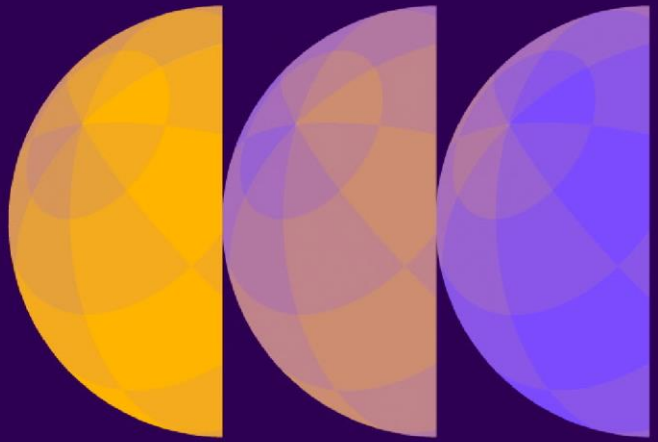
The UK's Sixth Carbon Budget – The Pathway to Net Zero

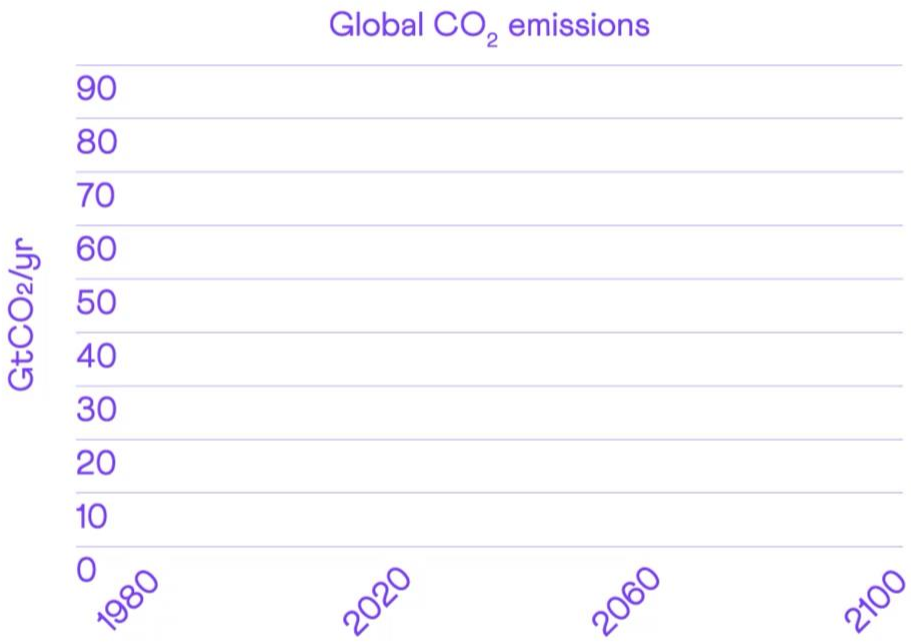
Richard Millar, Climate Change Committee

