Cheshire East Council

Borough-wide Baseline & Carbon Reduction Options

Menu of options

November 2022

Version 1.5

Contents

01 Background And Context

1. Background & Context
Introduction

Overview & Scope

In January 2022, Cheshire East Council announced a pledge to becoming a carbon neutral borough by 2045, five years ahead of the UK government's national 2050 target. This aligns with pledges made around the country by signatories to the UK100 target, which now represents over 50% of the UK population.

This study has been commissioned in response to that pledge and the emergent need for a defined action plan for the borough to deliver progress towards that ambitious goal.

The report is structured as follows:

- **Chapter 1** sets out this report in context of the council's existing work on this agenda and the motivation behind this study.
- **Chapter 2** sets out the borough-wide emissions profile as well as analysis of emissions from the council's own procurement and contract expenditure.
- **Chapter 3** introduces a series of emissions reduction pathways for borough-wide emissions, setting out the scale and nature of what is required to achieve carbon neutrality in Cheshire East.
- **Chapter 4** discusses tangible options for achieving reductions in each sector of emissions activity.
- **Chapter 5** explores means through which the council can engage with external stakeholders and offers recommendations for monitoring and reporting on progress.
- **Chapter 6** gives summary recommendations and next steps.

Objectives

- Define Cheshire East's borough-wide emissions and set out the activities that make the most significant contributions.
- Establish options for mitigating these emissions in the future with a view to meeting the borough's 2045 carbon neutral target.
- Provide the council with an evidence base of similar projects completed or underway across the UK to encourage their next stages of action plan development.

This helps the council by:

- Providing a robust evidence base from which to base future decisions and action planning development.
- Demonstrating the urgency and scale of required action in order to meet the council's ambitious goals.
- Coordinating positive momentum across the council towards a defined action plan that can deliver progress towards goals.

1. Background & Context
Context and Commitments

Contextualising this report

Following the council's recognition of the climate emergency in May 2019, the council set out commitments to reach carbon neutrality as an organisation by 2025. This was followed by the UK100 commitment to reach carbon neutrality as a borough by 2045.

This report builds on past work by Anthesis which sets out an action plan for the council's own target as well as a toolkit for local town and parish councils, this time focused solely on borough-wide targets.

The primary objective of this report is to provide an overview of potential interventions for sectors across the region to achieve significant emissions reductions by 2045 and present a range of potential actions the council could choose to take forward.

The sectors covered in this report are:

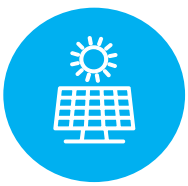
Domestic & Non-Domestic Buildings

Waste

Transport

Agriculture and Land use

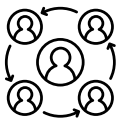
Industry



Energy Supply

1. Background & Context
Context and Commitments

Across these sectors, actions have been suggested on the basis of emissions modelling alongside the following principles:



- **Ensuring inclusivity and fairness:** Including relevant stakeholders and the parties affected by an activity in a collaborative and transparent process.

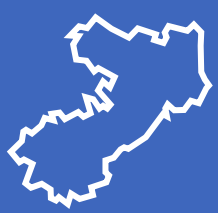
- **Decision making based on data and robust research:** Drawing on available quantitative and qualitative information from a range of sources.

- **Considering co-benefits alongside carbon:** Ensuring that where possible, positive secondary impacts are assessed and incorporated into action planning.

National, Regional and Local Commitments

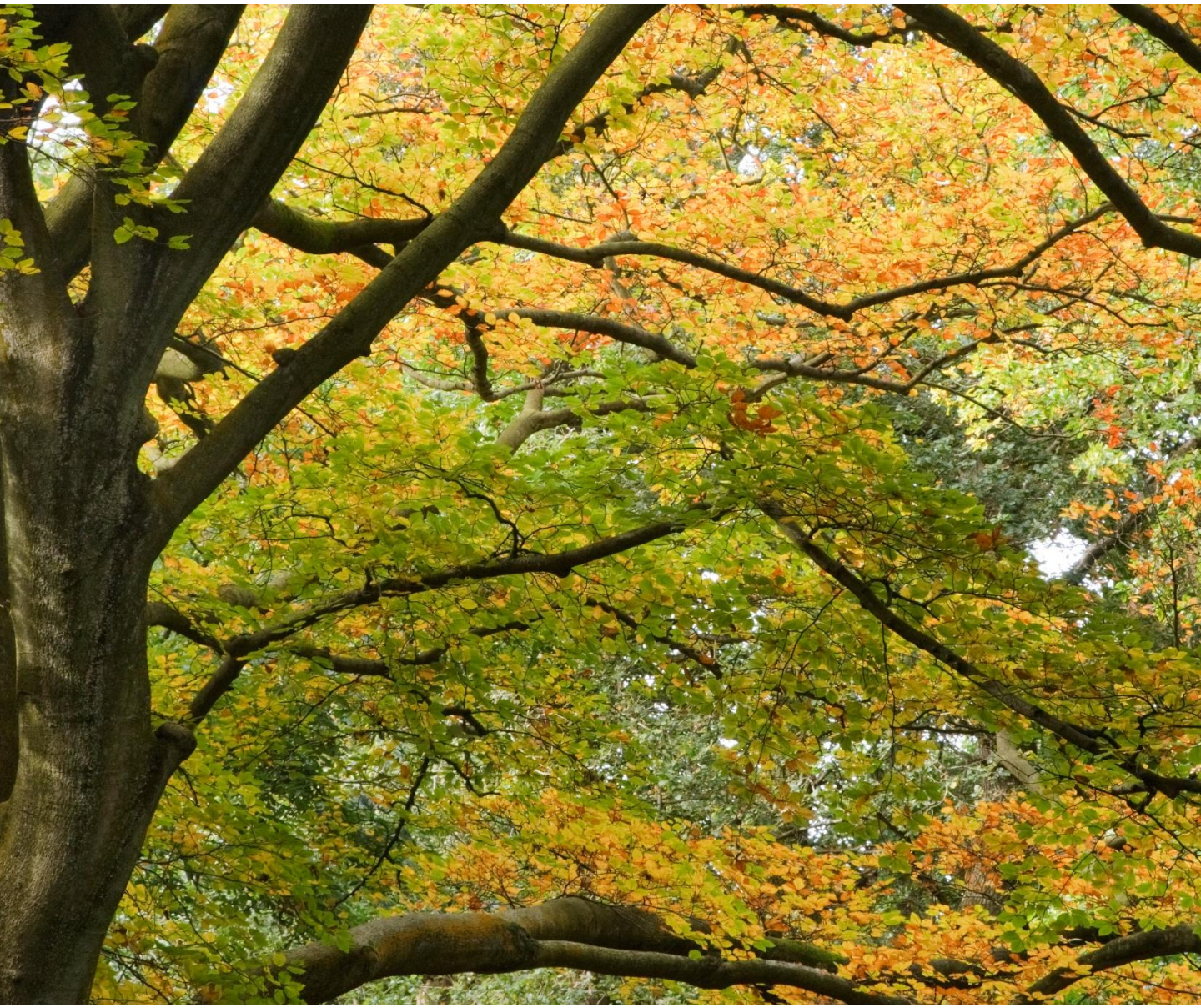
The Paris Agreement set the international target to limit global temperature rise to well below 2°C with the aim of 1.5°C above pre-industrial levels. The IPCC's follow-up report stated that this requires a global reduction in Greenhouse Gas (GHG) emissions of 45% by 2030. Governments strengthened their commitments at the COP meeting in Glasgow in 2021.

The Climate Change Act 2008 introduced a legally binding target for the UK to reduce GHG emissions by 80% by 2050. In June 2019, the target was updated to reach net zero by 2050. This was further enhanced in June 2021 when the UK government committed to reducing emissions by 78% by 2035 compared to 1990 levels.



In 2019, Cheshire East Council committed to becoming carbon neutral as an organisation by 2025. In 2022, the council committed to make Cheshire East a carbon neutral borough by 2045. The Council has provided a Climate Emergency Toolkit to its towns and parishes to achieve targets, deliver change and accelerate their carbon neutral transition.

02 Current Emissions Footprint



02a Borough-wide Scope 1 and 2 Emissions

In 2019, the borough's energy system was responsible for net emissions totalling 2,845 $ktCO_2e$. The majority resulted from buildings & facilities (48%) and transport (34%).

The current emissions profile for the area administered by Cheshire East Council is shown in Figure 2.1.

This covers the year 2019 and covers three greenhouse gases: carbon dioxide, nitrous oxide and methane. Throughout this report, emissions are given as a single figure measured in kilotonnes of carbon dioxide equivalent ($ktCO_2e$).

Footprint boundary

The emissions profile covers emissions generated within the borough boundary (Scopes 1 & 2) from a defined list of activities under the Greenhouse Gas Protocol for city-wide emissions. Some sub-categories of emissions have been combined for the purposes of Figure 2.1. The full list of disaggregated data can be found in Appendix 2.

Inventory development: The SCATTER tool has been enhanced this year to offer the council greater visibility of emissions sources associated with the borough. The council's emissions baseline data should be continually revisited and revised as is appropriate, allowing the council to track progress against its commitments.

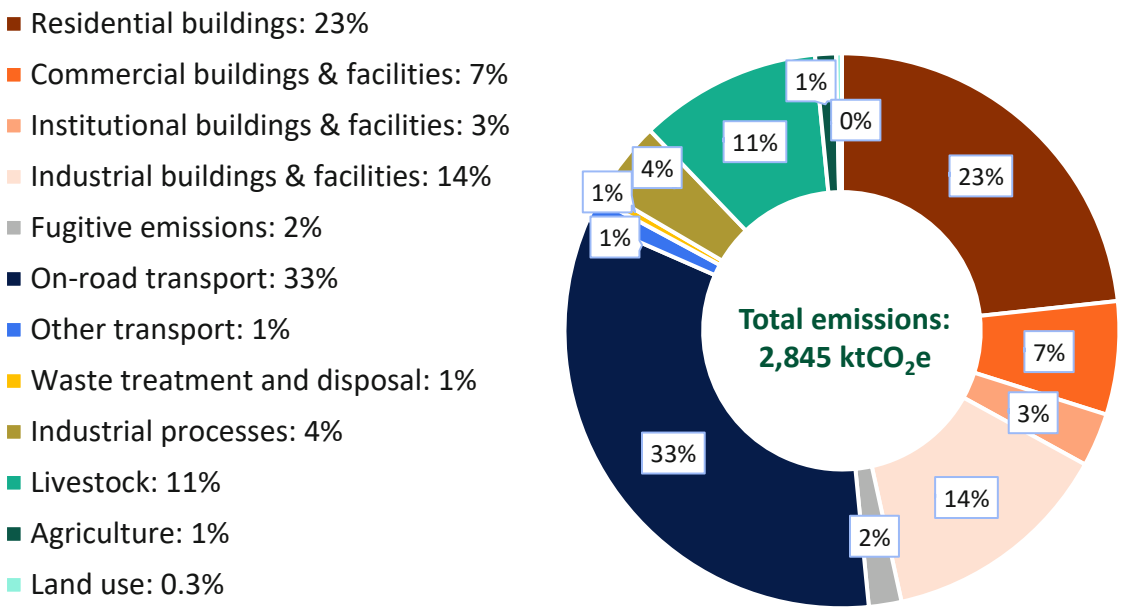


Figure 2.1: SCATTER 2019 inventory for Cheshire East shown by emissions sub-category. Percentages represent the proportion of the total emissions total of 2,845$ktCO_2e$.

2. Current Emissions Footprint
SCATTER Inventory

The following tables show which activities and emissions are grouped under each category.

Buildings: 1,379 $ktCO_2e$

- **Residential buildings (663 $ktCO_2e$):** Domestic households of all tenure types.
- **Institutional buildings & facilities (89 $ktCO_2e$):** Public sector buildings including schools, colleges and educational buildings, health centres, hospitals, leisure centres, Council buildings etc.
- **Industrial buildings & facilities (386 $ktCO_2e$):** Larger industrial facilities, including factories, warehouses and workshops associated with manufacturing and engineering.
- **Commercial buildings & facilities (188 $ktCO_2e$):** Buildings from which commercial businesses operate e.g. shops, shopping centres, offices, restaurants etc.
- **Fugitive emissions (54 $ktCO_2e$):** Fugitive emissions are leaks and releases of gases from a pressurized containment - such as appliances, storage tanks and pipelines.

Agriculture, forestry, livestock and land use: 346 $ktCO_2e$

- **Livestock (302 $ktCO_2e$):** Including emissions from both dairy and non-dairy cattle as well as other farm livestock.
- **Land use (9 $ktCO_2e$):** Includes DEFRA data on emissions for different land use types.
- **Agricultural vehicles (35 $ktCO_2e$):** Off-road transportation emissions in the agricultural sector have been apportioned to the borough based on its area of farmed land.

2. Current Emissions Footprint
SCATTER Inventory

The following tables show which activities and emissions are grouped under each category.

Transport: 979 $ktCO_2e$

- **On-road transport (942 $ktCO_2e$):** Emissions from all forms of on-road passenger vehicle, including cars, vans, motorcycles, buses and taxis.
- **Other transport (37 $ktCO_2e$):** Emissions from diesel-fuelled rail transport. A base assumption of 1% of total on-road emissions for other off-road vehicles. Waterborne navigation for inland water traffic.

Waste treatment and disposal: 16 $ktCO_2e$

- **Solid waste disposal (7 $ktCO_2e$):** Incorporates various waste streams across commercial, industrial and municipal sources.
- **Wastewater (7 $ktCO_2e$):** Scaled directly from national wastewater data by population.
- **Incineration & open-burning (2$ktCO_2e$):** Open combustion of solid waste.

Industrial processes: 125 $ktCO_2e$

- **Industrial processes (125 $ktCO_2e$):** National industrial processing emissions associated with heavy industry, such as iron & steel and chemicals, have been scaled down for the borough.

02b Council's own Scope 3 Emissions

2. Current Emissions Footprint
Council's Own Procurement Emissions

Introduction

This section considers emissions associated with the council's procurement. We have considered emissions from council contracts with a value over £5,000 from available data covering the financial reporting year 2021/22.

Findings summary

- **Emissions from contracts (Figure 2.6):** In FY2021/22, emissions from contracts have been estimated to total 4,317tCO_2e. The most significant contributions to this total are professional services (32%) and rentals (17%).

Here we explore in more detail the emissions created through council expenditure on external contracts, which have been estimated in excess of 223 tCO_2e for financial year 2021/22.

These emissions are the result of fossil fuel consumption stimulated by council expenditure e.g., energy used in the production of goods and supply of services, professional services, renting and leasing, accommodation and building and construction bought by the council.

Estimating emissions from procurement

The methodology used to estimate emissions from procurement is a high-level assessment, based on the broad application of industry sector emissions factors.

Council expenditure is categorised according to its industry sector before being converted into emissions using factors specific to that sector. There was no allowance made for suppliers being above or below average performance in terms of their emissions compared to the industry they are in. This means that the actual footprint from these contracts is likely to differ from this estimate.

Influencing emissions

Understanding the extent of emissions created by the council's procurement is valuable for a number of reasons:

- Assessing procurement emissions allows the council to measure and report its own carbon footprint in a more complete way.
- Analysing procurement spend gives an indication of the overlap between council supplier emissions and the in-borough total.
- This initial screening can serve as the basis for a more detailed engagement with council suppliers to encourage transparency of reporting on their emissions totals.

2. Current Emissions Footprint
Council's Own Procurement Emissions

Council contract procurement - findings

- Over the course of FY2021/22, Cheshire East Council's contracts are estimated to have resulted in 4,317tCO_2e. These results are shown opposite in Figure 2.2.
- The largest contributors to this total come from contractors working in professional services, which make up c. 32% of this total. Other significant contributions are from rental contracts (17%) and accommodation (16%). Buildings and construction are estimated to contribute approximately 10% of this total.
- Most contractors contribute a very small portion of the overall total; around 25% of the emissions are made up of sectors which contribute less than 250tCO_2e each.
- Lease contracts and professional service contractors contribute just under half of all emissions but make up around 60% of total spend.

