Spatial optimization of energy infrastructure considering ecosystem services

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What is the UK's climate strategy?

Climate Change Act 2008

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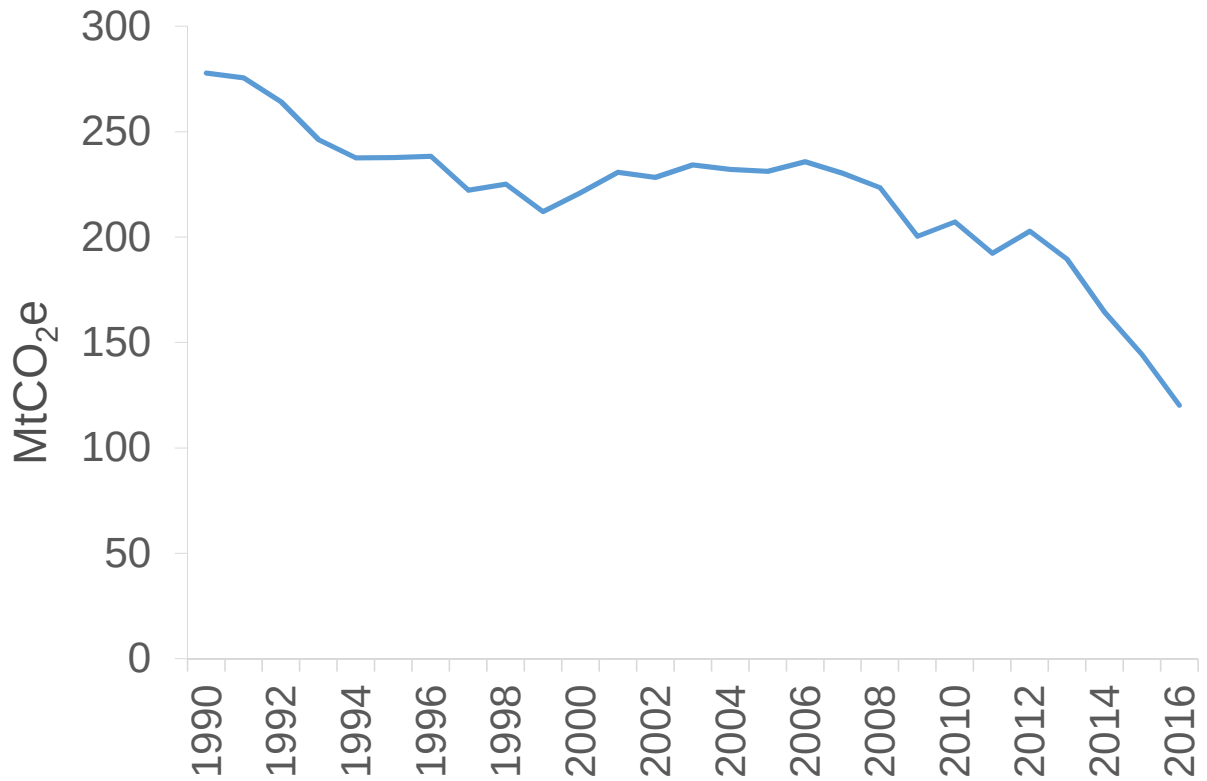
How have the UK's energy emissions changed?



