



3 June 2019

# Net Zero

The UK's contribution to stopping global warming

Committee on Climate Change

## Letter to Lord Deben, October 2018

- “the date by which the UK should achieve a) a net zero greenhouse gas target and/or b) a net zero carbon [dioxide] target in order to contribute to the global ambitions set out in the Paris Agreement”
- “whether now is the right time for the UK to set such a target”
- “the range which UK greenhouse gas emissions reductions would need to be within, against 1990 levels, by 2050 as an appropriate contribution to the global goal of limiting global warming to well below 2°C” and “towards global efforts to limit the increase to 1.5°C”
- “how reductions in line with your recommendations might be delivered in key sectors of the economy”
- “the expected costs and benefits across the spectrum of scenarios in comparison to the costs and benefits of meeting the current target”
- “updated advice on the long-term emissions targets for Scotland and Wales” “provided with regards to the respective devolved statutory frameworks on climate change”

## Sources of evidence





## Science and International context (Chapters 2-4)

- Climate science and international circumstances (Chapter 2)
- An appropriate UK contribution to the global effort (Chapter 3)
- Supporting increased global ambition (Chapter 4)



## Reaching net-zero emissions in the UK (Chapters 5-7)

- Reaching net-zero emissions in the UK (Chapter 5)
- Delivering a net-zero emissions target for the UK (Chapter 6)
- Costs and benefits of a net-zero target for the UK (Chapter 7)



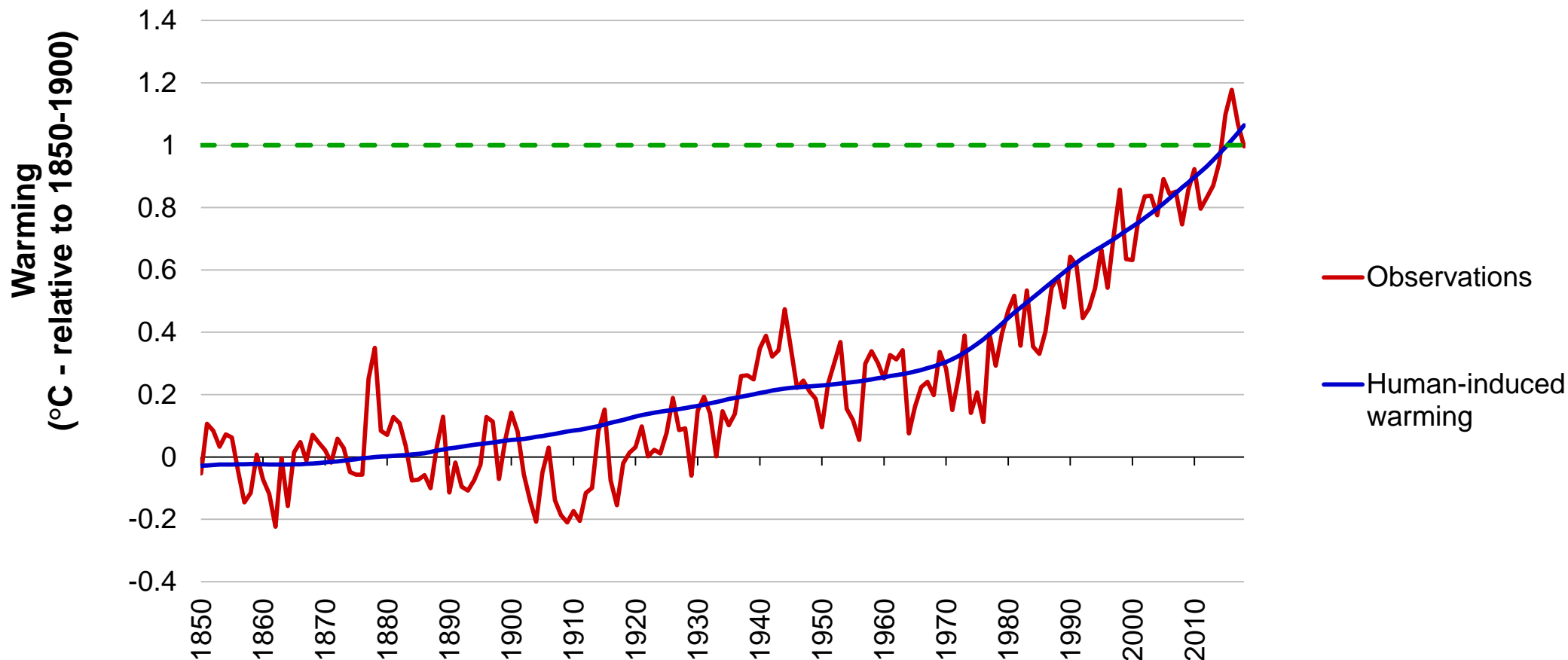
## Recommendations (Chapter 8)

# 1) Science and international context

Climate science and international circumstances

# The world is warming due to human influence and has already reach 1°C above preindustrial levels

## Observed and human-induced warming



The Paris Agreement refers to a range of temperature outcomes. It needs to be interpreted for setting national long-term targets

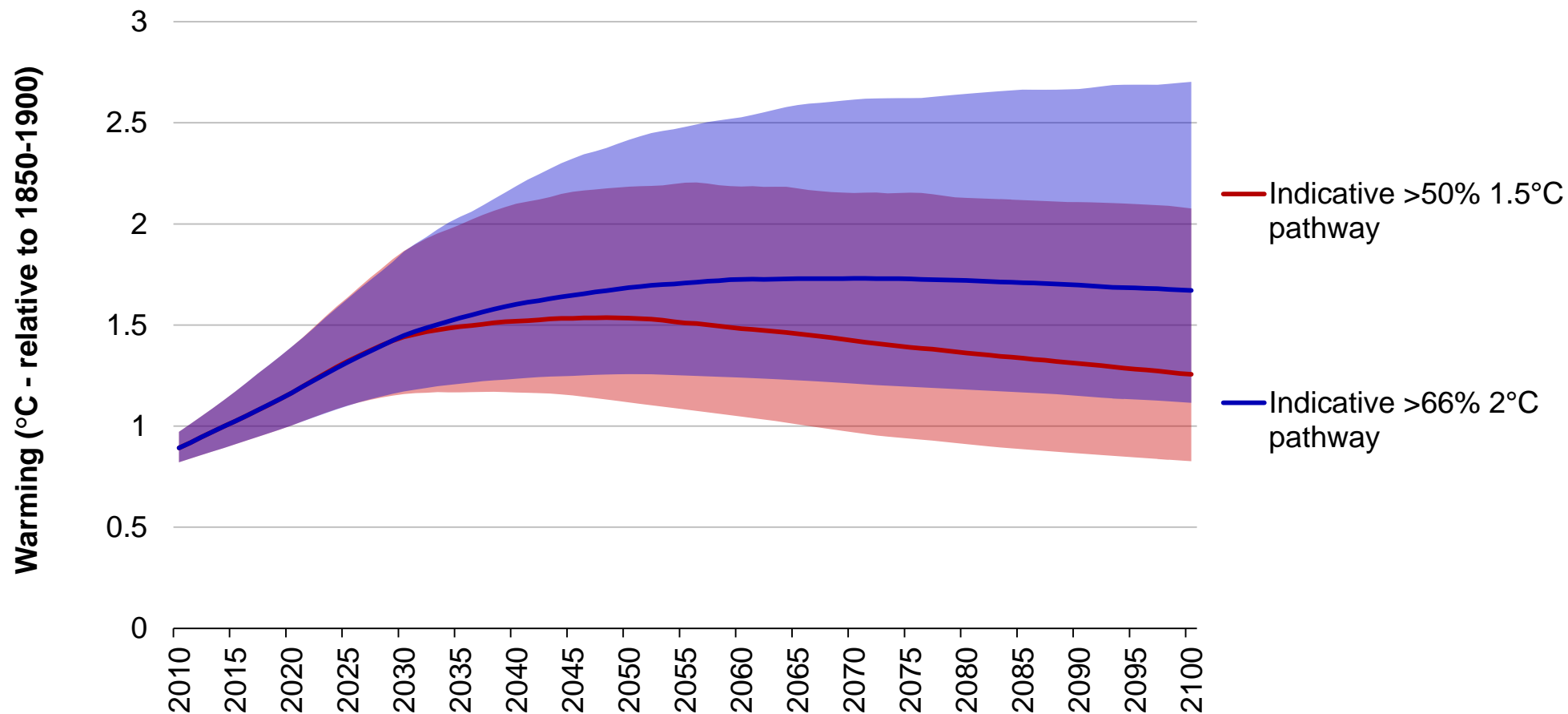
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**Paris Agreement long-term temperature goal:**

... holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change.