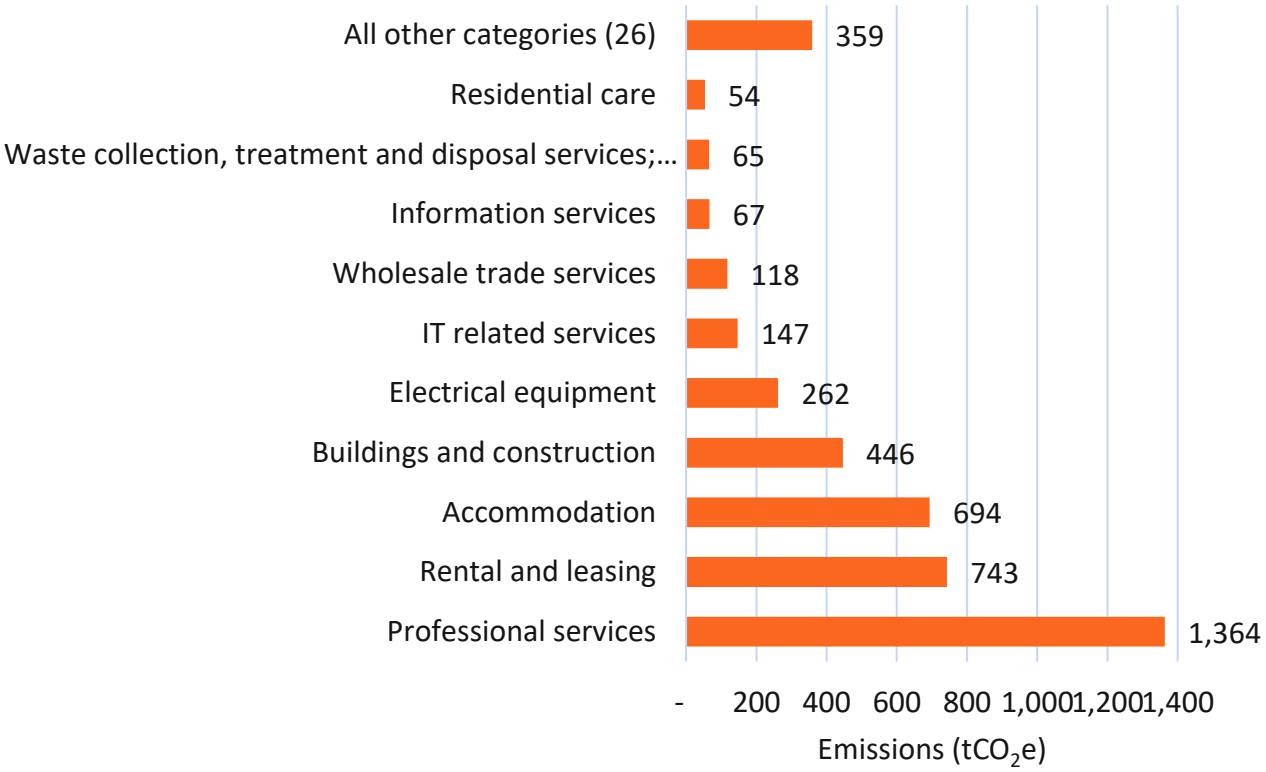


Figure 2.2: Carbon emissions per category for Cheshire East Council's procurement emissions.

2. Current Emissions Footprint
Council's Own Procurement Emissions

Per-contract emissions

The dominant contributor to the council's contractor emissions are professional services contracts, across over 100 recorded entries in the reporting period. Considering which contractors contribute the most significant number of emissions *per contract* gives a very different picture, as shown opposite in Figure 2.3.

The emissions-per-contract statistics indicate rental & leasing, waste collection and electrical equipment procurement as significant contributors to the council's overall total.

This bears relevance to the decarbonisation of the council's supply chain:

- The council should target specific contracts/contractors that are highly carbon intensive, such as those which rank highly in Figure 2.3.
- This approach may differ from the engagement with suppliers in the professional services sector which mitigate the emissions in Figure 2.2.

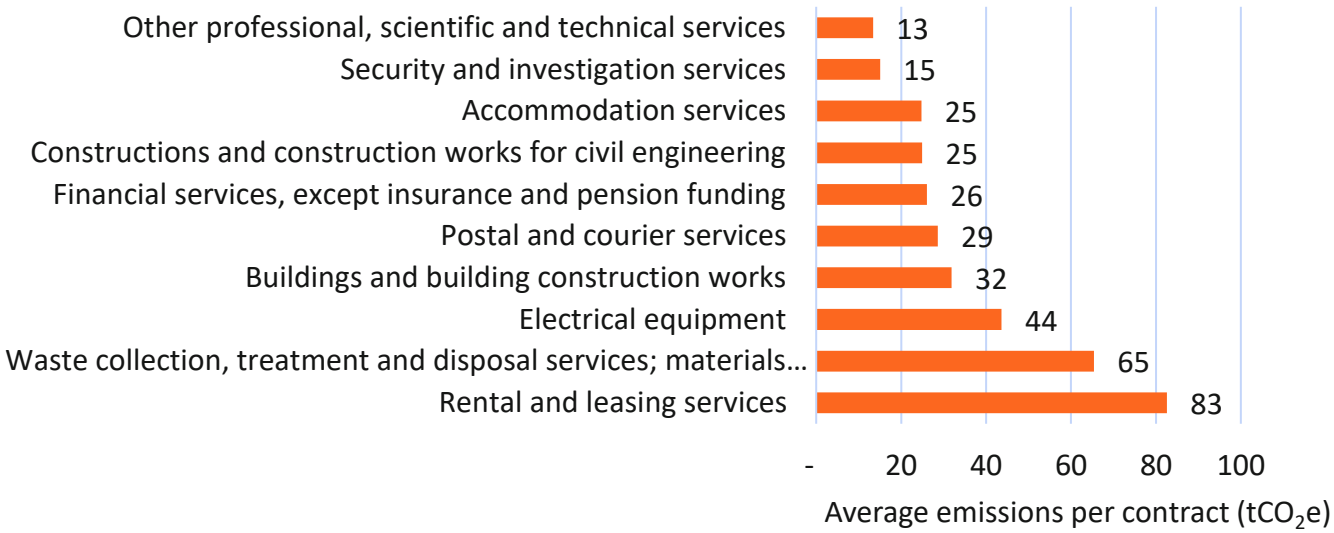


Figure 2.3: Carbon emissions per contract for Cheshire East Council's procurement emissions.

03 Emissions Reduction Pathways

3. Emissions Reduction Pathways

Introduction

Understanding what is required to achieve emissions reductions is an important step to designing low-carbon policies and projects for implementation. This chapter discusses a range of forward-looking emissions pathways based on the SCATTER Pathways tool.

SCATTER Pathways

As well as the inventory presented in Chapter 2, SCATTER also includes a Pathways model designed to help local authorities inform priorities for emissions reduction. It is intended to focus on '*what is required*' rather than '*how to get there*'.

The pathways are based on a combination of 30+ carbon reduction measures which can be implemented to various extents. These modelled pathways are intended to act as 'lines in the sand' for Cheshire East and demonstrate the scale and nature of change required to deliver significant emissions reductions. These pathways serve as an indication of whether the adoption of certain interventions can drive the transition to a low carbon economy and help to guide target-setting and key performance indicators.

SCATTER pathways run up to 2050 with interim milestones given for 2030, 2040 and 2045. These guide progress towards the borough's 2045 carbon neutral target.

It is important to note that SCATTER does not intend to prescribe certain technologies or policies, nor does it intend to discount other means of arriving at similar outcomes just because they do not feature in the model.

The feasibility of implementation is also not considered as this is dependent on action from national government and all actors. Is it intended to serve as an evidence base to help Cheshire East understand their current influence and offer challenge as to whether this influence can be applied in new, innovative and more ambitious ways.

Tyndall Centre carbon budget

The Tyndall Centre for Climate Change Research, based at the University of Manchester, have translated the Paris Agreement targets of limiting temperature change below 2°C into a fixed emissions 'carbon budget' for each UK local authority. A science-based pathway was included in the *Carbon Neutrality Action Plan 2020-25* and an updated version of this pathway has been included in this study.

For more details on the Tyndall Centre's work in this area, please visit their website for the full report.

Considerations in SCATTER

Considered in SCATTER

- Current technologies used for emissions reduction
- Measures across emissions sectors listed in the Inventory
- Scale and speed of change needed

Not considered in SCATTER

- New and emerging technologies
- Feasibility or policy limitations of implementation
- Availability of skills or funding

3. Emissions Reduction Pathways
SCATTER Pathways

The graph below shows two possible future emissions pathways for Cheshire East as modelled by SCATTER (for Scope 1 & 2 emissions) compared against the Tyndall Centre's recommended 13.6% annual reduction pathway.

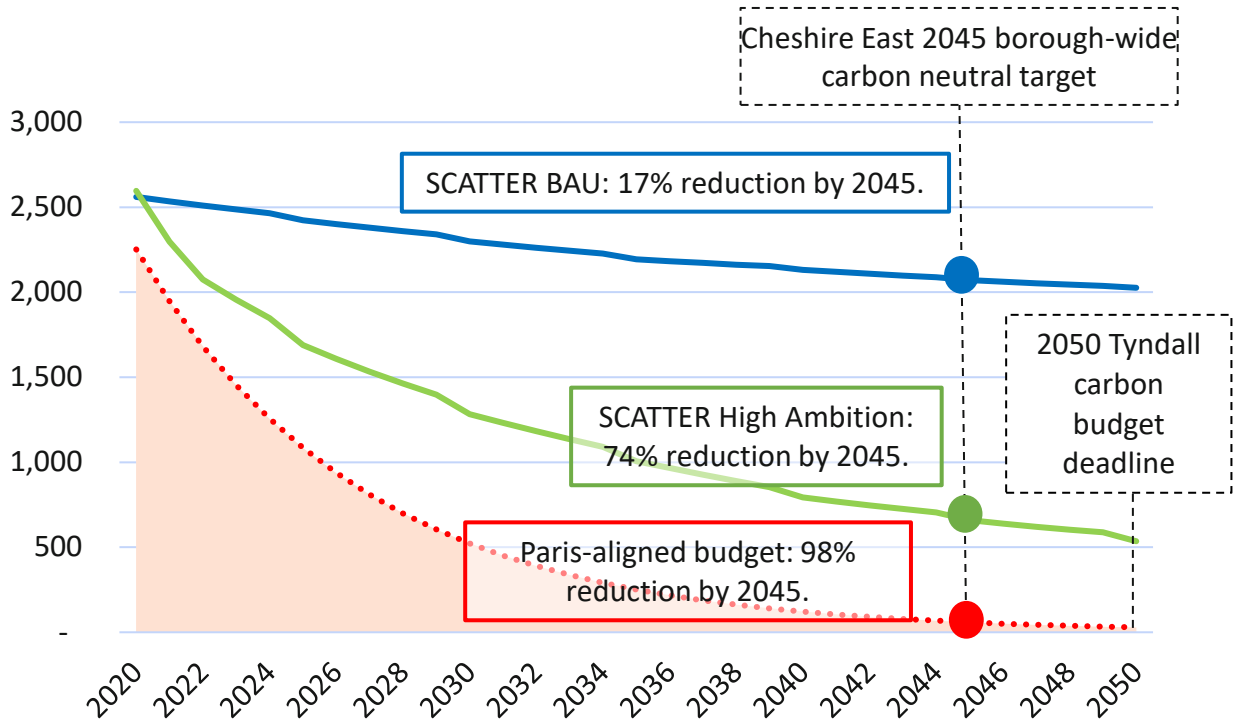


Figure 3.1: Future emissions pathway for Cheshire East (2020–2050).

Key

SCATTER BAU Pathway: Assumes Cheshire East continues along current "business-as-usual" (BAU) trajectory in terms of nationally-led policy and behavior change. Reductions are largely the result of continued grid decarbonisation.

SCATTER High Ambition Pathway: Assumes Cheshire East goes significantly beyond national policy and National Grid assumptions. It is the result of all interventions modelled by SCATTER at maximum ambition levels.

Paris-aligned Reduction Rate: Based on the Tyndall Centre's recommended annual reduction rate of 13.6%. This is not based on tangible policy or implementation, but informs the action required to meet Paris Agreement targets.

Paris-aligned Carbon Budget: A representative area equal to the cumulative emissions budget for Cheshire East, based on research by the Tyndall Centre for Climate Change Research.

For more details on the Tyndall Centre's work, please see Appendix 3.

3. Emissions Reduction Pathways
High Ambition Pathway

Along the High Ambition Pathway, **604ktCO_2e** remain in the energy system in 2045. This is despite applying the most ambitious interventions in the SCATTER tool for Cheshire East.

The High Ambition Pathway demands ambitious and urgent reduction interventions. The scale of the actions necessary to reduce emissions by 2045 requires immediate radical changes across the entire borough. Chapter 4 of this report outlines interventions to reduce carbon emissions across each sector.

Carbon reduction measures can be thought of as falling into two groups; interventions focused on reducing the overall demand for energy, and interventions that focus on switching to low-carbon fuel sources (primarily electricity supported by renewable supply).

Given this bias towards the electrification of heating, transport and industrial processes, future demand for electricity is likely to increase. SCATTER's pathways follow assumptions published by the National Grid's Future Energy Scenarios and models the level of renewables required locally to meet the borough's demand.

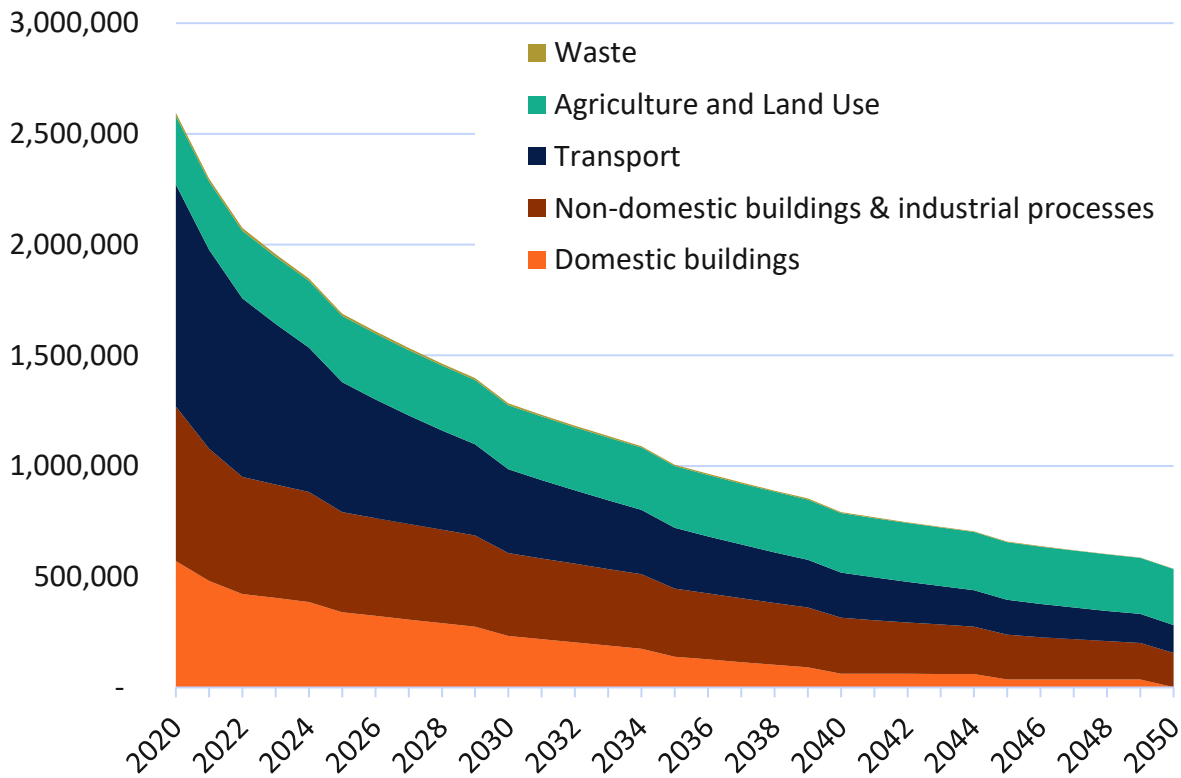


Figure 3.2: SCATTER High Ambition pathway for Cheshire East, broken down by sector. A more detailed breakdown of these emissions over time can be found in Figure 3.3.

3. Emissions Reduction Pathways
High Ambition Pathway

Adoption of the SCATTER High Ambition Pathway interventions delivers emissions reductions of 74% by 2045.

By 2045, the emissions profile for Cheshire East will look very different from today. Emissions from agriculture are estimated to become the most dominant sector in the 2045 profile, whilst energy efficiencies in buildings will have heavily decreased domestic and non-domestic building emissions. Electrification of vehicles will have also reduced transport emissions significantly.

Emissions from livestock are projected to fall 12% and the amount of emissions sequestered through increased forest coverage and other natural means is expected to increase significantly.

Despite significant concerted action, 604 $ktCO_2e$ of residual emissions remain in 2045. Though emissions from industry, buildings and transport have been heavily reduced, the scale of improvements will not be enough to achieve net zero by this date.

Further ambition and a variety of additional technologies and nature-based solutions will need to be considered to close this gap.

