The challenge of getting to Net Zero: A UK perspective

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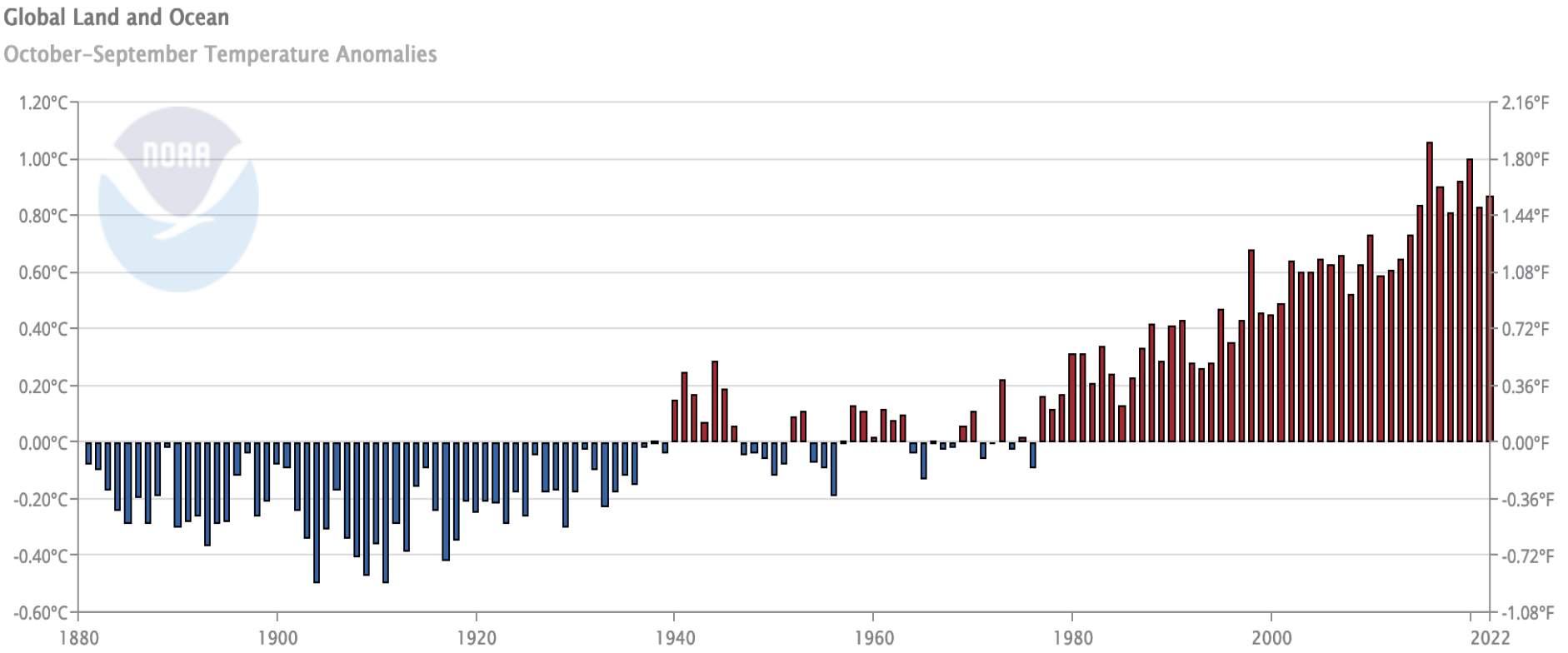
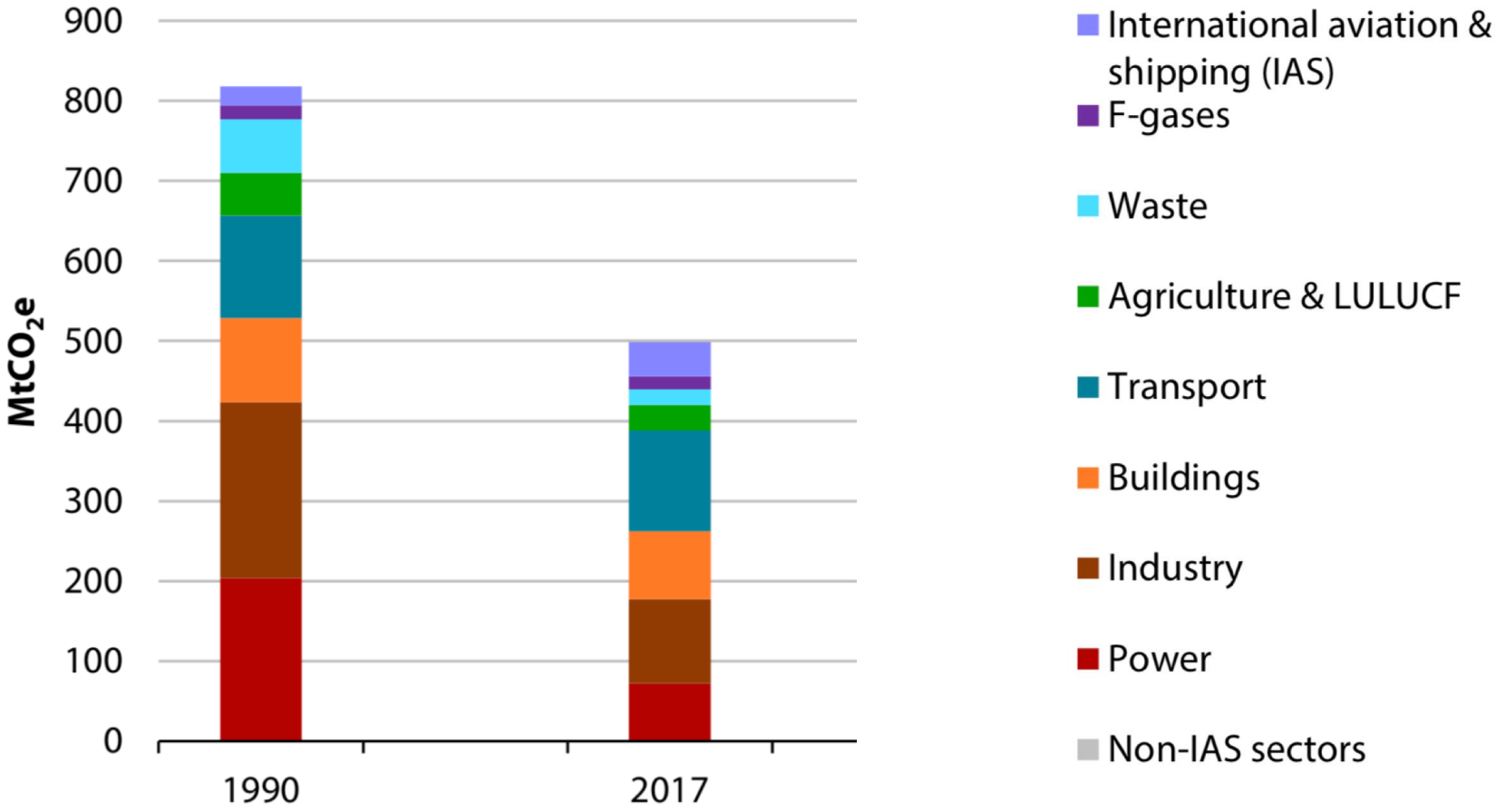
Global temperature



https://www.ncdc.noaa.gov/cag/

Progress towards goal of Climate Change Act (2008)