57% reduction in emissions between 1990 and 2016

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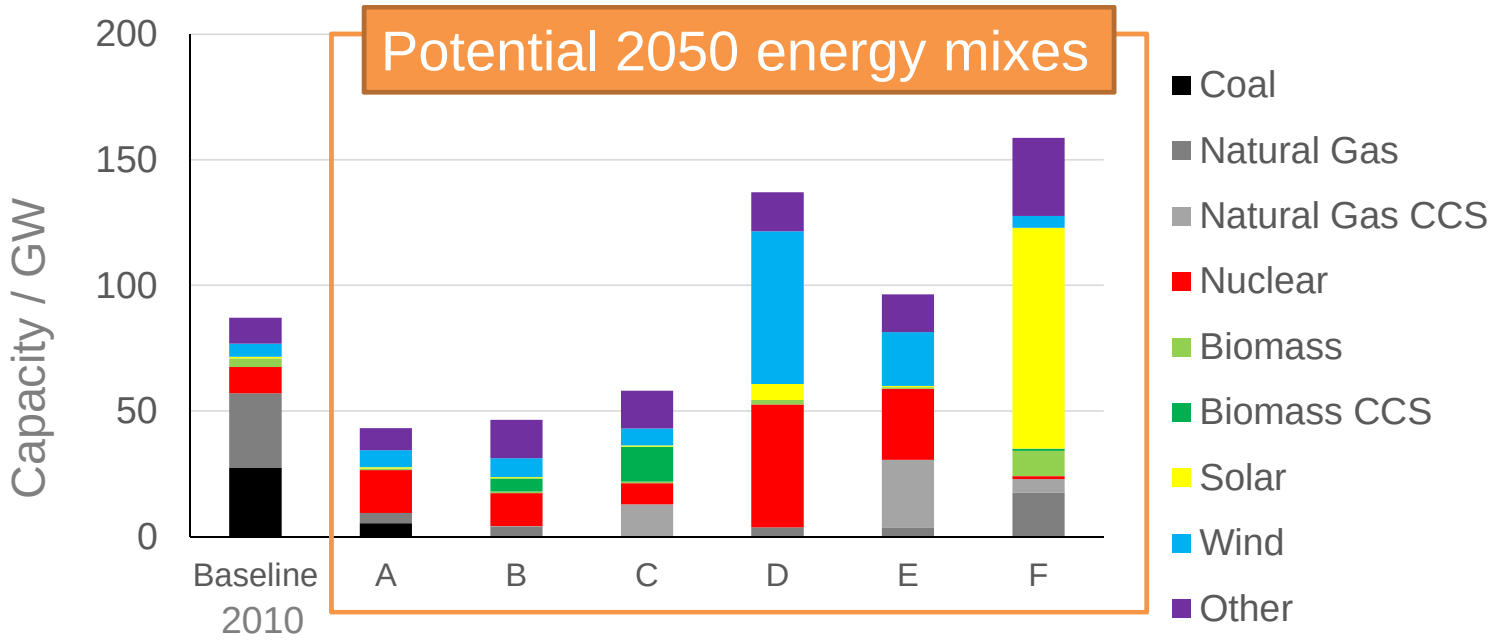
What's
NEXT

What might the UK's future energy system look like?



✓ Which energy technologies?

✓ How much energy is needed?

✗ Where will energy infrastructure be located?

UKTM model: how to meet future energy demand whilst minimizing costs and emissions

Why is location important when siting energy?

