships between Academia, Government, Industry











The DAFNI Partnership



Prof. Jim Hall Uni. of Oxford



Prof. Stephen Hallett Cranfield Uni.



Dr. Theo Tryfonas Uni. of Bristol.







Dr Assad Faramarzi Uni. of Birmingham



Dr. Aruna Sivakumar Imperial College



Prof. Daniel Coca Uni. of Sheffield



Dr Juan Bicarregui STFC



Dr. Nik Lomax Uni. of Leeds



Prof. Liz Varga UCL



Prof. Julien Harou Uni. of Manchester



Dr. Simon Blainey Uni. of Southampton



Prof. Phil James Uni. of Newcastle



Prof. Mike Batty UCL



Dr. Ruchi Choudhary Uni. of Cambridge

A Partnership of 12 universities and + STFC as development and hosting partner









The DAFNI Team





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Bethan Perkins Dhiwagaran Thangavelu Rose Dickinson James Hannah **Matt Jones** Rocio Garavito-Ramirez Jens Jensen Sarah Byrne Josh Owen Jack Haydock









The DAFNI Platform









DAFNI: A HTC Hardware Platform

- DAFNI provides a dedicated HTC cluster
 - o 27 server nodes, 792 CPUs, 16.8TB, 10 GPUs
 - 2PB hybrid storage
- Set up as a Kubernetes Cluster
- Can give more computing power to applications

Complemented by hardware investments in universities



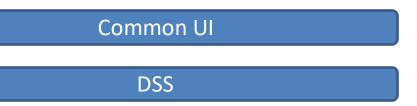


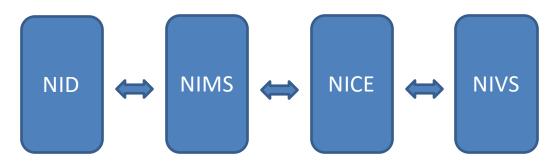




DAFNI

DAFNI Components





Data Store

Hardware Platform



National Infrastructure Database (NID)



National Infrastructure Modelling Service (NIMS)



National
Infrastructure
Cloud
Environment
(NICE)



National Infrastructure Visualisation Suite (NIVS)



DAFNI
Security Service
(DSS)

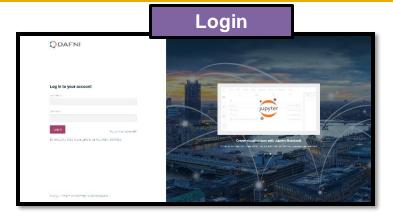


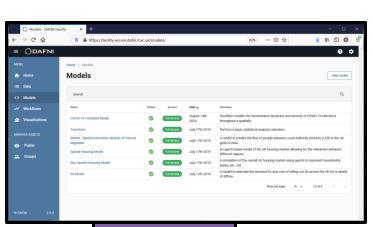




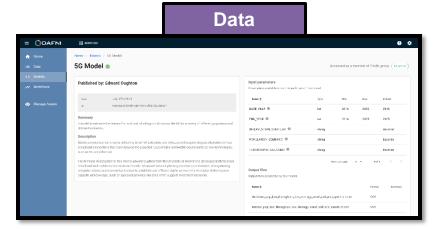


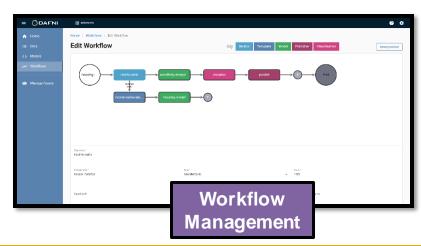
DAFNI Functionality

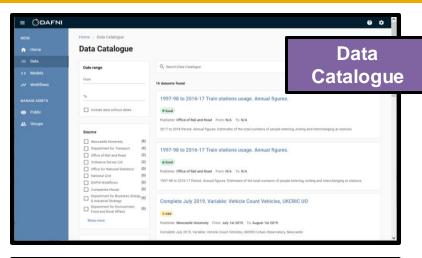


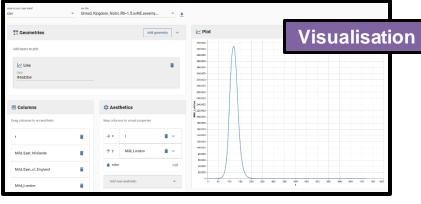


Models

















What DAFNI can offer?









