

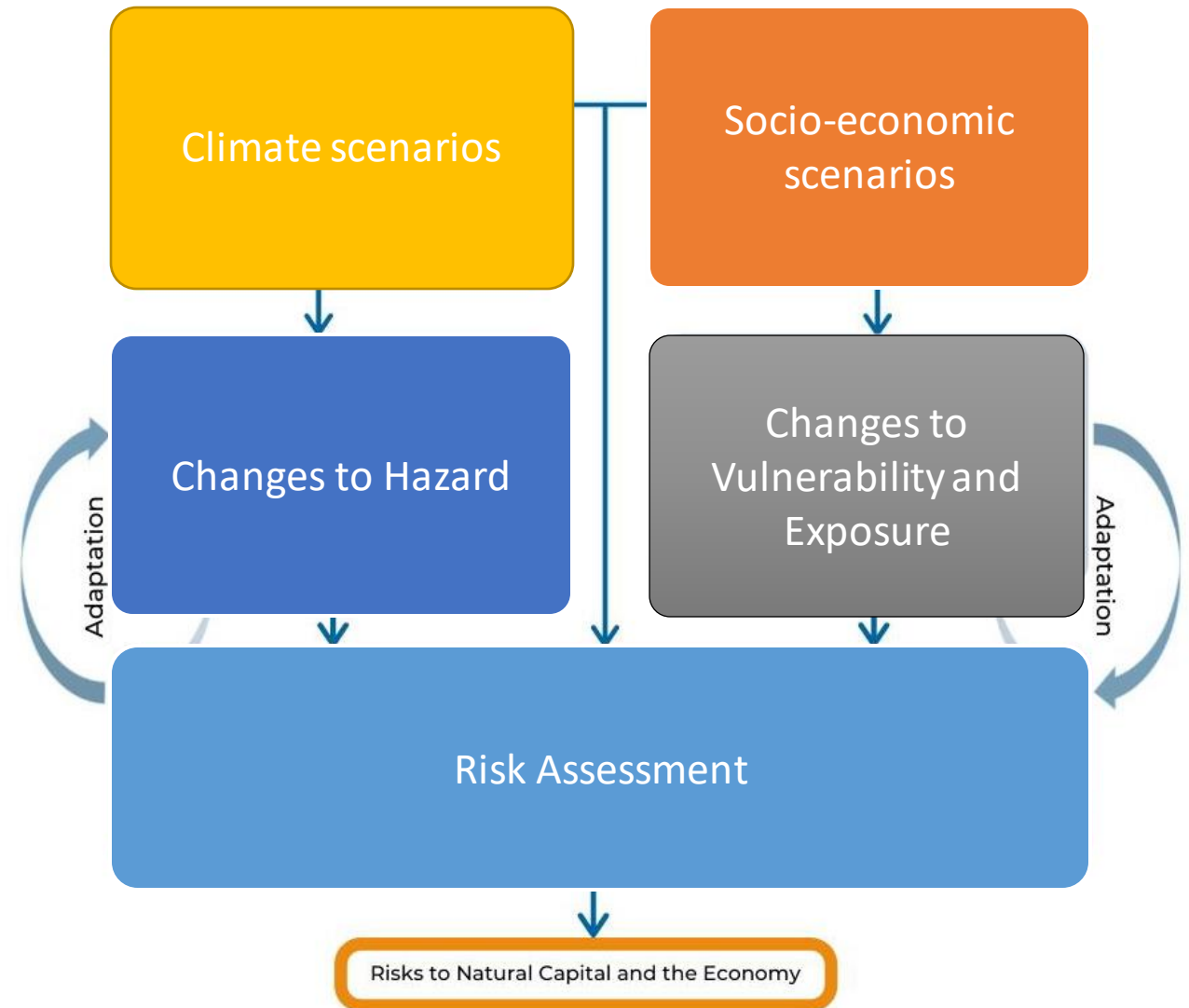
# OpenCLIM: Developing a framework for a national scale assessment of climate change risk and adaptation