Renewables have a larger spatial footprint

0.2 m^2/MWh

500 m^2/MWh

Land is a scarce resource

Siting energy infra. depends on many spatial factors

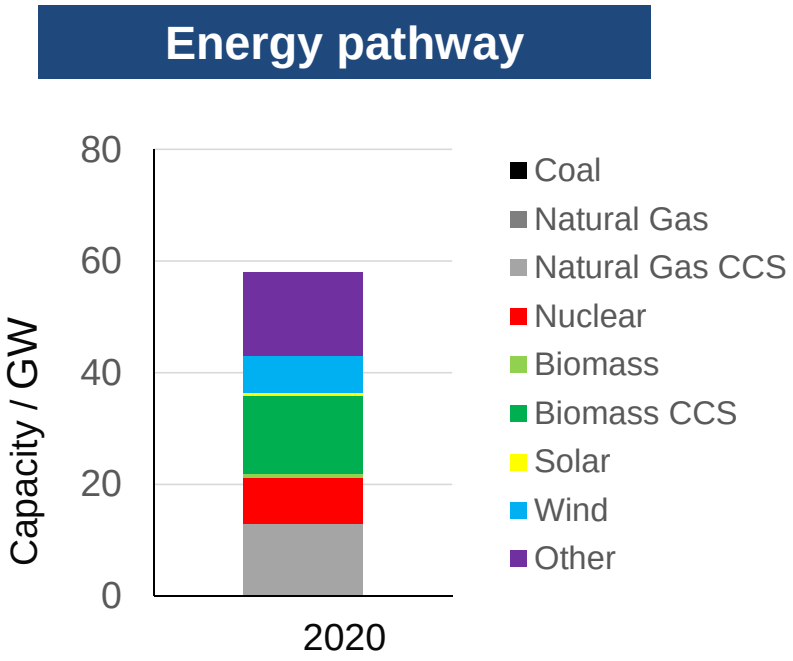
Terrain

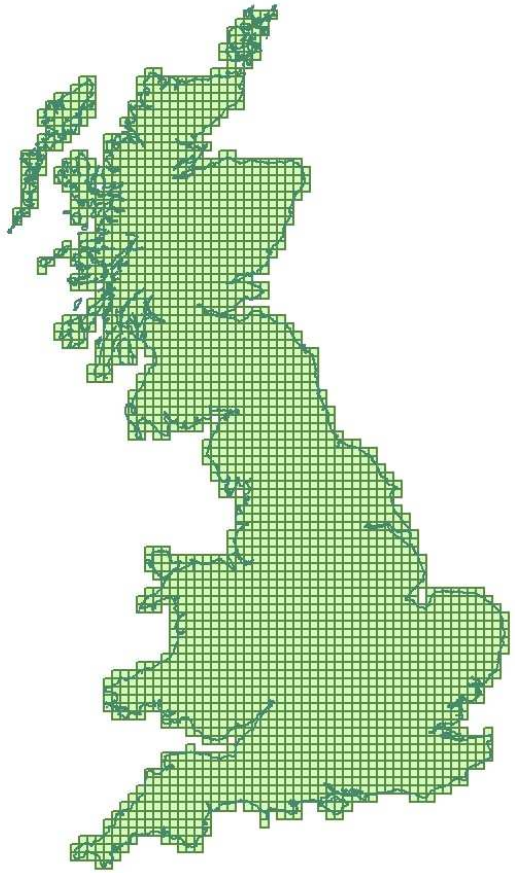
Env impact

Proximity to grid

Value of land

How can we spatialize energy pathways?





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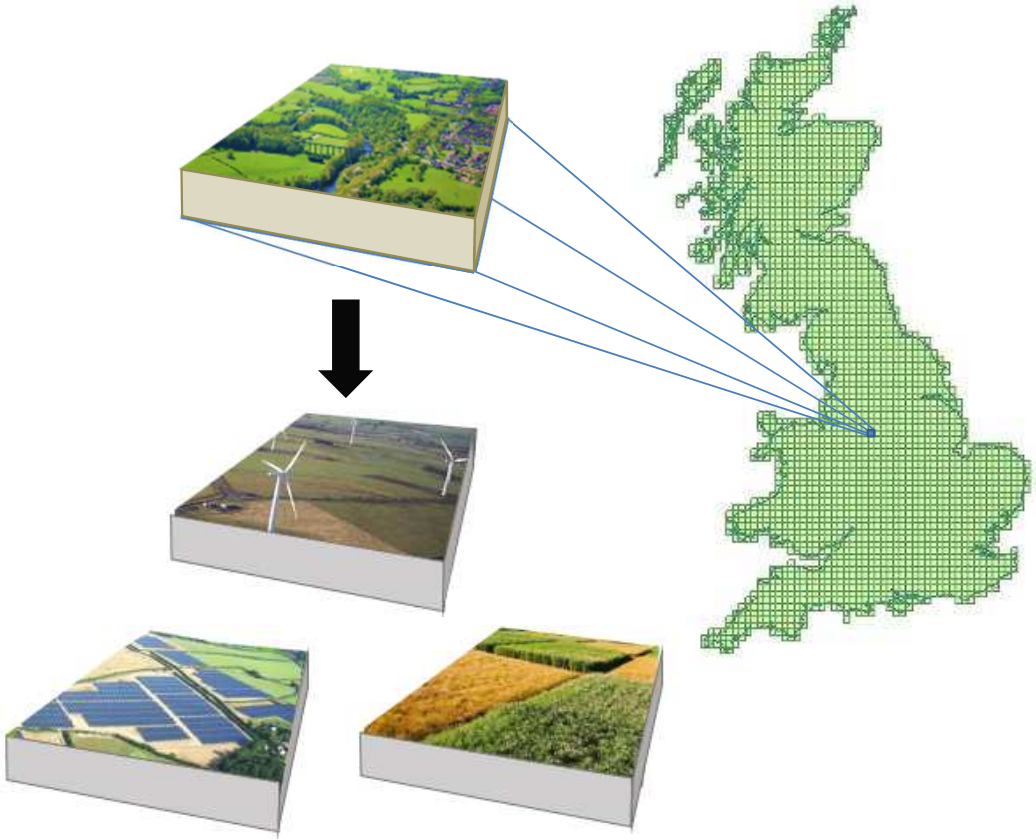

