

# Spatial optimization of energy infrastructure considering ecosystem services

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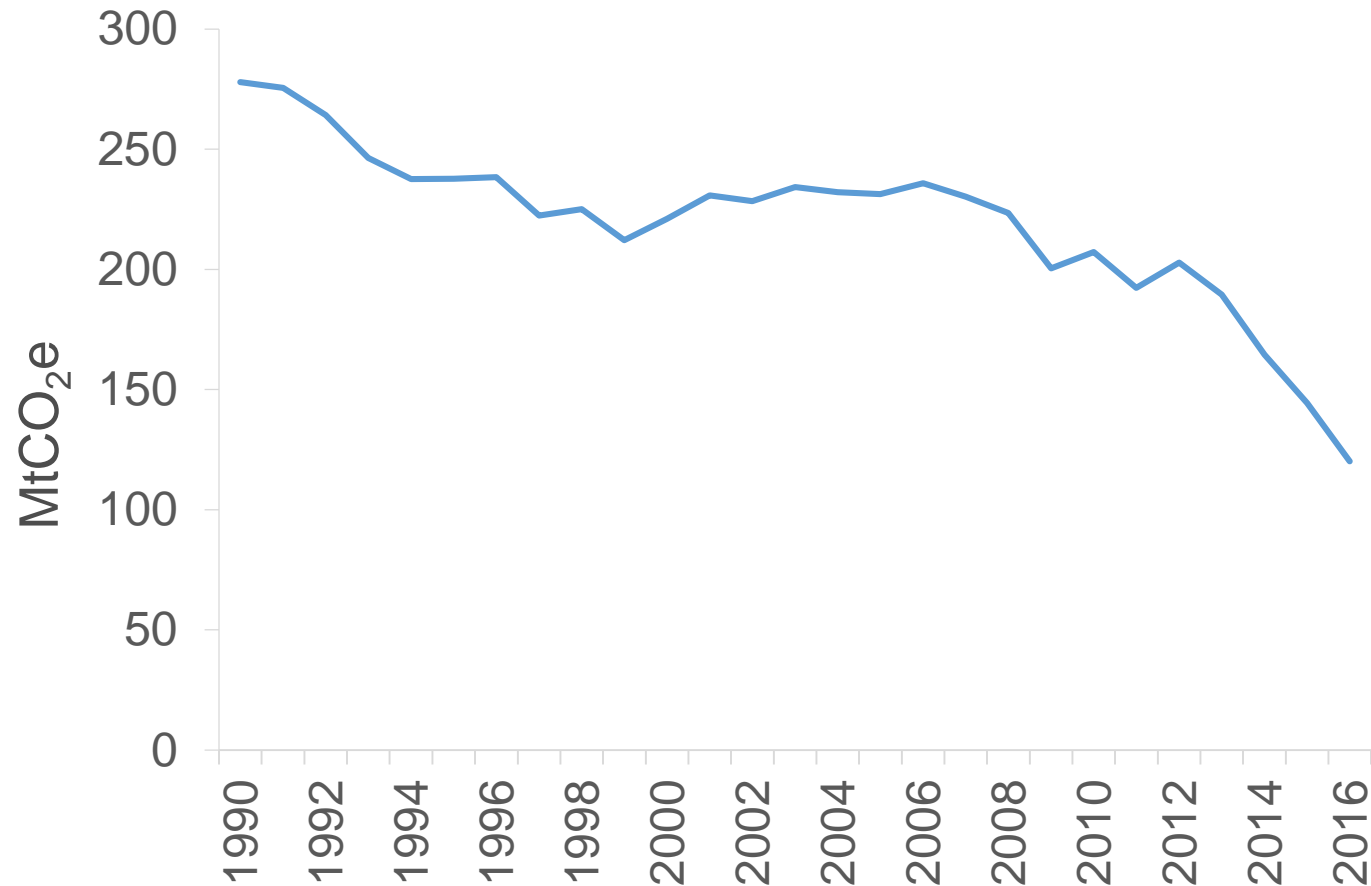
# What is the UK's climate strategy?