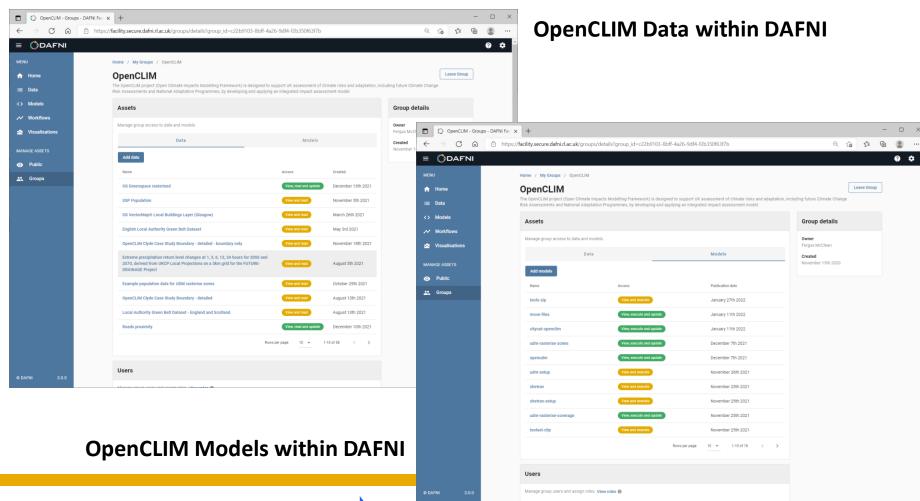
Infrastructure Systems Researchers

- Researchers into Infrastructure Systems
 - Setting a research agenda
 - Building on prior results
 - Working jointly to explore research challenges
- DAFNI offers:
 - A space to collaborate and share within research partnerships
 - A space to explore research questions at greater scale
 - o A space to allow different domains of interest to interact together
 - A space to share and publish reproducible results





DAFNI OpenCLIM: Building a shared framework in DAFNI









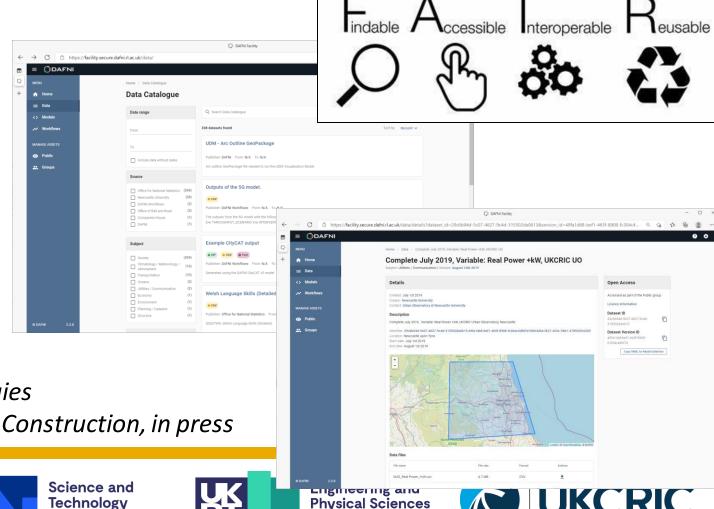


Publishing FAIR and Reproducable Research

- Publishing results data within the NID
 - Keeps them Accessible
 - Published with Rich Metadata for Findability
- Reproducible Results
 - Workflows can be rerun and reused
 - Version information for traceability
 - Results released to reviewers or more widely
- Still work to be done
 - Public PIDs (DOIs)
 - Richer Ontological Descriptions

Liz Varga et. al. Infrastructure and Cities Ontologies Proceedings of the ICE: Smart Infrastructure and Construction, in press

Facilities Counci





Research Software Engineers

Research Software Engineers

- Using computation to explore research questions
- Needing to process data from different sources
- Scaling to greater coverage, higher resolution
- Building richer system-of-system models combining different domains

• DAFNI offers :

- A space to collaborate and share within research partnerships
- A space to explore research questions at greater scale
- A space to allow different models from different domains of interest to interact together

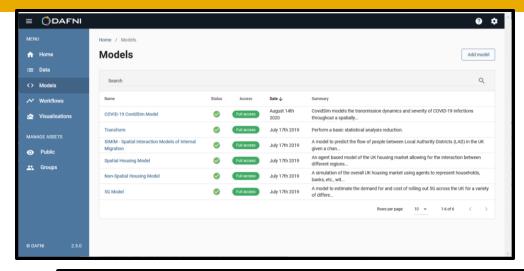




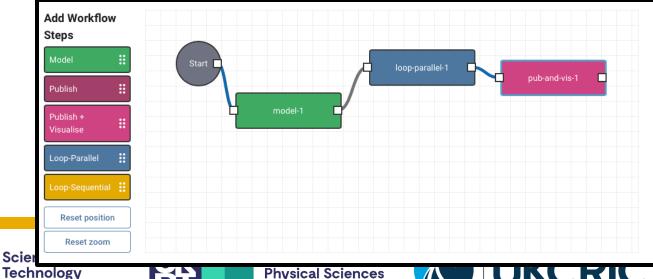


NIMS: Supporting user models

- Upload models from anywhere into a model repository
 - Models "containerised" using Docker
 - o Independent of code and operating systems
 - Sharing models
 - Within the same security framework
- Models can then be run on the HTC cluster
 - Kubernetes orchestration of containers
 - Scale up models for more compute
 - Access to data in the NID
 - Access to visualisations
- The NIMS allows workflows to be constructed
 - Coupling models together
- Key feature of providing an Infrastructure Ecosystem
 - Across different sectors
 - Across different scales
- A repository of models and workflow
 - Sharing models
 - Within the same security framework