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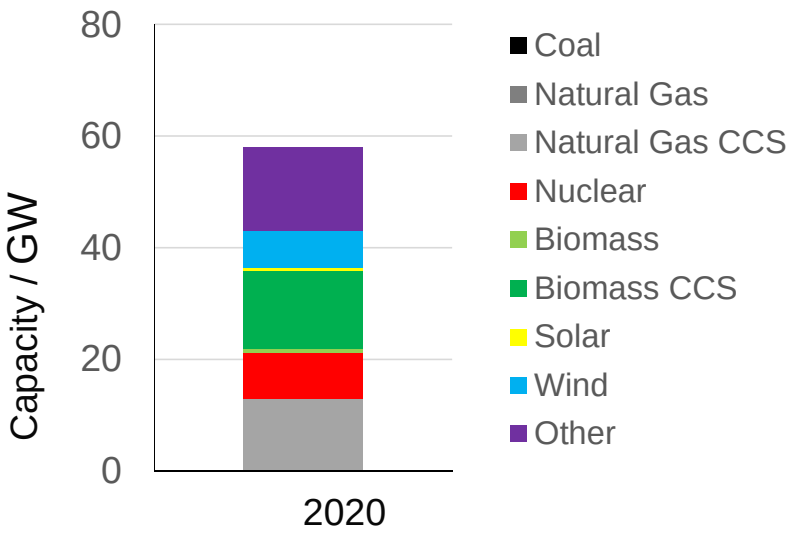
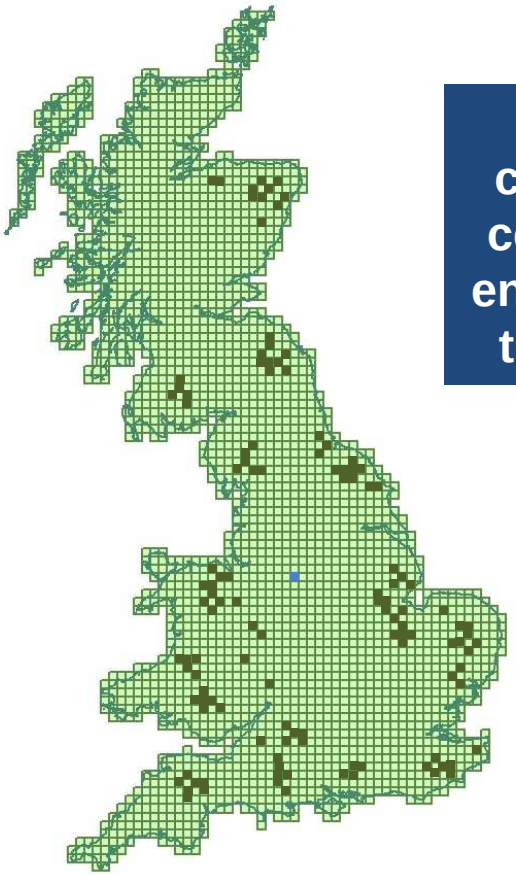
How can we spatialize energy pathways?

Energy pathway





Which combination of cells deliver the energy system at the least cost?