Climate Change Act 2008



# How have the UK's energy emissions changed?

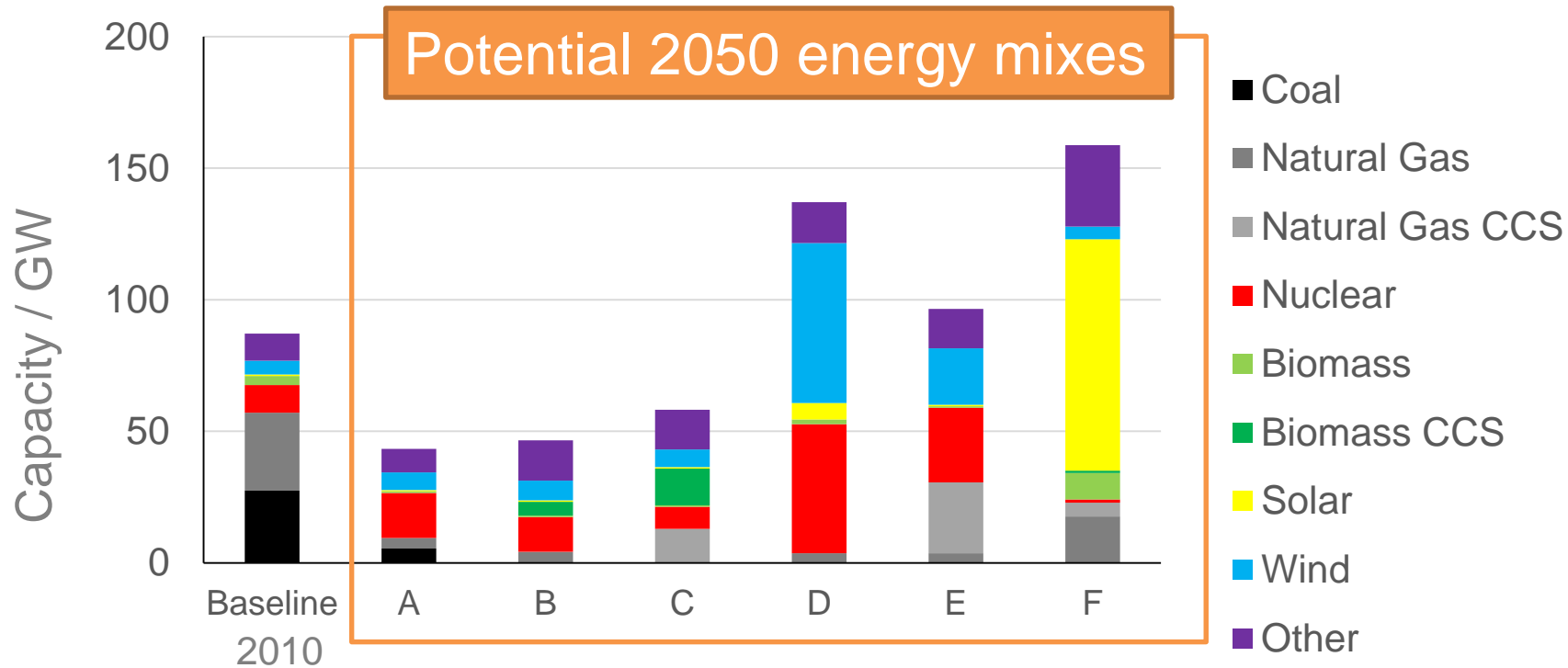


**57% reduction in emissions between 1990 and 2016**

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<sup>2</sup>/MWh



