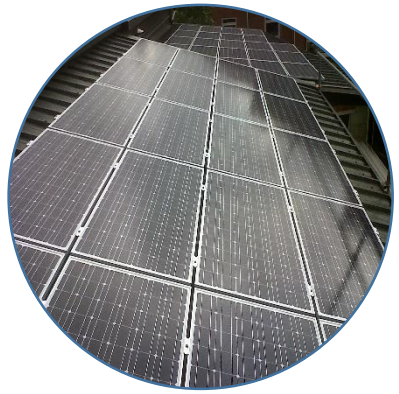
Net Zero Carbon Pathways

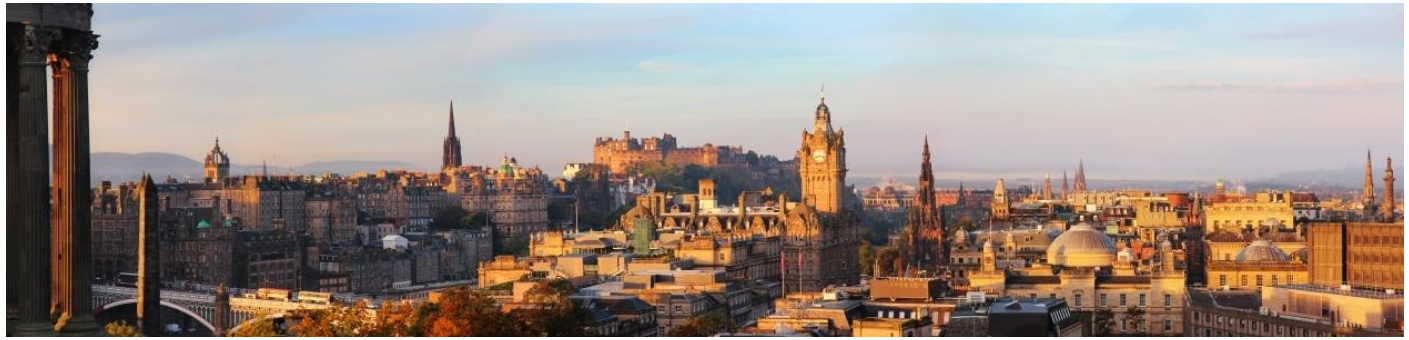
Peter Schofield – Director and Principal Environmental Consultant
Glyn Mountford – Director and Principal Engineer



ENERGY | ENVIRONMENT | TRAINING

GEP Environmental

- Provide **Climate Change and Carbon Consultancy** to the public sector across the UK
- Supporting and advising Local Authorities in **London** for over 10 years
- Our services are available **directly** or via the **London Energy Project (LEP) Additional Services Framework** (appointed for 8 years)
- The LEP Framework is available to any Local Authority in England and available for direct call-off until **31 March 2020**



Net Zero Carbon

The Context

Net Zero Carbon

Key Definitions

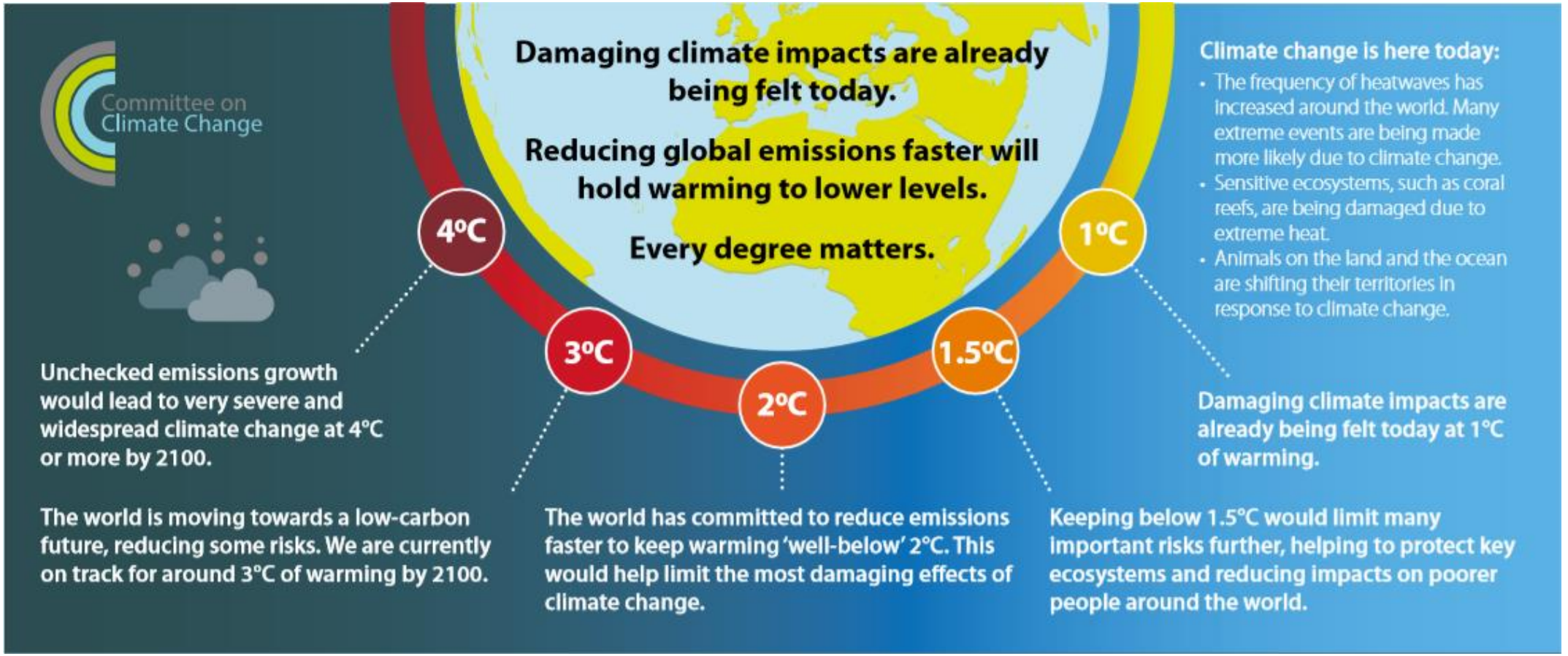
Net Zero Carbon – reduce emissions as close to zero as possible and then offset residual emissions

Other definitions:

- **Carbon Neutral** – offsetting carbon emissions (just offsetting, not focussed on carbon reduction)
- **Carbon Zero** – zero carbon emissions (no need to offset any emissions)
- **Carbon Positive** – organisations export renewable energy / use carbon removal technology greater than its organisational emissions.