DAFNI Conference 2022

Dr Craig Robson, Newcastle University

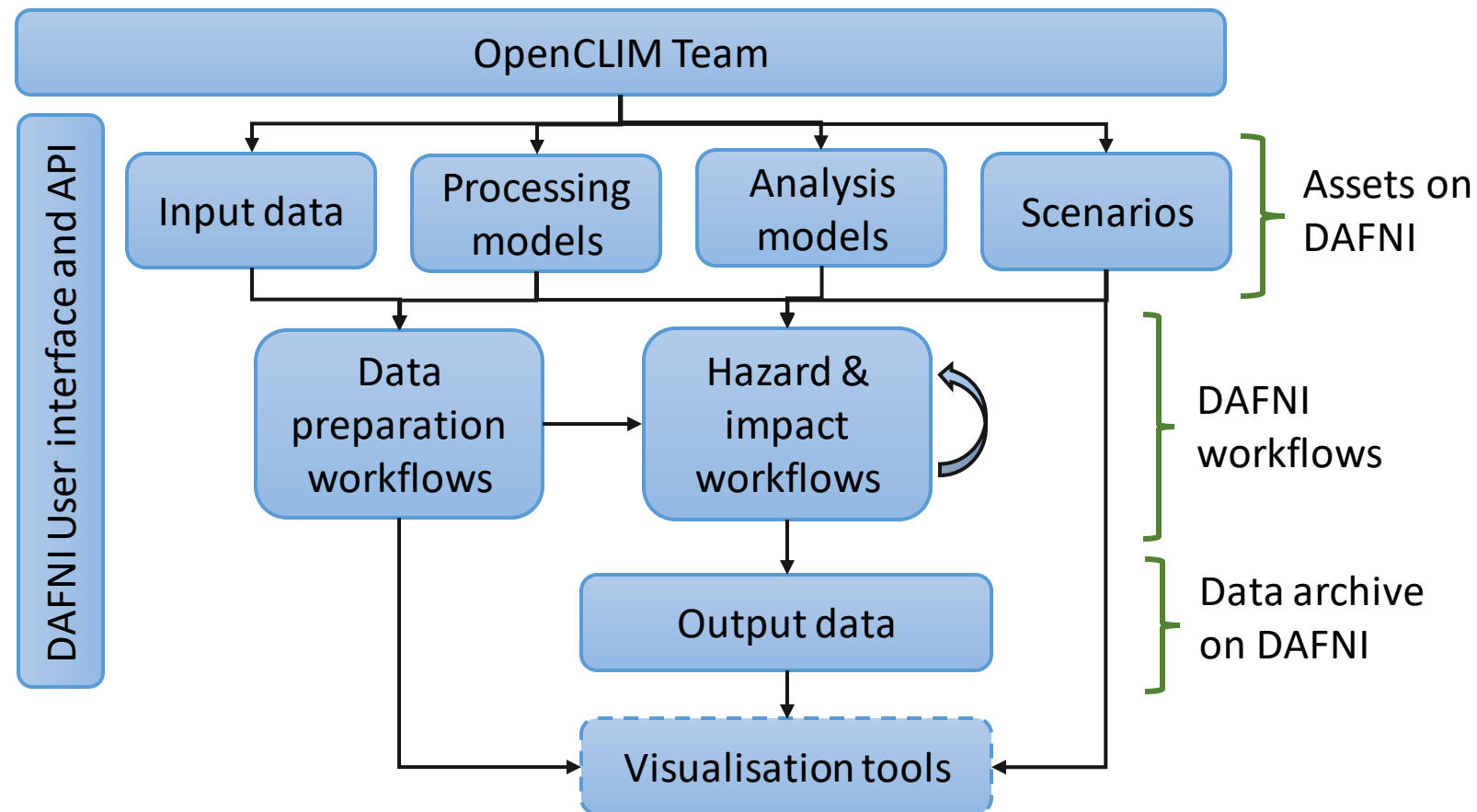
# Challenges

- Coupling different models together
- Computational power
- Multiple models and workflows
- Having an open, sustainable platform
- High resolution data



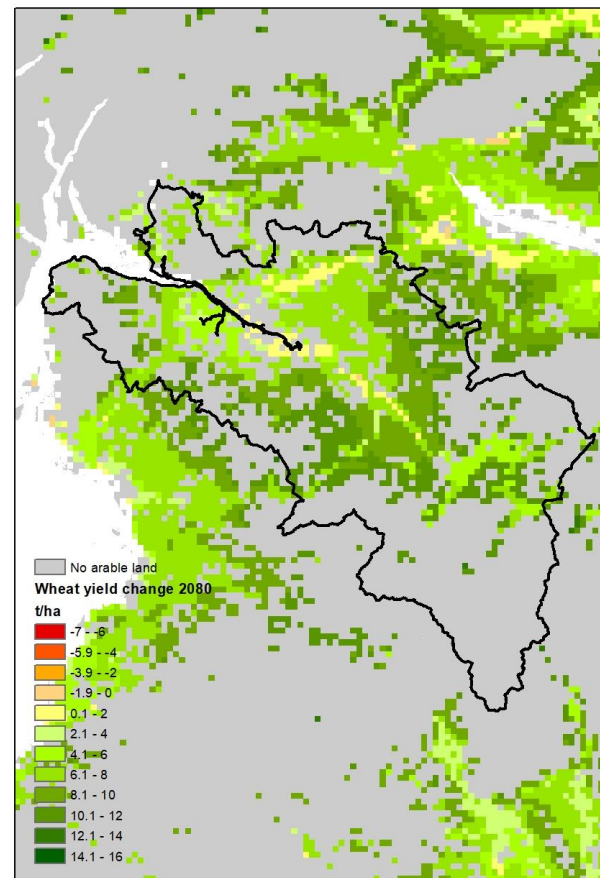
# How does OpenCLIM use DAFNI?