Decrease UK emissions to 20% of 1990 levels by 2050

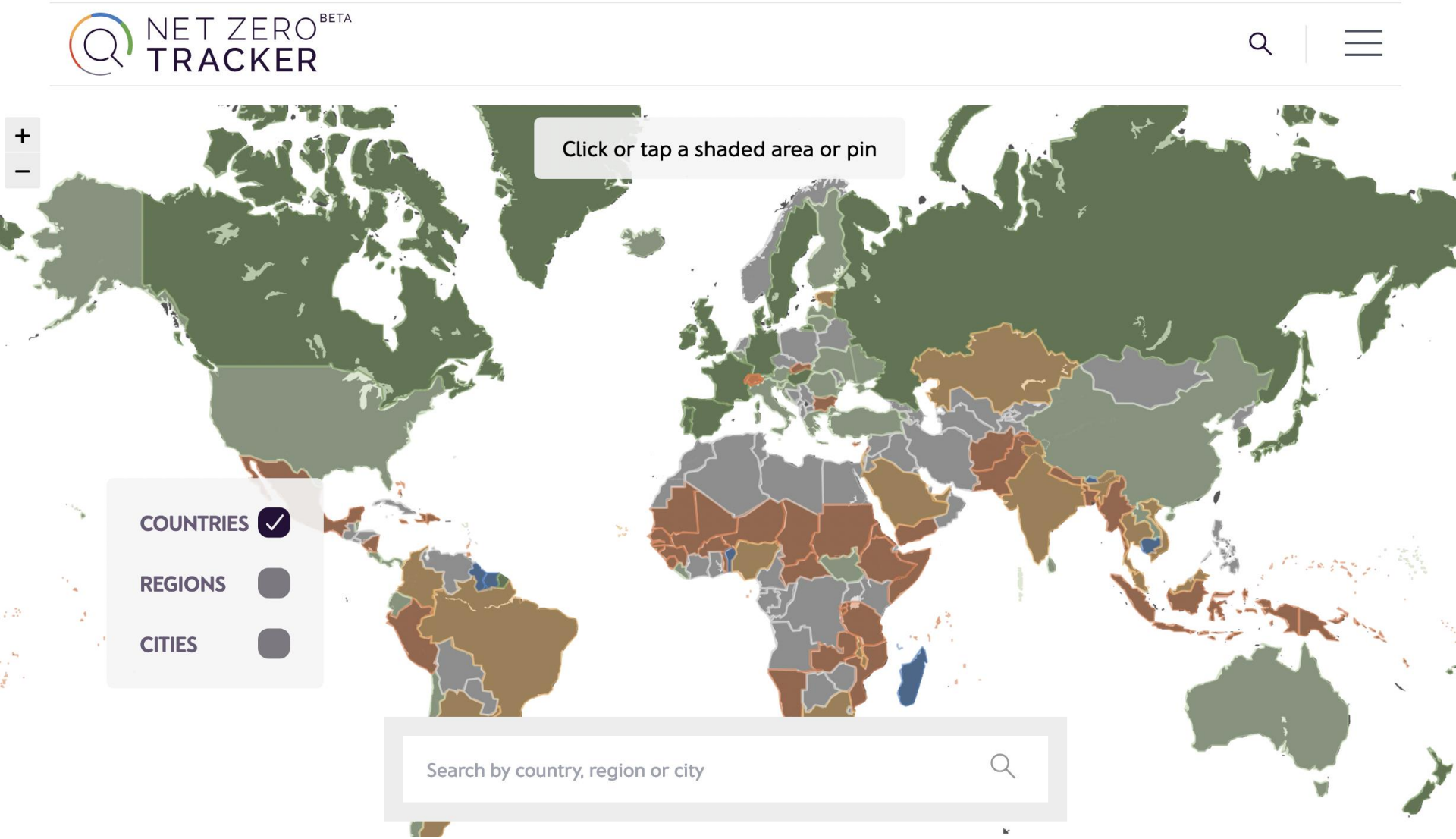



The Sun

The Paris agreement 2015/16

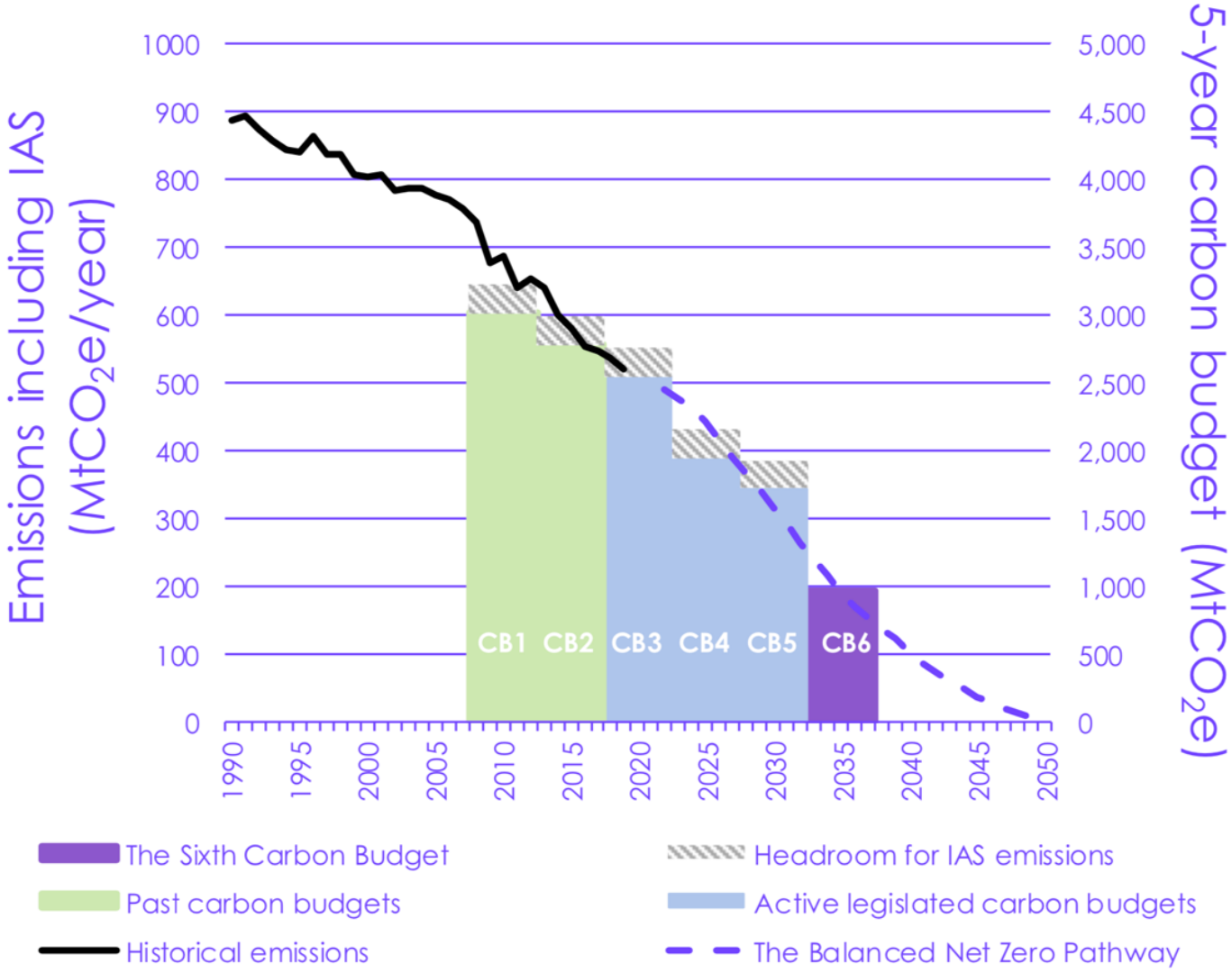
BEIS Minister, Chris Skidmore signs legislation to commit the UK to a legally binding target of net zero emissions by 2050 (June 2019)

Countries with net zero law (2022)



