York Climate Change Strategy: A City Fit for the Future: Technical Annex

About this Document

This Technical Annex supplements York Climate Change Strategy: A City Fit for the Future and aims to provide further detail on the content, analysis, policy context and objectives within the strategy. This technical annex should be used to provide a more in-depth understanding of the strategy and the assumptions behind pathways modelling.

Strategic Framework

The council and city partners are co-designing a 10 year plan that will be informed by three strategies covering climate change, economic growth and health and wellbeing. The council is following a sustainable approach to developing the city's ambitions for the decade ahead.

The goal of sustainability is to, "create and maintain conditions, under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic, and other requirements of present and future generations." or put simply - 'Enough, for all, forever'.

This means that sustainable approaches need to consider the interdependencies between actions that might affect the environment, society, and the economy. To this end, the council is developing three strategies to inform city-wide direction over the next decade.

The Strategy and Policy framework sets out how strategies and policies fit together to achieve overarching ambitions (Figure 1).



Figure 1: Strategic Framework showing the relationship between council Strategy, Policy and Action Plans.

Working Together

The Climate Change Strategy is for the whole of York. Achieving the ambition will be the responsibility of everyone living, working and visiting our city. We will need to work with existing and develop new networks and partnerships that can bring together organisations from the city's public, private, community, faith, education and academic sectors to achieve the ambitious objectives and targets.



Figure 2: The stakeholders and partnerships involved in supporting and delivering the Climate Change Strategy

In Focus: York Climate Commission

The York Climate Commission was formed in December 2020 with the approval of City of York Council. Recognising that no single organisation has the power, authority, resources or ability to achieve the citylevel change needed to deliver York's ambition, the Commission was created.

The role of the York Climate Commission

- Promote leadership in the city on climate change, encouraging stakeholders to take effective action now, while maintaining a long-term perspective.
- Provide authoritative independent advice on the most effective steps required to meet the city's carbon reduction target to inform policies and actions of local stakeholders and decision makers.

- Monitor and report on progress towards meeting the city's carbon targets and recommend actions to keep on track.
- Make the economic case for project development, implementation and investment in low carbon and climate resilient projects in the city; and promote best practice in public engagement on climate change and its impacts in order to support robust decision-making.
- Bring together major organisations and key groups in York to collaborate on projects that result in measurable contributions towards meeting the city's climate reduction target.
- Act as a forum where organisations can exchange ideas, research findings, information and best practice on carbon reduction and climate resilience.

Engagement & Consultation

The Climate Change Strategy was developed over a period of 18 months by speaking to residents, businesses, community groups and partners. It has also taken feedback gathered during delivery of the Covid Recovery and Renewal Strategy delivered in the aftermath of the pandemic and feedback from "My City Centre" consultation. The resident engagement process was phased to gather information with multiple ways to engage.

Our Big Conversation attitudinal survey helped to understand what's important for the people who live, work and study in our city. Over 2,000 responses, covering residents and businesses, were received, telling us about different aspects of living in the city. The survey was available online and via Our City, the resident newsletter.

A combination of technical and industry roundtable meetings, focused stakeholder and partner discussions helped shape the strategies and covered different aspects of climate change. Through the summer of 2021, we held a series of stakeholder roundtable workshops covering the main themes of the Climate Change Strategy. These workshops, attended by experts from academia and industry, explored the local barriers and opportunities to delivering change at the pace and scale required to meet our ambition.

More targeted independently facilitated focus groups to explore strategic themes with target demographics took place throughout May and June 2022. These targeted groups invited participation from residents who did not engage in Our Big Conversation to make sure we had a blend of perspectives shaping the strategies. The groups were:

- Students in York
- 16-24-year-olds in York
- Members of York's LGBTQIA+ community
- Blue-collar workers in York
- Parents of children aged 0-10 in York
- People with disabilities in York
- Members of York's BAME community
- People in York who are currently not in education, employment or training

We then invited residents, businesses, community groups, city partners, regional policy leads and city stakeholders to review the draft 10 Year Strategies and tell us what they think about what it will be like to live in the city in 2032 through the Our Big Conversation: 10 Year Strategies Consultation, held throughout the summer 2022. The survey was available online or in print in libraries. There were approximately 500 participants of which 100 completed responses. These included individual residents, stakeholder and partner groups and organisations.

Climate Corners were attended by officers from the carbon reduction team to answer resident questions about the strategies through the prism of climate change. Over 150 residents engaged through the climate corner and were invited to complete printed surveys or respond online.

Throughout the consultation process, there are five common themes that have been articulated throughout:

- I. Cost what financial burden does the Climate Change Strategy place on residents and businesses?
- II. Ambitions are we ambitious enough? there is an inherent tension between the pace of change, scale of ambition and cost.
- III. Interdependencies there are significant co-benefits between delivering the strategies together that has been identified through the comments – specifically climate action comments that have been provided in response to the Economic and Health and Wellbeing Strategies, including the health impact of climate action and the health benefits of an inclusive economy.
- IV. Individual perspectives the focus groups show the differing requirements and recommendations of different groups of people. Executive will need to balance these differences throughout decision making.
- V. Targets understanding the Climate Change targets has created some confusion. This will be resolved through the revised strategy and draft Action Plan, with more work to follow to understand anticipated impact of the actions.

The Climate Change Strategy was simultaneously the most and least supported, with two thirds in favour and nearly a third not supporting. The main issue raised was the perceived lack of an action plan, and a draft has been developed in response.

Over 75% of participants agreed or strongly agreed that all five of the principles in the strategies were correct with the most important being the commitment to build inclusive, healthy and fair communities followed by our commitment to adapt to change.

Key strategic priorities were mostly supported (recognised as either a priority or a high priority) with reducing carbon, reforming local transport (the two highest priorities), improving the Natural Environment, Energy Supply, making good health more equal, preventing poor health now and starting good health and wellbeing young all noted as more of a priority.

Residents and businesses highlighted several areas where they could contribute to delivering the strategies, and also where they would like the council to focus. Their feedback has helped inform the Climate Change Action Plan and will be used in subsequent iterations.

Policy Context

The York Climate Change Strategy exists within a complex policy context at the local, regional and national scale. The integration of Strategic objectives across policy areas is key requirement for delivering on our climate change ambition, with existing and emerging policy acting as levers and critical enablers for action.

| National | Regional | Local |
|--|--|---|
| The Clean Growth Strategy set targets to upgrade as many houses to EPC band C by 2035 (2030 for all fuel-poor households). The Government's preferred target is that non-domestic property owners in the private sector achieve EPC band B ratings by 2030. Alongside the strategy, BEIS published joint industrial decarbonisation and energy efficiency <u>action plans</u> with seven of the most energy intensive industrial sectors, including the food and drink sector. | The Yorkshire and Humber Climate <u>Commission</u> is an independent advisory body set up to bring actors from the public, private and third sectors together to support and guide ambitious climate actions across the region. | The <u>COVID-19 Economic Recovery</u> <u>Transport and Place Strategy</u> was produced to secure the active travel benefits that have been realised during the pandemic. The strategy proposes to invest and create new networks of park and cycle hubs, priority cycle routes, cycle hire and parking to prioritise active travel as the preferred from of commuting. |
| The <u>Future Homes Standard</u> provides an update to Part L of the building regulations and will include the future ban on gas boilers by 2025 (which may be brought forward to 2023 under the recent 10-Point Plan). | The Yorkshire and Humber Plan – The Regional Spatial Strategy to 2026 aims to guide development in the next 15 to 20 years. Relevant policies picked out below. | The <u>City of York Local Transport Plan</u> <u>2011-2031 (LPT3)</u> aims to reduce emissions across York by providing quality walking, cycling and public transport networks. <u>The Local</u> <u>Transport Plan 4</u> is under development and will reflect the objectives within the Climate Change Strategy |
| Energy White Paper outlines the latest plans on decarbonising the UK's energy system consistent with the 2050 net zero target. | Policy YH2: Climate change and resource use encourages better energy, resource and water efficient buildings and minimise resource demands from developments, as well as exploiting the continued supply of brown field opportunities. | In 2020, York launched a <u>Clean Air</u> <u>Zone</u> across the city which regulated buses. Funding from DEFRA and the Department for Transport was used to upgrade or replace existing buses using fossil fuels |
| The <u>UK Green Building Council</u> was set up in 2013 to investigate and recommend new ways forward to reach zero-carbon buildings. | Policy Y1: York sub area policy encourages strategic patterns of development on the Sub Regional City of York, whilst safeguarding its historic and environmental capacity. | York's <u>Public EV Charging Strategy</u> sets out their approach to accelerating the transition to EV through a public charging network. |
| Ten Point Plan for a Green Industrial Revolution includes ending the sale of new petrol and diesel cars and vans by 2030. | Policy T1: Personal travel reduction and modal shift highlights the need to reduce travel demand and congestion and encourage a shift to sustainable travel methods | CYC Asset Management Strategy 2017- 2022 sets out how the council will manage its built assets. This will be supplemented with the emerging Housing Retrofit Action Plan |
| Moving Forward Together strategy commits bus operators to only purchase ultra-low or zero carbon buses from 2025. | Policy T3: Public transport sets out the need for improving public transport infrastructure and services to address problems of congestion and accessibility | Private sector housing strategy 2016- 2021 covers the private housing stock in the city |
| Well Managed Highway Infrastructure <u>– A Code of Practice</u> - advocates sustainability through sustainable | Policy ENV12: Regional Waste Management Objectives advises that all plans, strategies, investment | Cultural strategy 2019-2025 is designed to make a measurable, positive difference to the people of York |

| consumption and production; climate change and energy; natural resource protection and environmental enhancement; and sustainable communities. | decisions and programmes should aim to reduce, reuse, recycle and recover as much waste as possible. | |
|---|--|--|
| The <u>Road to Zero Strategy</u> 2018 sets out new measures to establish the UK as a world leader in development, manufacture and use of zero emission road vehicles. | Policy ENV12: Encourages local authorities to support waste facilities and management initiatives by moving it ravel the management of waste streams up the hierarchy, achieving waste management performance targets, and managing waste at the nearest appropriate location | The Low Emissions Strategy is targeted at reducing airborne emissions and has a direct positive impact on reducing carbon and other ghg emissions |
| Waste and Recycling: Making Recycling Collections Consistent in England (2019) The government are working with local authorities and waste management businesses to implement a more consistent recycling system in England. The measures are expected to come into effect in 2023. | Policy YH1 of the <u>Yorkshire Humber</u> <u>Plan – Regional Spatial Strategy to</u> <u>2026</u> states that growth and change in the region will be managed to achieve sustainable development | "Let's talk rubbish" outlines York's Joint Municipal Waste Management strategy with North Yorkshire County Council. The report highlights an increased need for reducing, reusing and recycling. |
| Our Waste, Our Resources: A Strategy for England (2018) sets out how the country will preserve resources by minimising waste, promoting resource efficiency and moving to a circular economy. | Policy ENV5 of the <u>Yorkshire and</u> <u>Humber Plan</u> states the regions plan to maximise improvements to energy efficiency and increase renewable energy capacity. | The <u>City of York's Council Plan 2019-</u> <u>2023</u> outlines that the Council will review waste collection to identify options to provide green bins to more houses, curbside food waste collection and the range of plastics currently recycled. |
| Waste Prevention Programme for England aims to supporting a resource efficient economy, reducing the quantity and impact of waste produced whilst promoting sustainable economic growth | The Yorkshire and Humber Waste <u>Position Statement</u> was produced to ensure appropriate coordination in planning for waste | York are currently developing a <u>Green</u> <u>Infrastructure Strategy</u> which will establish a long-term vision for the planning and management of Green Infrastructure across York, identifying where the protection and enhancement of green spaces and natural elements can be achieved. |
| In <u>the UK's Industrial Strategy</u> , one of the grand challenges set is clean growth, which refers to driving economic growth whilst reducing carbon emissions, and maximising the advantages for UK industry. <u>The Ten Point Plan</u> for a Green Industrial Revolution includes plans to | The Yorkshire and Humber Waste <u>Technical Advisory Body</u> ensures effective collaboration between Waste Planning Authorities in Y&H. The <u>Yorkshire and Humber Regional</u> Biodiversity Strategy highlights how | The <u>City of York Local Biodiversity</u> <u>Action Plan 2017</u> provides information about the wildlife in York, the sites that are of value, its importance both for York and nationally, the current threats and what is being done to conserve it. Section 14 of the <u>City of York Local Plan</u> promotes sustainable connectivity |
| invest in carbon capture for industries that are particularly difficult to decarbonise. | the region can contribute to local, regional and international biodiversity obligations and identifies the key mechanisms and actions required of difference partners and sectors | through ensuring new development has access to high quality public transport, cycling and walking networks. |
| The 25 Year Environment Plan includes commitments to create new forests/woodlands, incentivise tree planting, explore innovative finance; and increase protection of existing trees. | The Humber Clean Growth Local White Paper sets out for the Humber region to be a net zero carbon economy by 2040. | York set an ambition to increase tree canopy cover in line with national average in the <u>Tree Canopy Expansion</u> <u>Target</u> |
| Land use: Policies for a Net Zero UK (2020) includes converting 22% of agricultural land (mostly from livestock) to forestry. | One of North Yorkshire and York Local Nature Partnership Strategy objectives is to conserve and enhance natural habitats and species. The LNP also sets out to strengthen natural corridors for species movement and aims to have a 75% coverage of green infrastructure corridors in LNP priority areas. | Joint Health and Wellbeing Strategy 2017-2022: considerable co-benefits to health and wellbeing from reducing carbon emissions and minimising the impact of climate change |

| Woodland Trust Emergency Tree Plan | The Humber Local Energy Strategy sets | |
|---|---|--|
| recommends Local Authorities write an | out two key objectives: To ensure | |
| Emergency Tree Plan and set targets | decarbonization in Humber in the | |
| for tree planting. | electricity, heat and transport sectors | |
| | and; To foster clean growth by | |
| | supporting low carbon technologies | |
| | and taking advantage of opportunities | |
| | of a low carbon economy. | |
| The UK's National Planning Policy | The York, North Yorkshire & East | |
| Framework (2019) states as a core | <u>Riding's Local Energy Strategy</u> provides | |
| planning principle that planning should | a clear pathway towards a low | |
| support the transition to a low carbon | economy by implementing high-impact | |
| future | low carbon energy technologies such | |
| | as energy efficient vehicles, renewable | |
| | heat pumps, anaerobic digestion and | |
| | biomass for heat. | |
| UK National Energy and Climate Plan | | |
| sets out integrated climate and energy | | |
| objectives, targets, policies and | | |
| measures for the period 2021-2030. | | |

In Focus: Tourism

Tourism in York

In 2018, York received <u>8.4 million visitors</u>, a figure which has increased 11.8% since 2014.

With York's permanent population estimated to be <u>209,900</u>, several key challenges arise when aiming to sustainably cater for both residents and tourists, such as:

- Tourism congestion, relating to the density and seasonality of visitors to the city
- Supporting businesses in the tourism sector to reduce emissions
- Ensuring the city remains livable for residents

We are in the process of updating our Tourism Strategy, which will include our approach to promoting sustainable tourism and how the sector can support our climate change ambition. Following the COVID-19 pandemic, the entertainment, tourism and hospitality sectors have been significantly impacted. Opportunities to influence behaviour change as the industries recover and as tourists return should will considered as part of the strategy.

"Sustainable tourism has the potential to advance urban infrastructure and universal accessibility, promote regeneration of areas in decay and preserve cultural and natural heritage... Greater investment in green infrastructure should result in smarter and greener cities, from which not only residents, but also tourists, can benefit." (<u>United Nations World Tourism Organisation</u>, 2015)

Emissions Profile

The current emissions profile for the area administered by City of York Council is shown in figure 3, based on the SCATTER tool calculations. This covers scope 1 and 2 emissions for the city-wide area of York. This covers 3 greenhouse gases: carbon dioxide, nitrous oxide and methane and relates to the 2018 reporting year. While the embodied carbon associated with creating products used in York is an important consideration, this emissions profile only covers emissions generated within the city, as this follows the same boundaries set out by UK Government.

Not all subsectors can be neatly summarised as a "slice" of this chart. Emissions from land use act as a carbon sink for the region, sequestering carbon from the atmosphere. An illustration of this has been included in the chart.



Figure 3: SCATTER emissions inventory for York, 2018

City-wide emissions data (sometimes referred to as "community" or "geographic") encompasses all emissions within a specific geopolitical boundary over which local governments can exercise a degree of influence through the policies and regulations they implement.

The Global Covenant of Mayors (GCoM) requires committed cities to report their inventories in the format of the Common Reporting Framework, to encourage standard reporting of emissions data. The GCoM Common Reporting Framework is built upon the Emissions Inventory Guidance, used by the European Covenant of Mayors and the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC), used by the Compact of Mayors. Both refer to the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories.

The main greenhouse gases defined by the United Nations Framework Convention on Climate Change (UNFCCC) are carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs) and sulphur hexafluoride (SF6), as well as nitrogen trifluoride (NF3). GCoM cities are required to report at least CO2, CH4 and N2O gases.

An emissions inventory uses activity data which is a quantitative measure of a level of activity that results in GHG emissions taking place during a given period of time e.g volume of gas used, tonnes of solid waste sent to landfill. Emission factors are then applied to this activity data. An emissions factor is a measure of the mass of GHG emissions relative to a unit of activity. Government conversion factors for greenhouse gas reporting are used. Global Warming Potentials (GWP) use a factor describing the degree of harm to the atmosphere of one unit of a given greenhouse gas relative to one unit of CO₂.

York Emissions Subsectors

The following tables demonstrate the profile of each emissions sector and explain the sources of Scope 1 and 2 emissions included in each¹:



Figure 4: Emissions by sector in York

Link data tables to appendix

In Focus: City of York Council Corporate Emissions

In 2021, City of York Council reported on emissions associated from its corporate activity for the first time. In total, its buildings, corporate waste, business travel and fleet were responsible for 3,635tCO₂e for the financial year 2020/21.

The council is committed to achieving net zero for its own operations by 2030 and has produced the following recommendations to achieve this:

- Produce a decarbonisation plan for our largest emitting sites to identify improvements in heat generation, building fabric and energy efficiency and renewable generation
- Adopt a policy to consider low carbon heating solutions for all system replacements
- Develop and promote a behaviour change campaign to reduce emissions associated with staff activity
- Explore opportunities to replace mains water with grey water
- Implement vehicle route planning and driver training across our corporate fleet
- Promote remote event attendance where possible
- Adopt a policy that prioritises train travel over flights, wherever possible
- Increase the proportion of hybrid and electric vehicles in the car club fleet and encourage staff to use electric and hybrid vehicles
- Review the corporate waste contract and undertake a waste audit

¹ Emissions sectors may not add up to exactly 100% due to rounding.

- Incorporate sustainable procurement and circular economy principles into our purchasing decisions
- Develop a methodology to calculate Scope 3 emissions associated with council activity

Emissions Reduction Pathway for York

The current emissions profile offers the baseline from which to measure progress towards net zero by 2030.

Also important is the fact that once emitted, greenhouse gases such as CO_2 and N_2O can remain in the atmosphere for extended periods of time – up to hundreds of years. This means it is crucial to consider York's *cumulative* year-on-year emissions.

The Paris Agreement aims of remaining *"…well below 2°C"* of warming dictate an upper limit of greenhouse gas emissions that are allowed.

We can join these ideas together in the form of a *carbon budget, which* guides a trajectory for emissions reduction.





The Tyndall Centre for Climate Change Research, based at the University of Manchester, have produced advisory climate change targets for York to make its fair contribution to meeting the objectives of the United Nations Paris Agreement on Climate Change. The latest scientific consensus on climate change in the Intergovernmental Panel on Climate Change Special Report on 1.5°C is used as the starting point for setting sub-national carbon budgets that quantify the maximum carbon dioxide emissions in York to meet this commitment.



Figure 5: Projected Emissions Reduction Pathway and Business as Usual Pathway for York

In Focus: SCATTER Tool

SCATTER is a local authority focussed emissions measurement and modelling tool, built to help create low-carbon local authorities. SCATTER provides local authorities and city regions with the opportunity to standardise their greenhouse gas reporting and align to international frameworks, including the setting of targets in line with the Paris Climate Agreement. Its use is free of charge to all local authorities in the UK.

The SCATTER tool:

- Generates a greenhouse gas emissions inventory following the Global Protocol for City-wide Greenhouse Gas emissions for your local authority area
- Helps the understanding and development of a credible decarbonisation pathway in line with emissions reduction targets
- Provides outputs that can be used for engagement to create a collaborative carbon reduction approach for local authorities

Objectives Analysis

Understanding carbon impact potential

Figure 6 provides a visual overview of the estimated carbon savings that would result if the objectives detailed in the Projected Emissions Pathway were achieved. Savings provided are cumulative, for the period 2020-2030.

- The diagram illustrates the high variance between the impact potential of the objective areas
- Mirroring the trend observed in the emissions inventory, the largest savings potential is found within the buildings and transportation sectors
- Specifically, actions associated with on-road transportation and building energy efficiency offer the biggest potential carbon savings

In seeking to achieve your net zero target, it is recommend prioritising action with the largest carbon saving potential.



Figure 6: Cumulative carbon savings for York, 2020-2030, in line with the Projected Emissions Reduction Pathway

Cost Implications

There are different types of cost to consider when evaluating carbon reduction actions, which can be helpful to define:

- <u>Capital expenditure</u> (capex) represents funds used to acquire, replace or upgrade a fixed asset e.g., the showroom price of an electric vehicle
- <u>Operational expenditure</u> (opex) represents funds spent or earned in the use and maintenance of that asset throughout its life e.g., the price of charging point electricity used to power the electric vehicle
- <u>Marginal cost</u> represents *additional* expenditure incurred as a result of choosing a low-carbon option over a higher-carbon alternative e.g., the difference between the showroom price of an electric vehicle versus a diesel equivalent

 <u>Annualised costs</u> represent a combined yearly capex and opex cost associated with a given initiative. The upfront capex is averaged over the lifetime of the project/asset (equivalent to a depreciation charge) and combined with any in-year operational cost/savings to provide a single number to compare assets like for like.

Each of these financial metrics represents an important consideration for the business case for different actions and are not always directly comparable. Estimates provided here reflect this, with an attempt made to clearly define the type and specific nature of each cost.

It should be noted that costs given are high-level estimates only and that forward-looking cost models are inherently limited in accuracy. Estimates are not intended to act as definitive costings and are instead better used as a means of appreciating the scale and nature of the financial implications of different activities.

Methodology

Estimates are based on a comparison between the cost of a baseline case (the "BAU") and Projected Emissions Reduction Pathway equivalent within SCATTER for each sector. Estimates have been made in isolation for different objectives based on specific research and data contexts. Where possible, an attempt has been made to enable like-for-like comparison between estimates made for different activities within the same sector. Cost assumptions are themselves based on government datasets and underlying research papers, most notably the CCC's <u>Sixth Carbon Budget</u>.