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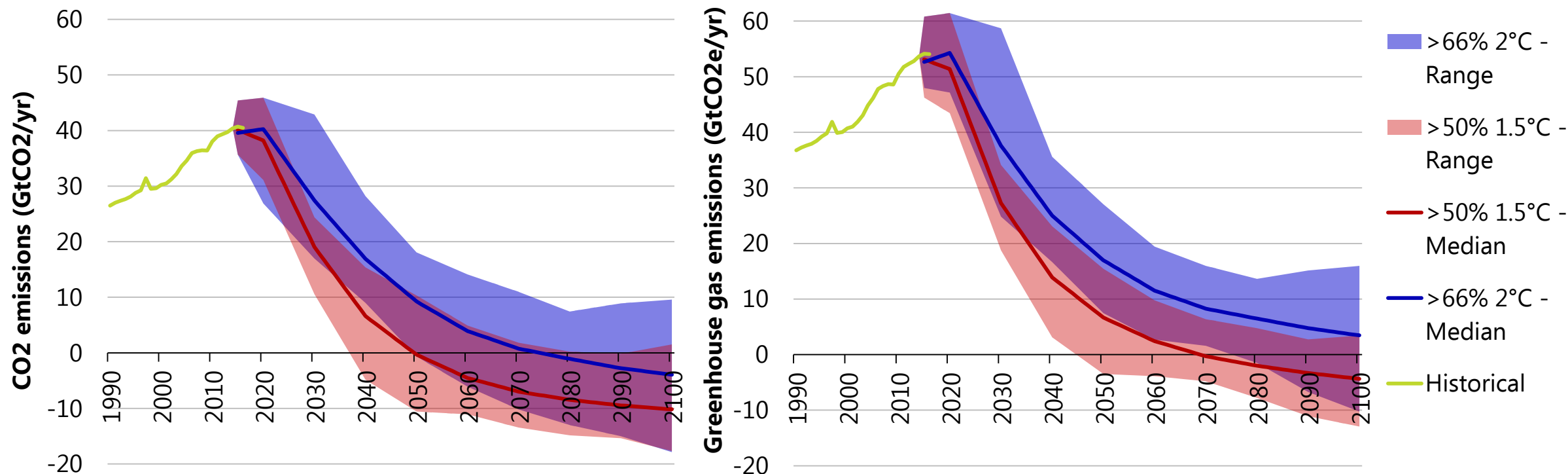
### Observed and human-induced warming





# Global emissions pathways consistent with Paris show declining CO<sub>2</sub> emissions rapidly to net-zero

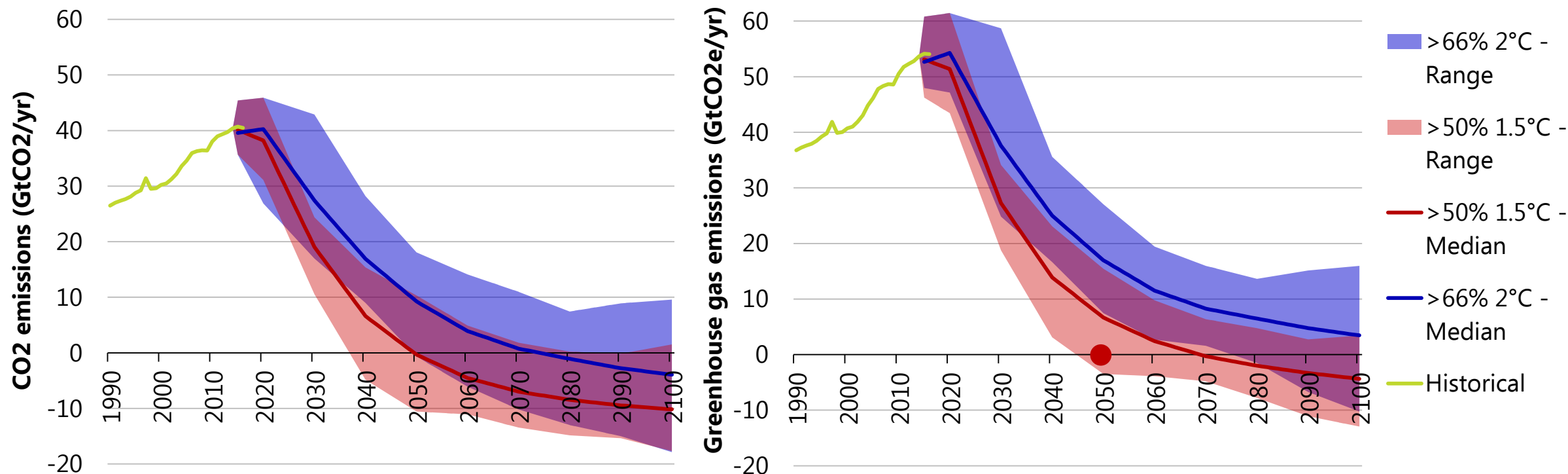
## Global emissions pathways consistent with Paris CO<sub>2</sub> (left) Aggregated GHGs (right)



**Source:** Huppmann, D. et al. (2018) A new scenario resource for integrated 1.5°C research.

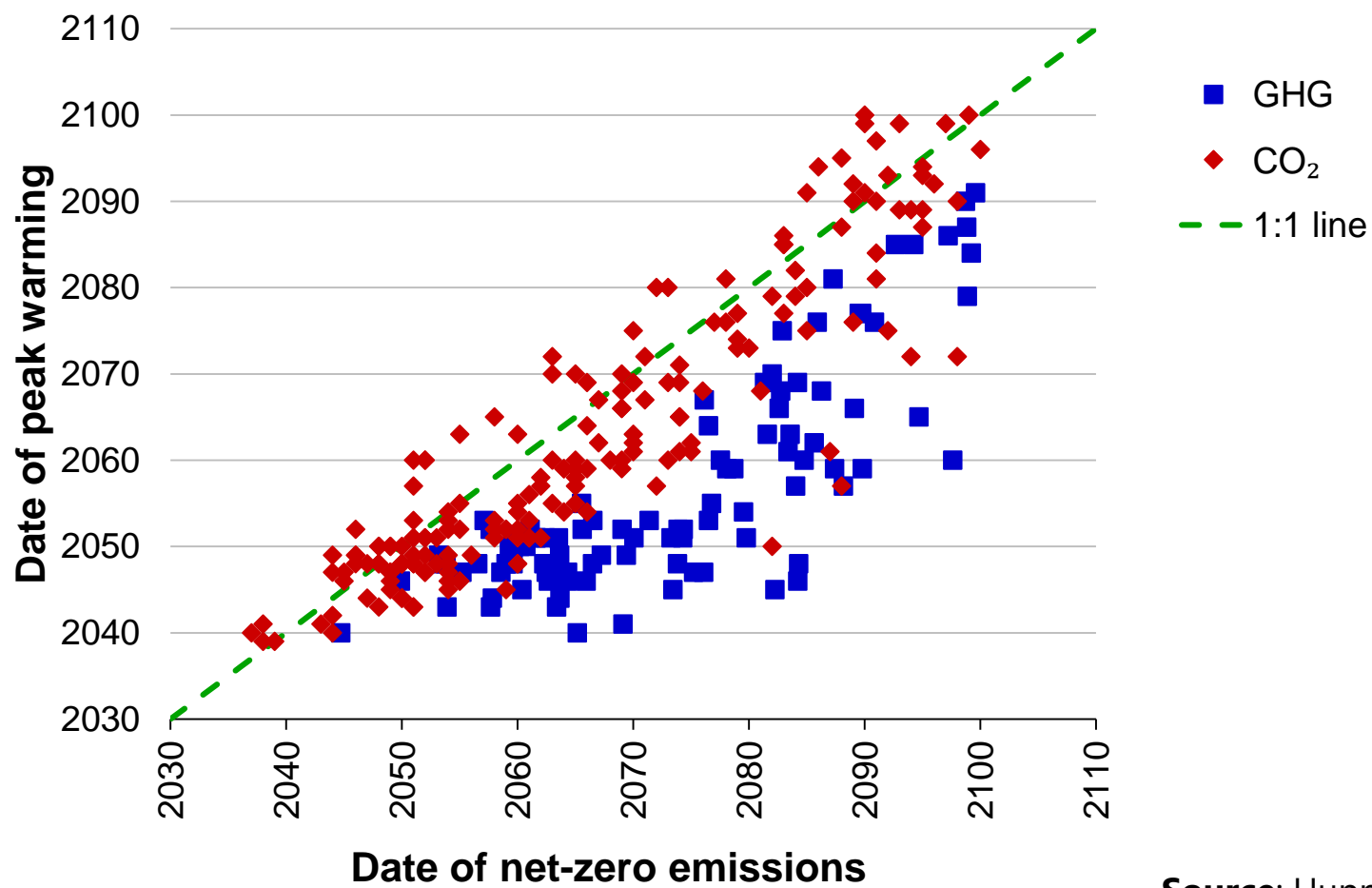
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## Global emissions pathways consistent with Paris CO<sub>2</sub> (left) Aggregated GHGs (right)