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Application of model
Preliminary findings

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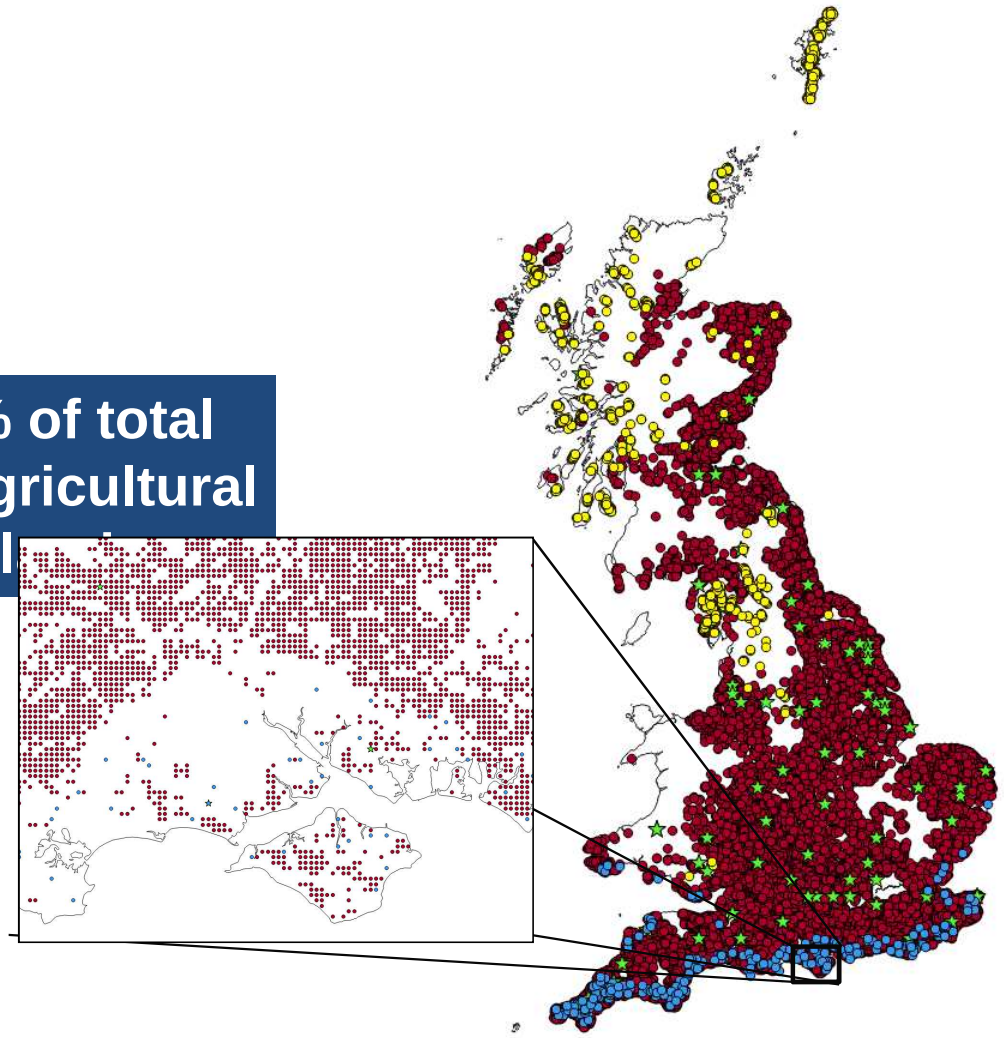
What are the spatial implications of energy futures?

