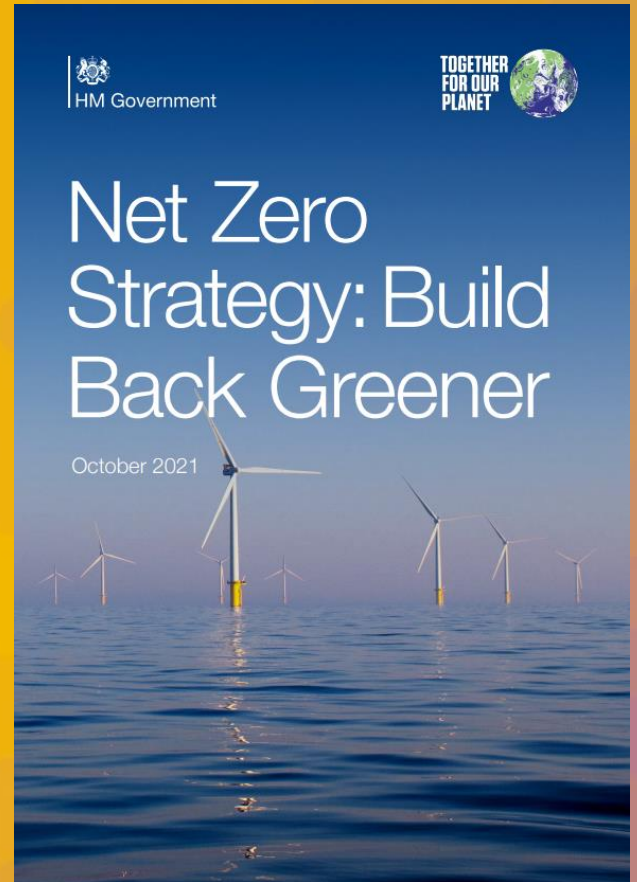


4th April 2022

# The UK's Net Zero strategy

Emily Nurse, UCL (Climate Change Committee)

IOP conference, RAL



## My journey into climate policy



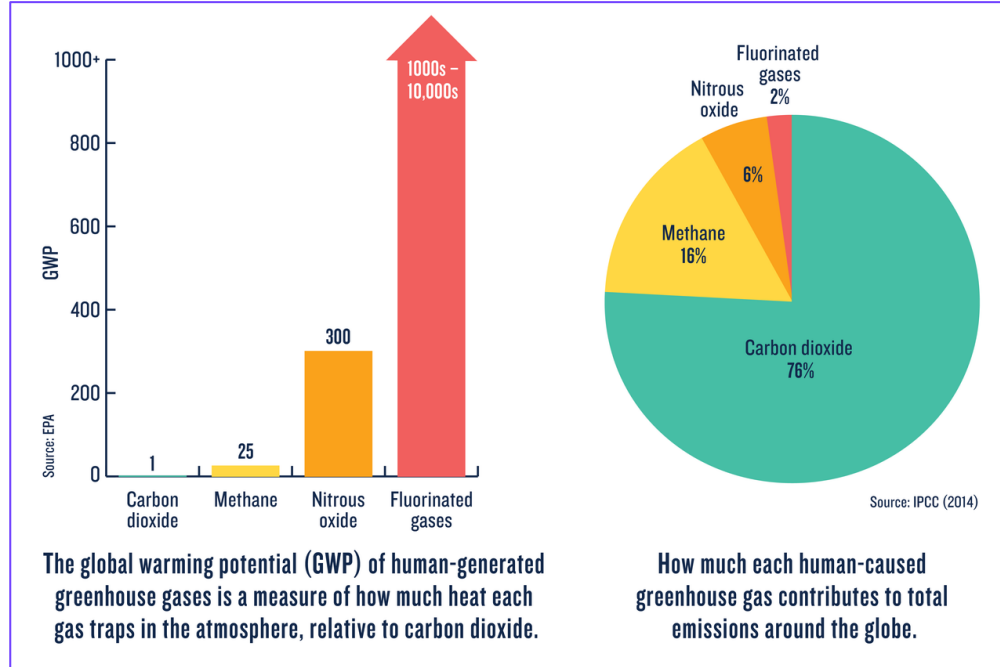
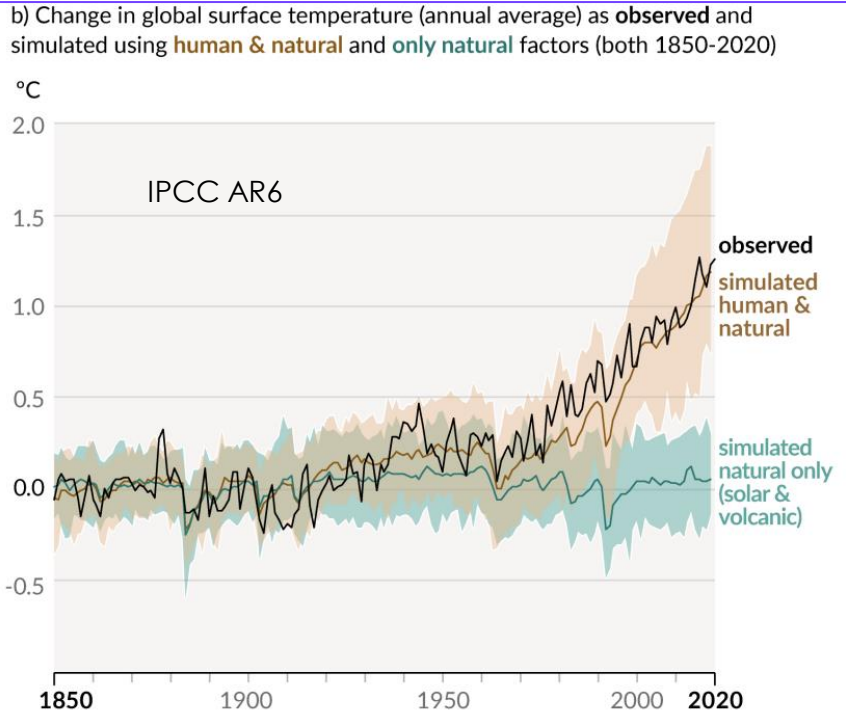
Government  
Office for Science



- Particle physicist at UCL on ATLAS
- January 2021 → September 2021 : Royal Society Policy associate scheme: policy secondment in Government Office of Science
- October 2021 : Climate Change Committee

- 1. Why Net Zero?**
- 2. The UK's Climate Change Act and the CCC**
- 3. The UK's Net Zero strategy: plans for emissions reductions by sector**