- Deploying models
- Data pre-processing
- Designing and deploying workflows
- Running workflows
- Data sharing

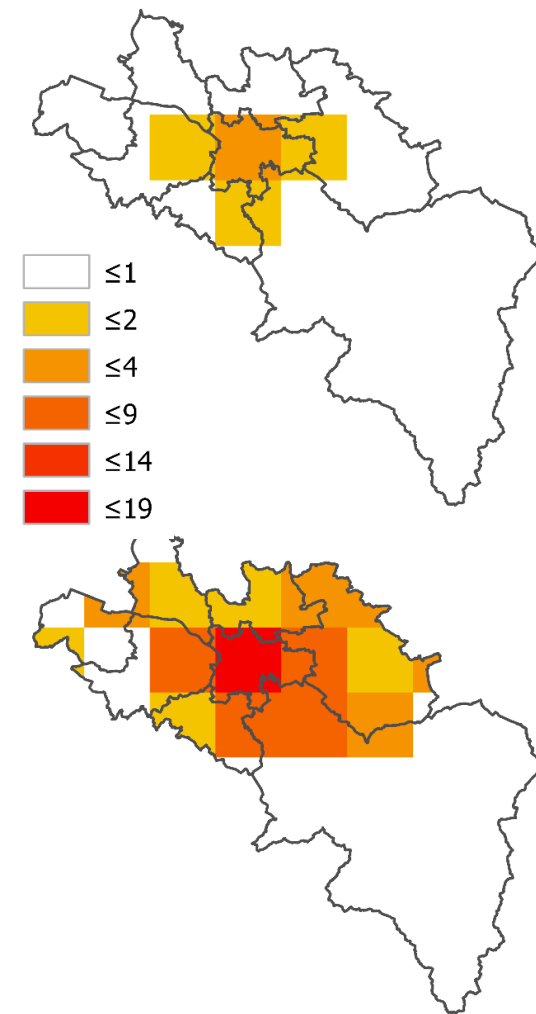


# Which climate hazards?

- Workflows/hazard areas
  1. Biodiversity and land cover
  2. Urban development
  3. Agriculture
  4. Heat stress
  5. Inland flooding
  6. Drought and Water supply
- These workflows are not independent and links will exist between these