Carbon savings

Understanding the activities which offer the highest potential carbon savings is another way York can prioritise action towards net zero. Understanding which activities contribute most to reducing both District's emissions also links into the hierarchy of actions for project development and sets out the "heavy hitting" objectives defined by SCATTER.

Estimating emissions savings

Using the Projected Emissions Reduction Pathway and "Business as Usual" scenarios we can estimate emissions savings, broken down into different categories. This is done by comparing the projected emissions along each pathway from different subsectors (e.g. domestic lighting or commercial heating) for each year, and defining the difference between them.

A visual representation of this method is given below.



Which areas of activity have been estimated?

The categories of emissions savings are broken down slightly differently to the SCATTER objectives, meaning that the savings are grouped slightly differently. This is because of the interdependency of the SCATTER objectives, where more than one objective contributes to the same savings subcategory.

Since one action can contribute to more than one SCATTER objective target, the savings from multiple separate objectives may be combined into one subcategory. This is illustrated below:

| Interdependent SCATTER objectives | Common savings subcategory | Example activity that mee both objectives |
|---|--|---|
| Domestic heating technologies Hot water demand | Domestic space heating and hot water | Installation of an efficient household heat pump |

Estimated Cumulative Savings

| Sector | SCATTER Objective | Subsector | Cumulative Savings from 2020 | |
|---------------|--|--|------------------------------|---------------------------|
| | | | 2030 | 2050 |
| Domestic | Improved building efficiency | Domestic space heating and hot water | 647 ktCO2e | 2,405 ktCO ₂ e |
| Domestic | Improved lighting and appliance efficiency | Domestic lighting, appliances, and cooking | 44 ktCO₂e | 117 ktCO₂e |
| Non- Domestic | Improved building efficiency | Industrial buildings and facilities | 205 ktCO ₂ e | 694 ktCO₂e |
| Non- Domestic | Improved heating efficiency | Commercial space heating, cooling, | F(1+CO - | 242 4460 - |
| Non- Domestic | Shifting off gas heaters | and hot water | Jo KCO2e | Zoz KtCO2e |
| Non- Domestic | Improved lighting and appliance efficiency | Commercial lighting, appliances, equipment, and catering | 38 ktCO2e | 101 ktCO₂e |

| Sector | SCATTER Objective | Subsector | Cumulative Savings from 2020 (ktCO2e) | |
|-------------------------|-------------------------------------|---------------------------|---------------------------------------|------------------------|
| | | | 2030 | 2050 |
| Waste | Reducing the quantity of waste | Solid waste disperal | 17 ktC0-0 | 54 ktCO.o |
| Waste | Increased recycling rates | Solid waste disposal | 17 KtCO2e | 54 KLCO2e |
| Transport | Switching to electric vehicles | | | 1,582 ktCO2e |
| Transport | Travelling shorter distances | | 632 ktCO2e | |
| Transport | Driving less | On-road | | |
| Transport | Improving freight emissions | | | |
| Industry | Shifting from fossil fuels | Industrial processes | 21 ktCO₂e | 87 ktCO₂e |
| Energy Supply | Local technologies | Stationary Energy sectors | 1.050 ktCO-0 | 3 744 ktCO-0 |
| Energy Supply | Large scale technologies | Stationary Energy sectors | 1,050 RC020 | 5,744 RC026 |
| The Natural Environment | Increase tree coverage and planting | | 51400 | |
| The Natural Environment | Land use management | Land use | J KtCO2e | 21 KtCO ₂ e |
| The Natural Environment | Livestock management | Livestock | 10 ktCO ₂ e | 57 ktCO₂e |

Buildings

Stakeholder Perspective

As part of the Climate Change Strategy & Action Plan development, three workshops were held, and a public attitude survey published to gain stakeholder views on how York could respond to the climate emergency. A summary of the key stakeholder views relating to buildings are detailed below.

| | Challenge areas | |
|---|-----------------|---|
| | Technical | Technologies that have reached maturity are now trusted and widely accepted (e.g. PVs), newer technologies still treated with scepticism and suffer from high cost. Heat pumps need financial subsidy to stimulate market until economies of scale drive down price. Complicated systems that underperform can generate negative reactions. Only appropriate solutions should be specified with local demonstrators/pilots to showcase new technology. |
| | Policy | Approach to decarbonisation of conservation/heritage assets is insufficient and inconsistent. National policy (NPPF) needs to reflect climate emergency priorities, local policy (The Local Plan) needs to provide standards and guidance for heritage retrofit and planning practice needs a consistent, joined up approach. Need to balance decarbonisation with reducing fuel poverty and recognise the role of demand reduction. |
| £ | Financial | Government subsidies for low carbon heating solutions have not been effective. Gas is too cheap and so a greater financial incentive is needed switch to electricity. Financial offers can be complicated and initial capital outlay may be prohibitive for some organisations/households. Role for specialist independent advice. |
| | Community | Broad awareness of need for change has increased significantly, but there is an evident behavioral gap when it comes to uptake. Inconvenience, lack of simple independent information, complicated list of suppliers and pricing all add hassle factors to retrofit. There is a need for an independent and trusted brokerage service and local pilot/demonstrators. |
| Þ | Delivery | Limited availability of specialist consultants (particularly for heritage buildings). Highly skilled project co-ordinators/managers also needed in construction sector. Potential for area-based skill sharing schemes for Clerk of Works/Building Inspectors. Need to provide suitable training, skills and market development but high level of inertia in trainers/education. National curriculum change will be slow so need to promote local apprenticeships and integrate into purchasing policy of local organisations. |

Cost Estimates

| SCATTER activity | Assessed cost (£m) |
|---------------------------------------|--|
| Switch to electric cookers | 6.1 (marginal opex as a result of switching to all-electric cooking systems) |
| New build standards are Passivhaus | 23 (marginal capex of building to Passivhaus standard during construction)119 (marginal capex of retrofitting new-build Part L in the future) |
| Reduced household energy demand | 700 (capex required for retrofit on existing homes) |
| Switching away from gas heating | 144 (marginal capex for domestic electric heating systems)-155 (marginal opex as a result of switching to electrified heating) |

Notes & Caveats

Switch to electric cookers

- No additional capex assumed with the cost of installation for new electric cooking systems.
- Main cost here represents the potential added cost of fuel each year if the borough switches over time to electric systems, based on a marginal cost over a gas equivalent.
- Projected Emissions Reduction Pathway assumes a linear transition to electric cookers ending in 2035 modelled as a retirement rate of 1/15th of gas systems replaced each year.
- The cost for a household that switches from a full gas to a full electric system may incur higher energy bills as a result of the higher cost of electricity. Long-run energy prices taken from the CCC Sixth Carbon Budget.
- This analysis does not consider government subsidies for energy prices which may have a significant role to play in lowering the cost to consumers.

New build standards are to Passivhaus

- These figures are taken from a <u>Currie & Brown and AECOM</u> report which defines the marginal cost between building Part-L or Passivhaus standard both during construction and retrofit phases at a later date. This also accounts for heating systems (assumes air-source heat pump in a semi-detached house).
- The cost of retrofitting runs very high because retrofitting newly-built Part L to higher standards in future can cost between 3-5 times more than building to Passivhaus during construction.
- Number of new builds taken from SCATTER newbuild projections between 2020-40.

Reduced energy demand in homes

• This represents the capex required to complete inner/external wall retrofit on the numbers of households described by the HA pathway.

- Point capital costs for insulation and all other costs come from this <u>BEIS study</u> into the cost of domestic retrofitting. This also accounts for economies of scale, other fixed project costs and local geographical weighting, as well as a hurdle rate.
- Assumes a linear transition of completed retrofit from 2020 household numbers.

Switching away from gas heating

- <u>CCC Sixth Carbon Budget</u> has data on capex and opex of a variety of domestic heating systems. An average of these systems was used to determine the cost estimate opposite.
- Number of households taken from SCATTER (2020) and split between gas/non-gas according to aggregated government estimates at LSOA level. A flat 5% assumption was made on households already served by an electric system. All other off-gas properties assumed to be oil boilers.
- All systems assumed replaced at some point (retirement rate 1/15), so replacement costs are calculated for all systems including fossil.
- Opex assumption assumes energy bills are reduced over time as a result of efficiency improvements of electric over gas.

| Ruilding archatupa | Improved building efficiency | | Switching away from gas heating | |
|-----------------------------|------------------------------|------------------|---------------------------------|------------------|
| building archetype | Capex (£m) | Annual opex (£m) | Capex (£m) | Annual opex (£m) |
| Arts, community and leisure | 5.1 | -0.007 | 1.1 | 0.1 |
| Education | 4.8 | -0.009 | 1.8 | 0.15 |
| Emergency services | 1.4 | -0.003 | 0.6 | 0.05 |
| Factories | 18.1 | -0.018 | 2.7 | 0.25 |
| Health | 3.9 | -0.010 | 1.7 | 0.15 |
| Hospitality | 4.1 | -0.007 | 0.8 | 0.05 |
| Offices | 14.2 | -0.018 | 1.6 | 0.15 |
| Shops | 13.3 | -0.018 | 1.1 | 0.1 |
| Warehouses | 5.8 | -0.008 | 1.1 | 0.1 |
| Total | 70.560.6 | -0.098 | 12.2 | 1.1 |

Notes & Caveats

Improved building efficiency

- Non-domestic buildings in any area make up a very broad stock of diverse properties.
- The Non-Domestic National Energy Efficiency Database (<u>ND-NEED</u>) was used to find the number of rateable properties in York.
- Costings from Building Energy Efficiency Survey (BEES), which outlines the cost of a package of retrofit measures across different non-domestic archetypes. These were mapped onto the ND-NEED rateable properties register at the local level according to a nationally representative mix of archetypes.
- Costs represent one round of retrofit. Annualised costs relate to the annual marginal expenditure across all sectors over the lifetime of a 15-year cycle of retrofit.

Switching away from gas heating

- Average load demand for heating across different archetypes calculated based on a combination of BEES consumption data and CCC statistics on heating systems.
- CCC publish £/kW values for capex and opex which have been applied to a scaled figure of average load demand for space heating and hot water.
- Figures represent the capex of a new heating system, whilst opex covers routine maintenance but not fuel costs. Fuel costs are only projected to constitute significant additional bills in the retail and office sectors, offering cost savings to many archetypes due to more efficient systems.
- \circ Heating systems assumed to be replaced at a rate of 1/15th each year.

• Costs expressed represent the annualised, marginal cost between a business-as-usual gas case and a Projected Emissions Reduction Pathway transition to electrified systems. They represent the annual additional cost of electric systems versus replacement like for like with gas.

Transport

As part of the Climate Change Strategy & Action Plan development, three workshops were held, and a public attitude survey published to gain stakeholder views on how York could respond to the climate emergency. A summary of the key stakeholder views relating to transport are detailed below.

| | Challenge areas | |
|----|-----------------|--|
| | Technical | There are many concerns regarding the lack of infrastructure surrounding the support of the transitions to EVs from a technical perspective; such as the lack of charging infrastructure and a gap in the data to help estimate the required change need to meet the growing demand. Central hub is needed to connect more than one mode of transport e.g., one app connecting all journeys with different modes and influence decision making with costs per mode and carbon cost. |
| | Policy | Long term security of policy is impossible due to change in political parties' agendas. Clarification on policy on EV charging demand. Historic nature of the city - how to accommodate infrastructure that is compliant with guidance. Members of the Council may not live in the inner-city areas - who they represent may limit York's activities. |
| E | Financial | Funding schemes are short term - no finance in the medium/long term e.g., in 7-8 years. Limited finance to pay for new bus networks/improvements. Need funding to encourage residents to switch and enact that behaviour change and ensure offers are affordable. How to make roads safer to increase cyclist confidence, speed reduction, large vehicle restriction - limited space. 73% of survey respondents listed that an efficient and affordable public transport system should be a key objective of York's Climate Change Strategy. |
| | Community | Lack of education on cost of an EV - Council should encourage people to think about switching to EV through more educational opportunities. Encourage co-creation - discuss solutions with members of the community. Engagement with community when encouraging shorter distances. Ethical considerations are important - fair and just transition to consider all communities. Direct engagement with communities to challenge conceptions and drive change. |
| 12 | Delivery | Facilitating behavior change by introducing earlier bus schedule. Number of residents put pressure on transport and infrastructure - puts more pressure on the NHS. Council to develop cycling routes through the city centre which connect to outer areas. People don't want to leave the safety of their vehicles, especially with the pandemic and weather is changeable. |

| Turne of cost | Overall investment (£m) | | | |
|--|-------------------------|----------|--|--|
| | Capex | Opex | | |
| Infrastructure: cars/ vans/ motorcycles | 74.5 | - | | |
| Infrastructure: HGVs/ buses | 38.3 | - | | |
| Infrastructure: rail | 3.7 | - | | |
| Total infrastructure | 116.5 | - | | |
| New vehicles: cars/ vans/ motorcycles | 433.5 | -1,441.1 | | |
| New vehicles: HGVs/ buses | 108.4 | -23.8 | | |
| New vehicles: rail | 30.9 | -129.5 | | |
| Total new vehicles | 572.8 | -1594.4 | | |
| Efficiency measures | - | -284.7 | | |

Notes & caveats

- <u>CCC Sixth Carbon Budget</u> costings for capital expenditure and operational savings in the surface transport sector have been recast under SCATTER objectives to 2050 to give an estimate for the implications of the Projected Emissions Reduction Pathway.
- Costs represent a scaled down portion of national expenditure in each area as set out in the Sixth Carbon Budget, based on vehicle registrations in York.

- Demand reduction and modal shift objectives have been mapped from the Projected Emissions Reduction Pathway onto the expenditure, assuming all costs rise proportionally.
- The vast majority of expenditure and savings related to transport is made in the purchase and operation of new electric vehicles.
- Additional costs have also been given as part of this analysis, shown below in Table X. These are sourced from <u>DfT</u> and <u>CCC Sixth Carbon Budget</u>.
- Scaled costings have also been included for the "efficiency measures" objective from CCC modelling. It should be noted that whilst the costings are representative of similar changes within SCATTER, the details of this measure do differ and this figure should be taken with an added caveat.

Waste

As part of the Climate Change Strategy & Action Plan development, three workshops were held, and a public attitude survey published to gain stakeholder views on how York could respond to the climate emergency. A summary of the key stakeholder views relating to waste are detailed below.

| | Challenge areas | |
|---|-----------------|---|
| | Technical | Need to consider whether there is potential for a waste recovery plant and if it is a long-term solution, as waste is diverted from landfill and is instead generating energy. Potential to utilise existing technology but with additional infrastructure or technology should be explored - e.g. the conversion of the anaerobic digestion site. Ongoing technical projects to find single use plastic alternatives through University of York. Mycelium packaging assessing technical viability. |
| | Policy | Having consistency between households and businesses, as businesses are mandated to do recycling and sort more waste as a result. There's a need to be consistent in policy in infrastructure for waste, packaging and producer responsibility alongside any ongoing cost and management of waste. Potential policy change could include food waste. |
| E | Financial | Uptake of Re-biz programme is not as high in certain areas due to a lack of audits and grants. 55% of respondents to the Our Big Conversation Residents survey listed cost as a key reason preventing them from reducing their carbon footprint in areas including waste. |
| | Community | Need to increase community awareness and business incentives to discourage single use plastic. Need for community champions who provide encouragement and education for the smallest businesses. |
| Þ | Delivery | The biggest issue with microplastics is their depository in natural areas, their life cycle needs to be managed. Time and effort into recycling different plastics and determine what can and can't be recycled. Greater emphasis on larger businesses, need to consider whether different language and a different approach is needed. |

| SCATTER activity | Assessed cost (£m) |
|--------------------------|-----------------------------------|
| Reduce overall volume of | |
| waste & increased | -56.9 (opex savings in gate fees) |
| recycling | |

Notes & caveats

Waste disposal

- This is based on simple modelling of future gate fees for recycling, landfill and incineration based on statistics in the 2019/20 <u>WRAP gate fees report</u>.
- SCATTER estimates for the volume and stream of waste are applied to current figures cast forwards to 2040.
- Gate fees represent the charge levied per tonne to dispose of waste by a given means e.g. landfill site or material recovery facility.
- Estimates do not cover the cost of collection and transport of waste. We have assumed there is no marginal cost between the two scenarios lifetime cost of electric refuse collection vehicles (RCVs) is comparable to that of diesel RCV (see table opposite from DfT data).
- Not all payments for waste are handled purely through gate fees but this represents a useful proxy for comparative costs of increased recycling and reducing waste volumes versus the counterfactual.

Commercial & Industrial

As part of the Climate Change Strategy & Action Plan development, three workshops were held, and a public attitude survey published to gain stakeholder views on how York could respond to the climate emergency. A summary of the key stakeholder views relating to industry are detailed below.

| | Challenge areas | |
|---|-----------------|--|
| | Technical | Although technology already exists to capture carbon emissions, such as carbon capture storage (CCS), it is not readily available. Consistent demand for energy in industry provides an opportunity for a Power Purchase Agreement. Consistent demand for energy in industry may limit the ability to rely on renewable energy without sufficient energy storage. |
| | Policy | There is an existing Clean Growth Strategy for the UK, which should be referenced and considered. Most policy focused on industry is at larger geographical scales than a local authority, so the influence of CYC may be limited. |
| £ | Financial | COVID Recovery Loan Scheme from government is set to help industries hit particularly hard by the pandemic and provides an opportunity for building back better and driving low-carbon growth and low-carbon infrastructure. Development of low-carbon infrastructure can have high associated costs. Businesses may not have significant available funds due to COVID-19, and therefore would need financial support to implement changes. Funding needs to be made available to businesses of all sizes. CCS has high associate costs. |
| | Community | Jobs may be created in CCS trials and low-carbon infrastructure. May face resistance from industry without support. There may be a skills shortage in the local workforce to install low -carbon infrastructure. |
| P | Delivery | External reporting mechanisms provide guidance and structure to reporting. External reporting mechanisms have high credibility and reflect well on the business. Knowledge of low-carbon infrastructure and energy efficiency measures to be included in new builds may be limited. Heritage and historical importance of York's landscape may limit infrastructure improvements. |

| SCATTER activity | Assessed cost (£m) |
|----------------------|--------------------|
| Industrial processes | 5.6 (capex) |

Notes & Caveats

- Cost represents the marginal capex of a low-carbon pathway for industry, scaled to Slough based on their share of national industrial fuel consumption.
- Government pathways can be found in the <u>industrial pathways to decarbonisation</u> summary report.

Natural Environment

| | Challenge areas | |
|---|-----------------|---|
| | Technical | Tree planting can be used to mitigate the risk of flooding which doesn't have to be within York's boundary and can be tied into local York initiatives. Trees offer a nature-based solution to the warming of urban areas by providing shade. |
| | Policy | O Under the UK's exit from the European Union, policy can move away from the Common Agricultural Policy and a provide a change in funding requirements for landowners. The requirements could focus on the public good and there could be more funding options for decarbonisation/afforestation. O The temporal period is a barrier to tree planting and tree cover reducing carbon emissions. Policy should consider that more mature trees have more significant impact but may not tie into the 2030 timeline. |
| £ | Financial | There are existing funding streams available for urban planting. There is an associated cost to the maintenance of trees and green space which needs to be demonstrated. The return on investment in the form of carbon sequestration will be more in the long-term. |
| | Community | Need to address the public view of the value of trees and how they benefit the city. Community engagement is very important and should be viewed as a positive upfront investment. Involving the community with green infrastructure initiatives engages people with nature. There may be disagreement and resistance to local changes, also known as "Not In My Back Yard"-ism (NIMBYSM), over the location of new trees. |
| Þ | Delivery | There are opportunities for rewilding and tree planting in the outer areas of York. Tree planting in urban areas can also look at levels of deprivation when deciding on locations to improve local areas. Land use availability - land under local authority ownership covers a small percentage of the district, which means that the impact tree planting can be dependent on the engagement and willingness of local landowners. |

| SCATTER activity | Assessed cost (£m) |
|------------------------------------|---|
| Increased forest and tree coverage | 3.9-0.77 (capex range depending on availability of government grant support) |

Notes & Caveats

- Tree coverage and land area change under SCATTER objectives were modelled to 2030 in terms of increase in hectares of woodland.
- <u>Woodland Creation & Management Grant</u> gives costs for capex and opex per hectare of new woodland, which have been applied to the new hectares.
- Further funding opportunities for woodland creation, maintenance, management and tree health can be found <u>here</u>.
- Figures represent a marginal case for Projected Emissions Reduction Pathway over BAU; the range represents the impact government grant funding may have.

Energy

As part of the Climate Change Strategy & Action Plan development, three workshops were held, and a public attitude survey published to gain stakeholder views on how York could respond to the climate emergency. A summary of the key stakeholder views relating to energy supply are detailed below.

| | Challenge areas | |
|---|-----------------|---|
| | Technical | Assessments from the Council should look at all renewable energy options e.g., a heat pump strategy, wind strategy. The use of technology should be maximised, e.g., apps that show the amount of money and carbon saved from renewable energy. Technology should also be used to amplify good practice e.g., apps to share case studies and tips. |
| | Policy | There is a gap in policy for new-build properties between the Local Plan and the requirements of Passivhaus. There is a need to balance Passivhaus and offering retrofitting such as loft insulation across the city, existing stock should also be focused on. Historic and heritage-based policy may conflict with renewable energy installation. |
| E | Financial | Energy Service Companies (ESCOs) can benefit SMEs through free or cheap audits, the development of a plan and help accessing finance to invest in upgrades. The payment then comes out of saving made from energy bills. This method is working well in Oxford but does require some initial capital investment. The ability of ESCOs to benefit small businesses may be limited. Funding opportunities are predominantly for larger businesses and need to be made available to small businesses. Need to provide a financial incentive for people/businesses. |
| | Community | Need to ensure all groups are accounted for and get a say in any transition/conversation. Negative view of putting in a planning application for wind turbines to the council due to negative past experiences. Opportunity for tying the COVID-19 recovery to initiatives. Role of the creative sector to reshape the heritage view of the city to now include renewable options e.g., wind turbines. |
| Þ | Delivery | Solar tiles may be more beneficial than solar panels. Implement smart grid technologies e.g., demand-side response to manage renewable energy supply/demand. Allocate small portion of new renewables to be community-owned. Carbon literacy may help with the missing conversation to promote renewable energy. |

| | Overall investment (£m) | | | | | | | | | | | | |
|-------------------------|-------------------------|---------|---------|---------|--|--|--|--|--|--|--|--|--|
| Renewable energy source | Capex | Opex | Capex | Opex | | | | | | | | | |
| | to 2030 | to 2030 | to 2050 | to 2050 | | | | | | | | | |
| Offshore wind | 32.6 | 47.5 | 127.2 | 227.9 | | | | | | | | | |
| Onshore wind | 47.2 | 29 | 21.9 | 15.2 | | | | | | | | | |
| Large-scale PV (>10kW) | 3.5 | 2.4 | 8.3 | 6 | | | | | | | | | |
| Small-scale PV (<10kW) | 136.3 | 27.9 | 398 | 76 | | | | | | | | | |
| Hydroelectric | 8 | 4.8 | 8.4 | 5.1 | | | | | | | | | |
| Total | 227 | 111 | 563.7 | 330.2 | | | | | | | | | |

Notes & Caveats

- The Projected Emissions Reduction Pathway for installed capacity across different renewable energy types has been cost modelled according to a <u>BEIS report</u> on the development of new installations.
- Costs of installation and maintenance are in constant flux; two benchmark constructing years (2030 & 2050) have been chosen from BEIS data and compared against capacities within the Projected Emissions Reduction Pathway

- It is important to acknowledge that not all costs are incurred by a single stakeholder, since larger installations are government funded and smaller scale PV installations are paid for by households and businesses.
- Figures below indicate the scale of investment in renewable energy each year in order to meet the capacity targets set out by the Projected Emissions Reduction Pathway.