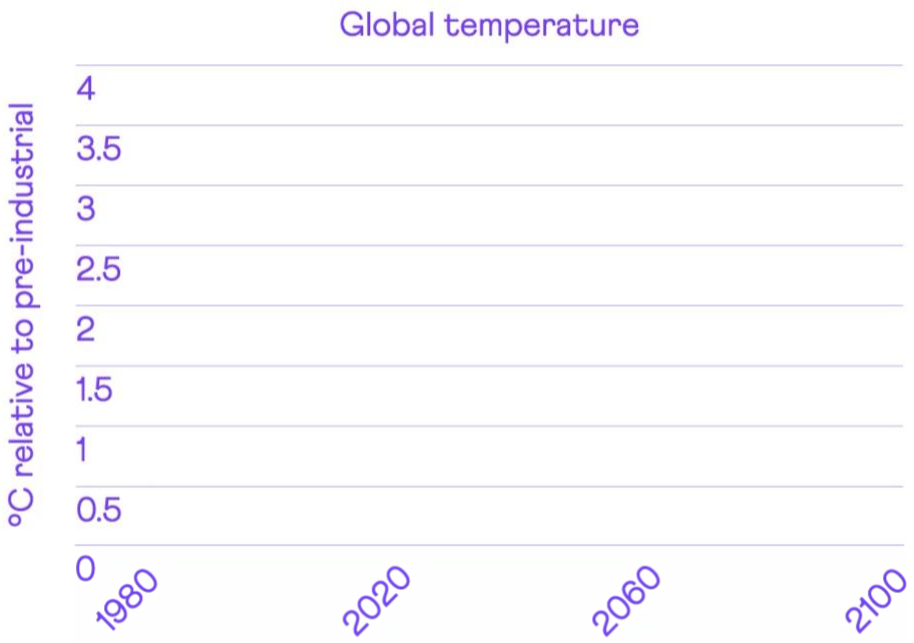


Climate
Change
Committee

The global climate challenge

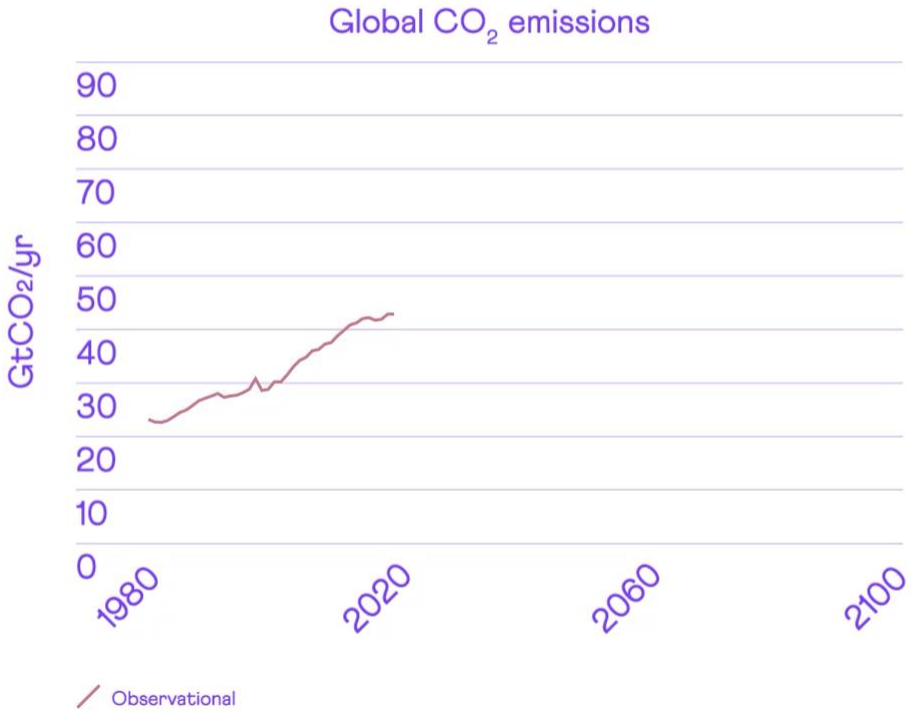
We have already added over 1C

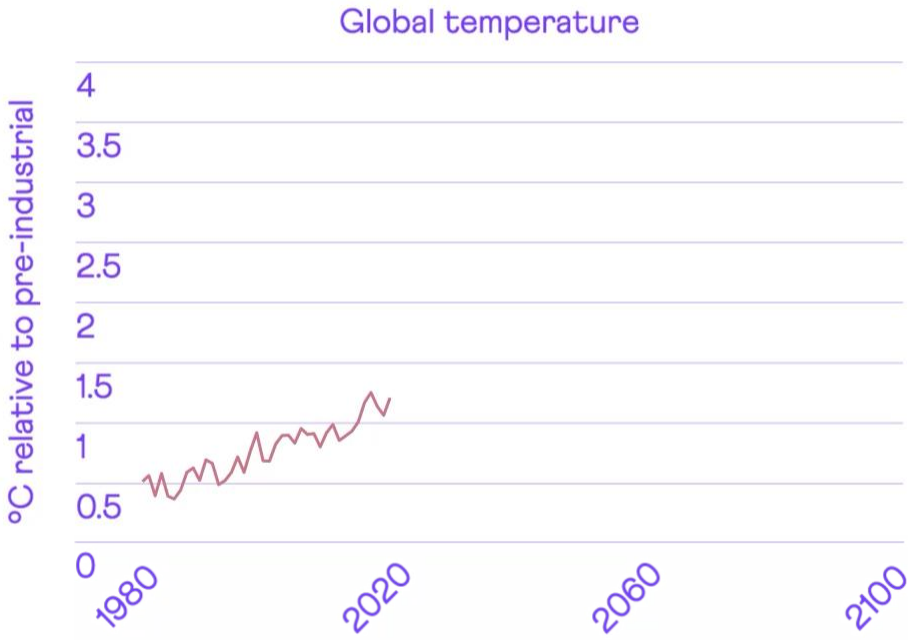




The global climate challenge

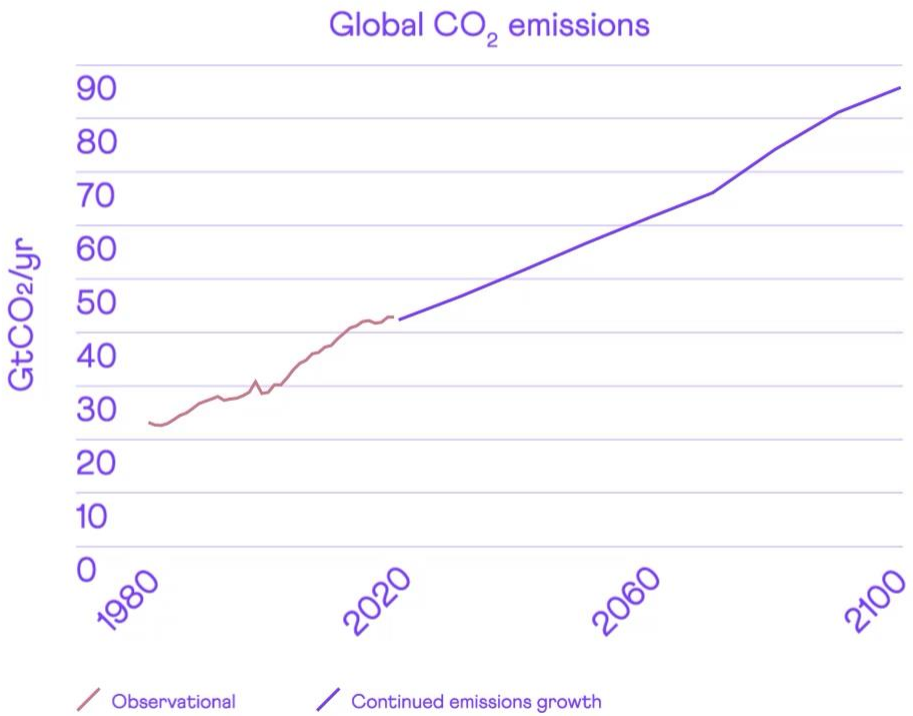
We were on track to ~4C

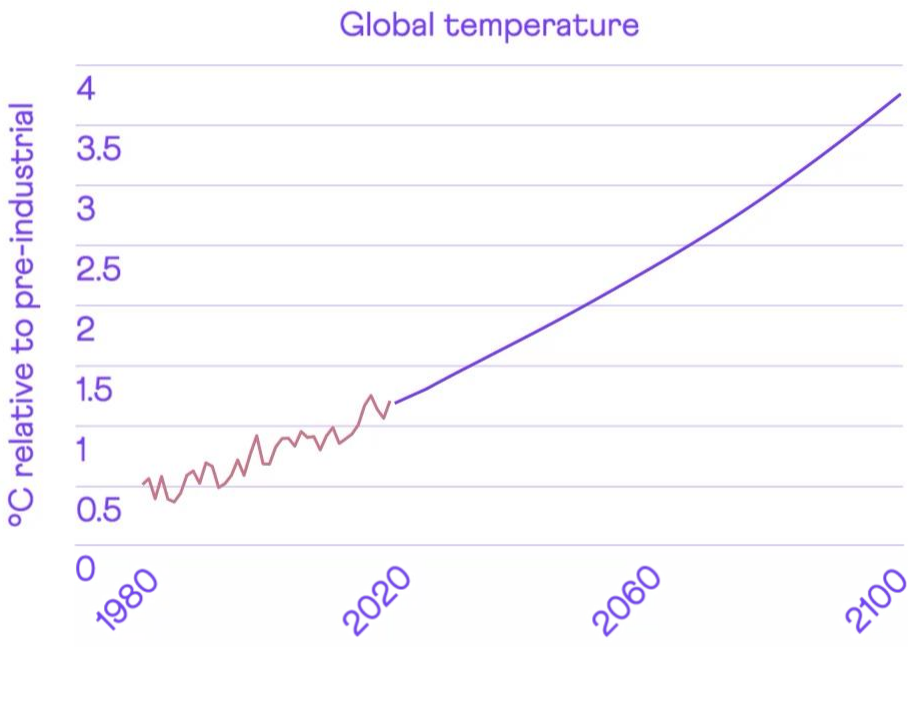




The global climate challenge

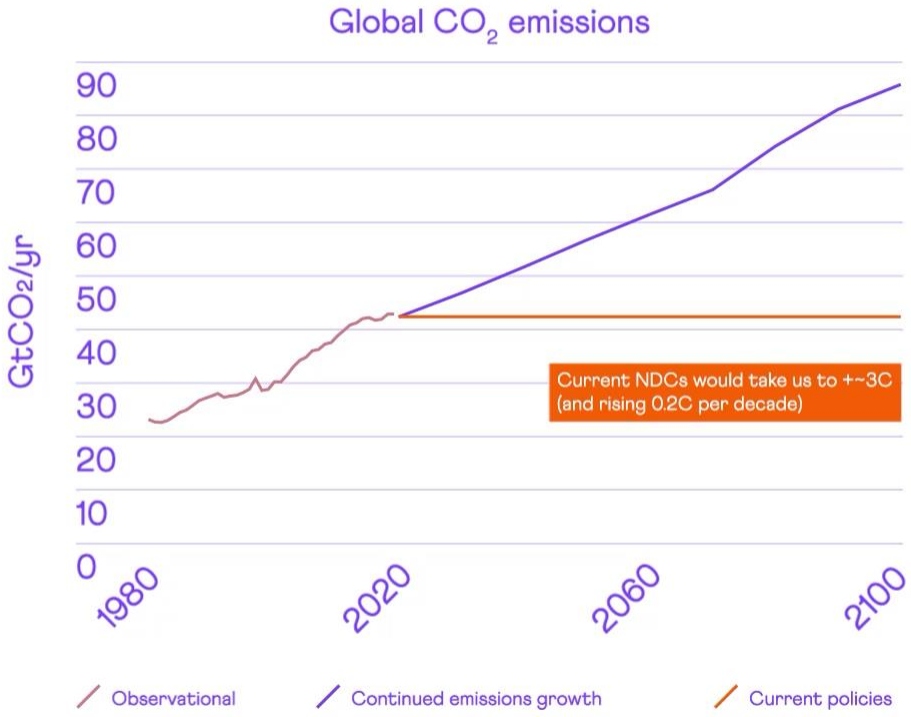
We are now on track to ~3C

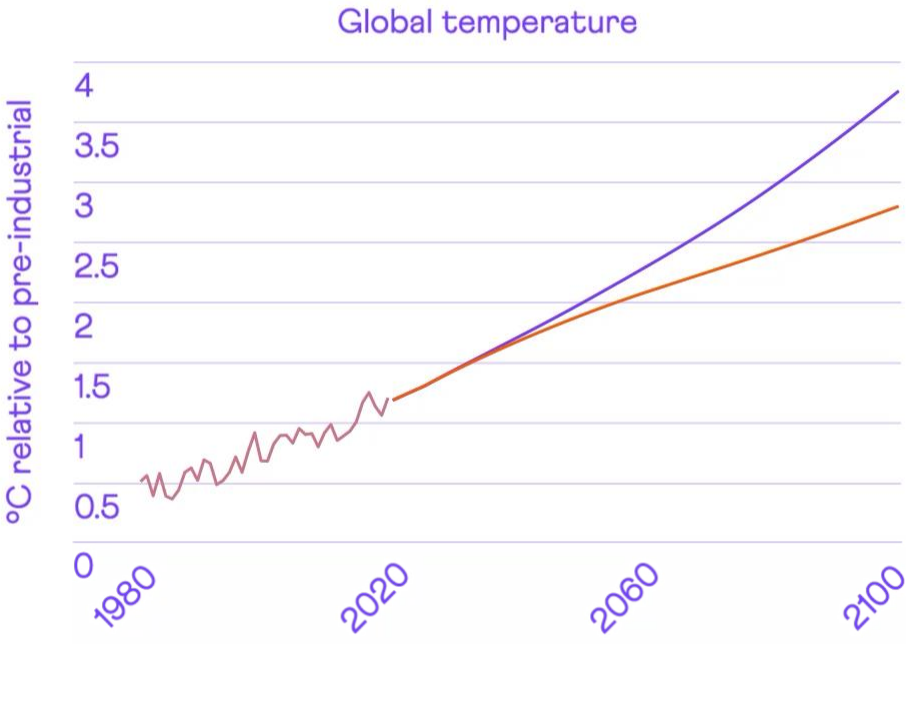




The global climate challenge

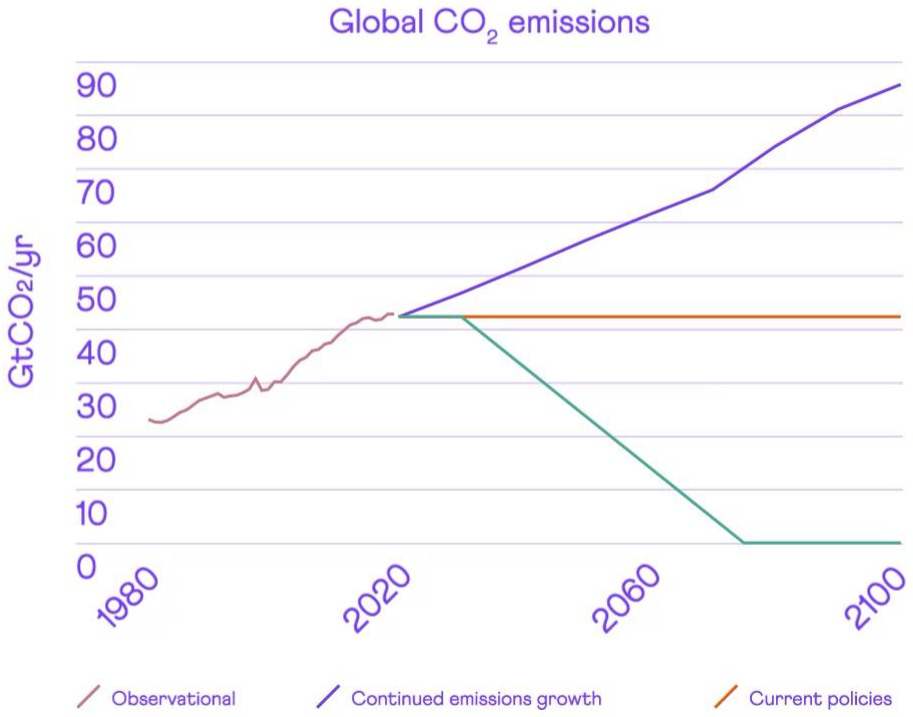
Net Zero before 2100 could keep warming to <2C

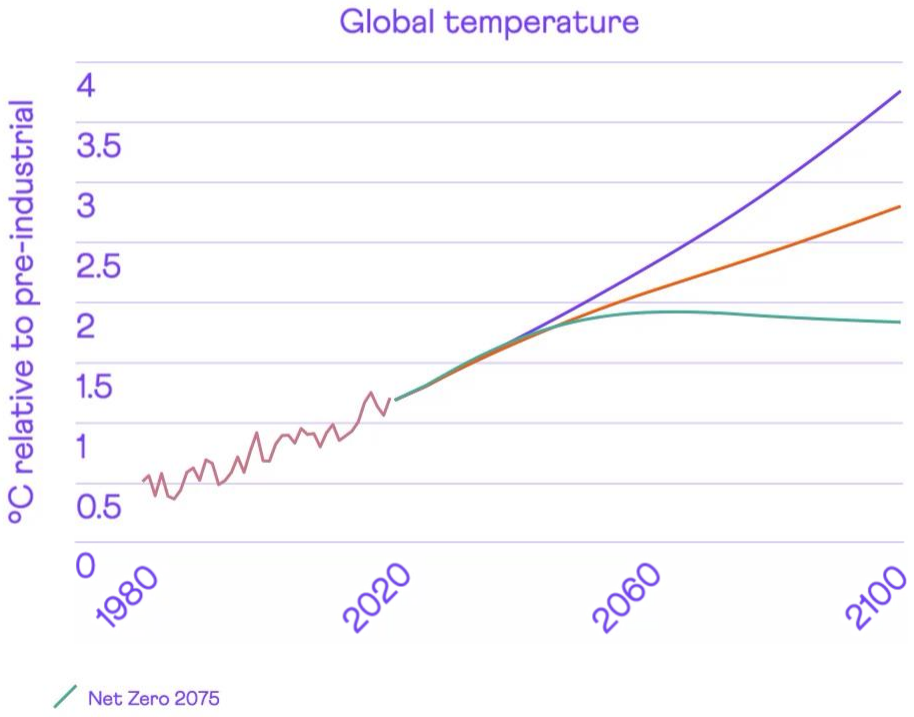




The global climate challenge

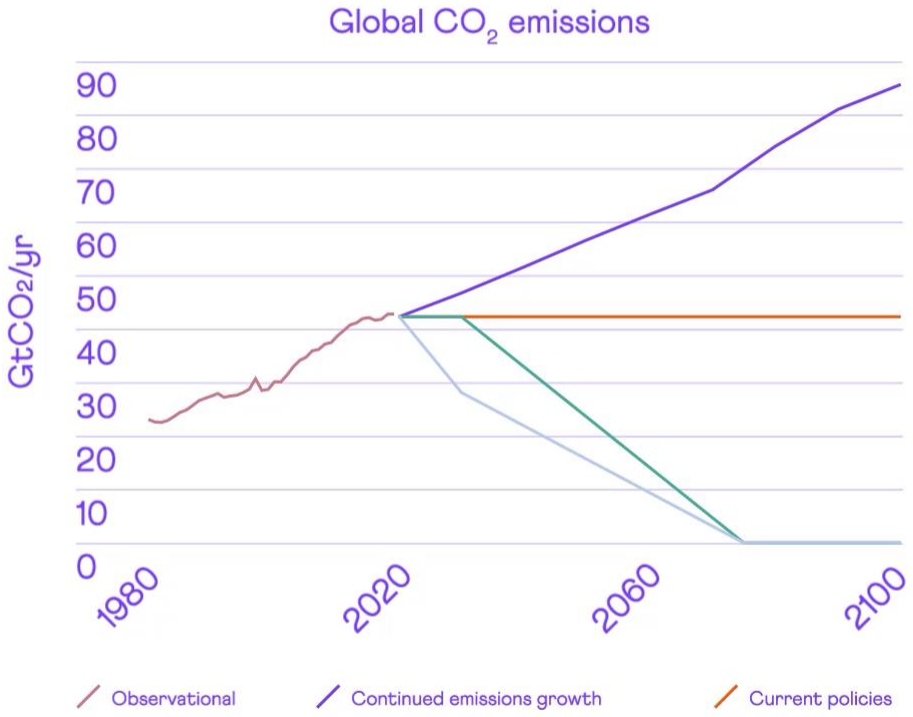
Keeping well-below 2C would require early action too

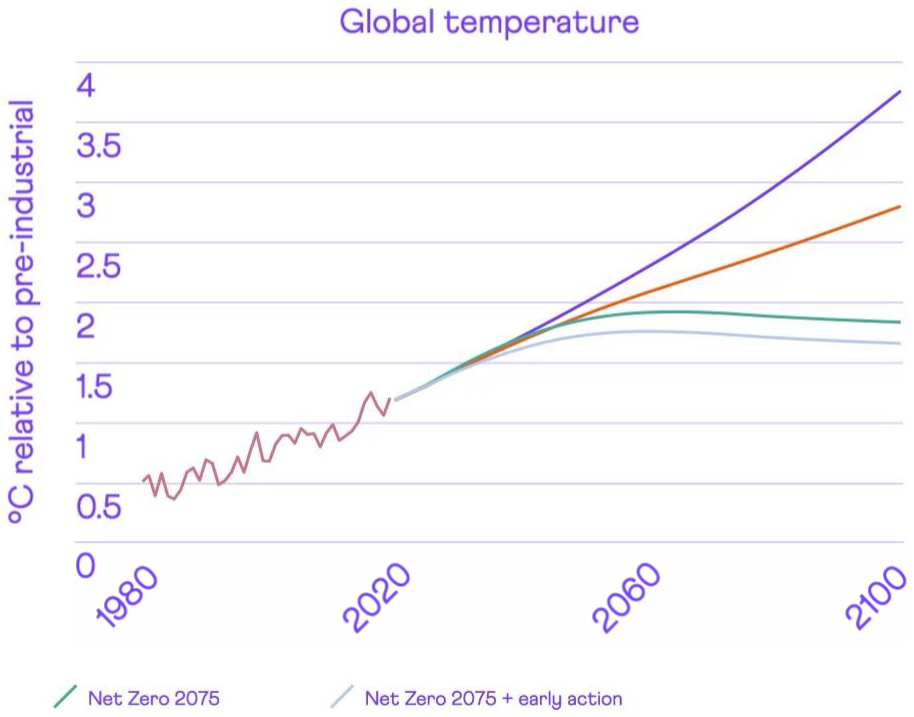




The global climate challenge

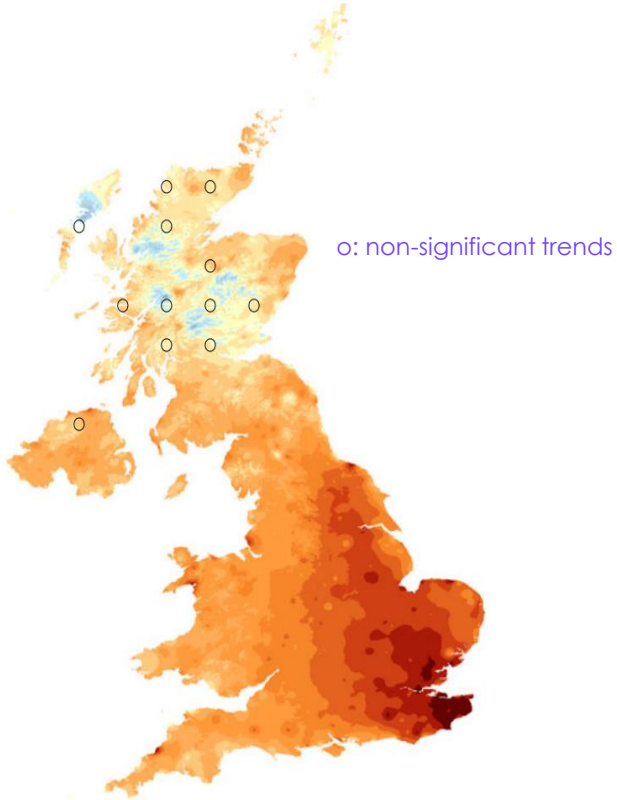
Fully aligning to 1.5C would require more early action and earlier Net Zero