500  
m<sup>2</sup>/MWh

Land is a scarce resource



Siting energy infra. depends on many spatial factors



Terrain



Env impact



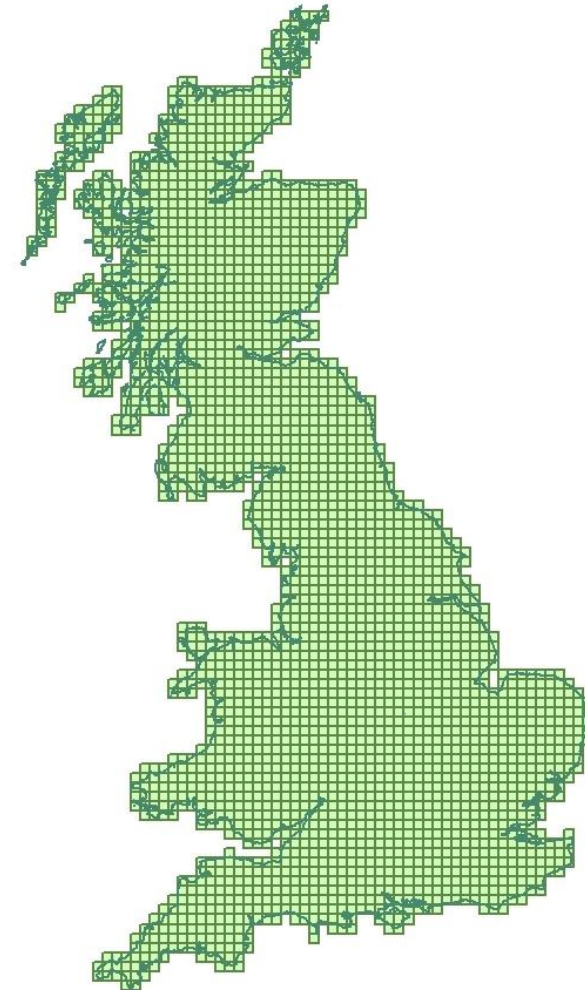
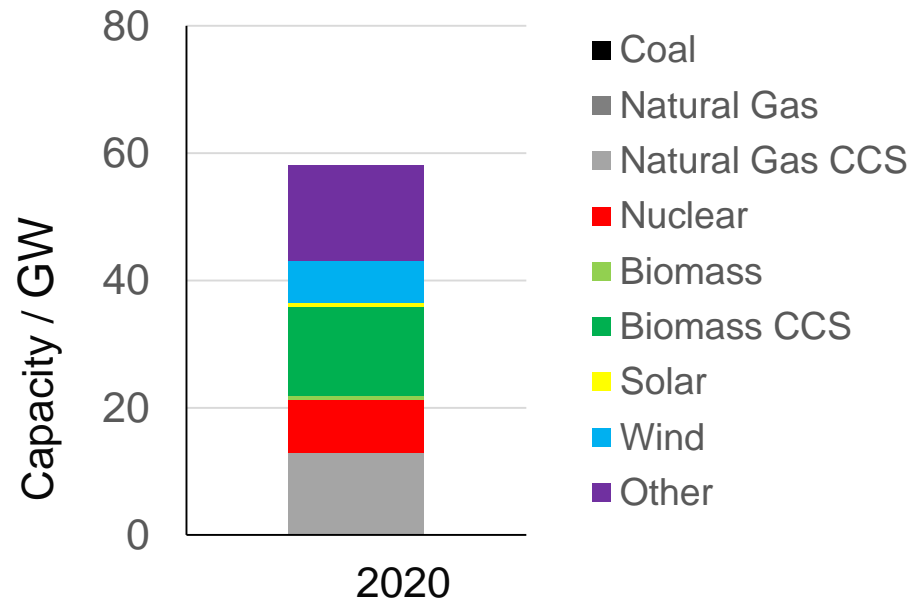
Proximity to grid