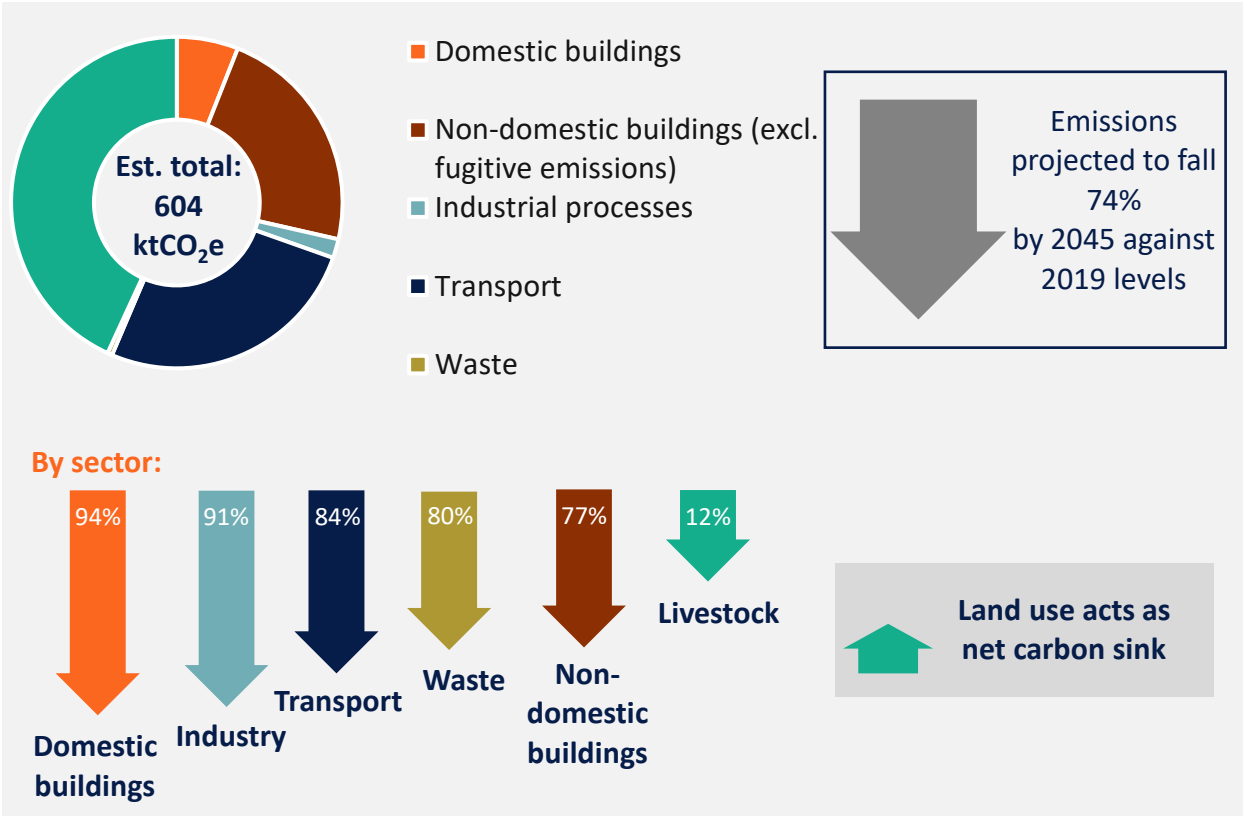


Figure 3.3: Estimated 2045 emissions profile (top). Emissions reductions across key sectors under the High Ambition Pathway (bottom).

3. Emissions Reduction Pathways
The Gap to Target

How can we go beyond the High Ambition Pathway?

Even with the successful implementation of extensive carbon reduction measures, it is likely that some hard-to-remove emissions will be "left over" in 2045. Defining the scale and nature of this gap to target is an important process to meeting reduction targets and goals.

By 2045, this gap is projected to be as high as **600 $ktCO_2e$** within Cheshire East, mostly made up of emissions from non-domestic buildings.

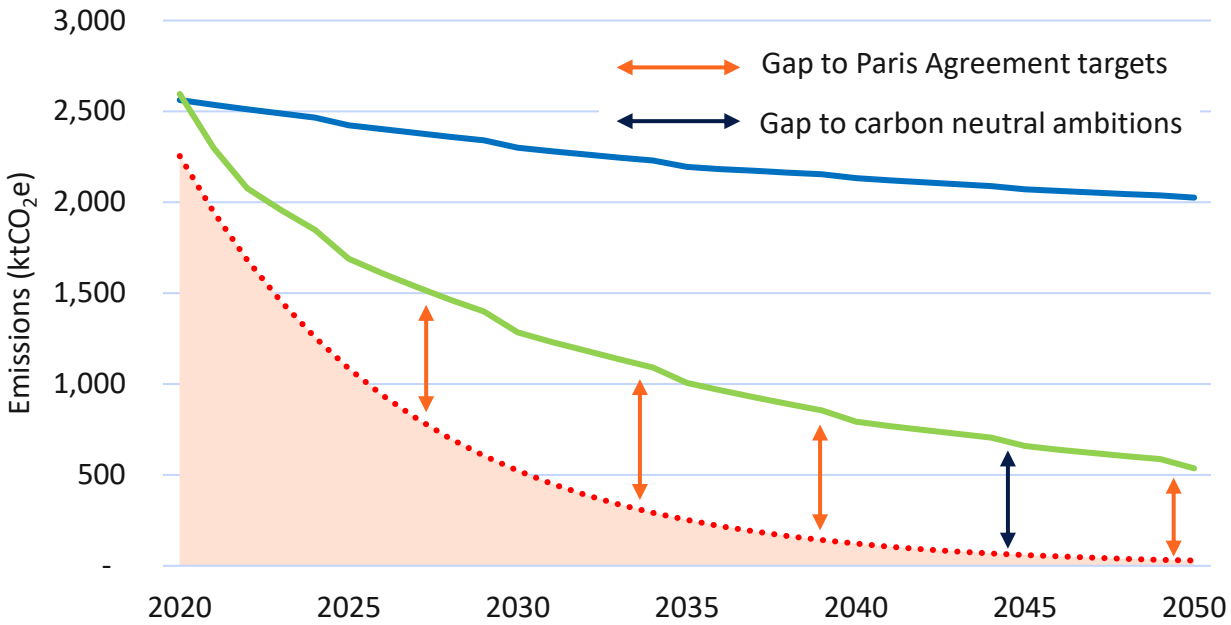


Figure 3.4: SCATTER pathways, with indicators given for the gap to target.

Closing the gap to target

The actions outlined in this report are largely rooted in SCATTER's "High Ambition" pathway, and the outlined actions should be prioritised for reasons of reliability, cost, and impact. The actions also provide scope for Cheshire East to "close the gap" to its target beyond the pathway's suggested actions. Three ways this could be achieved are outlined below and should be considered in relation to the recommendations in the plan:

- **Accelerated and increased deployment:** The borough may consider action 'above and beyond' the measures outlined in this report. For example, rather than a deep retrofit of 80% of homes as per SCATTER, stakeholders may aim for a deep retrofit of 90% of homes. It may also be the case that actions given in the plan can be delivered at an earlier date in order to accelerate emissions reductions.

3. Emissions Reduction Pathways
The Gap to Target

- **Technological innovation and marginal improvements:** Improvements to technology, such as solar PV, has moved forward at an unpredictably rapid rate in the past twenty years. Technological efficiency improvements in different areas may dramatically improve the feasibility for emissions reduction in different sectors. The development of a nascent hydrogen sector in the UK also presents opportunities, as highlighted in the recently published Hydrogen Strategy. The modelling of hydrogen is currently discounted from SCATTER pathways due to its limited maturity when the tool was developed.
- **Offsetting & Insetting:** This approach would emphasise nature-based solutions such as tree planting and the restoration of other ecosystems. Other nascent technologies such as carbon capture and storage (CCS) and negative emissions technologies (NETs) may also be considered. Cheshire East is also very heavily involved in the development of Authority-Based Insetting, which may also be a helpful mechanism in this space.

04 Menu of Options

4. Menu of Options
Introduction

This chapter explores the options available to the council which can deliver the emissions reductions set out in the SCATTER High Ambition pathway. There are a total of six sub-chapters aligned to the main emissions sectors within the borough emissions profile, set out in the following format:

- Introduction: a description of the scope, relevant policies and current contexts of activities covered. Sub-chapters are split up into domestic buildings, non-domestic buildings, transport, agriculture & land use, waste & industry and energy.
- SCATTER interventions: a description of the scale and nature of activity dictated by the SCATTER High Ambition pathway at milestone years. Three milestone years have been shown; a medium term 2030, the carbon neutral target year of 2045, and the pathways endpoint 2050 in line with national targets.
- Indicative costs and carbon savings: an assessment of the relative opportunity in terms of emissions reduction impact as well as high-level financial implications for each intervention.
- Actions library: A non-exhaustive list of actions and goals that can deliver progress against SCATTER interventions. These are illustrated in practical terms by the case studies. A comprehensive review of existing action has not been carried out as part of this study and it may be the case that some actions are already being implemented to some extent. These examples are suggested activities based on previous experience in other authorities, though stakeholders may wish to take different courses of action.
- Case studies: a catalogue of comparable projects either implemented or underway that deliver progress towards SCATTER interventions. These are discussed in more detail opposite.

SCATTER interventions

The SCATTER Pathways tool models future emissions pathways based upon defined activity levels within Cheshire East. The more ambitious the level of defined activity in each area, the closer the emissions trajectory tracks towards zero.

When taken together, these interventions define future emissions projections (i.e., the green line on Page 21). Within this chapter, the activities described are those which correspond to the SCATTER High Ambition Pathway. We give targets indicating ***what is needed*** to achieve carbon reductions across a number of interventions or action groupings, by 2050, for each sector. This is followed by detail around ***how to achieve*** the targets outlined in case studies. The pathways and intervention data provided includes Scope 1 & 2 emissions as set out by the SCATTER Inventory. Suggested action planning measures are intended to address all emissions sources.

4. Menu of Options
Introduction

Case studies

Case studies have been included on the basis of their linkage to SCATTER carbon reduction measures and the varying role of the council in delivery of each. They are intended to illustrate the scope and scale of action that the council can undertake to design its action plan.

For each case study given across the various sub-chapters, we have sought to define the following common points of detail to allow comparability and the scope for further assessment and detail:

- **Aims & objectives:** the main ambition of the case study alongside its strengths and shortcomings.
- **Impacts:** the implications of the case study in terms of carbon savings, costs and co-benefits. Equality implications have also been explored for these actions where applicable.
- **Responsibilities:** the role of the council, other partners and stakeholders, including the sources of funding for the case study.
- **Officer insights:** where available, feedback and commentary from council officers has been included following an engagement workshop with relevant colleagues as part of this study.

4.1 Domestic Buildings

4.1 Domestic Buildings

Introduction

Scope of section

This sub-chapter is focused on emissions from domestic buildings. This covers all households in Cheshire East, with emissions grouped into two categories; emissions from heating and hot water and emissions from lighting, appliances and cooking. Emissions from domestic buildings make up around one fifth of the borough-wide total. Within that, there is approximately an 80:20 split between emissions from heating and emissions from appliances.

Current context

- **EPC data shows most homes are C or D-rated:** Cheshire East has over 175,000 households. Of the 116,000+ EPCs awarded to domestic properties in Cheshire East since the start of 2012, almost two thirds (64%) were at C or D rating. Less than one in five EPCs were AB ratings.
- **Gas central heating is currently the dominant heating system, whilst a small proportion of properties are off-gas:** According to government estimates, 9% of homes in Cheshire East are not connected to the gas grid. These households are likely to use electric storage heating or oil fuel heating.
- **Fuel poverty affects just over 1 in 10 households in Cheshire East:** The UK government definition for what constitutes a fuel-poor home has been changed, but still indicates that around 11% of households are classified as low income, low energy efficiency. This data is also taken from the period before the large increases in domestic energy prices, which will increase this figure.
- **The mean level of electricity consumption per household has fallen just under 9% since 2010:** Trends in subnational electricity consumption statistics show that the typical household consumed 8.6% less power in 2022 compared to the first year of available data.

At a glance: SCATTER interventions for this sector

Reducing the demand for energy

- Retrofitting building fabric for existing homes
- Encouraging very high energy efficiency standards on new builds
- Using energy efficient lighting and appliances

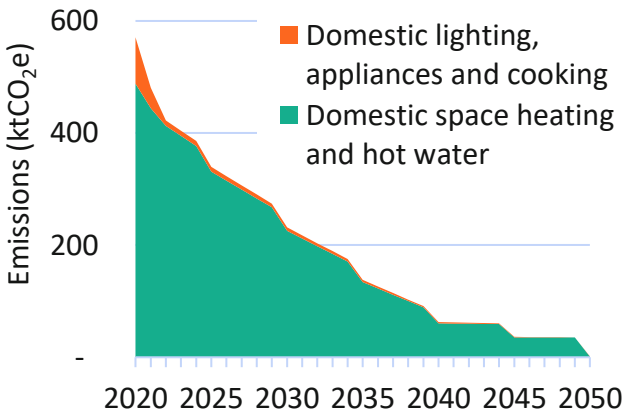
Encouraging low-carbon fuels

- Installing electric heating systems
- Installing electric cooking systems
- Community-based solutions for heating where electric systems are not feasible

Encouraging uptake of renewables

- Domestic installation of small-scale PV (see section 4.6)

Figure 4.1.1: Cheshire East's domestic buildings emissions along the SCATTER High Ambition Pathway, 2020-50.



36 $ktCO_2e$ of buildings emissions remaining at 2045 with a 94% reduction in emissions.

4.1 Domestic Buildings
SCATTER Interventions

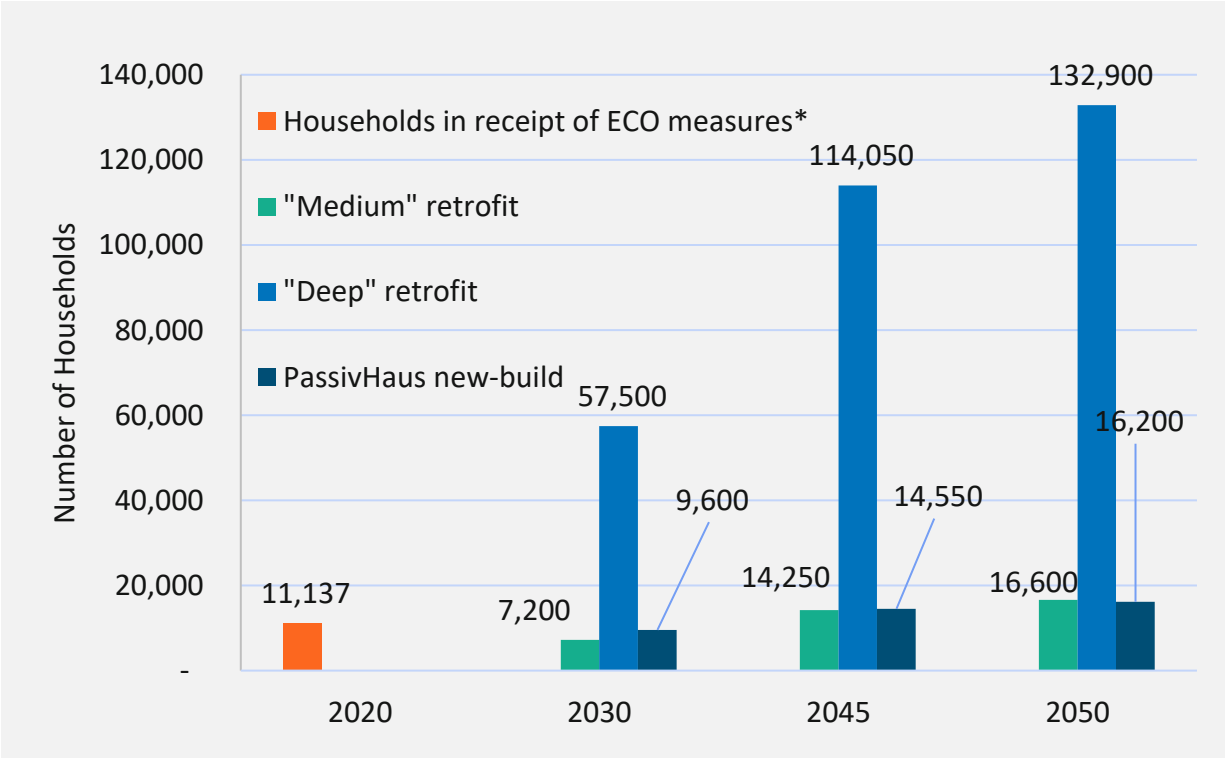
Improving energy efficiency of households

SCATTER's High Ambition pathway projects the impact of a substantial retrofit programme on existing homes within the borough which reduce their energy demand. This is also tied to very high energy efficiency standards for new-build properties:

- Medium retrofit: a 66% reduction in annual average energy demand (modelled as installation of inner-wall insulation).
- Deep retrofit: 83% reduction in annual average energy demand (modelled as installation of inner & outer wall insulation).
- New build standards: New builds are assumed to reach Passivhaus standard, which avoids costly retrofit in the future.

Whilst modelled as inner- and outer-wall insulation, the key metric is the achieved reduction in average demand; a combination of retrofit measures may be applied in practice to achieve this.

Figure 4.1.2: Retrofit rates along the High Ambition pathway. *ECO measures are included for comparison, though average improvements to energy demand fall well short of medium retrofit in practice.



4.1 Domestic Buildings
SCATTER Interventions

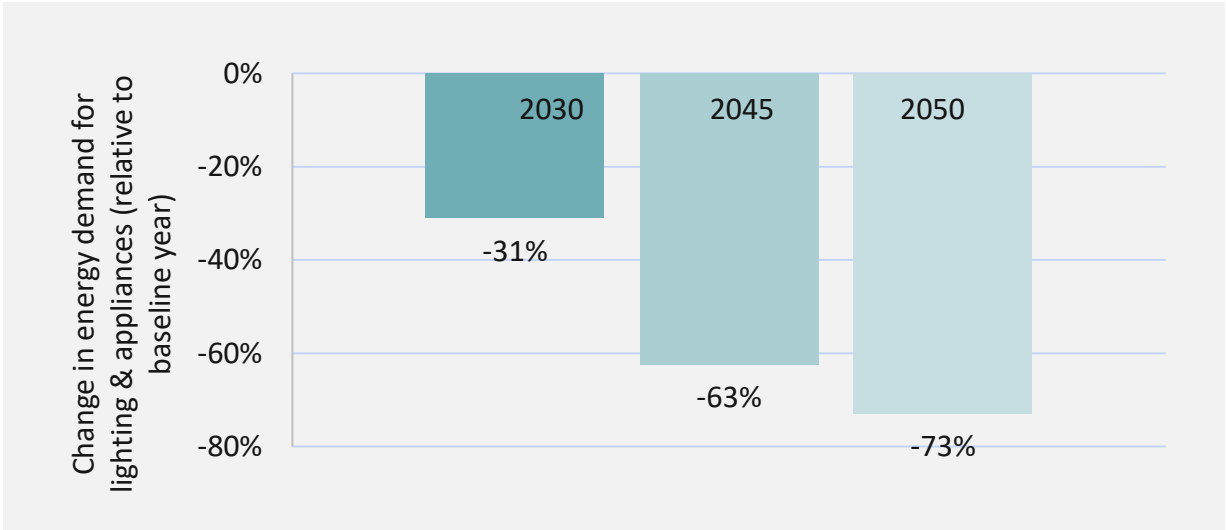
Cheshire East Council

Low-carbon, energy efficient cooking, lighting and appliances

This intervention considers the reduction in energy demand due to the installation of more efficient electrical devices. It also considers all types of cookers and catering equipment, regardless of their source fuel.

