The DAFNI Centre of Excellence for Resilient Infrastructure Analysis:

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DAFNI Computational Platform as a Community Hub

- **A Place for sharing and combining data and models**
  - A hybrid high-performance computing platform
  - A secure repository for national infrastructure data and models
- **A Place to support collaborations and deploy 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

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The DAFNI Centre of Excellence for Resilient Infrastructure Analysis:

Strengthening resilience in the natural and built environment in response to short-term and long-term threats via computational modelling

Short term shocks – e.g. flooding, heat events, emergency response

Long term shocks – e.g. effects and adaptations to climate change, demographic change

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Example Scenarios

- Risk and resilience of infrastructure in response to natural weather emergencies.
- Modelling food security in response to shocks to agriculture supply chains.
- Modelling resilience of utilities (e.g. energy, water, telecommunications) across a national scale to ensure resilience of supply in the face of environmental or societal change.
- Modelling response to shock events e.g., pandemics, geo-political events, economic downturns, civil emergencies.
- Modelling of cyber security and the risks of attacks on infrastructure.
- Shocks to urban environments to identify and address vulnerabilities in the networks within cities.
- Modelling resilience and adaptation of infrastructure and society in response to Climate Change.
- Modelling responses to global shocks in energy supply and analysing the transition risks as the economy adapts to the net zero carbon target e.g. in transport, telecoms, energy supply etc.

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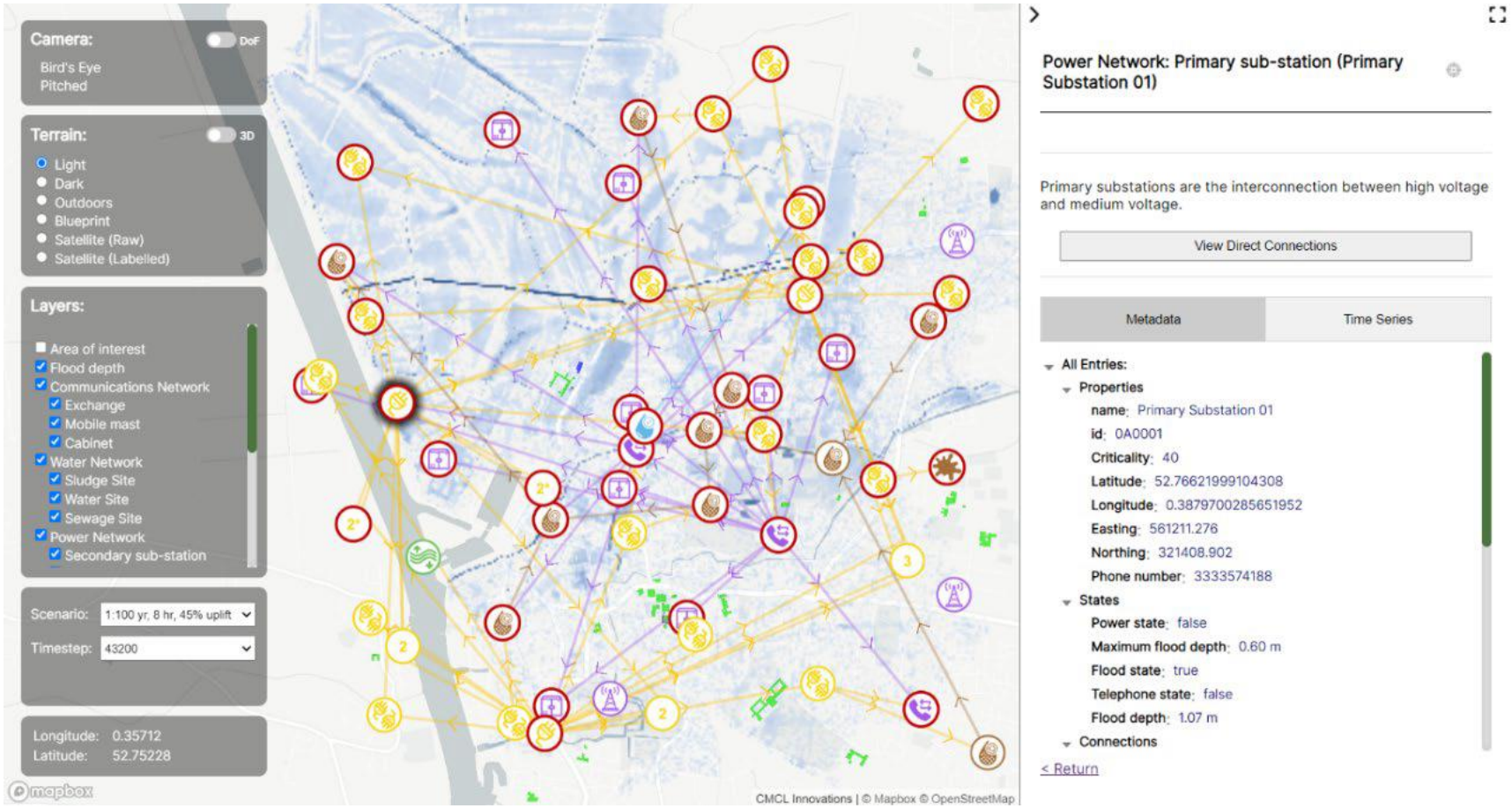
Example: Climate Resilience Demonstrator (CReDo)