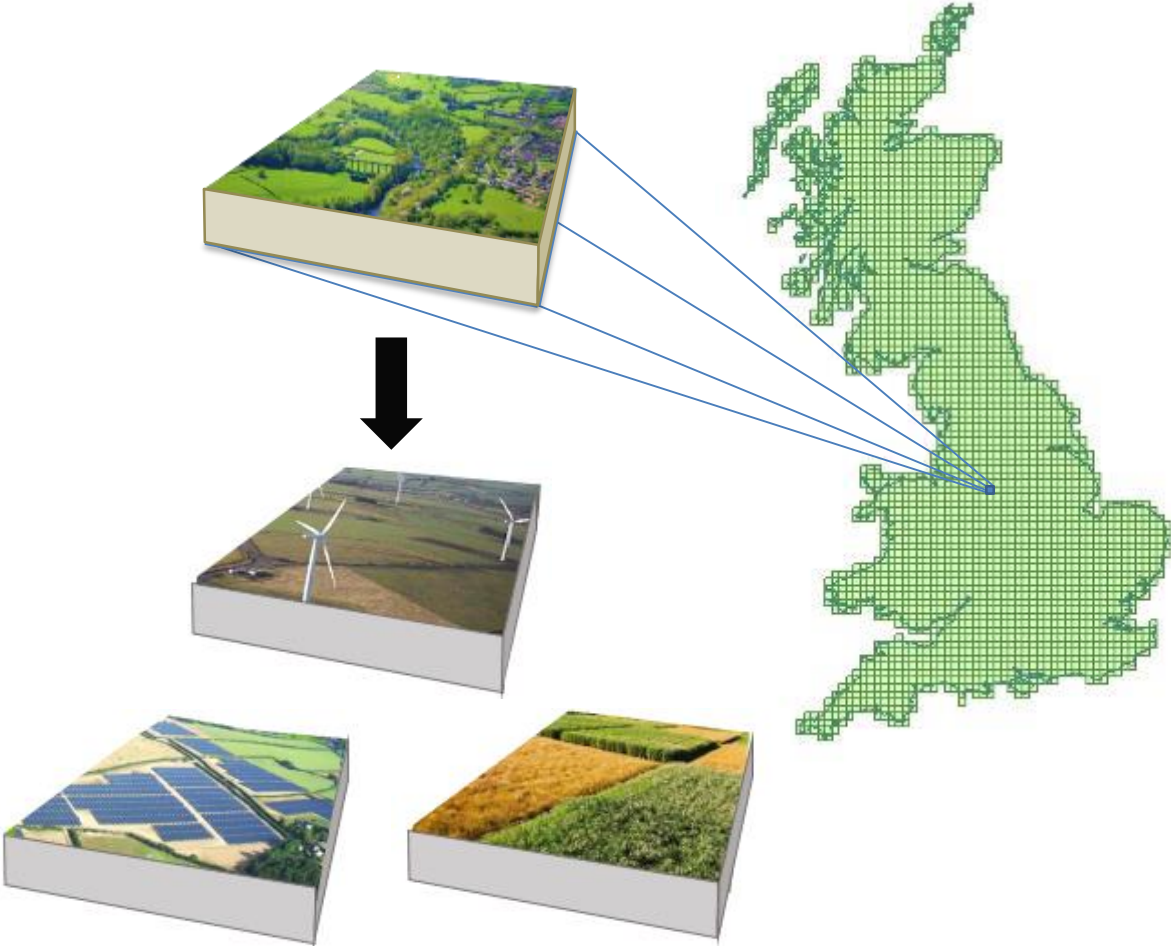
Value of land

# How can we spatialize energy pathways?

## Energy pathway