The global climate challenge

Warmest daytime temperatures in the UK (1960 to 2019)



o: non-significant trends

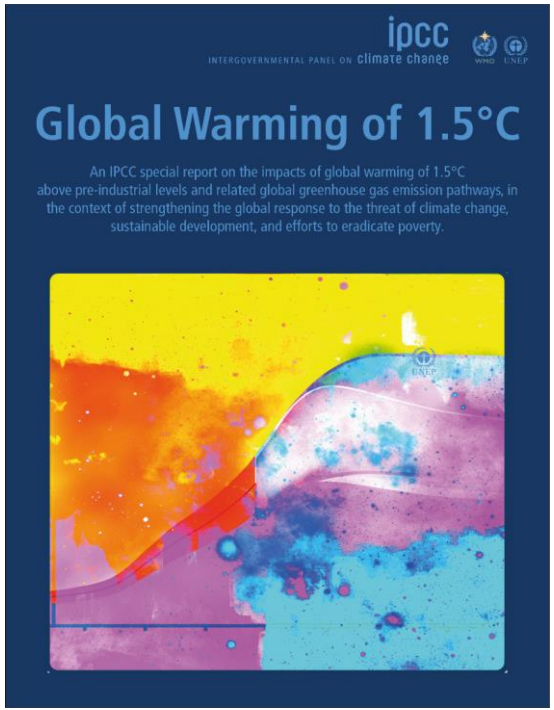
Trend (°C decade $^{-1}$)

-0.8 -0.6 -0.4 -0.2 0 0.2 0.4 0.6 0.8

Source:
Christidis et al, Nature Communications (2020)

When can the UK get to Net Zero

The CCC provided advice on when the UK can get to Net Zero in 2019



UK Climate Change Committee

Independent, Expert-led, Evidence-based

Mitigation Committee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Baroness Brown
Vice Chair
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Prof Piers
Foster
(Climate Science)


Prof Corinne
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systems)


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(Behaviour)


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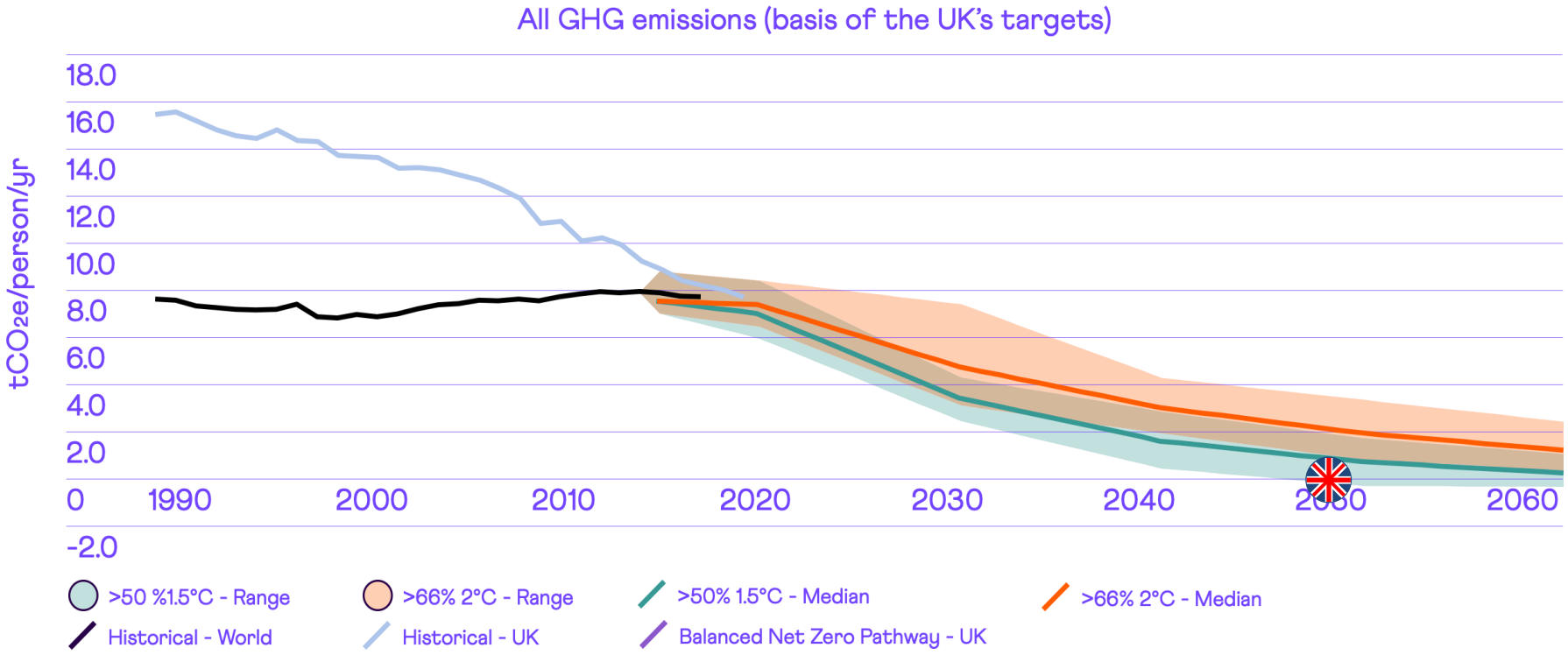
Davies
(Building Physics)


Prof Richard
Dawson
(Climate Risk)

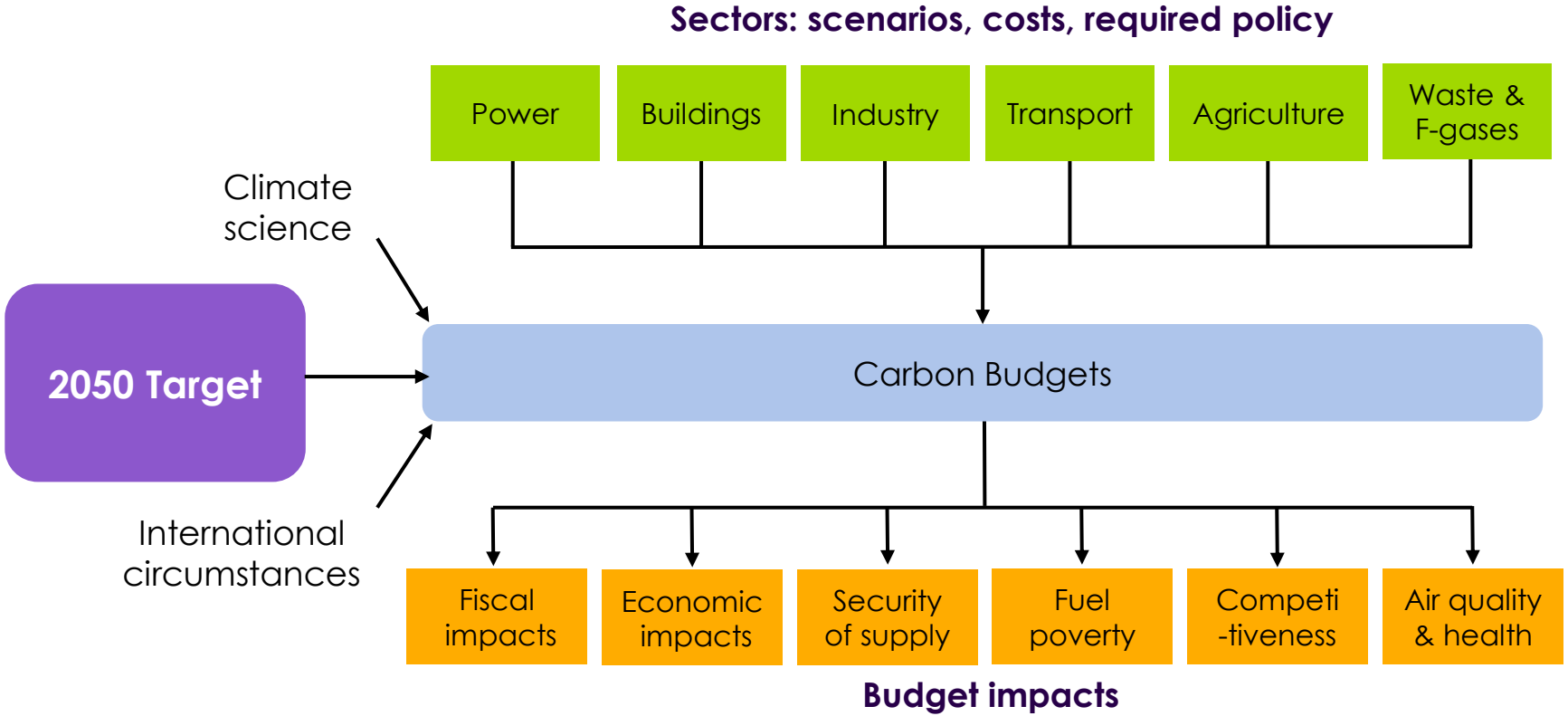
When can the UK get to Net Zero

Per person emissions vs global requirements of Paris



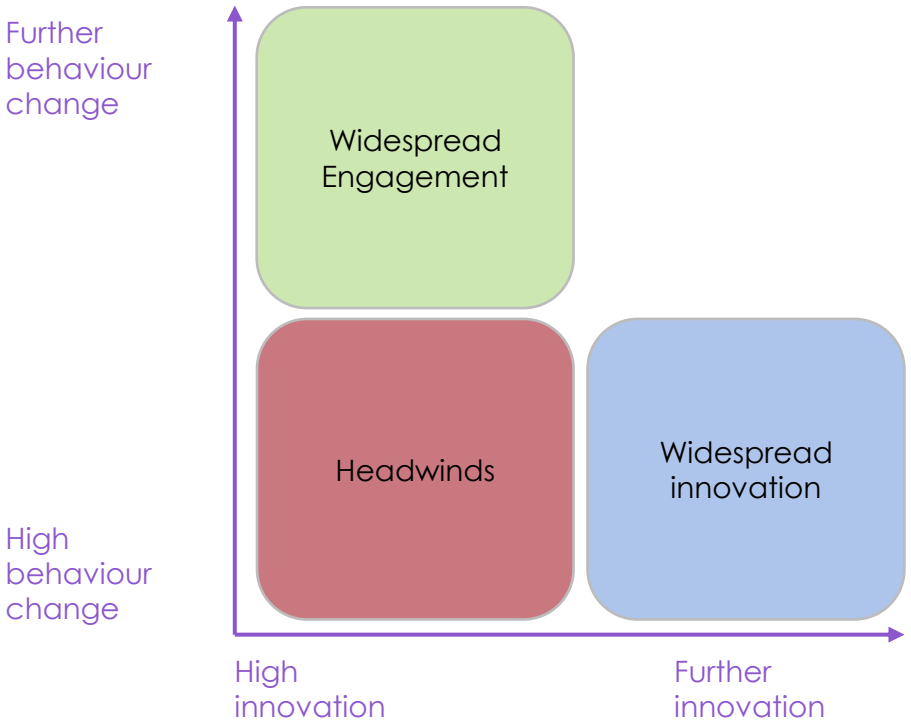
Setting the path to Net Zero – an approach defined by the Climate Act