Net Zero Carbon

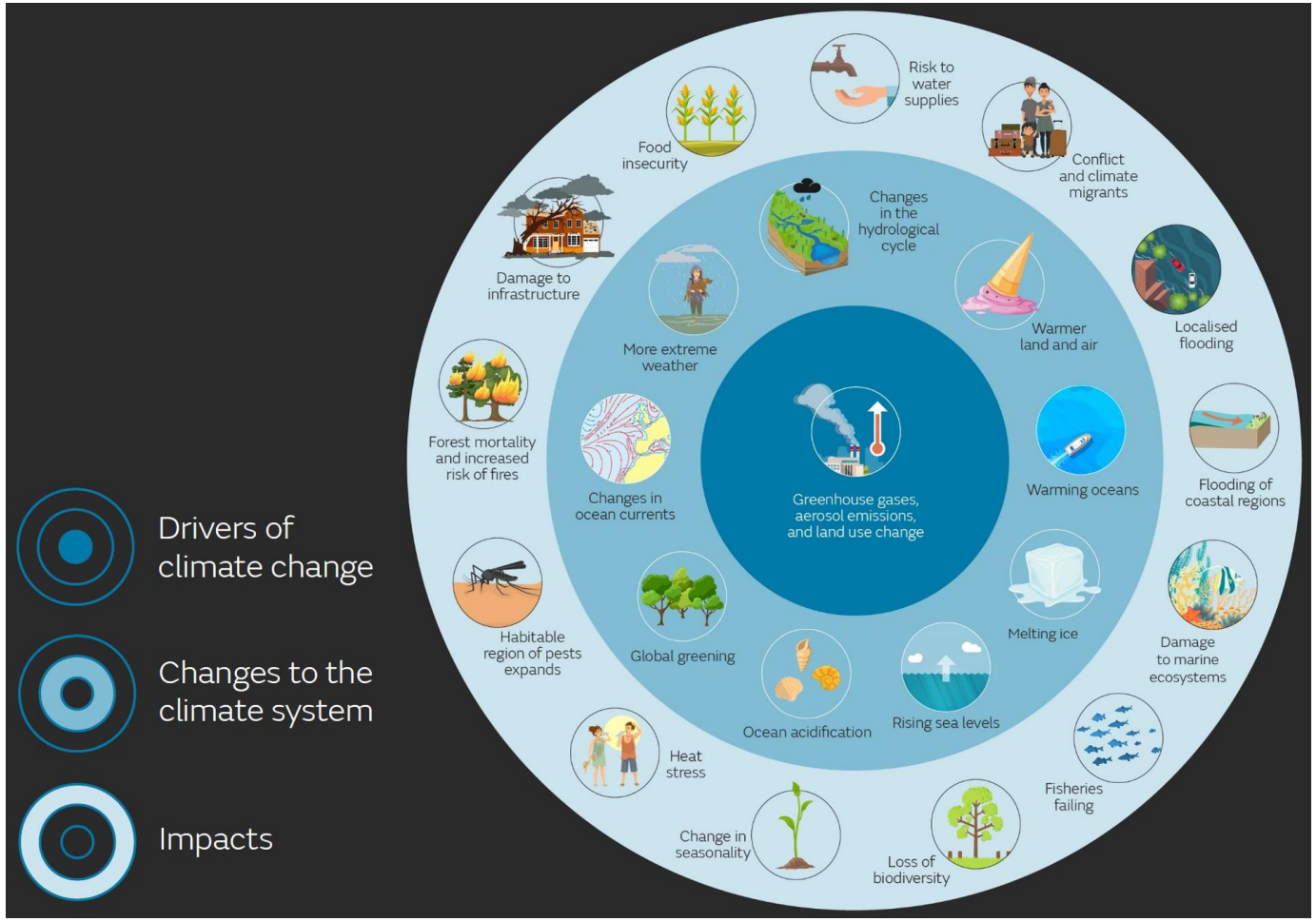
Context – Climate Change Scenarios



Source: Net Zero. The UK's contribution to stopping global warming. Committee on Climate Change, May 2019