# The Earth is warming

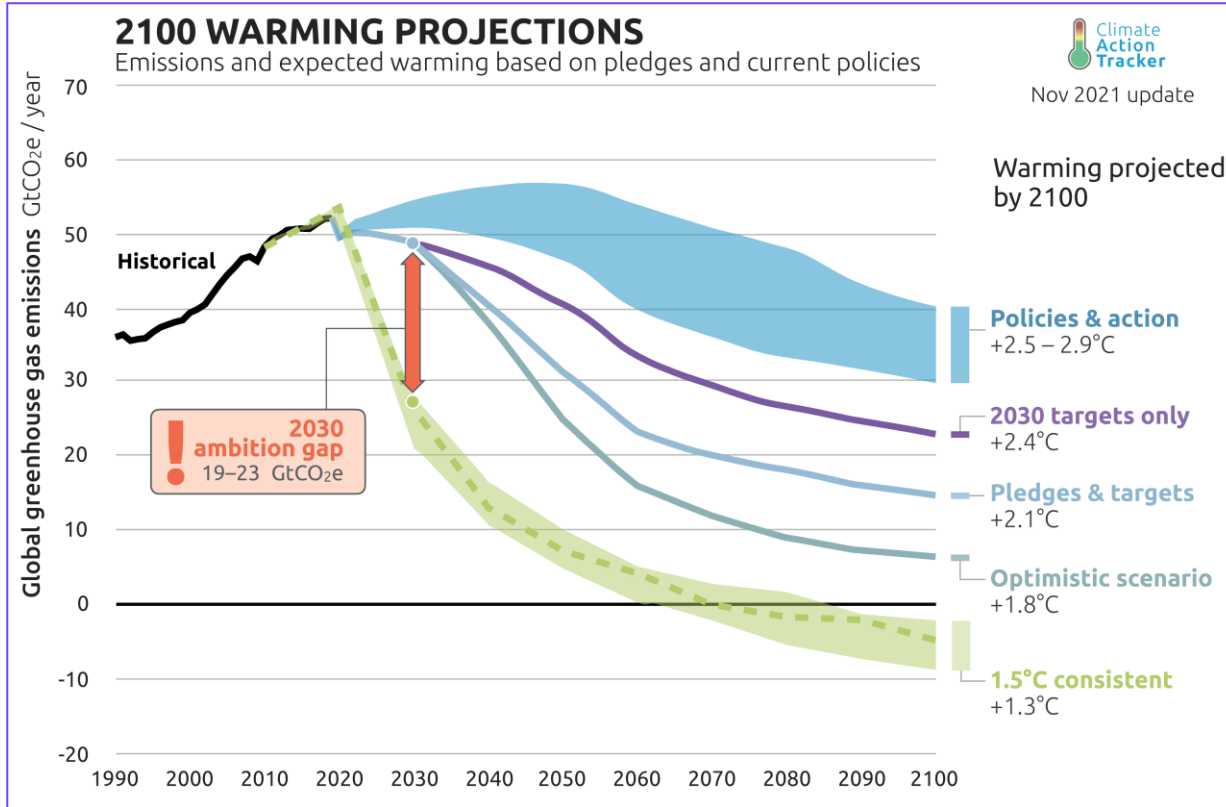


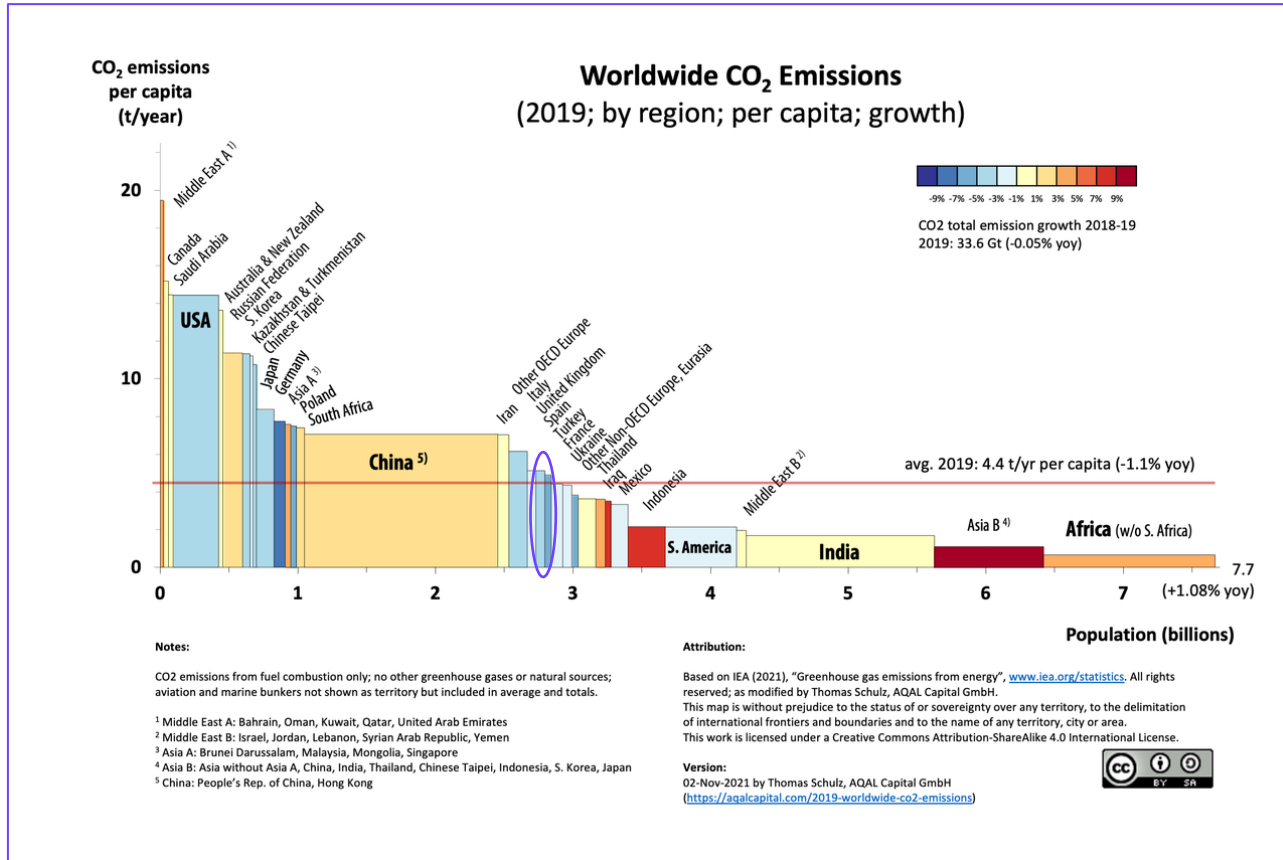
The global warming potential (GWP) of human-generated greenhouse gases is a measure of how much heat each gas traps in the atmosphere, relative to carbon dioxide.

How much each human-caused greenhouse gas contributes to total emissions around the globe.