Evidence-based, bottom up, whole economy approach



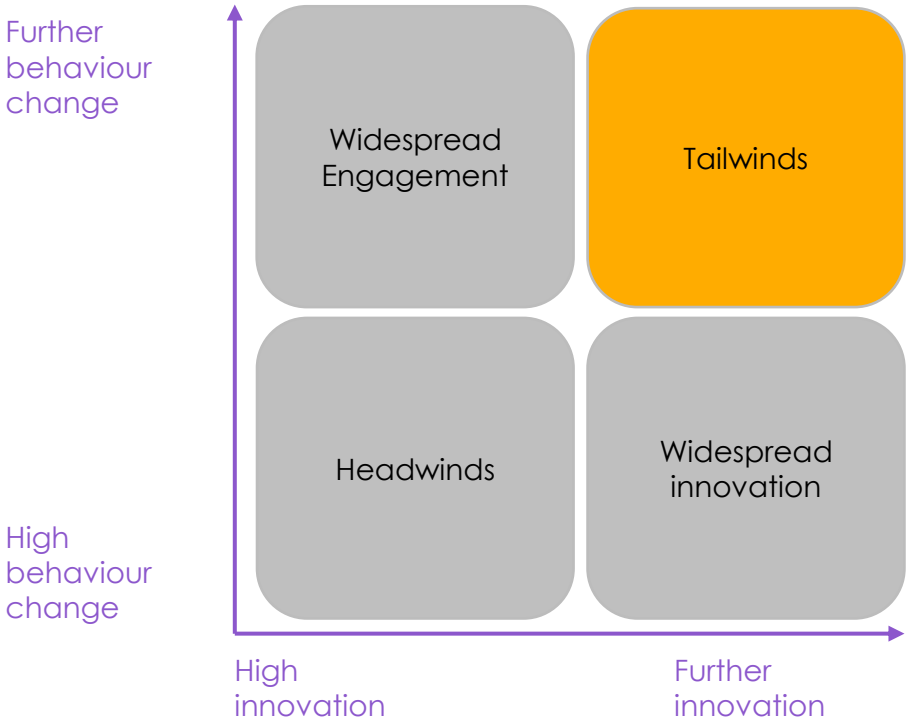
Our approach

Three exploratory scenarios to reach Net Zero by 2050

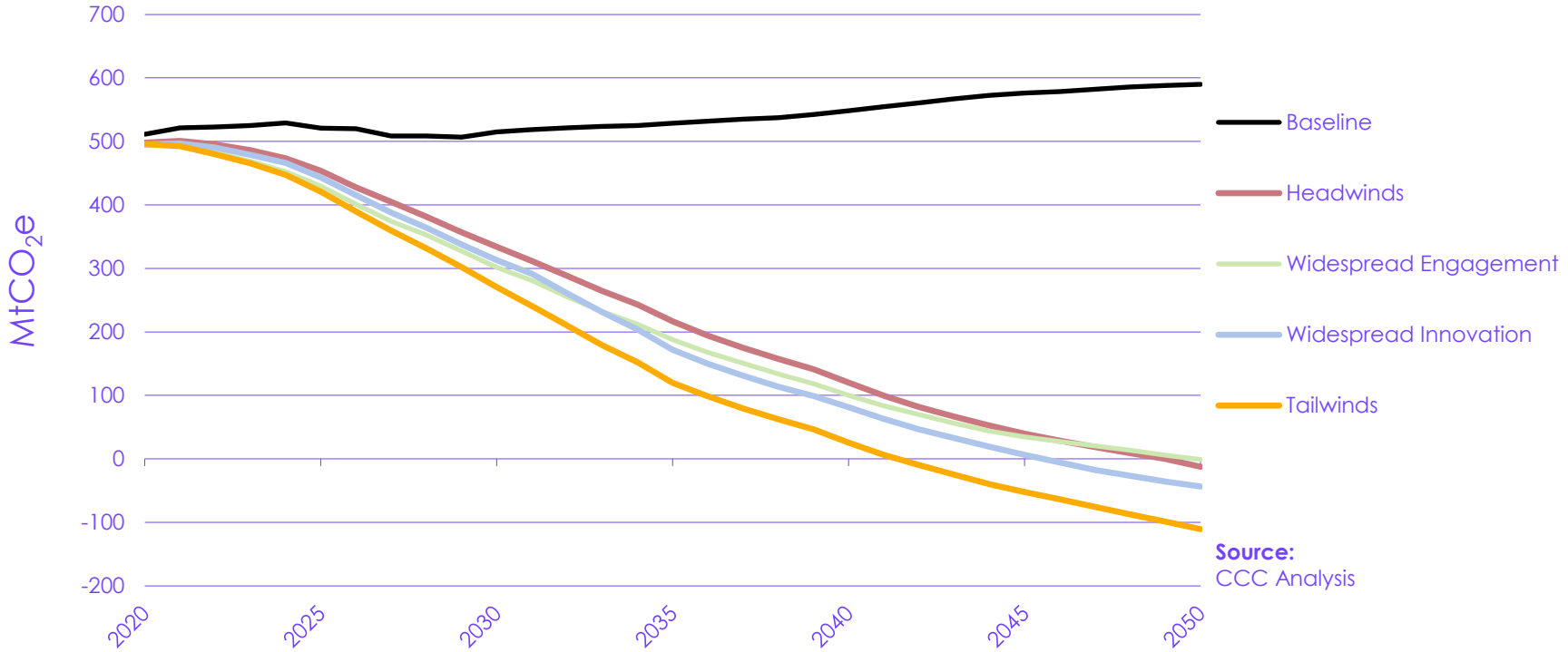


Our approach

One highly optimistic scenario with success on infrastructure, innovation, societal and behavioural change



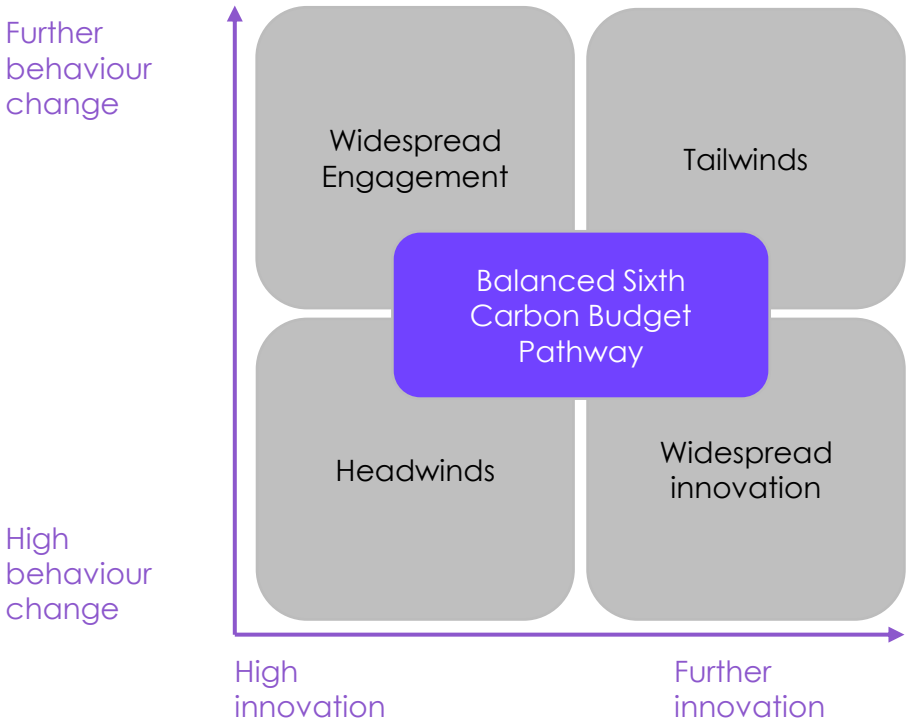
Our approach
Illustrative scenarios for UK Net Zero



Source:
CCC Analysis

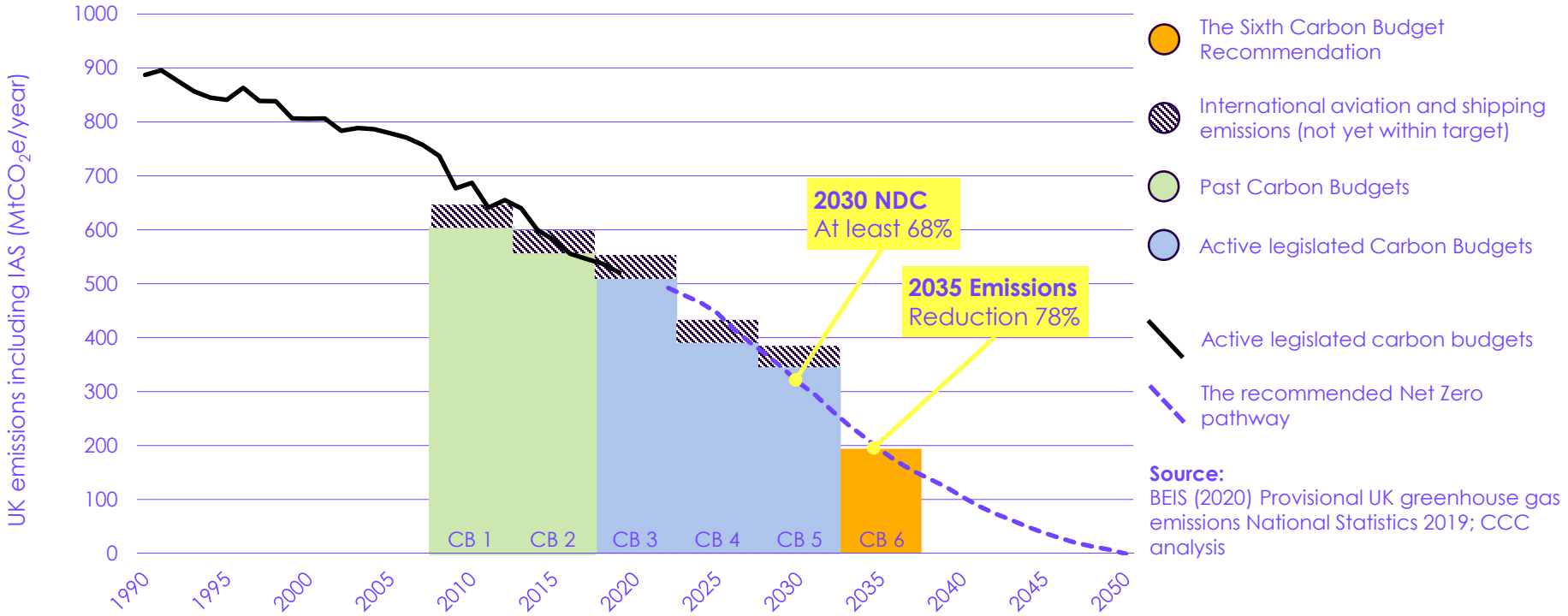
Our approach

A balanced pathway to keep options open



Our recommended path

The recommended UK Sixth Carbon Budget and 2030 NDC



Source:
BEIS (2020) Provisional UK greenhouse gas emissions National Statistics 2019; CCC analysis

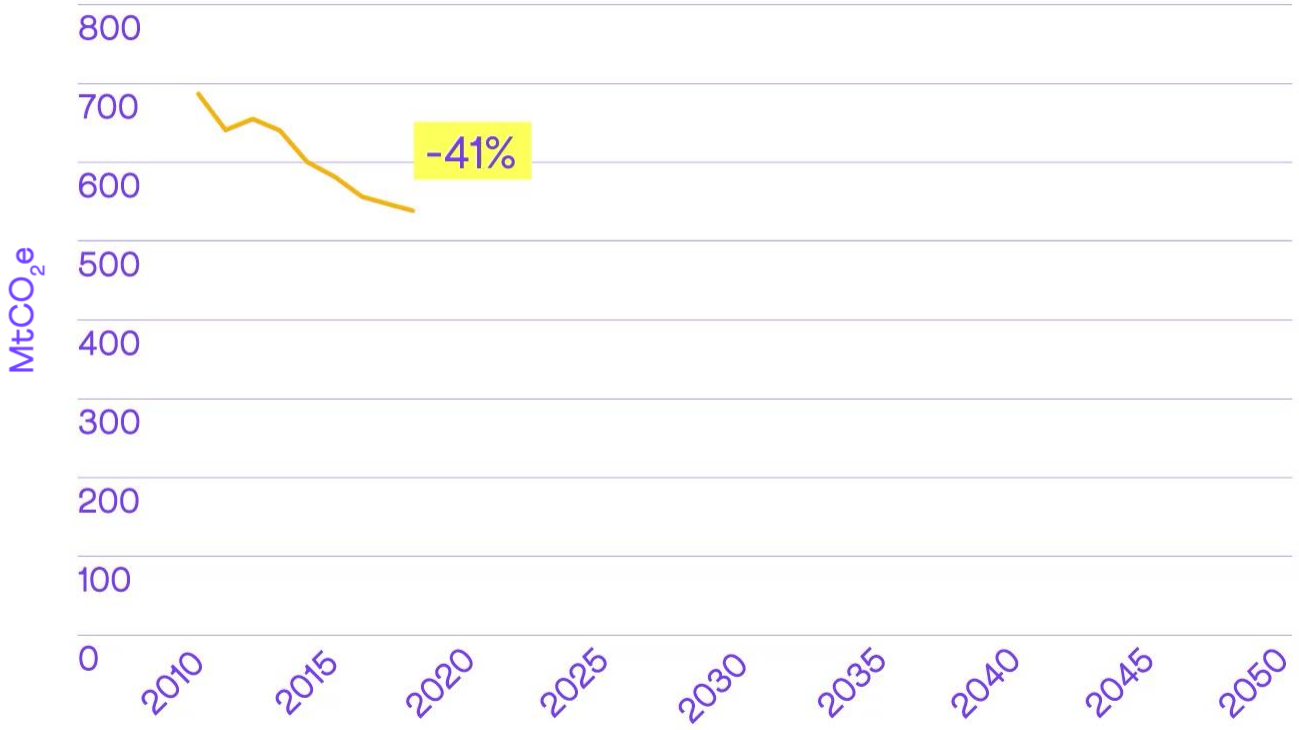
What changes will we see on the path to Net Zero?
2019

Key developments

Meat consumption p/ person (% reduction)	Reduced Demand
Insulation fitted (millions)	Reduced Demand
EV share of new sales (%)	Low-carbon Choices
Low-carbon share of boiler replacements	Low-carbon Choices
CCS ($MtCO_2e$)	Low-carbon energy
Electricity (TWh)	Low-carbon energy
Hydrogen (TWh)	Low-carbon energy
Afforestation (kha pa)	Land use
Perennial energy crops (kha pa)	Land use
Peatland restored (%)	Land use

What changes will we see on the path to Net Zero?

2025

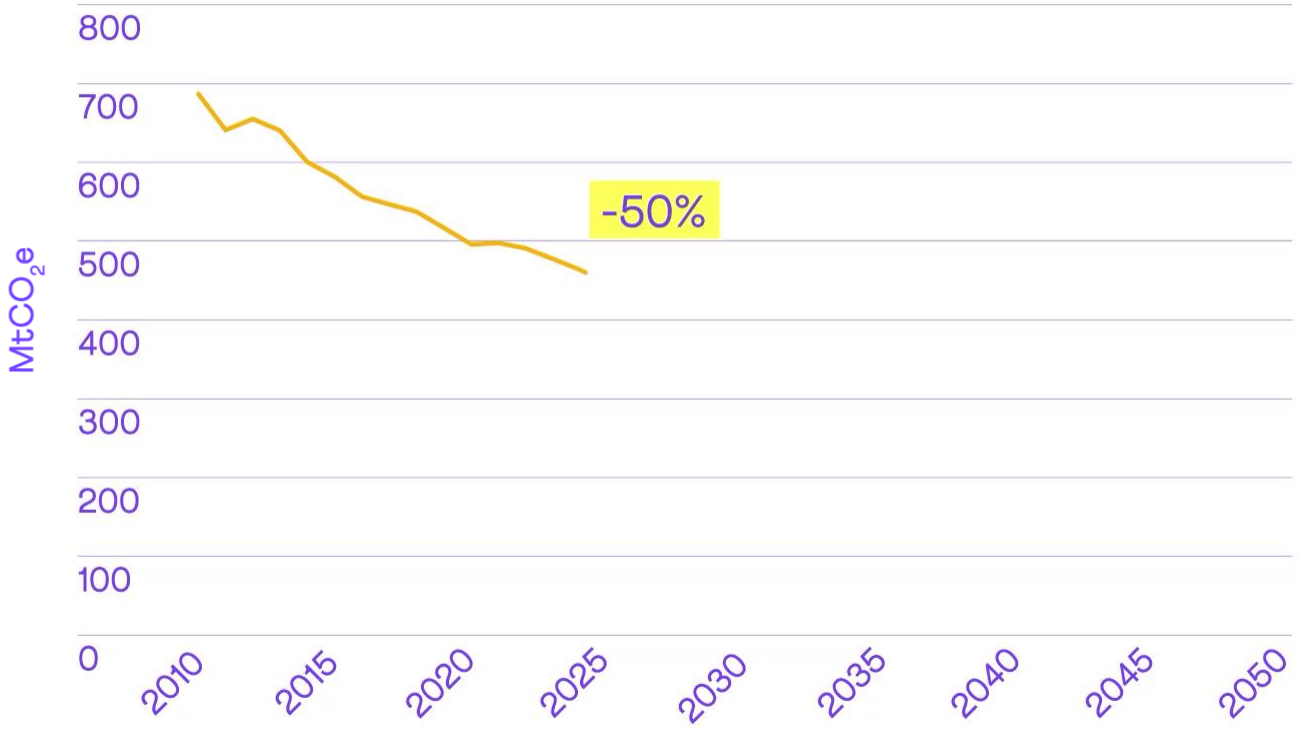


Key developments

Reduced Demand	Meat consumption p/ person (% reduction)	0%
	Insulation fitted (millions)	0
Low-carbon Choices	EV share of new sales (%)	13%
	Low-carbon share of boiler replacements	11%
Low-carbon energy	CCS ($MtCO_2e$)	0
	Electricity (TWh)	205
	Hydrogen (TWh)	0
Land use	Afforestation (kha pa)	19
	Perennial energy crops (kha pa)	0
	Peatland restored (%)	25%

What changes will we see on the path to Net Zero?