Net Zero Carbon

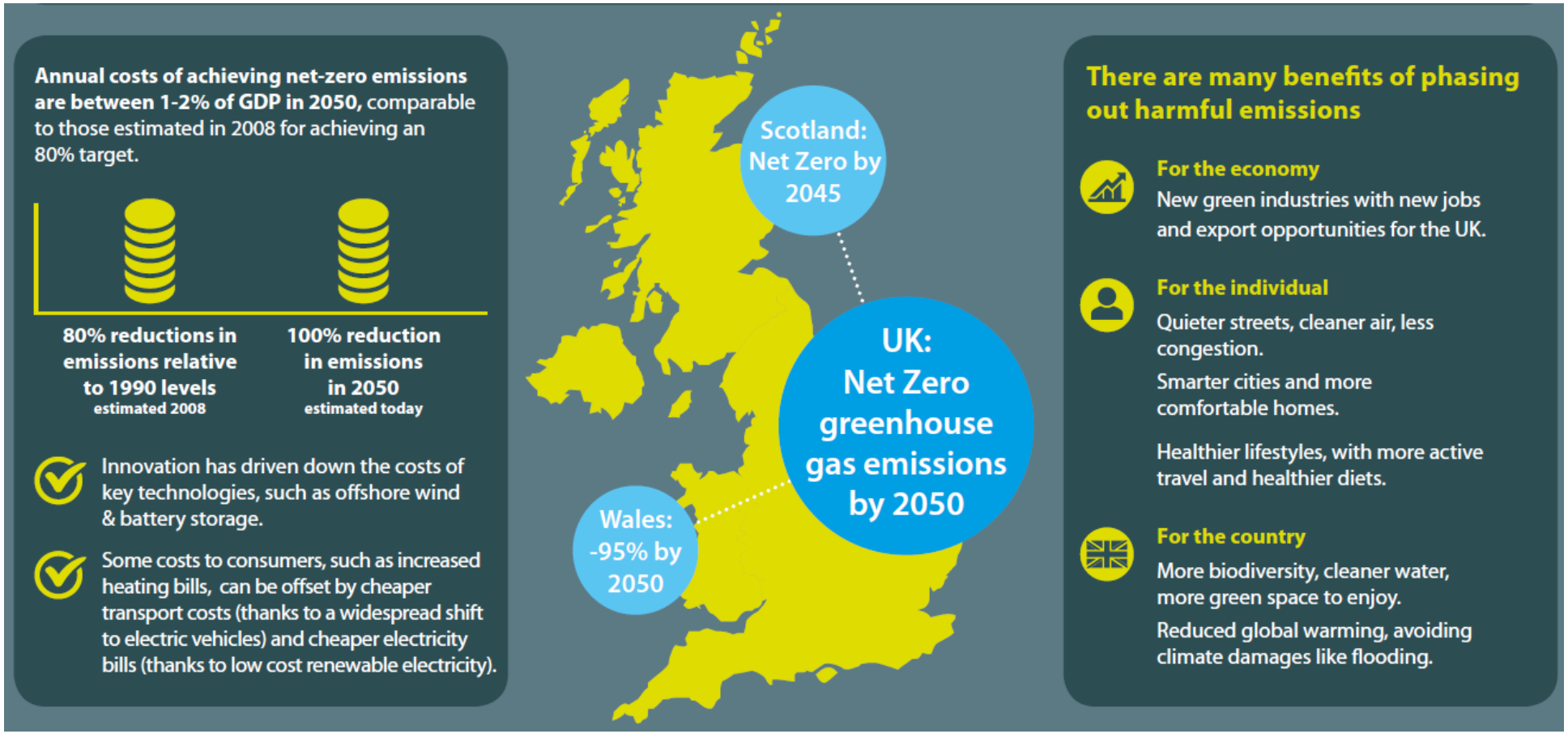
Context – Climate Change Impacts



Source: UK Met Office, Effects of Climate Change

Net Zero Carbon

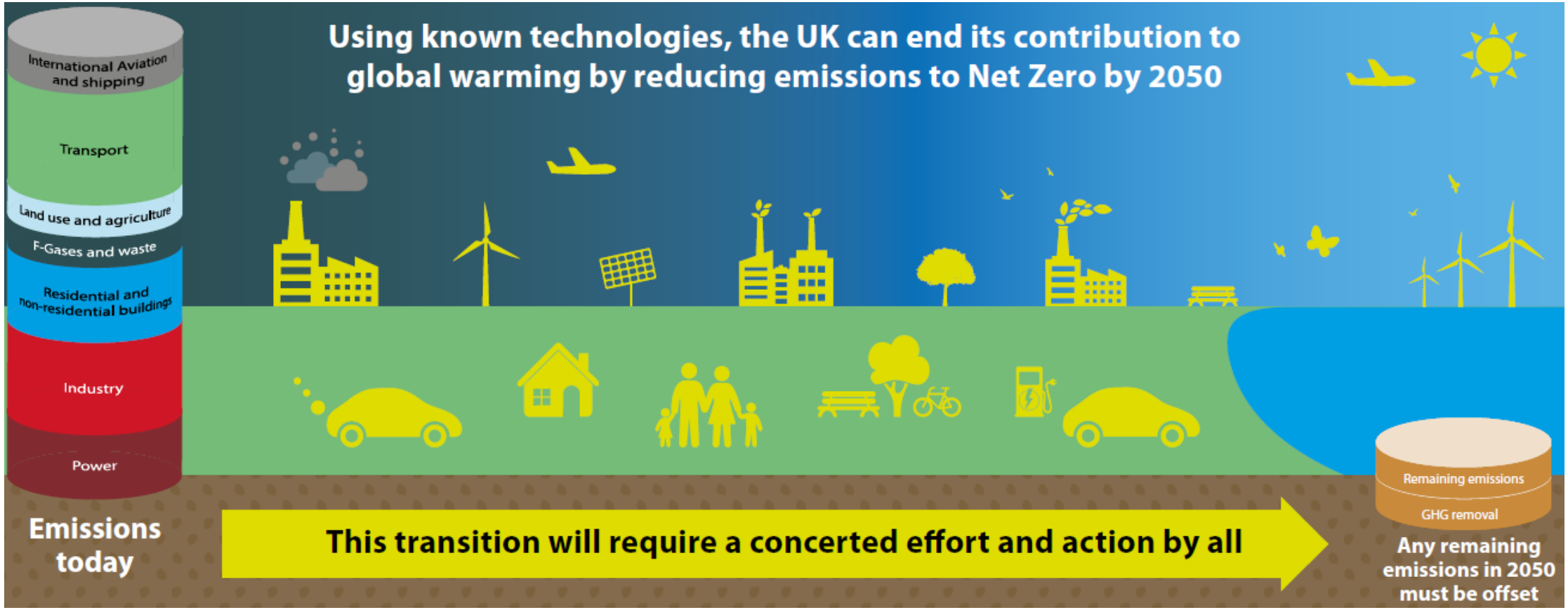
Context – Net Zero Target



Source: Net Zero. The UK's contribution to stopping global warming. Committee on Climate Change, May 2019

