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GeoAI: overcoming the hype and avoiding hallucinations

Planning Officers Society June 2025

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Digital Solutions Hub
Bringing
40+
Petabytes of Environmental Data
To your doorstep

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NERC DIGITAL SOLUTIONS PROGRAMME

- 5 year £8m investment to build a UKRI 'national facility' – the Digital Solutions Hub.
- Making NERC's 40+ PBs data **FAIR** to non-academic users to make better use of their data from the 5 data centres.
  - **F**inable **A**ccessible **I**nteroperable **R**eusable
- Connecting with **social**, **economic**, **health** and other **environmental** data across the **whole of the UK**.
- Users demand services not just a data portal:
  - '*we don't want a data.gov.uk type website*'
  - *'my laptop is 3 years old, it's not powerful enough to do analysis and I can't install software'*
  - **services** - built on top of the published data, but also a portal with good quality meta-data, API data endpoints for data integration into their own systems
- Users want to **tell stories** with data, create **apps, maps, dashboards**, **share** and **collaborate**.

Centre for Environmental Data Analysis — Science and Technology Facilities Council, Natural Environment Research Council

UK Centre for Ecology & Hydrology

British Antarctic Survey — Natural Environment Research Council

BGS British Geological Survey

BODC British Oceanographic Data Centre — Natural Environment Research Council

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Spotting hallucinations in GeoAI: a ridiculous example

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❌ Hallucinated Output:

Predicting peatland wildfire risk in the Thames Estuary - “Recent climate models suggest that rising summer temperatures and declining soil moisture in the Thames Estuary could increase the risk of peatland wildfires by 2080. These events pose a serious threat to the region’s carbon sinks and biodiversity corridors, particularly in areas of unmanaged wetland.

- Thames Estuary is mostly urban, salt marsh, and mudflat — not peatland.
- Wildfires in low-lying tidal wetlands are extremely rare.
- LLM mashed together plausible terms: 'peatland' + 'wildfire' + 'climate'.
- No scientific or spatial data supports this combination.

✅ Grounded GeoAI Output:

Salt marsh erosion risk under sea level rise in the Thames Estuary (UKCP18, 2080) - “According to UKCP18, salt marshes in the Thames Estuary are projected to retreat inland by over 2 km by 2080 due to accelerated tidal velocity and sediment starvation. Studies by the Marine Ecology Institute (2021) warn that this erosion could eliminate over 60% of estuarine marshes unless adaptive relocation is implemented.”

- Salt marshes exist and are documented by CEH, NE, EA.
- Sea level rise threatens intertidal habitats in estuaries.
- Uses UKCP18, LiDAR, habitat classification, and SMPs (shoreline management plans).
- Output grounded in real spatial and temporal data via RAG.

GeoAI must be spatially valid, data grounded, and ecologically plausible — not just fluent and sound convincing.

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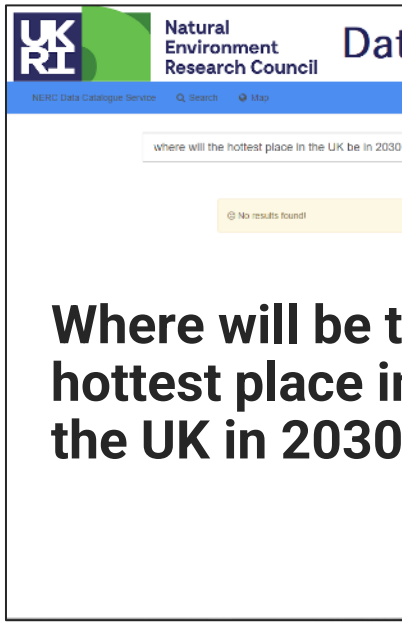
ENABLING BETT

- Search and di



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Search for NERC data

Where will be the hottest place in the UK in 2030?

Results

UKCP Local Projections at 2.2km Resolution for 1980-2080

Convection permitting climate model projections produced as part of the UK Climate Projection 2018 (

UKCP18 Convection-Permitting Model Projections for the UK at 2.2km resolution

Climate model runs at convection-permitting scale for the UK for three time slices (1981-2000, 2021-

UKCP18 Regional Projections for UK Countries for 1980-2080

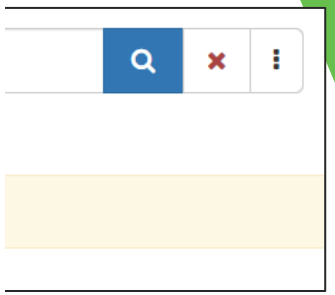
Regional climate model projections produced as part of the UK Climate Projection 2018 (UKCP18) proje

UKCP18 Regional Projections by Administrative Regions over the UK for 1980-2080

Regional climate model projections produced as part of the UK Climate Projection 2018 (UKCP18) proje