Emissions measured in “tonnes of CO<sub>2</sub> equivalence”: tCO<sub>2</sub>e

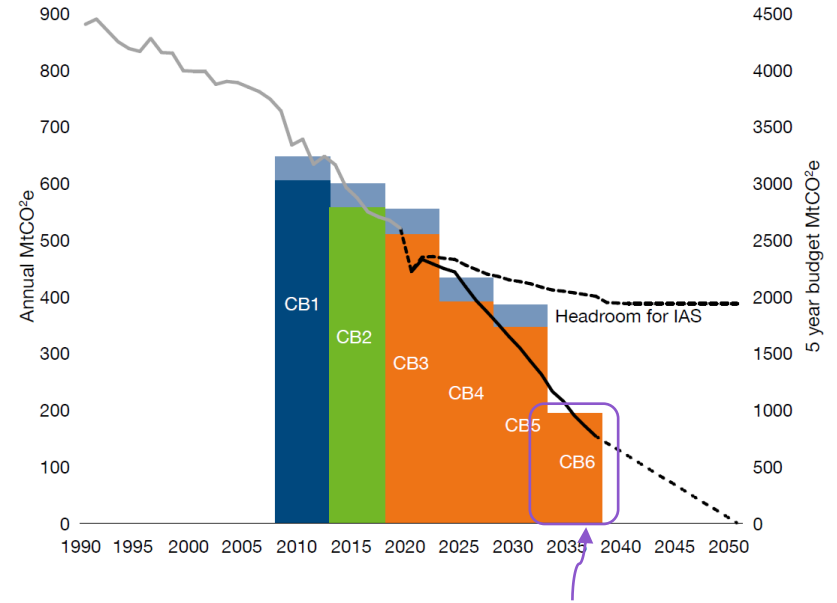
# Why Net Zero?





# The UK's 2008 Climate Change Act and the Climate Change Committee (CCC)

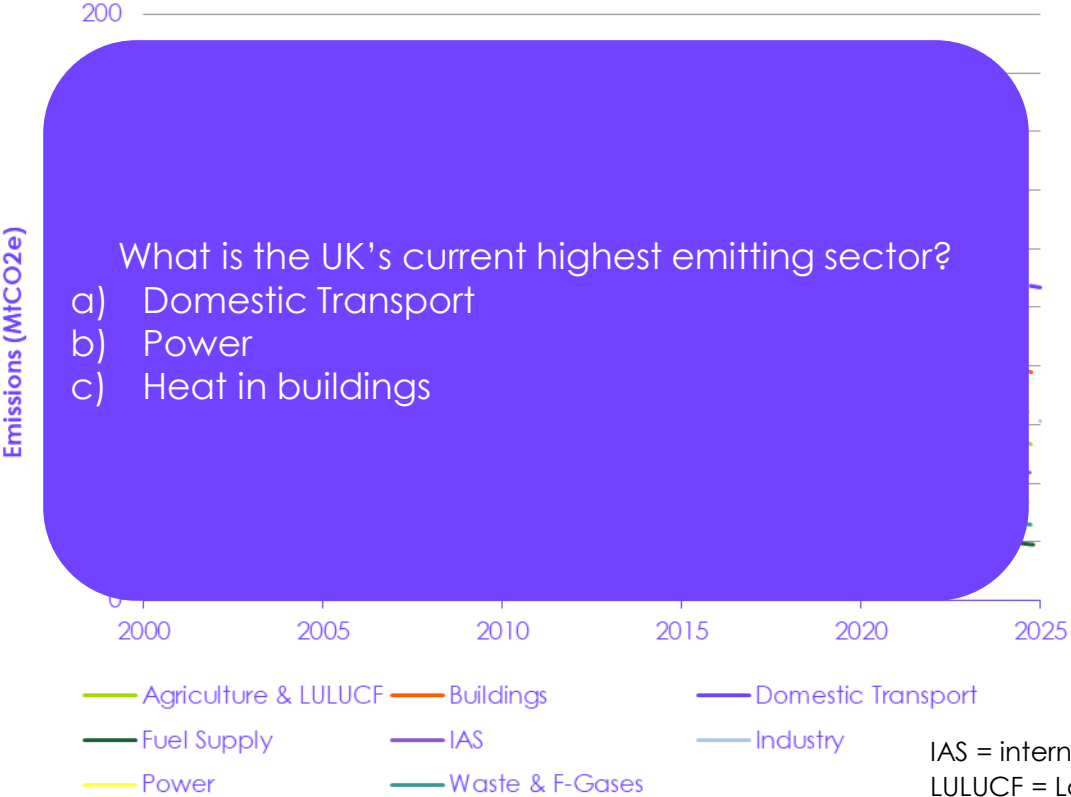
- 2008: Set target to reduce emissions by 80% on 1990 levels by 2050 and setup the CCC.
- The CCC
  - advises on setting and reaching targets and interim carbon budgets restricting total GHG emissions in 5-year periods.
  - Annually assesses the UK's progress towards the above
- 2019: Amendment to **Net Zero territorial\* emissions by 2050** as advised by the CCC
- Nationally Determined Contributions (NDCs) are separate commitments to the UN Framework Convention on Climate Change (UNFCCC) under the Paris agreement.
  - The UK's pledge in 2020 was a 68% reduction of UK territorial emissions by 2030 (compared to 1990 levels).



Includes international aviation and shipping

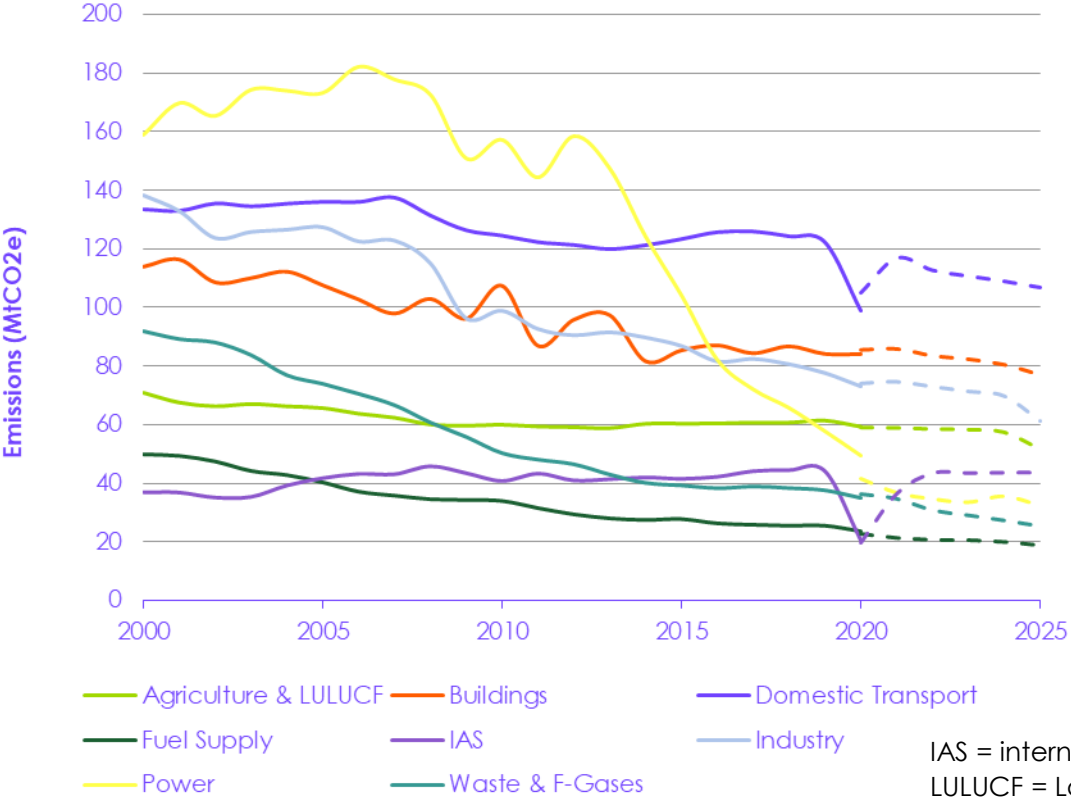
**\*Territorial emissions do not include imported emissions**