Date Tables

| Local Authority territori | ial CO ₂ emissions estimates | 2005-2019 (kt CO2) - Ful | ll dataset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------|---|--------------------------|------------|------|-------------------------|--------------|--------------------------|--------------------------------------|-------------|---------------------|---------------------------|------------------------|------------------------------|---------------------|---------------------------------|----------------------|---------------------------------|---------------------------|-------------------------|-----------------|--------------------------|----------------|--------------------------------|---------------------------------------|--|------------------------|---------------------|------------------|------------------------------------|-------------------------------|------------------------------------|------------------------------------|------------------------------------|--|---------------------------|------------------|---|----------------------------------|--------------|------------------------|
| Region/Country | Second Tier Authority | Local Authority | Code | Year | Industry Electricity | Industry Gas | Industry Dther Fuels' | Large Industrial Installations | Agriculture | Industry C Total | commercial Electricity | Commercial C Gas 'C | Commercial O Dther Fuels' | Commercial Total | Public Sector Electricity | Public Sector Gas | Public Sector Rher Fuels' | Public Sector Total | Domestic Electricity | Domestic Gas | Domestic Other Fuels' | Xomestic Total | Road Fransport (A roads) | Road Tr Transport ((Motorways) | Road Insport D Minor Ra bads) | ilesel Tra ilways C | ansport Tr Other | ansport Total | Net Emissions: E Forest land | Net Emissions: Cropland | Net Emissions: E Grassland N | Net missions: Er Vetlands Se | Net Er nissions: H ttlements | Net nissions: I arvested Wood E | LULUCF Net missions | F Grand Total | Population 000s, mid- year estimate) | Per Capita Emissions A (t) | rea (km²) Er | missions r km² (kt) |
| | * | × | X | - | * | × | × | ×. | × | × | × | × | × | * | * | × | * | × | * | × | × | × | × | ~ | | × | × | | × | × | × | × | - P | roducts 🚽 | × | - | - | × | | * |
| | Yark | York | E06000014 | 2005 | 51.7 | 50.9 | 27.9 | 2.5 | 6.7 | 139.8 | 174.6 | 112.3 | 0.7 | 287.5 | 50.7 | 56.8 | 1.6 | 109.1 | 185.8 | 259.7 | 15.6 | 461.1 | 198.0 | 0.0 | 104.5 | 7.8 | 3.5 | 313.9 | -7.4 | 9.3 | -10.7 | 0.0 | 5.6 | 0.0 | -3.3 | 1,308.1 | 188.2 | 6.9 | 272.0 | 4.8 |
| | | | | 2006 | 52.4 | 49.8 | 27.4 | 2.6 | 6.5 | 138.7 | 176.9 | 110.0 | 0.5 | 287.3 | 51.3 | 55.7 | 1.1 | 108.1 | 191.6 | 251.5 | 15.0 | 458.1 | 198.1 | 0.0 | 104.9 | 7.8 | 3.6 | 314.5 | -7.6 | 9.2 | -11.0 | 0.0 | 5.5 | 0.0 | -4.0 | 1,302.8 | 189.0 | 6.9 | 272.0 | 4.8 |
| | | | | 2007 | 49.1 | 33.2 | 27.2 | 2.6 | 5.9 | 117.8 | 165.7 | 73.2 | 0.5 | 239.3 | 48.1 | 37.0 | 0.9 | 86.1 | 188.8 | 236.0 | 13.8 | 438.5 | 195.9 | 0.0 | 108.6 | 8.0 | 3.6 | 316.1 | -7.6 | 8.8 | -11.2 | 0.0 | 5.3 | 0.0 | -4.7 | 1,193.2 | 189.8 | 6.3 | 272.0 | 4.4 |
| | | | | 2008 | 48.7 | 32.3 | 22.5 | 0.1 | 6.0 | 109.5 | 164.4 | 71.2 | 0.5 | 236.1 | 47.7 | 36.1 | 0.8 | 84.6 | 180.3 | 244.3 | 14.6 | 439.1 | 182.8 | 0.0 | 107.2 | 8.1 | 3.7 | 301.8 | -7.7 | 8.8 | -11.4 | 0.0 | 5.2 | 0.0 | -5.1 | 1,166.1 | 190.8 | 6.1 | 272.0 | 4.3 |
| | | | | 2009 | 44.8 | 27.3 | 19.1 | 0.3 | 5.8 | 97.2 | 151.3 | 60.2 | 0.4 | 211.9 | 43.9 | 30.5 | 0.6 | 74.9 | 165.2 | 223.0 | 13.8 | 402.0 | 177.1 | 0.0 | 103.6 | 8.2 | 3.7 | 292.6 | -7.7 | 8.9 | -11.5 | 0.0 | 5.0 | 0.0 | -5.2 | 1,073.5 | 192.4 | 5.6 | 272.0 | 3.9 |
| | | | | 2010 | 48.5 | 31.0 | 20.9 | 0.0 | 5.7 | 106.1 | 163.6 | 68.5 | 0.4 | 232.5 | 47.5 | 34.7 | 0.4 | 82.6 | 170.8 | 249.2 | 15.1 | 435.0 | 174.4 | 0.0 | 103.9 | 8.2 | 3.8 | 290.3 | -7.7 | 8.7 | -11.6 | 0.0 | 5.0 | 0.0 | -5.7 | 1,140.7 | 195.1 | 5.8 | 272.0 | 4.2 |
| | | | | 2011 | 43.3 | 26.8 | 18.0 | 0.2 | 5.9 | 94.1 | 150.3 | 55.6 | 0.4 | 206.2 | 42.8 | 28.9 | 0.8 | 72.4 | 162.8 | 206.6 | 12.9 | 382.3 | 170.5 | 0.0 | 103.4 | 8.1 | 3.8 | 285.7 | -7.8 | 8.6 | -11.8 | 0.0 | 4.9 | 0.0 | -6.1 | 1,034.7 | 197.8 | 5.2 | 272.0 | 3.8 |
| | | | | 2012 | 43.6 | 17.0 | 19.9 | 0.3 | 5.8 | 86.6 | 148.2 | 65.5 | 0.3 | 214.1 | 44.6 | 42.5 | 0.5 | 87.6 | 172.9 | 226.8 | 12.7 | 412.4 | 172.1 | 0.0 | 102.7 | 8.1 | 3.7 | 286.5 | -7.6 | 8.5 | -12.0 | 0.0 | 4.9 | 0.0 | -6.3 | 1,080.9 | 199.6 | 5.4 | 272.0 | 4.0 |
| | | | | 2013 | 40.6 | 30.8 | 17.7 | 0.1 | 5.3 | 94.4 | 139.8 | 74.3 | 0.3 | 214.4 | 40.9 | 35.4 | 0.3 | 76.6 | 158.3 | 229.5 | 13.7 | 399.4 | 168.8 | 0.0 | 105.3 | 8.0 | 3.8 | 285.9 | -7.6 | 8.3 | -12.3 | 0.0 | 4.7 | 0.0 | -6.9 | 1,063.8 | 202.1 | 5.3 | 272.0 | 3.9 |
| | | | | 2014 | 36.6 | 28.2 | 19.1 | 0.0 | 5.7 | 89.6 | 124.9 | 60.8 | 0.4 | 186.1 | 36.8 | 29.3 | 0.4 | 66.4 | 132.5 | 193.6 | 12.7 | 338.7 | 169.0 | 0.0 | 111.2 | 8.2 | 3.9 | 292.4 | -7.7 | 8.0 | -12.3 | 0.0 | 4.7 | 0.0 | -7.2 | 966.0 | 203.7 | 4.7 | 272.0 | 3.6 |
| | | | | 2015 | 29.1 | 50.0 | 20.2 | 0.1 | 5.7 | 105.0 | 97.0 | 46.7 | 0.6 | 144.3 | 28.9 | 30.4 | 0.2 | 59.5 | 112.5 | 204.0 | 12.7 | 329.2 | 174.7 | 0.0 | 112.9 | 8.2 | 4.0 | 299.9 | -7.8 | 8.0 | -12.6 | 0.0 | 4.7 | 0.0 | -7.7 | 930.2 | 205.8 | 4.5 | 272.0 | 3.4 |
| | | | | 2016 | 22.3 | 51.9 | 20.0 | 0.2 | 5.8 | 100.2 | 77.9 | 46.9 | 0.5 | 125.3 | 22.7 | 29.7 | 0.2 | 52.6 | 91.9 | 209.9 | 12.6 | 314.4 | 175.5 | 0.0 | 120.1 | 8.2 | 4.0 | 307.9 | -7.8 | 7.9 | -12.6 | 0.0 | 4.8 | 0.0 | -7.7 | 892.8 | 206.9 | 4.3 | 272.0 | 3.3 |
| | | | | 2017 | 22.2 | 34.5 | 20.4 | 0.1 | 5.8 | 83.0 | 66.7 | 51.7 | 0.2 | 118.5 | 19.3 | 24.7 | 0.3 | 44.2 | 78.8 | 203.2 | 12.5 | 294.5 | 178.4 | 0.0 | 121.8 | 8.1 | 4.2 | 312.6 | -7.8 | 7.9 | -13.0 | 0.0 | 4.6 | 0.0 | -8.2 | 844.7 | 208.2 | 4.1 | 272.0 | 3.1 |
| | | | | 2018 | 20.8 | 32.4 | 20.6 | 0.1 | 5.7 | 79.6 | 63.5 | 50.7 | 0.6 | 114.8 | 18.0 | 29.3 | 0.3 | 47.6 | 71.5 | 209.4 | 12.7 | 293.6 | 170.0 | 0.0 | 130.5 | 7.7 | 4.2 | 312.4 | -7.8 | 7.7 | -13.1 | 0.0 | 4.6 | 0.0 | -8.6 | 839.4 | 209.9 | 4.0 | 272.0 | 3.1 |
| | | | | 2019 | 17.2 | 33.1 | 19.8 | 0.1 | 6.3 | 76.5 | 56.3 | 47.7 | 0.5 | 104.5 | 16.8 | 24.3 | 0.2 | 41.3 | 63.5 | 208.5 | 12.2 | 284.1 | 165.8 | 0.0 | 132.6 | 7.1 | 4.3 | 309.8 | -7.8 | 7.8 | -13.2 | 0.0 | 4.5 | 0.0 | -8.6 | 807.6 | 210.6 | 3.8 | 272.0 | 3.0 |

| Local Authority territoria | I CO ₂ emissions estimates | estimates within the scop | be of influence of l | Local Auth | orities 2005-2 | 019 (kt CO ₂) - | Subset datas | set (Excludes I | large industri | al sites, railv | ways, motorwa | ys and land- | use) | | | | | | | | | | | | | | | | | | |
|----------------------------|---------------------------------------|---------------------------|----------------------|------------|-------------------------|-----------------------------|---------------------------|-----------------------------------|----------------|-----------------|---------------------------|-------------------|-----------------------------|---------------------|------------------------------|----------------------|--------------------------------|------------------------|-------------------------|--------------|---------------------------|-------------------|----------------------------------|--------------------------------|--------------------|--------------------|-------------|--|-----------------------------|------------|---------------------------------------|
| Region/Country | Second Tier Authority | Local Authority | Code | Year | Industry Electricity | Industry Gas | Industry 'Other Fuels' | Large Industrial Installations | Agriculture | Industry Total | Commercial Electricity | Commercial Gas | Commercial 'Other Fuels' | Commercial Total | Public Sector Electricity | Public Sector Gas | Public Sector 'Other Fuels' | Public Sector Total | Domestic Electricity | Domestic Gas | Domestic 'Other Fuels' | Domestic Total | Road Transport Ri (A roads) (| oad Transport (Minor roads) | Transport Other | Transport Total | Grand Total | Population ('000s, mid- year estimate) | Per Capita Emissions (t) | Area (km²) | Emissions per km ² (kt) |
| | | × | X I | | | * | * | | | | | - | E | | | | | * | | - | * | | * | * | | * | * | E. | | | - |
| | York | York | E06000014 | 2005 | 51.7 | 50.9 | 27.9 | 0.0 | 4.2 | 134.3 | 7 174.6 | 112.3 | 0.7 | 287.5 | 50. | 56. | 8 1.6 | 109.1 | 185.8 | 8 259.7 | 15.6 | 461.1 | 198.0 | 104.5 | 3.5 | 306.1 | 1,298.5 | 188.2 | 6.9 | 272.0 | 4.8 |
| | | | | 2006 | 52.4 | 49.8 | 27.4 | 0.0 | 4.0 | 133.6 | 6 176.9 | 110.0 | 0.5 | 287.3 | 51. | 55. | 7 1.1 | 108.1 | 191.6 | 6 251.5 | 15.0 | 458.1 | 198.1 | 104.9 | 3.6 | 306.7 | 1,293.8 | 189.0 | 6.8 | 272.0 | 4.8 |
| | | | | 2007 | 49.1 | 33.2 | 27.2 | 0.0 | 3.8 | 113.3 | 2 165.7 | 73.2 | 0.5 | 239.3 | 48. | 37. | 0 0.9 | 86.1 | 188.0 | 8 236.0 | 13.8 | 438.5 | 195.9 | 108.6 | 3.6 | 308.1 | 1,185.2 | 189.8 | 6.2 | 272.0 | 4.4 |
| | | | | 2008 | 48.7 | 32.3 | 22.5 | 0.0 | 3.7 | 107.1 | 1 164.4 | 71.2 | 0.5 | 236.1 | 47. | 36. | 1 0.8 | 84.6 | 180.3 | 3 244.3 | 14.6 | 439.1 | 182.8 | 107.2 | 3.7 | 293.7 | 1,160.7 | 190.8 | 6.1 | 272.0 | 4.3 |
| | | | | 2009 | 44.8 | 27.3 | 19.1 | 0.0 | 3.7 | 94.1 | B 151.3 | 60.2 | 0.4 | 211.9 | 43. | 30. | 5 0.6 | 74.9 | 165.3 | 2 223.0 | 13.8 | 402.0 | 177.1 | 103.6 | 3.7 | 284.4 | 1,068.1 | 192.4 | 5.6 | 272.0 | 3.9 |
| | | | | 2010 | 48.5 | 31.0 | 20.9 | 0.0 | 3.7 | 104.1 | 1 163.6 | 68.5 | 0.4 | 232.5 | 47.1 | 34. | 7 0.4 | 82.6 | 170.8 | 8 249.2 | 15.1 | 435.0 | 174.4 | 103.9 | 3.8 | 282.0 | 1,136.2 | 195.1 | 5.8 | 272.0 | 4.2 |
| | | | | 2011 | 43.3 | 26.8 | 18.0 | 0.0 | 3.8 | 91.0 | B 150.3 | 55.6 | 0.4 | 206.2 | 42. | 28. | 9 0.8 | 72.4 | 162.8 | 8 206.6 | 12.9 | 382.3 | 170.5 | 103.4 | 3.8 | 277.6 | 1,030.4 | 197.8 | 5.2 | 272.0 | 3.8 |
| | | | | 2012 | 43.6 | 17.0 | 19.9 | 0.0 | 3.9 | 84.4 | 4 148.2 | 65.5 | 0.3 | 214.1 | 44. | 42. | 5 0.5 | 87.6 | 172.5 | 9 226.8 | 12.7 | 412.4 | 172.1 | 102.7 | 3.7 | 278.4 | 1.076.9 | 199.6 | 5.4 | 272.0 | 4.0 |
| | | | | 2013 | 40.6 | 30.8 | 17.7 | 0.0 | 3.8 | 92.9 | 9 139.8 | 74.3 | 0.3 | 214.4 | 40. | 35. | 4 0.3 | 76.6 | 156.3 | 3 229.5 | 13.7 | 399.4 | 168.8 | 105.3 | 3.8 | 277.9 | 1,061.2 | 202.1 | 5.3 | 272.0 | 3.9 |
| | | | | 2014 | 36.6 | 28.2 | 19.1 | 0.0 | 3.8 | 87.1 | B 124.9 | 60.8 | 0.4 | 186.1 | 36. | 29. | 3 0.4 | 66.4 | 132.5 | 5 193.6 | 12.7 | 338.7 | 169.0 | 111.2 | 3.9 | 284.2 | 963.2 | 203.7 | 4.7 | 272.0 | 3.5 |
| | | | | 2015 | 29.1 | 50.0 | 20.2 | 0.0 | 4.0 | 103.3 | 3 97.0 | 46.7 | 0.6 | 144.3 | 28. | 30. | 4 0.2 | 59.5 | 112.5 | 5 204.0 | 12.7 | 329.2 | 174.7 | 112.9 | 4.0 | 291.7 | 928.1 | 205.8 | 4.5 | 272.0 | 3.4 |
| | | | | 2016 | 22.3 | 51.9 | 20.0 | 0.0 | 4.2 | 98.5 | 5 77.9 | 46.9 | 0.5 | 125.3 | 22 | 29. | 7 0.2 | 52.6 | 91.5 | 9 209.9 | 12.6 | 314.4 | 175.5 | 120.1 | 4.0 | 299.7 | 890.6 | 206.9 | 4.3 | 272.0 | 3.3 |
| | | | | 2017 | 22.2 | 34.5 | 20.4 | 0.0 | 4.2 | 81.3 | 3 66.7 | 51.7 | 0.2 | 118.5 | 19. | 24. | 7 0.3 | 44.2 | 78.0 | 8 203.2 | 12.5 | 294.5 | 178.4 | 121.8 | 4.2 | 304.5 | 843.1 | 208.2 | 4.1 | 272.0 | 3.1 |
| | | | | 2018 | 20.8 | 32.4 | 20.6 | 0.0 | 4.2 | 78.0 | 63.5 | 50.7 | 0.6 | 114.8 | 18. | 29. | 3 0.3 | 47.6 | 71.5 | 5 209.4 | 12.7 | 293.6 | 170.0 | 130.5 | 4.2 | 304.7 | 838.7 | 209.9 | 4.0 | 272.0 | 3.1 |
| Yorkshire and the Humber | York | York | E05000014 | 2019 | 17.2 | 33.1 | 19.8 | 0.0 | 4.2 | 74.3 | 3 56.3 | 47.7 | 0.5 | 104.5 | 16. | 24. | 3 0.2 | 41.3 | 63.5 | 5 208.5 | 12.2 | 284.1 | 165.8 | 132.6 | 4.3 | 302.7 | 806.9 | 210.6 | 3.8 | 272.0 | 3.0 |

| Pollution Inven | tory | | | | | | | | | | | | | | | | | CO ₂ emi | issions (kt) |
|----------------------------------|------------------------------|-----------------|---------------------|----------------------------|----------|--------|-----------|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------------------|--------------|
| Local Authority Distract Name | Operator | Site | Postcod Reference | Substance Name | × 2005 × | 2006 💌 | 2007 💌 20 | 008 💌 | 2009 💌 | 2010 💌 | 2011 💌 | 2012 💌 | 2013 💌 | 2014 💌 | 2015 💌 | 2016 💌 | 2017 💌 | 2018 💌 | 2019 💌 |
| York | British Sugar Plc | York | YO26 6XF AA2518 | Carbon dioxide | 59.31 | | | | | | | | | | | | | | |
| York | British Sugar Plc | York | YO26 6XF BW9239IF | Carbon dioxide - 'thermal' | | 57.29 | 80.64 | | | | | | | | | | | | |
| York | Nestle UK Ltd | York | YO91 1XY BO9298IQ | Carbon dioxide | | | | | 30.19 | 32.70 | 30.95 | 26.67 | 26.78 | 30.58 | 29.55 | 25.67 | 24.80 | 31.68 | 32.35 |
| York | Nestle UK Ltd | York | YO91 1XY BO9298IQ | Carbon dioxide - 'thermal' | | | | 43.84 | | | | | | | | | | | |
| York | Yorkshire Water Services Ltd | York Naburn STW | YO23 2XD 27/24/0124 | Carbon dioxide | | | | | 10.18 | | | | | | | | | | |
| York | Yorwaste Ltd | York | YO23 3RR BK0507IB | Carbon dioxide | 13.70 | | | | | | 0.03 | | | | | | | | |

https://www.gov.uk/government/statistics/uk-local-authority-and-regional-carbon-dioxide-emissions-national-statistics-2005-to-2019

The tables below set out the IPCC sectors from the UK GHGI which are included in each of the LA CO2 sector categories, including the specific fuels or other sub-categories where necessary.