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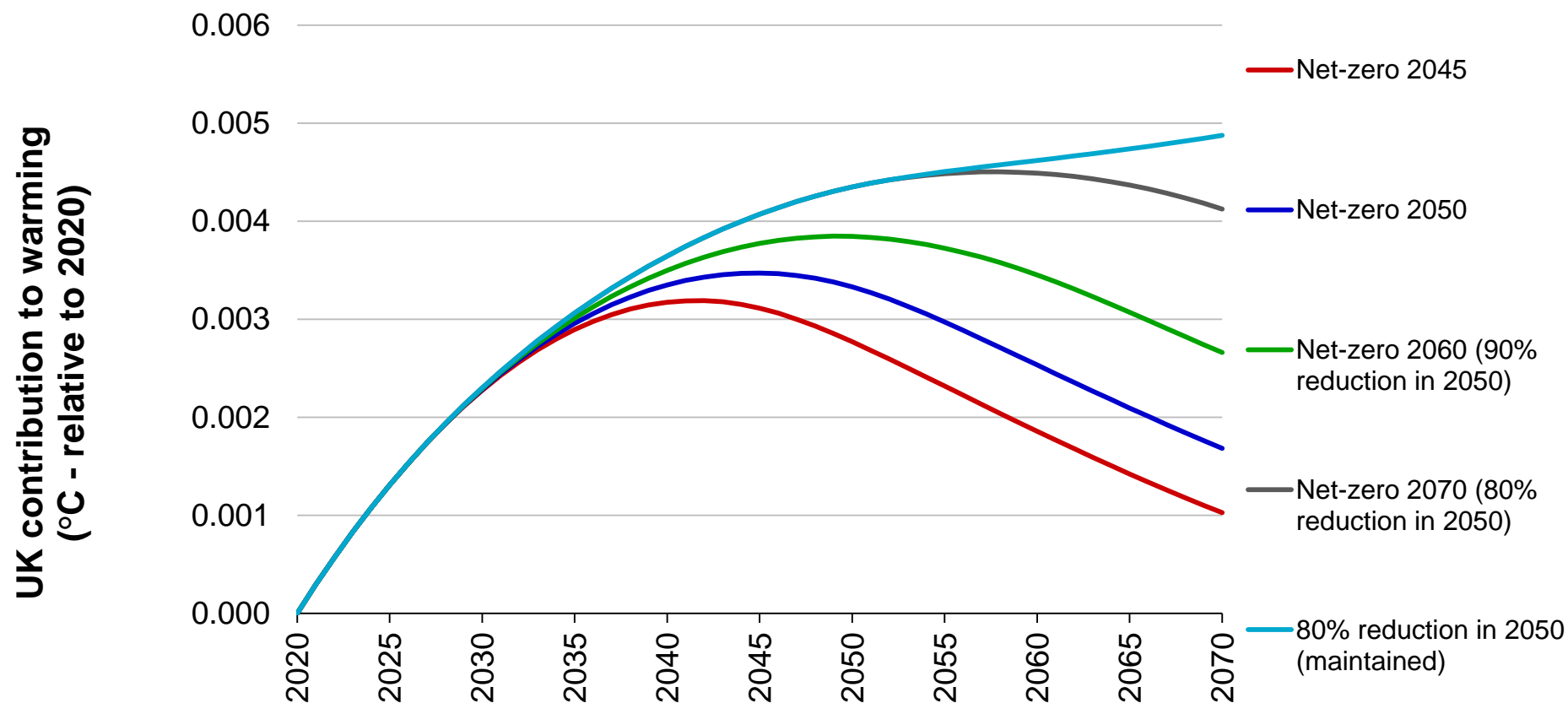
# Timing of peak warming is much more closely connected to the timing of net-zero CO<sub>2</sub> than for all GHGs



**Source:** Huppmann, D. et al. (2018) A new scenario resource for integrated 1.5°C research.

# Reaching net-zero GHG will end the UK's impact on global warming

## UK impact on global temperature under hypothetical future emissions pathways



Source: CCC Analysis

# 1) Science and international context

An appropriate UK contribution to the global effort



# A revised UK long-term emissions target should reflect the structure of the Paris Agreement

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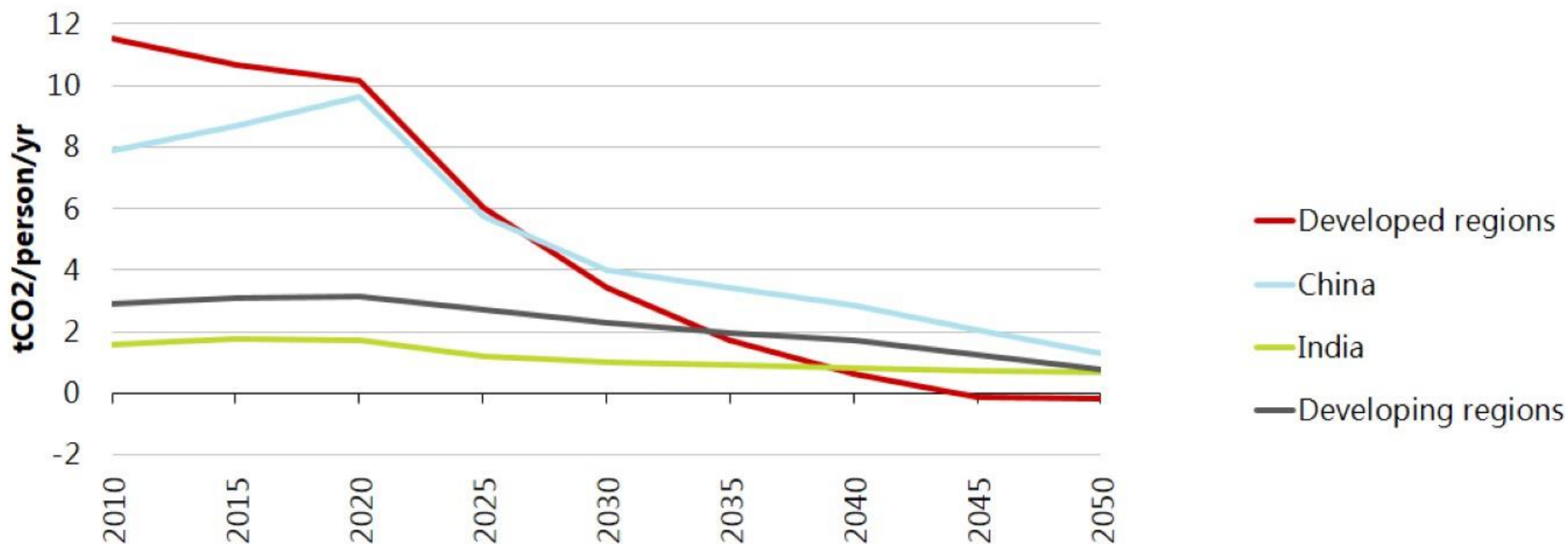
## **Key features of the Paris Agreement:**

- Largely 'bottom-up' structure. Emissions allowances are not and will not be allocated centrally to countries
- Reductions to be set according to 'highest possible ambition'
- Equity and fairness remain core principles, developed countries are expected to take the lead.