Energy demand reductions are applied to whatever fuel the building is using, such as mains electricity or gas-fired CHP.

Figure 4.1.3: Modelled energy demand reduction for changes for appliances, lighting and cooking defined against a 2019 baseline.



Current Context 2020	By 2045
• C. 11,000 households in Cheshire East have received at least one ECO measure since 2013 • The proportion of ABC-rated EPCs awarded has grown significantly since 2008; between 2008-13 only a third of EPCs were ABC-rated, in the most recent five year span this had risen to over 50% • Overall consumption of energy for lighting in the UK fell 25% between 2010 and 2019	• 14,250 households "medium" retrofit, 114,050 households "deep" retrofit • All of the 9,975 new houses projected in SCATTER to be built to Passivhaus standards • 63% reduction in domestic energy demand for appliances, lighting and cooking • 38% reduction in overall domestic heat demand

4.1 Domestic Buildings
SCATTER Interventions

Moving away from fossil fuel heating

This interventions models the transition from fossil fuel-source heating technologies to low-carbon alternatives. The technology mix under the High Ambition Pathway includes heat pumps for domestic buildings. Heat pumps are modelled in SCATTER to deliver the greatest emissions reduction for domestic buildings.

Transitioning to alternative heating technologies such as community-scale CHP and district heating networks can also deliver a significant amount of emissions reduction. Community scale combined heat and power (CHP) systems are a low-carbon alternative to individual gas/grid systems since they more efficiently convert fuel into electricity and heat. CHP systems can also be fed by renewable technologies, meaning that they also offer a long-term zero-carbon option for heating systems.

Heat pumps and CHP are also much more fuel-efficient than a traditional gas-fuelled boiler, meaning that a transition towards alternative heating systems will also contribute heavily to the overall reduction in energy demand in this sector.

The impact of this measure on emissions is heavily influenced by the availability of green electricity supplied by renewable energy sources. The transition toward electrified heating brings an added demand for electricity, which will have associated carbon emissions until the national grid is fully "greened". The more rapidly the grid greens and/or until local renewables are deployed to meet local demand, the greater the impact on emissions reduction.

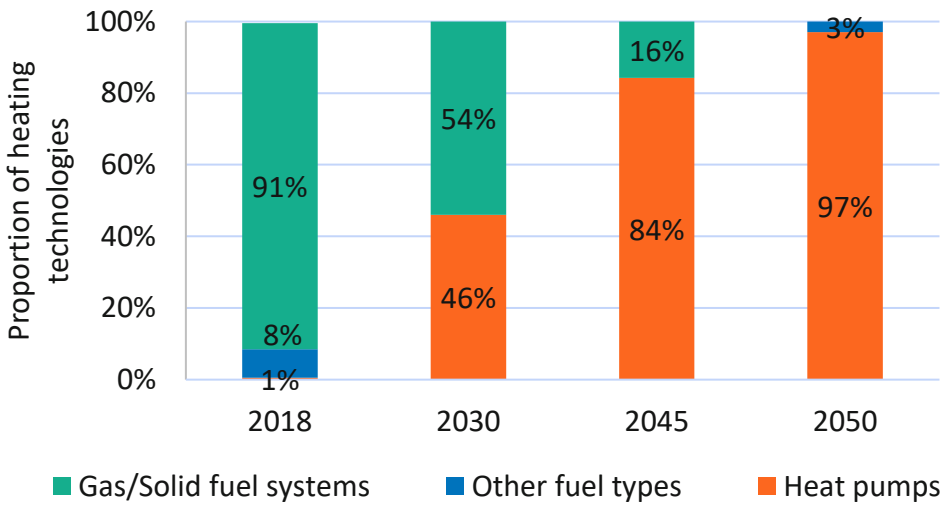


Figure 4.1.4: Modelled changes in the technology mix used for heating domestic buildings.

4.1 Domestic Buildings
SCATTER Interventions

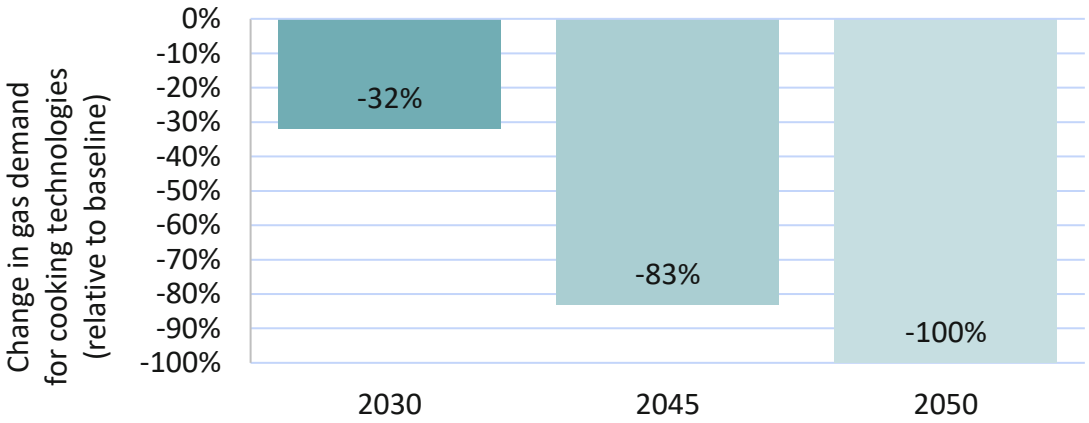


Figure 4.1.5: Modelled changes in gas usage for cooking systems. Baseline is taken as 2019 levels of consumption.

Current Context 2020	By 2045
• Government data suggests over 90% of properties in Cheshire East are connected to the gas grid • Between 2010 and 2020, domestic gas consumption across the borough fell by 2% overall, and 12% per household • Nationally in 2016, it was estimated that around 45-50% of domestic cooking was electrified	• 97% of domestic heating systems are heat pumps or equivalent electrified systems • Remainder of domestic heat demand is met by district heat sources • 83% decrease in gas usage for domestic cooking, displaced by electric systems

4.1 Domestic Buildings
Carbon Savings and Indicative Costs

Estimates for the carbon savings and high-level financial implications for different interventions are given overleaf in Figure 4.1.6.

Whilst there is no single means of identifying a priority order of low-carbon projects and initiatives, it is important to recognise where the most significant impacts can be made in terms of carbon savings and financial implications.

Our estimates use SCATTER data and research supported by the Committee on Climate Change in the UK's Sixth Carbon Budget to understand which interventions are likely to have the largest material impact on Cheshire East's emissions.

Different types of cost

- **Capital expenditure (capex)** represents funds used to acquire, replace or upgrade a fixed asset e.g., the showroom price of an electric vehicle
- **Operational expenditure (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
- **Marginal cost** 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

Notes for the domestic sector

- Avoiding the use of gas for heating is estimated to have the highest impact in terms of emissions savings.
- This can be met in two ways, either improvements to building fabric which improve energy performance, or the replacement of the heating system with a renewable fuel equivalent.
- The most significant capital costs are associated with retrofitting existing households.
- Energy efficiency measures offer paybacks of <10 years in most cases, though these impacts have not been quantified in this analysis.
- Constructing new builds to very high energy efficiency standards and with renewable heating systems already installed is significantly cheaper than retrofitting at a later date.

4.1 Domestic Buildings
Carbon Savings and Indicative Costs

SCATTER Intervention	Cumulative Emissions Savings (2020 - 2045)
• Improving energy efficiency of households • Moving away from fossil fuel heating	**8,154 $ktCO_2e$**
• Low-carbon, energy efficient cooking, lighting and appliances	**114 $ktCO_2e$**

Costed measure	Type of cost	Cost to 2045 (£m)
Retrofit of existing households	Capex	1,160
Replacing domestic heating systems with heat pumps	Marginal capex	235
Constructing new build to Passivhaus standards	Marginal capex	64
Switching to electric cookers in households	Marginal opex	+14*
Improved heating system efficiency	Marginal opex	-589*

Figure 4.1.6 (top): Carbon savings for SCATTER interventions along the High Ambition pathway.
Figure 4.1.7 (bottom): Table of indicative costings for the implementation of energy efficiency measures and heating systems retrofit. Negative values indicate cost savings.

*estimates based on 2019 energy prices, likely to have changed following changes to 2022 wholesale energy prices.

4.1 Domestic Buildings
Officer Insights

As part of this study, a workshop was held with council officers to hear views on potential actions, key barriers and enablers to their implementation and further implementation considerations. A summary of these views is shared below:

SCATTER Intervention	Barriers	Enablers	Implementation Considerations
Improving energy efficiency	*"Contractors skilled in insulation may only be suited to standardised building sizes"* *"Skills barrier to delivering retrofit"*	*"Future buildings are where there is the most opportunity (Part L regs)."*	*"The electrification of heat will have a huge impact on electricity grid. Need for work with DNOs and grid companies."* *"The council works very closely with developers"* *"Linking low-carbon actions to other agendas, such as mitigating fuel poverty, is an important way we can prioritise action"*
Moving away from fossil fuel heating	*"Lots of private landlords that would need to be engaged with"* *"Rural, older properties aren't well insulated and alternative heating sources aren't as cost effective"*	*"Jumping rural communities from oil to heat pumps to avoid the gas step would help a lot"*	*"Have to find a way to engage with landlords as lots of the borough is rented."*

4.1 Domestic Buildings
Officer Insights

As part of this study, a workshop was held with council officers to hear views on potential actions, key barriers and enablers to their implementation and further implementation considerations. A summary of these views is shared below:

SCATTER Intervention	Barriers	Enablers	Implementation Considerations
Low carbon and energy efficient cooking, lighting and appliances	*"Cost of living crisis – can people afford to invest now to save later?"*	*"Raising investment within community networks - how do we tap into third sector to do work locally"*	*"Engage residents and businesses on where to focus and where to start"*
Small-scale renewables	*"Need for trustworthy information e.g., where to buy solar panels"*	*"Group/community purchase of solar panels"*	*"The Council's Green Energy Fund has expired but what other avenues could be used?"*

4.1 Domestic Buildings
Actions Library

The below tables show potential actions that deliver progress towards the SCATTER intervention milestones. In the case that these link forwards to a case study, please click the link given in the final column of the table to read more details on example projects of this type.

Impact area	Example actions	Case studies
	Improving energy efficiency	
Private rental sector	• Raise the minimum energy efficiency standards for private rented properties from the current D rating up to a C (or higher) • Improve enforcement of these standards to capture non-compliance, providing support to tenants and landlords where needed • Create green accreditation schemes for private landlords including access to finance, suppliers, installers and discounted EPC surveys as an incentive to the private rental sector to improve energy efficiency • Set up a mechanism through which tenants can report landlords who fail to meet energy efficiency standards	West Midlands Combined Authority Consortium (page 38)
Owner-occupied sector	• Use household fuel poverty data to identify 'hotspots' of low energy efficiency properties • Provide guidance and advice to households to publicise the availability of government funding for retrofitting and energy efficiency measures, such as ECO3 • Set up means for residents to collaborate and showcase leading examples of decarbonization • Directly allocate funding for the retrofit of low energy efficiency homes in the borough	North-East Derbyshire District Council (page 38)
New-build development	• Mandate all new dwellings achieve energy efficiency standards beyond Part L of the 2013 Building Regulations • Require all new homes built on council land to be built to highest energy efficiency standards (e.g., Passivhaus or minimum kWh/m2)	City Of York Council (page 39)
Registered provider housing	• Prioritise energy efficiency improvements for worst-performing houses in social housing stock • Support providers to develop retrofit programmes using developer-sourced funding	Sutton Housing Partnership (page 40)
Skills and Workforce	• Work with training colleges to ensure skills to deliver medium and deep retrofit are within the local workforce	City of York Council (page 39)

4.1 Domestic Buildings
Actions Library

The below tables show potential actions that deliver progress towards the SCATTER intervention milestones. In the case that these link forwards to a case study, please click the link given in the final column of the table to read more details on example projects of this type.

Impact area	Example actions	Case studies
Moving away from fossil fuel heating		
Owner-occupied sector Private rental sector	• Provide guidance and advice to households to publicise the availability of government funding for heating system retrofits • Provide guidance and advice to households on heritage building retrofit • Identify existing residential developments that meet criteria for heat networks	
New-build development	• Assess all new developments for connection to a heat network and/or installation of heat pumps in favour of gas boilers • Communicate with developers to ensure the technical knowledge and resources to install non-gas heating systems in new developments	Manchester City Council (page 39)
Registered provider housing	• Assess feasibility for heat pumps in all RP housing developments • Support providers to develop retrofit programmes using developer-sourced funding	Sutton Housing Partnership (page 40)
Low carbon and energy efficient cooking, lighting and appliances		
Private and register provider housing	• Provide education, guidance and support to residents on low carbon energy efficiency appliance and lighting improvements	Southampton City Council (page 40)

4.1 Domestic Buildings
Case Studies

IMPROVING ENERGY EFFICIENCY
WEST MIDLANDS COMBINED AUTHORITY CONSORTIUM

Project summary

The West Midlands Combined Authority consortium, led by the combined authority, has been awarded funding to retrofit social housing, with the aim to retrofit 622 of the worst energy-performing properties across the region by March 2023.

Stakeholders

WMCA consortium partners include Sandwell Metropolitan Borough Council, Solihull Community Housing, City of Wolverhampton Council, Community Housing Group, Midland Heart, Orbit Housing and Wrekin Housing Group.

Funding

Led by the Energy Capital team at the WMCA, seven partners made a successful bid for a share of the Government's Social Housing Decarbonisation Fund and were awarded £7.5m. The total cost of the retrofitting project is £14.7m, therefore the remaining balance of £7.2m is funded from housing association and local authority budgets.

IMPROVING ENERGY EFFICIENCY
NORTH-EAST DERBYSHIRE DISTRICT COUNCIL

Project summary

North-East Derbyshire District Council is working with a council-owned social housing provider, Rykneld Homes Ltd. and Sustainable Buildings Services, to install external wall insulation at 324 council-owned homes.

Co-benefits

The council expects residents to save an average of £286 per household through lower energy bills.

Funding

The project was funded by the Government's Green Homes Grant Local Authority Delivery Scheme as well as the council's own resources. In phase 1a of the council project, the authority spent £2.5 million of its own money, supplemented by £0.6m of LADS 1a funding, to carry out work on 115 homes. For phase 1b, the council is using £1.04m of LADS 1b funding, supplemented by £7.2m of council investment, to work on 209 homes.

4.1 Domestic Buildings
Case Studies

IMPROVING ENERGY EFFICIENCY (NEW BUILD)
CITY OF YORK COUNCIL

Project summary

City of York Council has a Zero Carbon Homes Programme, where all properties are constructed to Passivhaus certification. The council worked with specialist consultants, with embodied carbon considered during the design process.

Council role

The council ran extensive procurement for a 5+ year multi disciplinary design team.

Carbon savings

120ktCO_2e of carbon are estimated to be saved from the programme. Total energy bills will be approximately more than 50% lower than a new build property and 40% of homes at each site will be affordable. Affordable housing and low energy bills will help tackle fuel poverty and increase disposable income.

Funding

City of York Council secured grant funding for local training on the installation and maintenance of heat pumps.

MOVING AWAY FROM FOSSIL FUEL HEATING
MANCHESTER CITY COUNCIL

Project summary

Manchester City Council partnered with Keepmoat Homes to build houses with electrified heating. The homes were fitted with solar PV and battery storage and an AI heating system, including partitions and a consideration of weather and occupant behaviour to determine how much electricity to draw from the grid.

Co-benefits

The intelligent heating system saves occupants money from more efficient energy use and free energy from solar PV. There is reduced human responsibility due to the self learning system. Additionally, the system is designed to be low maintenance and long-lasting.

Funding

The council used government funding from the Homes & Communities Agency.

4.1 Domestic Buildings
Case Studies

IMPROVING ENERGY EFFICIENCY
SUTTON HOUSING PARTNERSHIP

Project summary

The Sutton Housing Partnership will launch a pilot project with Engie to trial an airtight wrap, a super-insulated facade and roof to transform eight properties across London into low maintenance, net-zero carbon homes. The project will also offer advice and guidance for local authorities, housing associations and registered providers to decarbonise homes to Energiesprong standards.

Co-benefits

The pilot hopes to create homes that are low maintenance and reduce bills for tenants through increased energy efficiency.

Funding

The project secured funding from the Mayor of London's Energy Leap Pilot scheme.

LOW-CARBON, ENERGY EFFICIENT COOKING, LIGHTING AND APPLIANCES
SOUTHAMPTON CITY COUNCIL

Project summary

Southampton Council runs energy provider CitizEn Energy, which has provided free low energy LED lightbulbs for council homes. The council has plans to install lightbulbs in 100 homes overall.