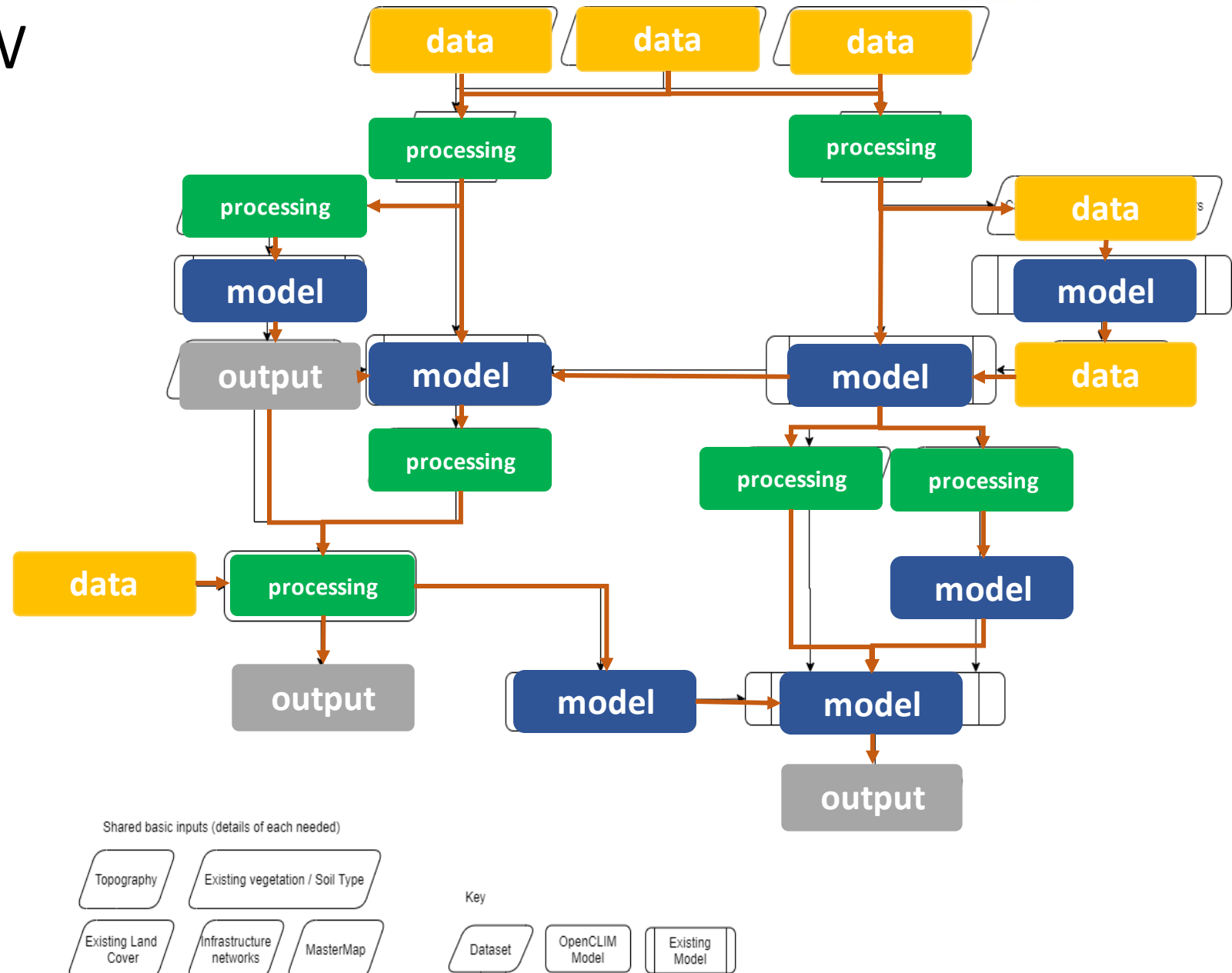
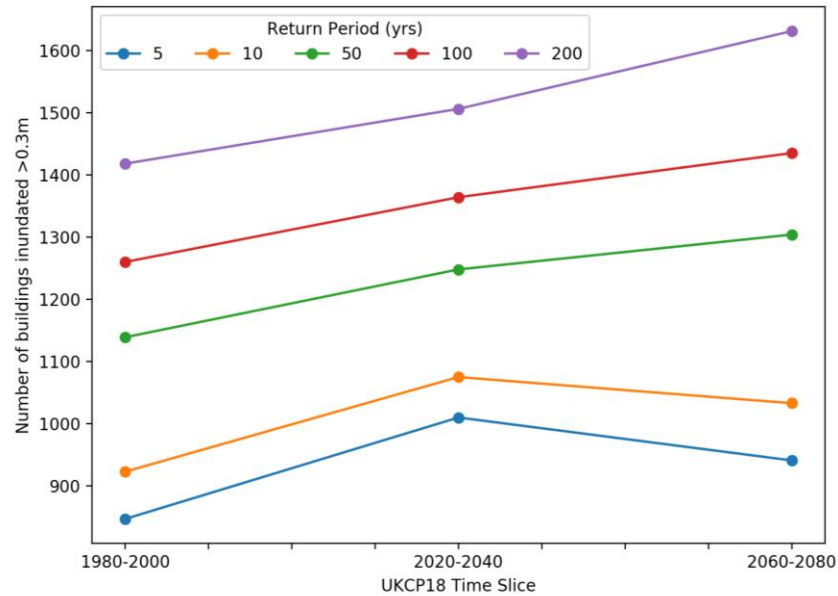
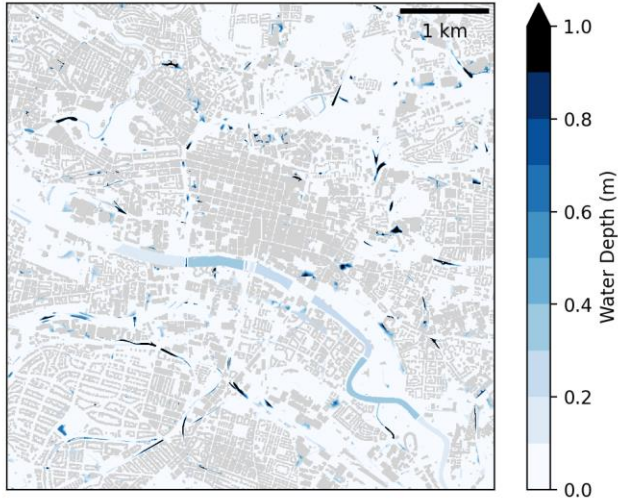


Change in yield 2080  
(current arable land only)



Change in exposure by 2080 to  
increasing temperatures

# Example workflow



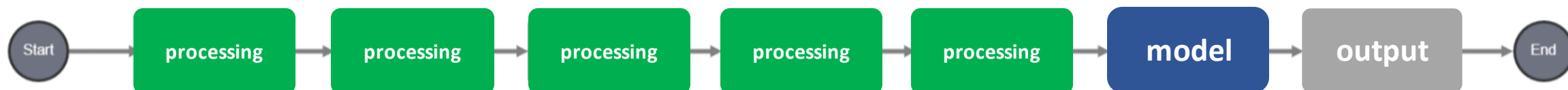
# Workflow example

[Home](#) / [Workflows](#) / [UDM v4](#) / Workflow Instance Status

## Workflow Instance Status

Key Model Publisher Visualisation Loop-Parallel Loop-Sequential [Reset position](#)

Click and drag on the white area around the Workflow to pan the canvas.





