DAFNI and OpenCLIM

(Open CLimate IMpacts modelling framework)

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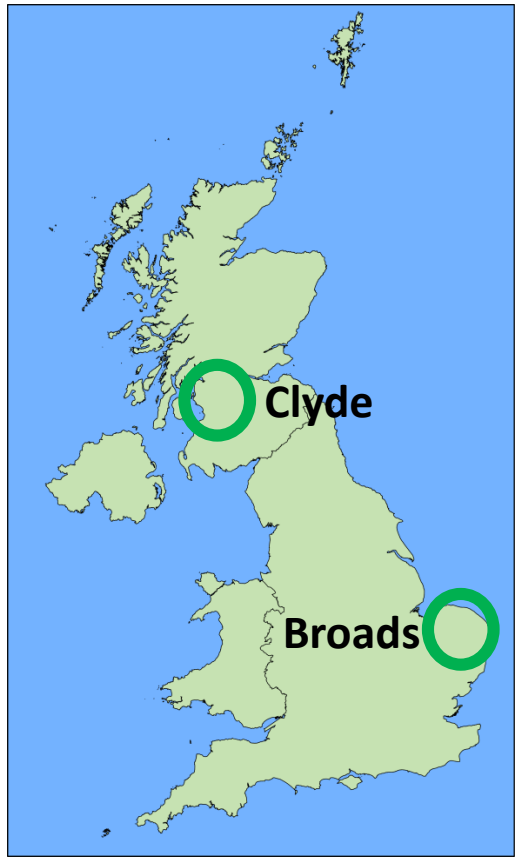
UKCRIC

OpenCLIM Project Background

Goal: to deliver the assessment method for Climate Change Risk Assessment 4 (CCRA4) – i.e., enhance the UK's climate change risk capability

- To develop and implement an advanced open, integrated, spatial, model framework
  - Linking state-of-the-art models within an integrated framework
- National Assessment across the United Kingdom,
  - working with the CCC, DEFRA and the devolved administrations
- Case studies to explore results in more detail with stakeholders.
  - Norfolk Broads (Lead stakeholder: Broads Authority)
  - Clyde Catchment (Lead stakeholder: Climate Ready Clyde)



Robert Nicholls (Principal Investigator)
University of East Anglia team: Prof R Warren, Dr Y He, Dr J Price, Dr P Sayers, Mr A Minns
Newcastle University team: Mr V Glenis, Dr E Lewis, Prof C Kilsby, Dr AC Ford, Prof RJ Dawson, Dr C Robson, Dr LS Smith
University of Bristol: Dr OD Andrews
Centre for Ecology and Hydrology (CEH): Prof R Pywell; Mr J Redhead
Science and Technology Facilities Council (STFC): Dr B Matthews and DAFNI team
Sayers and Associates (Sub-Contractor)