# Sectoral emissions



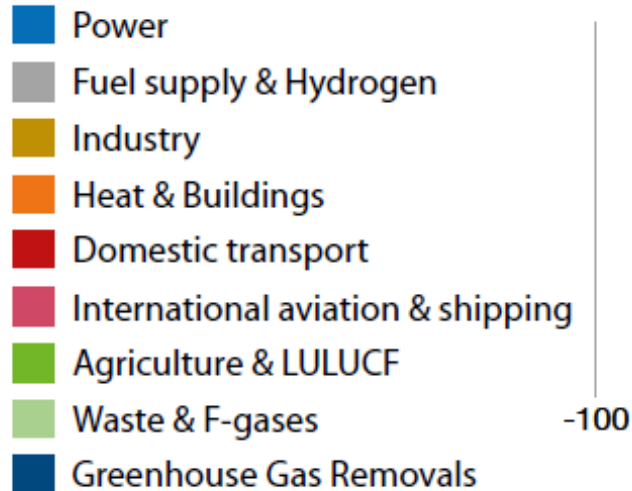


# Sectoral emissions



IAS = international aviation & shipping  
 LULUCF = Land use, land use change & forestry

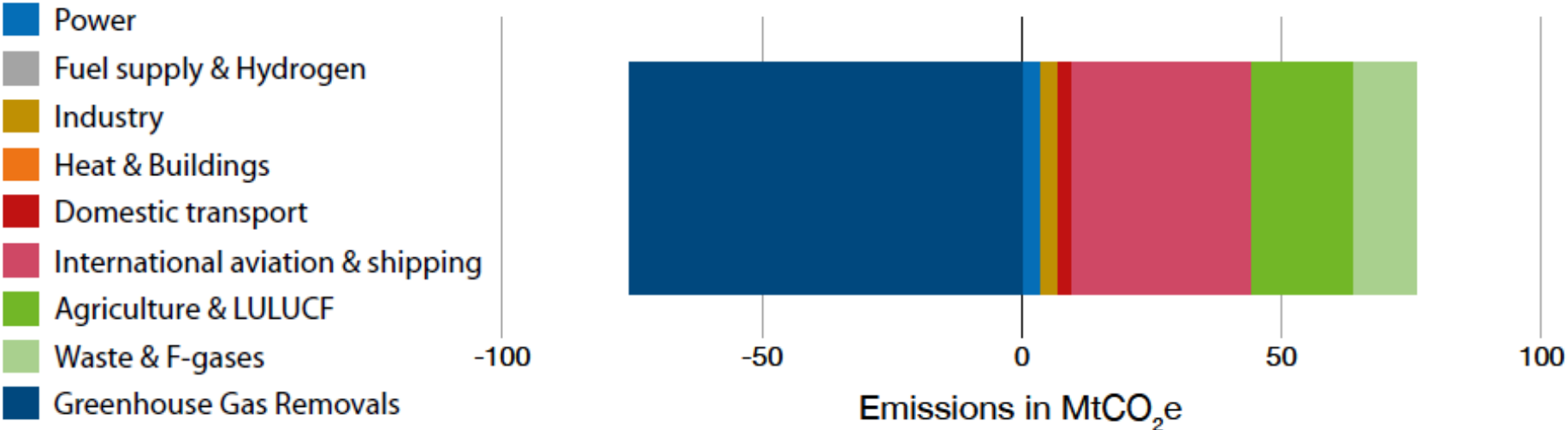
## 2050 emissions in the NZS's high electrification scenario



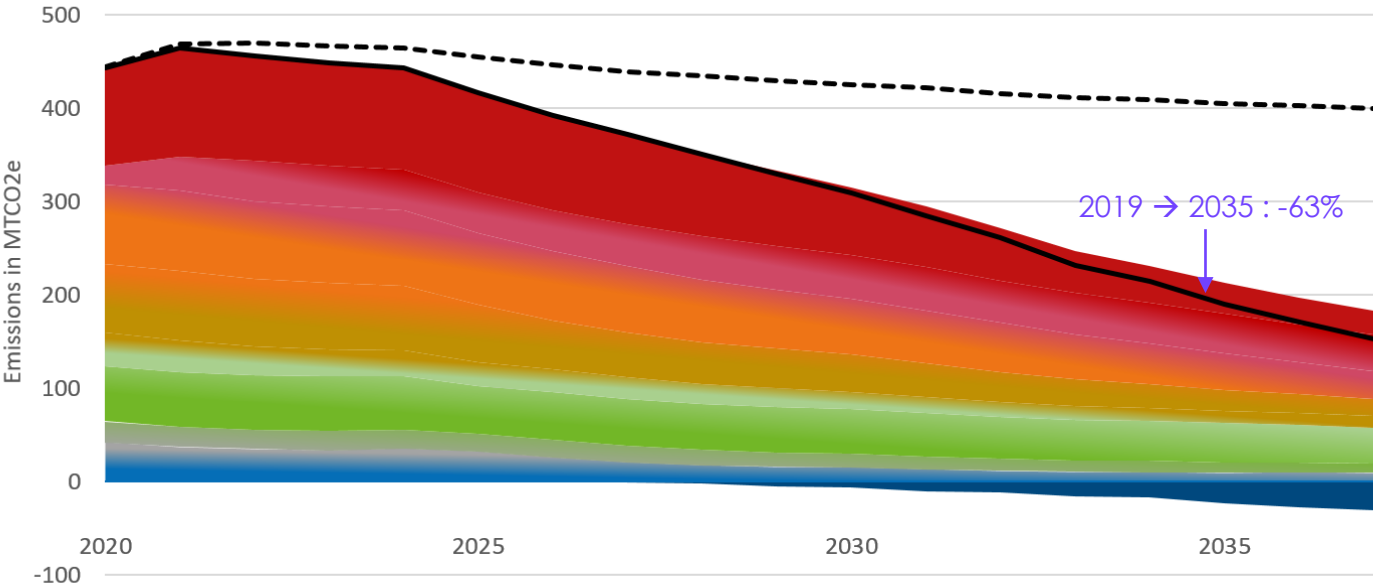
What will the UK's highest emitting sector be in 2050?

