Strategies and Tools for Resilience of Buried Infrastructure to Meteorological Shocks (STORMS)

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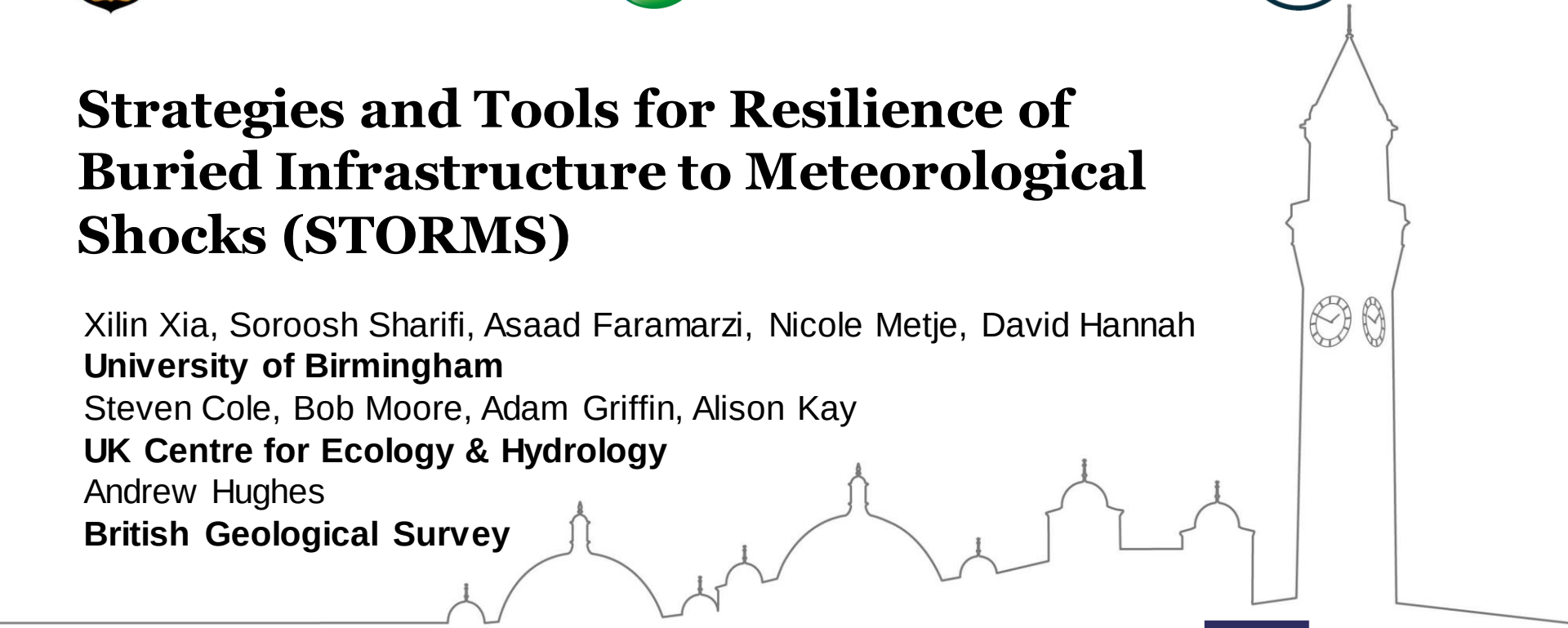