Net Zero Carbon

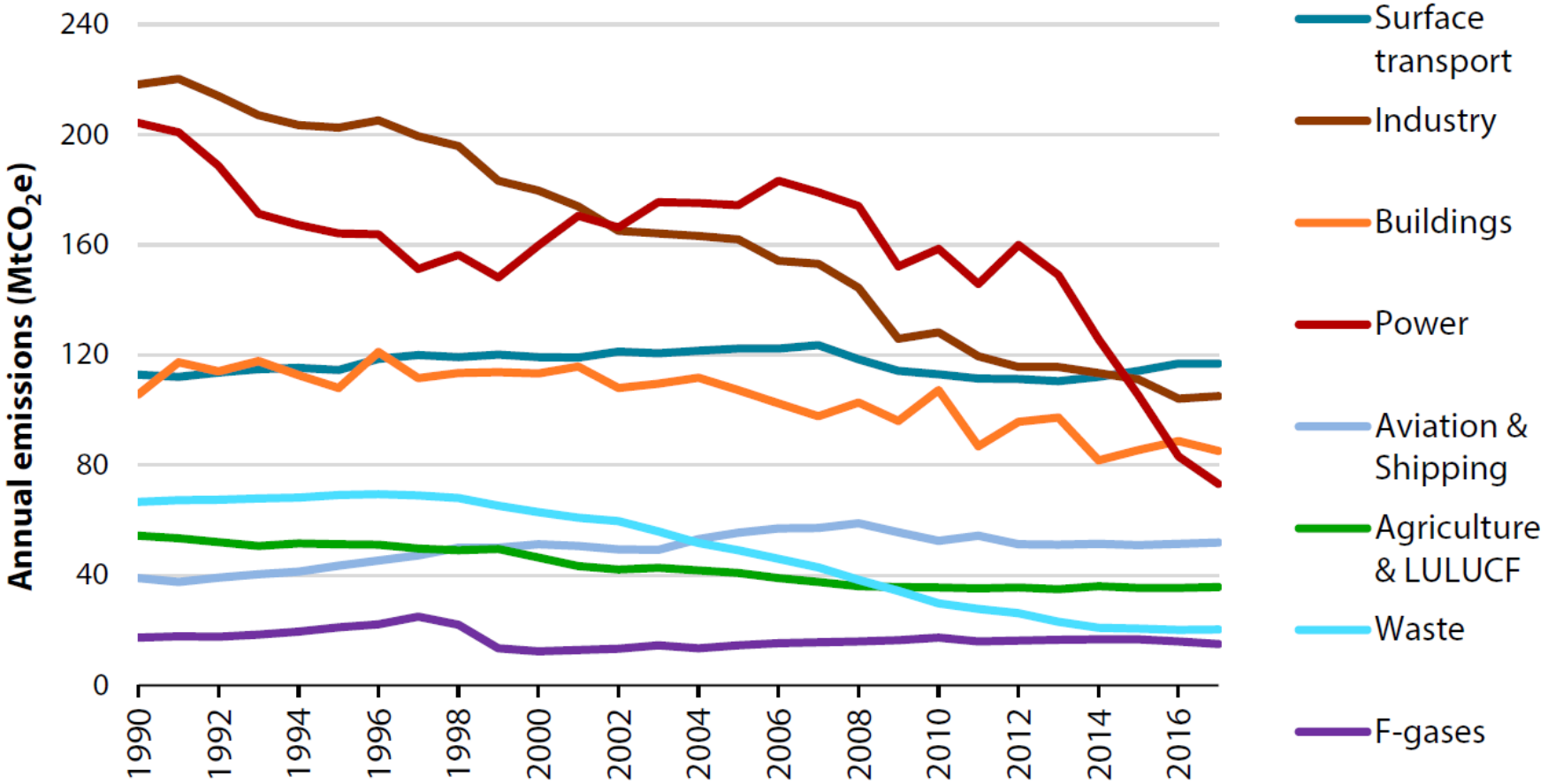
Context – The Challenge



Source: Net Zero. The UK's contribution to stopping global warming. Committee on Climate Change, May 2019

Net Zero Carbon

Context – Progress Reducing UK Emissions (1990 – 2017)



Source: Net Zero. The UK's contribution to stopping global warming. Committee on Climate Change, May 2019

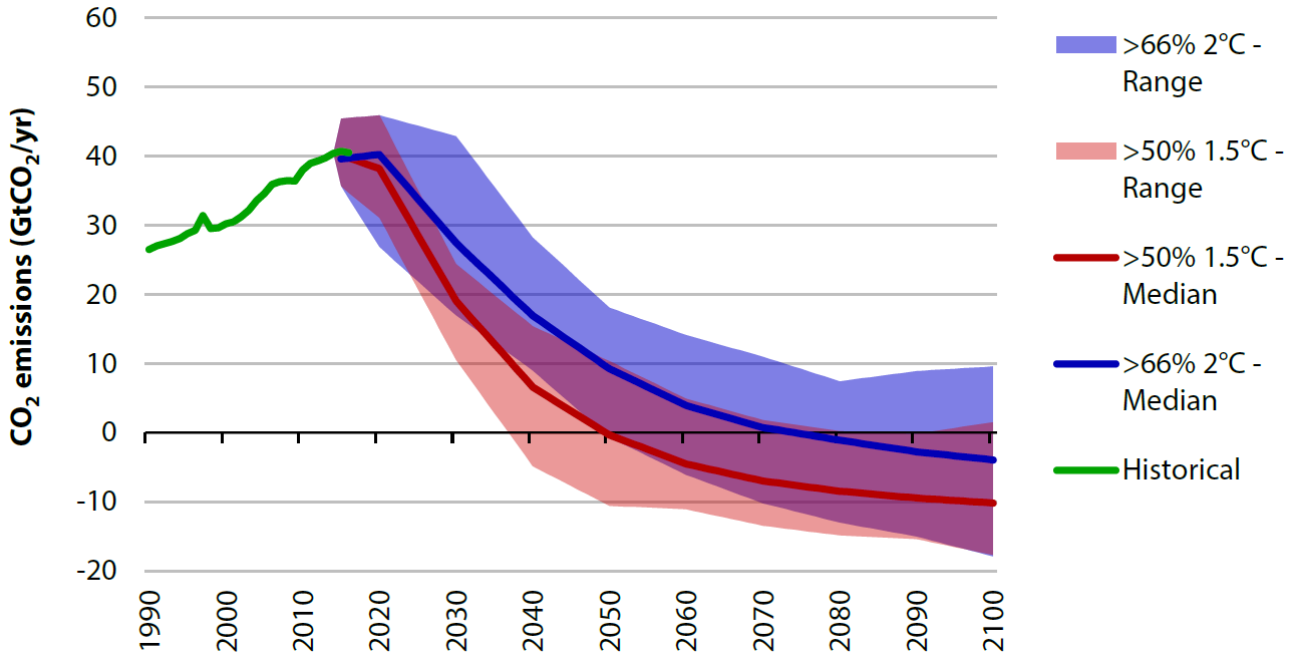
Net Zero Carbon

What are Net Zero Carbon Pathways?

Net Zero Carbon

What are Emissions Scenarios?

- **Emissions scenarios** describe the association between **carbon emissions** and **temperature change**
- Emissions scenarios are linked to different **climate scenarios** (i.e. well below 2°C scenario and well below 1.5°C scenario)
- Enable us to understand the **rate of change in carbon emissions** that is required to minimise impacts of climate change