2030

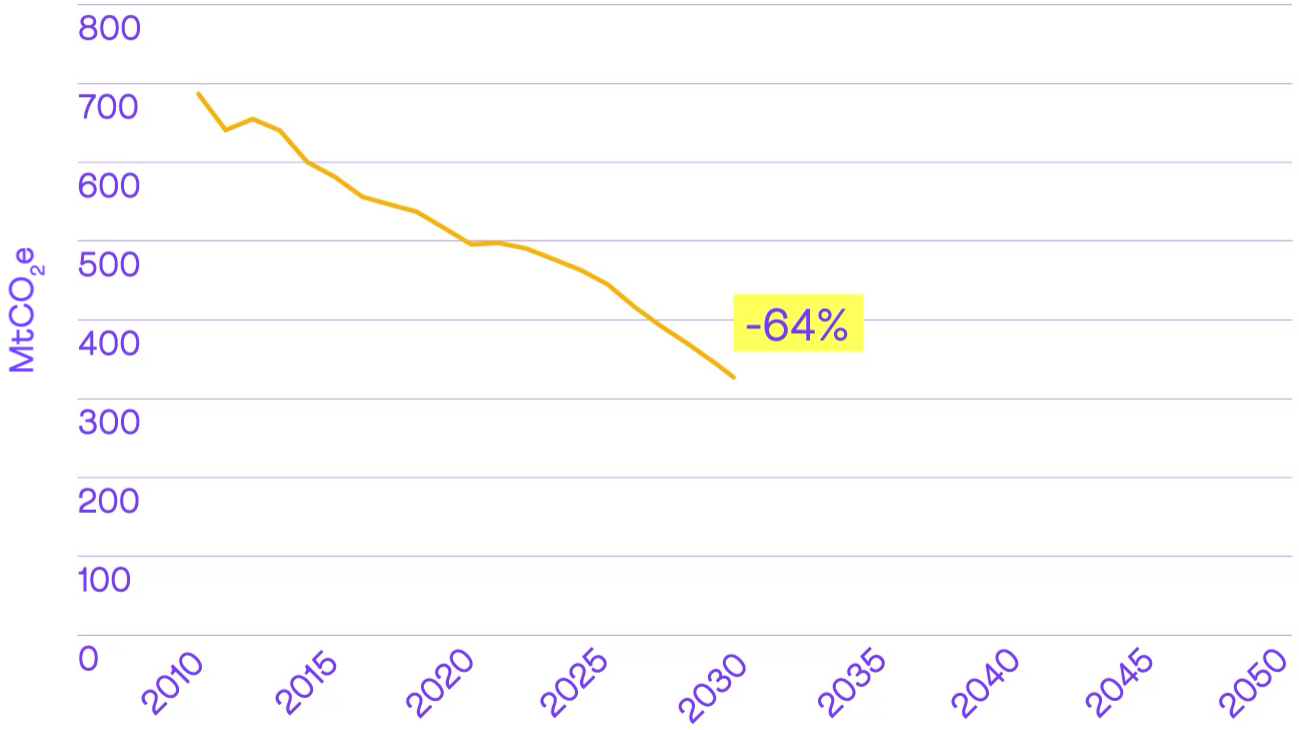


Key developments

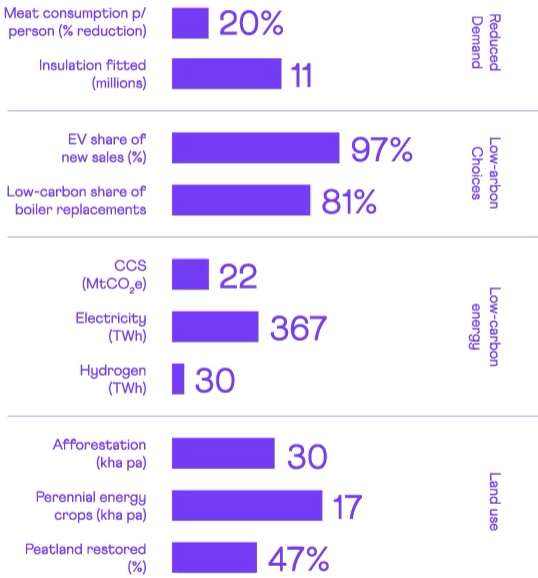
Meat consumption p/ person (% reduction)	9%	Reduced Demand
Insulation fitted (millions)	4	
EV share of new sales (%)	48%	Low-carbon Choices
Low-carbon share of boiler replacements	31%	
CCS ($MtCO_2e$)	0	Low-carbon energy
Electricity (TWh)	238	
Hydrogen (TWh)	1	
Afforestation (kha pa)	30	Land use
Perennial energy crops (kha pa)	5	
Peatland restored (%)	36%	

What changes will we see on the path to Net Zero?

2035

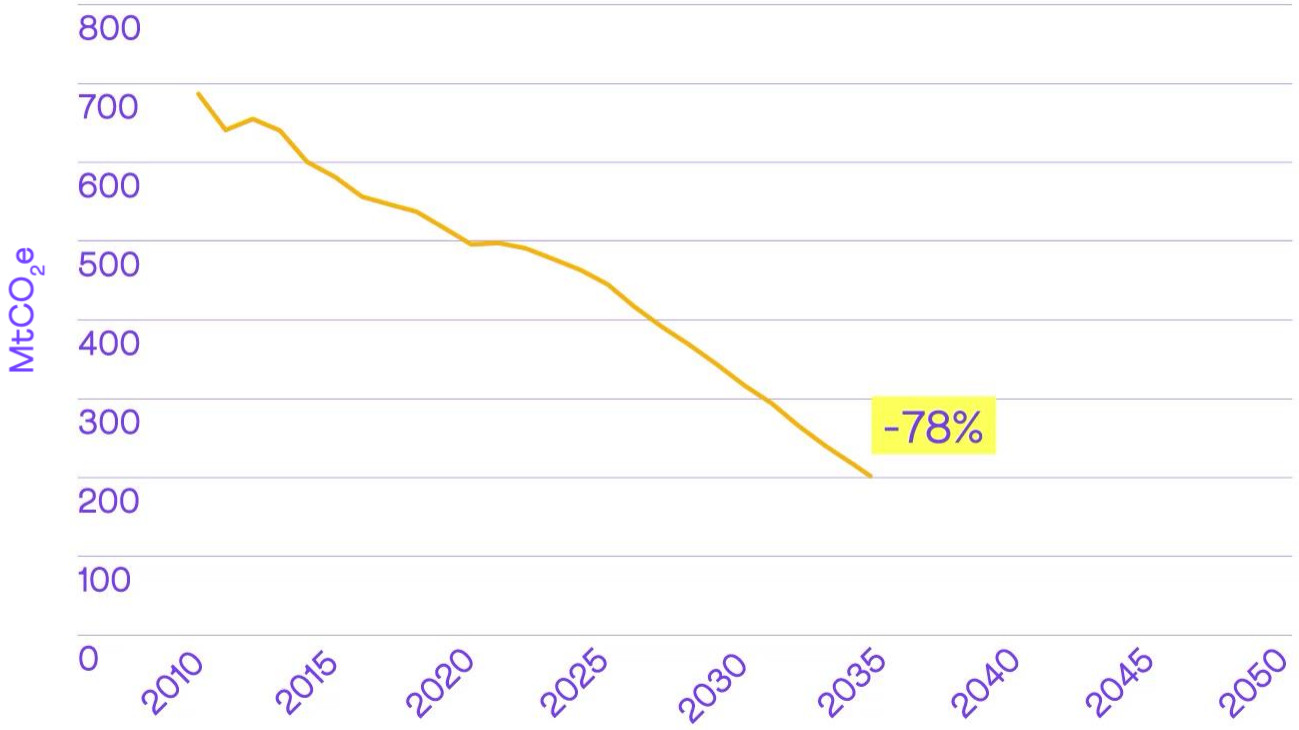


Key developments

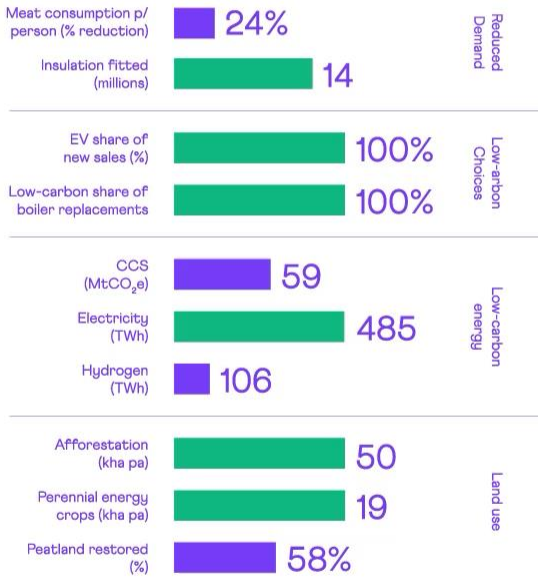


What changes will we see on the path to Net Zero?

2050

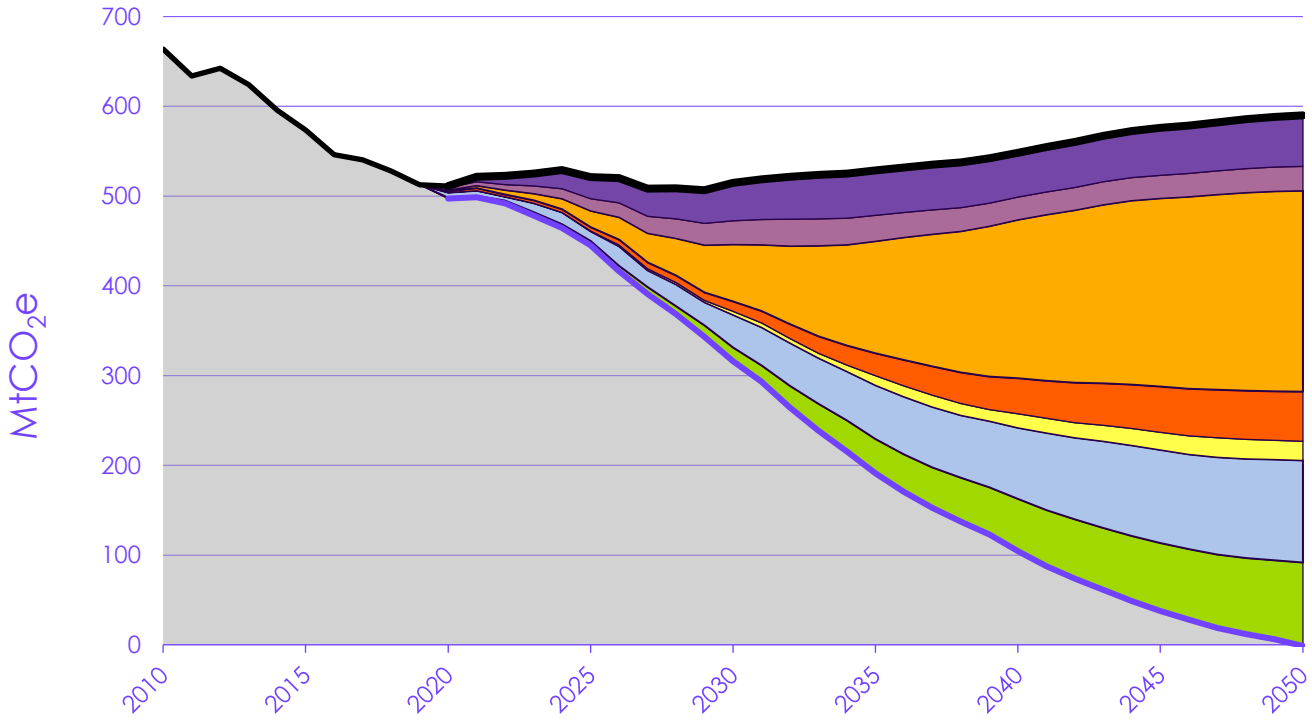


Key developments



Emissions abatement on the balanced path

Meeting Net Zero requires actions across four key areas



1. Demand reduction and efficiency

- Reduced demand for carbon-intensive activities
- Greater efficiency in use of energy and resources

2. Take-up of low-carbon solutions

- Electrification
- Hydrogen and other low-carbon technologies
- CO2 capture from fossil-fuels and industry