- a) Domestic transport
- b) Buildings
- c) International aviation and shipping
- d) Agriculture and land use

# 2050 emissions in the NZS's high electrification scenario



# The Net Zero strategy's delivery pathway, up to the 6<sup>th</sup> carbon budget

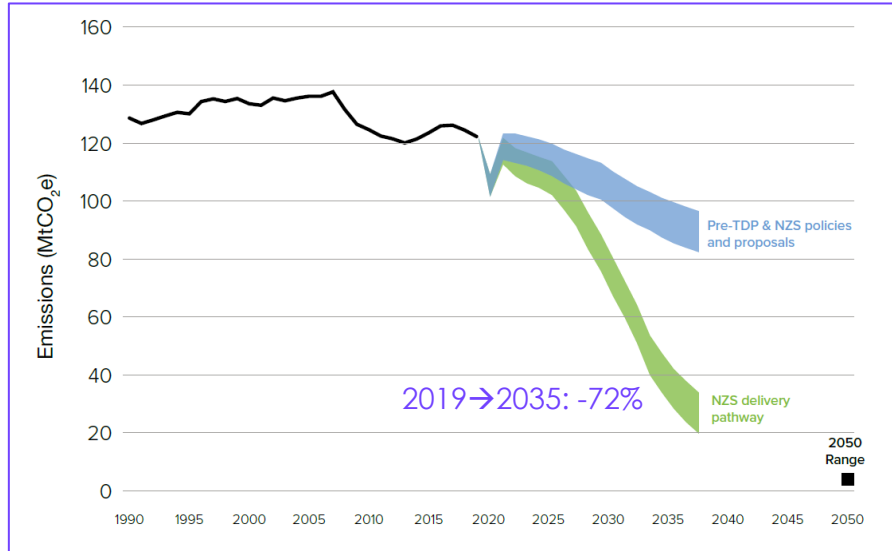


— Delivery pathway to 2037      - - - Baseline emissions

- Domestic Transport
- International aviation and shipping
- Heat and buildings
- Industry
- Waste & F-gases
- Agriculture & LULUCF
- Fuel supply
- Power
- Greenhouse Gas Removals

## Domestic transport (mostly cars/vans)

[23% of UK emissions in 2019]



- Scale up switch to electric cars
- Shift to more public transport and walking / cycling

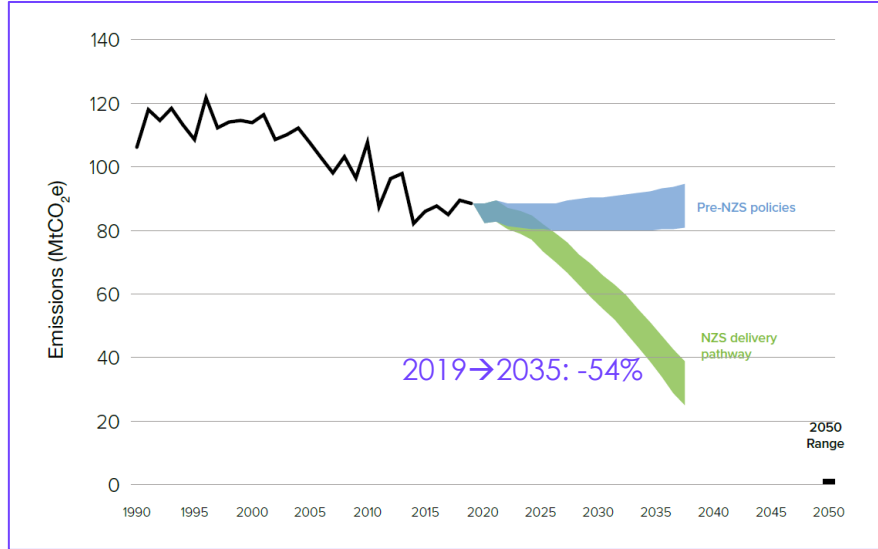
## End sales of new petrol / diesel cars by 2030

light vehicle <lifetime> = 14 years



## Heat and buildings (mostly gas heating)

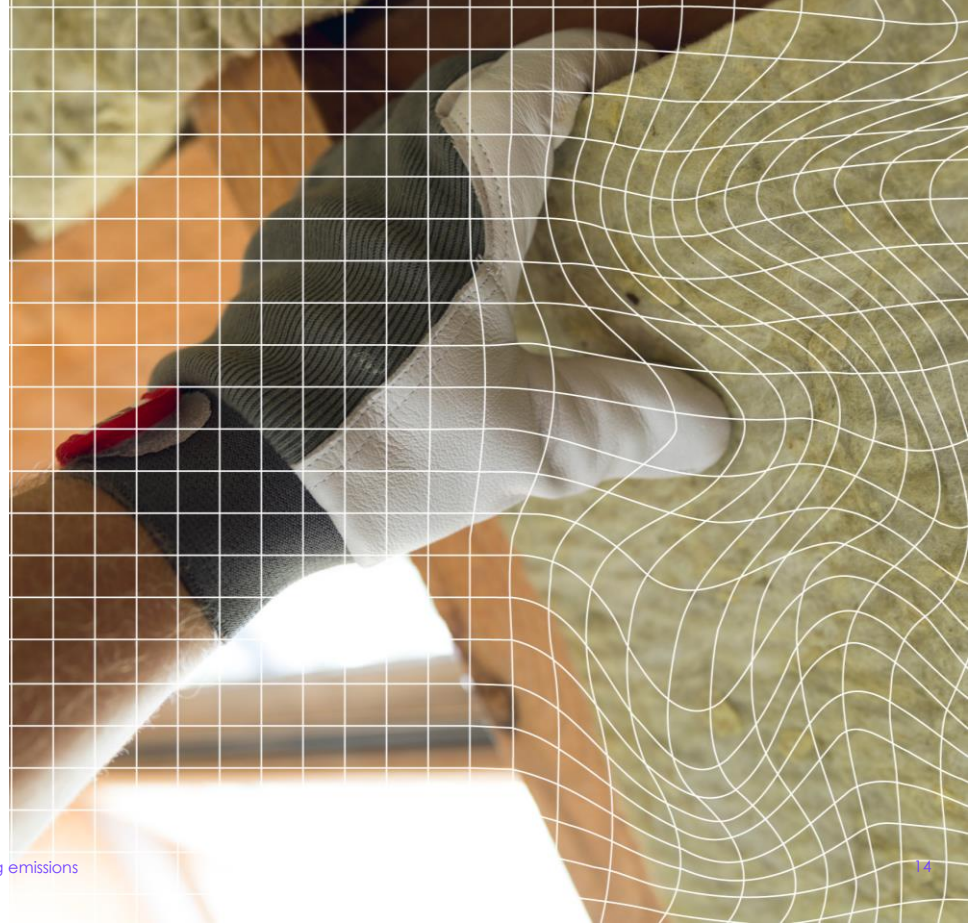
[17% of UK emissions in 2019]



- Electric heat-pumps, district heating and some Hydrogen boilers to replace gas boilers
  - Government is trying a market driven approach to drive down the cost of heat-pumps
- Urgent need to insulate our housing stock!