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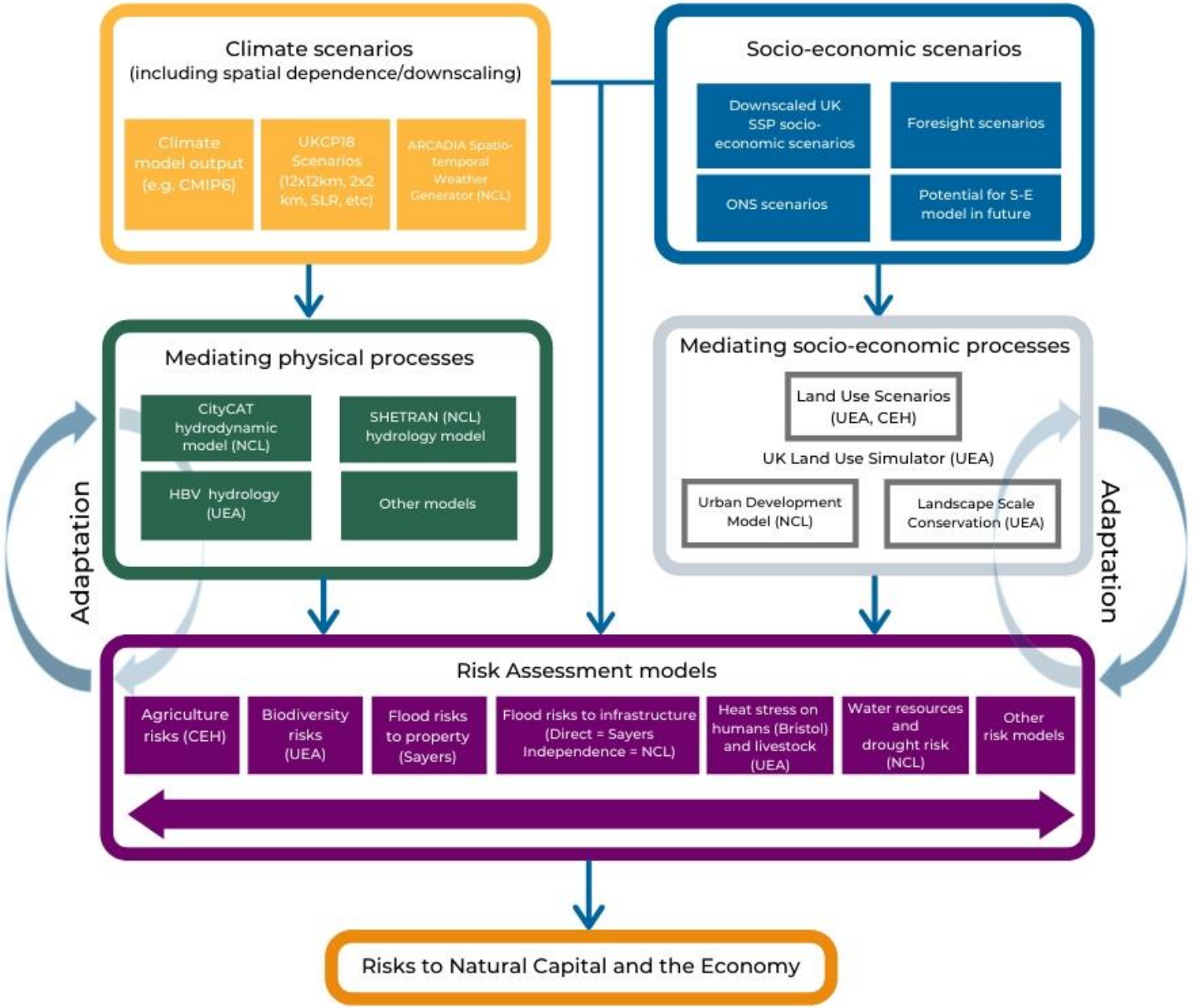
Scientific Structure of OpenCLIM.



OpenCLIM - Scenarios

Topic Areas

1. Biodiversity/land cover
2. Urban development
3. Agriculture
4. Heat stress
5. Inland flooding
6. Drought and Water supply

Fluvial Flooding

A. Climate-related flood hazard

- How might climate change impact flood risk and damages in the future across the UK and the devolved administrations?
- What is the most important 'gap' you see in existing climate flood risk assessments?
- What areas of uncertainty that may influence future flood risk concern you most?