# Science and international context

## Appropriate UK contribution to global emissions pathways

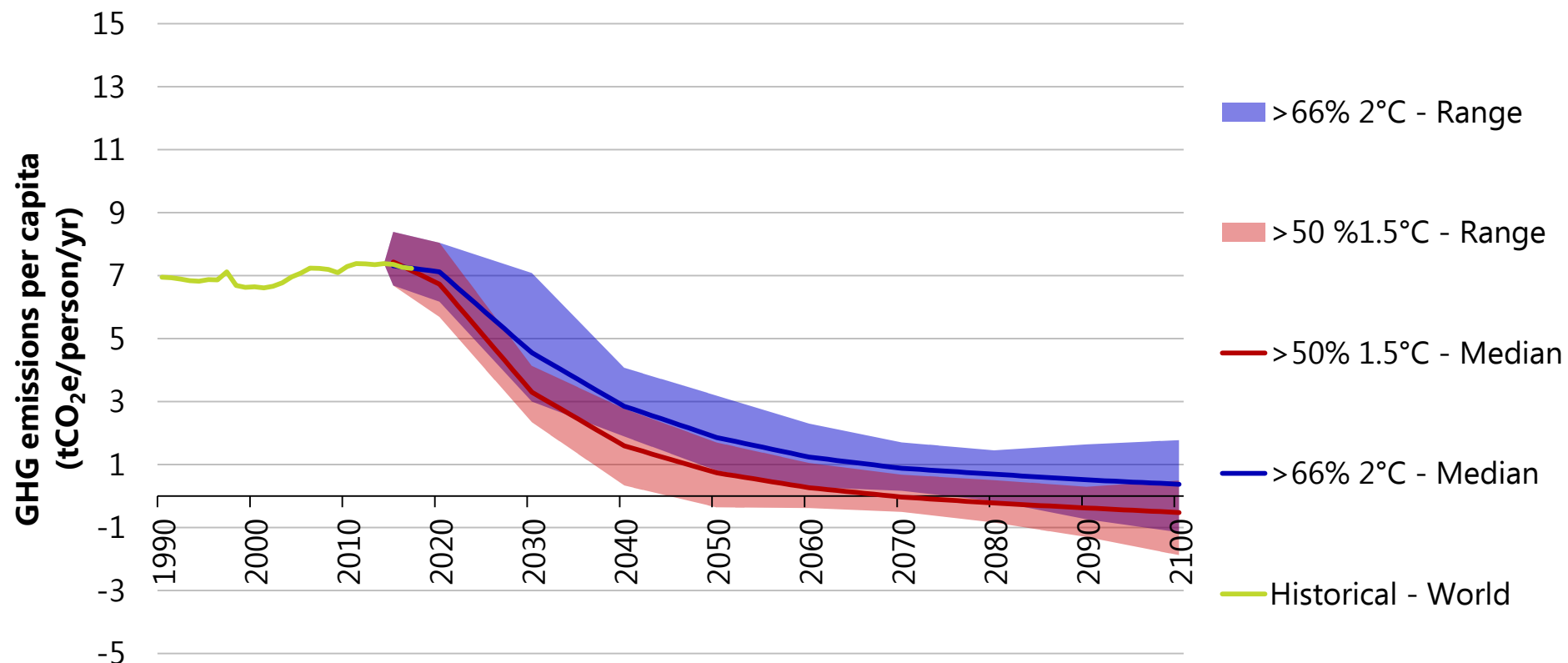
**Per capita CO<sub>2</sub> emissions (2010-2050)**  
**'Leadership-driven' scenario consistent with limiting global warming to well below 2°C**



**Source:** UCL (2019) Modelling 'leadership-driven' scenarios of the global mitigation effort

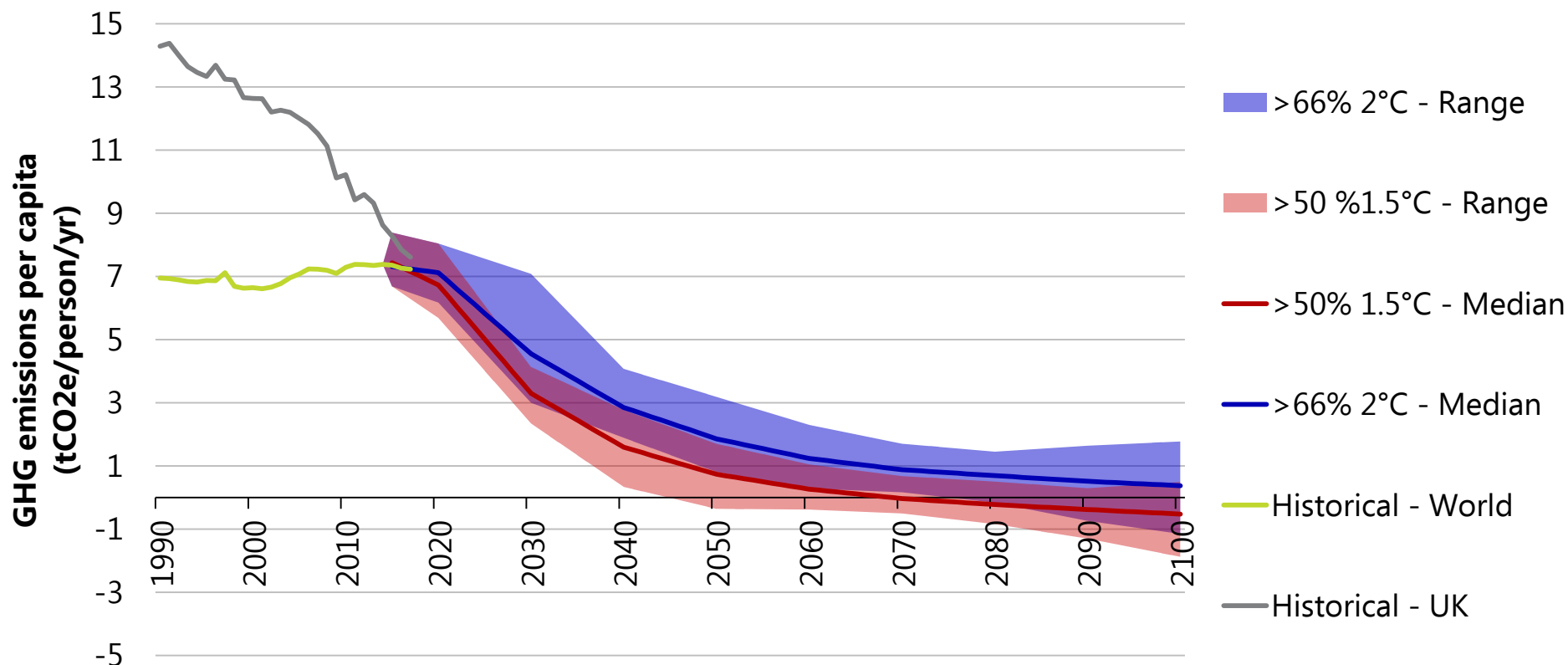
# Historical rates of per person emissions reduction in the UK have been similar to what is required from world as a whole

## Evolution of global per capita emissions over time



# Historical rates of per person emissions reduction in the UK have been similar to what is required from world as a whole

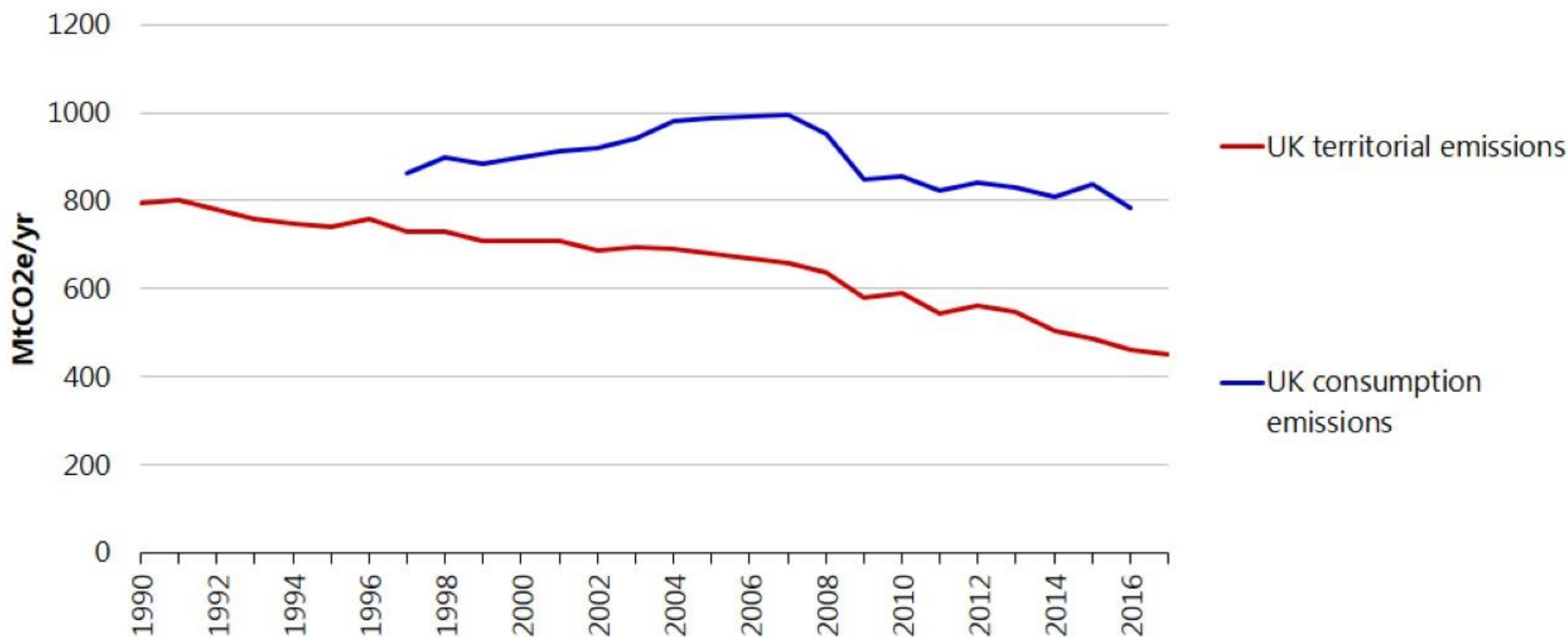
## Evolution of global per capita emissions over time