Dark green = in law ; light green = in policy document ; brown = in discussion

Pre COP26: UK commits to 78% reduction by 2035



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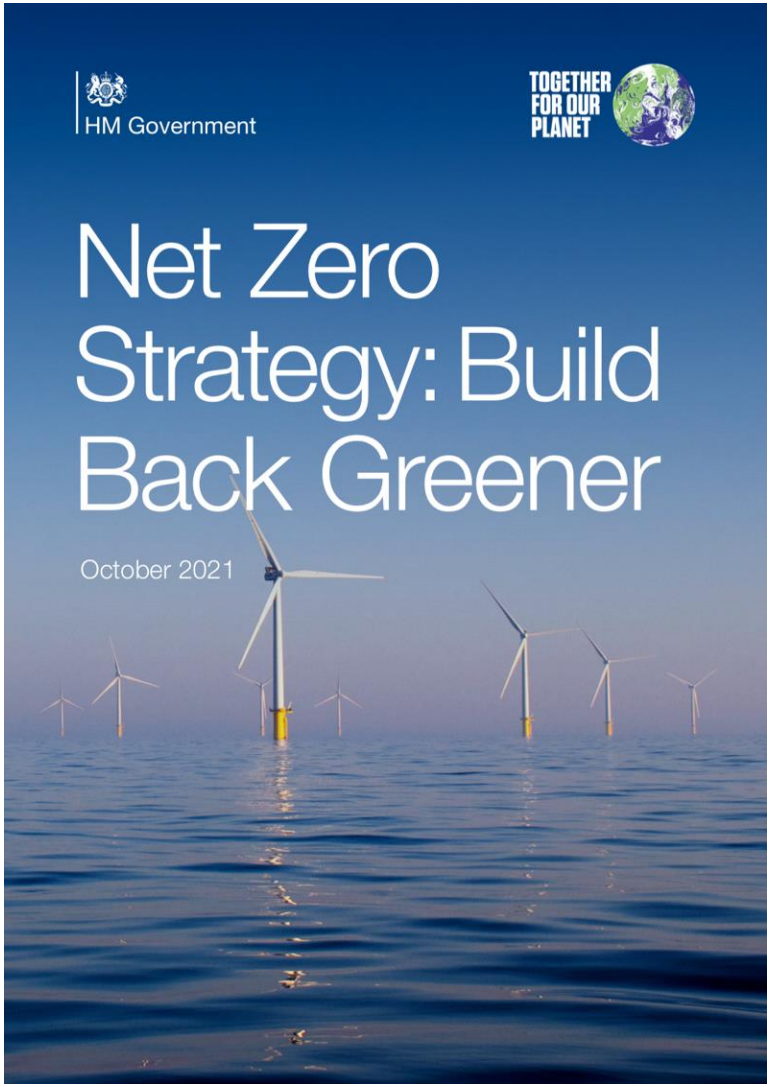
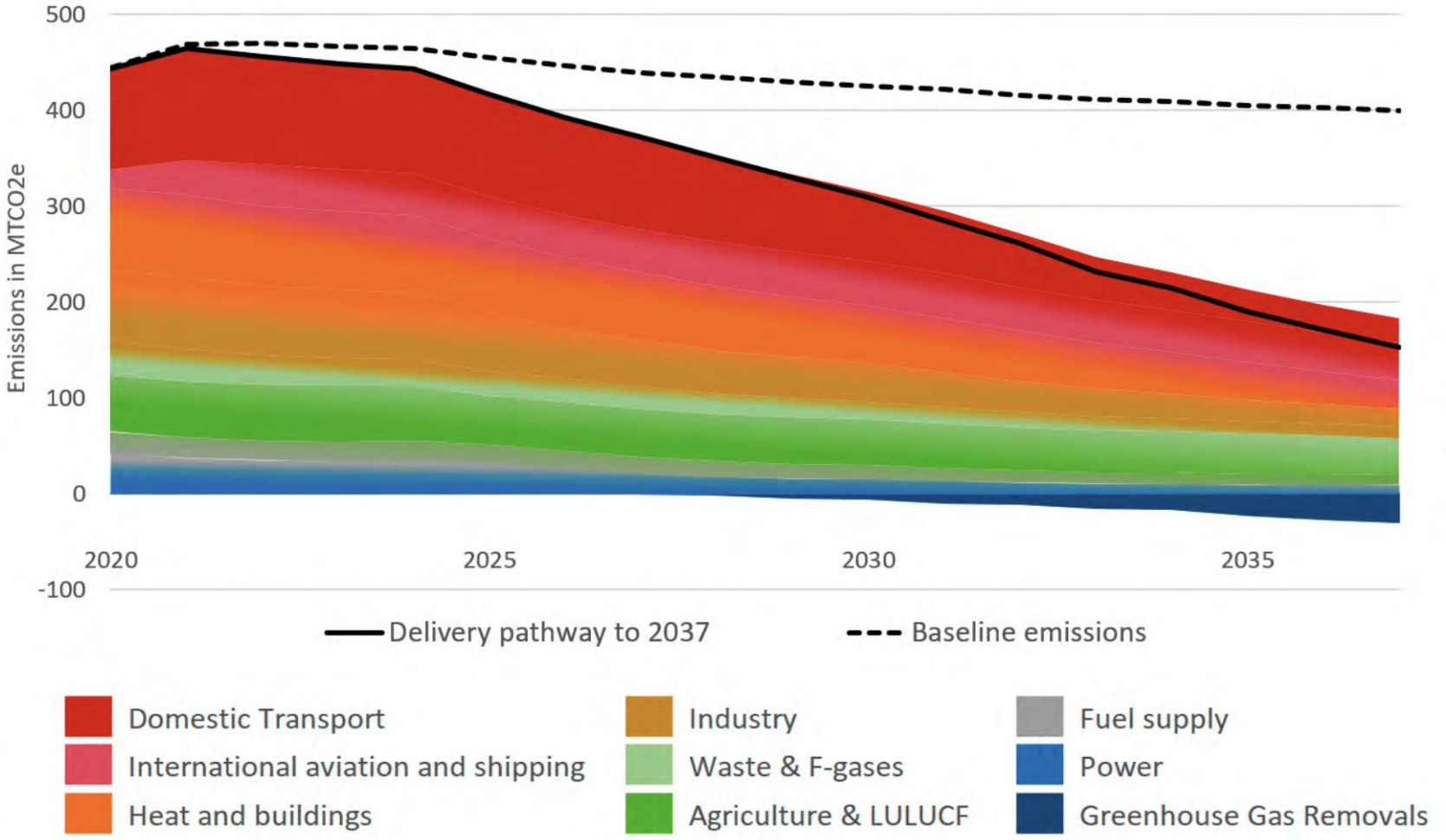

HM Government
TOGETHER FOR OUR PLANET
Net Zero Strategy: Build Back Greener
October 2021


HM Government
UK Net Zero Research and Innovation Framework
October 2021

Figure 1: Indicative delivery pathway to 2037 by sector



Source: BEIS Analysis (2021)

How is Net Zero managed in UK Government

BEIS (Business, Energy and Industrial Strategy) are responsible for climate mitigation.

They have overall responsibility for UK meeting Carbon Budgets and Net Zero Goal

They apportion 'effort shares' to other government departments that they must meet.

UK target for Carbon Budget 6 (i.e. by 2035) is 78% reduction relative to 1990 emissions.

Defra is responsible for four sectors:

- Agriculture (≈55 $MtCO_2e$ pa),
- Land-use, land-use-change, and forestry: LULUCF (≈13 $MtCO_2e$ pa)
- Waste (≈32 $MtCO_2e$ pa)
- F-gases (≈15 $MtCO_2e$ pa)

Defra's effort share for 2035 of about a third of this total, reflecting challenge of decarbonising these sectors

Numbers from Climate Change Committee Carbon Budget 6 Report 2020

Land and agriculture emissions

Figure M.7.1 Breakdown of agriculture emissions (2018)

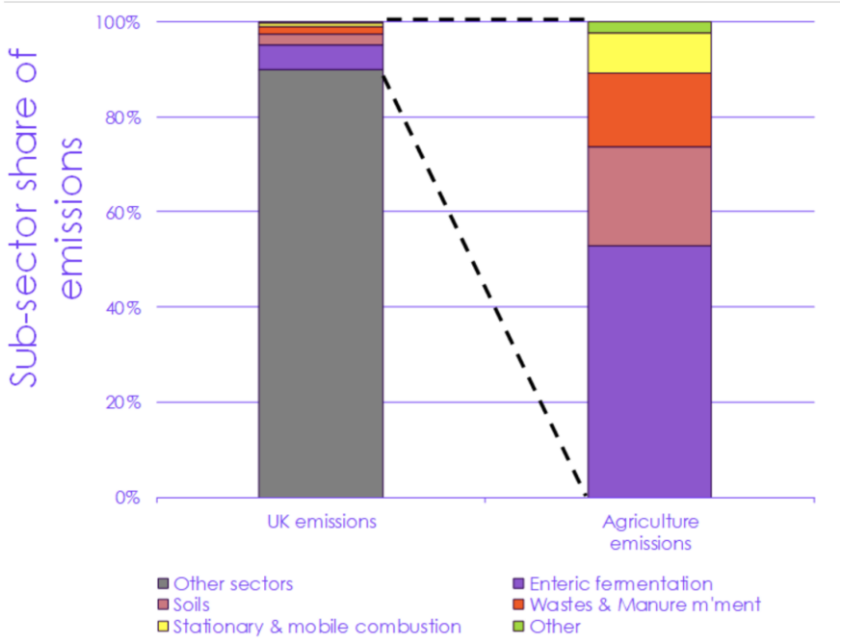
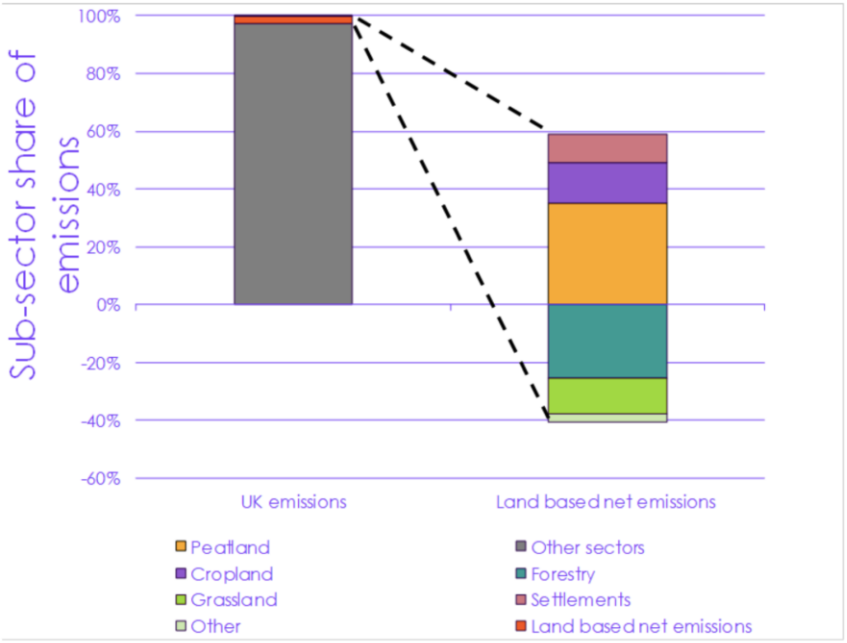