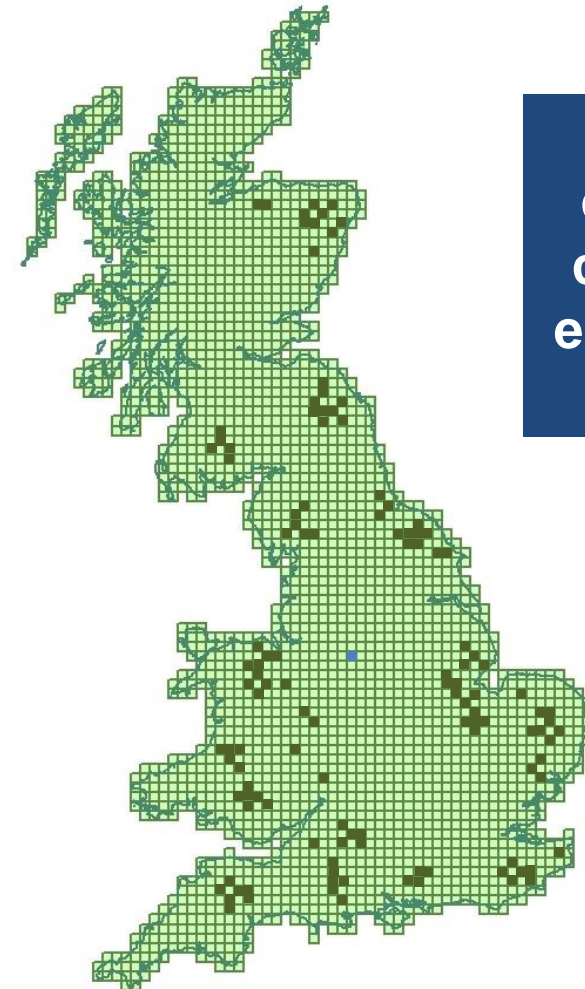
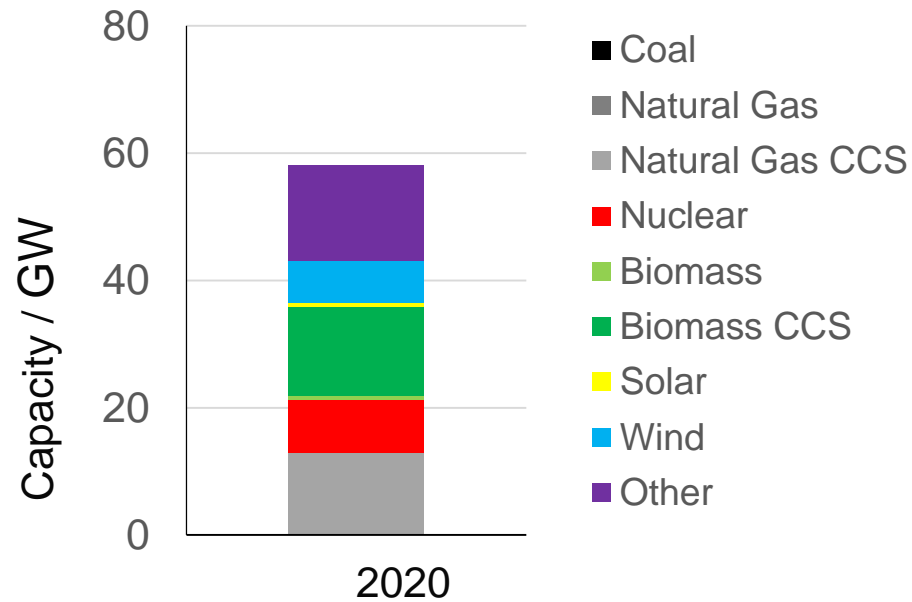
# How can we spatialize energy pathways?