Co-benefits

The bulbs installed have a running cost of approximately 10% of an old-style light bulb.

Funding

Southampton Council owns and runs CitizEn Energy and has invested in the company, which provides green energy tariffs alongside impartial advice on securing affordable energy for households.

4.1 Domestic Buildings
Case Studies – Equality Implications

It is crucial that Cheshire East considers strategic objectives that extend beyond carbon reductions when action planning. These include reducing inequality, improving public health and encouraging economic security. Below we have assessed the implications of low-carbon actions in the context of different co-benefits and equality considerations. Definitions of the different categories of co-benefit and equality implication can be found in Appendix 7.

Intervention	Potential positive co-benefits	Equality implications
Improving energy efficiency of existing buildings	○ Public health: More comfortable, livable buildings. Reduction in excess winter mortality. ○ Council services: Reduction in resident energy bills, reduction in reliance on council services. Reduction in fuel poverty and associated inequalities. Households more resistant to extreme weathers and events. ○ Local environment: Improvements to air quality as a result of more efficient energy consumption.	○ Low-income residents: Large proportion of residents will not have access to upfront capital required to carry out retrofits. Costs of retrofit may also be passed directly onto the tenant, particularly in the rented sector. ○ Remote communities: More likely to require substantial intrusive programmes of work and live in hard-to-treat housing.
Improving energy efficiency of new buildings	○ Public health: More comfortable, livable buildings. ○ Council services: Reduction in resident energy bills, reduction in reliance on council services. Reduced pressure on public infrastructure for new developments. ○ Economic security: Creation of new jobs and opportunities for skills and training in the low carbon construction sector. Increased investment into low carbon construction businesses.	○ Businesses: Achieving very ambitious standards is likely to apply heavy pressure to local trade and housing providers in terms of time and cost. ○ Low-income residents: Poor visibility of climate risks can lead to new developments being poorly equipped for a changing climate. ○ Council services: Poor integration between infrastructure planning and service provision can lead to low availability of public services.

4.1 Domestic Buildings
Case Studies – Equality Implications

It is crucial that Cheshire East considers strategic objectives that extend beyond carbon reductions when action planning. These include reducing inequality, improving public health and encouraging economic security. Below we have assessed the implications of low-carbon actions in the context of different co-benefits and equality considerations.

Intervention	Potential positive co-benefits	Equality implications
Moving away from fossil fuel heating, improving energy efficiency of lighting and appliances	○ Public health: Reduction in indoor pollution. Reduction in energy bills (in some cases). ○ Economic security: Creation of new jobs and opportunities for skills and training in the low carbon construction sector. Increased investment into low carbon construction businesses.	○ Remote communities: Less likely to be connected to mains supplies for gas and electricity, making it harder to access these residents. ○ Businesses: Existing tradespeople may need retraining to have capacity to install electrified heating. ○ Low-income residents: The upfront capital for installation is a barrier to accessing lower operational costs.

RetrofitWorks – YourHomeBetter, GMCA

RetrofitWorks is a cooperative set up to accelerate uptake within the able-to-pay market for domestic retrofit. Its principle is to connect households with the resources and contractors who can implement energy efficiency measures.

Their partnership with YourHomeBetter in Greater Manchester focuses specifically on lower-income owner-occupied households.

Specific case studies on the delivery of this retrofit can be found on the YourHomeBetter website.

A description of the categories discussed in these tables can be found in Appendix 7.

4.2 Non-Domestic Buildings

4.2 Non-Domestic Buildings
Introduction

Scope of Section

This sub-chapter is focused on emissions from non-domestic buildings. This covers all commercial, institutional and industrial properties and sites in Cheshire East.

As with domestic buildings, emissions fall into two broad categories; emissions from heating and hot water and emissions from lighting, appliances and cooking. Emissions from non-domestic buildings make up around 27% of the borough-wide total. Within that, there is approximately a 60:40 split between emissions from heating and emissions from appliances.

Current context

- **Display Energy Certificate data indicates two in three commercial sites are CD rated:** Since 2012, 66% of awarded DECs fall under C or D rating; just over 8% were A or B rating.
- **Mean electricity consumption across non-domestic meters fell by almost a quarter between 2010 and 2020:** Outright consumption fell by just under 20% over that period; after factoring in the growth of new sites, the per-meter consumption fell by over 23%.
- **There is less reliance on natural gas for heating in non-domestic buildings:** According to the UK Building Energy Efficiency Survey, only 63% of non-domestic floor area is heated by natural gas. In some sectors, such as retail, this falls as low as 39%. Considering the split of electrical and non-electrical fuels used in heating, the proportion of electrical energy used for heating, cooking and hot water is around 18%, with around 75% of heating met by gas supply. Of the non-gas fuels used for heating, electricity is the dominant alternative fuel.

4.2 Non-Domestic Buildings
Introduction

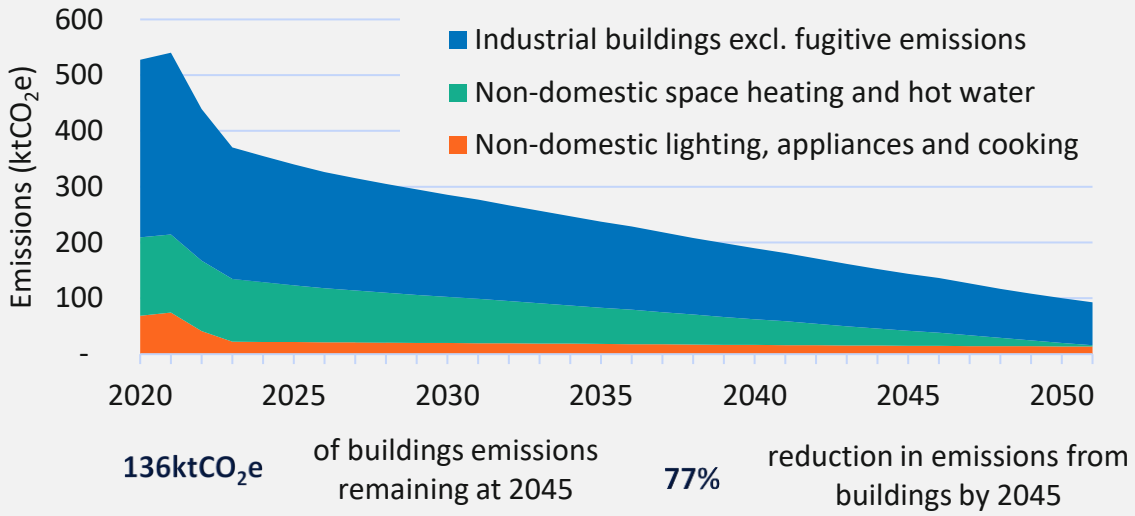


Figure 4.2.1: Cheshire East's non-domestic buildings emissions along the SCATTER High Ambition Pathway, 2020-50.

At a glance: SCATTER interventions for this sector

Reducing the demand for energy
- Retrofitting existing buildings to reduce their energy demand
- Using energy efficient lighting and appliances

Encouraging low-carbon fuels
- Installing electric heating systems
- Installing electric cooking systems
- Alternative solutions for heating where electric systems are not feasible

Encouraging uptake of renewables
- Local installation of small-scale PV (see section 4.6)
- Exploration of alternative sources of renewable energy (see section 4.6)

4.2 Non-Domestic Buildings
SCATTER Interventions

Improving energy efficiency of non-domestic buildings

SCATTER's High Ambition pathway models non-domestic energy demand changes differently to domestic properties. Instead of a per-household estimate based on different building archetypes, only the outright reduction in energy demand is projected. This is due to the much broader range of buildings considered within this sector. Demand reduction can be achieved by:

- Retrofit: The same solutions as in the domestic case apply; the installation of new insulation, draughtproofing, building management controls etc. will all have a significant impact on the energy demand of different sites.
- Efficient heating systems: see overleaf.
- New build standards: Ensuring new developments are designed to very high energy efficiency standards will avoid costly future retrofits.

Low-carbon, energy efficient cooking, lighting and appliances

This intervention considers the reduction in energy demand due to the installation of more efficient electrical devices. It also considers all types of cookers and catering equipment, regardless of their source fuel. This intervention is very similar to the domestic buildings equivalent.

Energy demand reductions are applied to whatever fuel the building is using, such as mains electricity or gas-fired CHP.

Across a typical range of buildings, lighting, cooling and appliances account for approximately 45% of daily energy use, whilst heating and hot water accounts for approximately 46%. This is a very different energy use profile when compared to domestic households and measures which regulate energy usage, such as building management controls, can be a much more significant means of reducing emissions as a result.

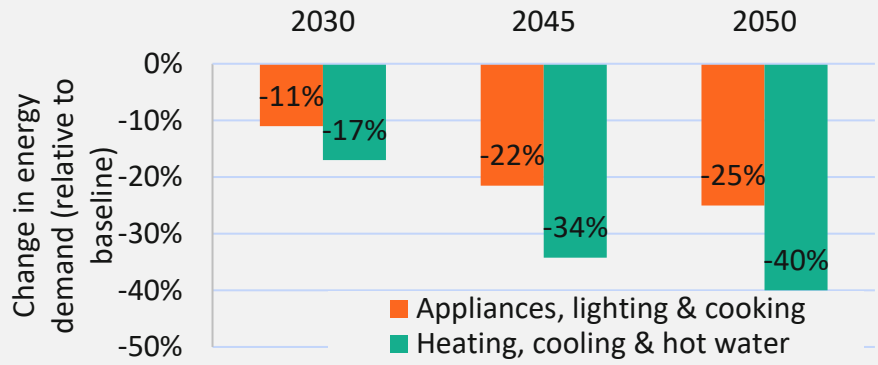


Figure 4.2.2: Projected changes in energy demand along the High Ambition pathway for non-domestic buildings. Baseline is taken as 2019 levels of consumption.

Current Context 2020	By 2045
• Over 1 in 4 of DECs are rated EFG • Gas consumption grew 6% overall between 2010 and 2020 with mean consumption per meter increasing 12%	• 34% reduction in non-domestic heating demand • 22% reduction in non-domestic energy demand for appliances, lighting and cooking

4.2 Non-Domestic Buildings
SCATTER Interventions

Moving away from fossil fuel heating

This intervention models the transition from fossil fuel-source heating technologies to low-carbon alternatives. The technology mix under the High Ambition Pathway includes a proportion of heat pumps for non-domestic buildings, as well as a number of district heating networks.

Transitioning to alternative heating technologies such as district heating using combined heat and power can also deliver a significant amount of emissions reduction in the non-domestic sector.

As with domestic heating systems, the additional electricity demand for heating means that the transition to nationally or locally-available renewable energy sources is an important partner intervention to the decarbonization of fossil fuel heating.

Fugitive emissions have also been excluded from these pathways under the assumption that attributed emissions will fall to zero as the demand for gas also wanes.

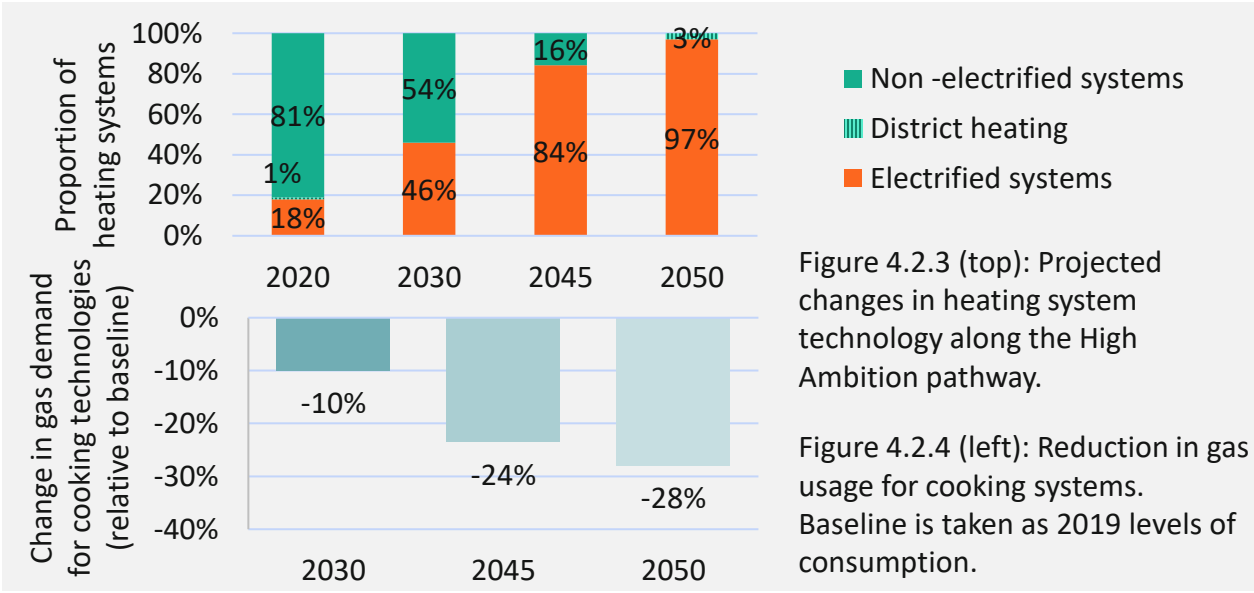


Figure 4.2.3 (top): Projected changes in heating system technology along the High Ambition pathway.

Figure 4.2.4 (left): Reduction in gas usage for cooking systems. Baseline is taken as 2019 levels of consumption.

Current Context 2020	By 2045
• Most recently available surveys indicate that nationally approximately 75% of non-domestic heating is fuelled by gas, with small contributions from district heating	• 97% of non-domestic heating systems are electric, with the remainder (3%) district heating • 28% decrease in gas usage for non-domestic cooking, displaced by electricity

4.2 Non-Domestic Buildings
Carbon Savings and Indicative Costs

Notes for the non-domestic sector

- As with the domestic sector, the most significant opportunities to reduce emissions lie in the reduction in the amount of gas used for heating.
- The marginal costs of replacing gas heating systems with renewable fuels (i.e. electric systems) may be relatively small when compared to other measures in this analysis.
- These estimates do not include heat networks and the potential for combined heat and power.
- Costs to replace heating system vary significantly according to the building archetype and demand profile; a "typical" split was assumed within Cheshire East to model a representative split of buildings.
- As with the domestic sector, any new developments should be completed to very high efficiency standards and with low-carbon heating solutions to save on more costly retrofit in the future.

For descriptions of types of cost, please see page 32.

SCATTER Intervention	Cumulative Emissions Savings (2020 - 2045)
• Improving energy efficiency of non-domestic buildings • Moving away from fossil fuel heating	**1,190 $ktCO_2e$**
• Low-carbon, energy efficient cooking, lighting and appliances	**140 $ktCO_2e$**
• Industrial buildings and facilities	**2,696 $ktCO_2e$**

Costed measure	Type of cost	Cost to 2045 (£m)
Retrofit of existing buildings	Capex	186
Replacing heating systems	Marginal capex	29

Figure 4.2.5: Carbon savings for SCATTER interventions along the High Ambition pathway. Table of indicative costings for the implementation of energy efficiency measures and heating systems retrofit.

4.2 Non-Domestic Buildings
Officer Insights

As part of this study, a workshop was held with council officers to hear views on potential actions, key barriers and enablers to their implementation and further implementation considerations. A summary of these views is shared below:

SCATTER Intervention	Barriers	Enablers	Implementation Considerations
Improving energy efficiency	*"Associated high cost, for both public and private buildings"*	*"The councils has potential ways to develop regulations around energy"*	*"The council can work with other councils to support building owners on masse to make their buildings more efficient"*
Moving away from fossil fuel heating	*"Lots of SMEs in the borough - need to find innovative ways to improve buildings as most are renting"* *"Struggled to find contractors with suitable skills for renewable heating systems"*	*"The council has done some work on decarbonisation studies for heritage buildings and therefore already has some lessons learned, even though this remains to be a challenging area to tackle"* *"Existing connection through historic houses - historical estates also own large amounts of land in the area"*	*"Contributions from developers within new developments. The council can exercise more over new developments rather than existing developments"*
Low-carbon, energy efficient cooking, lighting and appliances	*"Access to funding and expertise - may be desire in building owners but not aware on how and where to make changes"*	*"Energy prices being as high as they are, we're getting the attention of businesses for help to reduce costs"*	*"Opportunity for council to set up a CIC to provide expertise that is impartial - a trustworthy, independent body"*

4.2 Non-Domestic Buildings
Actions Library

The below tables show potential actions that deliver progress towards the SCATTER intervention milestones. In the case that these link forwards to a case study, please click the link given in the final column of the table to read more details on example projects of this type.

Impact area	Example actions	Case studies
	Improving energy efficiency	
Existing private sites	• Encourage annual energy reporting requirements across the borough's non-domestic buildings • Support businesses in accessing green finance by providing staff resources for guidance and advice via business networks • Provide guidance and share best practice on heritage building retrofit	Cambridgeshire County Council (page 39)
New-build development	• Investigate using Section 106 developer contributions to deliver net zero infrastructure	
	Moving away from fossil fuel heating	
Existing private sites	• Conduct wider feasibility studies for additional low-carbon energy networks in town centres and industrial estates across the borough	Southampton City Council (page 40)
Existing public sector and council-owned sites	• Review the opportunities for low-carbon heating systems within the Council's own buildings • Ensure guidance and finance opportunities are provided to public services to encourage uptake of low carbon heating	Nottingham City Council (page 39)
	Low-carbon, energy efficient cooking, lighting and appliances	
Private and public sector sites	• Provide guidance and support to businesses and public services on low carbon energy efficiency appliance and lighting improvements • Develop and implement an appliance and lighting energy efficiency review for all council owned buildings	London Borough Of Sutton (page 39) Nottingham City Council's Accelerating Reduction In Carbon Project (page 40)

4.2 Non-Domestic Buildings
Case Studies

IMPROVING ENERGY EFFICIENCY AND MOVING AWAY FROM FOSSIL FUEL HEATING
CAMBRIDGESHIRE COUNTY COUNCIL

Project summary

Cambridgeshire County Council has partnered with an energy services provider to provide the Cambridgeshire Schools Energy Programme. 55 schools have electrified heating systems with a shift to renewables.