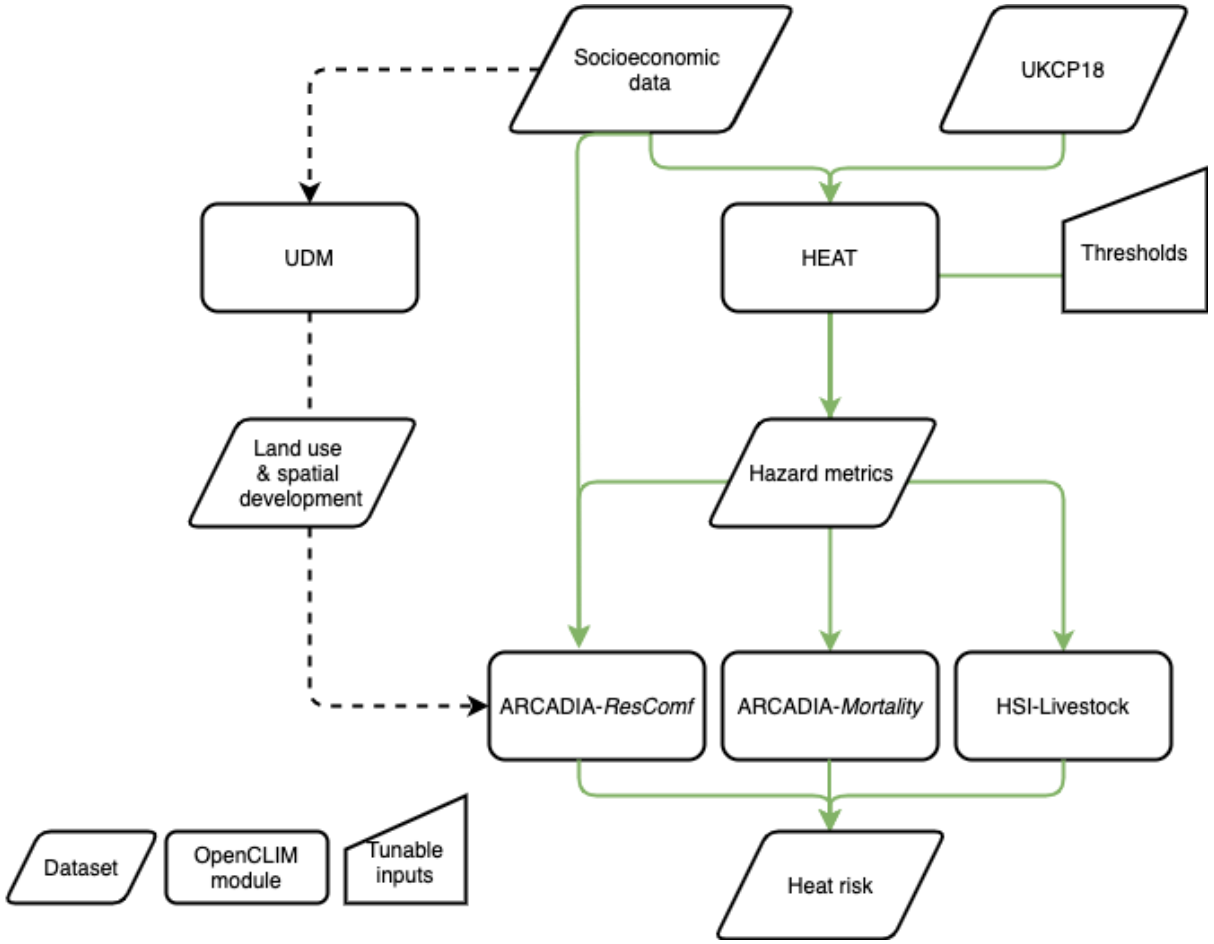
B. Adaptation to flood risk

- How might changes in development affect flood risk?
- How can we reduce flood risk through carefully designed land use change?
- What is the most important sectoral influence on flooding for OpenClim to consider?

Models

- **HEAT :** sWGBT, VP
- **ARCADIA:** Mortality risk, Residential Discomfort, Labour Productivity
- **HBV & SHERTRAN:** Streamflow, runoff depth, reservoir flow, soil moisture, g'water
- **CityCAT:** fine scale surface water floods
- **Future Flood Explorer:** flood risk and damages
- **National Water Simulation:** Reservoir storage, water restrictions, abstraction shortfalls
- **CropNET & EcoCROP:** potential/actual crop yield, crop suitability
- **Urban Development Model (UDM):** Spatial Development, land use
- **Wallace Initiative:** species richness, climate change refugia for biodiversity

Heat in OpenCLIM



- HEAT calculates hazard component. First priority → feed hazard outputs and derived climate metrics into ARCADIA mortality & residential discomfort
  - workflow for HEAT to produce bias adjusted UKCP18 RCM heat stress variables to replace WG inputs currently used in ARCADIA
  - scaling up ARCADIA to UK (and data needs); links with UDM (greenspace); HEAT links with livestock (HSI-Livestock)
- **Katie Jenkins, UEA**