# Tool

## • Suite

Zip

Clip

Merge  
(vector)

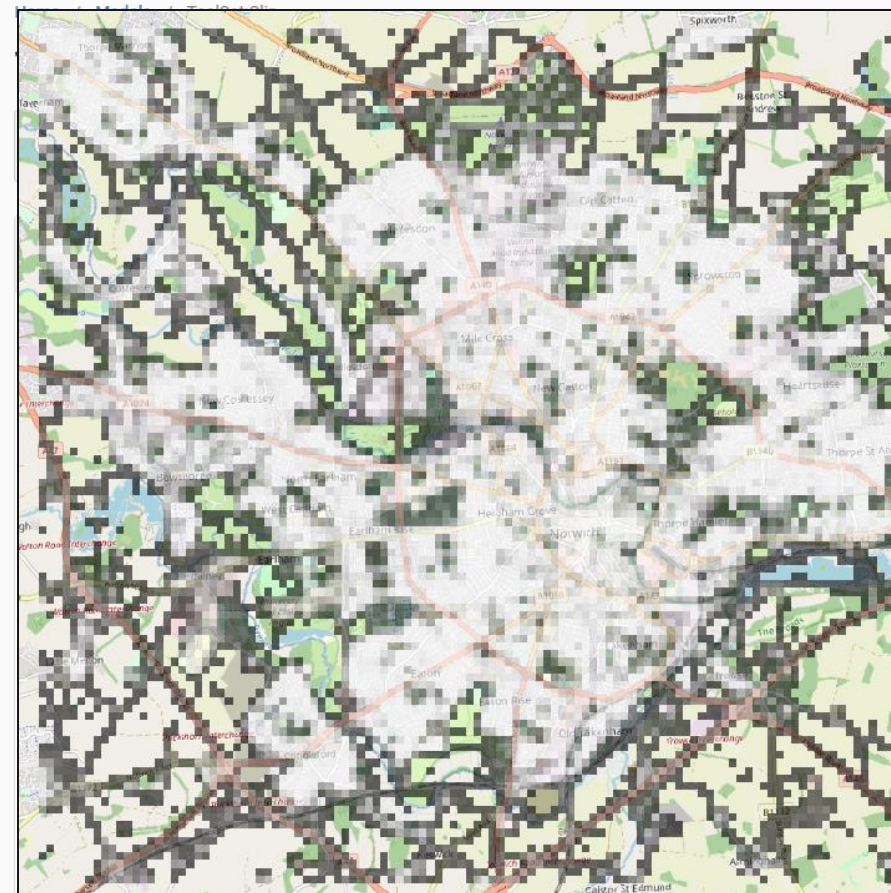
Re-project

ve files

stense  
ximity

ect by  
tribute

At a 100m resolution, the  
% of land covered by  
development



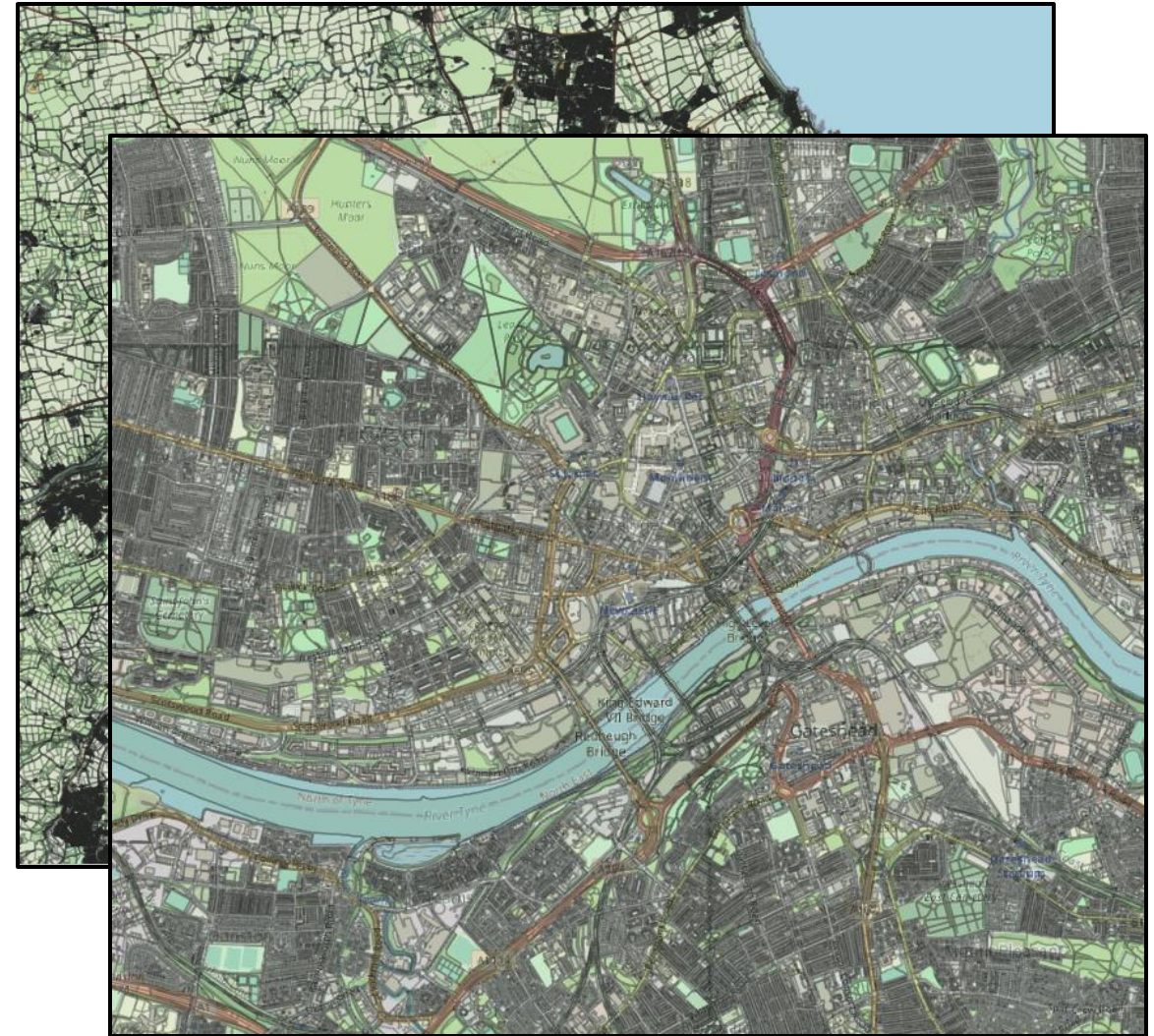
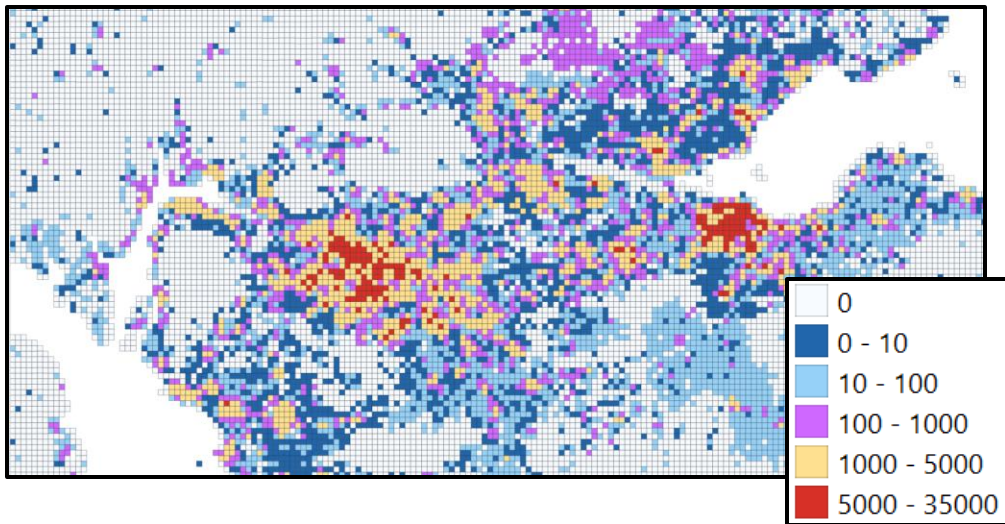
Delete model version

by the output  
d for details. When  
the clip data do not



# Data

- National and local analysis
- OS MasterMap
- UKCP18
- Socio-economic scenarios





# DAFNI API

- Script running of workflows
- Can initiate large runs quickly
- Can script in other steps
  - e.g uploading and downloading data

## Create the parameter sets

```
workflows = []
workflow_version = '06315ff6-35b0-4ebf-a032-c0daf6faaa1d'

# parameters
years = [2030, 2040, 2050]
ssps = [4, 5]

name = 'udm-example-%s-%s' %(scenario_ssp, scenario_year)

for ssp in ssps:
    for year in years:
        data = json.loads(template.render(
            name=name,
            workflow_version=workflow_version,
            year = year,
            ssp = ssp
        ))
```

Existing workflow ID from DAFNI

Set the parameters we want to use in the workflow

Create a list of parameter sets using DAFNI schema with parameters set above

## Start the workflows

```
responses = []
start = 0
end = 1
count = 0
for data in tqdm(workflows[start:end], initial=start, total=len(workflows)):
    r = requests.post(f'https://dafni-nims-api.secure.dafni.rl.ac.uk/workflows/execute/{workflow_version}/',
        headers=get_headers(), json=data)
    # raise for status()
    print(r.text)
    count += 1
    if count == 10:
        count = 0
        print('waiting for 5 minutes')
        time.sleep(5 * 60)
    else:
        time.sleep(5)
    responses.append(r)
```