DAFNI Annual Conference 2023
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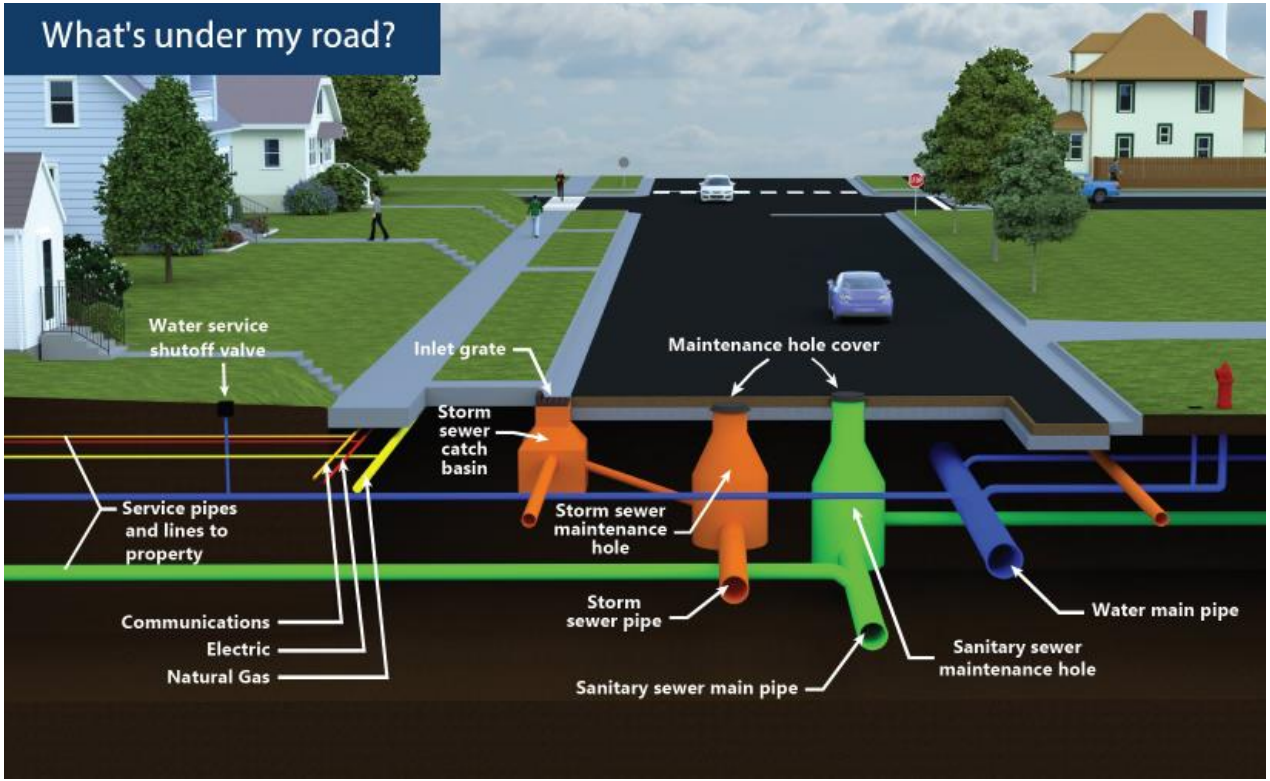
Buried Infrastructure



Buried infrastructure provides essential services: Water, Energy and Communication

Impacts from extreme weather events

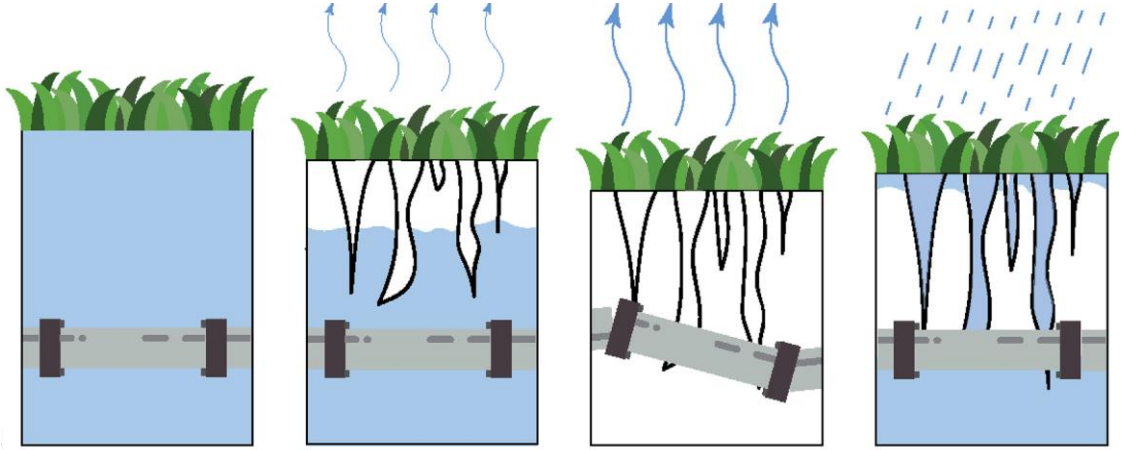
- Buried infrastructure is vulnerable to extreme weather events.
- The 2015/16 UK winter floods caused over **£100 million** in direct damages to utilities.
- The storm surge of Hurricane Sandy in 2012 caused more than **$10 billion** in damage to the underground infrastructure of New York.
- Damages to buried infrastructure is costly – over **£2.4 billion** per year.