# Science and international context

## Appropriate UK contribution to global emissions pathways

### Historical consumption emissions in the UK



**Source:** CCC analysis; Defra (2019) UK's carbon footprint; BEIS (2019) Final UK greenhouse gas emissions national statistics: 1990-2017.















# 1) Science and international context

Supporting increased global ambition

# Science and international context

## Supporting increased global ambition

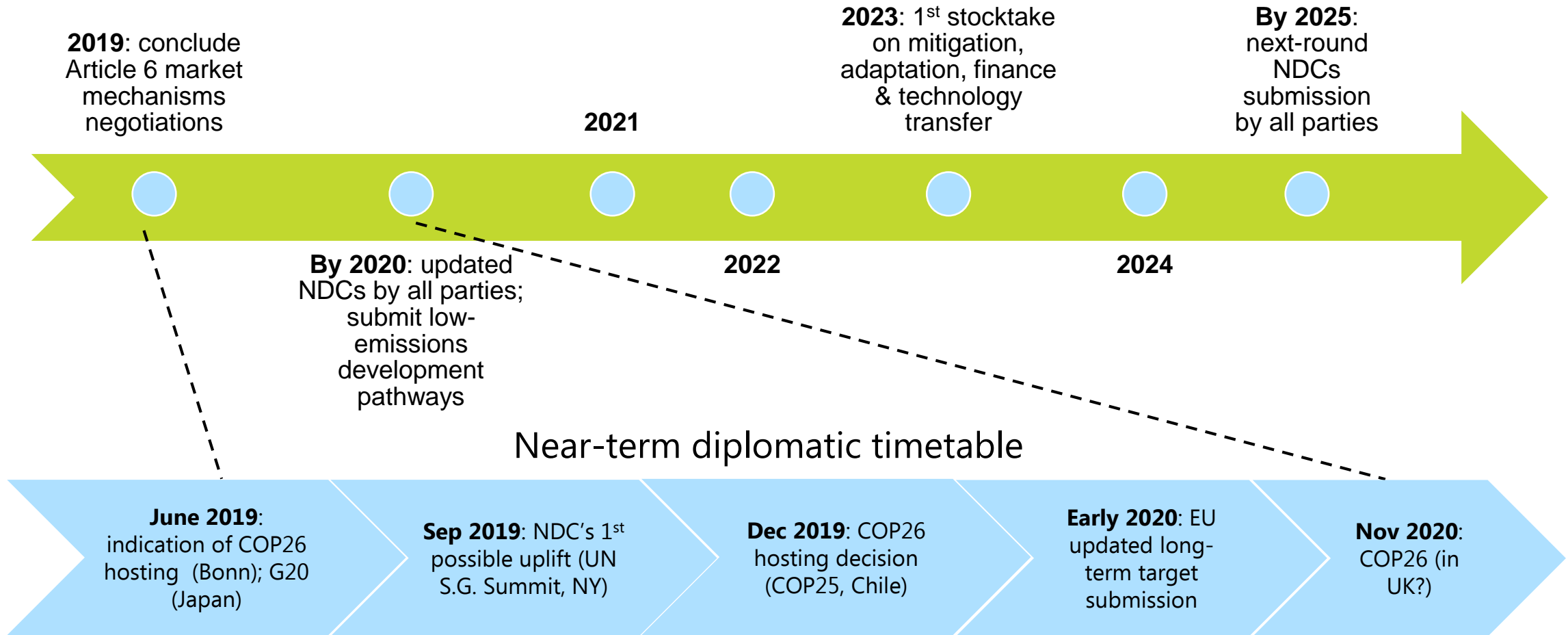
	Net-zero: CO <sub>2</sub> or GHGs	Date to achieve target by	Formality	International offsetting?	International aviation & shipping?
<b>Proposed UK target</b>	GHGs 	2050	To be legislated in Climate Change Act		
<b>Net-zero targets under consideration</b>					
European Union	GHGs 	2050	Proposed by European Commission		
France	GHGs 	2050	Bill - not yet legislated		
New Zealand	To decide 	2050	Bill - currently being drafted		

# Science and international context

## Supporting increased global ambition

	Net-zero: CO <sub>2</sub> or GHGs	Date to achieve target by	Formality	International offsetting?	International aviation & shipping?
<b>Net-zero targets that have been adopted</b>					
California	Unclear 	2045	Executive Order		
Sweden	GHGs 	2045	Legislation		
Denmark	Unclear 	2050	Legislation		
Norway	GHGs 	2030	Binding Agreement		

# A UK net-zero target would support raising international ambition ahead of the UN climate summit in September



## 2) Reaching net-zero emissions in the UK

UK scenarios



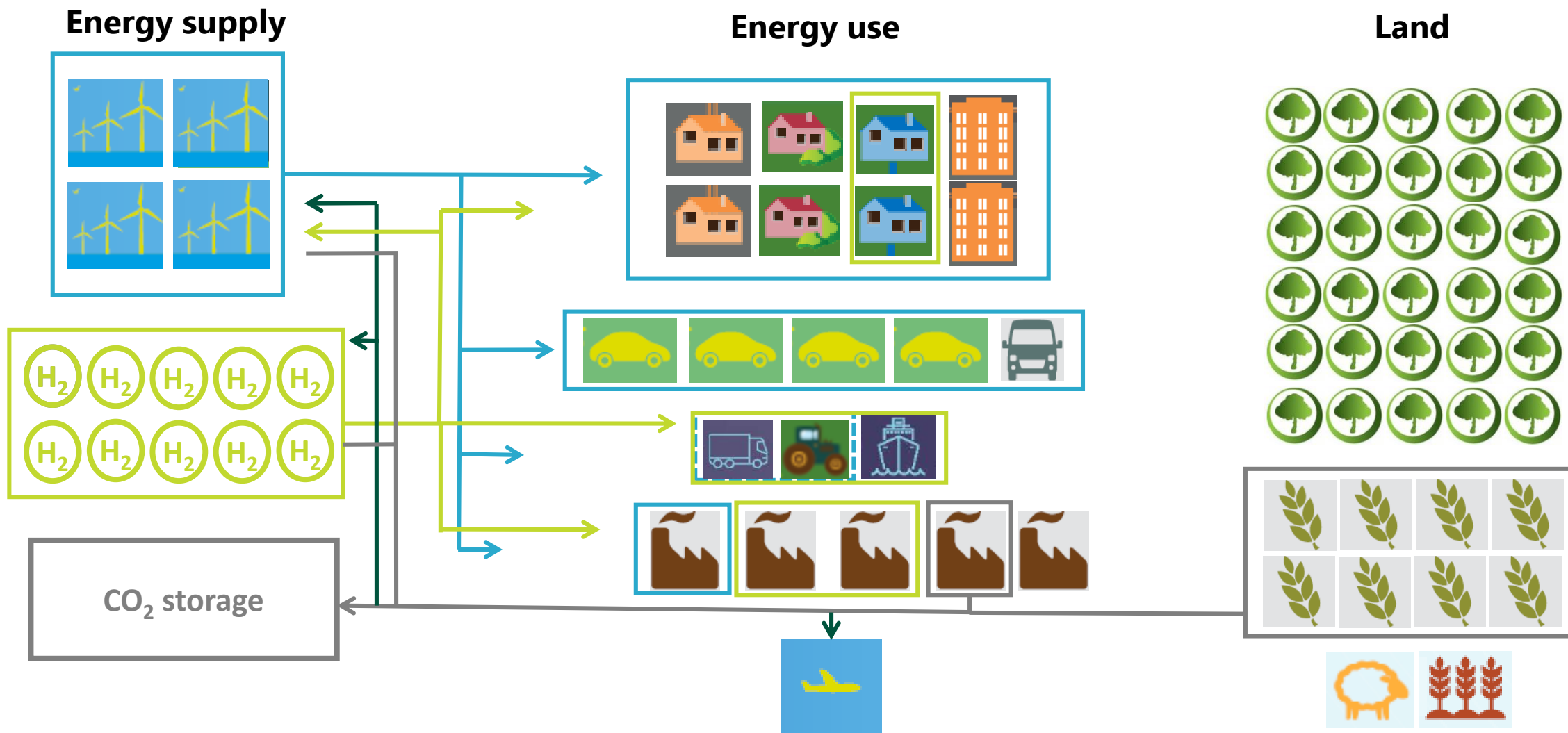
There is a range of technologies and behaviour changes that can help reduce emissions.