Thermal imagery of England

Thermal imagery for selected areas of England was taken by a FLIR SC 6000 HS thermal camera mounted



- Many users not aware of NERC and its data.
- Difficult to find data

- Using a Large Language Model (LLM) we have trained it on all the NERC meta-data records.
- When we ask the same question…

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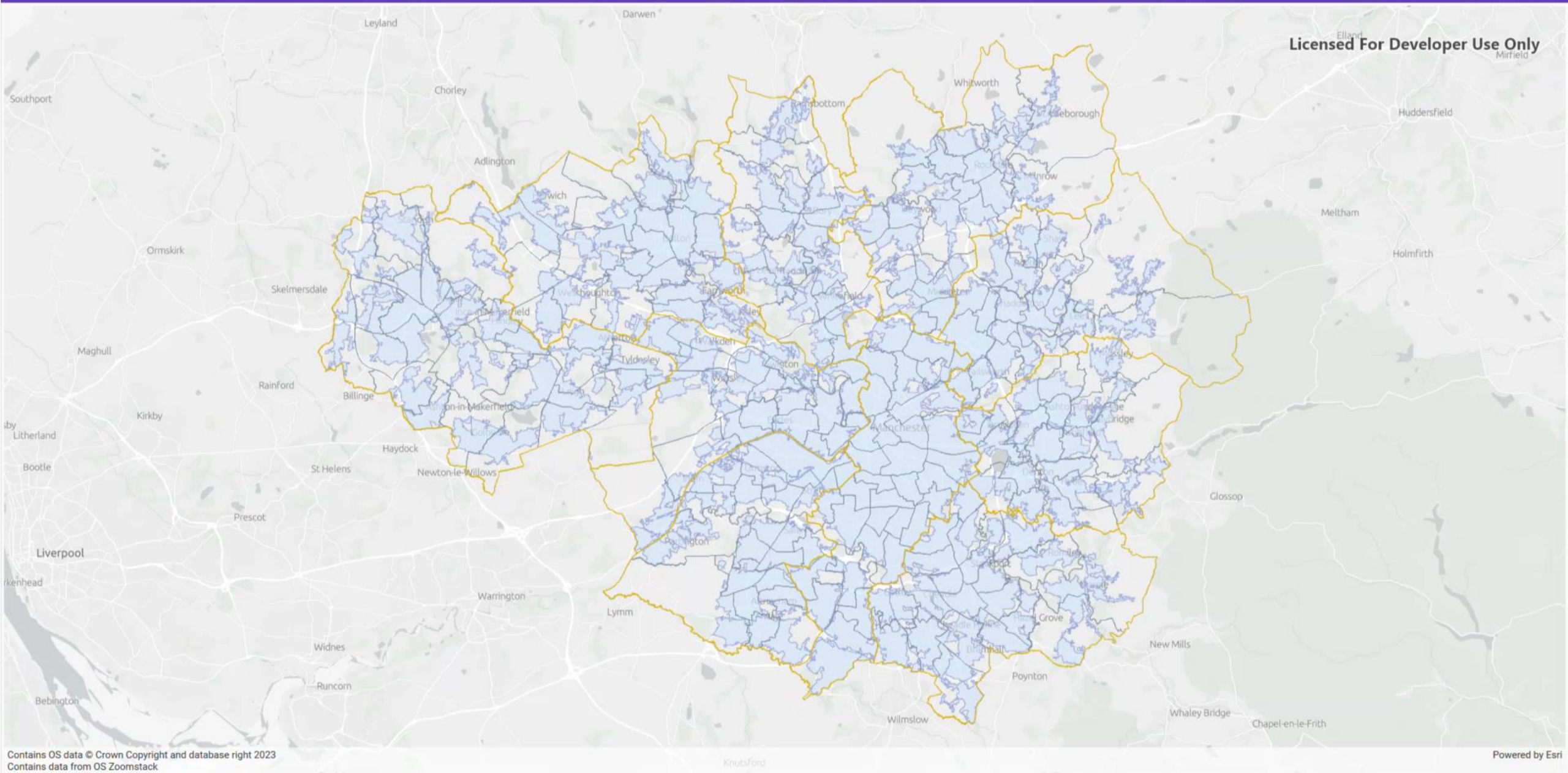
NDSH Hub Demo

Please enter your AI Prompt here.



ANY QUESTIONS?

- Want to be involved in user testing?
- Sign-up for our newsletter so you can be informed of developments http://www.digital-solutions.uk/
  - richard.kingston@manchester.ac.uk
- Thank you to all the team here in Manchester and particularly **Dr Morteza Hosseini** and **Vasilis Vlastaras**!

@NERCdsh @gisplanner

The Pankhurst Institute

AI is not your new GIS analyst. It's your intern – it needs good data, context, and supervision.