Figure M.7.3 Breakdown of land emissions (2018)



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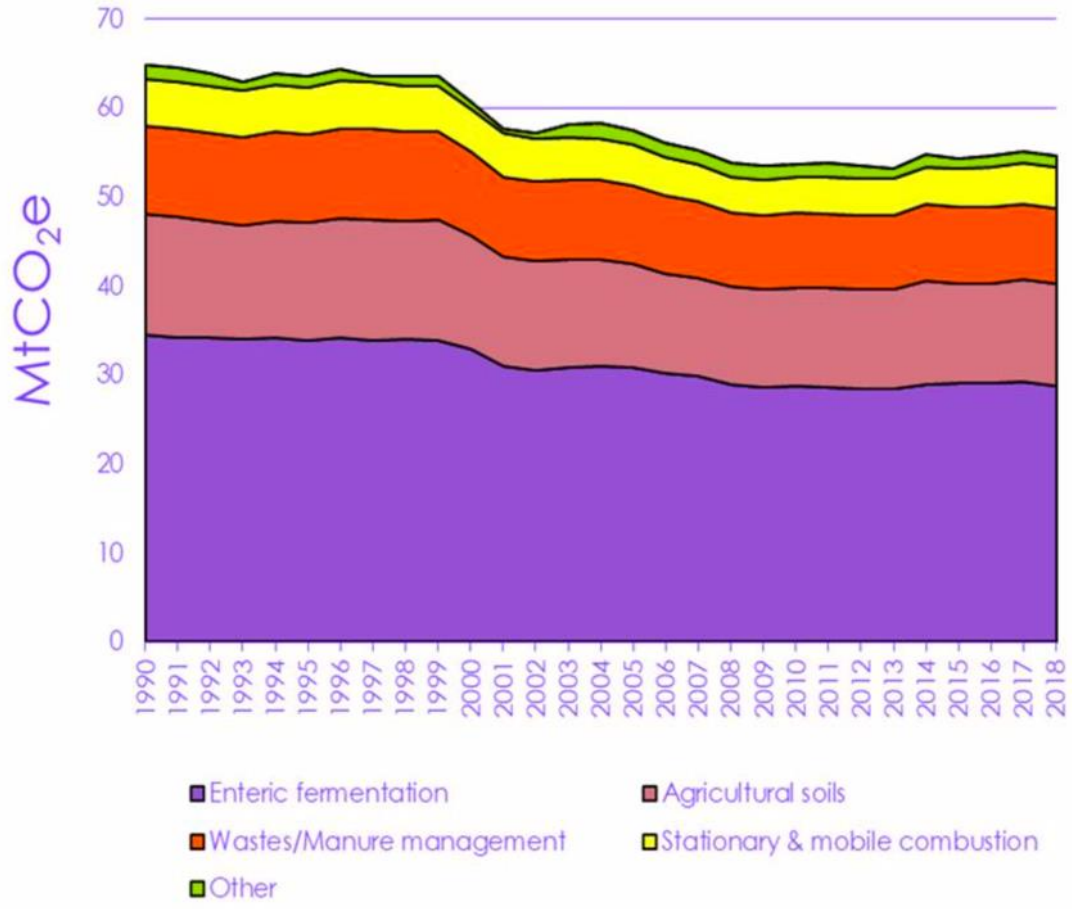
The lack of progress on agriculture

Figure M.7.2 UK agricultural emissions (1990-2018)



Source: BEIS (2020) Provisional UK Greenhouse Gas National Statistics for the UK; CCC analysis.

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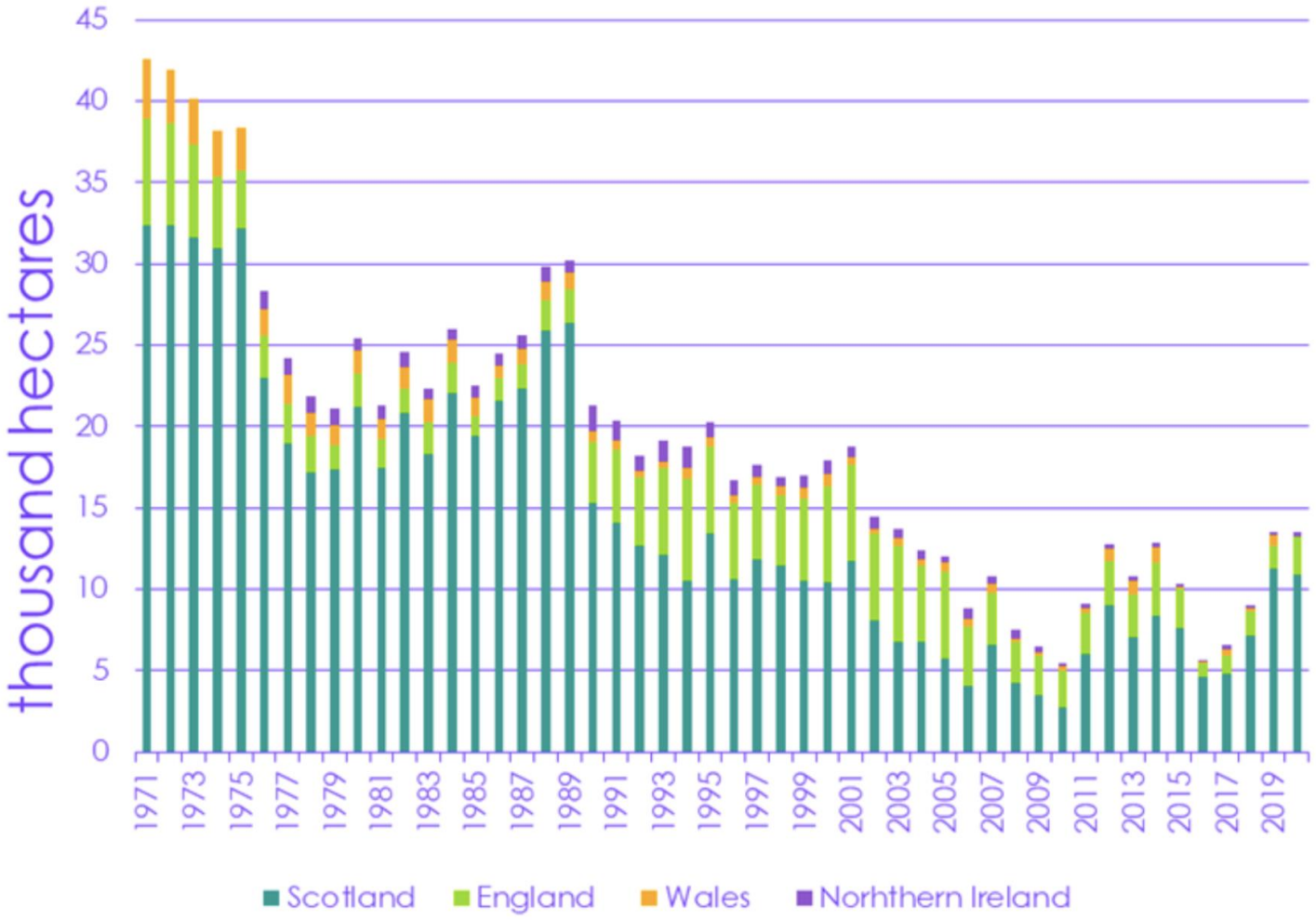
Trees Biomass Peat Cows

Tree planting rates (last 40 years)