We split these into 'Core', 'Further Ambition' and 'Speculative' options:

- **Core** options are low-cost, low-regret options that make sense under most strategies to meet the current 80% 2050 target
- **Further Ambition** options are more challenging and generally more expensive than the Core options
- **Speculative** options currently have very low levels of technology readiness, very high costs, or significant barriers to public acceptability

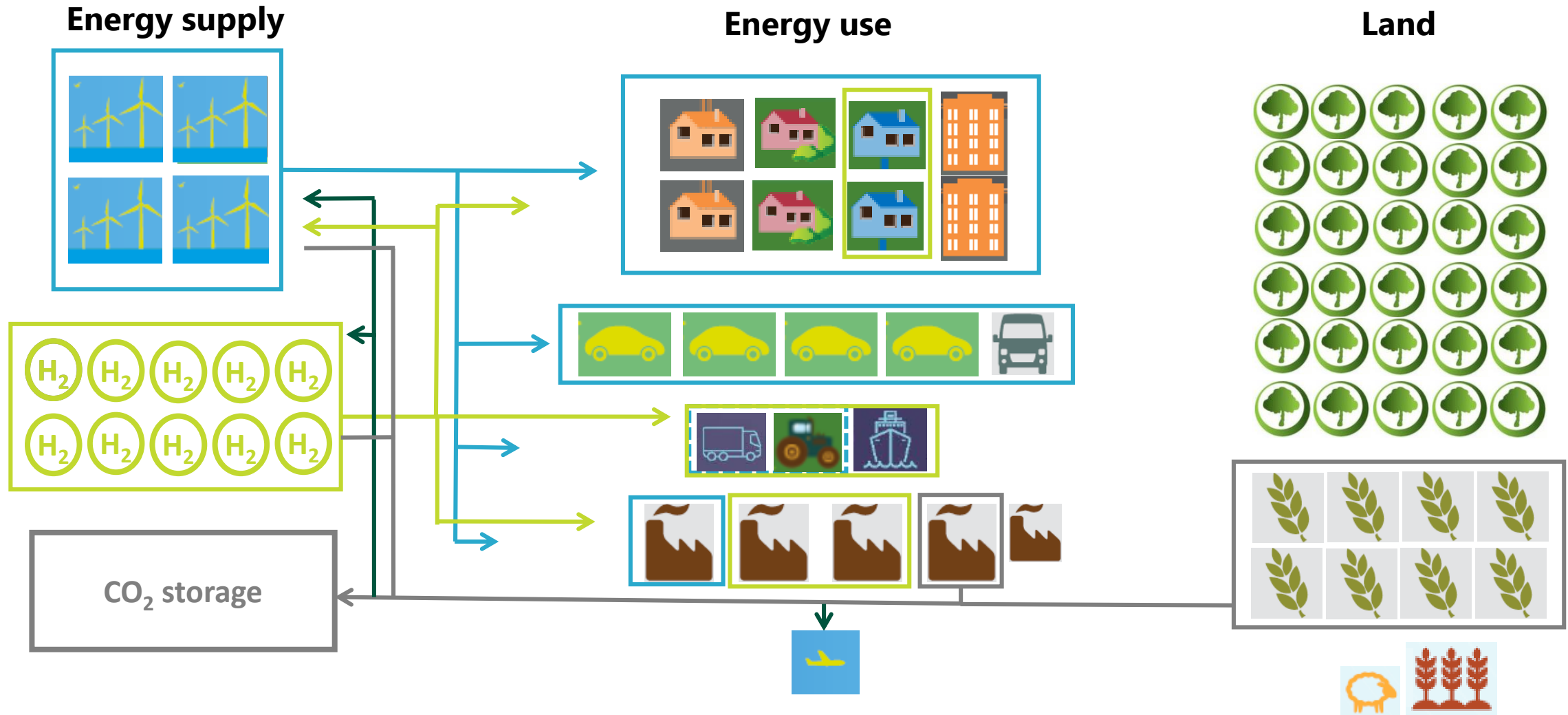
# Reaching net-zero emissions in the UK

## How UK net-zero scenarios can be delivered



# Reaching net-zero emissions in the UK

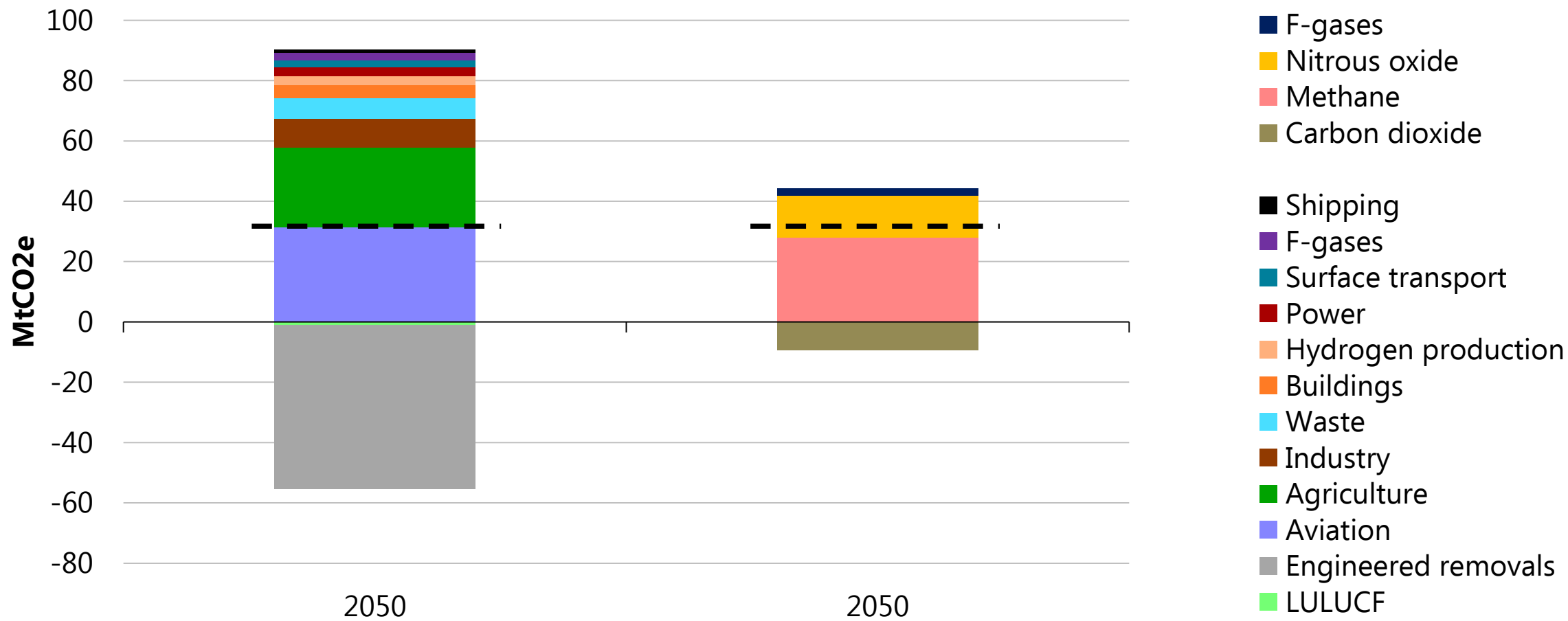
## How UK net-zero scenarios can be delivered