3. Expansion of low-carbon energy

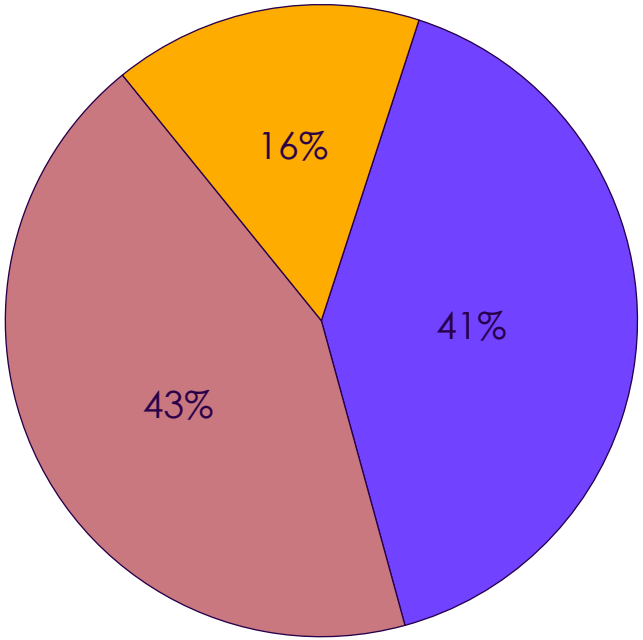
- Low-carbon hydrogen and electricity production

4. Offsetting emissions

- Natural carbon storage and greenhouse gas removals

Emissions abatement on the balanced path

Role of behavioural and societal change in meeting the Sixth Carbon Budget (by 2035)



- Low-carbon technologies or fuels, not societal/behavioural changes
- Measures with a combination of low-carbon technologies and societal/behaviour changes
- Largely societal or behaviour changes

Source:
CCC Analysis

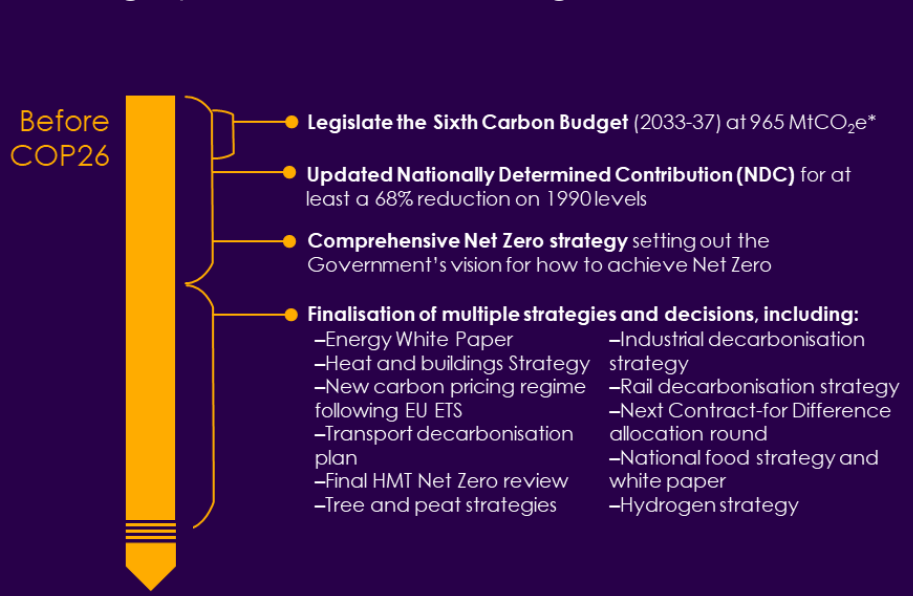
The policy challenge
A real-world constraint: asset lives

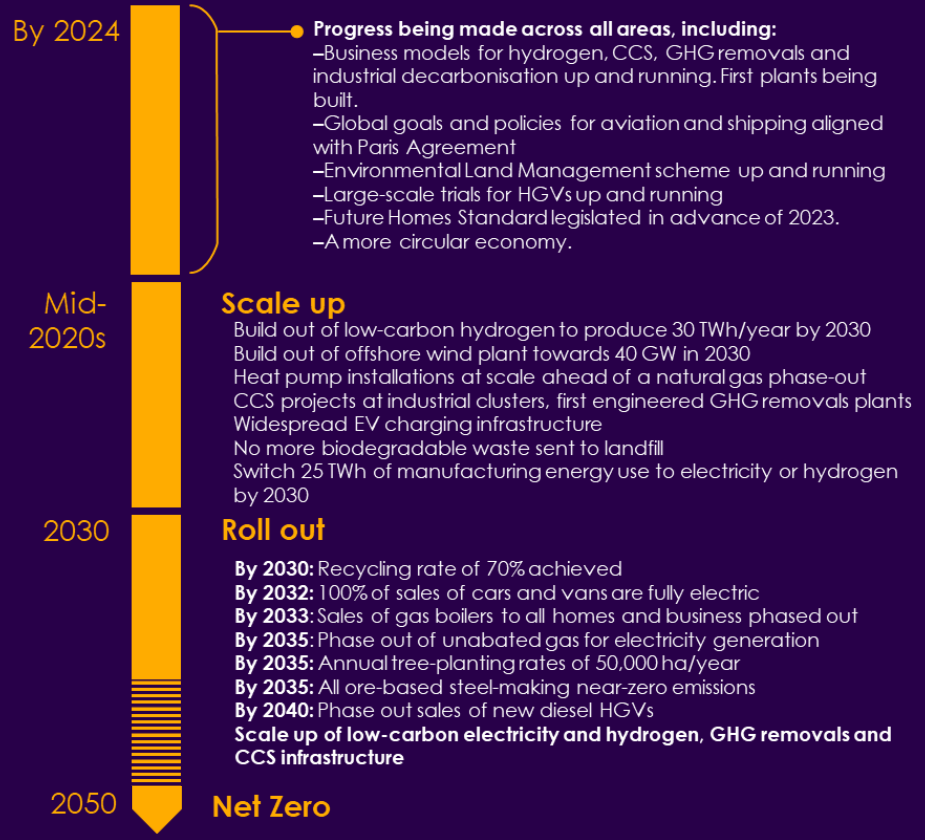
Sector	Asset	Lifetime
Transport	Light Vehicle HGV	14 years (average) 8 – 13 years
Manufacturing and Construction	Combustion (Boilers, furnaces, mobile machinery, generators, kilns, compressors, dryers, heaters, ovens, Other process assets.	10-35 years
Buildings	Fossil fuel boiler Air Source Heat Pump Ground Source Heat Pump Loft and cavity insulation Solid wall insulation	15 years 15 years 20 years 42 years 36 years
Power generation	Gas plant Offshore wind Nuclear plant	25 years 30 years 60 years
Aviation	Aircraft	30 year technical
Shipping	Ships	30 years technical

Source: CCC analysis.

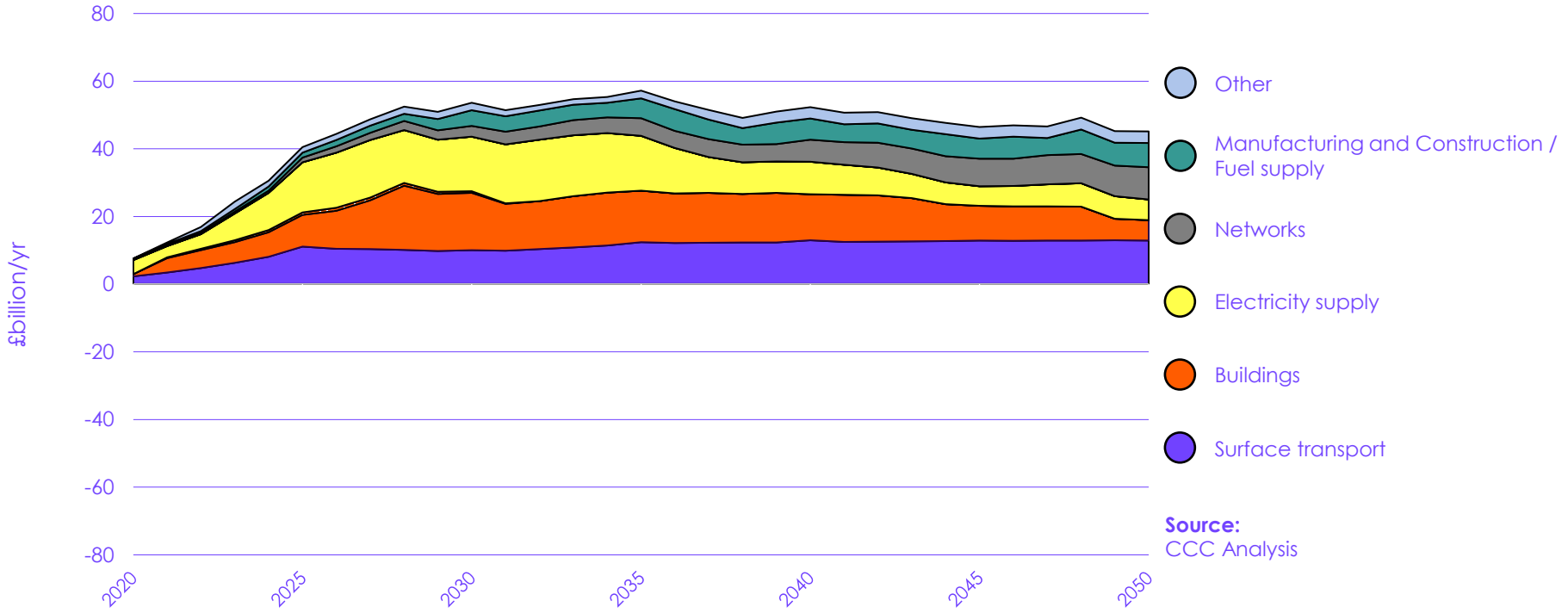
The policy challenge

Scaling up in the 2020s; Rolling out in the 2030s





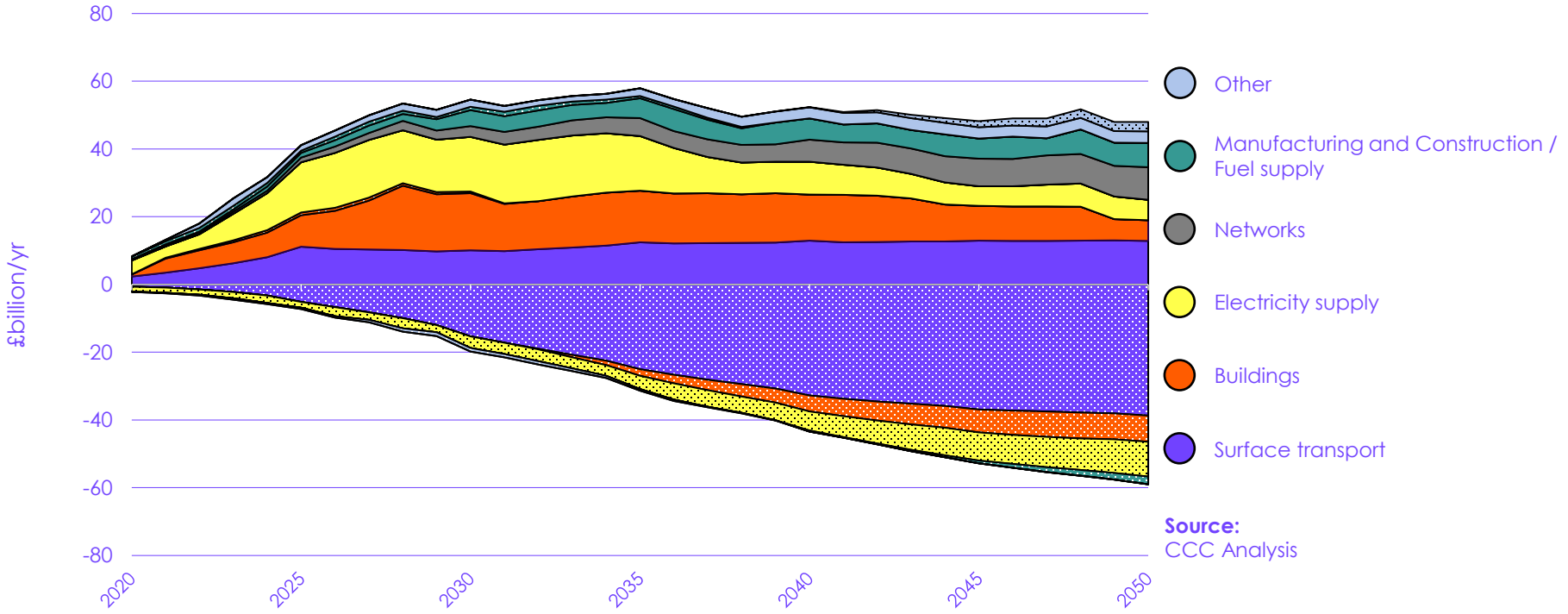
Investing for Net Zero
Major investment programme