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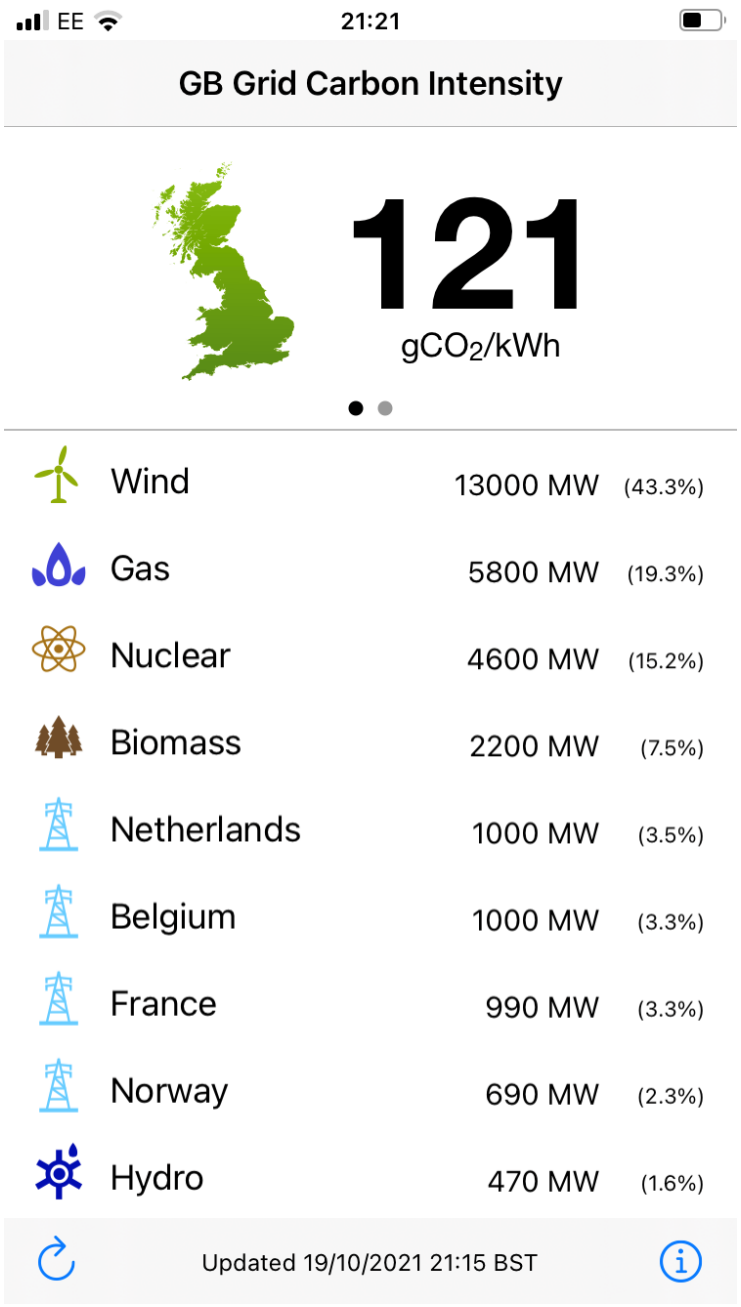
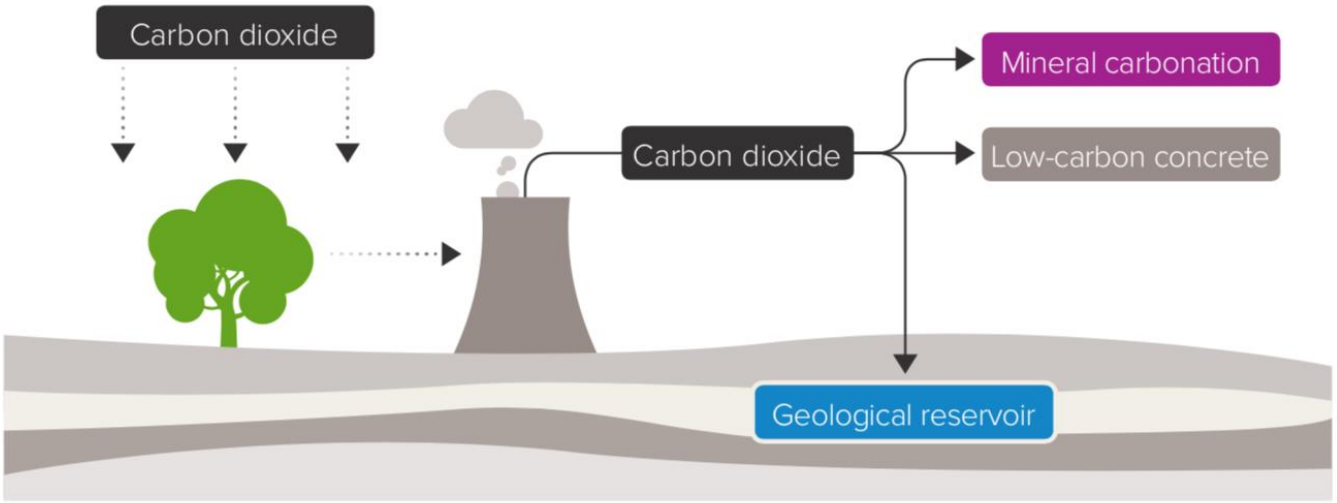
Trees are not just for woodlands

Biomass



Grid Carbon app

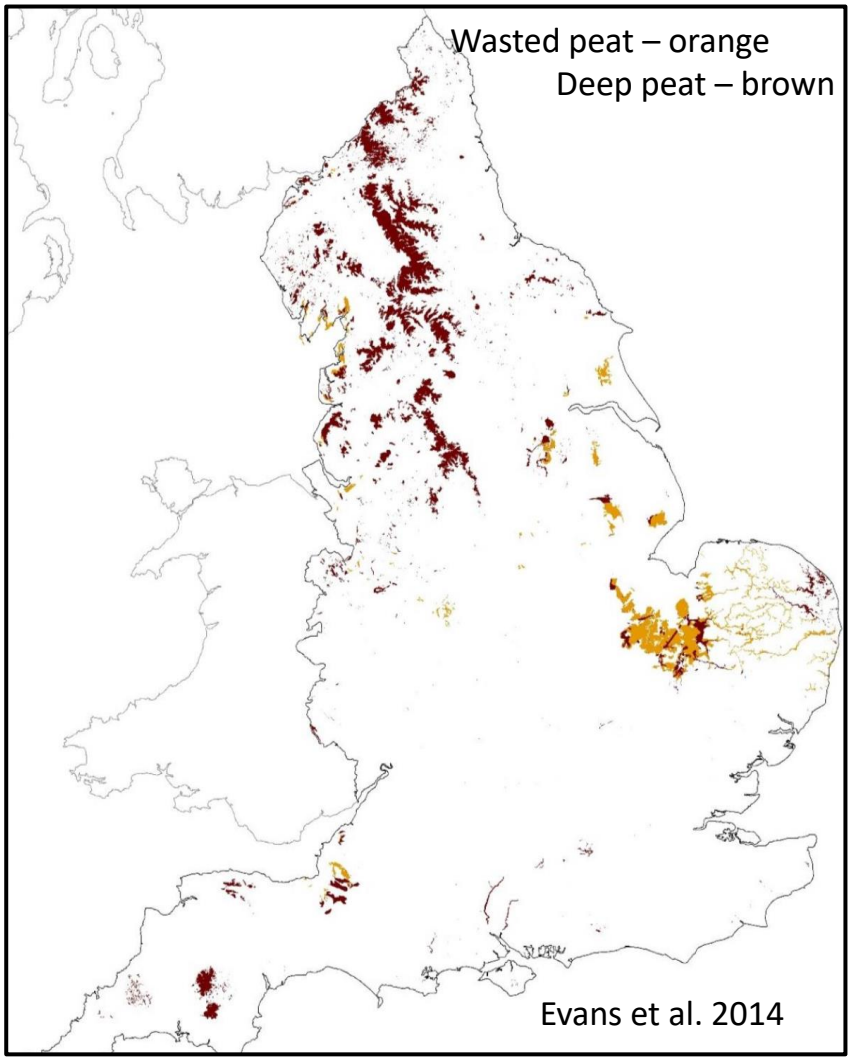
Bioenergy with Carbon Capture and Storage (BECCS)