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Objectives

Build on current DAFNI to form a Centre of Excellence in Modelling Resilience

- Provide a centre of expertise and capacity to support computational modelling of resilience challenges for the BSRW programme.
- Provide a collection of compute and data resources of value to the BSRW programme.
- Provide a programme of research to explore shocks within the sub-theme of *Strengthening Resilience in Natural and Built Environment* via computational modelling on the DAFNI platform.
- To develop the platform to enrich resilience scenarios as necessary.
- To engage with the wider stakeholder community to promote and exploit the platform.

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Programme

1. ***Support computational modelling across the BSRW programme***
   - DAFNI will be made available to support the programme within the DAFNI user access and support.

2. ***Develop a Reference collection of Models and Data***
   - Legacy collection of models and data to support the programme

3. ***Provide tools for exploring and evaluating resilience***
   - Assessing models for their value in supporting resilience within a framework.

4. ***Develop Resilience Scenarios:***
   - Developing a collection of resilience scenarios exploring particular shocks.

5. ***Core development***
   - The DAFNI platform will be further enhanced to support the requirements of resilience programme.

6. ***Engagement with the wider stakeholder community***
   - With academia, government and industry

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A Community Centre of Excellence

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Community participation in the DAFNI programme

Research Programme

A total fund of £1.4M is available overall for projects, funded at 80% FEC, for up to 18 months.

Three funding streams:

1. **Supporting Key Models.**
2. **Developing a Resilience Framework.**
3. **Exploring Resilience Scenarios**.

Applicants should specify which funding stream they are applying and can apply for more than one stream, but must complete a ***separate JeS application for each stream***.

1. Supporting key models.

The CoE would like to provide a collection of key models and data to support research into resilience

- Models are hard to develop and sustain, and require domain experts

Applicants should propose an existing model which is of value to the wider community to support research into resilience of infrastructure.

The CoE will support RSE time to support the ongoing maintenance and evolution of the model:

- Packaging, versioning, licensing, and documenting the model
- Maintain its open availability on the DAFNI Platform
- Enhancing the coverage, quality, and robustness of the model;
- Providing use cases of the model

We proposed funding of up to £50,000 and expect to support 4-6 of projects.

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2. Developing a Resilience Framework

The CoE would like to provide tools for exploring and evaluating resilience.

- How do we express and assess the resilience of infrastructure systems?
- Use tools such as uncertainty quantification, sensitivity analysis, redundancy and failover, cascade effects, and interconnectedness analysis.

Applicants should propose applied research to develop and apply state of the art research in frameworks to evaluate resilience within infrastructure systems engineering

- Provide leadership to the CoE in approaches to analysing resilience
- Recommend tools and processes which can adopted in the DAFNI platform to assess resilience.

We expect to support 1-2 projects with funds of up to £200,000.

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3. Exploring Resilience Scenarios

The CoE would like to have a portfolio of example research which explore how resilient particular infrastructure systems are to short and long-term shocks.

- projects within the research community to develop a scenario within the platform
- Making use of the capabilities offered by DAFNI

Applicants should propose scenarios which allow the responses to a shock to be explored using the DAFNI platform

- how to access, use and combine data and computational models to evaluate the impact of shocks,
- propose appropriate responses and adaptations to further resist, absorb and recover from the shock event.
- be made available to stakeholders via the DAFNI platform
- Provide scaling up or location independence and/or span across different infrastructure
- Interactions with the environmental, economy and society

We would anticipate projects of with funds of £100,000 - £350,000 and expect to support 3-6 projects in total.

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All Projects

All projects regardless of stream should:

- Start by 1 October 2023 and finish by 31 March 2025
- Provide a resourcing plan so they can start quickly!
- Provide an engagement plan to outreach to wider stakeholders in academia, government, and industry.
- Work with the core DAFNI team to coordinate the research programme.
- Provide their outputs openly via the DAFNI platform
- Provide a report and summary for publication on the DAFNI platform
- Attend DAFNI events, particularly User Conferences in Sept 2023 and in 2024.

All projects can expect help and advice from the core DAFNI team

- Access to shared resources on the DAFNI platform
- Training and advice on using the platform
- Access to user support and RSE support as needed

Become part of the Centre of Excellence

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Thank you for listening

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