Source:
CCC Analysis

Investing for Net Zero

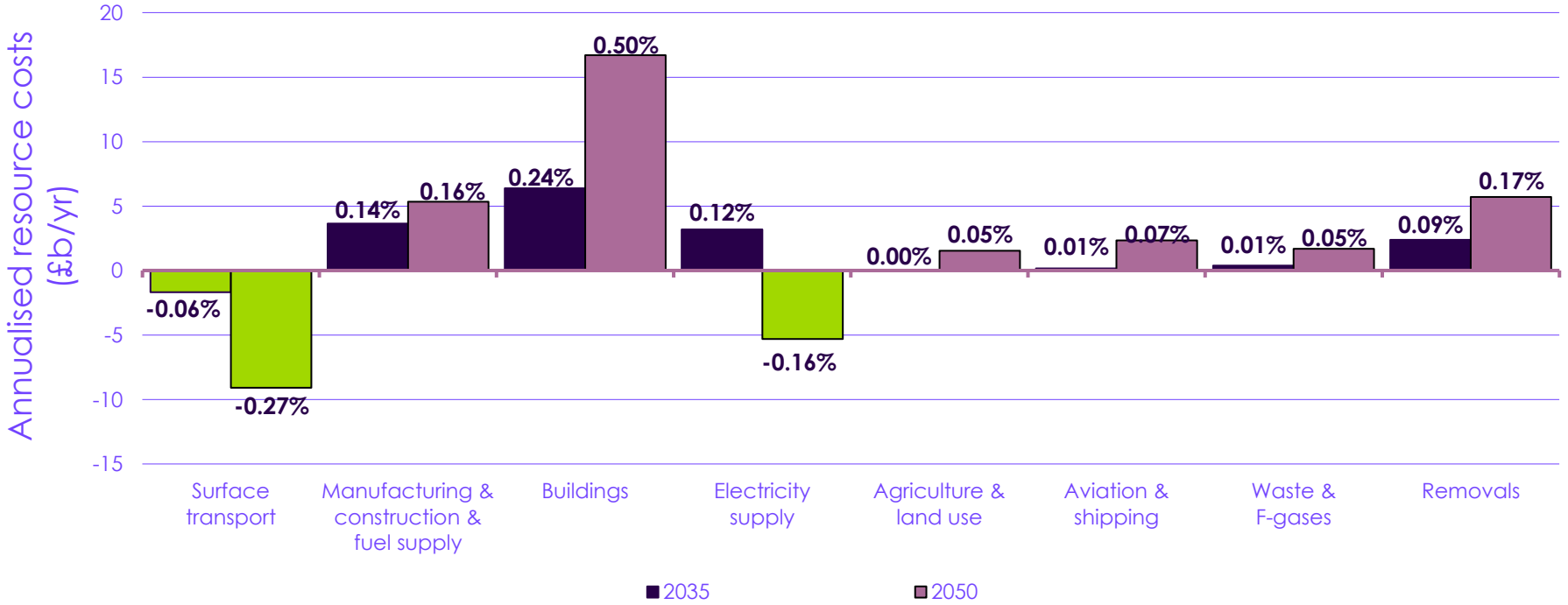
Major investment programme, delivering offsetting operating cost savings



Source:
CCC Analysis

The ‘fair distribution’ challenge

Annualised resource costs in 2035 and 2050



Source: CCC Analysis

Costing the transition pathway

Impact on GDP

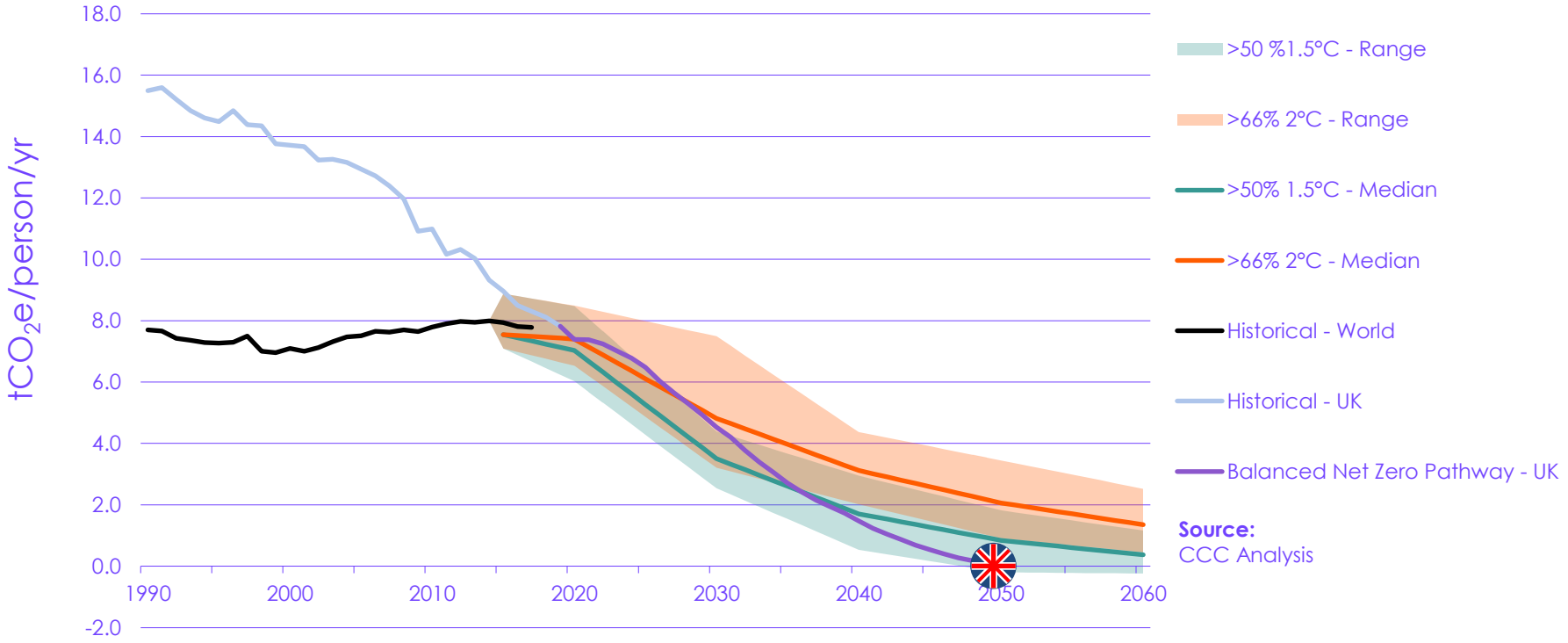
Co-benefits
(e.g. air quality, reduced climate impacts, health)

Clean growth opportunities
(e.g. export of low-carbon goods + services)

Source: CCC analysis.

The UK's contribution to global decarbonisation

UK per person emissions on the balanced path



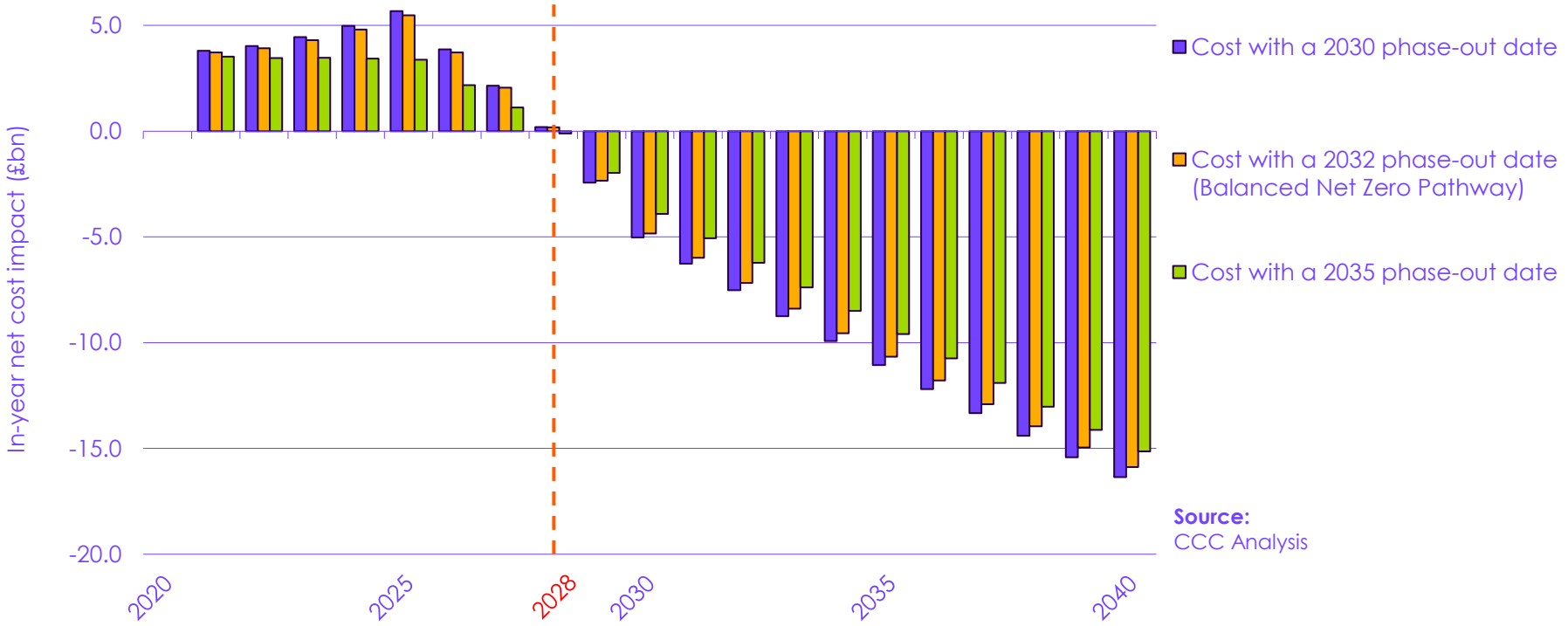
Source:
CCC Analysis

www.theccc.org.uk

@RichardJ_Millar

The impact of innovation

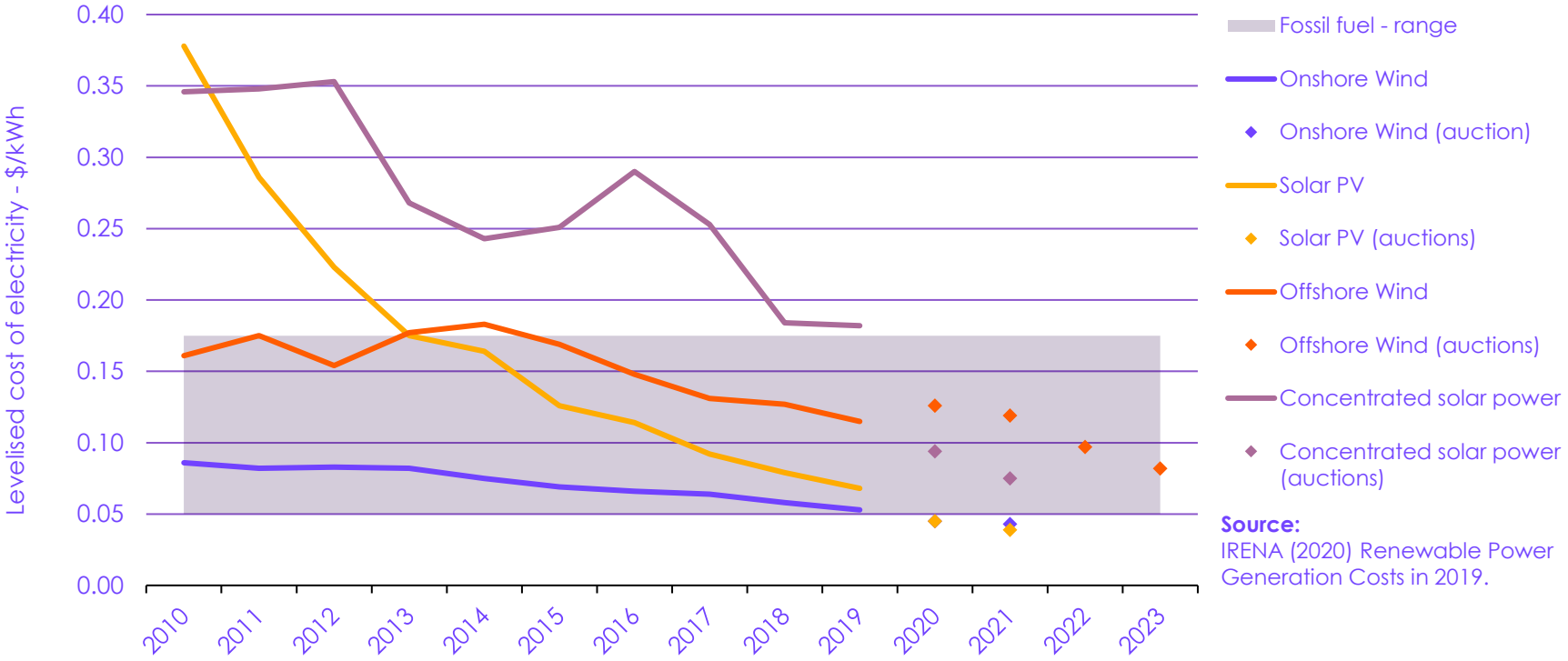
Net cost to the UK economy of the phase-out of fossil-fuelled cars and vans - 2030, 2032, 2035



Source:
CCC Analysis

The impact of innovation

Global average levelised cost of electricity ($2019)

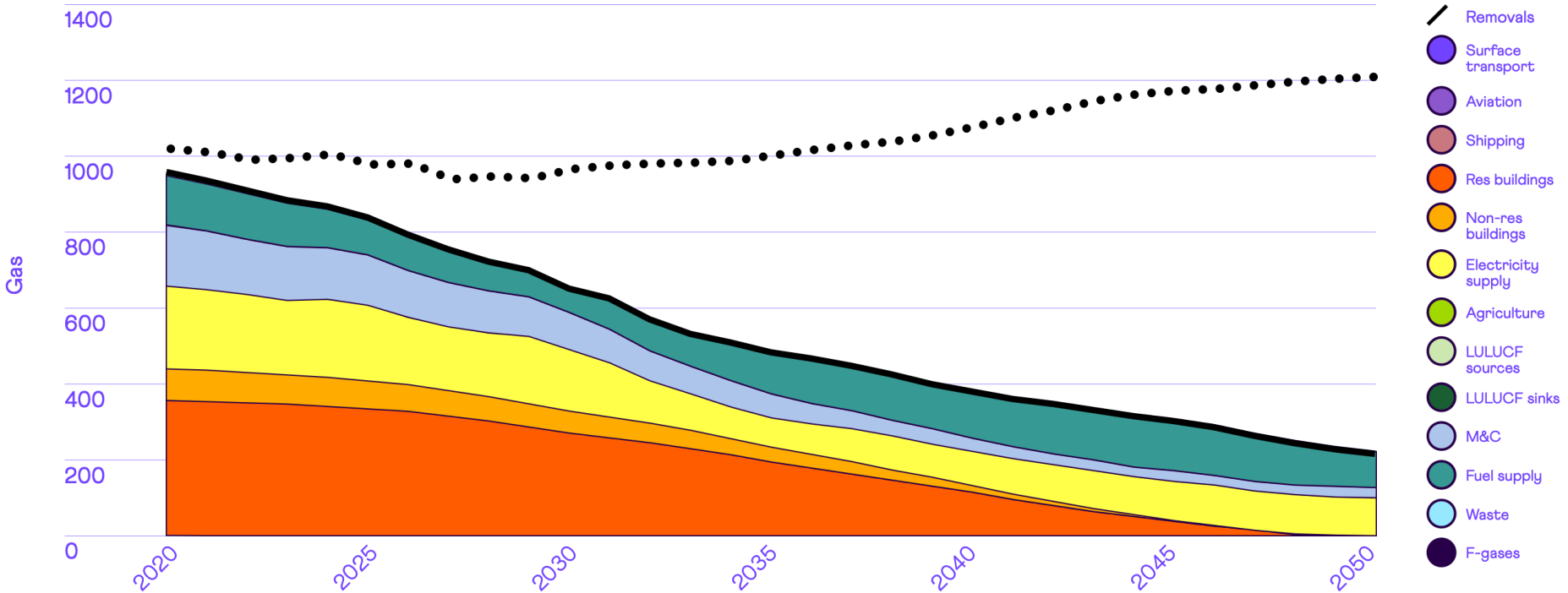


Source:
IRENA (2020) Renewable Power Generation Costs in 2019.