## Phase-out new gas boilers and ensure all homes meet EPC C by 2035

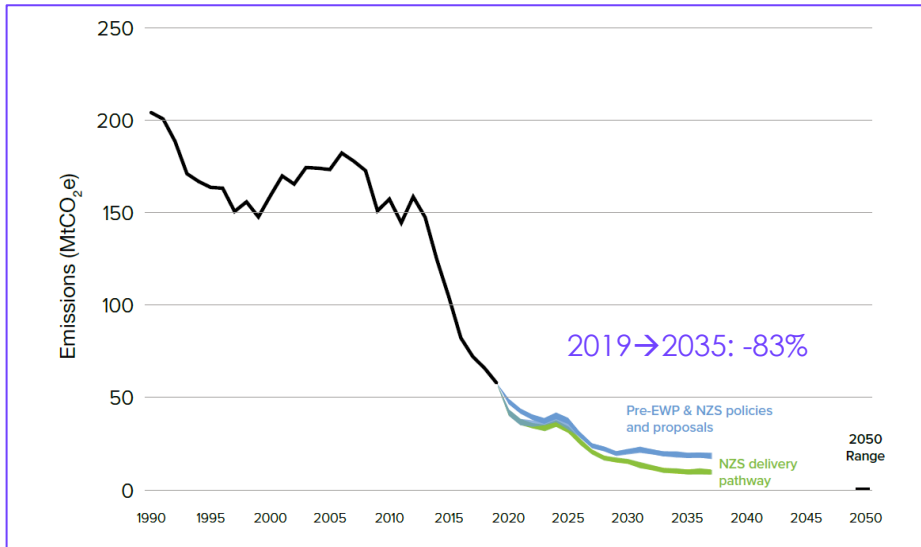
Gas boiler <lifetime> = 15 years





# Power (emissions from electricity generation)

[11% of UK emissions in 2019]



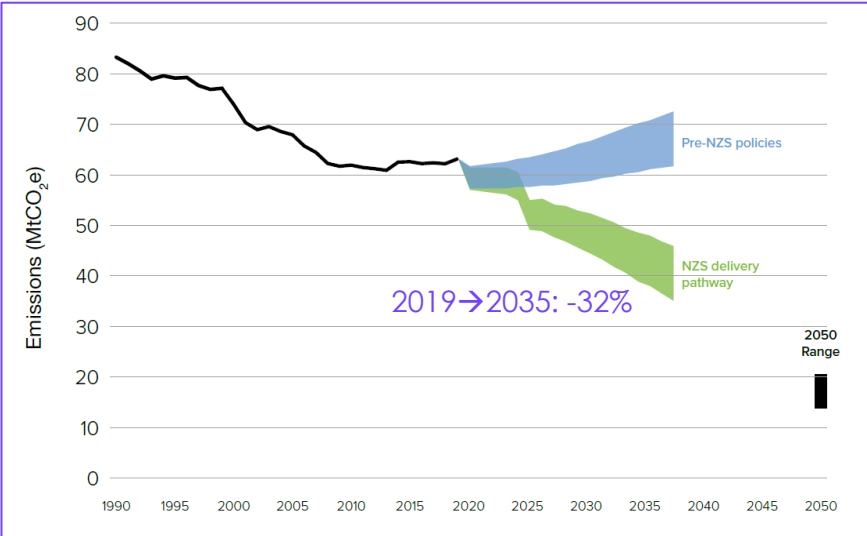
- Electricity demand could double by 2050
- Backbone of renewables (wind/solar) supplemented with: nuclear; hydrogen; gas / bioenergy with carbon capture
- Flexible system

## All electricity generation to be low-carbon by 2035



# Agriculture and land use

[12% of UK emissions in 2019]



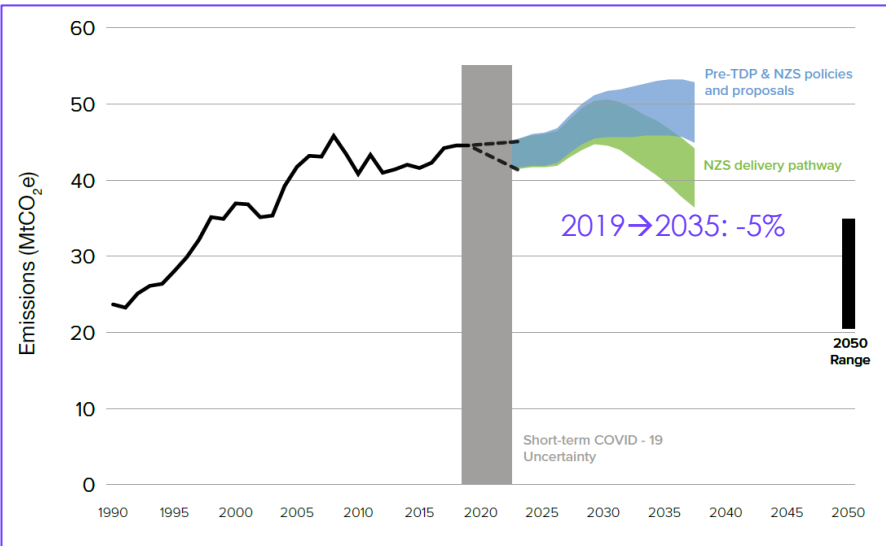
- The UK is currently 13% woodland.
  - Need to increase tree planting and peatland restoration
- **There are no government targets for diet change.**
  - The CCC recommends a 20% reduction in meat and dairy consumption by 2030





# International aviation and shipping

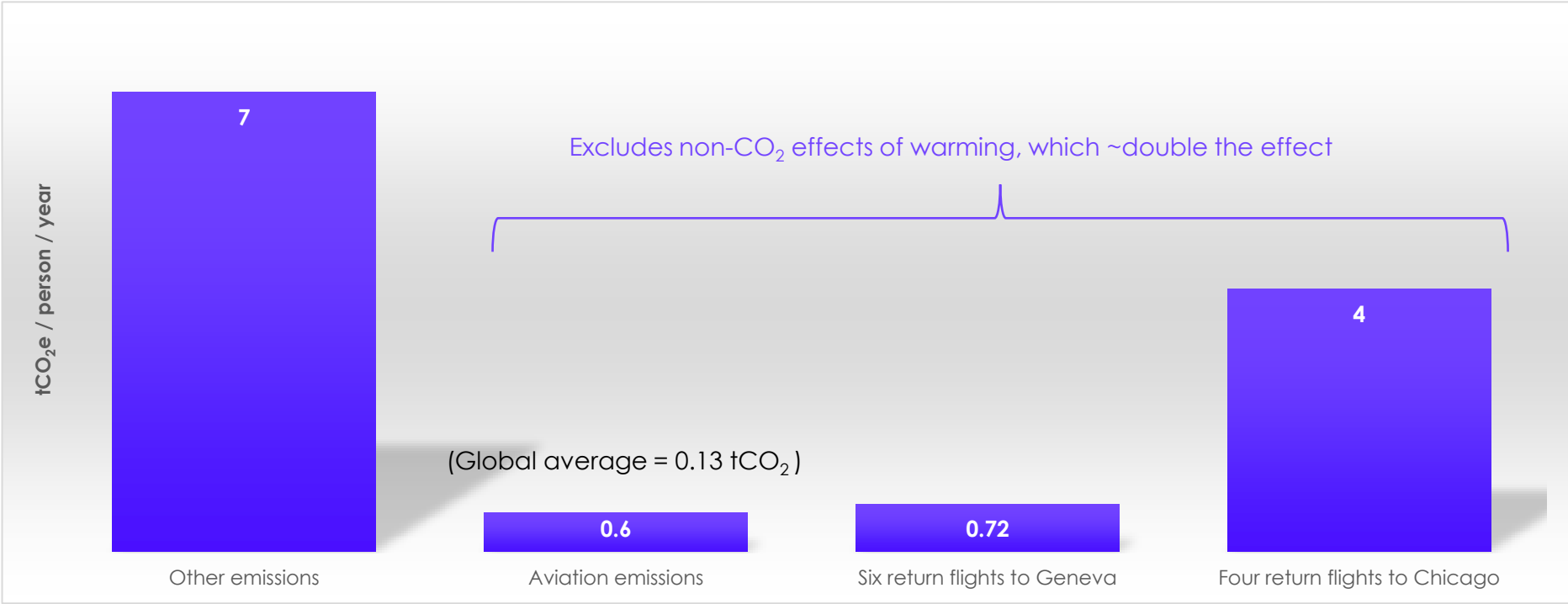
[9% of UK emissions in 2019]