| Sectors used in LA CO ₂ - IPCC or o | other scope |
|---|---|
| LA CO ₂ Sector | Scope |
| Industry Electricity | Non-domestic, as per BEIS subnational gas statistics sub-national-methodology-quidance.pdf |
| | Some large users included in 'Unallocated' purchases from high voltage lines |
| | Further split using IDBR data for SIC07 subsections 01-32, 35-39 & 42 |
| Industry Gas | Non-domestic, as per BEIS subnational gas statistics |
| | Some large users included in 'C. Large Industrial Installations' |
| | Further split using IDBR data for SIC07 subsections 01-32, 35-39 & 42 |
| Large Industrial Installations | Large industrial installations excl. gas combustion - from e.g. EUETS, IPPC & EEMS |
| Industry 10th or Fridal | Large gas users excluded from BEIS subnational dataset |
| Industry Other Fuels | 1A2 Blast furnace gas |
| | 1A2 Coal |
| | 1A2 Coke |
| | 1A2 Coke oven gas |
| | 1A2 DERV |
| | 1A2 Gas oil |
| | 1A2 LPG |
| | 1A2 Lubricants |
| | 1A2 OPG |
| | 1A2 Petroleum coke |
| | 1A2 Scrap tyres |
| | 1A2 Waste |
| | 1A2 Waste ons |
| | 1A4a Burning oil (Railways - stationary combustion) |
| | 1A4a Coal (Railways - stationary combustion) |
| | 1A4a Fuel OII (Railways - stationary combustion) 1A4a Gas oil (Railways - stationary combustion) |
| | 286 |
| | 287 |
| | 288 |
| | 203 |
| | 5C1 |
| Agriculture | 1A4c Burning oil |
| | 1A4c Coal |
| | 1A4C Fuel OII 1A4C Gas oil |
| | 1A4c Petrol |
| | 3H |
| Commercial Electricity | Non-domestic, as per BEIS subnational gas statistics |
| | Some large users included in 'Unallocated' purchases from high voltage lines |
| | Further split using IDBR data for SIC07 subsections 33, 41, 43-82, 88-96 |
| Commercial Gas | Non-domestic, as per BEIS subnational gas statistics |
| | <u>sub-national-methodology-guidance.pdr</u> |
| | Further split using IDBR data for SIC07 subsections 33, 41, 43-82, 88-96 |
| Commercial 'Other Fuels' | 1A4a Burning oil (Miscellaneous industrial/commercial combustion) |
| | 1A4a Coal (Miscellaneous industrial/commercial combustion) |
| | 1A4a Gas oil (Miscellaneous industrial/commercial combustion) |
| Public Sector Electricity | Non-domestic, as per BEIS subnational gas statistics |
| | sub-national-methodology-guidance.pdf |
| | Some large users included in 'Unallocated' purchases from high voltage lines |
| Public Sector Gas | Non-domestic, as per BEIS subnational gas statistics |
| | sub-national-methodology-guidance.pdf |
| | Some large users included in 'C. Large Industrial Installations' |
| Public Sector 'Other Fuels' | 1A4a Burning oil (Public sector combustion) |
| | 1A4a Coal (Public sector combustion) |
| | 1A4a Fuel oil (Public sector combustion) |
| Domestic Electricity | As per BEIS subnational electricity statistics |
| Domestic Electricity | sub-national-methodology-guidance.pdf |
| Domestic Gas | As per BEIS subnational gas statistics |
| Domestic 'Other Fuels' | 1A4b Anthracite |
| | 1A4b Burning oil |
| | 1A4b Coal |
| | 1A4b Coke |
| | 1A4b Gas oil |
| | 1A4b LPG |
| | 1A4b Peat |
| | 1A4b Petrol |
| | 1A4b SSF |
| | 2D2 |
| Road Transport (A roads) | 1A3b (A roads) Petrol/DERV |
| Road Transport (Minor roads) | 1A3b (Minor roads) Petrol/DERV |
| Diesel Railways | 1A3c Gas oil |
| Transport Other | 1A3b LPG |
| | 1A3c Coal |
| | 1A3d |
| | 1A3e |
| Net Emissions: Forest land | 4A AD |
| Net Emissions: Grassland | 4C |
| Net Emissions: Wetlands | 4D |
| Net Emissions: Settlements Net Emissions: Harvested Wood Products | 4E 4G |

| IPCC sect | tors covered by LA CO ₂ |
|--------------|--|
| IPCC code | IPCC name |
| 1A2a | Iron and steel |
| 1A2b | Non-Ferrous Metals |
| 1A2c | Chemicals |
| 1A2d | Pulp Paper Print |
| 142e | food processing beverages and tobacco |
| 1A26 | Non-metallic minerals |
| 1A2gvii | Off-road vehicles and other machinery |
| 1A2gviii | Other manufacturing industries and construction |
| 1A3bi | Cars |
| 1A3bii | Light duty trucks |
| 1A3biii | Heavy duty trucks and buses |
| 1A3biv | Motorcycles |
| 1A3bv | Other road transport |
| 1A3c | Railways |
| 1A3d | Domestic navigation |
| 1A3eii | Other Transportation |
| 1A4ai | Commercial/Institutional |
| 1A4hi | Residential stationary |
| 1A4hii | Residential: Off-road |
| 14461 | Agriculture/Egrestry/Eiching: Stationary |
| 1440 | Agriculture/Forestry/Fishing: Off-road |
| 201 | Cement Production |
| 241 | Lime Production |
| 242 | Glass production |
| 24.5 | Other process uses of carbonates: coramics |
| 2A40 | Other process uses of carbonates, cerannes |
| 2840 | Ammonia Broduction |
| 201 | Chemical Induction |
| 201 | Titanium diaxida production |
| 200 | Soda Ash Broduction |
| 207 | Soud Ash Production |
| 2000 | Ethylene Oxide |
| 2000 200f | Carbon black production |
| 2001 | Petrochemical and carbon black production: Other |
| 200g | Steel |
| 2014 | Sieter |
| 2010 | Aluminium Draduction |
| 203 | |
| 201 | Lubricant use |
| 202 | Non-energy products from fuels and solvent use. Paranin wax us |
| 203 | Non-energy products from fuels and solvent use: Other |
| 204 | Other neo |
| 264 | Liming Limestone |
| 201 | Liming - Intestone |
| 302 | Linning - doloringe |
| 3N 4A1 | Creat Land remaining Forget Land |
| 441 | Forest Land remaining Forest Land |
| 4AZ | Cranland Demoining Cranland |
| 401 | Cropiano Remaining Cropiano |
| 401 | |
| 402 | Crassland Romaining Crassland |
| 401 | Land converted to Graceland |
| 4CZ | Lanu converteu to Grassianu Watlands romaining watlands |
| 4U1 4D2 | weuarius remaining wetiands |
| 402 | Land converted to wetlands |
| 4E1 | Settlements remaining settlements |
| 4E2 | Land converted to Settlements |
| 46 | Harvested wood Products |
| 501.20 | Non-diogenic: Clinical waste |
| 5C1.2b | Non-biogenic: Other Chemical waste |

Renewable electricity: number of installations at Local Authority Level

| | | | Estima | ed | | | | | | | | | | | | | |
|----------------|------------------------|--------------------------|----------------|---------|--------------|--------------|-------|-----------|----------|------------|------------|--------------|-------------|---------|---------|----------|-------|
| | | | numbe | of | | | | Anaerobic | Offshore | | | | Municipal | Animal | Plant | | |
| | 0 Local Authority Name | Region | Country househ | olds Ph | hotovoltaics | Onshore Wind | Hydro | Digestion | Wind | Wave/Tidal | Sewage Gas | Landfill Gas | Solid Waste | Biomass | Biomass | Cofiring | Total |
| 2020 E06000014 | York | Yorkshire and The Humber | England 8 | 1,212 | 3,301 | 6 | - | - | - | - | 2 | 2 | - | - | - | - | 3,311 |
| 2019 E06000014 | York | Yorkshire and The Humber | England 8 | 1,212 | 3,288 | 6 | - | - | - | - | 2 | 2 | - | - | - | - | 3,298 |
| 2018 E06000014 | York | Yorkshire and The Humber | England 8 | 1,212 | 3,183 | 6 | - | - | - | - | 2 | 2 | - | - | - | - | 3,193 |
| 2017 E06000014 | York | Yorkshire and The Humber | England 8 | 1,212 | 3,135 | 6 | - | - | | - | 2 | 2 | - | - | - | - | 3,145 |
| 2016 E06000014 | York | Yorkshire and The Humber | England 8 | 1,212 | 3,085 | 6 | - | - | - | - | 2 | 2 | - | - | - | - | 3,095 |
| 2015 E06000014 | York | Yorkshire and The Humber | England 8 | 1,212 | 2,944 | 6 | - | - | - | - | 2 | 2 | - | - | - | - | 2,954 |
| 2014 E06000014 | York | Yorkshire and The Humber | England 8 | 1,212 | 2,386 | 7 | - | - | - | - | 2 | 2 | - | - | - | - | 2,397 |

Renewable electricity: Installed Capacity (MW) at Local Authority Level

| Local Authority | | | | Estimated number of | | | | Anaerobic | Offshore | | | | Municipal | Animal | Plant | | |
|--------------------|----------------------|--------------------------|---------|------------------------|---------------|--------------|-------|-----------|----------|------------|------------|--------------|-------------|---------|---------|----------|--------|
| Code | Local Authority Name | Region | Country | households | Photovoltaics | Onshore Wind | Hydro | Digestion | Wind | Wave/Tidal | Sewage Gas | Landfill Gas | Solid Waste | Biomass | Biomass | Cofiring | Total |
| 2020 E06000014 | York | Yorkshire and The Humber | England | 84,212 | 12.424 | 0.043 | - | - | - | - | 0.717 | 7.119 | - | - | - | - | 20.302 |
| 2019 E06000014 | York | Yorkshire and The Humber | England | 84,212 | 12.1 | 0.0 | - | - | - | - | 0.7 | 7.1 | - | - | - | - | 20.0 |
| 2018 E06000014 | York | Yorkshire and The Humber | England | 84,212 | 11.6 | 0.0 | - | - | - | - | 0.7 | 7.1 | - | - | - | - | 19.5 |
| 2017 E06000014 | York | Yorkshire and The Humber | England | 84,212 | 11.4 | 0.0 | - | - | - | - | 0.7 | 7.1 | - | - | - | - | 19.3 |
| 2016 E06000014 | York | Yorkshire and The Humber | England | 84,212 | 11.1 | 0.0 | - | - | - | - | 0.7 | 7.1 | - | - | - | - | 19.0 |
| 2015 E06000014 | York | Yorkshire and The Humber | England | 84,212 | 10.7 | 0.0 | - | - | | - | 1.1 | 7.1 | - | - | - | - | 19.0 |
| 2014 E06000014 | York | Yorkshire and The Humber | England | 84,212 | 8.5 | 0.1 | | - | | - | 1.1 | 7.1 | - | - | - | - | 16.8 |

Renewable electricity generation: (MWh) at Local Authority Level

| Local | | | E | stimated | | | | | | | | | | | | | |
|----------------|----------------------|--------------------------|------------|-----------|---------------|--------------|-------|-----------|----------|------------|------------|--------------|-------------|---------|---------|----------|------------|
| Authority | | | n | umber of | | | | Anaerobic | Offshore | | | | Municipal | Animal | Plant | | |
| Code | Local Authority Name | Region | Country ho | ouseholds | Photovoltaics | Onshore Wind | Hydro | Digestion | Wind | Wave/Tidal | Sewage Gas | Landfill Gas | Solid Waste | Biomass | Biomass | Cofiring | Total |
| 2020 E06000014 | York | Yorkshire and The Humber | England | 84,212 | 12,213.716 | 115.613 | - | - | - | - | 4,258.048 | 23,021.000 | - | - | - | - | 39,608.377 |
| 2019 E06000014 | York | Yorkshire and The Humber | England | 84,212 | 11,181 | 93 | - | - | - | - | 5,198 | 28,665 | - | - | - | - | 45,138 |
| 2018 E06000014 | York | Yorkshire and The Humber | England | 84,212 | 11,309 | 90 | - | - | - | - | 4,269 | 28,003 | - | - | - | - | 43,670 |
| 2017 E06000014 | York | Yorkshire and The Humber | England | 84,212 | 98,585 | 357 | - | - | - | - | 4,503 | 31,061 | - | - | - | - | 134,507 |
| 2016 E06000014 | York | Yorkshire and The Humber | England | 84,212 | 96,738 | 358 | - | - | - | - | 4,685 | 33,587 | - | - | - | - | 135,368 |
| 2015 E06000014 | York | Yorkshire and The Humber | England | 84,212 | 8,755 | 107 | - | - | - | - | 4,275 | 34,715 | - | - | - | - | 47,852 |
| 2014 E06000014 | York | Yorkshire and The Humber | England | 84,212 | 7,316 | 269 | - | - | - | - | 3,762 | 35,233 | - | - | - | - | 46,581 |

https://www.gov.uk/government/statistics/regional-renewable-statistics

| A. City information | Eota cource | Autoria Autoria |
|-----------------------------------|-------------------|------------------------------|
| official same of local government | Yak | Not Docuring |
| Country | | respond to when |
| Region | | Not Estimated |
| 10410603497 | | confidential |
| Readent population | | Combination of notation ways |
| description of boundary and map | | 8.0 |
| 10° | | Required |
| Heating/cooking degree days | | Optional |
| E. Inventory setup | | |
| 2WP (PCC AR version used) | IPCC #3 AK (2007) | Tea |
| funer of employee fortex | 10/7 | 201 |