The measures installed include solar photovoltaics, heat and lighting controls, solar thermal, combined heat and power, new boilers and air source heat pumps.

Co-benefits

The scheme has enabled schools to reduce energy use by 15-25% and save on energy costs, with a collective saving of over £600,000 per annum. Comfort levels for students and staff have also been improved.

Funding

The scheme cost £11 million from 2014 to 2021 and partially used funding from the council's Low Energy Investment Fund. The council also provided loans to the schools for a period between 15-20 years.

MOVING AWAY FROM FOSSIL FUEL HEATING
NOTTINGHAM CITY COUNCIL

Project summary

Nottingham City Council partnered with a solar PV developer EvoEnergy to install a solar carport across nine buildings at the Ken Martin Leisure Centre. Traditional car parking space are covered with canopies that generate renewable energy without any loss of space.

Carbon savings

The project has been calculated to save 41 tones of CO_2e per annum.

Funding

The installation is part of a larger development scheme of the site costing £13. million. The project has a payback period of 11 years through reduced energy costs and will generate income until the end of the Feed-in Tariff Scheme.

4.2 Non-Domestic Buildings
Case Studies

IMPROVING ENERGY EFFICIENCY AND MOVING AWAY FROM FOSSIL FUEL HEATING
SOUTHAMPTON CITY COUNCIL

Project summary

Southampton City Council's Clean Growth Fund provides funding to make all its non-domestic buildings (~130 buildings) and street lighting carbon neutral. The measures installed include onsite renewable energy generation (solar photovoltaics), battery storage and energy efficiency improvements.

Co-benefits

The financial savings from the works from Phase 1 of the project will be £115,000 per year through reduced energy bills.

Carbon savings

The project is delivered in partnership with the local South West Energy Hub and is expected to save 7,000 tonnes of CO_2e per annum.

Funding

The project is valued at £1.2 million and is funded by the £20 million Clean Growth Fund, which draws together council funds, Salix Finance, grants and other sources.

IMPROVING ENERGY EFFICIENCY AND LOW-CARBON, ENERGY EFFICIENT COOKING, LIGHTING AND APPLIANCES
NOTTINGHAM CITY COUNCIL'S ACCELERATNG REDUCTION IN CARBON PROJECT

Project summary

Nottingham City Council provides free carbon reduction audits and carbon reduction measures grants to small-medium businesses to help them decarbonise, improve their resource efficiency and adopt 'smart' energy applications.

Carbon savings

Since using the scheme, one business saves 10 tonnes of carbon per annum.

Considerations

The project is part-funded by the European Regional Development Fund - uncertain future applicability - available until June 2023. Also, the project is only applicable to SMEs with less than 250 employees

Funding

The programme partially uses funding from the European Regional Development Fund, alongside funding from the council and Midlands Engine.

4.2 Non-Domestic Buildings
Case Studies

IMPROVING ENERGY EFFICIENCY AND LOW-CARBON, ENERGY EFFICIENT COOKING, LIGHTING AND APPLIANCES
LONDON BOROUGH OF SUTTON

Project summary

The London Borough of Sutton has made energy efficiency improvements across its estate, including libraries, offices, depots and a public hall. Nine buildings in total were targeted, of varying age, condition and usage.

Energy conservation measures included:

- Lighting upgrades
- Voltage optimisation
- Boiler control upgrade
- Heating system insulation

Co-benefits

In Year 2 of the project, over £250,000 have been saved from reduced energy bills, with a 27% decrease in electricity use.

Carbon savings

Through the scheme, Sutton has reduced its carbon footprint by 484tCO_2e.

Funding

The London Borough of Sutton used funding from the Retrofit Accelerator – Workplaces programme, which is jointly funded by the Greater London Authority (GLA) and the European Regional Development Fund (ERDF).

LOW-CARBON, ENERGY EFFICIENT COOKING, LIGHTING AND APPLIANCES
NORTHUMBERLAND COUNCIL

Project summary

Northumberland Council replaced approximately 20,000 streetlights with new LED lights.

Carbon savings

Following completion, 2,700tCO_2e were saved between April 2015 and March 2021. The project was delivered by Galliford Try working in partnership with the Council.

Co-benefits

Energy bills reduced by £1.1 million a year, with approximately 75% of these savings used to repay the 'Invest to Save' loan.

Funding

The Council invested £25 million of its capital 'Invest to Save' budget. Invest to Save is a funding mechanism that councils can use where the initial funding is repaid within 25 years from anticipated budget savings.

4.2 Non-Domestic Buildings
Case Studies – Equality Implications

It is crucial that Cheshire East considers strategic objectives that extend beyond carbon reductions when action planning. These include reducing inequality, improving public health and encouraging economic security. Below we have assessed the implications of low-carbon actions in the context of different co-benefits and equality considerations.

Intervention	Potential positive co-benefits	Equality implications
Improving energy efficiency of existing buildings	○ Economic security: Reduction in energy bills. Improved productivity among workforce in extreme weathers. Opportunities for skills and training in the low carbon construction sector. ○ Local environment: Improvements to air quality as a result of more efficient energy consumption.	○ Businesses (SMEs): A large proportion of businesses are tenants, as opposed to owning their own premises, making retrofit upgrades much more challenging to deliver. ○ Remote communities: More likely to require substantial intrusive programmes of work and live in hard-to-treat housing.
Improving energy efficiency of new buildings	○ Economic security: Reduction in energy bills. Improved productivity among workforce in extreme weathers. Creation of new jobs and opportunities for skills and training in the low carbon construction sector. Increased investment into low carbon construction businesses. ○ Council services: Reduced pressure on public infrastructure for new developments.	○ Businesses: Achieving very ambitious standards is likely to apply heavy pressure to local trade in terms of time and cost. ○ Businesses: Poor visibility of climate risks can lead to new developments being poorly equipped for a changing climate.

4.2 Non-Domestic Buildings
Case Studies – Equality Implications

It is crucial that Cheshire East considers strategic objectives that extend beyond carbon reductions when action planning. These include reducing inequality, improving public health and encouraging economic security. Below we have assessed the implications of low-carbon actions in the context of different co-benefits and equality considerations.

Intervention	Potential positive co-benefits	Equality implications
Moving away from fossil fuel heating, improving energy efficiency of lighting and appliances	○ Public health: Reduction in indoor pollution. Reduction in energy bills.	○ Remote communities: Less likely to be connected to mains supplies for gas and electricity, making it harder to access these residents. ○ Businesses (large): In many cases, larger firms and organisations take a portfolio approach to site retrofits, which may mean deprioritizing sites in Cheshire East. ○ Businesses (SMEs): The upfront capital for installation is a barrier to accessing lower operational costs, in particular for smaller businesses.

Glasgow City Council - new-build standards

Glasgow have led the implementation of ambitious energy efficiency standards across new-build developments. Standards require new-builds to achieve a "Gold Level" 27% improvement against the standards required by 2015 Building Regulations.

In acknowledgement of the technical constraints demanded by these standards, the council designed and released three "options" to comply with the new standards. These each achieve the Gold Level in terms of energy performance but reach that goal in different ways.

This allows flexibility for developers and contractors working across different building types and ensures high energy performance standards without stymying investment and project delivery.

Specific details can be found here.

A description of these categories can be found in Appendix 7.

4.3 Transport

4.3 Transport
Introduction

Scope of Section

This sub-chapter is focused on emissions from transport. This is dominated by on-road transport and includes all private and freight travel in Cheshire East. There is also a small contribution from waterborne, rail and off-road vehicles. On-road transport is responsible for the overwhelming majority of transport emissions in the borough (and 38% of the borough total overall).

Any additional emissions from increased electricity consumption associated with electric vehicle (EV) charging are included under the buildings sector.

Current context

- **Very few registered vehicles are currently ultra low emissions vehicles (ULEV):** Of the 225,000 registered cars in Cheshire East, c. 5,000 (2.2%) are ULEV. A significant proportion of registered ULEVs are company vehicles (around 1,500 of the 5,000 total, or 30%).
- **The proportion of emissions from vehicles driving on Cheshire East's motorways has remained largely unchanged since 2005 at around 40% of on-road emissions:** Analysing historic BEIS emissions data, the proportion of emissions from motorways has been fairly consistent, varying only by a few percentage points from year to year and showing no real trend over time. There has however been a shifting emissions trend in the proportion of emissions from A-roads and Minor roads, with a growing proportion of emissions attributed to Minor roads.
- **Data indicates that currently over two thirds of all trips taken are in private vehicles:** 45% of all trips taken in 2018/19 in rural towns and fringe areas are as the driver of a car/van. This proportion rises to 54% in rural village environments.

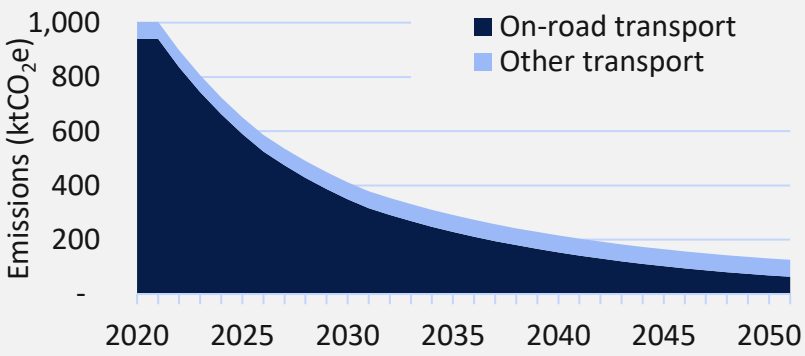
At a glance: SCATTER interventions for this sector

Reducing the demand for energy

- Travelling shorter distances
- Modal shift away from private vehicle use

Encouraging low-carbon fuels

- Switching to electric vehicles
- Improving emissions from freight



157 $ktCO_2e$
of transport emissions remaining at 2045

84%
reduction in emissions from transport by 2045

Figure 4.3.1: Cheshire East's transport emissions along the SCATTER High Ambition Pathway, 2020-50.

4.3 Transport
SCATTER Interventions

Travelling shorter distances

The simplest way to reduce transport emissions is to reduce the overall travel demand per person. This can be achieved in a number of ways and is linked to encouraging more flexible working patterns, more decentralised public services and infrastructure improvements.

Given that Cheshire East is a rural and expansive local authority, focusing these measures within the borough's towns is likely to be the only means of recording significant progress in light of this measure.

Modal shift away from private vehicle use

As well as reducing the average distance travelled per passenger, SCATTER also considers changes to the *mode* of travel i.e. the means by which the journey was completed.

SCATTER breaks these modes of transport into private vehicle (i.e. cars), public (which includes buses and trains) and active (i.e. walking and cycling).

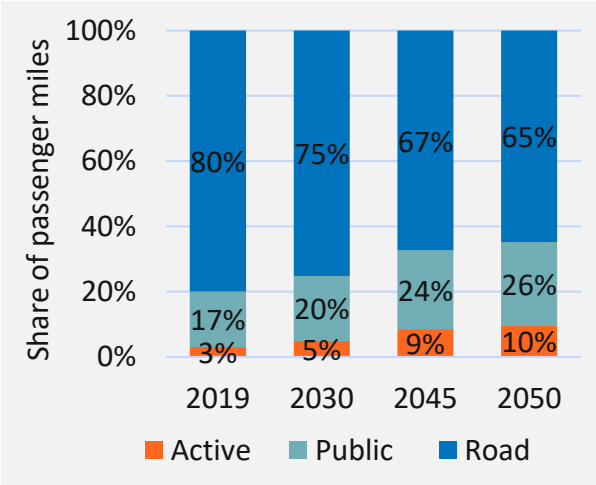


Figure 4.3.2: Modal shift along the High Ambition Pathway. Baseline statistics for modal split are taken from DfT surveys.

The baseline modal split data in Figure 4.3.2 is taken from the Department for Transport (DfT) National Travel Survey statistics. This describes the *mileage* taken by passengers, as opposed to the *number* of trips.

Modal shift is a crucial measure to mitigate transport emissions and encouraging the transition towards active and public transport should be considered equally important as the transition to electric vehicles, particularly in the context of additional co-benefits. These are explored in more detail in the case studies section.

The council may find limitations in the extent to which it can influence modal shifts given the high degree of throughfare traffic using the M6 and the M56, though the majority of on-road emissions are attributed to driving on smaller roads and trends indicate a growing shift of activity towards Minor roads.

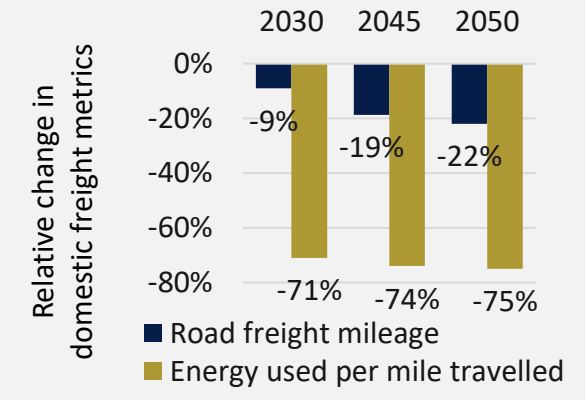
Current Context 2020	By 2045
• Private cars and taxis were responsible for over 75% of the mileage on Cheshire East's roads in 2019, equivalent to 2.3 billion miles • Total passenger journeys on local buses fell over 30% between 2009/10 and 2019/20 from 5.5 million to 3.9 million	• 25% reduction in the average number of passenger miles travelled per person • Share of miles driven on-road falls from c. 80% to c. 67% • Share of miles covered by active and public transport rises from c. 20% to c. 33%

4.3 Transport
SCATTER Interventions

Switching to electric vehicles

One of the most important steps to reducing transport emissions in Cheshire East will be the transition to electric vehicles. SCATTER models this separately for private vehicles, public vehicles and freight vehicles. As with other interventions around electrification, the success of a borough-wide switch to EV relies heavily on grid decarbonisation and renewable electricity supply.

Current estimates on the level of charge point infrastructure required to meet a large-scale transition to electric vehicles vary based on usage patterns and habits. If government infrastructure strategies are delivered – which have committed to 300,000 charge points nationally by 2030 – there will be thousands of additional charge points in Cheshire East compared to at present.



Improving freight emissions

Freight emissions are difficult to tackle, posing challenges both in terms of vehicles themselves (which are challenging to electrify) as well as influencing (given the common transient nature of freight through the borough). SCATTER operates on two metrics which reduce Scope 1 & 2 freight emissions:

- Improved journey efficiency: reducing the mileage travelled by HGVs through more efficient infrastructure and fewer "empty-trailer" journeys.
- Improved efficiency of freight vehicles themselves i.e., reduction in energy used per mile travelled as more fuel-efficient (and eventually electric) vehicles are used.

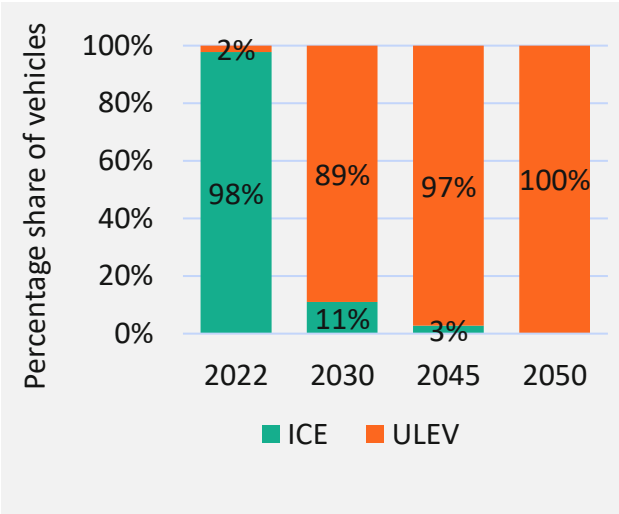


Figure 4.3.3 (left): Changes to freight mileage distribution and trip fuel efficiency.
Figure 4.3.4 (right): Vehicle technology split.

Current Context 2020	By 2045
• Of 225,000 registered vehicles, c. 2% are currently registered as ULEV • In 2019, there were 0.2 billion miles of heavy goods vehicle activity in Cheshire East, as well as 0.4 billion miles from light commercial vehicles	**Private & public transport** • 97% of private vehicles are EV or HEV • 100% of buses and trains are electric **Freight** • 19% reduction in road freight mileage • 74% increase in efficiency per mile travelled

4.3 Transport
Carbon Savings and Indicative Costs

Notes for the transport sector

- Mitigating on-road emissions is one of the single largest opportunities for carbon savings, along with domestic heating.
- Replacing on-road vehicles with electric equivalents may be costly in the near term but the marginal cost over petrol and diesel vehicles falls away rapidly.
- Operational cost savings due to higher fuel efficiency and parts maintenance also mitigate the capital costs with vehicle replacement.
- Batteries, a significant contributor to the cost of electric vehicles, are anticipated to continue to fall in price until the end of the 2020s as technological improvements make each unit of supplied power cheaper.
- The CCC projects a nationwide scale of annual investment in excess of £12 billion in 2035 will be required to meet demand for charge points (in the case of private vehicles) and potentially hydrogen fuel infrastructure (in the case of HGVs).