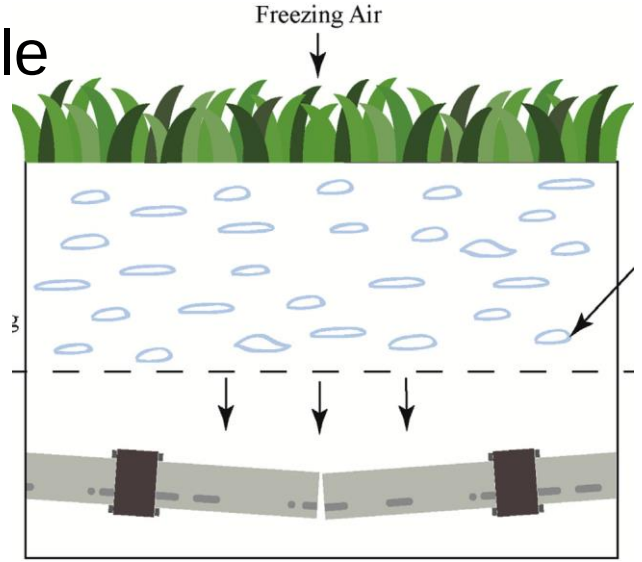
Impacts from extreme weather events

- Extreme floods
  - Wash-off
  - Sinkhole
  - Uproot of trees
  - Loss of bearing

Impacts from extreme weather events

- Wet-Dry Cycle and Freeze-Thaw Cycle
  - Differential soil movement (Swelling and Shrinkage)
  - Breakage of rigid pipes





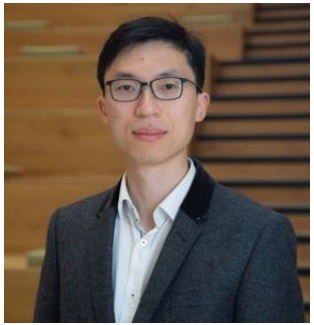
Barton at al. (2019)

Aim of STORMS project

- How a significant weather event, or 'shock', impacts the UK's buried infrastructure remains unclear
  - Likely and relevant weather/climate scenarios
  - Spatial and temporal distributions of impacts
- There is no established broad-scale risk assessment tool for buried infrastructure involving
- Our aim is to develop a **comprehensive weather-related risk assessment framework** to understand the potential impacts of scenarios under both current and future climate.
- Co-develop **adaptation measures** with stakeholders to increase resilience to extreme weather events and Climate Change.