| C. Emission sources and emissions | | | | | | | | | | | Clobal Warming Potenti 1 | uk 23 211 | | |
|------------------------------------|--------------------------------------|---|--|---|--|---|--|---------------------------------|--|---|--|---|---|--|
| ancan E | Sale succes | Lor non- Everypeice of activity /facility | Direct Fluet combaction) or Indext (gd aceegg) or Other | Activity data | Description of eventual source | Emission factors (kg gal) | D D E | | 0 | Cold startin | Eniloconi (kgCCD4) v CD3 CH4 | | | |
| Stationary energy | Necidential Buildings | Domectic space heating and hot water | Diekt 1,677.54 Diekt 6,658.60 Diekt 199,318.41 | E 4,86,293 646 5474,3036 3 27,403,715 646 5474,3036 E 1,080,344,917 646 5474,3036 | Deniedic space heating and hot water, Coal Private on references tab believed and the heating and hot water, Miniarway products. Private one references tab Doniectic space heating and hot water, date. Private one references tab | Coal (dometic) 0.85 Percul 0.29 Natural gas 0.18 | 15 0.038 0.000 12 0.005 0.001 14 0.000 0.000 | 0.355 0.236 0.386 | kWh (Grass CV) kWh (Grass CV) kWh (Grass CV) | BESS, 2020. Enventouse gas reporting: ca BESS, 2020. Enventouse gas reporting: ca BESS, 2020. Enventouse gas reporting: ca | 1,511,546 134,5 6,420,666 13,5 FREERING 260,5 | 10 21,329 1,677,14 16 18,228 16 238,356 | 1 1877,141 agC02# 6,618,199 agC02# 199,211,410 agC02# | Tenery consustant of a set (Second and Tenery consustant of the Second and Tenery consustant of the Second and Tenery consustants in the Second and |
| | | | Market 14,717.41 Direct 419.72 Other 242.51 | 6 40,80,301 605 507A,8028 6 40,80302 605 507A,8028 9 4,803,010 605 507A,8028 | Donestic space-basing and hot water, NecKody House one references too Somestic space-basing and hot water, Bosonogy & waters. Somestic space-basing and hot water, Social House one references too | techolygenediad 0.25 Bonars Gras/Row - Coll/Moneric_sci | 4 5305 0.001 | C.001 | kWh (Grass CV) | 810, 2020 Divertiona gar mparting ca 810, 2020 Divertional gar mparting ca 810, 2020 Divertional gar mparting ca | 14,371,638 22,6 | | 54,767,427 42,039 418,781 42,029 342,687 42,029 | Weight consumption on the UCP (CPU) Execution of the UCP (CPU) Execution of the UCP (CPU) Execution of the UCP (CPU) |
| | | | 00ker 1,715.84 00ker 23,908.04 00ker 2,528.34 | 1 27,612,735 695 0474,3006 1 1,080,944,917 695 0474,3006 1 65,865,991 695 0474,3006 | Domestic space heating and hot wones Motivinus products. If soars one references can Domestic space heating and hot wones door Domestic space heating and hot wones door Domestic space heating and hot wones (becistory House one references can | Nexu(_sci task-sign_sci tectscitygerectel_sci 0.00 | 22 0.000 0.000 | 840.0 803.0 803.0 | kWh (Grass CV) kWh (Grass CV) kWh (Grass CV) | BES, 2020. Greenhouse gas reporting: co BES, 2020. Greenhouse gas reporting: co BES, 2020. Greenhouse gas reporting: co | 1,417,825 8,3 | 168 7,814 · | 1,N5,836 5gC02# 25,808,087 5gC02# 2,328,841 5gC02# | Intergy consumption in the LCE proof data Intergy consumption in the UCE proof data Intergy consumption in the UCE proof data Intergy consumption in the UCE proof data |
| | | Domestic lighting, appliances, and cooking | Dieci 776-21 Dieci ND | 48,880,932 499 49 | Schedic space heating and hot water, Boenergy & watter. Heats one references tab Schedict lighting, application, and costing, Cost. Heat one references tab houses to be address and costing. House and water. House one offerences tab | tiones (res)trav_tct - Cosi (donestic) 0.85 hosti | 5 0.035 0.004 | 0.004 | kWh kWh [Grass CV] | RES, 2020. Greenhouse gas reparting: car RES, 2020. Greenhouse gas reparting: car RES, 2020. Greenhouse our manifest car | | | 775,080 kgc02# kgc02# 50 | No ceal products reported used for lighting, appliance and cooking in the UCH INCENDED. No exemptions in the UCH INCENDED. No exemptions in the UCH INCENDED. No exemptions and ever accounter on the North INCENDED. No exemptions and ever accounter on the North INCENDED. No exemption and ever accounter on the North INCENDED. No exemption and ever accounter on the North INCENDED. No exemption and ever accounter on the North INCENDED. No exemption and ever accounter on the North INCENDED. No exemption and ever accounter on the North INCENDED. No exemption and ever accounter on the North INCENDED. No exemption and ever accounter on the North INCENDED. No exemption and ever accounter on the North INCENDED. No exemption and ever accounter on the North INCENDED. No exemption and ever accounter on the North INCENDED. No exemption and ever accounter on the North INCENDED. No exemption and ever accounter on the North INCENDED. No exemption and ever accounter on the North INCENDED. No exemption and ever accounter on the North INCENDED. No exemption and ever accounter on the North INCENDED. No exemption accounter on the N |
| | | | Diekt 4,883.21 Vdiekt 60,821.51 | E 28,66,712 KWh DMA_RCUK 237,966,001 KWh DMA_RCUK | Nonwork: Bythen, appliances, and cooking, data | Naturalge 0.18 Districtly prevated 0.25 | 64 6-300 0.000 54 6-305 0.001 | 0.188 | kwh jGrass CVJ CW3 | MIT, 2020. Granchouse gas reporting car MIT, 2020. Granchouse gas reporting: car | 4,851,236 6,3 60,303,880 154,6 | 467 2,665 · 171 326,000 · | 4,862,328 hgCO2# 40,821,555 hgCO2# | Energy consumptions on the surgery system of the surgery of the su |
| | | | 00e/ ND 00e/ ND | - 60% DMA EUX | Accession ageining, applications, and cooking, increasing in landow in the cooking applications can Decreasing lapplications, and cooking, Performance and House are informatic call Decreasing lapplications, and cooking, Performance patients and the cooking Performance call | Coal (domenta), Sch | | 0.063 | kWh (Grass CV) kWh (Grass CV) | Alti, 2020. Convolution par importing: ca Alti, 2020. Convolution par importing: ca Alti, 2020. Convolution par importing: ca | | | - NgCO2# 50 | no contenting intervention of a single graphication and content of an incomentation of a single contention of a single content of a single con |
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| 2019 | Industrial Processes Other industry | Other industry 2016 Broduct use 2016 | kWh - | | | | 0.2654 | 016 BEIS (Amanda Penistone, Roger Littlewood, Sam Bradley); Scottish Gove DA Pivot Tables withtp://naei.beis.go/UK | Traction | Industrial Processes_Other industry2019 Product use_Product use2019 |
| 2019 | Aviation spirit | Aviation spirit 2010 | tonnes | 3127.67 | 61.46 | 29.8 | 3218.92 | 219 BED (Hinned Fernhouse gas reporting: conversion factors 2019. Conversion Ference in https://www.gov.uk/government/pu/Fu | uel for pist | Aviation spirit2019 |
| 2019 | Biogas | Biogas 2019 | kWh | 3149.67 | 1.91 | 29.8 | 0.00021 | 119 BEIS, 2020. Greenhouse gas reporting: conversion factors 2019. Conversional factors 2019. Conversion factors 2019. Co | Jel for turi | Aviation turbine tuei2019 Biogas2019 |
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| 2019 | Diesel (average biofuel blend) Diesel (average biofuel blend)_Sc3 | Diesel 2019 Diesel 2019 | kWh (Gross CV) | 0.24137 | 0.00003 | 0.00322 | 0.05822 | 119 BEIS, 2020. Greenhouse gas reporting: conversion factors 2019. Conversivels https://www.gov.u.uk 119 BEIS, 2020. Greenhouse gas reporting: conversion factors 2019. Convers/WTT - fuels https://www.gov.u.UK | 1 | Diesel (average bioruel biena)2019 Diesel (average bioruel blend)_Sc32019 |
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| 2019 | Fuel Oil | Fuels 2019 | kWh (Gross CV) | 0.26683 | 0.00035 | 0.00065 | 0.26782 | 19 BEIS, 2020. Greenhouse gas reporting: conversion factors 2019. ConversiFuels https://www.gov.uk/government/public | cations/gr | Fuel Oil2019 |
| 2019 | Gas Oil | Liquid fuels_Gas oil 2019 | kWh (Gross CV) | 0.25359 | 0.00027 | 0.0029 | 0.25676 | 219 BEIS, 2020. Greenhouse gas reporting: conversion factors 2019. Convers Fuels https://www.gov.u.UK | casororgi | Gas Oil2019 |
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| 2019 2019 | 9 Natural gas_Sc3 9 Organic_Composting | Natural gas WTT 2019 Refuse_Organic: mixed food and garder 2019 | kWh (Gross CV) tonnes | 0 | 0 | 0 | 0.02391 10.2039 | 119 BEIS, 2020. Greenhouse gas reporting: conversion factors 2019. Convers/WTT - fuels https://www.gov.uUK 119 BEIS, 2020. Greenhouse gas reporting: conversion factors 2019. Convers/Waste disposal https://www.gov.uUK As | s defined (| Natural gas_Sc32019 Organic_Composting2019 |
| 2019 | 9 Petrol Sc3 | Petrol (average biofuel blend) 2019 Petrol (average biofuel blend) WTT 2019 | kWh (Gross CV) kWh (Gross CV) | 0.23235 | 0.00072 | 0.00066 | 0.23373 0.06318 | 219 BEIS, 2020. Greenhouse gas reporting: conversion factors 2019. Convers Fuels https://www.gov.uUK 219 BEIS, 2020. Greenhouse gas reporting: conversion factors 2019. Convers/WTT - fuels https://www.gov.uUK | | Petrol2019 Petrol_Sc32019 |
| 2019 2019 | Municipal Waste Electricity Municipal wastewater NMVOC | electricity, from municipal waste inciner 2019 electricity, from municipal waste inciner 2016 | kWh m3 | 0 | 0 | 0 | 0.000015 | 119 ecoinvent 3.6 (2019); electricity, from municipal waste incineration to generic market for el https://www.gov.uk/government/public 116 European Environment Agency: EMEP (2016) EMEP/EEA air pollutant emission inventory euidebook 2016 Europe | cations/gr / | Municipal Waste_Electricity2019 Municipal wastewater NMVOC2019 |
| 2019 | n/a | Used where data is provided in CO2e 0 | n/a bood | 1 | 166 5573608 | 0 5162610 | 1 4217 777791 | 0 n/a | | n/a2019 |
| 2019 | 9 Deer | Deer 2017 | head | 0 | 20.22 | 0.101863 | 535.8551781 | 17 UK werage livestock emissions factors Table3 Asi; T | hese are th | Deer2019 |
| 2019 | Horses | Horses 2017 | head | 0 | 19.56 | 0.5422575 | 650.5927352 | 17 DK average investock emissions factors Table3.4c1; | hese are ti | Horses2019 |
| 2019 2019 | 9 Non-dairy cattle 9 Poultry | Non-dairy cattle 2017 Poultry 2017 | head | 0 | 61.71394352 0.012014023 | 0.5775239 0.0049174 | 1714.950713 1.765735214 | 117 UK average livestock emissions factors Table3.As1; Table3.http://naei.beis.go/UK Th 117 UK average livestock emissions factors Table3.As1; Table3.http://naei.beis.go/UK Th | hese are ti / hese are ti / | Non-dairy catile2019 Poulty2019 |
| 2019 2019 | 3 Sheep 3 Swine | Sheep 2017 Swine 2017 | head | 0 | 4.973816124 5.574262898 | 0.0026216 | 125.1266456 189.8665171 | D17/UK average livestock emissions factors Table3.As1; Table3.http://naei.beis.go/UK Th D17/UK average livestock emissions factors Table3.As1; Table3.http://naei.beis.go/UK Th | hese are ti s | Sheep2019 Swine2019 |
| 2019 2019 | EF_Hydro EF_Hydro/Pumped Storage | electricity production, hydro, run-of-rive 2013 electricity production, hydro, pumped s 2013 | kWh kWh | 0 | 0 | 0 | 0 | D13 Zero emissions - all emissions are scope 3 and not included GB D13 Zero emissions - all emissions are scope 3 and not included GB | | EF_Hydro2019 EF_Hydro/Pumped Storage2019 |
| 2019 | EF_Nuclear | electricity production, nuclear, pressure 2013 electricity production, photovoltair, 577 2013 | kWh kWh | 0 | 0 | 0 | 0 | 113 Zero emissions - all emissions are scope 3 and not included GB 113 Zero emissions - all emissions are scope 3 and not included // ce | - | EF_Nuclear2019 EF_Solar PV2019 |
| 2019 | EF Wind | electricity production, wind, 1-3MW tur 2013 | kWh | 0 | 0 | 0 | 0 | D13 Zero emissions - all emissions are scope 3 and not included GB | 1 | EF_Wind2019 |
| 2019 2018 | e cr Wind (Uttshore) B Industrial Processes Chemicals | executory production, wind, 1-3MW tur 2013 Chemicals | kWh | 0 | 0 | 0 | 0 0.094475132 | J12 J22 J22 J22 J22 J22 J22 J22 J22 J22 | 1 | er_wina (Uttshore)2019 Industrial Processes_Chemicals2018 |
| 2018 | B Industrial Processes_Iron and steel B Industrial Processes_Mineral products | Iron and steel Mineral products | kWh kWh | 0 | 0 | 0 | 0.849476877 0.053517151 | 016 BEIS (Amanda Penistone, Roger Littlewood, Sam Bradley); Scottish Gove[DA Pivot Tables wi(http://naei.beis.go/UK 016 BEIS (Amanda Penistone, Roger Littlewood, Sam Bradley); Scottish Gove[DA Pivot Tables wi(http://naei.beis.go/UK | | Industrial Processes_Iron and steel2018 Industrial Processes_Mineral products2018 |
| 2018 | B Industrial Processes Non-ferrous metals Industrial Processes Other industry | Non-ferrous metals Other industry | kWh kWh | 0 | 0 | 0 | 0.03833479 0.26536312 | 016 BEIS (Amanda Penistone, Roger Littlewood, Sam Bradley); Scottish Gove DA Pivot Tables withttp://naei.beis.go/UK 016 BEIS (Amanda Penistone, Roger Littlewood, Sam Bradley): Scottish Gove DA Pivot Tables withttp://naei.beis.go | 1 | Industrial Processes_Non-ferrous metals2018 Industrial Processes_Other industry2018 |
| 2018 | Product use Product use | Product use | kWh | 0 | 0 | 0 | 2.01826E-09 | 016 BEIS (Amanda Penistone, Roger Littlewood, Sam Bradley); Scottish Gove DA Pivot Tables withttp://naei.beis.gov.uk/reports/reports | rection | Product use_Product use2018 |
| 2018 | Aviation turbine fuel | Aviation turbine fuel | tonnes | 3149.67 | 1.69 | 29.8 | 3181.15 | 18 BEIS, 2019. Greenhouse gas reporting: conversion factors 2018. Convers Fuels Fu | iel for turl | Aviation turbine fuel2018 |
| 2018 | s Biogas Biogas Sc3 | Biogas Biogas WTT | kWh | | | | 0.02405 | 112 BED, 2019. Greenhouse gas reporting: conversion factors 2018. Conversibilities with the conversion factors 2018. Conv | 1 | Biogas_2018 Biogas_Sc32018 |
| 2018 2018 | Biomass Grass/Straw Biomass Grass/Straw_Sc3 | Biomass Grass/straw Biomass Grass/Straw_Sc3 | kWh kWh | | | | 0.01314 0.01604 | 118 BEIS, 2019. Greenhouse gas reporting: conversion factors 2018. ConversiBioenergy UK 118 BEIS, 2019. Greenhouse gas reporting: conversion factors 2018. Conversion factors 2018 - Full set (for advanced users) | 1 | Biomass Grass/Straw2018 Biomass Grass/Straw_Sc32018 |
| 2018 2018 | Biomass Wood logs Biomass Wood logs Sc3 | Biomass_Wood logs Biomass Wood logs Sc3 | kWh kWh | | | | 0.01506 | 118 BEIS, 2019. Greenhouse gas reporting: conversion factors 2018. ConversiBioenergy UK 118 BEIS, 2019. Greenhouse gas reporting: conversion factors 2018. Conversion factors 2018 - Full set (for advanced users) | 1 | Biomass Wood logs2018 Biomass Wood logs Sc32018 |
| 2018 | B Coal (domestic) | Coal (domestic) | kWh (Gross CV) | 0.3147 | 0.02565 | 0.00438 | 0.34473 | D18 BEIS, 2019. Greenhouse gas reporting: conversion factors 2018. ConversiFuels UK | | Coal (domestic)2018 Coal (domestic) Sc22018 |
| 2018 | 8 Coal (electricity generation) | Coal (electricity generation) | kWh (Gross CV) | 0.30924 | 0.00009 | 0.00179 | 0.31112 | 18 BEIS, 2019. Greenhouse gas reporting: conversion factors 2018. Conversi Fuels UK | 0 | Coal (electricity generation)2018 |
| 2018 | 3 Coal (industrial) | Coal (industrial) | kWh (Gross CV) | 0.32153 | 0.00089 | 0.00239 | 0.32482 | 118 BEIS, 2019. Greenhouse gas reporting: conversion factors 2018. Conversional UK | | Coal (industrial)2018 |
| 2018 | 3 Coal (industrial)_Sc3 3 Diesel (average biofuel blend) | Coal (industrial) WTT Diesel | kWh (Gross CV) kWh (Gross CV) | 0.24414 | 0.00004 | 0.0035 | 0.05066 | 118 BEIS, 2019. Greenhouse gas reporting: conversion factors 2018. Convers/WTT - fuels UK 118 BEIS, 2019. Greenhouse gas reporting: conversion factors 2018. Convers/Fuels UK | 1 | Coal (industrial)_Sc32018 Diesel (average biofuel blend)2018 |
| 2018 | B Diesel (average biofuel blend) Sc3 B Electricity generated | Diesel Electricity | kWh (Gross CV) KWh | 0.28088 | 0.00066 | 0.00153 | 0.05833 | 118 BEIS, 2019. Greenhouse gas reporting: conversion factors 2018. Convers/WTT - fuels UK 118 BEIS, 2019. Greenhouse gas reporting: conversion factors 2018. Convers/UK Electricity UK | 1 | Diesel (average biofuel blend)_Sc32018 Electricity generated2018 |
| 2018 | Electricity generated | WTT- UK electricity (generation) | KWh | 0 | 0 | 0 | 0.04198 | 018 BEIS, 2019. Greenhouse gas reporting: conversion factors 2018. Convers WTT- UK & overseas elec | | Electricity generated2018 |
| 2018 | B Electricity generated Electricity generated_Sc3 | WTT- UK electricity (T&D) WTT and T&D | KWh kWh (Gross CV) | 0 | 0 | 0 | 0.00358 | 118 BEIS, 2019. Greenhouse gas reporting: conversion factors 2018. Conversi <u>WTT- UK & overseas elec</u> 118 BEIS, 2019. Greenhouse gas reporting: conversion factors 2018. Conversi WTT- UK & overseas elec UK | | Electricity generated2018 Electricity generated_Sc32018 |
| 2018 | 3 Fuel Oil 3 Fuel Oil Sc3 | Fuels WTT - fuels | kWh (Gross CV) kWh (Gross CV) | 0.26733 | 0.00034 | 0.00064 | 0.26831 | 018 BEIS, 2019. Greenhouse gas reporting: conversion factors 2018. Convers/Fuels 018 BEIS, 2019. Greenhouse gas reporting: conversion factors 2018. Convers/WTT - fuels | 1 | Fuel Oil2018 Fuel Oil_Sc32018 |
| 2018 2018 | 3 Gas Oil 3 Gas Oil Sc3 | Liquid fuels Gas oil Gas Oil Sc3 | kWh (Gross CV) kWh (Gross CV) | 0.25359 | 0.00028 | 0.02265 | 0.27652 | 118 BEIS, 2019. Greenhouse gas reporting: conversion factors 2018. Convers Fuels UK 118 BEIS, 2019. Greenhouse gas reporting: conversion factors 2018. Convers/WTT - fuels | | Gas Oil2018 Gas Oil_Sc32018 |
| 2018 | 3 Landfill gas | Landfill gas | kWh | | | | 0.0002 | 118 BEIS, 2019. Greenhouse gas reporting: conversion factors 2018. ConversiBioenergy UK | 1 | Landfill gas2018 Landfill gas. Sc2018 |
| 2018 | 3 LPG | Length gas with | kWh (Gross CV) | 0.21419 | 0.00015 | 0.00014 | 0.21448 | 118 BEIS, 2019. Greenhouse gas reporting: conversion factors 2018. Conversion factors 2018. UK | 1 | LPG2018 |
| 2018 | 3 LPG_Sc3 3 Marine fuel oil | LPG WTT Marine fuel | kWh (Gross CV) kWh (Gross CV) | 0.25877 | 0.00011 | 0.00367 | 0.02697 | 118 BEIS, 2019. Greenhouse gas reporting: conversion factors 2018. Convers/WTT - fuels UK 118 BEIS, 2019. Greenhouse gas reporting: conversion factors 2018. Convers/Fuels UK | i | LPG_Sc32018 Marine fuel oil2018 |
| 2018 | 3 Marine fuel oil Scope 3 3 Municipal Waste Closed-loop | Marine fuel Refuse Municipal Waste Closed-loop | kWh (Gross CV) tonnes | | | | 0.05076 21.3842 | 118 BEIS, 2019. Greenhouse gas reporting: conversion factors 2018. Convers/WTT - fuels UK 118 BEIS, 2019. Greenhouse gas reporting: conversion factors 2018. Convers/Waste disposal UK As | s defined () | Marine fuel oil Scope 32018 Municipal Waste_Closed-loop2018 |
| 2018 | Municipal Waste Combustion | Refuse Municipal Waste Combustion Refuse Municipal Waste Landfill | tonnes | | | | 21.3842 | 118 BEIS, 2019. Greenhouse gas reporting: conversion factors 2018. ConversiWaste disposal UK As 118 BEIS, 2019. Greenhouse gas reporting: conversion factors 2018. ConversiWaste disposal UK Th | s defined () | Municipal Waste_Combustion2018 Municipal Waste Landfill2018 |
| 2018 | Municipal Waste_Open-loop | Refuse_Municipal Waste_Open-loop | tonnes | | | | 21.3842 | D18 BEIS, 2019. Greenhouse gas reporting: conversion factors 2018. Conversi Wate disposal UK As | s defined (| Municipal Waste_Open-loop2018 |
| 2018 | 3 Natural gas | Natural gas | kWh (Gross CV) | 0.18362 | 0.00024 | 0.0001 | 0.18396 | 11 BEIS, 2019. Greenhouse gas reporting: conversion factors 2018. Conversively water treatment OK 118 BEIS, 2019. Greenhouse gas reporting: conversion factors 2018. Conversively water treatment UK | í | Natural gas2018 |
| 2018 | 3 Natural gas_Sc3 3 Organic Composting | Natural gas WTT | kWh (Gross CV) | | | | 0.02557 | 118 BEIS, 2019. Greenhouse gas reporting: conversion factors 2018. Convers/WTT - fuels UK 118 BEIS, 2019. Greenhouse gas reporting: conversion factors 2018. Convers/Waste disposal UK As | | Natural gas_Sc32018 Organic_Composting2018 |
| | 3 Petrol Sc3 | Refuse Organic: mixed food and garden waste Composting | connes | | | | 0.23377 | 018 BEIS, 2019. Greenhouse gas reporting: conversion factors 2018. Convers Fuels UK | s defined (| |
| 2018 2018 | | Refuse_Organic: mixed food and garden waste_Composting Petrol (average biofuel blend) Petrol (average biofuel blend) WTT | kWh (Gross CV) kWh (Gross CV) | 0.23234 | 0.00072 | 0.0007 | 0.06317 | 018 BEIS, 2019. Greenhouse gas reporting: conversion factors 2018. Convers/WTT - fuels UK | s defined (| Petrol2018 Petrol_Sc32018 |
| 2018 2018 2018 2018 | Municipal Waste_Electricity | Refuse. Organic: mixed food and garden waste. Composting Patrol (average biofuel blend) Patrol (average biofuel blend) WTT electricity, from municipal waste incineration to generic marke districtly. from municipal waste incineration to generic marke | kWh (Gross CV) kWh (Gross CV) kWh | 0.23234 | 0.00072 | 0.0007 | 0.06317 | 118 BBES, 2019. Greenhouse gas reporting: conversion factors 2018. ConversiWTT - fuels UK 117 locoinvent 3.4 (2017); electricity, from municipal waste incineration to generic market for el https://www.ecoinvent.org/ 117 locoinvent and environment Access 2018 LEME/EA by Collisity at environment Access 2018 LEME/EA by Collisity 2018 LEME/EA b | s defined (1 | Petrol2018 Petrol_Sc32018 Municipal Waste_Electricity2018 Municipal wastewater, NMU/CC2018 |
| 2018 2018 2018 2018 2018 2018 | 8 Municipal Waste_Electricity 8 Municipal wastewater_NMVOC 8 n/a | Refuse Organic: mixed food and garden waste. Composting Petrol (average biofuel blend) Petrol (average biofuel blend) WTT electricity, from municipal waste incineration to generic marke electricity, from municipal waste incineration to generic marke Used where data is provided in CO2e | kWh (Gross CV) kWh (Gross CV) kWh m3 | 0.23234 | 0.00072 | 0.0007 | 0.06317 0 0.000015 1 | 138 EEE, 2015. Greenhouse par reporting: conversion factors 2018. ConveryUTT - fuels 117 ecolomost 14 2017; electricity, from unicipal waste information to generic market or ell https://www.ecolewett.org/ 156 European Environment Agency, EMEP (2016) EMEP/EEA air pollutate elevision innertory, pilite://www.ecolewett.org/ /n/a /n/a /n/a /n/a | s defined (| Petrol2018 Petrol_Sc32018 Municipal Waste_Electricity2018 Municipal wastewater_NM/VOC2018 n/a2018 |
| 2018 2018 2018 2018 2018 2018 2018 2018 | Municipal Waste_Electricity Municipal wastewater_NMVOC n/a Dairy Cattle Deer | Refuse: Organic mixed food and garden waste Compositing Petrol (average biddnai blend) Petrol (average biddnai blend) Petrol (average biddnai blend) VITT elektrichy, from municipal waste indiverzation to generic marke elektrichy, from municipal waste indiverzation to generic marke Used where data is provided in CO2e Dairy Cattle Deer | kWh (Gross CV) kWh (Gross CV) kWh m3 head head | 0.23234 | 0.00072 | 0.5054756 | 0.06317 0 0.000015 1 4149.267853 538.3779279 | 139, BER, 2016, Greenhouse per reporting conversion factors 2018. Conversivel T-fueits UK reporting 12, 2017, 20 | s defined (| Perol_2018 Perol_Sci2018 Municipal Waste_Electricity2018 Municipal wastewate_NMVOC2018 n/a2018 Dairy Catle2018 Dear/2018 |
| 2018 2018 2018 2018 2018 2018 2018 2018 | Municipal Waste_Electricity Municipal wastewater_NMVOC Ar/a Soary Cattle Goats Hones | Refuse Organic mixed food and garden waste Composting Petrol Javarga biotbast Blend) Petrol Javarga biotbast Blend) VTT electricity, from municipal waste incineration to generic marke electricity, from municipal waste incineration to generic marke ibid where data is provided in CO2e Dairy Cattle Deer Goats Honose | kWh (Gross CV) kWh (Gross CV) kWh m3 head head head head head | 0.23234 | 0.00072 159.9454446 20.22 5.13 19.56 | 0.5054756 0.1103286 0.0555516 0.616082 | 0.06317 0 0.000015 1 4149.267853 538.3779279 144.804374 672.5924373 | 128 BEC 2005 Generhouse as responses to the second | s defined (| Petro2018 Petro2,Sc20018 Municipal Waste,Electricity2018 Municipal Wastewater_NB/VOC2018 n/a2018 Dairy Cate2018 Dear2018 Munsea2018 |
| 2018 2018 2018 2018 2018 2018 2018 2018 | Municipal Waste Electricity Municipal Wastewater, NMVOC In/a Dairy Cattle Doary Cattle Doars Doars Deser De | Refrate Organic mixed food and protee water. Compacting, Thereal Deverse bioding the second | Utimities CV) kWh (Gross CV) kWh (Gross CV) kWh (Gross CV) kWh (Gross CV) head head head head head head | 0.23234 | 0.00072 159.9454446 20.22 5.13 19.56 63.0428222 0.021247011 | 0.5054756 0.1103286 0.0555516 0.616082 0.5826673 0.004933 | 0.06317 0 0.000015 1 4149.267853 538.3779279 144.804374 672.5924373 1749.705425 2.001216647 | 138 BISE, 2016 Geenhouse gas regorings conversion factors 2016. Conversivel T-fuels in gas and the second | s defined (/a /bese are ti bese are ti bese are ti bese are ti bese are ti bese are ti | Perc2019 Perc3, Sc2019 Perc4, Sc2019 Perc4, Sc2019 Perc4, Sc2019 Perc4, Sc2019 Perc4, Sc2019 Perc4019 |
| 2018 2018 2018 2018 2018 2018 2018 2018 | J Municipal Waste Electricity J Municipal Wastewater, NMNOC joja J Dairy Cattle J Goats J Board J Root Mairy cattle J Non dairy cattle J Noutry J Sheep J Sheep J Sheep | Indus Organic mixed food and profession water. Comparing Netrol lawrage block block of WTT vertex lawrage blocks block of WTT vertex lawrage blocks and water indexeator to generic marke block of Links in a product in CDar Dary Calling and a set indexeator to generic marke Dary Calling and the Indexeator of the Indexe Constant | Utimiks KWh (Gross CV) KWh (Gross CV) KWh (Gross CV) KWh head head head head head head head hea | 0.23234 | 0.00072 159.9454446 20.22 5.13 19.56 63.0428222 0.021247011 4.667992956 6.6883366746 | 0.5054756 0.1103286 0.616082 0.5826673 0.004933 0.0024563 0.1749544 | 0.06317 0.000015 1.4149.257853 538.3779279 1.44.89374 672.5924373 1749.705425 2.001219647 117.4318127 219.5887633 | 193 BBES, 2019 Gerenhouse gas regorings conversion factors 2018 (Conversive) T1-fuels UK 2019 BBES, 2019 Gerenhouse gas regorings conversion factors 2018 (Conversive) T1-fuels factors 2018 2019 Conversities 12:000 Conversion factors 2018 (Conversion Factors 2018) 2010 Gerenhouse Conversion factors 20 | s defined (//////////////////////////////////// | Perso2018 Perso2.52018 Manipal Moste, Electricity2018 Manipal Markowski Daar Castad2018 Dear/2018 Bancy2018 Monas019 Alexand2018 Banke2018 Sanke2018 |
| 2018 2018 2018 2018 2018 2018 2018 2018 | Municipal Waste Electricity Municipal Waste Electricity A Municipal wastewaster_NMVOC A Municipal wastewaster_NMVOC A Municipal wastewaster_NMVOC B Const Co | Refues Organic mixed food and profee water. Comparing Thread Derarge builder Unit Versite Derarge builder Unit descriction, from municipal water individual to generic marks black ullerer data is prosted in CODE Derar Derar Derar Derar Derar Derar Senson Sens | Ummex EXV (Gross CV) KWh (Gross CV) KWh (Gross CV) KWh head h | 0.23234 | 0.00072 159.9454446 20.22 5.13 19.56 6.3.0428222 0.021247011 4.667992956 6.698366746 | 0.5054756 0.1103286 0.0555516 0.616082 0.5826673 0.004933 0.0024563 0.1748644 | 0.06317 0 0.000015 1 4149.267853 538.3779279 144.80374 672.5924373 1749.705425 2.00219647 117.4318127 219.56763 0 0 | 13 BES, 2016 Gereinhouse gar regoring conversion factor 2016. Convert/VIT - faults in the start/inverse start in the start/inverse start inverse start in the start/inverse start inverse start invers | s defined (| New 2018 New 2018 Manicipal Mathematical Sciences of the Manicipal Mathematical Sciences of the Dary Catalog 18 Dearbot 18 Processor 18 Dearbot |