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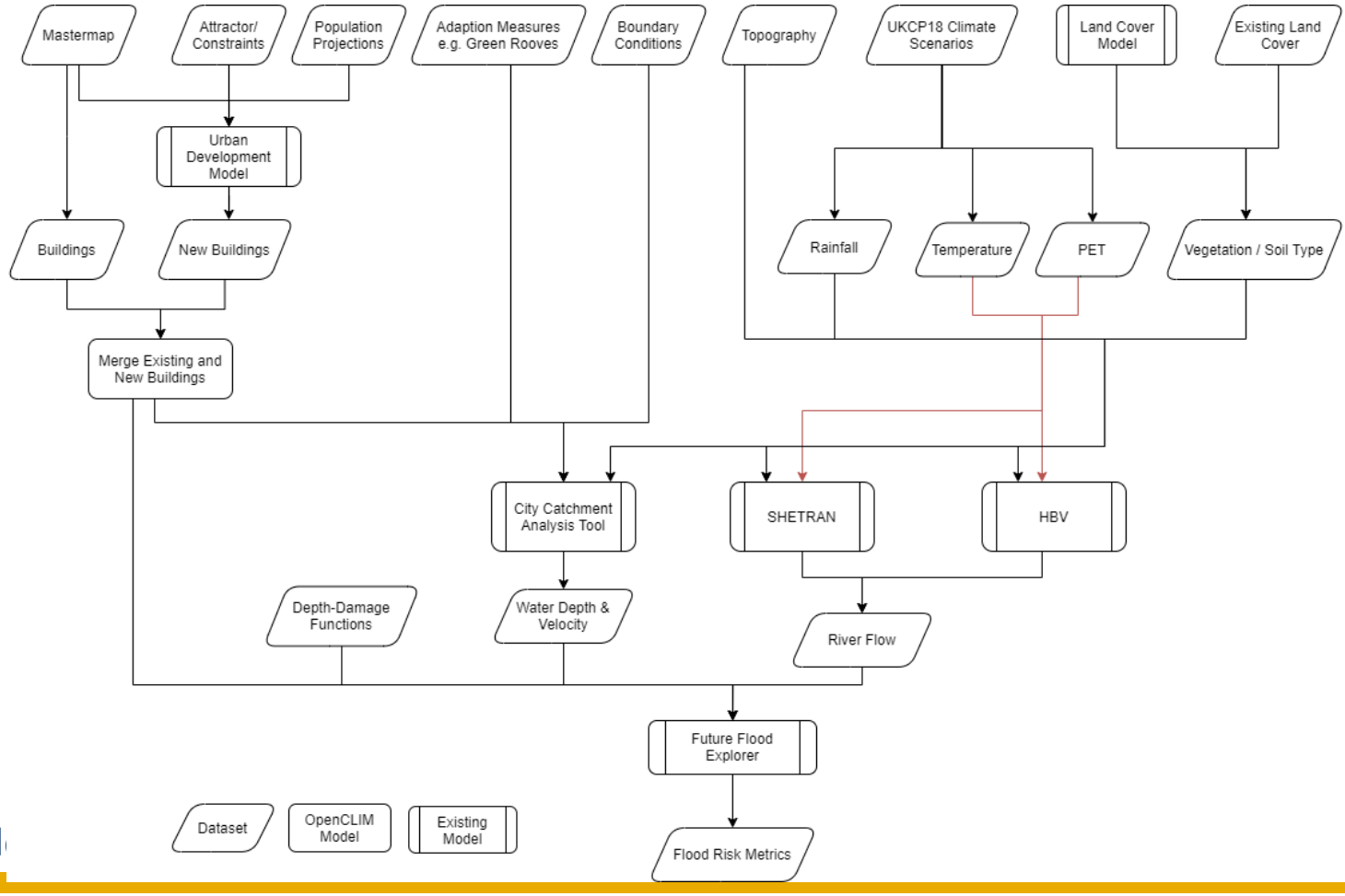
OpenCLIM and DAFNI

- Capturing workflows to capture scenarios
- Implement these models using a Multi-systems modelling approach

- Working with DAFNI to provide
  - A framework for combining models together
  - A place where users can go to access and run workflows
  - A legacy where models can be accessed for the long-term

- Example of CityCAT (next few slides)
  - Richard Dawson, Fergus MacLean, Luke Smith, Craig Robson, Chris Kilsby, University of Newcastl



CityCAT workflow in DAFNI – run flood model

Parameters*

Name	Value
Return Period (years)	100 (Default: 100, Min: 10, Max: 200)
Duration (hours)	1 (Default: 1, Min: 1, Max: 6)
Domain Size (km)	5.5 (Default: 5.5, Min: 0.1, Max: 10000)
Domain Centroid X (OSGB)	258722 (Default: 258722, Min: 225379, Max: 311599)
Domain Centroid Y (OSGB)	665028 (Default: 665028, Min: 600201, Max: 684815)
Pooling radius (km)	20 (Default: 20, Min: 10, Max: 50)