- Focus on low emissions fuels and efficiency improvements
- The government has very little ambition in reducing flying
  - the CCC recommends limiting growth in flying to 25% (compared to 65% from business as usual) by 2050

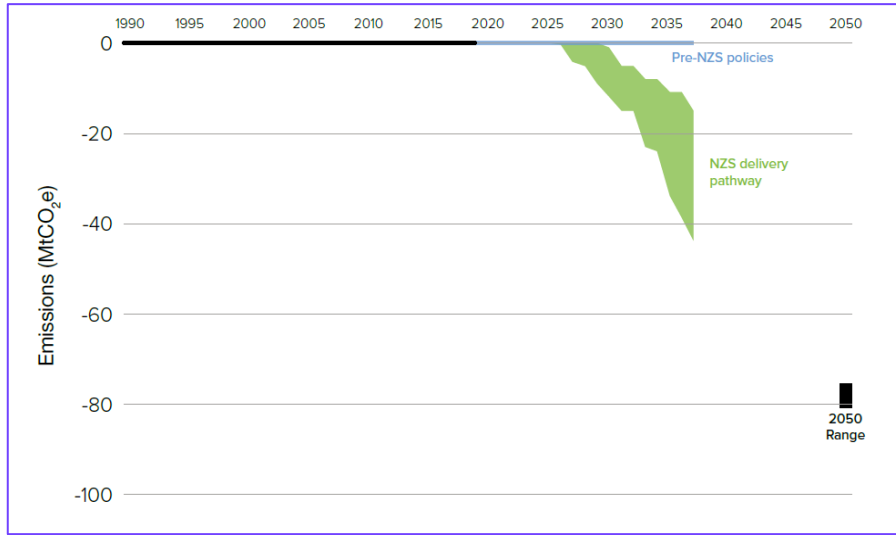


# Emissions from flying compared to UK average emissions (2019)



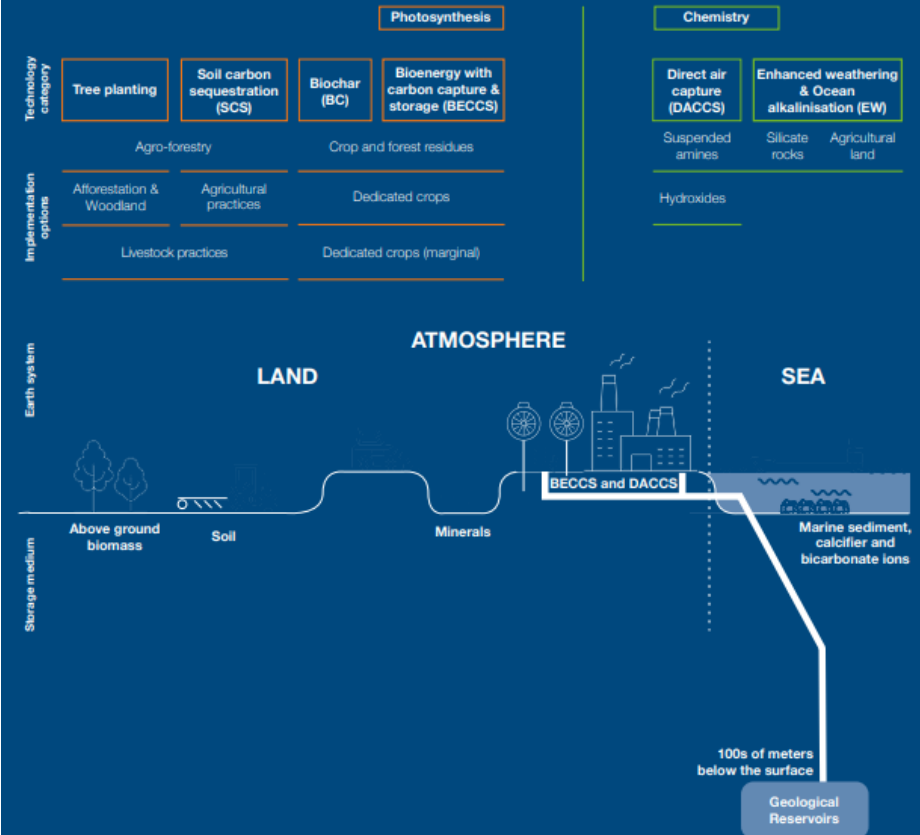
Source: [Carbon Footprint Calculator](#)

# Greenhouse gas removals (GGRs)

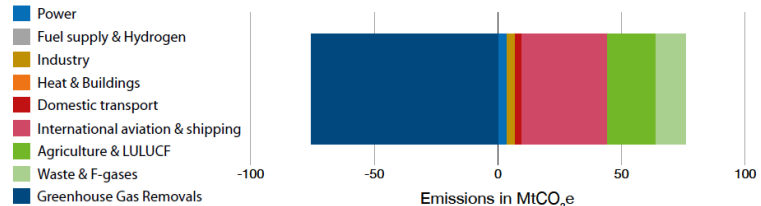
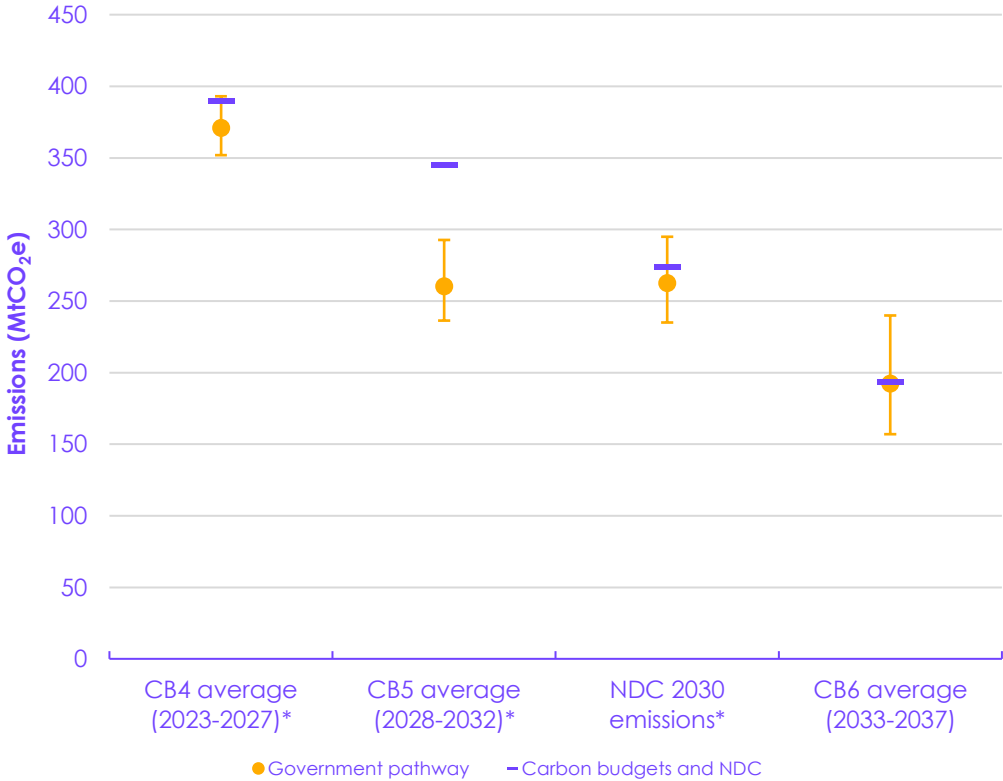