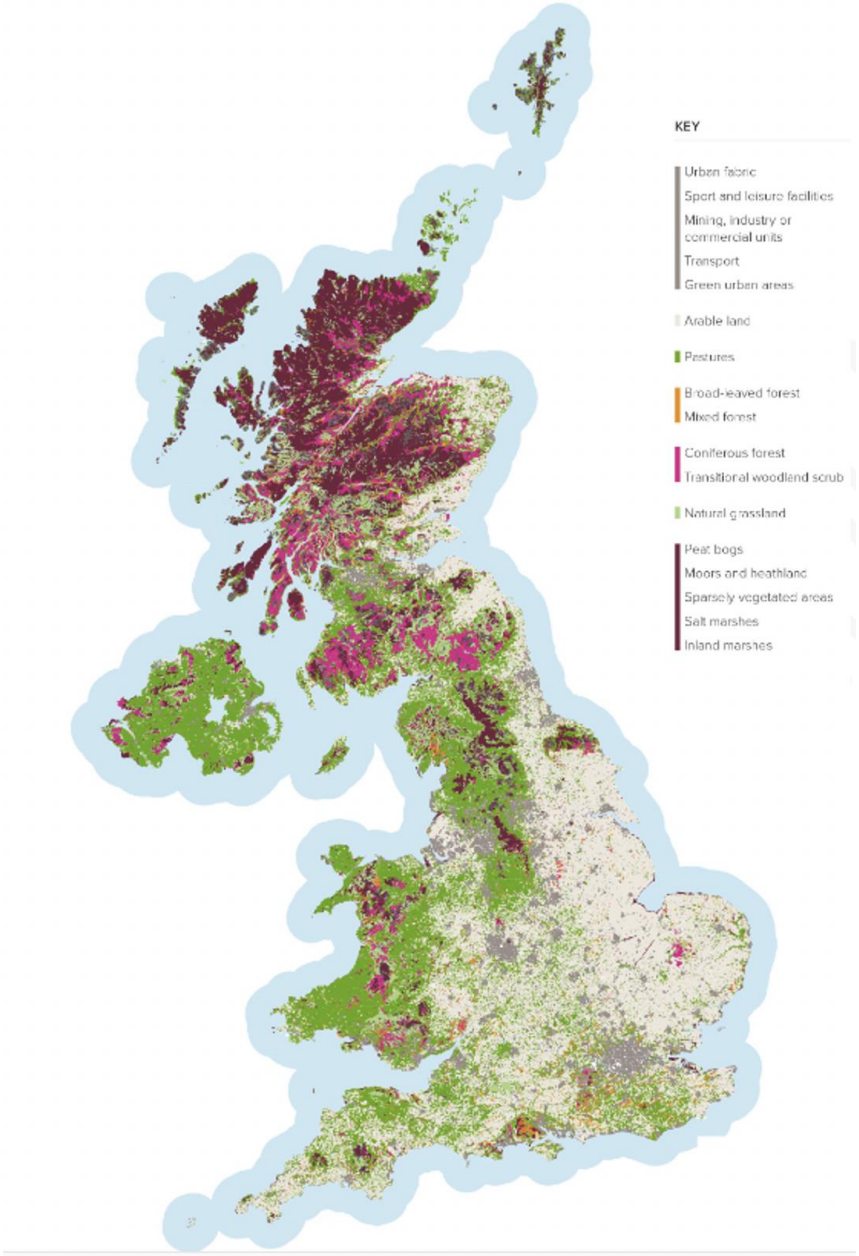


Utilising biomass for energy, capturing the CO_2 emissions and storing them to provide lifecycle greenhouse gas removal