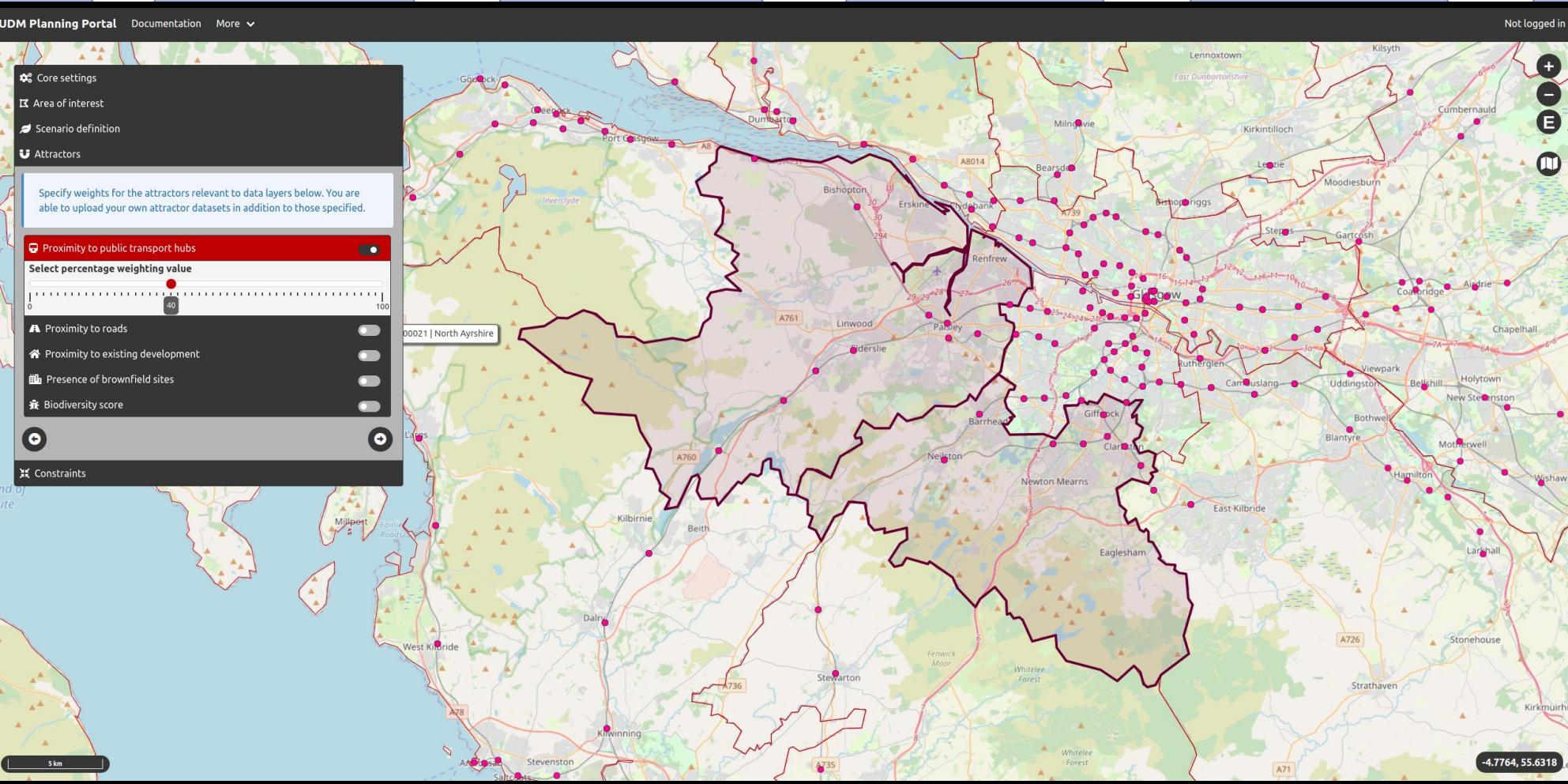
Loop through the list of parameter sets

Run a parameter set/workflow instance on DAFNI

# DAFNI API +

Generate parameter sets for workflow inputs

Write instance information to metadata



UDM Planning Portal Documentation More

Not logged in

Core settings

Area of interest

Scenario definition

Attractors

Specify weights for the attractors relevant to data layers below. You are able to upload your own attractor datasets in addition to those specified.