Datasets to use in Model

Digital Elevation Model *	OS Terrain™ 5 DTM (Clyde)	Path on disk: inputs/dem
UKCP18 *	UKCP Local Projections on a 5km grid over the UK for 2041-2060 (Clyde)	Path on disk: inputs/ukcp
Buildings	Sample buildings	Path on disk: inputs/buildings

(Will be replaced by UDM output)

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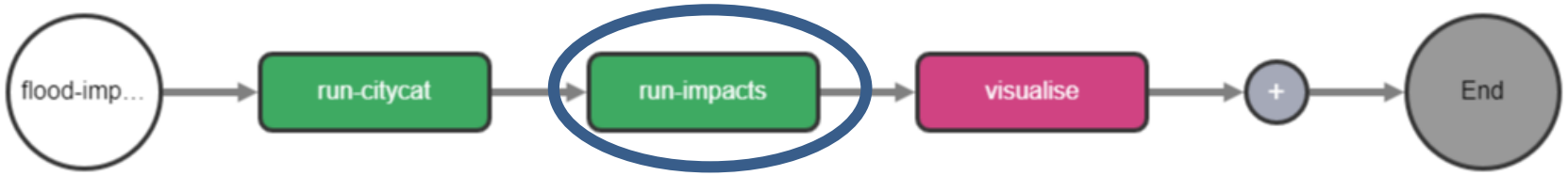
CityCAT workflow in DAFNI – assess impacts



Parameters*

Name	Value
Threshold depth (m)	0.01
	Default: 0.01, Min: 0, Max: 1

Datasets to use in Model

MasterMap * OS MasterMap (Glasgow) Use default

Path on disk: inputs/mastermap

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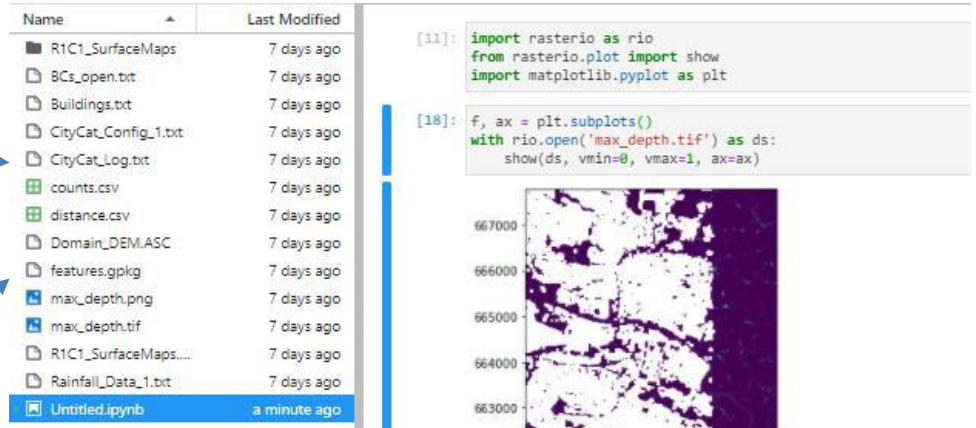
CityCAT workflow in DAFNI - Visualise