| 2018 2018 2018 2018 2018 2018 2018 2018 |) Aunicipal Waste, Electricity Aunicipal wastewater, NMVOC A Daving Cattle Deer Gosts Pontary Pontary Pontary Senee Pontary Senee Pontary P | Influse Organic mixed food and profee water. Comparing There have a below the service of the service of the service of the descricts, from municipal wases indicated to be generic marks descricts, from municipal wases indicated to be generic marks Dary Catle Dary Catle Dary Catle Dary Catle Dary Catle Catles Same descricts production, hydro, num of near electricity production, hydro, num of near electricity production, hydro, num of near descricts production, hydro, num of near descricts production, hydro, num of near descricts production, hydro, num of near | Uumins (kink) (kinks (kink) Kink) (kinks (kink) ma ma head head head head head head head head kink) head h | 0.23234 | 0.00072 159.9454446 20.22 5.13 19.56 63.0428222 0.02124722 0.02124726 6.698366746 | 0.5054756 0.1103286 0.0555516 0.616082 0.5826673 0.004933 0.0024563 0.1748644 | 0.05317 0 0.000015 1 4149.267853 538.3779279 144.804374 672.5924373 1749.705425 2.001219647 117.4318127 219.657633 0 0 0 | 13 BIS_2005 Generhouse gas regoring conversion factors 2016. Convert/VIT - fuelts Image / more start Image / more start 10 Disconsent 1.4 (2017). Conversion factors 2016 (Conversion Factors 2017). Conversion factors for fuelt conversion factors for fueld conversion factors for fueld conversion factors for fueld conversion factors for facto | s defined (| PergColl Research PergColl Research PargColl Res |
| 2018 2018 2018 2018 2018 2018 2018 2018 | | Refacts Organic mixed froat and profer works Composition Refacts Organic mixed froat and profession of the detectory, from municipal waters independent detectory, from municipal waters independent detectory, from municipal waters independent Dark Cattle Dark Cattle Dark Cattle Dark Cattle Detectory detectory production, hydro, numed faireger extension of the second dark of the second detectory production, hydro, numed faireger extension of the second dark of the second detectory production, hydro, numed faireger detectory production, multi, JAWW tables, muthors with JAW tables, muchon dark detectory production, multi, JAWW tables, muthors detectory production, multiple and tables and tables and tables detectory production, multiple and tables and tables and tables detectory production, multiple and tables and tables detectory production, multiple and tables detectory production, m | Uumes why Gross CV) Why Gross CV Why Gross CV Why Gross CV Why m3 Mad head head head head head head head kaWh kWh kWh kWh head head head head head head head hea | 0.23234 | 0.00072 159 9454446 20.22 5.13 19.55 63.0428222 0.021247011 4.65799356 6.698366746 | 0.5054756 0.103286 0.0555516 0.616082 0.5826673 0.004933 0.0024563 0.1748644 | 0.06317 0 1.000015 1.4440,267853 538.3779279 1.44.803374 672.5924373 1.748705455 2.00219647 117.4318127 219.5687633 0 0 0 0 0 0 0 0 | 131 BILE, 2005 Geenhouse gas regorings conversion factors 2016. ConversiveTT - fuels in the part of head parts of the part of | s defined (| PareScript Storag Mancipal Homa, Enersing/2018 Mancipal Homa, Enersing/2018 Mancipal Homa, Enersing/2018 Dany Catalogue B Dany Catalogue B Dany Catalogue B Dany Catalogue B Parescholl B Senapol D Senapol D Sen |
| 2018 2018 2018 2018 2018 2018 2018 2018 | | Refuel Organic mixed food and profer works Composition, Refuel Service Buick Isond, WITT Verono (Jancese Buick Isond) WITT velections, from municipal wates indiversation to generic marks back with the service of the service of the service of the Buick Isond Isond Isond Isond Isond Isond Isond Isond Isond Buick Isond Isond Isond Isond Isond Isond Isond Isond Isond Medical Isond Isond Isond Isond Isond Isond Isond Isond Medical Isond Isond Isond Isond Isond Isond Isond Isond Isond Medical Isond Isond Isond Isond Isond Isond Isond Isond Isond Medical Isond Iso | Wath Gross CV) Wath Gross CV Wath Gross CV Wath Gross CV Wath Gross CV Madd Madd head head head head head head kath head kath head kath kath head kath head kath head kath kath head head head head head head head hea | 0.23234 | 0.00072 159.9454446 20.22 5.13 19.55 63.0428222 0.021247011 4.65799256 6.678366746 | 0.5054756 0.103286 0.0555516 0.616002 0.5826673 0.0024583 0.1748644 | 0.06317 0.00005 1.4149.267853 538.3779279 1.44.804374 7.40370423 1.201215647 1.201215647 1.201215647 0.0 0 0 0 0 0 0 0 0 0 0 0 0 0 | 13 BIST, 2016 Greenhouse gas reporting conversion factor 2016. Convert/WT - Mark To United //mean Aug. Mark and/ Star Star Star Star Star Star Star Star | s defined (| New 2018 III III IIII IIIIIIIIIIIIIIIIIIIIIII |
| 2018 2018 2018 2018 2018 2018 2018 2018 | J koncipal waters (I textority J koncipal waters (I textor) J koncipal waters (I textor) J koncipal J koncipal | Refuse Organic mixed food and profee works Compacting Refuse Organic mixed food and profee works Compacting Refuse Organic Market Refuse Ref | MaxWh (Gross CV) MAN (Gross CV) KWN Maad head kWh KWh KWh KWh KWh KWh KWh | 0.23234 | 0.00072 159.9454446 20.22 5.13 19.55 63.0428222 0.02124701 4.667992956 6.698366746 | 0.0007 | 0.06317 0 0.000015 44.92.27833 53.3779279 14.4.80174 67.2590437 17.92.759437 17.92.759437 17.93437 0 0 0 0 0 0 0 0 0 0 0 0 0 | 131 BES, 2016 Gerenhouse gas regoring conversion factors 2016. Convert/VIT - fuels integr/mean action of the cong/ Domesmin 1 A (2017), and actions, their congruence makes the philiciton general constraints on philipse for the congruence of the c | s defined (i i i i i i i i i i i i i | NeedSoft 2018 Neergie Viewer, NetVoC2018 Mancipal watersteature, NetVoC2018 Advancipal watersteature, NetVoC2018 Advancipal watersteature, NetVoC2018 DeerOv18 D |
| 2018 2018 2018 2018 2018 2018 2018 2018 | Municipal waves (Bentory) Municipal waves (Bentory) Municipal waves (Bentory) Date (Calibo Date (Calibo Date (Calibo Date (Calibo Date (Calibo Date) Date (Calibo Date) Date) Date (Calibo Date) | Reface Organic mixed froat and profer works Comparing Reface Organic mixed froat and profession of the Reface Organic based based of the Reface Organic based of the Reface Or | Ukuwi (Gross CV) WWi (Gross CV) WWi (Gross CV) WWi (Gross CV) WWi (Gross CV) WWi (Gross CV) Nead | 0.23234 | 0.00072 159.9454446 20.22 5.13 19.56 6.63042822 0.021247011 4.65992366 6.698366746 - - - - | 0.0007 | 0.06317 0 0.000015 144.90.3773 144.90.3773 144.90.3774 144.90.3774 144.90.3774 144.90.3774 144.90.3744 174.97545 174.97545 174.97545 0 0 0 0 0 0 0 0 0 0 0 0 0 | 131 BIES, 2016 Geerminous gas regorings conversion factors 2016. Conversivel T-fuels inter //www.inscrement.org/ | s defined ())))))))))))) | Anex2010 018 Mancipal Water, Diestrop/2018 Mancipal Water, Diestrop/2018 Mancipal Water, Diestrop/2018 Dary CaleBOTB Dary |
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| FileName | Data reference | Reference | Reference 2 URL Tab Data | vear Method |
|---|-----------------------------------|--|---|--|
| DATA_AG | DATA_AG | Agricultural small area statistics: 2002 to 2017 | Welsh Governmerhttps://gov.SmallAreas | 2017 Original small area statistics have been pasted. Residual codes have been mapped to individual local authority codes with reference to the Wales_LA tab, as all local authorities were matched correctly no further action was required. |
| DATA_AG | | ECUK Data tables US Farm Census - LGD2014, 2013-2016 | Energy Consumpti https://www.U5 OpenData NI https://datan/a | 2018 ECUK data table - units added, year added, external references removed, type added 2016 Existing LA codes have been mapped against the 2018 LA list to ensure they are correct. As all data matched correctly, no further |
| DA FA_AG | | Number of holdings with crops and grass and area of crops and grass by regional grouping and region, hung 2001 and 2016 | Scottish Governm https://www2016 | actions were required. 2016 Original agricultural holding file has been pasted, and the number of local authorities in each sub-region has been listed (only sub- regional data wailable). Sub-genore have been manned to individual level autorities and rub region has been listed (only sub- regional data wailable). Sub-genore have been manned to individual level autorities and rub region have been been been been been been been be |
| DATA_AG | | grouping and region, June 2001 and 2016 Structure of the agricultural industry in England and the UK at June, English | Department for Erhttps://www2013-2016 L | regionai oasta availaine); sub-regions have been mappet to indivídual local autoríties, and sub-regional averages have been apportioned to exh local autohority depending on the amount of local autorities in exh sub-region. 2017 Original agriucultural structure file has been pasted, and existing LA codes have been mapped against the 2018 LA list to ensure |
| DATA_AG | DATA_Aviation | geographical breakdowns, local authority. 2014-based local authority population projections for Wales, 2014 to 2039 | Welsh Governmnthttps://stat.n/a | tiney are correct. Aggregated data has been removed. 2014 Original population file has been pasted, and existing LA codes have been mapped against the 2018 LA list to ensure they are correct. The wide has have been filtered for fall user in the AFS CPCM inclusion and instructions of the solution of the solution. |
| DATA_Aviation | | | | correct. Ine data nas been intereo tor all ages in the ALG UNDUP column and local authority codes have been updated where necessary. Welsh data has been extrapolated to 2041, as 2014-based population projections are currently only available for Wales. |
| DATA_Aviation | | 2016-based Population Projections for Areas within Northern Ireland, 11 LGDs - population totals (2016-2041) | Northern Ireland https://www.LGD14 | 2010 Original population hite has been pasted, and existing LA codes have been mapped against the 2018 LA list to ensure they are correct. The data has been filtered for 'all ages' in the AGE GROUP column and local authority codes have been updated where necessary. |
| DATA_Aviation | | Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990- 2018 Population Projections for Scottish Areas (2016-based) | Luke Jones, Glen 1http://naei. UK By Sourc | 2018 Categories 1A3a and Aviation Bunkers for England, Wales, Scotland and Northern Ireland. 2016 Original population file has been pasted, and existing LA codes have been mapped against the 2018 LA list to ensure they are |
| DATA_Aviation | | Population projections for local authorities: Table 2, 2016 based | Office for Nationa https://www.Persons | correct. The data has been filtered for 'all ages' in the AGE GROUP column and local authority codes have been updated where necessary. C3G Original population file has been pasted, and existing LA codes have been mapped against the 2018 LA list to ensure they are |
| DATA_Aviation | 0474 010 | | Development (* 2014) - 20 | correct. The data has been filtered for 'all ages' in the AGE GROUP column and local authority codes have been updated where necessary. The units have been changed from thousand-persons to persons. |
| DATA_CHP | DATA_CHP | DUKES 7.10 Large scale CHP schemes in the United Kingdom, operational at the end of December 2018 (DUKES 7.10) | Department for Bittps://www7.2 Department for Bittps://www7.10 | 2018 Targe scale CHP schemes in the United Kingdom as at December 2017. Each power plant has been manually assigned to a local Authority, and the fuel consumption for heat and electricity is given an average value according to its installed capacity, based on |
| DATA_CHP | | Inland consumption of primary fuels and equivelents for energy use, 1970 to 2018 (DIKES 1.1.1) | Department for Bihttps://www1.1.1 | DUKES / J, Fuel used to generate electricity and heat in CHP installations 2018 n/a |
| DATA DUKES 5.11 | DATA_DUKES 5.11 | Power stations in the United Kingdom, May 2019 (DUKES 5.11) | Department for Bihttps://www5.11 | 2018 External links, footnotes, table headings and blank rows removed and unit column added. The local authority codes from the ONS list have been matched to station names. The plant installed capacity (MWI) has been converted to kWh and mutiplied by respective load factors for different field heaves from DIRFS 5 or DIRFS 10 |
| DATA_ECUK | DATA_ECUK | RETAIL MARKET MONITORING Annual Transparency Report For calendar year 2018 | Northern Ireland Ihttps://www.n/a | 2018 Northern Ireland gas and electricity consumption data has been apportioned to local authorities based on total industrial and domestic fuel consumption in other fuel types as published by BEIS |
| DATA_ECUK DATA_ECUK | | ECUK Data tables U3 ECUK Data tables U4 | Energy Consumpti https://wwsU3 Energy Consumpti https://wwsU4 | 2018 External links removed, columns added for units, type, and year. Type tag as "domestic". 2018 External links removed, columns added for units, type, and year. Type tag as "industrial". |
| DATA_ECUK | | ECUK Data tables US Total final energy consumption at regional and local authority level | Energy Consumpti https://wwwU5 Department for Bihttps://www2018r GWh | 2018 ECUK data table - units added, year added, external references removed, type added 2018 Mapped against full Local Authority list to apply final LA code; combined areas (e.g. England, Outer London) removed from |
| DATA_ECUK DATA_Emissions | DATA_Emissions | 2005 to 2018 UK local and regional CO2 emissions – data tables | Department for Bi <u>https://wwv</u> Full dataset | dataset. 2018 Lk mapping checked and codes updated 2018 Machine keland est and electricity comments |
| DATA_Fuel | DATA_Fuel | RETAIL MARKET MONITORING Annual Transparency Report For calendar year 2018 | Northern Ireland Ihttps://www.n/a | 2018 Northern Ireland gas and electricity consumption data has been apportioned to local authorities based on total industrial and domestic fuel consumption in other fuel types as published by BEIS |
| DATA_Fuel | DATA Fugitive | rucer initial energy consumption at regional and local authority level | weish Governmenttos://www2018r GWh | zuso mappes ogainst tuil Local Authority list to apply final LA code; combined areas (e.g. England, Outer London) removed from dataset. 2014 Original population file bas been pasted, and existing LA coder have been mapped assist the 2019 LA List to accurate the area. |
| | SHIM_FUBILIVE | 2024 oused local authomy population projections for Wales, 2014 to 2039 | | Company population me has been passed, and existing L4 codes have been mapped against the 2018 L4 hist to ensign they are correct. The data has been filtered for "all agas" in the AGE R60V column and local authority codes have been updated where necessary. Welsh data has been extrapolated to 2041, as 2014-based population projections are currently only available for the company of the available for the company of the co |
| DATA_Fugitive | | 2016-based Population Projections for Areas within Northern Ireland, 11 LGDs - population totals (2016-2041) | Northern Ireland !https://www.LGD14 | Wates. 2016 Original population file has been pasted, and existing LA codes have been mapped against the 2018 LA list to ensure they are correct. The data has been filtered for 'all ages' in the AGE GROUP column and local authority codes have been updated where |
| DATA_Fugitive | | Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990- 2017 | Luke Jones, Glen Thttp://naei. UK By Sourc | necessary. 2017 Category 1B |
| | | Population Projections for Scottish Areas (2016-based) | National Records https://www.Table 2 | 2016 Original population file has been pasted, and existing LA codes have been mapped against the 2018 LA list to ensure they are correct. The data has been filtered for 'all ages' in the AGE GROUP column and local authority codes have been updated where |
| DATA_Fugitive | | Population projections for local authorities: Table 2, 2016 based | Office for Nationa https://www.Persons | necessary. 2016 Original population file has been pasted, and existing LA codes have been mapped against the 2018 LA list to ensure they are correct. The data has been filtered for 'all ages' in the AGE GROUP column and local authority codes have been updated where |
| DATA_Fugitive | DATA_IP | 1.1 Aggregate energy balance 2018 | DUKES_1.1-1.3 https://www 2018 | necessary. The units have been changed from thousand-persons to persons. 2018 >Dukes 1.2 2009 Units have been added in column A. Industrial fuel consumption has been tagged in column B against industry |
| DATA_IP DATA_IP | | Devolved Administration GHG Inventory 1990-2019 Electricity: commodity balances (DUEES 5.1) | BEIS (Amanda Penhttp://naei.beis.gov.uk/ | type: Iron and steel, Non-ferrous metals, Mineral products, Chemicals 2018 DA Pivot Tables with GHG emissions by source (1990-2016), filtered for "Industrial Process" 2018 2Dites 2: Linits have been added in column. A fundational addression in advance & assist industre transmission of the statement of the state |
| DATA_IP | | RETAIL MARKET MONITORING Annual Transparency Report For calendar wear 2018 | Northern Ireland Ihttps://www.internet.onl | steel, Non-ferrous metals, Mineral products, Chemicals 2018 Northern Ireland gas and electricity communication data has been apportioned to local authorities based on total industrial and |
| DATA_IP | | Total final energy consumption at regional and local authority level | Department for Bihttps://www2018r GWh | domestic fuel consumption in other fuel types as published by BEIS 2018 Mapped against full Local Authority list to apply final LA code; combined areas (e.g. England, Outer London) removed from |
| DATA_IP DATA_Livestock | DATA_Livestock | Agricultural small area statistics: 2002 to 2018 | Welsh Governmerhttps://gov.SmallAreas | dataset. 2018 |
| DATA_Livestock DATA_Livestock | | Cattle populations in Northern Ireland from 1981 to 2018 ENGLAND COW NUMBERS BY COUNTY ENGLACID COW NUMBERS BY COUNTY | Department of Ag https://wwwCATTLE Agriculture & Horthttps://dair.compare_20 | 2017 2016 2016 Cub contacts have been among to individual local autorities, and sub contacts laws needs have been among intend to apply local |
| DATA Livestork | | 2016 city regional grouping and region June 2001 and | Jostani Governini https://www201/ | authority depending on the amount of local authorities, and sub-regional averages have been apportioned to each local authority depending on the amount of local authorities in each sub-region. Dairy/non-dairy cattle proportions have been allocated based on Number of cattle. 2007 to 2017 from the Svatiich Aarimitirual Census |
| DATA_Livestock | | Farm Census - LGD2014, 2013-2016 | OpenData.NI Farm https://datan/a | 2016 Proportion of dairy and non-dairy cattle has been allocated based on a dataset, Cattle populations in Northern Ireland from 1981 to 2018, published by the Northern Ireland Department of Agriculture, Environment and Rural Affairs |
| | | Structure of the agricultural industry in England and the UK at June, English geographical breakdowns, local authority. | Department for Erhttps://www2013-2016 L | 2016 Data has been allocated from sub-regions to Local Authorities based on number of authorities in that sub-region. Dairy/non-dairy cattle numbers per local authority have been applied according to a dataset "England Cow Numbers by County" published by the |
| DATA_Livestock | | Table 3. Number of cattle, 2007 to 2018: Data obtained from Cattle Tracing Scheme | Scottish Agriculturhttps://wwwTable 3 catt | Agriculture & Horticulture Development Board. 2018 |
| DATA_OFFROAD | DATA_OFFROAD | Total final energy consumption at regional and local authority level Renewable electricity by local authority | Department for Bihttps://www2018r GWh Department for Bihttps://www1A - General | 2018 1% of total on-road fuel consumption apportioned to off-road 2018 Renewable electricity expectation (MWh) for England Scotland Wales and Northern Ireland allocated at local authority level |
| DATA_RF | DATA_RF | Sub-national residual fuel consumption data, Residual fuel consumption at regional and local authority level. | Department for Bihttps://www2016 | 2018 Original residual fuels file has been pasted, and existing LA codes have been mapped against the 2018 LA list to ensure they are correct. Aggregated totals are excluded. |
| DATA_Waste | DATA_Waste | Business waste data 2018 | Scottish Environmhttps://wwwTotal_local | 2018 External links removed, column added for units and local authority codes from ONS list matched to local areas. The dataset has been checked for any local authority exclusions. |
| DATA_Waste | | Household waste summary data, 2018 | Scottish Environmhttps://wwwTable 1 | 2018 External links removed, column added for units and local authority codes from ONS list matched to local areas. The dataset has been checked for any local authority exclusions. 2018 External links removed, column added for units and local authority codes from ONS list matched to local areas. The dataset has |
| DATA_Waste | | Local authority collected waste generation from April 2000 to March 2019 (England | Department for Erhttps://www.Table 2 | been checked for any local authority exclusions. 2018 External links removed, column added for units and local authority codes from ONS list matched to local areas. The dataset has been schedule for any leaf histories multiple |
| DATA_Waste | | and regions) and local authority data April 2018 to March 2019 Rolling 12 month period of combined municipal reuse/recycling/composting rates | Rolling 12 month https://stat-Waste Land | neem cnecked for any local authority exclusions, whereby, averages have been taken for local authorities in County Councils and Metropolitan Borough Councils. 2018 The individual data exports (i.e. waste tonnages by variable) from the Stats Wales online data tool were compiled into a master |
| DATA_Waste | | by local authority Waste From All Sources Application - Waste management (tonget) Monomout | Scotland's Enviror https://www.anvironee | local authority waste dataset. External links removed column added for units and local authority codes from ONS list matched to local areas. The dataset has been checked for an local authority exclusions. 2018 External links removed column added for units and local authority encounter. The dataset has seen and the second secon |
| DATA_Waste | DATA_Wastewater | subcategory 2014-based local authority population projections for Wales, 2014 to 2039 | Welsh Governmn https://stat.n/a | been checked for any local authority exclusions. 2014 Original population file has been pasted, and existing LA codes have been mapped against the 2018 LA list to ensure they are correct. The data has been filtered for 'all aga's in the AGE GROUP column and local authority codes have been updated where |
| DATA_Wastewater | | 2016-based Population Projections for Areas within Northern Ireland, 11 LGDs - | Northern Ireland !https://wwwLGD14 | necessary. Weish data has been extrapolated to 2041, as 2014-based population projections are currently only available for Wales. 2016 Original population file has been pasted, and existing LA codes have been mapped against the 2018 LA list to ensure they are |
| DATA_Wastewater DATA_Wastewater | | population totals (2016-2041) Devolved Administration GHG Inventory 1990-2019 | BEIS (Amanda Perhttn://naei.beis.cou.uk/ | correct. The data has been filtered for 'all ages' in the AGE GROUP column and local authority codes have been updated where necessary. 2018 |
| DATA Waster | | Population Projections for Scottish Areas (2016-based) | National Records https://wwwTable 2 | 2018 Original population file has been pasted, and existing LA codes have been mapped against the 2018 LA list to ensure they are correct. The data has been filtered for 'all ages' in the AGE GROUP column and local authority codes have been updated where necessary. |
| DATA_wastewater | | Population projections for local authorities: Table 2, 2016 based | Office for Nationa https://www.Persons | INCERSING THE ADDA ADDA ADDA ADDA ADDA ADDA ADDA AD |
| DATA_Wastewater | | UK Informative Inventory Report (1990 to 2017) | Ricardo Energy & https://uk-a6.6 Wastewater | necessary. The units have been changed from thousand-persons to persons. NMMOC emissions from municipal watewater treatment (WWT) plants are estimated using the Tier 1 method given in the 2016 EMM/EFEA Guidebook. The approach uses the default emission factor (15 mg NMOC/m) avaitewater handled) and activity data estimates based on a time series of avaite water generated from reisidental poperties for treatments from the UK water |
| DATA_Wastewater ECUK_3.02 ECUK_4.04 | ECUK_3.02 ECUK_4.04 | ECUK Data tables U3 ECUK Data tables U4 | Energy Consumpti https://www.U3 Energy Consumpti https://www.U4 | companies. 2018 External links removed, columns added for units, type, and year. Type tag as "domestic". 2018 External links removed, columns added for units, type, and year. Type tag as "industrial". |
| ECUK_5.04 | ECUK_5.04 Data_Transport_Water | ECUK Data tables US | Energy Consumpti https://www.US | 2018 ECUK data table - units added, year added, external references removed, type added This dataset provides the total energy consumption, by fuel, for UK National Navigation. This is defined as Fuel oil and eas/diesel |
| | | | | oil delivered, other than under international bunker contracts, for fishing vessels, UK oil and gas exploration and production, coastal and inland shipping and for use in ports and harbours. |
| | | | | Final fuel consumption from national navigation. DUKES have aligned energy demand for shipping in line with the estimates of marine fuel use in the UK's National Atmospheric Emissions Inventory (NAE). The NAEI figures use BEIS's estimate of marine fuels and device the calls behave lateral interactions of device the interaction of the state |
| | | Digest of UK Energy Statistics | 1.1 Aggregate ene http://njs.analysisoncba | and derive the split between international and domestic use ("national navigation") based on an activity based study of the UK's 2018 marine fuel use. |
| | | Locations of Canal & River Trust owned or managed waterways within England and | 1Km canal by Local http://data-canalrivertri | 2018 Linear data containing two layers with locations of Canal & River Trust owned or managed waterways within England and Wales. Table PORT0701 (a) Waterbome transport within the United Kingdom, goods Lifted (tones) Note - Coastal or offshore traffic which start or finishes at a point upstream of the inland waterways boundary is included twide - one in UK inland waters traffic (in the coastwise or one poort components of segaing traffic by routed) and once in Coastwise traffic between UK ports' or Denoted traffic of UK oncy? This close to anyow have the traffic or allow attempts included twide - one to the traffic or allow attempts included twide - one traffic to the traffic or allow attempts included twide - one to the traffic or allow attempts included twide - one to the traffic or allow attempts in the close traffic between UK ports' or |
| | | Department for Transport Statistics Domestic Waterborne Freight Statistics | Waterborne transhttps://wwwTable PORT(| traffic started of inhied outside inhiad wetter. Ta avoid obule counting wetterways in indicated in the stafficted effel if the traffic started of inhied outside inhiad wetter. Ta avoid obule counting wetterways in indicate inhibitoria international the IUK in terms of goods iffed, only the internal and foreign components of inland waters traffic are added to the coastivise 2013 staffic and nego traffic totals in devine the wearell totals. |
| | | Department for Transport Statistics Domestic Waterborne Freight Statistics Department for Transport Statistics Domestic Waterborne Freight Statistics Department for Transport Statistics Domestic Waterborne Freight Statistics | Waterborne trans https://wwwTable PORT0701 (Internal inland wa https://wwwTable PORT0703 All UK major and ihttps://wwwTable PORT0101 | To avoid double counting of goods moved in Table PORTOOI(b) from 2000 onwards, only the internal and foreign components of inland waters findling are added to the coastwise traffic and oneport traffic totals to derive overall totals of waterborne freight transport in the UK in terms of goods moved. |
| | | | | |