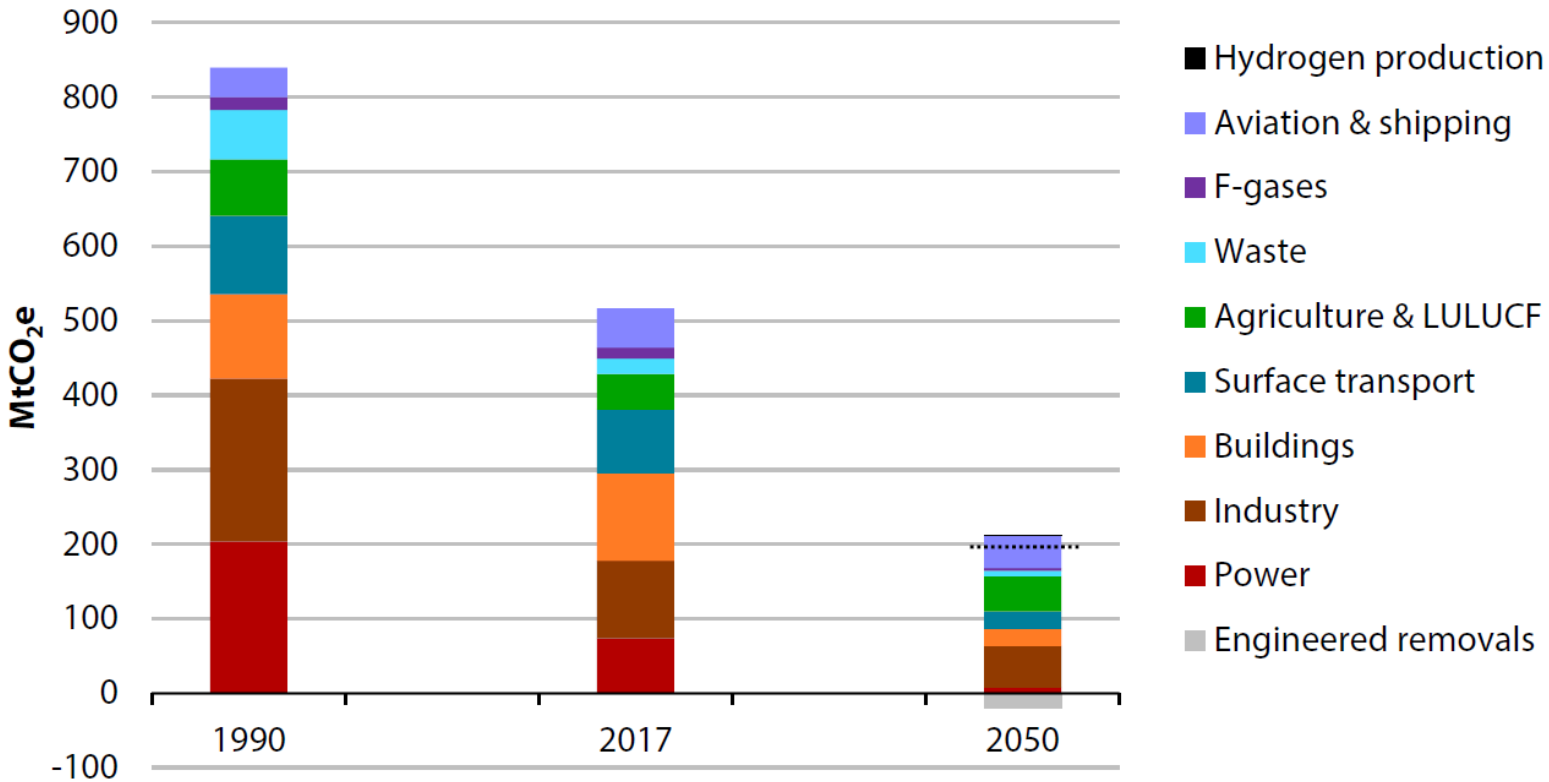


Source: Net Zero. The UK's contribution to stopping global warming. Committee on Climate Change, May 2019

Net Zero Carbon

What does Net Zero by 2050 look like?

- Requires significant **carbon emissions reduction** across all sectors
- Greenhouse Gas (GHG) **removals** will be required to balance positive emissions (aka **residual emissions**)
- GHG removals include **carbon sequestration through afforestation** and **Carbon Capture and Storage**

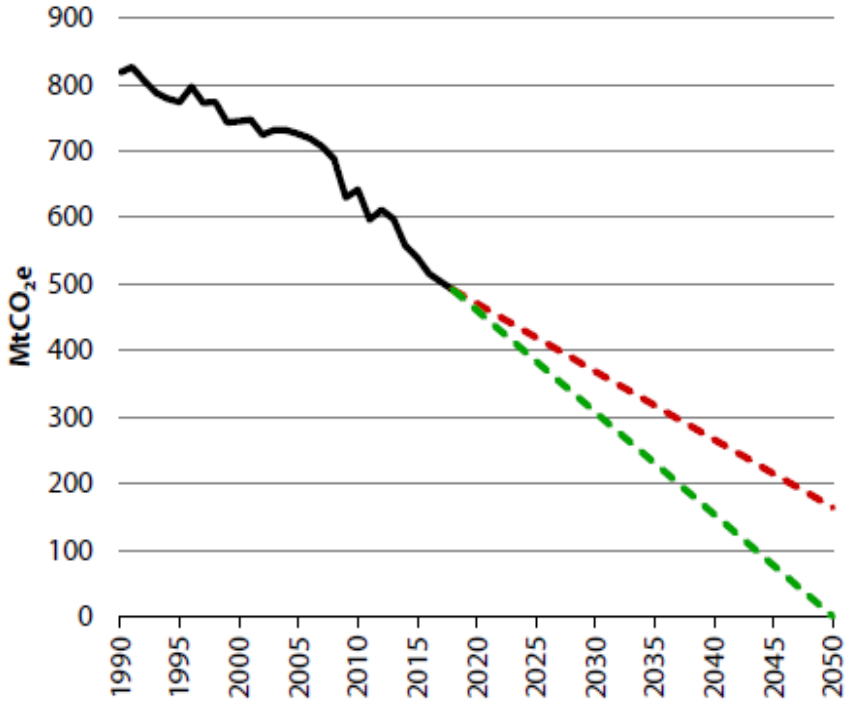


Source: Net Zero. The UK's contribution to stopping global warming. Committee on Climate Change, May 2019