- Residual emissions will be balanced with GGRs
- Bioenergy with carbon capture & storage (BECCs) and direct air carbon capture and storage (DACCs)

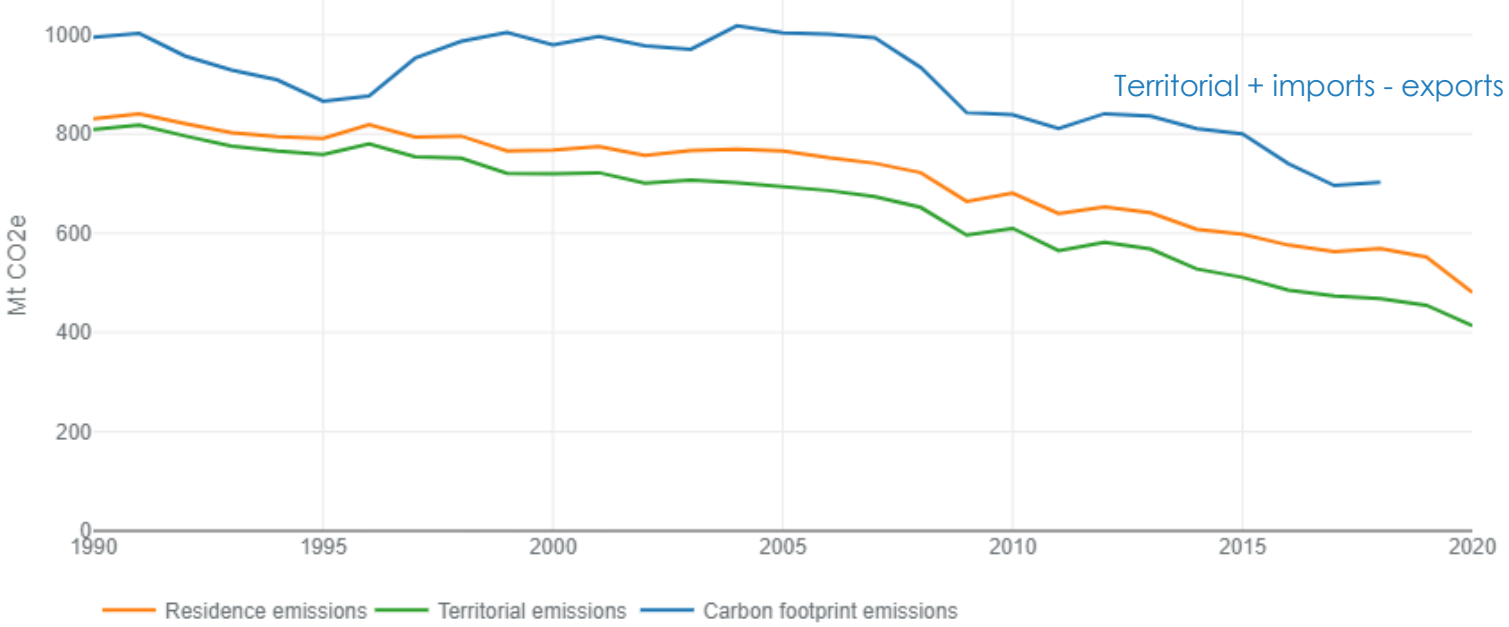
Figure 25: Non-exhaustive illustration of the current portfolio of GGRs.<sup>90</sup>



# Dealing with uncertainty



# What about imported emissions?



Source: [climate-change.data.gov.uk](https://climate-change.data.gov.uk)

I haven't covered emissions in particle physics, please refer to the Snowmass white paper: [\[2203.12389\] Climate impacts of particle physics \(arxiv.org\)](#) and show your support here: <https://indico.fnal.gov/event/53795/>

arXiv:2203.12389v1 [physics.soc-ph] 23 Mar 2022

## Climate impacts of particle physics

Kenneth Bloom<sup>1,\*</sup>, Veronique Boisvert<sup>2,\*\*</sup>, Daniel Britzger<sup>3</sup>, Micah Buuck<sup>4</sup>, Astrid Eichhorn<sup>5</sup>, Michael Headley<sup>6</sup>, Kristin Lohwasser<sup>7</sup>, and Petra Merkel<sup>8</sup>

<sup>1</sup>University of Nebraska-Lincoln, Lincoln, NE, USA

<sup>2</sup>Royal Holloway University London, United Kingdom

<sup>3</sup>Max-Planck-Institute for Physics, Munich, Germany

<sup>4</sup>SLAC National Accelerator Laboratory, Menlo Park, CA, USA

<sup>5</sup>CP3-Origins, University of Southern Denmark, Denmark

<sup>6</sup>Sanford Underground Research Facility (SURF), Lead, SD, USA

<sup>7</sup>University of Sheffield, United Kingdom

<sup>8</sup>Fermi National Accelerator Laboratory (Fermilab), Batavia, IL, USA

**Abstract.** The pursuit of particle physics requires a stable and prosperous society. Today, our society is increasingly threatened by global climate change. Human-influenced climate change has already impacted weather patterns, and global warming will only increase unless deep reductions in emissions of CO<sub>2</sub> and other greenhouse gases are achieved. Current and future activities in particle physics need to be considered in this context, either on the moral ground that we have a responsibility to leave a habitable planet to future generations, or on the more practical ground that, because of their scale, particle physics projects and activities will be under scrutiny for their impact on the climate. In this white paper for the U.S. Particle Physics Community Planning Exercise (“Snowmass”), we examine several contexts in which the practice of particle physics has impacts on the climate. These include the construction of facilities, the design and operation of particle detectors, the use of large-scale computing, and the research activities of scientists. We offer recommendations on establishing climate-aware practices in particle physics, with the goal of reducing our impact on the climate. We invite members of the community to show their support for a sustainable particle physics field [1].

## Contact us

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