Degrading Peatland

Release ≈ 20 $MtCO_2e$ per year
Inc. ≈10 $MtCO_2e$ per year from lowland peat

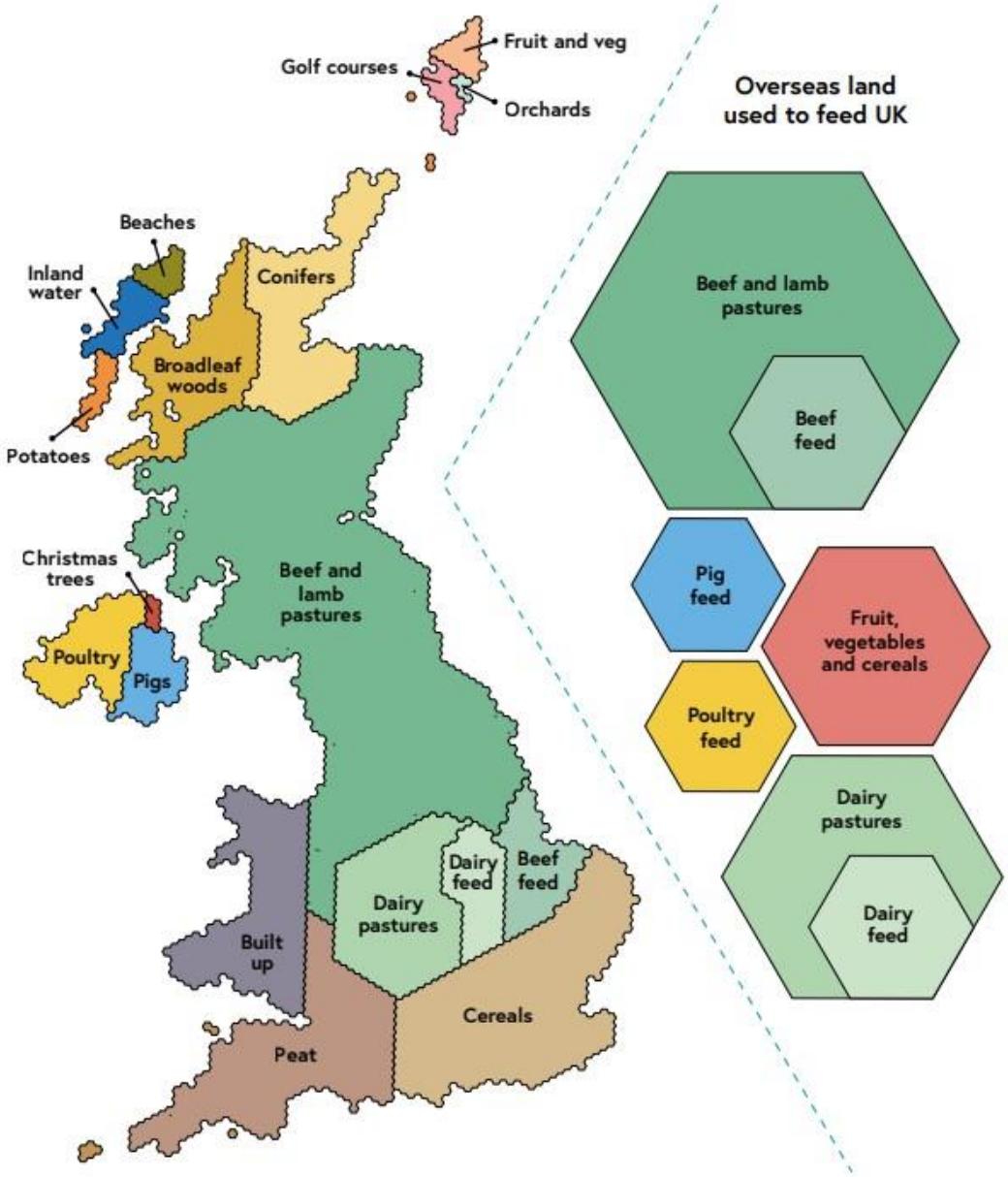




What do we use our land for

Of 24m ha, we need at least 2m to reduce net emissions

Royal Society Multifunctional Landscapes



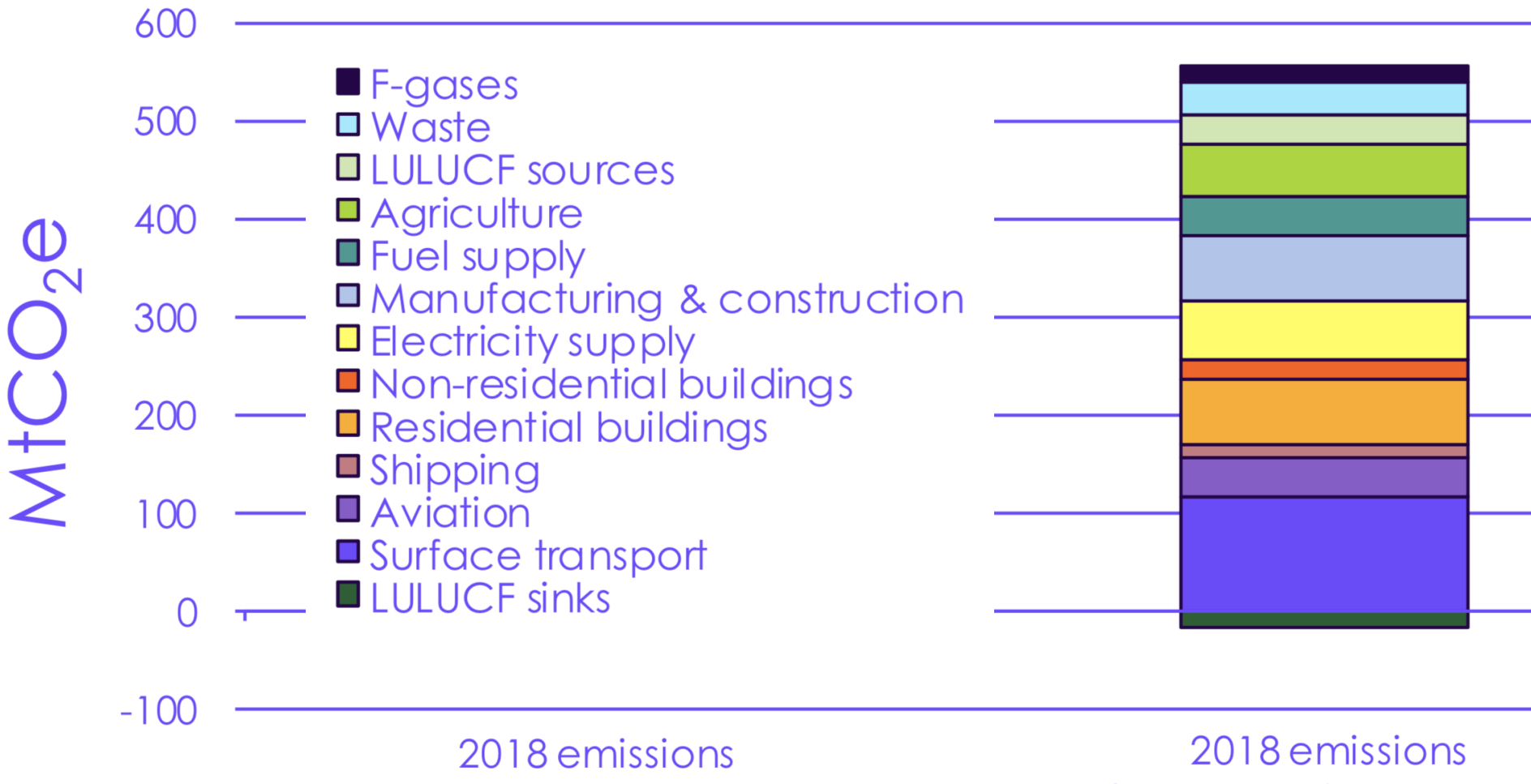
What do we use our land for

Dimbleby Review 2

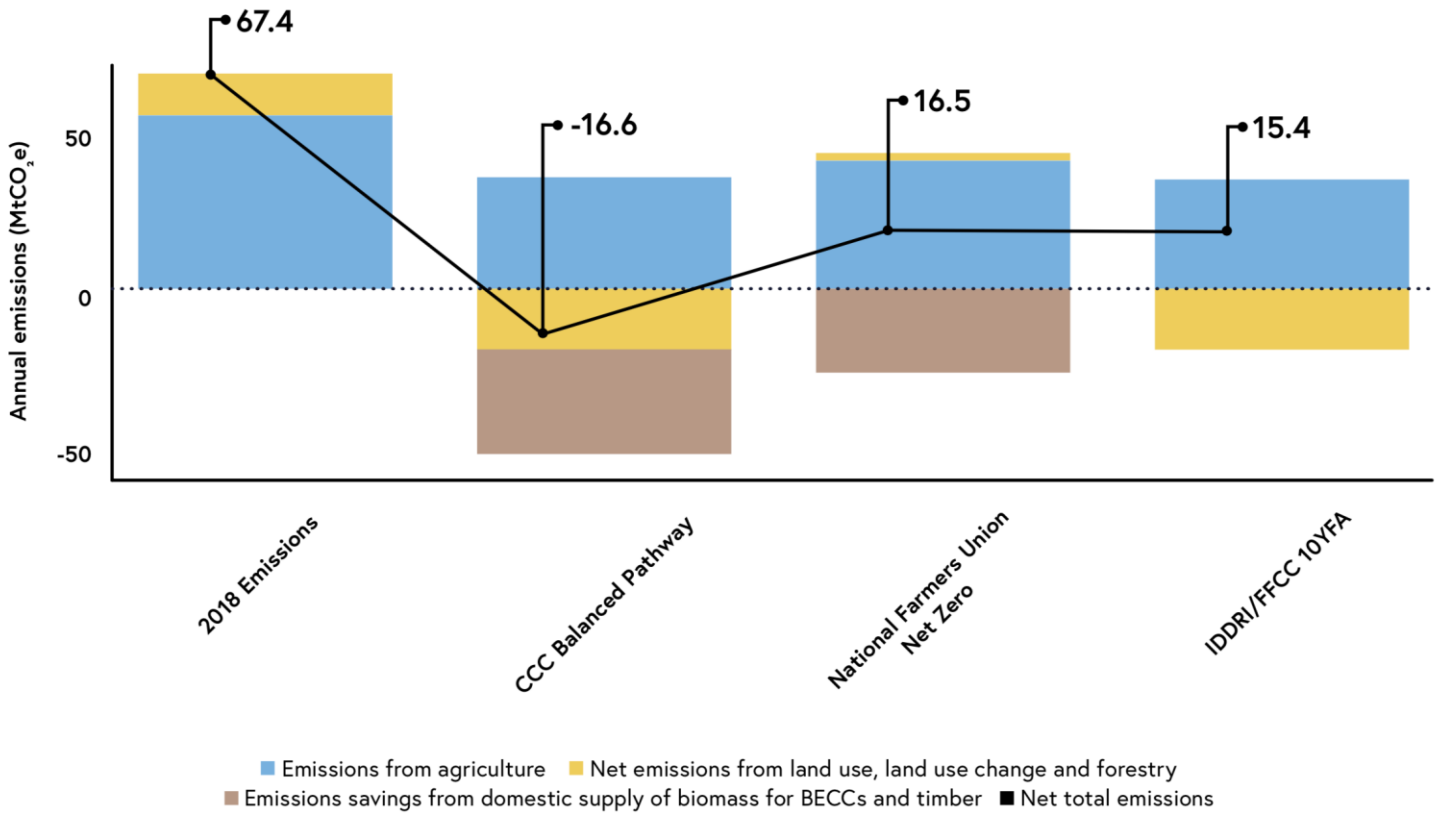
From Natural Resources Chapter of UK Net Zero Strategy

Key policies:

- Supporting low-carbon farming and agricultural innovation through the Farming Investment Fund and the Farming Innovation Programme to invest in equipment, technology, and infrastructure to improve profitability, benefit the environment and support emissions reductions.
- We will boost the existing £640 million Nature for Climate Fund with a further £124 million of new money, ensuring total spend of more than £750 million by 2025 on peat restoration, woodland creation and management – above and beyond what was promised in the manifesto. This will enable more opportunities for farmers and landowners to support Net Zero through land use change.
- Restoring approximately 280,000 hectares of peat in England by 2050 and trebling woodland creation rates in England, contributing to the UK's overall target of increasing planting rates to 30,000 hectares per year by the end of the Parliament.
- £75 million on net zero related R&D across Natural Resources, Waste & F-gases, to inform our pathway to 2037.

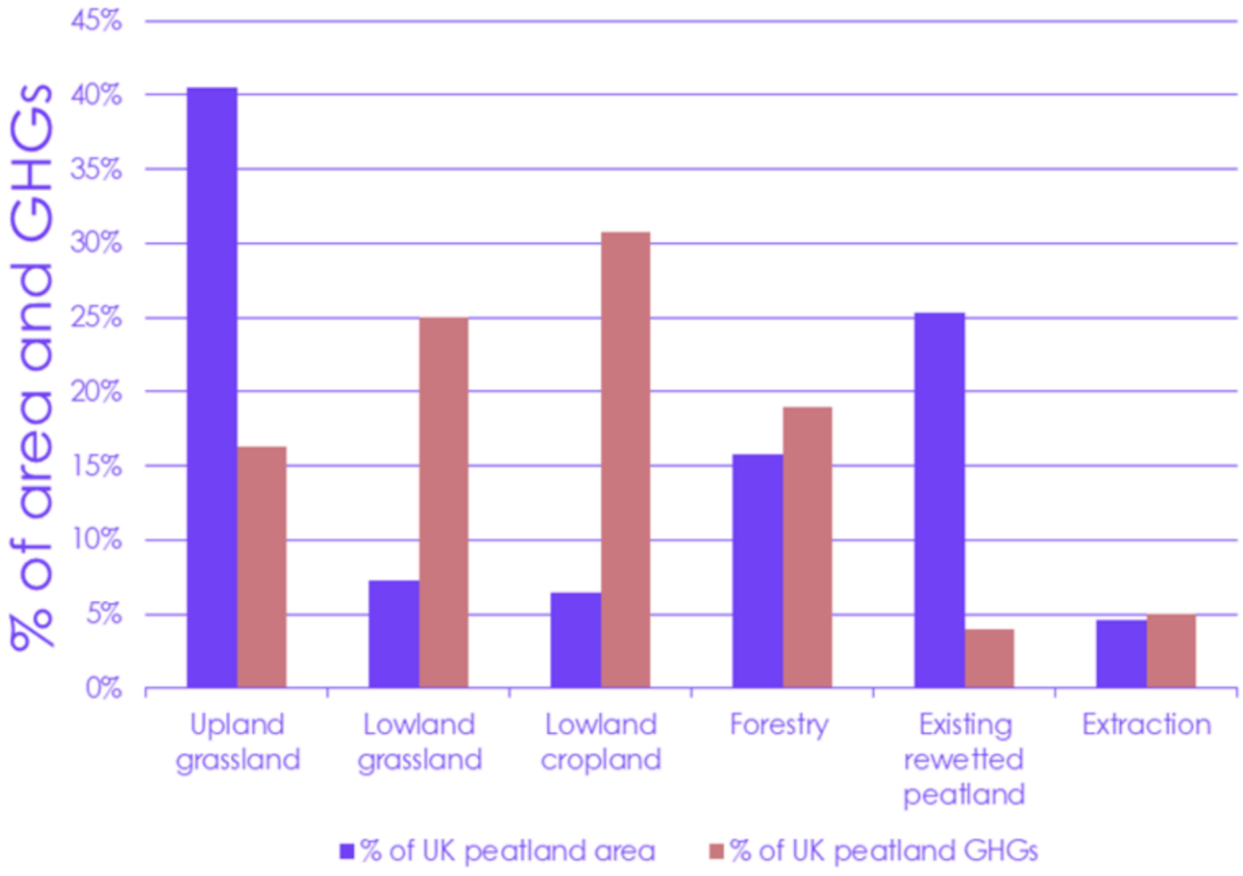

600
500
400
300
200
100
0
-100
MtCO2e
F-gases
Waste
LULUCF sources
Agriculture
Fuel supply
Manufacturing & construction
Electricity supply
Non-residential buildings
Residential buildings
Shipping
Aviation
Surface transport
LULUCF sinks
2018 emissions
2018 emissions