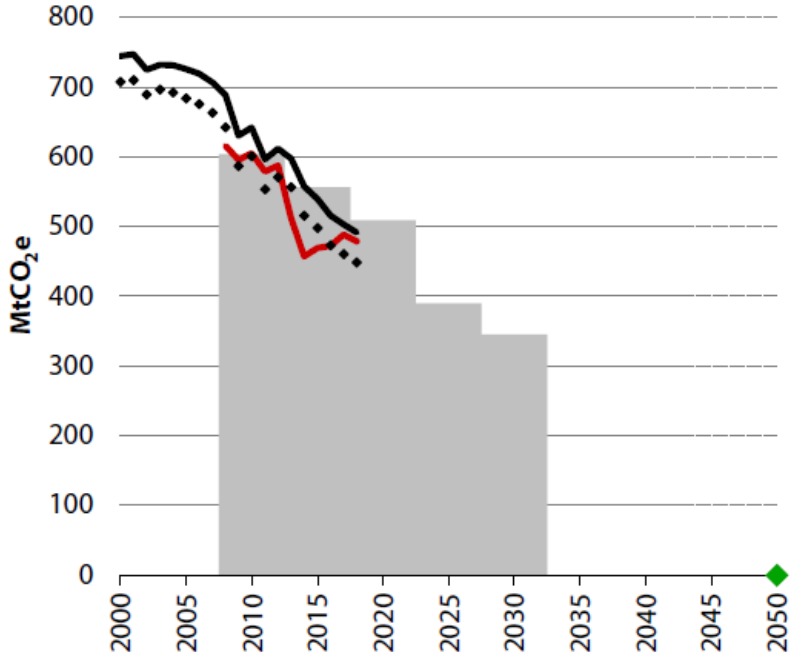
Net Zero Carbon

Net Zero Carbon Pathway and Carbon Budgets for the UK

Net Zero Carbon Pathway



Carbon Budgets



Source: Reducing UK Emissions. 2019 Progress Report to Parliament. Committee on Climate Change, July 2019