# Reaching net-zero emissions in the UK

## Remaining emissions in the Further Ambition scenario

**Remaining emissions by sector (left) and type of gas (right)**

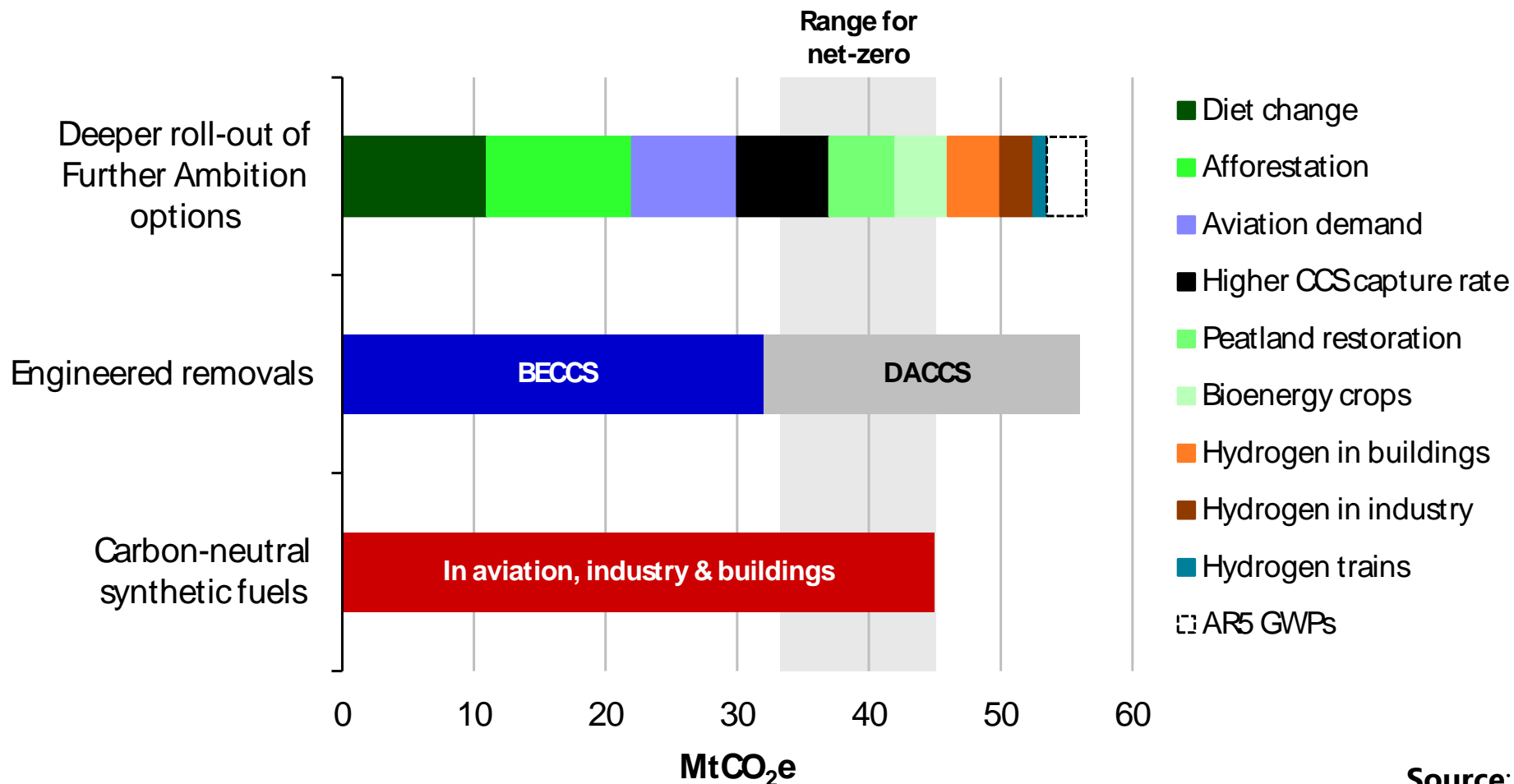


**Source:** CCC analysis

# Reaching net-zero emissions in the UK

## A mix of Speculative options is likely to be needed

### Additional abatement potential from Speculative options in 2050



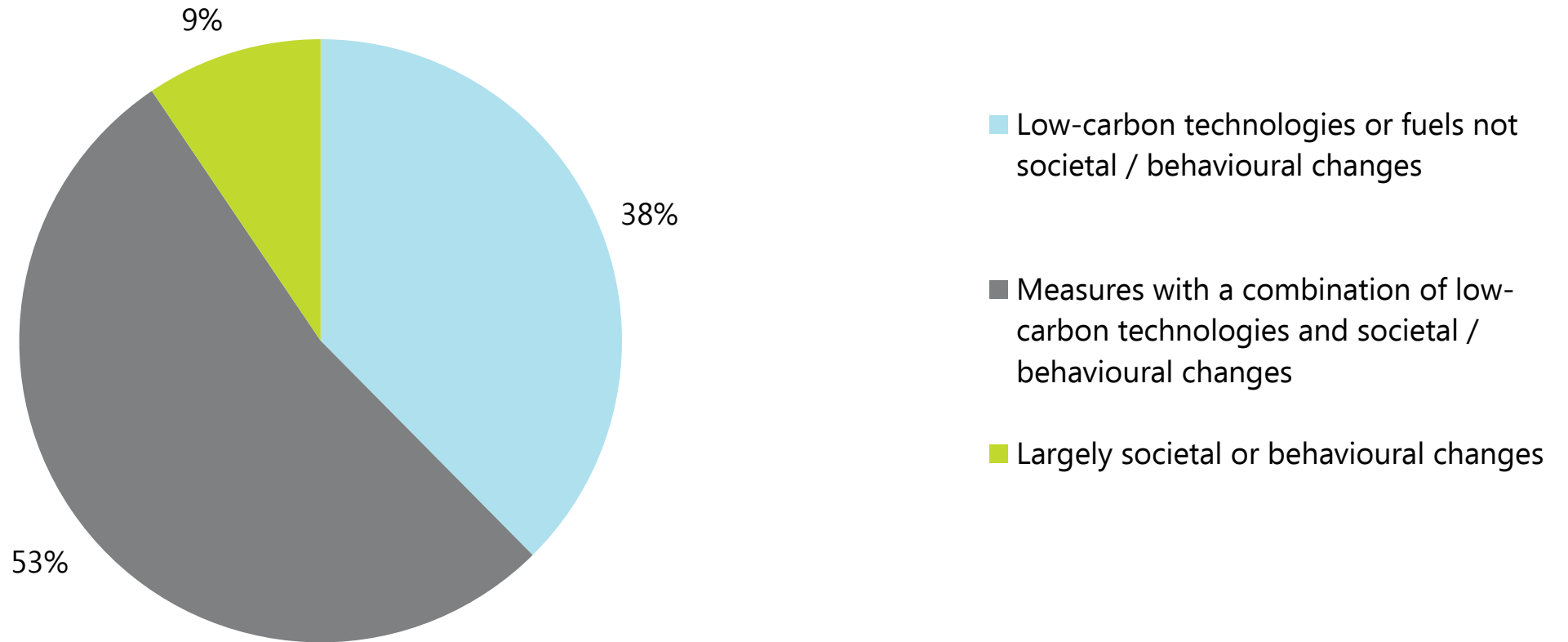
Source: CCC analysis



# Reaching net-zero emissions in the UK

## People need to be engaged

### Role of societal and behavioural changes



**Source:** CCC analysis

## 2) Reaching net-zero emissions in the UK

Costs and benefits

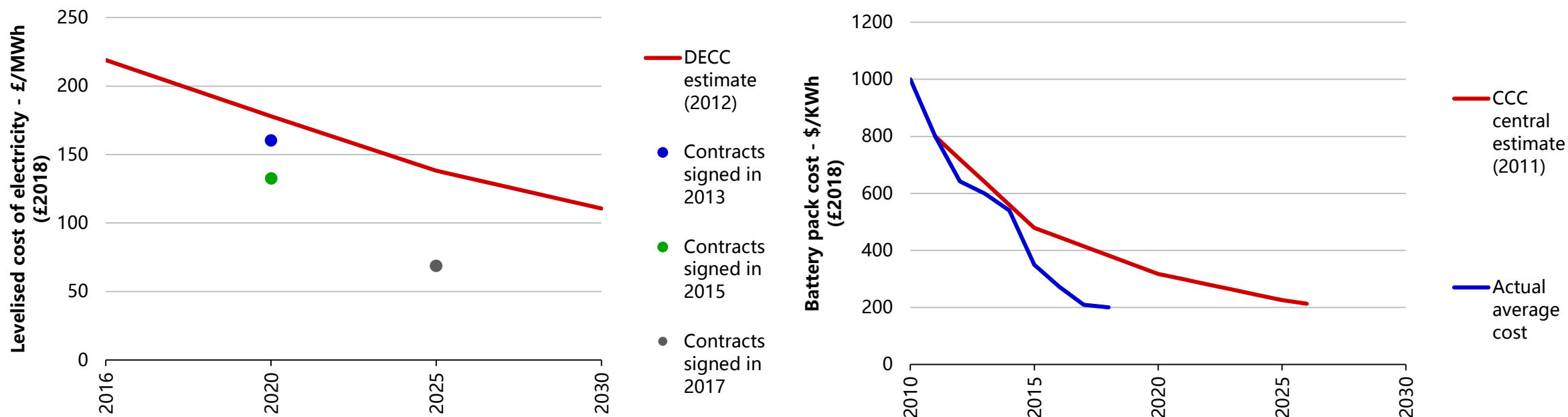
# Reaching net-zero emissions in the UK

## Costs are far lower than we imagined

### The importance of innovation

#### Costs of example low-carbon technologies compared to past projections

##### Offshore wind (left) Battery packs for electric vehicles (right)

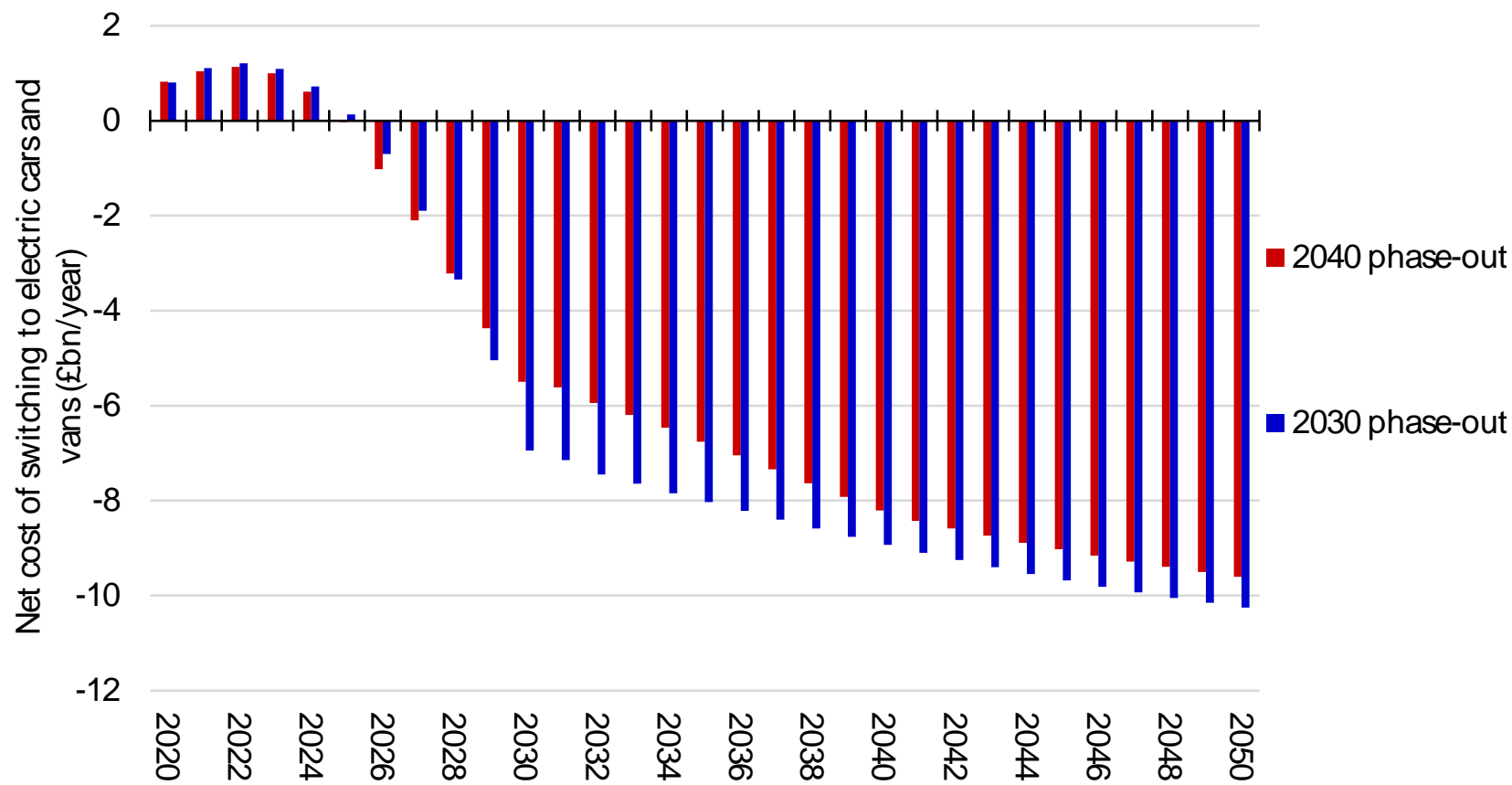


**Source:** Offshore wind costs, CCC analysis based on DECC (2012) Electricity generation costs and LCCC (2019) CfD register. Battery forecasts, CCC (2015) Sectoral scenarios for the 5<sup>th</sup> Carbon Budget, outturn costs from BNEF (2018) Electric cars to reach price parity by 2022

# Reaching net-zero emissions in the UK

## The sooner we switch to electric vehicles the better

### A 2030 switchover to electric vehicles would save more money than a 2040 switchover



Source: CCC analysis

# Reaching net-zero emissions in the UK

## No extra cost than already expected

More effort ↓	2050 target (v 1990)	Estimated cost	↓ Same cost
	2003: -60% CO <sub>2</sub>	0.5-2.0% of GDP	
	2008: -80% GHG	1-2% of GDP	
	Now: -100% GHG	1-2% of GDP	



**Co-benefits**



**Clean Growth**

## 3) Recommendations





- **The UK should legislate as soon as possible to reach net-zero greenhouse gas emissions by 2050.** The target can be legislated as a 100% reduction in greenhouse gases (GHGs) from 1990 and should cover all sectors of the economy, including international aviation and shipping. The Climate Change Act continues to offer appropriate governance.
- The aim should be to meet the target **through UK domestic effort**, without relying on international carbon units (or 'credits').
- **Now is the right time to set a net zero target..** It is technically possible, based on current consumer behaviours and known technologies, with prudent assumptions over cost reduction.