STORMS team

University of Birmingham



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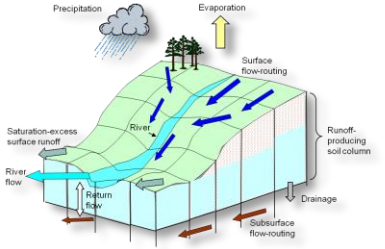
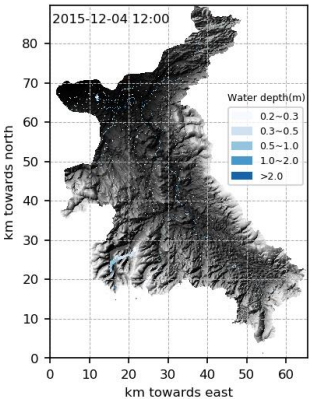
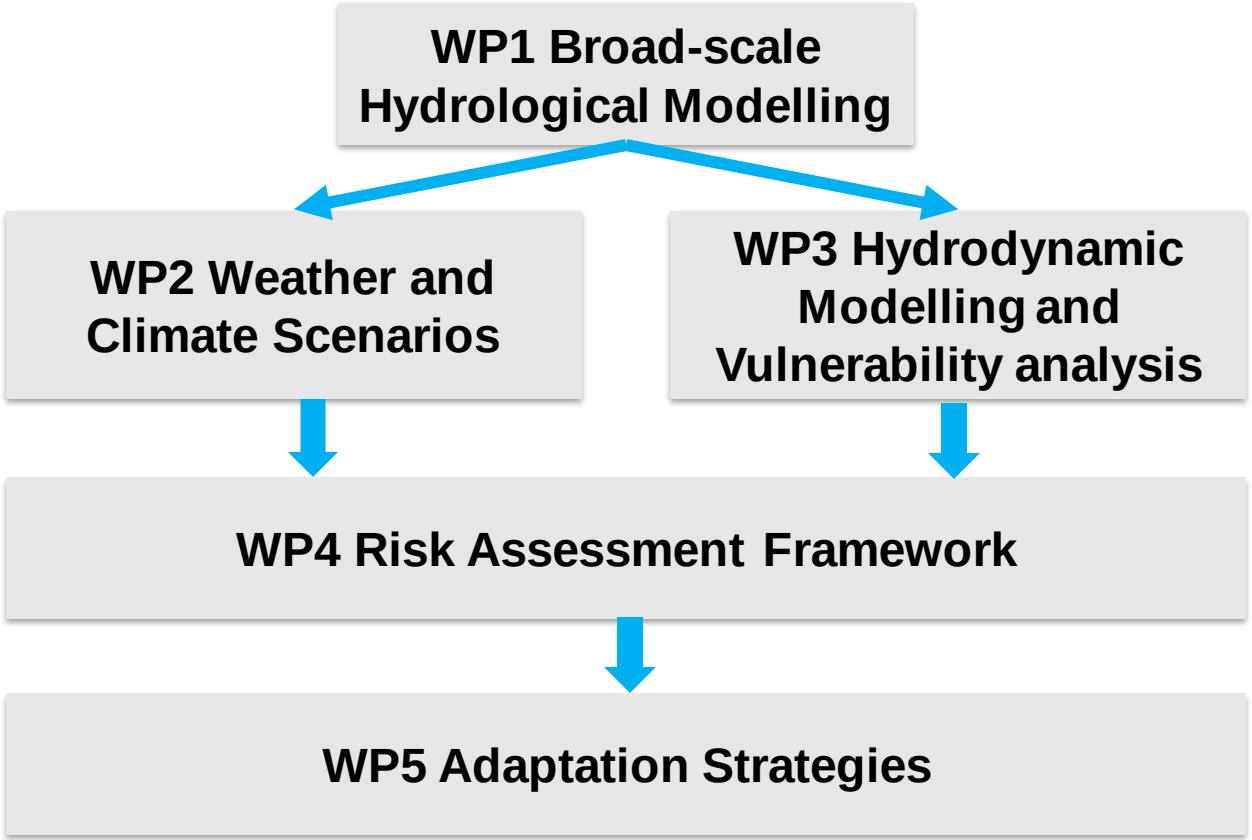
Models and Data

- UKCEH's Hydrological Model G2G – operational model for national flood forecasting across Great Britain
- Open-Source Hydrodynamic Model HiPIMS – a key flood model on DAFNI
- National Hydrological and Geological Datasets from UKCEH and BGS
- Experimental Datasets and Digital Twin from National Buried Infrastructure Facility– a £30M investment
- Asset datasets from industry partners: LSBUD, Northumbria Water, Thames Water





Work Packages



Key Deliverables and Impacts

- Risk assessment workflow on DAFNI for Buried Infrastructure
  - Extreme weather and hydrological scenarios and workflow for generating them
  - Multi-hazard hydrodynamic model (flood/landslide/entrainment)
  - Fragility curves for buried infrastructure assets
- Report for co-designed resilience and adaptation strategies
- Anticipated impacts
  - Enhanced decision-making
  - Guidance for climate adaptation
- Infrastructure on the ground can be benefited too

Stakeholder engagement

- We will engage widely: *Academia, Industry, Government Agencies, General public, International partners, other DAFNI-supported projects*
- A range of activities are planned:
  - Adaptation workshops
  - DAFNI training workshops
  - Outreach Activities
  - …

UK Research and Innovation

Thank you!

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BGS British Geological Survey