Pathways calculation method

Introduction

The general method for calculating the emissions trajectories is based on factors for the change yearon-year in the city area in terms of the starting data point – for example fuel consumption, numbers of trees/animals, or levels of different types of waste.

The starting point for all the pathways is the Inventory data. These emissions sources are referenced in the Interventions descriptions below. There is one key area where we haven't used this approach. For the energy supply baseline in Pathways, we've apportioned national energy generation trajectories to local authorities by area etc., rather than using the actual reported data per area, to try to come to a better estimation of future capacity for the different scenarios.

When multiple interventions are applied to an inventory area, the effect is the product of all these interventions

Electricity supply method

A key difference with how the inventory and pathway are calculated is that the pathway considers locally-generated electricity to be used locally, in preference to using the grid electricity.

Locally-produced electricity which we have calculated from the source data is used first. When this all used, remaining demand is met with imported electricity. This has a different expected emissions factor each year. The grid factor projections, which change year on year have been taken from BEIS projections to 2100².

If too much local electricity is produced, this is considered exported. Electricity to be used locally is used in the following order until total demand for that year is met:

- Solar PV
- Onshore wind
- Hydro
- Offshore Wind
- Wave/Tidal
- Biomass
- Nuclear
- CHP
- Fossil Fuels

Comparison to the Tyndall Centre carbon budget and BEIS LACO₂ data

Please be aware that the scope for the inventory calculated by SCATTER differs from the Emissions of carbon dioxide for Local Authority areas published by BEIS in a few key ways. SCATTER includes other gases to CO₂, uses different starting data, and includes categories not covered by the BEIS dataset. This is also the dataset used by the Tyndall Centre for their budgets.

The key reason for the discrepancy is that the more granular fuel consumption data we use for local authorities doesn't include large industrial installations. Among the exclusions is "A considerable amount of consumption fed directly to power stations and some very large industrial consumers, as this would be disclosive." These are mostly installations using power through a central voltage system.

² Treasury Green Book supplementary appraisal guidance on valuing energy use and greenhouse gas (GHG) emissions. - Table 1: Electricity emissions factors to 2100, kgCO2e/kWh (March 2019)

Interventions

Forestry

- Metric: Increase in forest land area
- Emissions sources affected: Emissions arising from land classified as "forestry"
- Interventions Increase in forest land area
 - 1. 5% increase in forest cover by 2030.
 - 2. 10% increase in forest cover by 2030.
 - 3. 16% increase in forest cover by 2030.
 - 4. 24% increase in forest cover by 2030.

Original land use trajectories from DECC 2050 are used. Each land use type is mapped to a land use type used in the current SCATTER, by km². The rate of change in each land use trajectory is calculated for five-year chunks.

Land Management

- Metric: Increase in land used to grow crops for bioenergy
- Emissions sources affected: Emissions arising from land classified as grasslands, cropland, settlements and "other".
- Interventions
 - 1. 2% decrease in grassland
 - 2. 3% decrease in grassland
 - 3. 4% decrease in grassland
 - 4. 7% decrease in grassland

Original land use trajectories from DECC 2050 are used. Forestry is treated as a separate lever Each land use type is mapped to a land use type used in the current SCATTER, by km^2 The rate of change in each land use trajectory is calculated between 2020 and 2050 The mapping is as follows: Arable, for food crops (grades 1–3) LU_C Cropland Arable, for 1st gen energy crops (grades 1–3) LU_C Cropland Arable, for 1st gen energy crops (grades 1–3) LU_C Cropland Arable, for 2nd gen energy crops (grades 1–3) LU_C Cropland Grassland, for 2nd gen energy crops (grades 3–4) LU_G Grassland Grassland, for livestock and fallow (grades 3–5) LU_G Grassland Settlements LU_S Settlements Forests LU_F Forestland Other LU_O Other.

Livestock Management

- Metric: Number of livestock
- Emissions sources affected: Total number of dairy cattle; Total number of non-dairy cattle; Total number of sheep; Total number of pigs; Total number of horses; Total number of poultry
- Interventions
 - 1. 0.2% annual growth in dairy cows & livestock
 - 2. No change from current levels
 - 3. 0.2% annual reduction in livestock numbers
 - 4. 0.5% annual reduction in livestock numbers

Annual rates of change are applied for livestock. These are linear trajectories, but currently modelled in five-year periods. The trajectories are unchanged from the original DECC 2050 pathways and SCATTER V1. Trajectories impact dairy and non-dairy cattle, pigs. horses, and sheep, but not poultry.

Tree-planting

Increase in non-woodland tree planting in the area.

- Metric: hectares of tree canopy
- Emissions sources affected: Tree cover outside woodland.

The baseline data for this is based on the National Forestry Inventory's data³ on tree cover outside woodland, including small woods, groups of trees, lone trees, and hedgerows. Statistics are for England, Scotland, Wales, GB, individual NFI regions, and separately for urban and rural areas. Where urban/rural classification is available (English Local Authorities)[2], the data has been apportioned according to this; in Wales and Scotland data is apportioned according to Country only. No data is available for Northern Ireland. The Forest Research report and datasets also provide information on the numbers, and mean areas of these tree cover features, plus estimates of lengths and areas of hedgerows.

- Interventions
 - 1. Tree-planting to increase current coverage by 30% by 2030; no subsequent commitments.
 - 2. Tree-planting to increase current coverage by 30% by 2030; from 2030-2050 further increase of 5%.
 - 3. Tree-planting to increase current coverage by 30% by 2030; from 2030-2050 further increase of 10%.
 - 4. Tree-planting to increase current coverage by 30% by 2030; from 2030-2050 further increase of 20%.

Tree planting rates are calculated based in Manchester City of Trees (2014), A Potential Woodland Study - Phase 1 report.

The sequestration of carbon dioxide per hectare of trees is based on estimates of the tonnes carbon per hectare relationship and per biome estimate of total carbon storage potential for temperate broadleaf and mixed forests, using the original estimates from a Bastin et al's 2019 paper The global tree restoration potential⁴, and exclusions of soil organic carbon carried out in the follow-on study by Taylor & Marconi (2020)⁵. The resulting tonnes C increase with 1 hectare canopy, without soil organic carbon, is 81.

Using the example of one urban tree, gaining a canopy cover of $25m^2$ – the average according to Forest Research⁶ – the lifetime uptake is around 750 kgCO₂. We have modelled this uptake profile over the

https://www.biorxiv.org/content/10.1101/730325v2.full.pdf

³ <u>https://www.forestresearch.gov.uk/tools-and-resources/national-forest-inventory/what-our-woodlands-and-tree-cover-outside-woodlands-are-like-today-8211-nfi-inventory-reports-and-woodland-map-reports/</u>

⁴ Bastin, J.F., Finegold, Y., Garcia, C., Mollicone, D., Rezende, M., Routh, D., Zohner, C.M. and Crowther, T.W., 2019. The global tree restoration potential. Science, 365(6448), pp.76-79. Supplementary material available from: <u>https://science.sciencemag.org/content/sci/suppl/2019/07/02/365.6448.76.DC1/aax0848-Bastin-SM.pdf</u>

⁵ Taylor, S.D. and Marconi, S., 2020. Rethinking global carbon storage potential of trees. A comment on Bastin et al.(2019). Annals of Forest Science, 77(2), pp.1-7. Paper available at:

⁶ <u>https://www.forestresearch.gov.uk/tools-and-resources/national-forest-inventory/what-our-woodlands-and-tree-cover-outside-woodlands-are-like-today-8211-nfi-inventory-reports-and-woodland-map-reports/</u>

duration of the project based on the carbon calculations provided by the Woodland Carbon Code⁷, for the increasing annual sequestration rate as the tree grows.

Demand for heating and cooling

- Metric: TWh electricity and gas use by lighting, appliances and cooking
- Emissions sources affected: Domestic lighting, appliances, and cooking; Petroleum products (2); Domestic lighting, appliances, and cooking; Gas; Domestic lighting, appliances, and cooking; Electricity
- Interventions
- 1. By 2050, domestic lighting and appliance total energy demand has dropped by 80%.
- 2. By 2050, domestic lighting and appliance total energy demand has dropped by 66%.
- 3. By 2050, domestic lighting and appliance total energy demand has dropped by 39%.
- 4. By 2050, domestic lighting and appliance total energy demand has dropped by 27%.

Reduced net TWh demand from domestic lighting and appliances.

Electrification of lighting, appliances, and cooking

- Metric: TWh electricity and gas use by lighting, appliances and cooking
- Emissions sources affected: Domestic lighting, appliances, and cooking; Petroleum products (2); Domestic lighting, appliances, and cooking: Gas; Domestic lighting, appliances, and cooking: Electricity
- Interventions
- 1. Small reductions in energy demand from cooking; no change in heat source.
- 2. Small reductions in efficiency of domestic cooking. Proportion of cooking which is electric increases to 100% in 2050. This lever combines reductions in energy demand from domestic cooking with an anticipated shift to electrified heat.

Scenario 1 assumes small efficiency gains but no shift in the share of domestic cooking which is electric; Scenario 2 increases electrification proportion to with 100% cooking electrified by 2050.

Domestic space heating and hot water - Demand

The key metric used in the *demand* trajectory in SCATTER is the total TWh energy consumed each year by households. Reductions in the total energy (TWh) consumed per household each year are applied to the total energy consumption for domestic water heating. This is the proportion of total energy reported domestic energy consumption for each fuel⁸ allocated to hot water using statistics for Energy Consumption in the UK (ECUK)⁹.

Total growth or reduction in demand per year is allocated to each fuel based on how much it is used in domestic water heating. The per-annum percentage changes in consumption of each fuel type for each intervention level are below.

⁷ <u>https://www.woodlandcarboncode.org.uk/standard-and-guidance/3-carbon-sequestration/3-3-project-carbon-sequestration</u>

⁸ <u>https://www.gov.uk/government/collections/total-final-energy-consumption-at-sub-national-level</u>

⁹ https://www.gov.uk/government/statistics/energy-consumption-in-the-uk

| Intervention | Electricity | Solid | Liquid | Gaseous |
|--------------|-------------|--------------|--------------|--------------|
| | | hydrocarbons | hydrocarbons | hydrocarbons |
| 1 | 0.102% | 0.007% | 0.018% | 0.245% |
| 2 | - | - | - | - |
| 3 | (0.072%) | (0.005%) | (0.013%) | (0.173%) |
| 4 | (0.171%) | (0.012%) | (0.031%) | (0.412%) |

Level 1 is an increase in domestic hot water demand, and level 2 assumes no change. These are proportionate to the scenarios mapped out in the original DECC 2050 Pathways calculator.

Insulation of new houses

This metric is applied to the current heating demand for your local authority. Numbers of new houses are taken from local authority household projections for England¹⁰. Where these do not go to 2041, the data has been extrapolated based on the trend. This amounts to a 12% increase between 2020 and 2040 in the number of households across the UK, a 2-3% increase every five years.

Demolition rates are assumed to be 0.1%¹¹ of current housing stock, roughly 28,000 dwellings per annum.

- Emissions sources affected: Domestic space heating and hot water; Coal (2); Domestic space heating and hot water; Petroleum products (2); Domestic space heating and hot water; Gas; Domestic space heating and hot water; Electricity; Domestic space heating and hot water; Bioenergy & wastes
- Interventions:
 - 1. All new houses are built to 2013 building regulations (no change).
 - 2. 50% new houses are built to 2013 building regulations; 40% to AECB standard; 10% to passivhaus standard.
 - 3. 30% new houses are built to 2013 building regulations; 40% to AECB standard; 30% to passivhaus standard.
 - 4. 100% new build is built to passivhaus standard.

We have modelled interventions based on application of combination of the following standards to all new build properties:

2013 building regulations (base case)

Association for Environment Conscious Building (AECB) standard

The AECB standard refers to a standard developed by the Association for Environment Conscious Building, aimed at those wishing to create high-performance buildings using widely available technology at little or no extra cost.

PassivHaus standard

Passivhaus is an international energy performance standard. The core focus of Passivhaus is to dramatically reduce the requirement for space heating and cooling, whilst also creating excellent indoor

¹⁰

https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/datase ts/householdprojectionsforengland

¹¹ [7] 2050 Calculator Tool (DECC) IX.A DOMESTIC SPACE HEATING AND HOT WATER <u>http://2050-calculator-tool-wiki.decc.gov.uk/pages/31</u>

comfort levels. This requires very high levels of insulation; extremely high performance windows with insulated frames; airtight building fabric; 'thermal bridge free' construction; and a mechanical ventilation system with highly efficient heat recovery. For more information see the UK Passive House Organisation website.

The key metric used in the insulation trajectory in SCATTER is the average kWh per year consumed by houses in the local area. To carry out these calculations, we partnered with the Association for Environment Conscious Building. Space heat demand has been modelled in PHPP (Passive House Planning Package).

The kwh/year energy consumption assumed for these standards, respectively, are:

| | kwh/year |
|-------------------------------------|----------|
| New build 2013 building regulations | 10,335 |
| New build AECB standard | 2,720 |
| New build Passivhaus standard | 1,020 |
| Comparison with EPC scoring (SAP) | |

The PHPP system has been used to estimate savings in space heat demand from buildings. This is a more accurate and detailed assessment method than the Standard Assessment Procedure (SAP), which is based on the annual energy costs for space heating, water heating, ventilation and lighting (minus savings from energy generation technologies) under standardised conditions, used for generating EPC scores. It uses a scale from 1 to 100. The method used means that the Specific Space Heat Demand of a building is often underestimated.

| | | PHPP Space heat demand for different housing kwh/yr | PHPP assessment of Specific Space Heat Demand kWh/m2.a | SAP assessment of Specific Space Heat Demand kWh/m2.a | SAP under (-ve) or over (+ve) estimate estimating SHD compared to PHPP % |
|--------------------|----------------------|---|--|---|--|
| Bungalow | Original house | 15,275 | 230 | 161 | -30% |
| | Deep IWI | | | | |
| | retrofit | 4,500 | 75 | 44 | -41% |
| | Deep EWI | | | | |
| | retrofit | 3,142 | 51 | 32 | -37% |
| Town house | Original house | 17,772 | 117 | 112 | -4% |
| | Deep IWI retrofit | 5,183 | 40 | 42 | 5% |
| | Deep EWI retrofit | 2,106 | 18 | 25 | 39% |
| Semi- detatched | Original house | 11,714 | 179 | 140 | -22% |
| | Deep IWI retrofit | 4,895 | 62 | 45 | -27% |
| | Deep EWI retrofit | 2,507 | 26 | 22 | -15% |

Retrofit

The options presented allow you to change the proportion of houses that will receive different levels of retrofit assumed in your area in a target year of 2040.

The starting point for this is a weighted average of average kwh/year consumed by house types across England only – which has been applied to all local areas. A possible future improvement would be to localize this starting point per Local Authority, but this has not been done in this iteration as more localized and comparable data was not available.

The house types which have been modelled to generate this average, with the weightings, are:

- Bungalow (17%)
- 3-storey mid-terrace town house (35%)
- 2-storey semi-detached (48%)

The retrofit options are:

- Unimproved (repair & maintenance only)
- "medium" (deep inner wall insulation)
- "deep retrofit" (deep external wall insulation)

The assumed space heating demand (total kwh/household) are as follows:

| | | | kwh/year |
|------------------|--------------|-------------------------------|---|
| | Original | Deep inner-wall insulation | Deep external wall insulation ("deep |
| House type | (unimproved) | ("medium retrofit" |) retrofit") |
| Bungalow | 15,275 | 4,500 | 3,142 |
| Town house | 17,772 | 5,183 | 2,106 |
| Semi-detached | 11,714 | 4,895 | 2,507 |
| Weighted average | 14,444 | 4,927 | 2,478 |

Interventions:

- 1. All current households remain at weighted average heat loss.
- 2. By 2050, 30% of current stock is retrofitted to a medium level; 20% deep retrofit
- 3. By 2050, 40% of current stock is retrofitted to a medium level; 40% deep retrofit.
- 4. By 2050, 10% of current stock is retrofitted to a medium level; 80% deep retrofit.

Technology mix for heating

SCATTER considers thirteen technologies for heating buildings:

- 1. Gas boiler (old)
- 2. Gas boiler (new)
- 3. Resisitive heating
- 4. Oil-fired boiler
- 5. Solid-fuel boiler
- 6. Stirling engine μCHP
- 7. Fuel-cell µCHP
- 8. Air-source heat pump
- 9. Ground-source heat pump
- 10. Geothermal
- 11. Community scale gas CHP
- 12. Community scale solid-fuel CHP
- 13. District heating from power stations

Trajectories are modelled as a linear trend from the current mix towards the selected end distribution in 2050. In order to estimate the current technology mix, we compared the scenarios defined in the DECC 2050 Calculator with the Energy Technologies Institute Clockwork model¹² results for Manchester.

¹² ETI (2015), UK Energy Systems Model Clockwork and Patchwork Results Charts <u>http://www.eti.co.uk/programmes/strategy/esme</u>

The scenarios from the 2050 calculator have been organised into order for the trajectories by prioritising high electrification, and district heating, with dependence on solid fuel the lowest priority.

The optimum scenario from the ESME analysis, which includes cost and return estimates (not within the scope of SCATTER) corresponds most closely to level 8, 50% of heating from heat-pumps (air and ground-source); the rest from community scale CHP.

Some scenarios have been excluded on the basis of their dependency on coal, and their similarity to other scenarios.

The primary fuel source, electrification level and heating system mix in 2050 for each scenario is summarised in the table below:

| | | | Gas boiler (old) | Gas boiler (new) | Resistive heating | Oil- fired boiler | Solid- fuel boiler | Stirling engine µCHP | Fuel-ce µCHP | Air- Il source heat pump | Ground- source heat pump | Geothermal | Community scale gas CHP | /Community scale solid- fuel CHP | District heating from power stations |
|----------|-----------------|--------------|------------------------|------------------------|----------------------|-------------------------|--------------------------|----------------------------|-----------------|-----------------------------------|-----------------------------------|------------|-------------------------------|--|--|
| BASELINE | Electrification | Primary fuel | 44% | 5 39% | 7% | 69 | 6 2% | | - | - 19 | 6 | | 1% | | |
| (1) | level | source | | | | | | | | | - | | | | |
| 2 | 2 Very low | Gas | | 90% | 10% | | | | | | | | | | |
| 3 | 8 Very low | District | | | | | 10% | 5 19% | ó | | | 1% | 24% | 35% | 5 11% |
| 4 | Low | Gas | | | 10% |) | | | 909 | % | | | | | |
| 5 | Low | Mixed / None | | | | | 5% | | 169 | % | 25% | 5 1% | 23% | 23% | 5 7% |
| 6 | Low | District | | | | | 15% | | | 149 | % 20% | 5 | 15% | 5 25% | 5 11% |
| 7 | Medium | Gas | | | | | | 10% | 6 209 | % | 30% | 5 | 33% | ò | 7% |
| 8 | Medium | Mixed / None | | | | | 10% | | | 259 | % 25% | | 13% | 5 20% | 5 7% |
| ç | Medium | District | | | | | | | | 589 | % 30% | 5 1% | | | 11% |
| 10 | High | Solid | | | | | | | | 509 | % 30% | , b | | 20% | ò |
| 11 | High | Gas | | 20% | | | | | | 609 | % 20% | , b | | | |
| 12 | 2 High | Mixed / None | | | 10% | | | | | 609 | % 30% | , D | | | |
| 13 | BHigh | District | | | 7% | | | | | 609 | % 30% | 5 | | | 3% |

In order to translate these into year-on-year changes to the energy consumption reported at a local level in the BEIS fuel data, we calculated the proportion of space heating with each technology per year, applying technology efficiencies to understand the total demand for each fuel type. The change in demand in fuel each year is applied to the current demand. Technology efficiencies are summarised

| he | OW. |
|-----|-----|
| DC. | |

| | Heating / cooling efficiency | |
|--------------------------------------|------------------------------|--|
| | (annual mean) | |
| Gas boiler (old) | 76% | |
| Gas boiler (new) | 91% | |
| Resisitive heating | 100% | |
| Oil-fired boiler | 97% | |
| Solid-fuel boiler | 87% | |
| Stirling engine µCHP | 63% | |
| Fuel-cell µCHP | 45% | |
| Air-source heat pump | 200% | |
| Ground-source heat pump | 300% | |
| Geothermal | 85% | |
| Community scale gas CHP | 38% | |
| Community scale solid-fuel CHP | 57% | |
| District heating from power stations | 90% | |

Biomass/coal power stations

- Metric: TWh generation
- Emissions sources affected: fossil fuel generation and biomass generation recorded at a national level in DUKES.
- Interventions

- 1. No change in solid fuel power generation.
- 2. Solid biomass generation increases by 50% in 2025, dropping off after that; Coal phase-out follows trajectories from the National Grid's Two Degrees scenario.
- 3. Solid biomass generation doubles in 2025, dropping off after that; Coal phase-out follows trajectories from the National Grid's Two Degrees scenario.
- 4. Solid biomass generation quadruples in 2025, dropping off after that; Coal phase-out follows trajectories from the National Grid's Two Degrees scenario.
- 5. Biomass generation replaces fossil fuel powered generation. Trajectories for phase-out are taken from the National Grid Future Energy Scenarios¹³ Two Degrees scenario.