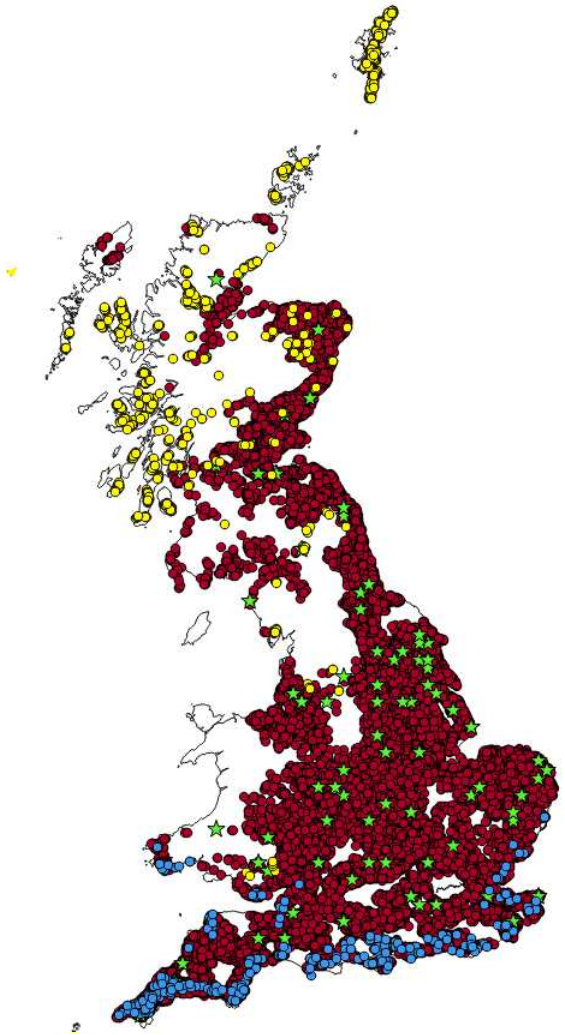
13% of total UK agricultural l



Spatial footprint	2.25M ha
Annualised cost	£1.81 billion

- Solar
- Wind
- Bioenergy power station
- Bioenergy crop

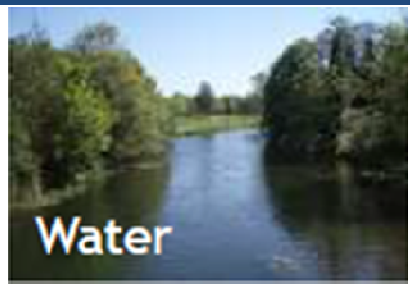
What about the environment?

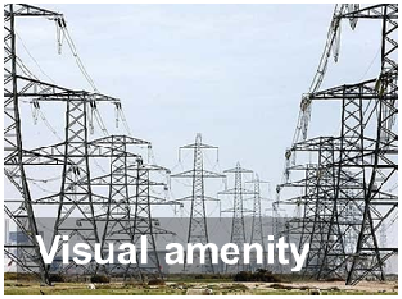


Exclude areas of land like National Parks

What about the environment?

The value of the environment





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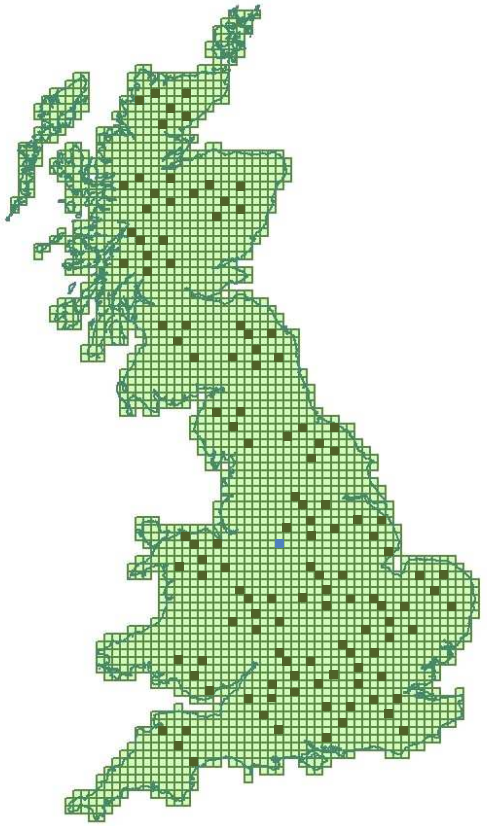
Financial



Thank you for listening!

Key messages:

1. Spatial optimization allows us to improve our understanding of the feasibility of different energy futures.

2. Including the value of the environment in energy modelling could help improve decision-making.

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NERC SCIENCE OF THE ENVIRONMENT

UKERC UK Energy Research Centre

ADVENT ADdressing Valuation of Energy and Nature Together

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