Changes in energy demand

Natural gas (TWh)

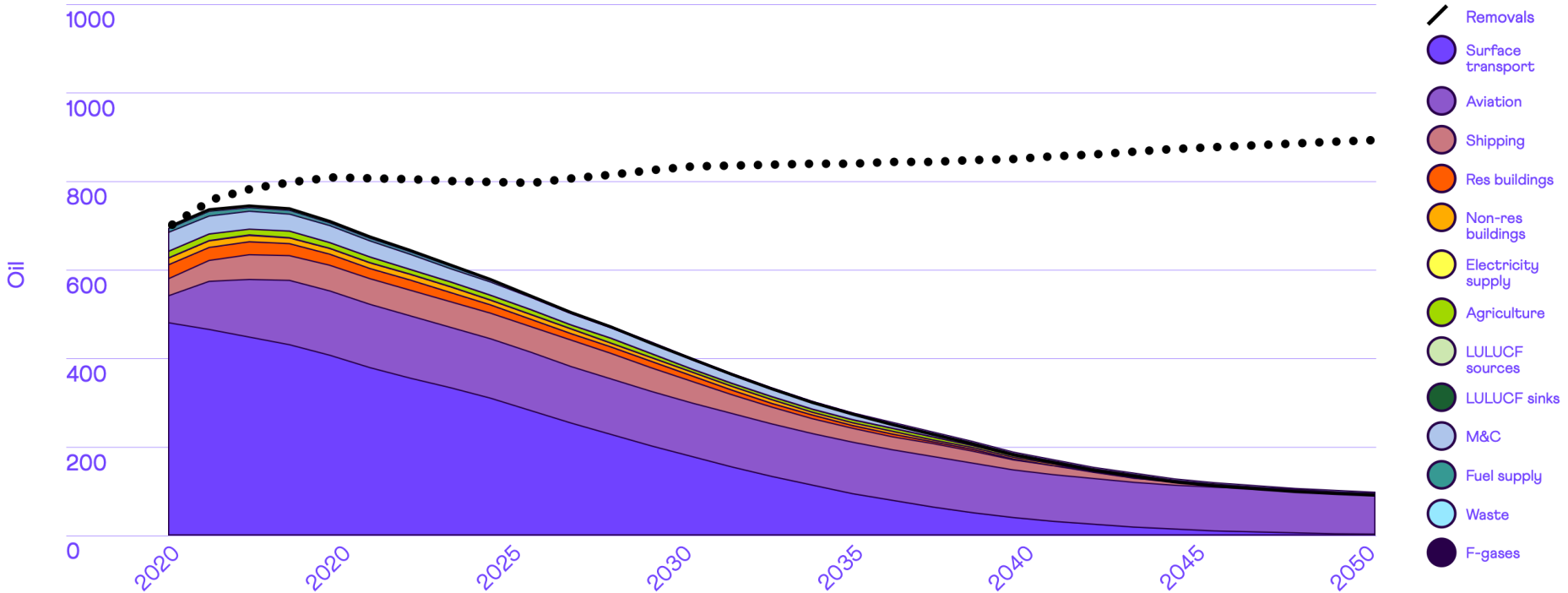
Source:
CCC Analysis



Changes in energy demand

Oil (TWh)

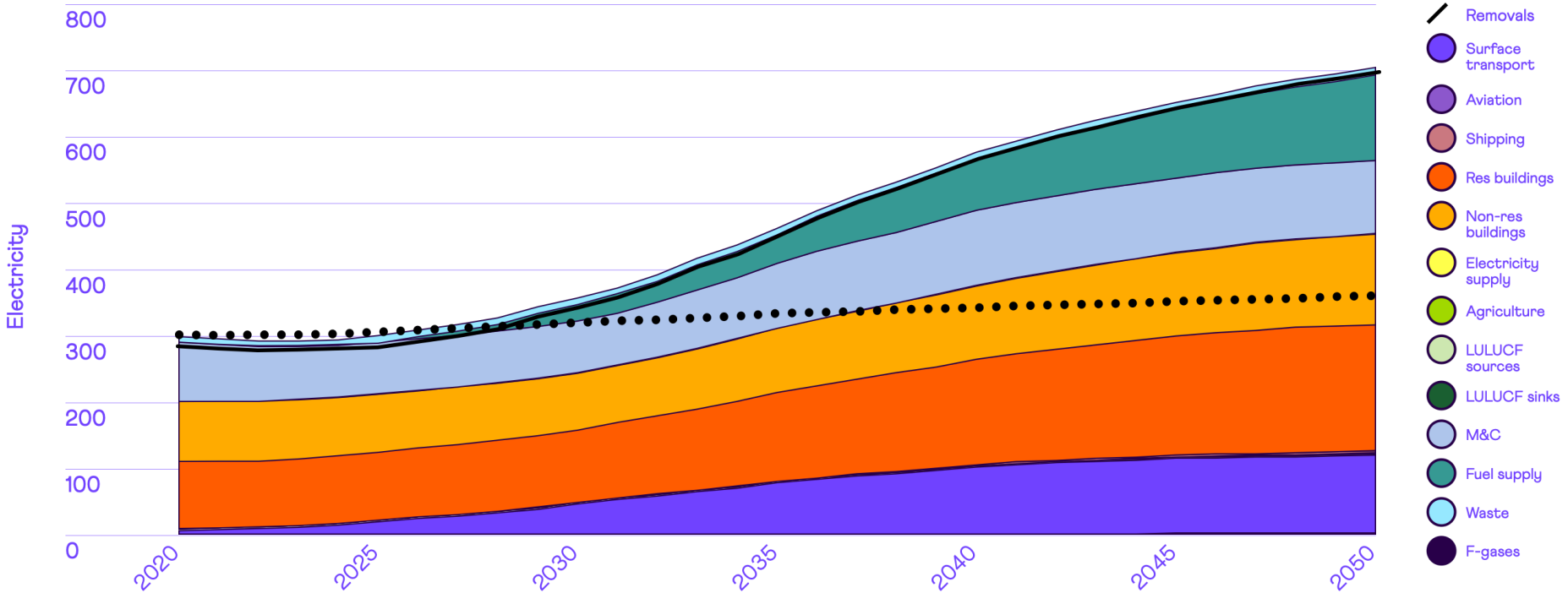
Source:
CCC Analysis



Changes in energy demand

Electricity (TWh)

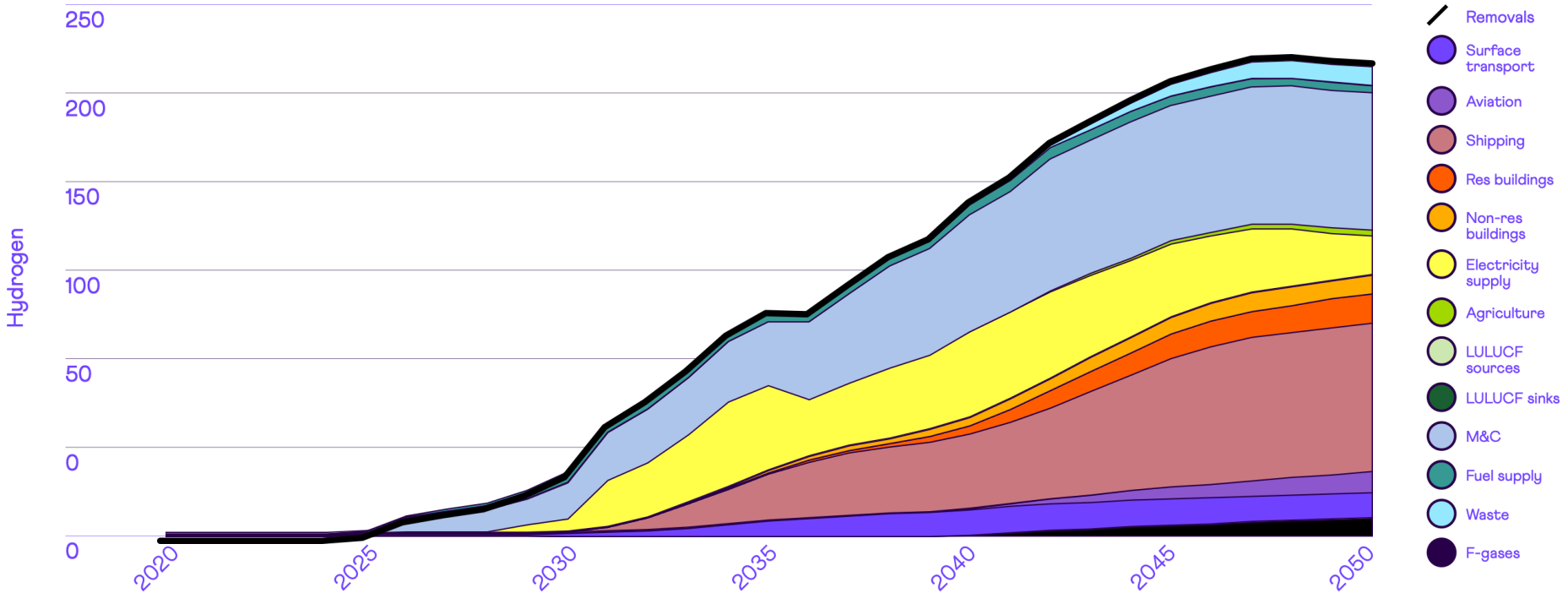
Source:
CCC Analysis



Changes in energy demand

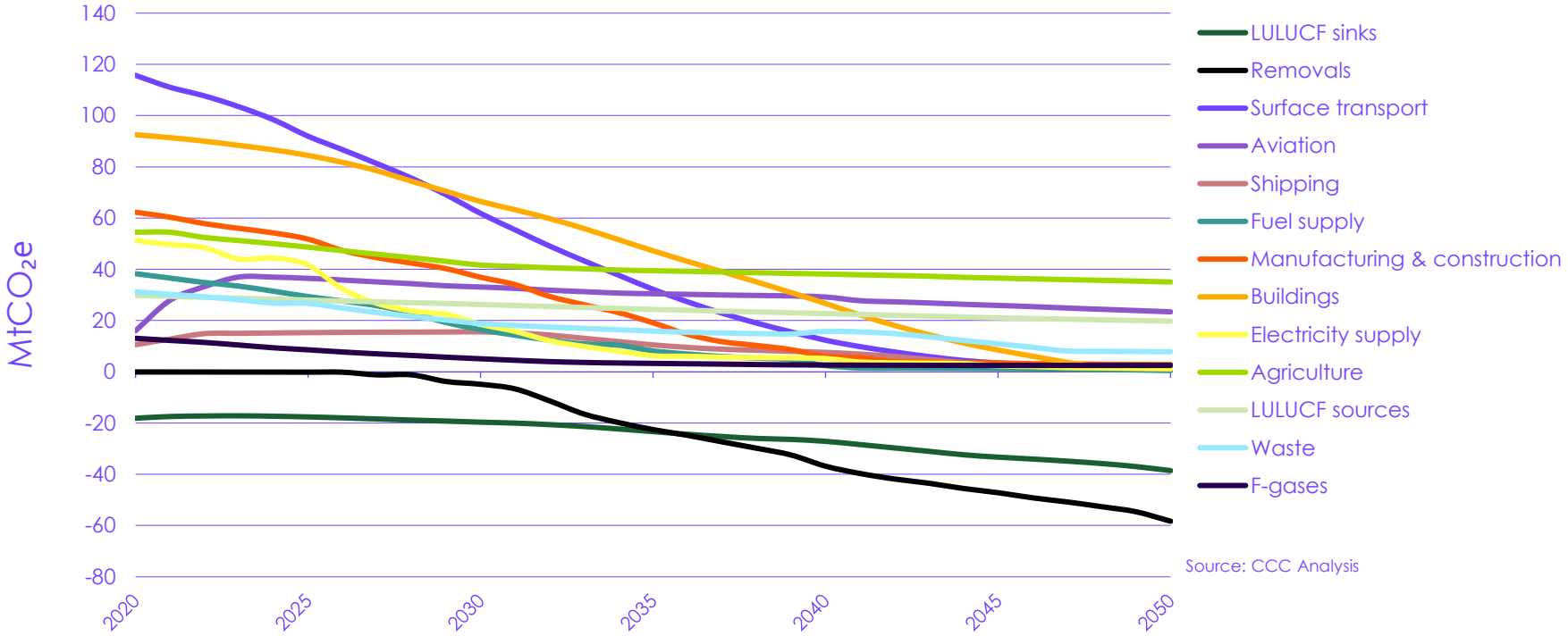
Hydrogen (TWh)

Source:
CCC Analysis



Emissions reductions on the path to Net Zero

Sectoral contributions



Source: CCC Analysis