Facilities Council

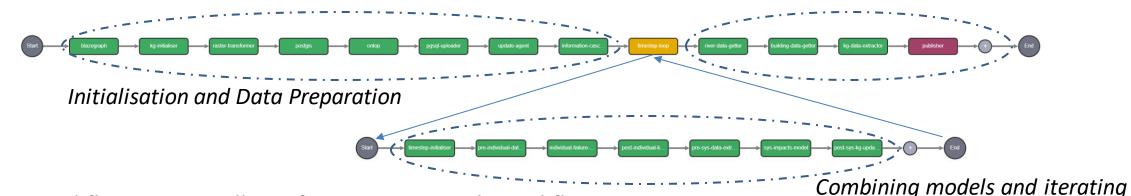


Research Council



CREDO: Rich workflows

Visualisation and Data Publication



- DAFNI workflow system allows for increasing rich workflows
 - Using reusable building blocks in containers
 - Parameter sets separating workflows from different parameter instances
 - New features to support: "Service models", iterators and loops
 - Improvements to groups and versions
- Still improvements to go:
 - o "adaptor" models for data preparation
 - Updatable data feeds.





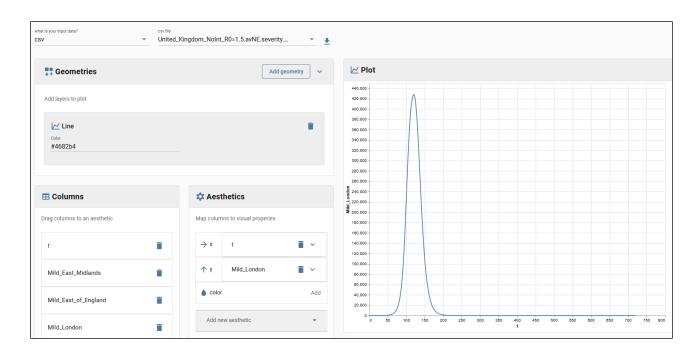




NIVS: Building Visualisations

- The National Infrastructure Visualisation Service
 - o Build visualisations from workflow output
- Two ways
 - Drag and drop tool
 - Jupyter Notebooks













Research Collaborators and Stakeholders

Collaborators

- Including government and industry
- Data and model providers
- Policy and decision makers

DAFNI offers:

- A neutral space to safely share data and models
- A common place to access results of analyses
- Transparent and auditable results
- An access framework that gives control to the user









Getting Involved with DAFNI









DAFNI-ROSE: Building a Community

DAFNI-ROSE

A grant under EPSRC's Resource-Only Strategic Equipment programme
July 2021-June 2023

- A production platform
 - With an enriched collection of data and models
- Developing the User Base
 - Research users
 - Working with CDTs for early careers researchers
- Looking towards further development:
 - Digital Twins:
 - Information Integration infrastructure
- Forming Multi-disciplinary partnerships
 - With academia, government and Industry

Also User Domain Projects

Emerging Themes:

- Digital Twinning
- Interaction with the Natural Environment









Accessing DAFNI

Access to DAFNI is **FREE** to UK Researchers

Also as a facility in JeS

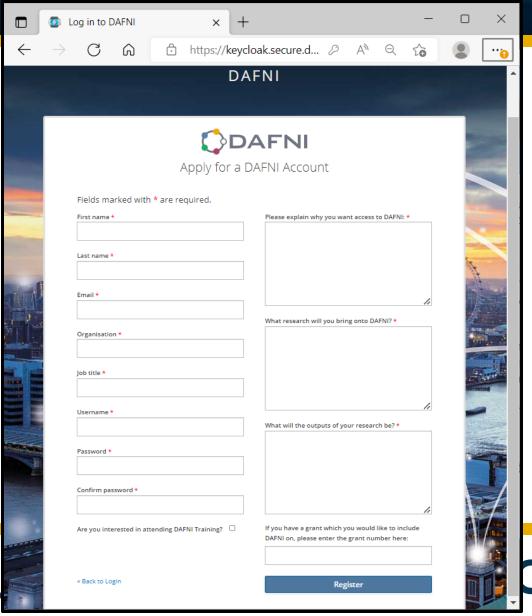
Trial accounts for others on application

Also inclusion on Research Grants

Talk to us

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Engineering and Physical Sciences Research Council