Counts of buildings and distances of roads that have been inundated

Maximum flood depth



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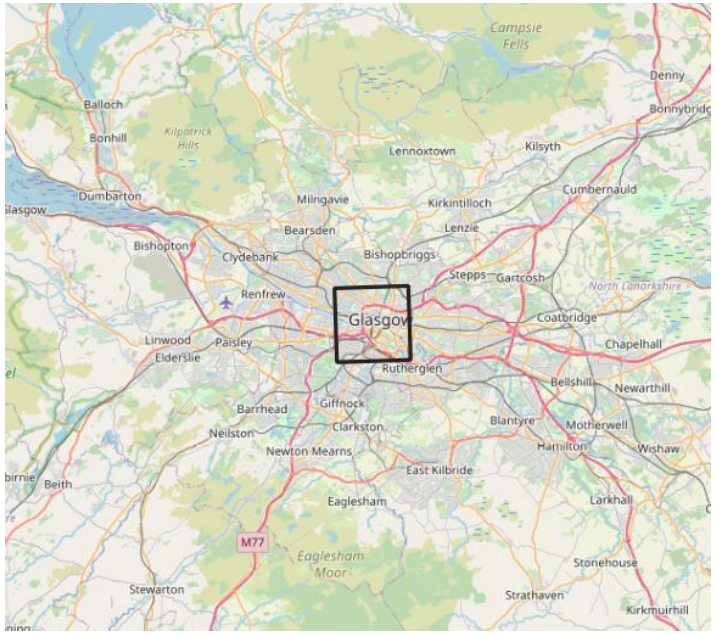
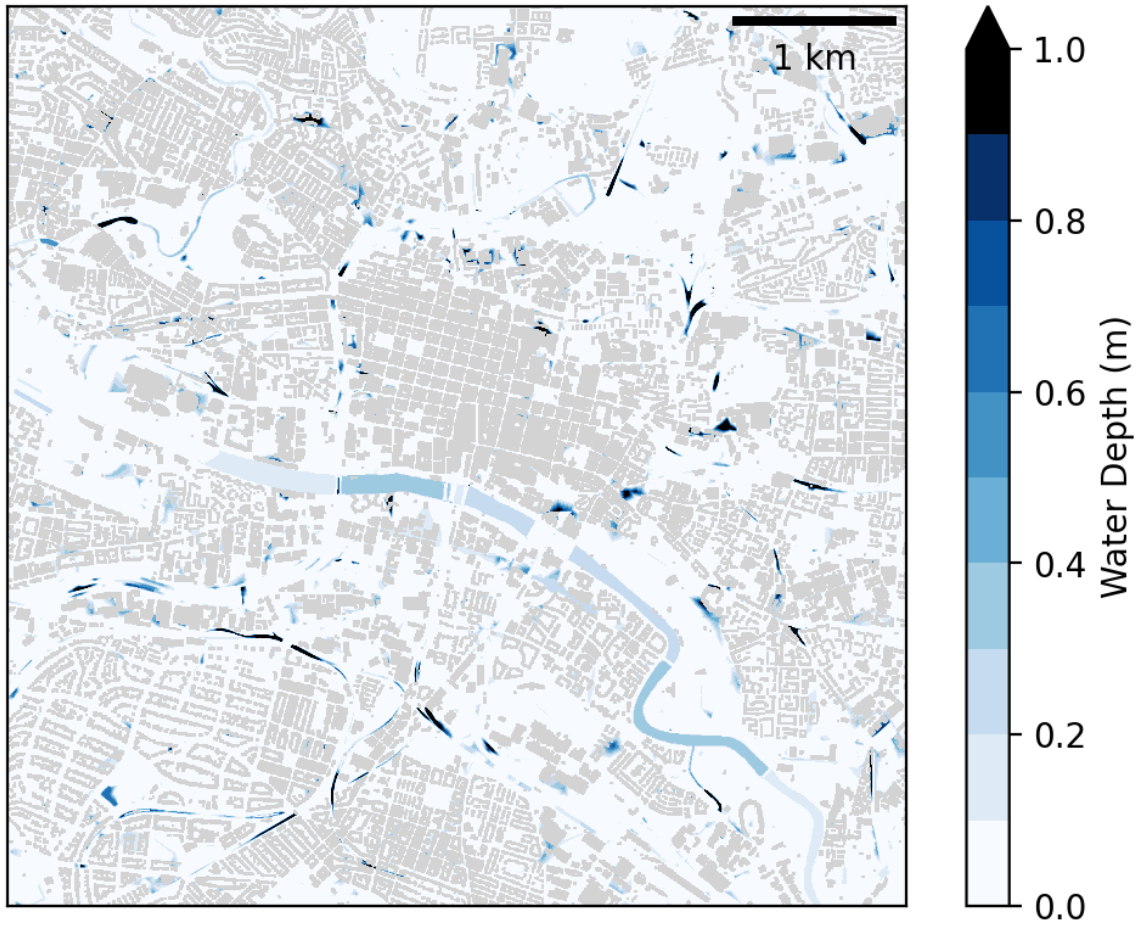
Central Glasgow CityCAT





Thank You

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