Hydroelectric power stations

- Metric: TWh generation
- Emissions sources affected: Hydro, Hydro pumped storage
- Interventions
 - Hydroelectric power generation grows to 19 MWh per hectare inland water in 2030; 20 in 2050
 - 2. Hydroelectric power generation grows to 19 MWh per hectare inland water in 2030; 21 in 2050.
 - 3. Hydroelectric power generation grows to 25 MWh per hectare inland water in 2030; 26 in 2050.
 - 4. Hydroelectric power generation grows to 34 MWh per hectare inland water in 2030; 41 in 2050.

Increasing baseline hydroelectric power generation capacity. The TWh generated per GW capacity is calculated using the assumptions in the National Grid's Two Degrees scenario (2019).

Offshore wind

- Metric: TWh generation
- Emissions sources affected: Offshore wind
- Interventions
 - 1. No change to large-scale offshore wind generation.
 - 2. Large-scale onshore wind generation grows to 3.4 MWh per hectare in 2030; 5.3 MWh in 2050.
 - 3. Large-scale onshore wind generation grows to 8 MWh per hectare in 2030; 5.9 MWh in 2050.
 - 4. Large-scale onshore wind generation grows to 8 MWh per hectare in 2030; 6.9 MWh in 2050.
 - 5. Increasing the rate at which offshore wind generation capacity changes. The TWh generated per GW capacity is calculated using the assumptions in the National Grid's Two Degrees scenario (2019).

Onshore wind

- Metric: TWh generation
- Emissions sources affected: Onshore wind

¹³ <u>https://www.gov.uk/government/collections/total-final-energy-consumption-at-sub-national-level</u>

- Interventions
 - 1. Large-scale onshore wind generation grows to 26 MWh per hectare in 2030; 1.46 MWh in 2050.
 - 2. Large-scale onshore wind generation grows to 1.56 MWh per hectare in 2030; 1.75 MWh in 2050.
 - 3. Large-scale onshore wind generation grows to 1.75 MWh per hectare in 2030; 1.93 MWh in 2050.
 - 4. Large-scale onshore wind generation grows to 1.9 MWh per hectare in 2030; 2.2 MWh in 2050.

This lever works to increase the rate in installed GW per annum for onshore wind. The TWh generated per GW capacity is calculated using the assumptions in the National Grid's Two Degrees scenario (2019).

Small-scale wind

- Metric: TWh generation
- Emissions sources affected: Onshore wind not from Major Power Producers
- Interventions
 - 1. No change to small-scale onshore wind.
 - 2. Small-scale wind grows to 3 MWh per hectare in 2030; 2.6 in 2050 (from a baseline of 1.2 MWh per hectare.)
 - 3. Small-scale wind grows to 2.6 MWh per hectare in 2030; 2.9 in 2050 (from a baseline of 1.2 MWh per hectare.)
 - 4. Small-scale wind grows to 2.8 MWh per hectare in 2030; 3.3 in 2050 (from a baseline of 1.2 MWh per hectare.)

Total small-scale wind capacity is calculated in GW. The change each year is calculated for each five-year period of time. This change is applied to current reported small-scale wind.

Solar PV – Large

- Metric: TWh generation
- Emissions sources affected: Solar PV from Major Power Producers
- Interventions
 - 1. No change in large-scale solar generation to 2030; growing to 100 kWh per hectare in 2050 (from a baseline of 50 kWh per hectare.)
 - 2. Large-scale solar generation grows to 100 kWh per hectare in 2030; 200 in 2050 (from a baseline of 50 kWh per hectare.)
 - 3. Large-scale solar generation grows to 100 kWh per hectare in 2030; 250 in 2050 (from a baseline of 50 kWh per hectare.)
 - 4. Large-scale solar generation grows to 200 kWh per hectare in 2030; 400 in 2050 (from a baseline of 50 kWh per hectare.)

Solar PV – Small

- Metric: TWh generation
- Emissions sources affected: Solar PV not from Major Power Producers
- Interventions

- 1. Local solar capacity grows to allow generation equivalent to 750 kWh per household in 2030; 1350 in 2050 (from a baseline of 400 kWh per household.)
- 2. Local solar capacity grows, generating equivalent to 1200 kWh per household in 2030; 2200 in 2050 (from a baseline of 400 kWh per household.)
- 3. Local solar capacity grows, generating equivalent to 1550 kWh per household in 2030; 3000 in 2050 (from a baseline of 400 kWh per household.)
- 4. Local solar capacity grows, generating equivalent to 2500 kWh per household in 2030; 5200 in 2050 (from a baseline of 400 kWh per household.)

Total small-scale solar PV is calculated in TWh generated, based on defined rates of total installed capacity (GW). The TWh/GW capacity generation efficiencies from 2017 - 2050 are taken from the National Grid's Two Degrees scenario (2019) for large scale solar PV, but the year on year rates of change are applied to the domestic / small scale solar PV recorded.

Demand for heating and cooling

- Metric: Change in energy demand for commercial lighting, appliances and catering.
- Emissions sources affected: Commercial space heating, cooling, and hot water; Petroleum products (2); Commercial space heating, cooling, and hot water; Gas; Commercial space heating, cooling, and hot water; Electricity; Commercial space heating, cooling, and hot water; Coal (2); Institutional space heating, cooling, and hot water; Gas; Institutional space heating, cooling, and hot water; Gas; Institutional space heating, cooling, and hot water; Electricity; Institutional space heating, cooling, and hot water; Gas; Institutional space heating, cooling, and hot water; Electricity; Institutional space heating, cooling, and hot water; Coal (2)
- Interventions
 - 1. In 2050, commercial heating, cooling and hot water demand is 103% of today's levels
 - 2. In 2050, commercial heating, cooling and hot water demand is 83% of today's levels
 - 3. In 2050, commercial heating, cooling and hot water demand is 70% of today's levels
 - 4. In 2050, commercial heating, cooling and hot water demand is 60% of today's levels

Changes are linear between 2020 and 2050.

Technology mix for heating and cooling

- Metric: Change in energy demand for commercial, industrial and institutional lighting, appliances and catering.
- Emissions sources affected: Commercial lighting, appliances, equipment, and catering; Petroleum products (2); Commercial lighting, appliances, equipment, and catering; Gas; Commercial lighting, appliances, equipment, and catering; Electricity; Commercial lighting, appliances, equipment, and catering; Coal (2); Institutional lighting, appliances, equipment, and catering; Petroleum products (2); Institutional lighting, appliances, equipment, and catering; Gas; Institutional lighting, appliances, equipment, and catering; Electricity; Institutional lighting, appliances, equipment, and catering; Coal (2); Institutional lighting, appliances, equipment, and catering; Petroleum products (2); Institutional lighting, appliances, equipment, and catering; Petroleum products (2); Institutional lighting, appliances, equipment, and catering; Petroleum products (2); Institutional lighting, appliances, equipment, and catering; Petroleum products (2); Institutional lighting, appliances, equipment, and

SCATTER considers eleven technologies for heating buildings:

- Gas boiler (old)
- Gas boiler (new)

- Resisitive heating
- Oil-fired boiler
- Solid-fuel boiler
- Stirling engine µCHP
- Fuel-cell μCHP
- Air-source heat pump
- Ground-source heat pump
- Geothermal
- Community scale gas CHP
- Community scale solid-fuel CHP
- District heating from power stations

Trajectories are modelled as a linear trend from the current mix towards the selected end distribution in 2050. See Domestic Buildings for more detail on the modelling of these.

Energy demand for lighting, appliances and cooling

- Metric: TWh in energy demand for commercial, industrial and institutional lighting, appliances and catering
- Emissions sources affected: Commercial lighting, appliances, equipment, and catering; Petroleum products (2); Commercial lighting, appliances, equipment, and catering; Gas; Commercial lighting, appliances, equipment, and catering; Electricity; Institutional lighting, appliances, equipment, and catering; Petroleum products (2); Institutional lighting, appliances, equipment, and catering; Gas; Institutional lighting, appliances, equipment, and catering; Electricity
- Interventions
 - 1. Commercial lighting & appliance energy demand increases 28% by 2050
 - 2. Commercial lighting & appliance energy demand increases 15% by 2050
 - 3. Commercial lighting & appliance energy demand decreases -4% by 2050
 - 4. Commercial lighting & appliance energy demand decreases -25% by 2050

Total demand (TWh) from commercial, industrial, and institutional lighting and appliances increases in scenarios 1 and 2; decreases in scenarios 3 & 4.

Electrification of lighting, appliances, and catering

- Metric: Energy demand mix for commercial lighting, appliances and catering through electrification
- Emissions sources affected: Commercial lighting, appliances, equipment, and catering; Petroleum products (2); Commercial lighting, appliances, equipment, and catering; Gas; Commercial lighting, appliances, equipment, and catering; Electricity; Institutional lighting, appliances, equipment, and catering; Petroleum products (2); Institutional lighting, appliances, equipment, and catering; Gas; Institutional lighting, appliances, equipment, and catering; Electricity
- Interventions
 - 1. Share of cooking which is electric is as today.
 - 2. By 2050, 100% of commercial cooking is electrified.

This lever combines reductions in energy demand from commercial cooking with an anticipated shift to electrified heat. Scenario 1 assumes small efficiency gains but no shift in the share of commercial cooking which is electric. Scenario 2 increases electrification proportion to with 100% cooking electrified by 2050. This results in an increase in electricity consumption and decrease in other fuels used for commercial cooking.

Industrial processes – Efficiency

- Metric: Total TWh consumption and energy mix from energy intensity of industry.
- Emissions sources affected: Industrial buildings & facilities; Petroleum products; Industrial buildings & facilities; Gas; Industrial buildings & facilities; Electricity; Industrial buildings & facilities; Coal
- Interventions
 - 1. Industry moves to higher natural gas consumption, with electricity consumption falling before 2035 then remaining constant.
 - 2. Industrial electricity consumption as a share of total energy increases between 2035 and 2050, reaching 40% of total energy consumption.
 - 3. Industrial electricity consumption is 50% of total energy consumption by 2035; 65% by 2050.

This lever impacts the energy consumption trajectories from industrial buildings and facilities, and split by energy demand. The trajectories are focused on electrification of industry.

Industrial processes – Output

- Metric: GHG emissions from industrial processes
- Emissions sources affected: Iron and steel process emissions; Non-ferrous metals process emissions; Mineral products process emissions; Chemicals process emissions; Other industry process emissions
- Interventions
 - 1. Other industry process emissions are reduced at a rate of 2.6% per year.
 - 2. Reductions in process emissions from all industry, with larger emissions reductions in the chemicals industry (0.4% pa) and other industry (6% pa). Metals and minerals industries also reduce process emissions 0.2% pa and 0.1% pa respectively.
 - 3. Reductions in process emissions from all industry: general industry reduces process emissions at a rate of 4.5% per year. Chemicals emissions reduce 1% per year; metals 0.7% per year, and minerals 0.8% per year.

This lever impacts the process emissions from industrial activity. Separate trajectories are modelled for chemicals, metals, and minerals, industries. Growth rates are applied to the different industries' direct greenhouse gas emissions. Growth in "output index" from industry which applies to current process emissions and energy demand. Specific trajectories per industry type, mapped from 2015 - 2025 and 2025 – 2050.

Domestic freight (road and waterways)

- Metric: TWh fuel use by on-road transport; TWh fuel use by waterborne freight
- Emissions sources affected: On-road transportation, waterborne transport
- Interventions

- 1. 47% increase in distance travelled by road freight; 40% increase in efficiency. In waterborne transportation, 15 % decrease in fuel use.
- 2. 27% increase in distance travelled by road freight; 60% increase in efficiency. In waterborne transportation, 6 % increase in fuel use.
- 3. 6% decrease in distance travelled by road freight; 71% increase in efficiency. In waterborne transportation, 25 % increase in fuel use.
- 4. 22% decrease in distance travelled by road freight; 75% increase in efficiency. In waterborne transportation, 28 % increase in fuel use.

Domestic freight interventions affect both on-land and waterborne freight.

On-land freight interventions are based on the on-road fuel consumption allocated to your Local Authority¹⁴. For this iteration of SCATTER, it has not been possible to separate the proportion of this attributable to freight. A UK-wide average has been applied to every Local Authority, based on the Local Authority specific data available for road transport fuel consumption[2].

For Waterborne freight, total fuel consumption from national navigation increases as waterborne transport is increased.

Domestic passenger transport – Demand

- Metric: TWh fuel use across all transport
- Emissions sources affected: Petroleum products (2)Road transport; Onroad Sc Petroleum; Coal (2) Rail; Petroleum products (2)Rail
- Interventions
 - 1. No change to total travel demand per person
 - 2. 5% reduction in total distance travelled per individual per year by 2030.
 - 3. 15% reduction in total distance travelled per individual per year by 2030.
 - 4. 25% reduction in total distance travelled per individual per year by 2030.

Domestic passenger transport - Modal Shift

- Metric: TWh fuel use by different transportation options
- Emissions sources affected: Petroleum products (2)Road transport; Onroad Sc Petroleum; Coal (2) Rail; Petroleum products (2)Rail

The initial modal split used is taken from the National Travel Survey's 2017/18 Average Distances Travelled by Mode¹⁵. The split represents the distribution between average distance travelled per transport mode in Urban Conurbations across England. "Urban conurbation" has been chosen with the intention of representing LA's using the tool who have both urban and rural coverage. Full statistics are available summarized in the Factsheets published by the DfT¹⁶. The Rural Urban Classification is an Official Statistic and is used to distinguish rural and urban areas. The Classification defines areas as rural if they fall outside of settlements with more than 10,000 resident population¹⁷. The mode share data is

¹⁴ <u>https://www.gov.uk/government/collections/road-transport-consumption-at-regional-and-local-level</u>

¹⁵<u>https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/822089/nt</u> <u>s-2018-factsheets.pdf</u>

¹⁶<u>https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/822089/nt</u> <u>s-2018-factsheets.pdf</u>

¹⁷ <u>https://www.gov.uk/government/statistics/2011-rural-urban-classification</u>

a national breakdown of average mode share, which does not split by local authority, therefore this is not tailored to each local authority area.

The following changes are applied to reach level 4 ambition:

- o % walking x3
- o % cycling x3
- o % using buses x3
- o % using railways x1.5

Levels 2 and 3 are mid-points between L1 and L4.

- Interventions
 - 1. No change to current national average modal split by total miles: 74% transportation by cars, vans and motorcycles.
 - 2. Average modal share of cars, vans and motorbikes decreases from current national average 74% total miles to 56% in 2050.
 - 3. Average modal share of cars, vans and motorbikes decreases from current national average 74% total miles to 47% in 2050.
 - 4. Average modal share of cars, vans and motorbikes decreases from current national average 74% total miles to 38% in 2050.

| | Trajectory | | | |
|-----------------------------|------------|-------|-------|-------|
| Mode | 1 | 2 | 3 | 4 |
| Walking | 6.3% | 12.5% | 15.7% | 18.8% |
| Pedal cycles | 1.1% | 2.2% | 2.7% | 3.3% |
| Cars, Vans, and Motorcycles | 73.9% | 58.8% | 51.2% | 43.6% |
| Buses | 4.2% | 8.4% | 10.5% | 12.5% |
| Railways | 14.5% | 18.1% | 20.0% | 21.8% |

Domestic passenger transport – Technology

- Metric: TWh fuel use by different transportation options
- Emissions sources affected: Petroleum products (2)Road transport; Onroad Sc Petroleum; Coal (2) Rail; Petroleum products (2)Rail
- Interventions
 - 1. Cars, buses and rail is 100% electric by 2050. Slight increase in average train occupancy.
 - 2. Cars, buses and rail is 100% electric by 2040. Slight increase in average train occupancy and bus occupancy.
 - 3. Cars, buses and rail is 100% electric by 2035. Average occupancies increase to 18 people per bus km (from 12), 1.62 people per car-km (up from 1.56), and 0.42 people per rail-km (from 0.32).
 - 4. Cars and buses are 100% electric by 2035, rail is 100% electric by 2030. Average occupancies increase to 18 people per bus km (from 12), 1.65 people per car-km (up from 1.56), and 0.42 people per rail-km (from 0.32).

International aviation

- Metric: TWh fuel use from aviation
- Emissions sources affected: Aviation_fuel_Sc1; Aviation_fuel_Sc3

- Interventions
 - 1. Department for Transport "central" forecast for aviation.
 - 2. Department for Transport "high" forecast for aviation.
 - 3. Department for Transport "low" forecast for aviation.

Department for Transport growth forecasts¹⁸ for international aviation, applied to both in-boundary airport emissions and to scope 3 emissions from people in the local area travelling. A rate of change calculated between aviation in 2030, 2040 and 2050.

The "Central" forecast represents the DfT base-case; "Low" encapsulates 'lower economic growth worldwide with restricted trade, coupled with higher oil prices and failure to agree a global carbon emissions trading scheme'; "High" scenario projects 'Higher passenger demand from all world regions, lower operating costs and a global emissions trading scheme'¹⁹.

International shipping

- Metric: TWh fuel use by on-road transport; TWh fuel use by waterborne freight
- Emissions sources affected: Petroleum products (2)Road transport; Onroad Sc Petroleum 004:Petroleum products_internal; 004:Petroleum products_coastal
- Interventions
 - 1. 47% increase in distance travelled by road freight; 40% increase in efficiency. In waterborne transportation, 15 % decrease in fuel use.
 - 2. 27% increase in distance travelled by road freight; 60% increase in efficiency. In waterborne transportation, 6 % increase in fuel use.
 - 3. 6% decrease in distance travelled by road freight; 71% increase in efficiency. In waterborne transportation, 25 % increase in fuel use.
 - 4. 22% decrease in distance travelled by road freight; 75% increase in efficiency. In waterborne transportation, 28 % increase in fuel use.

For Waterborne shipping, total fuel consumption from national navigation increases as waterborne transport is increased. Road freight trajectories are developed from a combined impact of reduced distance travelled by HGVs (mostly diesel; electric trajectories only begin in the 2040s) with an increased efficiency (i.e. reduced energy demand per vehicle-km). The starting point for road freight efficiency is 5.29 TWh/bn vehicle-km (BEIS 2017), Road transport energy consumption at regional and local authority level, 2015) Baseline trajectory sees this efficiency increased to 3.15 TWh/bn vehicle-km by 2050. For the most ambitious (L4) scenario, the efficiency in 2050 is 1.34TWh/bn vehicle-km.

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¹⁸ <u>https://www.gov.uk/government/publications/uk-aviation-forecasts-2017</u>

¹⁹<u>https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/781281/uk</u> -aviation-forecasts-2017.pdf

Increase in rates of recycling

- Metric: Increase in proportion of total waste directed towards recycling.
- Emissions sources affected: Open-loop; Closed-loop; Landfill; Composting; Combustion; Wastewater
- Interventions
 - 1. 65% recycling, 10% landfill, 25% incineration by 2040; remaining constant to 2050
 - 2. 65% recycling, 10% landfill, 25% incineration achieved by 2035 remaining constant to 2050
 - 3. 65% recycling, 10% landfill, 25% incineration achieved by 2035, recycling rates increasing to 75% by 2050
 - 4. 65% recycling, 10% landfill, 25% incineration achieved by 2035, recycling rates increasing to 85% by 2050

This lever interacts with reduction in volume of waste to define the total waste arisings and which waste stream they are captured in. Here, trajectories calculate the percentage recycling, landfill and "other" waste, applying these changes to the waste recorded in each category.

The "base case" is that the EU targets for 65% recycling are reached in 2035²⁰; subsequent trajectories have different anticipated dates for reaching this. In Scenario 2, 65% recycling is met between 2045 and 2050. In Scenario 3, recycling increases steadily from 65% just after 2035 to 81% in 2050. In scenario 4, the recycling target is met earlier than 2035 and by 2050 85% all waste is recycled. The scenarios are applied to reported recycled and landfilled waste, as the change in the anticipated % waste recycled.

Reduction in volume of waste

- Metric: Reduction in volume of waste
- Emissions sources affected: Open-loop; Closed-loop; Landfill; Composting; Combustion; Wastewater
- Interventions
 - 1. Total volume of waste is 124% of 2017 levels by 2040.
 - 2. Total volume of waste is 109% of 2017 levels by 2040.
 - 3. Total volume of waste is 86% of 2017 levels by 2040.
 - 4. Total volume of waste is 61% of 2017 levels by 2040.

Total volume of waste arising is calculated by type (Household, Commercial & Industrial, Construction & Demolition) according to defined percentage changes in each. This total is summed for each five-year period. The change in this total each year is applied to all types of reported waste for the local authority.

By simplifying the trajectory, and applying the same reduction in wastage rates uniformly, a level of detail between different types of waste arising has been lost. However, the original waste trajectories are similar.

²⁰ European Waste targets for 2035 <u>https://www.letsrecycle.com/news/latest-news/eu-set-softer-targets-55-recycling-2025/</u>