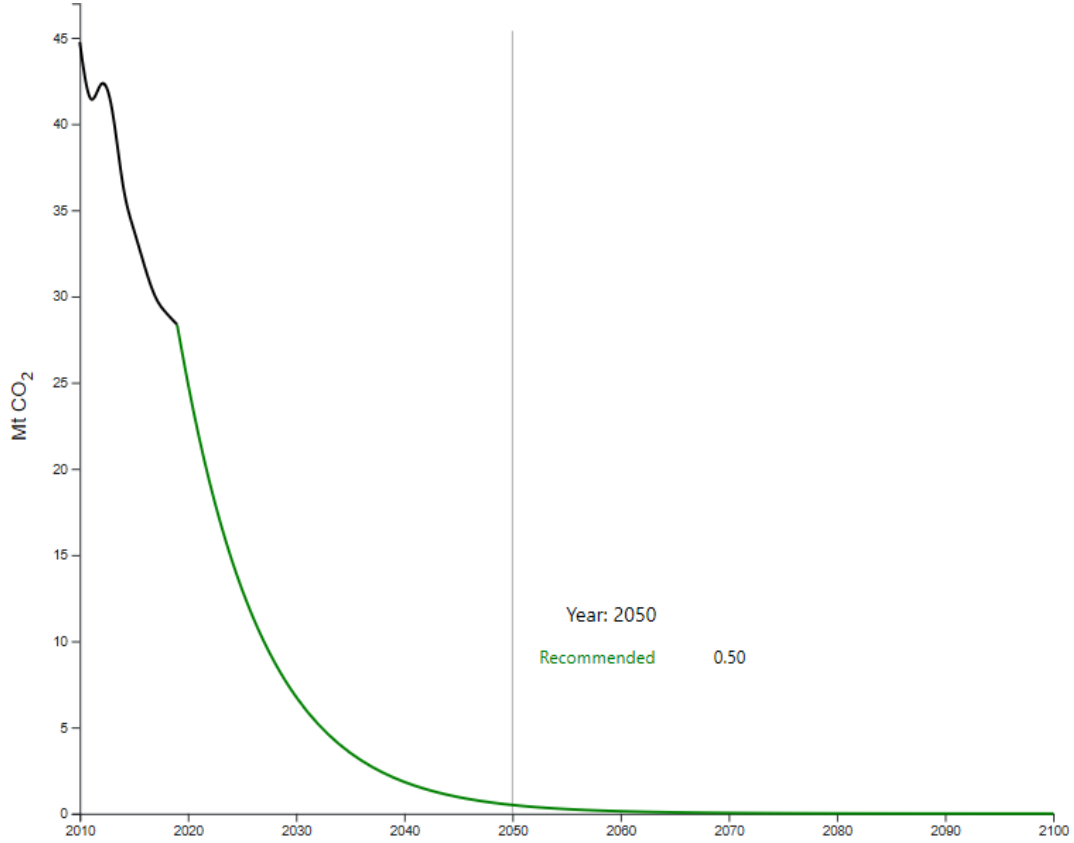
Net Zero Carbon

Net Zero Carbon for London Local Authorities

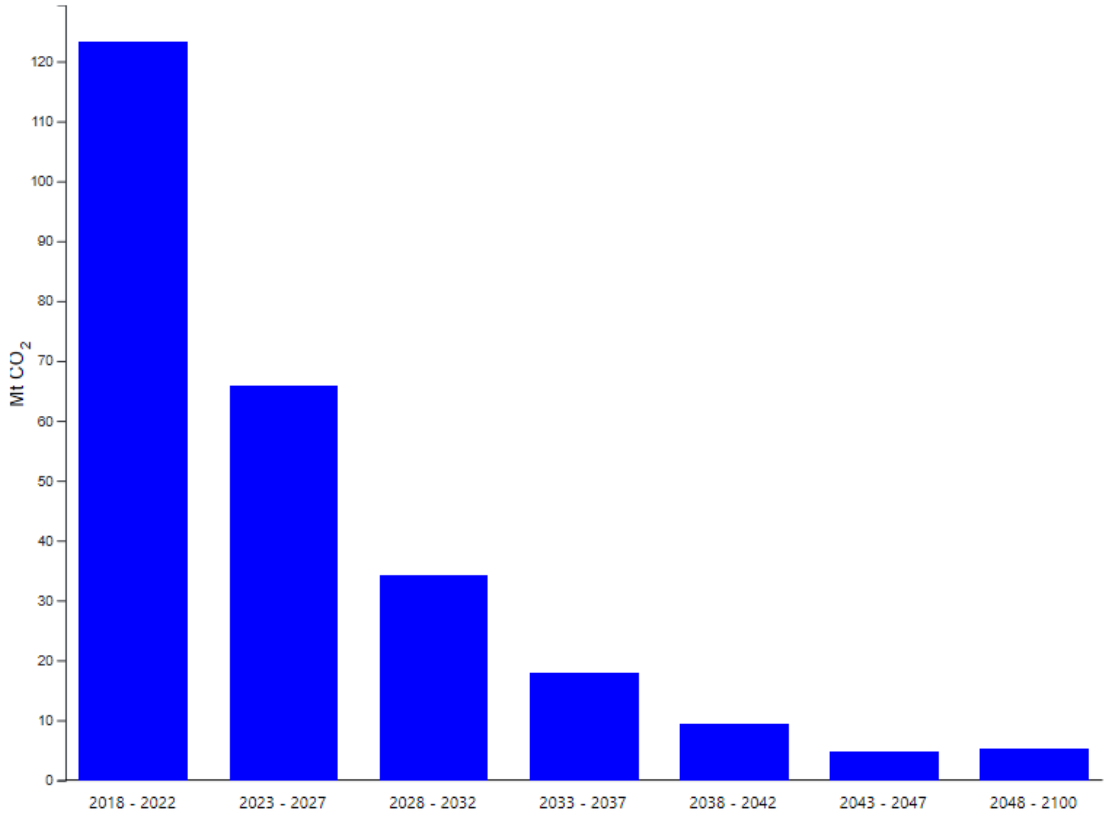
Net Zero Carbon

Net Zero Carbon Pathway for London Authorities

Net Zero Carbon Pathway



Carbon Budgets



Source: The Tyndall Carbon Budget Tool

Net Zero Carbon

What do Local Authorities in London need to do?

- Stay within a maximum cumulative carbon emissions budget of **203.5 million tonnes ($MtCO_2$)** for the period of 2020 to 2100*
- Reduce emissions on average by a minimum of **-12.2% per year**
- **This requires an immediate and rapid programme of decarbonisation**
  - Transition away from fossil fuel use
  - Deploy low carbon electricity generation
  - Manage land uses to increase levels of carbon sequestration

*Based on 2017 CO_2 emission levels, London would use this entire budget within 7 years from 2020!

Net Zero Carbon

Local Authority Response

Net Zero Carbon

Declaring a Climate Emergency

- Recognition that climate change presents a **risk** to the community
- Acknowledgement that the measures taken to date are not enough
- A signal of intent that the Council and community **need to act** on the causes and impacts of climate change

Source: https://www.climateemergency.uk/

Net Zero Carbon

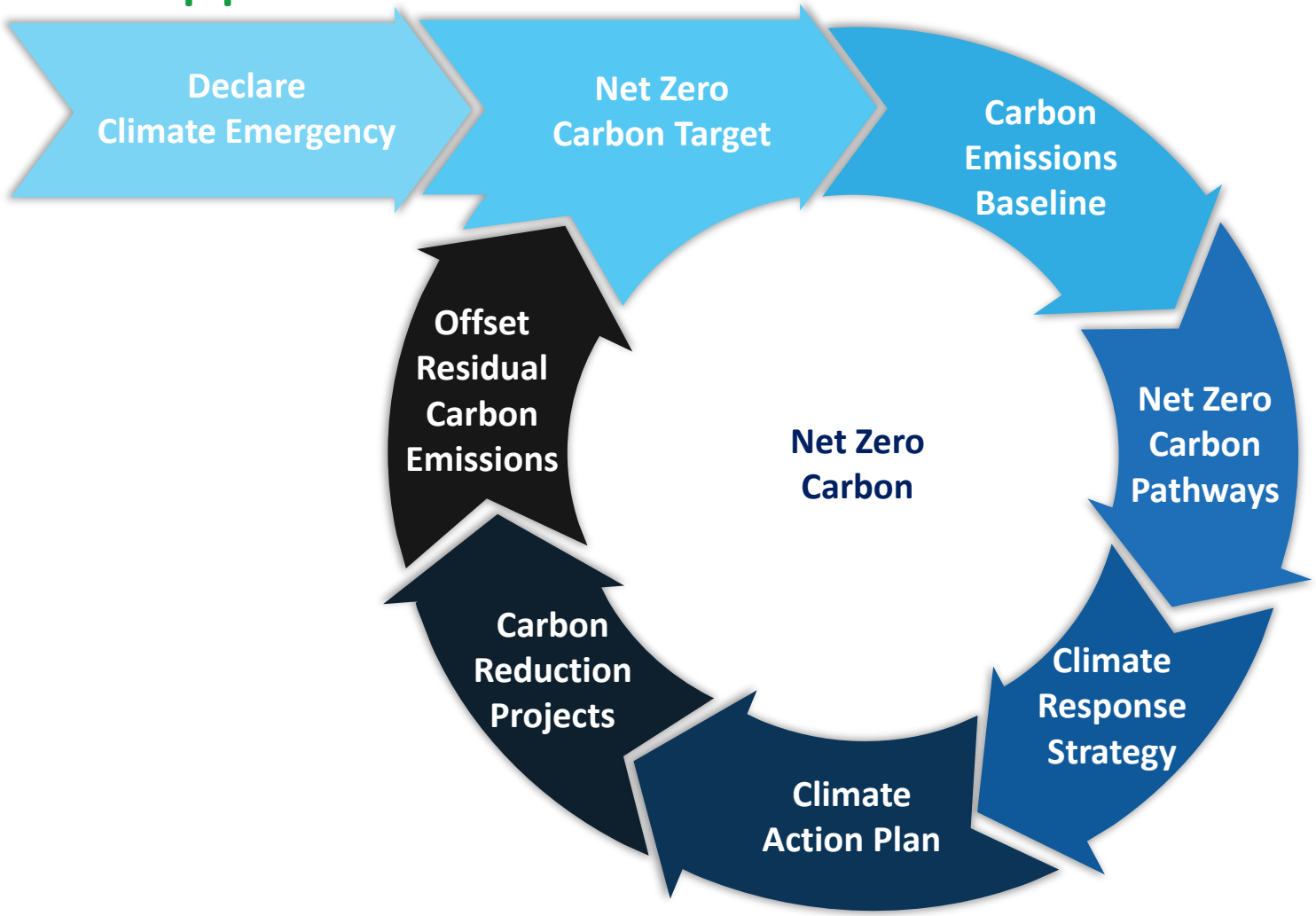
Common features of a Climate Emergency Declaration?

- Setting a **Net Zero Carbon target** and deadline
  - i. **Council** – usually aiming for 2030
  - ii. **Borough** – usually aiming for 2050
- Development of a **Climate Response Strategy** and/or **Climate Action Plan**
- Expressing a willingness to **collaborate** with local people, organisation and businesses
- Call to **Government** to provide support and take action

Declared a Climate Emergency - What next?