# How can we spatialize energy pathways?

## Energy pathway



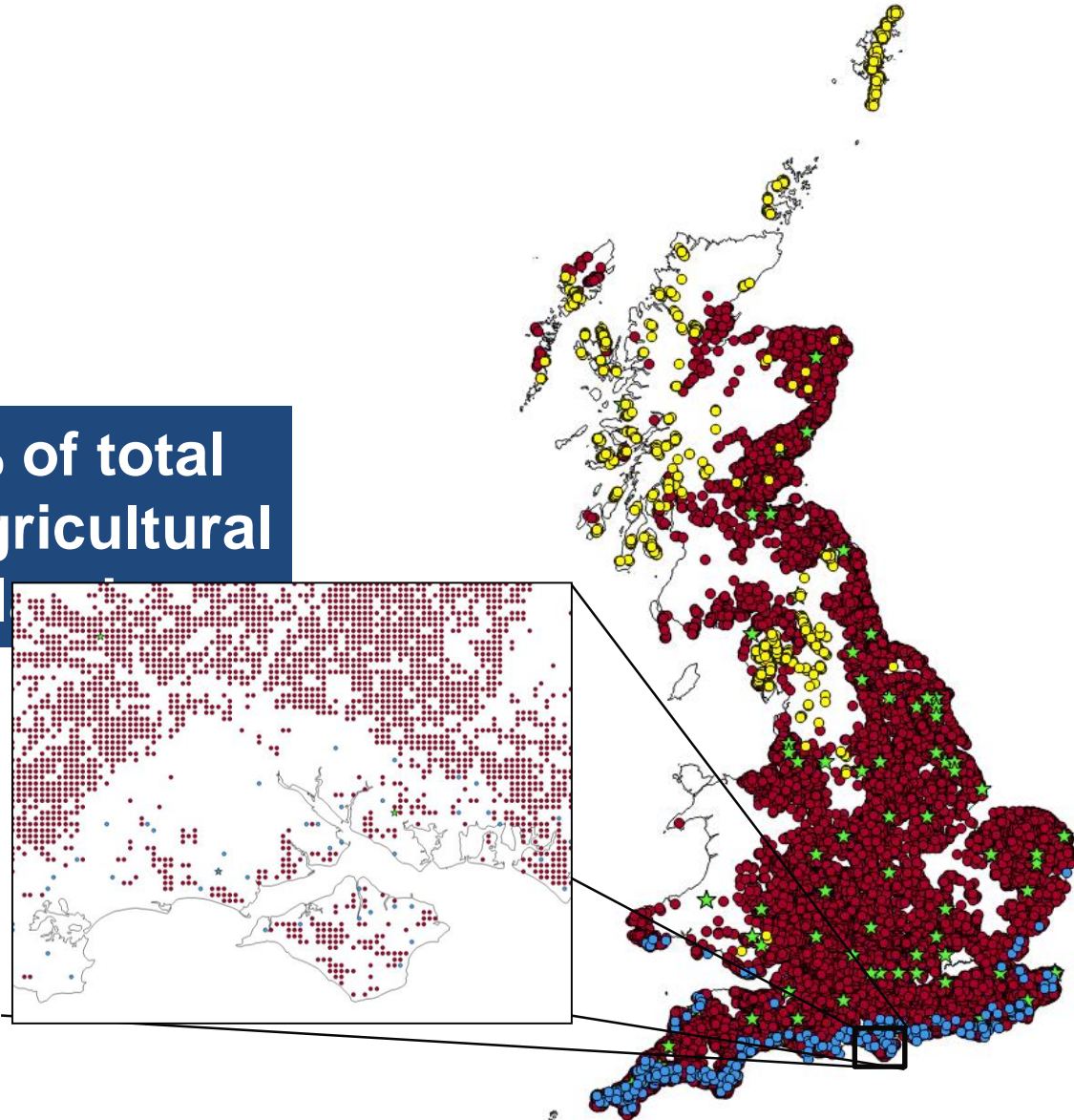
**Which combination of cells deliver the energy system at the least cost?**