For descriptions of types of cost, please see page 32.

Figure 4.3.5: Carbon savings for SCATTER interventions along the High Ambition pathway. Table of indicative costings for the implementation of electrification measures and modal shift changes. Negative values indicate cost savings.

SCATTER Intervention	Cumulative Emissions Savings (2020 - 2045)
• On-road transport	**6,994 $ktCO_2e$**
• Rail	**28 $ktCO_2e$**

Costed measure	Type of cost	Cost to 2045 (£m)
Cars, vans, motorcycles (new vehicles)	Capex	970
Cars, vans, motorcycles (infrastructure)	Capex	144
HGVs/buses (new vehicles)	Capex	61
HGVs/buses (infrastructure)	Capex	355
Rail (new vehicles)	Capex	7
Rail (infrastructure)	Capex	68
Efficiencies/modal shift	Opex	-564

Transport glossary
ICE – Internal combustion engine
ULEV - Ultra-low emission vehicle (a vehicle which emits <75 gCO_2/km travelled).

4.3 Transport
Officer Insights

As part of this study, a workshop was held with council officers to hear views on potential actions, key barriers and enablers to their implementation and further implementation considerations. A summary of these views is shared below:

SCATTER Intervention	Barriers	Enablers	Implementation Considerations
Travelling shorter distances	*"Transport options considered too late within the planning and development process"*	*"Mandated planning in new housing developments"*	*"Reducing the demand for travel in local plans"*
Modal shift away from private vehicle use	*"Rural nature of the borough makes it difficult to encourage cycling and walking"* *"Safety of active travel - need for introduction of 'quiet lanes'"* *"Lack of accessibility in train stations for cyclists"*	*"Gamification of active travel will also contribute to health co-benefits"* *"Good train network; need for improvement in access to and from stations"*	*"Need to consider better connectivity and availability of public transport - needs to be easy and easier than individual cars"* *"Need to try make different modes work together"* *"Joined up ticketing - can we provide high quality bus routes to business parks or key areas"*
Switching to electric vehicles	*"Challenges in rural areas for EV - insufficient power capacity"*	*"The charging network in Cheshire East is getting better"*	*"Accelerate EV charging points where EV take up is slower"*
Improving emissions from freight	*"Challenge to install infrastructure"* *"Travel planning needed for businesses"*	*"Electric bikes increase the range of what is a cyclable distance"*	*"Other councils have run EV trials to target fears around business continuity - work with organisations to overstep this and see functionality"*

4.3 Transport
Actions Library

The below tables show potential actions that deliver progress towards the SCATTER intervention milestones. In the case that these link forwards to a case study, please click the link given in the final column of the table to read more details on example projects of this type.

Impact area	Example actions	Case studies
Travelling shorter distances		
Optimise commuting and business travel routes	• Implement planning policy and support developers to create neighbourhoods more easily accessible by car, de-centralizing amenities within residential neighbourhoods • Engage with businesses on route optimisation techniques • Engage with schools to identify opportunities for new or extended school bus routes, reducing the need for children to travel to school by car • Facilitate agile working practice for businesses through the provision of support to access hybrid working technology	Stroud Borough Council (page 64) Waltham Forest Council (page 65)
Modal shift away from private vehicle use		
Incentivise active travel through planning	• Use planning to allocate street space and furniture in favour of active travel and transport • Include requirements in building and planning policy which further incentivize active travel, such as secure storage and drying rooms • Identify sites of high active travel footfall and consider implementation of Low- or Slow-Traffic Neighbourhoods in these areas	Waltham Forest Council (page 65)
Incentivise active travel through behavioural change	• Work with schools and academies in the borough to set up walking buses and provide cycle workshops • Gather specific local data on the levels of active and public travel in town centres across the borough • Set public targets to improve air quality across the borough and report progress in line with current air quality metrics • Assess viability of imposing a surcharge/congestion charge for the worst-performing/most polluting vehicles whilst avoiding penalising lower-income households. • Explore the option of free or subsidised bus travel passes for residents to ease this transition	Nottingham City Council's Workplace Parking Levy (page 64)

4.3 Transport
Actions Library

Impact area	Example actions	Case studies
Switching to electric vehicles		
Incentivising more rapid transition to ULEV	• Roll out emissions-based parking permits and ULEV zones in town centres • Publicise this strategy to encourage uptake of EVs among residents • Organise EV leasing opportunities and funding schemes to enable all communities access to EVs, especially lower-income communities across the borough • Support private hire vehicle sector in switching to EV through interest-free loans or other mechanisms • Trial electric vehicle buses on busier routes • Lobby national government for improved support for electric vehicle infrastructure, including electrification of the rail network • Identify sites for EV infrastructure through consultation and a strategic assessment, such as car parks and taxi ranks • Install EV infrastructure in identified strategic sites across the borough	Coventry County Council (page 65) Durham County Council (page 66)
Improving emissions from freight		
Consolidate and reduce impact of freight journeys	• Assess the feasibility of local distribution hubs which utilise low-carbon "Last Mile" deliveries • Use forums & business groups to explore consolidating journeys e.g. restaurants based near each other could utilise the same supplier • Encourage and support council suppliers and other businesses to utilise rail freight opportunities as opposed to HGVs • Develop an e-cargo bike scheme for local deliveries • Encourage residents & businesses to consider "miles travelled" in their purchasing decisions and buy locally where possible	Southampton City Council and Eastleigh Borough Council (page 67) Bristol Freight Distribution Centre (page 67)

TRAVELLING SHORTER DISTANCES AND MODAL SHIFT
STROUD BOROUGH COUNCIL

Project summary

Stroud Borough Council coordinated with Gloucestershire County Council to adopt a Settlement Hierarchy policy which requires proposals for new homes or workplaces to be located only in places that are readily accessible by located only in places that are readily accessible by public transport, bike, or foot. If this isn't possible, proposals must contribute to new infrastructure which improves their accessibility via those modes. Therefore, all proposals are obliged to discourage car usage and enable residents to travel shorter distances.

Stroud District Council is also integrating its Local Plan with its Sustainable Transport Strategy which prioritises walking, cycling, public transport, car-sharing and taxis, and then cars as a last priority. Interventions include improving the region's bus services, segregated cycle routes, railway improvements and the promotion of mobility-as-a-service, encouraging people to have occasional access to vehicles rather than needing to own a private vehicle.

Co-benefits

The policy improves connectivity and mobility between urban and rural areas alongside facilitating health benefits through improved active travel infrastructure.

Funding

Stroud Borough Council included the update within its ordinary Local Plan update budget, so no additional cost was incurred.

MODAL SHIFT
NOTTINGHAM CITY COUNCIL

Project summary

Nottingham City Council developed the Workplace Parking Levy which charges employers who provide 11 or more parking spaces £428 per parking space per annum (excluding disabled spaces, NHS premises and emergency services). The revenue generated funds local transport projects and improvements. £83 million of revenue has been raised so far directly from the levy.

Co-benefits

The city has seen reduced air pollution and congestion alongside an improvement in connectivity from the public transport improvements funded by the levy. Additionally, employers and investors have not been deterred by the levy.

Carbon savings

350 tCO_2e have been saved by bus electrification also paid for by the levy.

Funding

The costs to set up the levy amounted to £1.8 million, which was part funded by the council alongside the UK government. The levy costs £475,000 per annum in operational costs.

TRAVELLING SHORTER DISTANCES AND MODAL SHIFT
WALTHAM FOREST COUNCIL

Project summary

The Enjoy Waltham Forest Initiative included measures to increase active travel, such as pedestrianising high streets and installing blended crossings, which are designed to slow traffic and emphasise pedestrian priority. These include:

- 22km of segregated cycle lanes
- 300 new bike hangars
- 100 junction changes
- 40 modal filters (to prevent local rat runs)

Co-benefits

The policies meant that residents are walking for 32 more minutes a week, cycling for an extra 9 minutes and are less exposed to nitrogen dioxide and PM2.5 by 15-25% and 6-13% respectively. 15 new parklets and parks have also been installed with wildflower beds and 700 new trees planted, increasing urban green space. There are also economic benefits to businesses in the area benefiting from pedestrianised roads.

Council role

The council carried out extensive engagement and consultation with residents, with a 3-week pilot used as a live consultation and 90% of homes targeted by the consultation contacted in-person.

Funding

The council secured £30 million of funding from Transport for London and provided a further £15 million from the borough's own sources.

SWITCHING TO ELECTRIC VEHICLES
COVENTRY CITY COUNCIL

Project summary

Coventry City Council has partnered with EO Charging and Stratford Energy to create an open fast charging network, Plug In Coventry, which operates as pay-as-you-go. Plug In Coventry aims to encourage businesses to either buy or lease electric charge points on their premises. EO Charging maintain leased charge points and pass on revenue generated to the business.

Co-benefits

Increased number of journeys made by electric vehicles is predicted to improve air quality by reducing journeys made by fossil fuels. Facilitating electric vehicle infrastructure also enables residents not able to participate in active travel to use low-carbon transport.

Funding

Plug In Coventry is part of the Coventry and Warwickshire Green Business Programme which is part funded by the European Regional Development Fund and the Midlands Engine.

SWITCHING TO ELECTRIC VEHICLES
DURHAM COUNTY COUNCIL

Project summary

Durham County Council aims to make charge points accessible for all County Durham residents under its Community Vehicle Charging scheme. This covers all residents living in rural areas and those in terraced housing with no off-street parking. Over 100 charge points have been installed. The project's long-term goal is for every Durham resident to live within a five-minute walk of an EV charge point.

Co-benefits

Increased number of journeys made by electric vehicles is predicted to improve air quality by reducing journeys made by fossil fuels.

Council role

The council convened the EV community working group which includes council members, members of the Scaling On Street Charging Infrastructure (SOSCI) initiative, and residents. The SOSCI has 13 partners and has included parish and town councils, the North East Combined Authority, the LA7 group of local authorities in North East England, Durham University, Northern Powergrid and Charge My Street (a community benefit society that installs charge points).

Funding

The council won funding from multiple sources including Innovate UK, the UK Government's On-Street Residential Charge Point Scheme and the Weardale Electric Vehicle Accelerator project. The council also used top-up funding from the council's general budget and the county's fourteen unique Area Action Partnerships (forums bringing together county, town and parish councillors, public sector employees and community members).

4.3 Transport
Case Studies

DOMESTIC FREIGHT
SOUTHAMPTON CITY COUNCIL AND EASTLEIGH BOROUGH COUNCIL

Project summary

Southampton City Council and Eastleigh Borough Council loaned 20-25 businesses e-cargo bikes under its RIDES project (Realising Innovative Deliveries in Eastleigh and Southampton). These ranged from sustainable transport teams and estates teams to parks and outdoor education teams to small businesses making deliveries.

Council role

The council secured the funding and coordinated the bid for the funding with The Hub Cycleworks and Monty's Bike Hub. A zero-emissions delivery company (Zedify Southampton which runs the project on a day-to-day basis, assisting with maintenance, delivery of bikes and data gathering.

Co-benefits

E-cargo bike use can reduce congestion and reduce air pollution due to fewer heavy goods vehicles and vans making journeys using fossil fuels.

Funding

£50,000 in funding was secured by the council from the Energy Savings Trust and the Department for Transport.

DOMESTIC FREIGHT
BRISTOL CITY COUNCIL

Project summary

Bristol City Council paired with Bath City Council to subsidise the Bristol Freight Consolidation Centre which was used voluntarily by 150 businesses across Bristol and Bath to consolidate their deliveries. The centre was operated by DHL under contracts procured by the council until 2018. Electric vehicles were used between 2007 and 2017.

Co-benefits

At the peak of the Centre's use, there was a 70%-80% reduction in the number of onward trips - meaning for every 10 vehicles making a delivery to the centre, just 2 or 3 onward journeys were made. The Centre reduced the number of delivery vehicles travelling through central Bristol and consequently reduced air and noise pollution.

Carbon savings

When electric vehicles were used by the Centre, 11 tonnes of carbon were saved per annum.

Funding

The council subsidised the Centre and procured the contracts to delivery services. When the council's funding ended in 2018, DHL continued to offer a freight consolidation services for commercial use.

4.3 Transport
Case Studies – Equality Implications

It is crucial that Cheshire East considers strategic objectives that extend beyond carbon reductions when action planning. These include reducing inequality, improving public health and encouraging economic security. Below we have assessed the implications of low-carbon actions in the context of different co-benefits and equality considerations.

Intervention	Potential positive co-benefits	Equality implications
Travelling shorter distances	○ Economic security: Improved connectivity brings increases to land value as well as reach of local businesses. Supports economic growth of local businesses and could provide more local jobs. ○ Council services: Decreased congestion and delays from more efficient use of transport networks. Improved resident participation in the community and improved access to services locally. ○ Public health: Reduction in air pollution related illnesses. Increased uptake in active travel improves public health.	○ Vulnerable/disabled: Lack of efficient and accessible active and public travel infrastructure may limit the potential of opportunities. These communities may need more specialist services not available locally. ○ Low-income: Less likely to be well served by decentralised services in the first place and in many cases do not benefit from increases in the value of local land assets.
Modal shift away from private vehicles	○ Council services: Improved coverage of public transport benefits and promotes public safety. ○ Public health: Public transport provision improves accessibility of the borough for more people. Active transport provision reduces burden on healthcare and improves health outcomes almost universally.	○ Low-income: High cost of public transport will act as a barrier to these communities shifting away from private vehicle use. ○ Vulnerable/disabled: Private vehicles may be the only feasible option for certain groups within this category. ○ Remote communities: Public transport is unlikely to be feasible for the most rural areas within Cheshire East, who continue to rely on private vehicles.

4.3 Transport
Case Studies – Equality Implications

Intervention	Potential positive co-benefits	Equality implications
Switching to electric vehicles and decarbonising freight	○ Local environment: Decreased use of ICE vehicles has direct benefits to air quality. ○ Public health: Reduced air and noise pollution brings improvements to physical and mental health outcomes. ○ Council services, economic security: Improvement in affordability of EVs over time brings operational financial savings. ○ Economic security: Opportunities for investment and new jobs in businesses supplying low carbon transport options e.g. e-cargo bike deliveries.	○ Low-income: Current costs will prohibit these communities from switching to EV and the likelihood is that lower-income residents will continue to use cheaper ICE vehicles in the medium-term. Lack of proper infrastructure for charging and high upfront costs are significant barriers for low-income households and smaller businesses to access the operational savings of switching to EV. ○ Businesses: May face increased costs in the face of congestion or emissions zones that sanction ICE vehicles. Will require support to ensure the upfront cost of switching to EV businesses is not prohibitive.

Liftshare – vehicle sharing scheme

Liftshare connects passengers and drivers travelling similar routes into a single vehicle, splitting the cost and environmental implications.

Specifically, users with mobility or other health concerns that limit their ability to drive can advertise journey needs and be matched with drivers.

Liftshare has been used for large employers seeking to reduce the amount of car traffic routed to their sites/offices and could be coupled with a levy similar to the one employed by Nottingham City Council (see below) to reduce congestion in built-up areas.

Nottingham Workplace Parking Levy

Nottingham City Council have operated a levy on *employers* providing a threshold number of parking spaces to discourage congestion. Around half of levies in Nottingham are passed to the end-user.

Funds raised by the levy are then used towards public transport infrastructure and improvements.

A description of these categories can be found in Appendix 7.

4.4 Agriculture & Land Use

4.4 Agriculture & Land Use
Introduction

Scope of Section

This sub-chapter is focused on emissions from agricultural activities, livestock and emission released from changes in the use of land. SCATTER calculates emissions from livestock based on an estimated head count for each livestock type. The use of green spaces and the natural environment as a carbon "sink" to remove emissions from the atmosphere has high potential in Cheshire East compared to other local authorities in the country.
Emissions-conscious management of natural infrastructure can also offer significant co-benefits for the local economy and enhance biodiversity whilst protecting the long-term stability of the agricultural sector in the borough.
These additional factors are not captured neatly within SCATTER, which focuses purely on emissions impacts, but case studies in this section do provide more detail on these.

Current context

- **The vast majority of emissions from livestock stem from cattle:** Over 90% of recorded emissions are the result of cattle farming, with around two thirds of these emissions attributed to non-dairy cattle.
- **Agriculture is a significant part of local industry, with over 1,500 commercial holdings providing employment to over 4,000 workers and landholders:** In total, farmed land takes up over 85,000ha of Cheshire East's land, almost three quarters of the borough's land area. The number of commercial holdings in the borough is among the highest across the north west.
- **Woodland coverage is between 7-12% for the majority of the borough, though Macclesfield has very high coverage (37%):** The proportion of residents who live within 500m of a woodland is around 1 in 6 for most of the borough, with the exception of Crewe & Nantwich, the proportion of which is much smaller – closer to 1 in 16.