Net Zero Carbon

Our Approach to Net Zero Carbon



- Encourages **pro-active** approach for planning to **achieve** Net Zero Carbon
- Approach does not need to be consecutive – **action** is key
- Based on process of annual **performance monitoring**
- Requires **engagement** across the Council
- **Decarbonisation** is key
  - Buildings
  - Transport

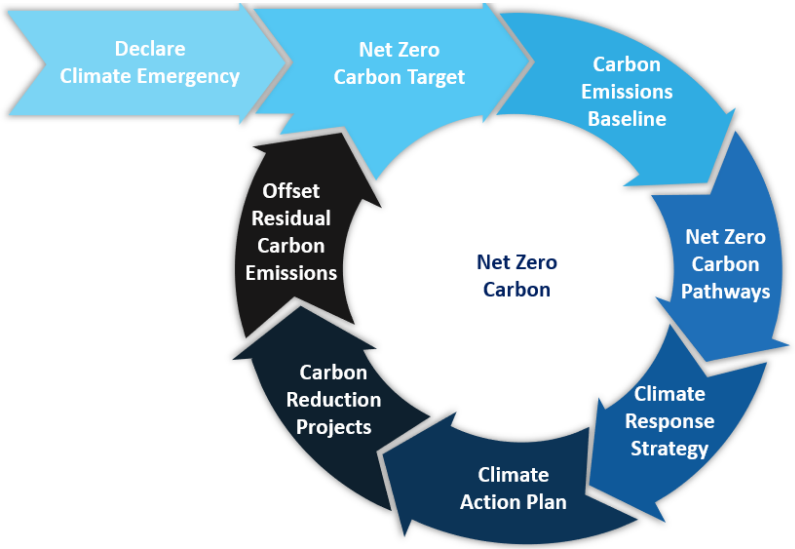
Net Zero Carbon

What are the challenges?

- **Calculating Carbon Emissions Baseline and Pathways**
  - ❖Setting the scope of the baseline (corporate, schools, housing)
  - ❖Access to data and quality/completeness
  - ❖Ensuring the pathway is accurate – it forms the basis of future decision making
- **Strategy and Action Plan**
  - ❖Short time frame – typically a 10 year timeline
  - ❖Optimum mobilisation of resources
  - ❖Ensuring that planned actions/projects will achieve Net Zero Carbon
- **Carbon Reduction Projects**
  - ❖Quick wins already achieved
  - ❖Identify projects that deliver best carbon cost-effectiveness
  - ❖Decarbonisation of Heat in Buildings – **Case Study**

Net Zero Carbon

How are GEP Environmental supporting?



Climate Change and Carbon Consultancy

- ✓Carbon Emissions Baselines and Carbon Pathways
- ✓Net Zero Carbon Strategy and Action Plans

Energy Saving in Buildings and Transport

- ✓Building Energy Efficiency Surveys
- ✓Renewable Technology Feasibility Assessments
- ✓EPCs and DECs

London Energy Project (LEP) Additional Services Framework

Available for direct call-off until 31 March 2020

Case Study

Decarbonisation of Heat in Buildings

Decarbonisation of Heat in Buildings

Green Gas

- Different to **green energy** which is generated from **renewable sources** or when providers pay to **offset carbon emissions** in worldwide projects
- **Biomethane (Green Gas)** is much harder to generate than renewable electricity, so it's much less common in “Green” energy tariffs.
- Sources include anaerobic digestion, landfill gas, synthetic gas
- Gas is processed before injection into the grid

DOMESTIC GREEN ENERGY SUPPLIERS			
Supplier	Green Gas	Carbon Offset	p/kWh
Green Energy UK	100%		4.62
Bulb	10%	90%	3.37
Good Energy	6%	94%	4.7
Ecotricity		100%	4.76

Decarbonisation of Heat in Buildings

Case Study: St Andrews University

- St Andrews University DH Network
- Large scale biomass district heating scheme - **6.5MW biomass boiler**, 23km of low heat loss pipe, connecting 41 buildings.
- Completed late 2017

GEPEnv called in to to help the University to optimise further **Carbon Savings** and **maximise the use** of the Biomass heat network

GEPEnv provided technical feasibility, developed business case and supported the Universities funding application

Decarbonisation of Heat in Buildings

Case Study: St Andrews University

Challenges:

- Restraints on DH Heat flow capacity
- Existing significant localized gas consumption – boilers left in circuit acting as heat loss
- Smoothing demand profile to minimise use of gas boilers to meet early morning and other peaks
- Potential connection of other low carbon heat sources onto network
- Further building heat demand reduction focusing on controls, air handling systems, fume cupboards, improved building fabric modelling and smart room technologies

Decarbonisation of Heat in Buildings

Case Study: St Andrews University

Project Engineering Solutions:

- ✓Relocate some boiler capacity to energy centre - ensure hot water is only circulated through the boilers when required – pump segregation and control improvements – Gas savings 5,000MWhrs or 85% - 900 tCO_2
- ✓Improved utilisation of the biomass boiler. Increase thermal storage at building level by around 3,000 litres for 50 buildings, savings around 3,000MWhrs of biomass / gas consumption – 500 tCO_2
- ✓Substantial savings in gas boiler maintenance

Decarbonisation of Heat in Buildings

Case Study: St Andrews University

Project Engineering Solutions (Cont'd):

- ✓Heat pumps using rejected heat recovery from chiller systems – 500,000kWh – 100 tCO_2
- ✓Sea Water heat pumps - as the lead heating system, with filtered sea water – 200,000kWh – 40 tCO_2
- ✓Ground / water source heat pump to replace existing gas fired boilers combined with improvement on fabric insulation - to operate heating at the lower temperatures – 450,000kWh – 90 tCO_2
- ✓All above attracted Renewable Heat Incentive

Decarbonisation of Heat in Buildings

Case Study: St Andrews University

Project Engineering Solutions (Cont'd):

- Controls including programme of delta T 3p to 2p valves across a range of LTHW systems
- Air Handling system efficiencies, Inverter Controls and heat recovery systems
- Modelling of building thermal improvements
- Smart room control technologies phase 1 – focus on electronic time and motion controllers for TRV's – commercial spaces with room booking and halls of residence

Thanks for listening.

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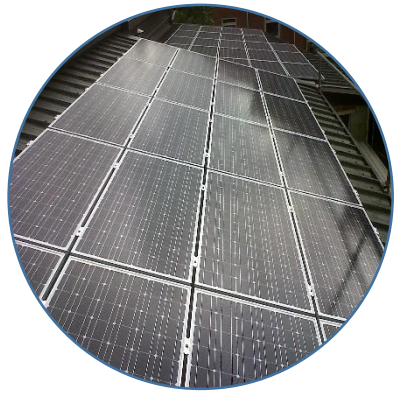

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