# Application of model

## Preliminary findings

# What are the spatial implications of energy futures?

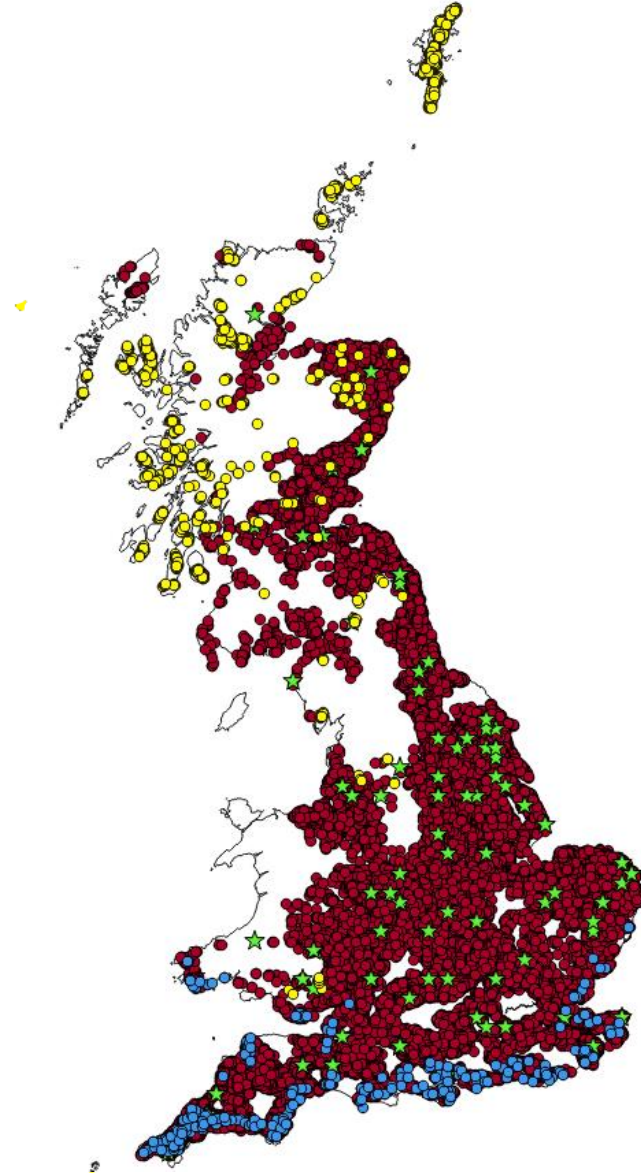
**13% of total  
UK agricultural**



Spatial footprint	2.25M ha
Annualised cost	£1.81 billion

- Solar
- Wind
- ★ Bioenergy power station
- Bioenergy crop

# What about the environment?

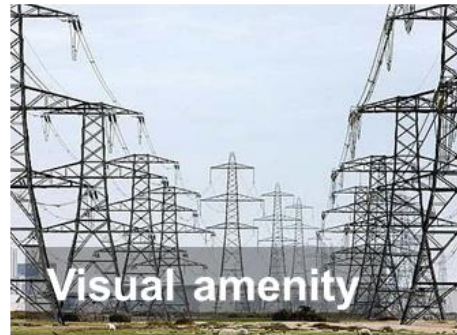


**Exclude areas of land  
like National Parks**

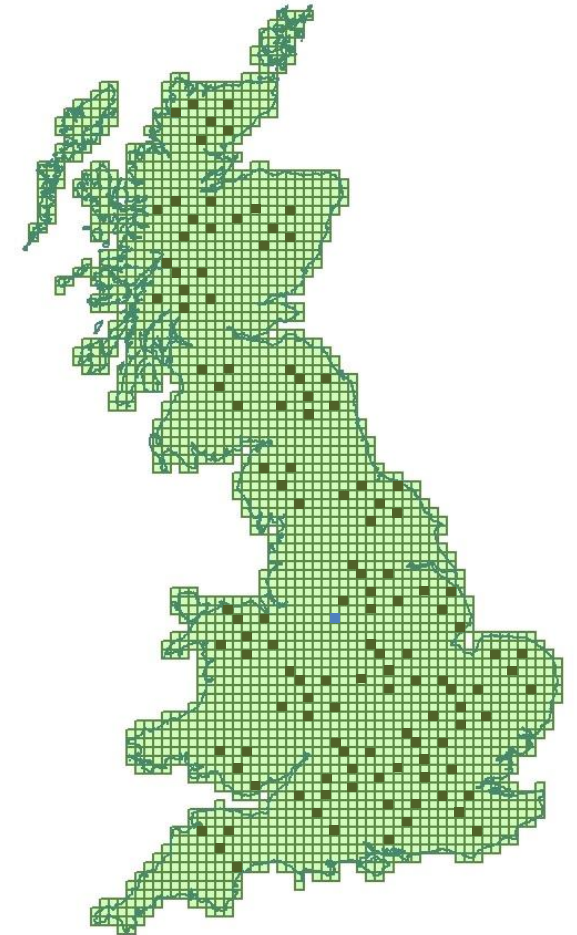
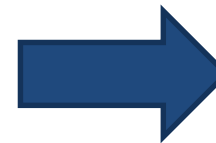


# What about the environment?

## The value of the environment



## 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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