- **An earlier date should not be set at this stage.** Some sectors could reach net zero earlier, but for most sectors 2050 appears to be the earliest credible date, to give time to develop speculative options as alternatives for any shortfalls. Avoiding the need for early capital scrappage or punitive policies.
- **The target is an appropriate contribution to the Paris Agreement.** The UK can benefit from the international influence of setting a bolder target, using it as an opportunity for further positive international collaboration.
- **Wales should set a target for a 95% reduction in emissions by 2050 relative to 1990.** Wales has less opportunity for CO<sub>2</sub> storage and relatively high agricultural emissions that are hard to reduce. On current understanding it could not credibly reach net-zero GHGs by 2050.
- **Scotland should aim for net-zero greenhouse gas emissions by 2045.** Scotland has proportionately greater potential for emissions removal than the UK overall and can credibly adopt a more ambitious target. Interim targets should be set for Scottish emissions reductions (relative to 1990) of 70% by 2030 and 90% by 2040.



- **Net zero target is only credible if policy to reduce emissions ramps up significantly**
  - The target can only be delivered with a strengthening of policy to deliver emissions reductions across all levels and departments of government. This will require strong leadership at the heart of Government. Delivery must progress with far greater urgency.
  - Policies must be designed with businesses and consumers in mind. They must be stable, long-term and investable. The public must be engaged, and other key barriers such as low availability of necessary skills must be addressed.
  - Report emphasises previous CCC recommendations for: Heating buildings; CCS; Electric vehicles; Agriculture; Waste; Low Carbon Power.
  - With new recommendations for stronger approaches to: Industry; land use; HGVs; aviation and shipping; and GHG removals.
- **Overall costs are manageable, but must be fairly distributed.** Rapid cost reductions during mass deployment for key technologies mean that net zero can be met at an annual resource cost of up to 1-2% of GDP to 2050, the same cost as the previous expectation for an 80% reduction from 1990.
- **HM Treasury should undertake a review of how the transition will be funded and where the costs will fall.** It should develop a strategy to ensure this is, and is perceived to be, fair. A broader strategy will also be needed to ensure a '**just transition**' across society, with vulnerable workers and consumers protected.