Different views of 2035



Dimbleby Review 2021

Lowland farmland is most of the peat problem



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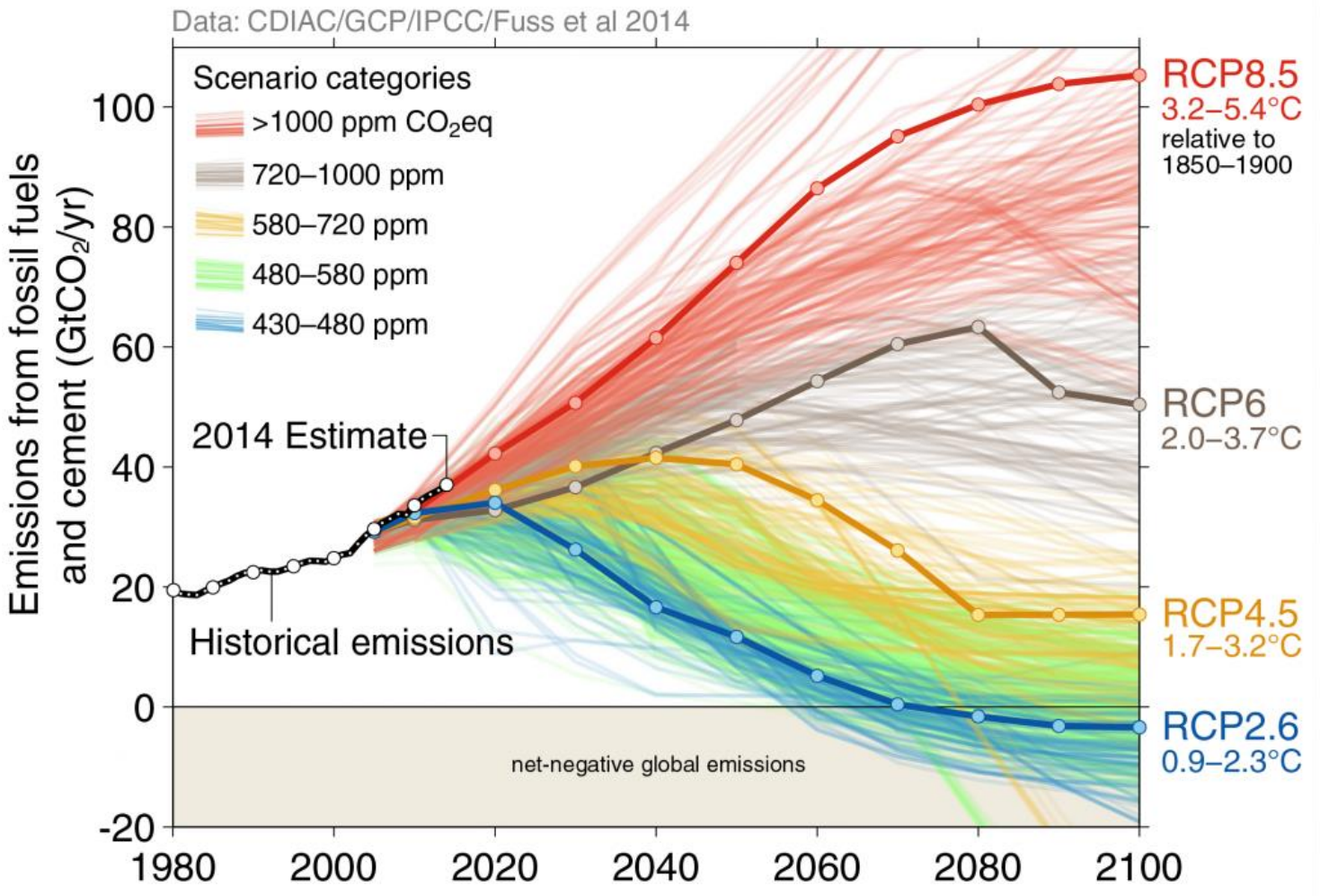
Integrated Assessment Models: Future emission scenarios



At the time of Paris Agreement

87% of 2°C scenarios and 100% of 1.5°C scenarios use some greenhouse gas removal (GGR)

$GtCO_2$ per year levels of GGR required by 2030s

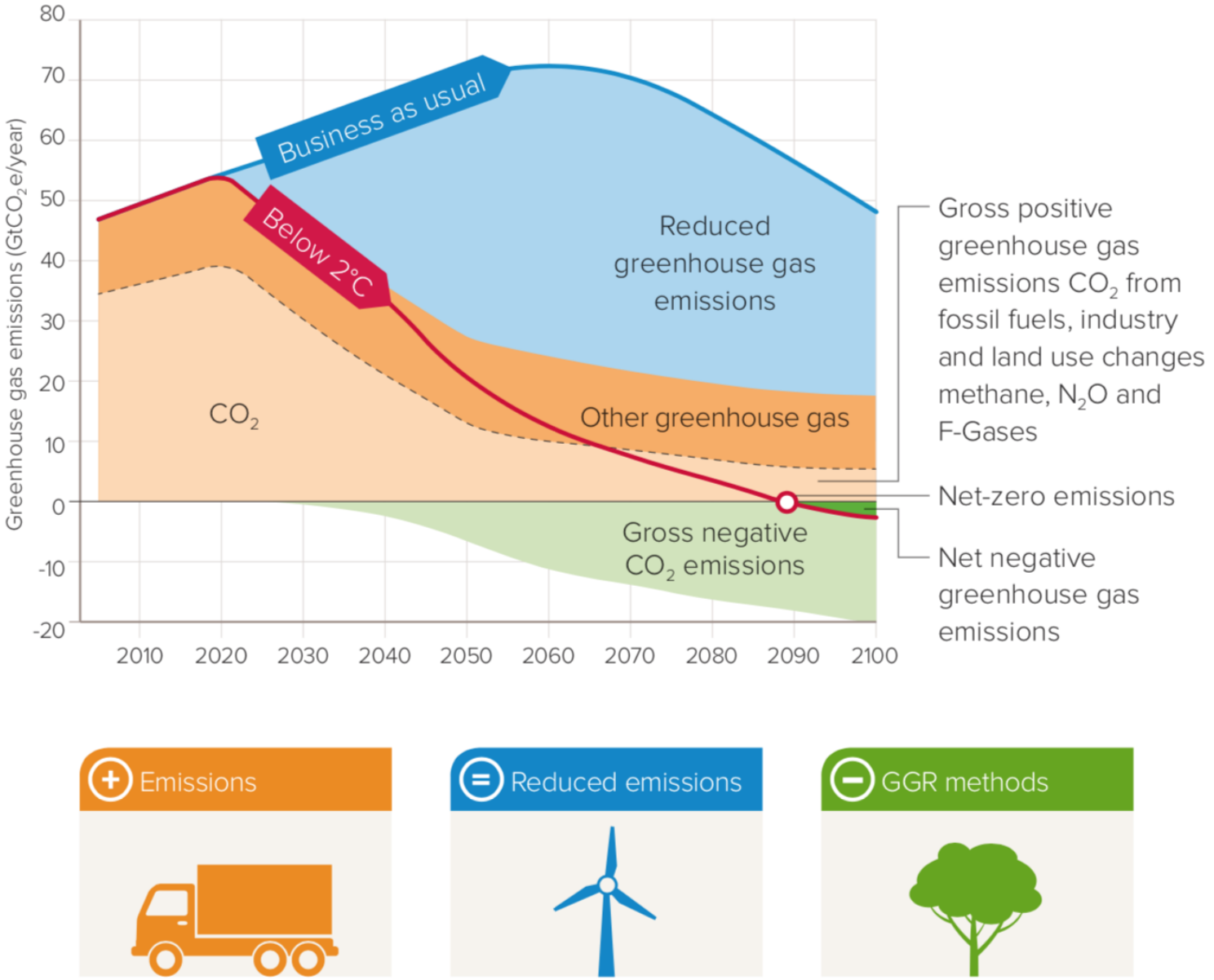


Figure from RS/RAEng GGR report, 2018

GGR methods: Must both remove and store CO_2

Storage location	Greenhouse gas removal method: Increased biological uptake	Natural inorganic reactions	Engineered removal
Land vegetation (living)	Afforestation, reforestation and forest management; Habitat restoration;		
Soils and land vegetation (dead)	Soil carbon sequestration; Biochar	Enhanced terrestrial weathering	
Geological	BECCS	Mineral carbonation at surface	DAC + geological storage DAC + sub-surface mineral carbonation
Oceans	Ocean fertilisation	Ocean alkalinity	DAC + deep ocean storage
Built environment	Building with biomass		Low-carbon concrete

Figure from RS/RAEng GGR report, 2018