Proximity to public transport hubs

Select percentage weighting value

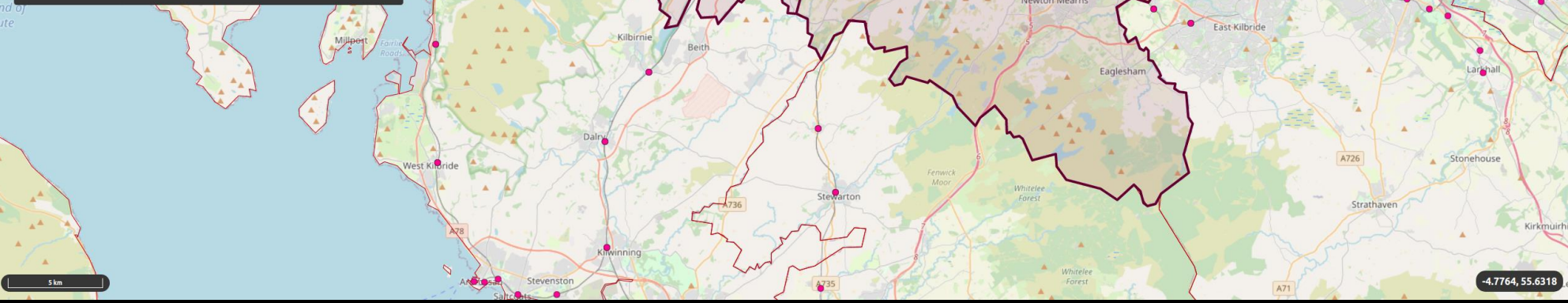
Proximity to roads

Proximity to existing development

Presence of brownfield sites

Biodiversity score

Constraints

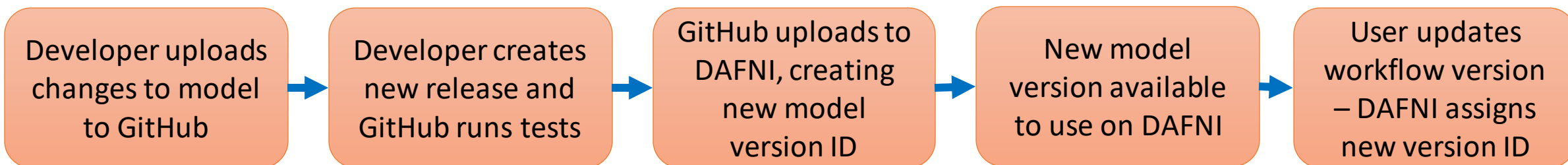


|     |  |                  |                 |                     |             |                                      |           |      |  |
|-----|--|------------------|-----------------|---------------------|-------------|--------------------------------------|-----------|------|--|
| uid | 7a27d4f0-942f-11e5-b66c-9952-942f-11e5-837c6134-9433-11e5-efc0a9fe-9433-11e5-5c078e52-9434-11e5-c851805e-9434-11e5-34a5032a-9435-11e5-a0e6db62-9435-11e5-8d5a-a1c8b10e48 | ebd923ed-b527-48 | https://facilit | UDM & Flood-impacts | UDM;CityCat | aa039375-4c8e-4bf8-af39-8949a12d4f2  | ### Clyde | 2050 | 5 A single run of the UDM model with some fi |
|     | 538a27c8-9487-11e5-8d5a-a1c8b10e48   | ebd923ed-b527-48 | https://facilit | UDM & Flood-impacts | UDM;CityCat | ebbe1a4a-586d-4dbb-9d9a-8bbc71e38    | ### Clyde | 2070 | 5 A single run of the UDM model with some fi |
|     | bf9beca8-9487-11e5-8d5a-a1c8b10e48   | ebd923ed-b527-48 | https://facilit | UDM & Flood-impacts | UDM;CityCat | d576b82f-efac-44fe-b309-72ea223f511e | ### Clyde | 2100 | 5 A single run of the UDM model with some fi |
|     | 2bc05eaa-9488-11e5-8d5a-a1c8b10e48   | ebd923ed-b527-48 | https://facilit | UDM & Flood-impacts | UDM;CityCat | 988fbfc9-56ce-42db-be7d-6aa80f79515  | ### Clyde | 2080 | 5 A single run of the UDM model with some fi |

# Provenance management

- Data & results
- Model versioning
  - Tests and uploads
- Workflow versioning

| OpenUDM           |                       |                |                                   |
|-------------------|-----------------------|----------------|-----------------------------------|
| Published Date    | UDM                   |                |                                   |
| May 13th 2022     |                       |                |                                   |
| April 27th 2022   |                       |                |                                   |
| April 27th 2022   | Published Date        | Version Tags   | Version Message                   |
| February 3rd 2022 | May 13th 2022 - 10:21 | Latest Default | fix output publish step           |
| February 3rd 2022 | May 13th 2022 - 10:03 |                | updated udm model for ufg outputs |
| February 3rd 2022 | May 13th 2022 - 08:20 |                | look for urban fabric .gpkg       |
| February 3rd 2022 | May 13th 2022 - 08:03 |                | fetch ufg outputs                 |





# Summary

- DAFNI provides a platform to build the OpenCLIM framework
- The flexibility of the platform enables a dynamic approach to how OpenCLIM uses DAFNI
- DAFNI has evolved to meet the needs of the project
- It provides a legacy for the OpenCLIM project
- A platform to share models and data

# Thanks for listening

Dr Craig Robson (craig.robson1@ncl.ac.uk)

Newcastle University