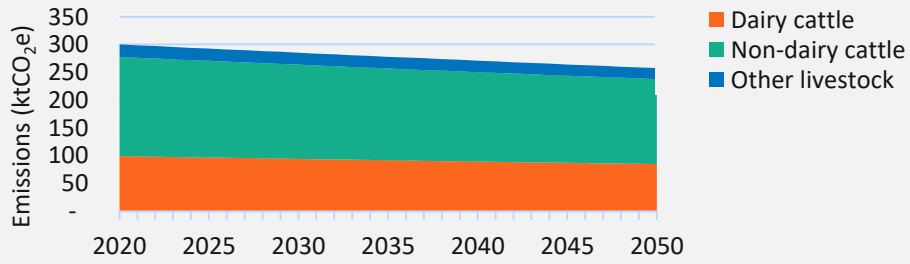


Figure 4.4.1: Cheshire East's ALU emissions along the SCATTER High Ambition Pathway, 2020-50.

Outcomes

- **12%** reduction in emissions from livestock by 2045
- **264ktCO$_2$e** of livestock emissions remaining at 2045

At a glance: SCATTER interventions for this sector

Reducing the impact of agriculture

- Lower per-head emissions for livestock
- Land uses that protect woodland and grassland coverage

Encouraging carbon sequestration

- Increased tree coverage and planting
- Holistic consideration of urban growth and cropland development

4.4 Agriculture & Land Use
SCATTER Interventions

Reducing the emissions impact of agriculture

SCATTER models the decline of livestock emissions purely through a reduction in the headcount population of cattle (dairy & non-dairy), pigs and sheep, but not poultry. Reducing the outright population of livestock is one means of achieving this trajectory, but alternatives would involve the adoption of farming practices and mechanisms that reduce emissions locally. This would reduce the per-head emissions factor, feasibly allowing the same population of livestock to create fewer emissions. Emissions factors are based on various activities, including:

- Methane released through enteric fermentation of livestock (i.e. emissions directly from livestock through eructation and excretion)
- Methane released through manure storage
- Nitrous oxide released through manure management

Options to mitigate enteric fermentation (methane) emissions may include changes to livestock feed, whilst other technologies and techniques can reduce the creation of greenhouse gases created by manure storage and management. More details of these are given in the case studies (page 77). Collaborative solutions with the agricultural industry to mitigate these emissions are explored further in the case studies, with guidance on inclusive action plan development given in Chapter 5.

Encouraging carbon sequestration

SCATTER models tree coverage in two ways; increased forest/ woodland coverage as well as tree planting outside of woodlands. This also incorporates a transition of the borough's grassland towards forested land.
Alternative land use types, such as wetlands, are not modelled directly within SCATTER.

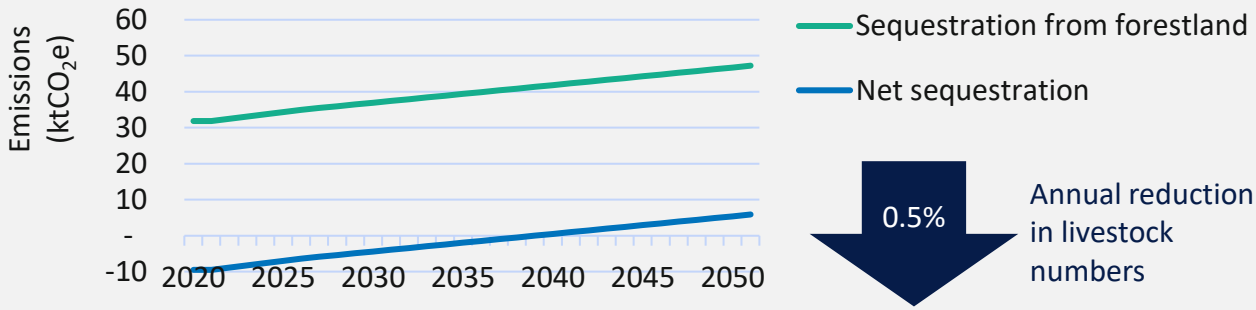


Figure 4.4.2: Changes to Cheshire East's livestock numbers and sequestration statistics from forestland.

Current Context 2020	By 2045
• Livestock populations estimated to be: • 125,000 cattle • 8,000 pigs • 140,000 sheep • 1,800,000 poultry • Lone tree coverage currently around 45 trees per hectare	• C. 13% reduction in livestock numbers • Lone tree planting grows to equivalent of 58 trees per hectare • 24% increase in forest coverage, 7% decrease in grassland

4.4 Agriculture & Land Use
Carbon Savings And Indicative Costs

Notes for the agricultural sector

- Despite the relatively smaller modelled reductions in emissions from the agricultural sector compared to other emissions sectors, livestock and land use represent a significant emissions reduction opportunity.
- Reducing livestock emissions is estimated to provide particularly significant savings in emissions.
- The UK government's Woodland Creation & Maintenance Grant (WCMG) heavily subsidises the creation of new woodlands (up to 80%).
- Using WCMG estimates of £8,500 per hectare of unsubsidised capital cost for new woodland, we arrive at an estimate of around £31m for the creation of new wooded areas in line with SCATTER's High Ambition pathway.
- Project specific costings relating to livestock and sustainable farming practices can be found in the case studies in this section.

For descriptions of types of cost, please see page 32.

SCATTER Intervention	Cumulative Emissions Savings (2020 - 2045)
• Livestock	**701 $ktCO_2e$**
• Land use	**126 $ktCO_2e$**

Costed measure	Type of cost	Cost to 2045 (£m)
Woodland creation	Capex	31
Woodland maintenance	Opex	7

Figure 4.4.3: Carbon savings for SCATTER interventions along the High Ambition pathway. Table of indicative costings for the implementation of electrification measures and modal shift changes. Negative values indicate cost savings.

4.4 Agriculture & Land Use
Officer Insights

As part of this study, a workshop was held with council officers to hear views on potential actions, key barriers and enablers to their implementation and further implementation considerations. A summary of these views is shared below:

SCATTER Intervention	Barriers	Enablers	Implementation Considerations
Tree cover	*"Internal barriers to initiatives regarding identifying land"* *"Ongoing costs for street trees and maintenance"*	*"Number of initiatives existing on nature-based insetting - the council has now joined the Mersey forest, connected with the wildlife trust"*	*"Acceptance of urban roadside trees needs to be readdressed - need to stress the benefits of trees"*
Land management	*"Farming in the borough is a significant part of the economy and that is unlikely to change dramatically"*	*"The peatlands and mosses in the borough have been mapped"*	*"Engagement and actions should also focus on privately owned land"*
Urban greening	*"Carbon capture may add to demand for land and compete with biodiversity net gain and other aspects"*	*"People generally care about the natural environment; this is the hook for a lot of by-in"*	*"There are community groups who could help implement actions regarding tree planting, Biodiversity Net Gain and community orchards"*
Sustainable farming practices	*"Some initiatives are hindered by landowners/farmers not engaging as the new Common Agricultural Payment system has not been finalised"*	*"Growing awareness between link of land use and freshwater systems e.g., catchment cleanups and working with surrounding agricultural land to mitigate farming impacts"*	*"Engagement with the main agricultural college in the borough. Potential to partner with them"*

4.4 Agriculture & Land Use
Actions Library

The below tables show potential actions that deliver progress towards the SCATTER intervention milestones. In the case that these link forwards to a case study, please click the link given in the final column of the table to read more details on example projects of this type.

Impact area	Example actions	Case studies
	Tree cover	
Maintain existing tree cover	• Develop a long-term strategy to protect and manage existing urban trees and woodland in the borough • Carry out ongoing inventory and report on tree & hedgerow abundance, diversity and cover statistics • Engage with community groups (e.g., friends of parks groups) and schools to carry out tree monitoring and inventories through a Tree Warden programme	Greater Manchester City of Trees (page 77) Valuing Ealing's Urban Trees (page 78)
Increase tree coverage	• Carry out opportunity mapping to assess areas of the borough which could be converted to small-scale woodland or are available for tree planting • Ensure tree cover is considered for all new developments through the new Local Plan by mandating for a minimum level of tree coverage in new developments, and exploring incentives for developers to retain trees • Prioritise tree planting initiatives in more deprived and less green wards of the borough, where the opportunities for, and benefits of, action are greatest • Engage with private landowners in the borough to identify opportunities for tree and hedge planting	
	Land management	
Support sustainable land use	• Restore, retain and protect existing land uses which store CO_2 on council-owned land • Reduce the 'heavy' maintenance of bushes, shrubs and green spaces • Explore opportunities to increase and maintain soil health on council owned land to support carbon capture	Newcastle City Council (page 78) Kent Nature Partnership (page 77)

4.4 Agriculture & Land Use
Actions Library

The below tables show potential actions that deliver progress towards the SCATTER intervention milestones. In the case that these link forwards to a case study, please click the link given in the final column of the table to read more details on example projects of this type.

Impact area	Example actions	Case studies
	Urban greening	
Maintain and enhance urban green spaces	• Maintain and increase where possible the number of Green Flag status parks across the borough • Impose more ambitious green space requirements in planning policy for development and ensure that green spaces are at the heart of planning • Carry out a mapping exercise to assess which areas of the borough could be designated, protected and enhanced as green space, ensuring equitable access for communities in Cheshire East	Hackney London Borough Council (page 79) London's Wild West End Project (page 79)
	Sustainable farming practices	
Enable and support sustainable farming	• Encourage low carbon farming practices in line with recommendations made in the Agriculture and Land Use Analysis Report and working with the NFU. • Work with NFU and other key agricultural stakeholders to provide guidance on reducing artificial fertiliser to farmers • Engage with farmers who are already growing low energy crops to showcase best practice among other farmers	Regenerative Agriculture at Durie Farms (page 81) Knepp Estate (page 80) Luton Hoo Estate (page 81) School Of Regenerative Land-based Practices (page 81) Cornwall Council (page 82)

4.4 Agriculture & Land Use
Case Studies

TREE COVER
GREATER MANCHESTER CITY OF TREES

Project summary
Greater Manchester City of Trees is a leading example of how a tree planting project can address climate change objectives whilst engaging the local community and providing numerous co-benefits. So far, the initiative has planted 537,173 trees and used 17,255 volunteer hours. It aims to plant 3 million trees and bring 2,000 hectares of unmanaged woodland back into community use.

Council role
The council is not directly involved with the initiative. Landowners, volunteers (including corporate opportunities), and schools work with the initiative.

Co-benefits
The programme directly increases the number of trees in deprived urban environment, which has benefits to mental and physical health. Also, engaging with schools informs young people around the benefits of protecting and enjoying the natural environment.

LAND MANAGEMENT
KENT NATURE PARTNERSHIP

Project summary
The Kent Nature Partnership Biodiversity Strategy 2020-2045 is a plan that aims to protect and recover threatened species through habitat maintenance, restoration and creation. It also aims to provide a natural environment that inspires citizen engagement and is well used, and which residents can benefit from. The bulk of the strategy contains a comprehensive set of overarching objectives, supported by targets which equate to specific actions to be undertaken. The impact of the strategy will be reviewed every 5 years.

Council role
The strategy is written by the Kent Nature Partnership, which is managed by Kent County Council. The Partnership includes a group of charities, public sector bodies, academics, and local authorities.

Co-benefits
"Connecting people with the natural environment" forms one of the key goals of the strategy and is focused on ensuring that the "widest possible range of ages and backgrounds will be benefiting from the mental and physical health benefits of the natural environment". There is no comprehensive calculation of the co-benefits of achieving the strategy. The plan aims to ensure the "widest possible range of ages and backgrounds will be benefiting from the mental and physical health benefits of the natural environment".

4.4 Agriculture & Land Use
Case Studies

LAND MANAGEMENT
NEWCASTLE CITY COUNCIL

Project summary

Newcastle City Council's Green Infrastructure Delivery Framework Outlines the council's plans for the "creation, protection, enhancement and management of green infrastructure". The work builds on a 2011 evidence report which ensured that the implementation of green infrastructure was considered as part of the city's Core strategy and Urban Core Plan. It sets out the delivery mechanisms and provides an ongoing action plan, a monitoring framework through which to report on green infrastructure achievements.

Council role

The council implemented the framework. Multiple stakeholders across the council are listed throughout the report.

Co-benefits

The strategy takes a joined-up approach with other council delivery areas relating to land use, such as transport and infrastructure. The joined-up approach to the strategy means co-benefits such as resilience to climate change (e.g., through Sustainable Drainage Systems), and improved mental and physical wellbeing (e.g., through protection and enhancement of open spaces) are considered throughout.

TREE COVER
VALUING EALING'S URBAN TREES

Project summary

Valuing Ealing's Urban Trees is a strategy and research document providing the basis for a comprehensive city management plan for Ealing's urban forest as well as informing the council's tree strategy.

The report provides a quantitative baseline for carbon storage, carbon sequestration, and other benefits of the trees currently in the borough. This evidence base provides a foundation and case for future action.

The report also gives specific recommendations on next steps for the council in using the findings to build a tree strategy.

Council role

The council facilitated and funded the report. The study enables a top line cost benefit analysis of services provided by the council tree department. Trees for Cities and several other 3rd parties were involved in research.

4.4 Agriculture & Land Use
Case Studies

URBAN GREENING
HACKNEY COUNCIL

Project summary
As part of Hackney's Parks and Green Spaces Strategy 2021-2031, the council launched the Community Parklet Scheme. A parklet reclaims space used for parking vehicles on residential streets and replaces it with seating and planted beds – or other uses suggested by residents. Ten were installed by the end of 2021. All parklets are listed on a map on Hackney Council's website and residents can request a parklet of their own.

Council role
The council implemented the scheme and either the council or community volunteers can manage the parklets.

Co-benefits
The parklets give residents a place to meet, play and socialise and create a calmer, greener street for all. The parklets also encourage reduced traffic, reducing air pollution and encouraging more active travel.

URBAN GREENING
WILD WEST END

Project summary
London's Wild West End project involves large property owners establishing green corridors between existing green space to encourage birds, bees and bats back into London, allowing both people and wildlife to move between them. The number of green installations has increased by 29%. The project drives a collaborative approach to urban greening between multiple stakeholders. A value table used to direct support to most impactful projects considers: Biodiversity; Climate; Microclimate; Wellbeing; and Social factors.

Considerations
The are some limitations on landowners and tenants' ability to modify central London properties (due, for example, to heritage laws).

Stakeholders
The Mayor of London is involved as a partner. The major London property owners and Business Improvement Districts (BIDs) work in partnership with the Mayor of London, and wildlife charities.

Co-benefits
The project improves wellbeing of residents through increased exposure to nature is a core part of the project's vision. The "multifunctional" benefits of green space are considered when choosing projects as part of the "Value Table".

4.4 Agriculture & Land Use
Case Studies

SUSTAINABLE FARMING PRACTICES
REGENERATIVE AGRICULTURE - DURIE FARMS

Project summary

Durie Farms is a predominantly pastoral farm based in Fife. Since 2006, the farm has applied "soil centric" principles to land management. Key principles followed:

- Minimising Soil Disturbance
- Increasing Diversity (for example species, rotation, companion cropping)
- Keeping living roots in the soil at all times (for example with winter cover crops, have no fallow land)
- Keeping soil covered

The practices have improved soil quality increases the quantity of carbon held by the land. Crops are more resilient and nutrients in the soil are more prevalent, reducing the need for fertilisers.

Stakeholders

Durie Farm, partnering with James Hutton Institute, which supports research on the farm's initiative.

Co-benefits

Healthier soils yield additional benefits, such as cleaner water, and improved drought and flood resilience. Also, once established, the new techniques have made the farm more profitable.

SUSTAINABLE FARMING PRACTICES
KNEPP ESTATE

Project summary

Knepp is a 3,500-acre estate just south of Horsham, West Sussex. Since 2001, the land – once intensively farmed - has been devoted to a pioneering rewilding project. Since the launch of the rewilding initiative, biodiversity has flourished. Knepp's income is now based on a mix of meat sales and premium eco-tourism.

Considerations

The approach is not suitable for all types of agriculture/food production.

Co-benefits

The project has proven economically viable, with profit margins over 20%. Rewilding leads to greatly improved land productivity, increased carbon sequestration and soil carbon stocks. In addition to carbon mitigation, the rewilded land offers benefits for soil quality and water purification; flood mitigation; air purification; insect populations; and human health and wellbeing.

4.4 Agriculture & Land Use
Case Studies

SUSTAINABLE FARMING PRACTICES
LUTON HOO ESTATE

Project summary

Luton Hoo Estate conducted compound fertiliser trials. The trials tested new low carbon fertilisers, compared to the farm's standard practice. The test was intended to act as a proof of concept for the new fertilisers ability to reduce agricultural carbon impacts. The trialed fertiliser is termed a "compound fertiliser" and is produced by the blending of waste organic fibre, ammonia, and carbon dioxide. Initial results suggests that the new fertiliser has positive effects on carbon impact while maintaining the same yield as that of conventional fertilisers.

Considerations

The study did not explore the differences in costs of the new fertiliser.

Stakeholders

The trials were in collaboration between farmers in Bedfordshire and researches, and fertiliser producers including Luton Hoo Estate; Cranfield University; CCM Technologies.

Co-benefits

Compound fertilisers release significantly less carbon during production than conventional fertilisers, while also encouraging increased soil carbon sequestration. The "closed loop" production method of the fertiliser reduces reliance on finite resources. The use of the fertilisers also reduces leaching during wet periods.

SUSTAINABLE FARMING PRACTICES
APRICOT CENTRE

Project summary

The Apricot Centre in Devon is running a 1-year Level 3 Traineeship which prepares trainees to:

- Work in regenerative farming or small holding type settings;
- Work in post-harvest roles such as food processing in regenerative food products;
- Work in community supported agriculture or the circular food economy;
- Work in regenerative land-based systems;

Progress into higher education courses such as a Level 4 Regenerative Food Systems; BSc in Regenerative Farming and Food systems and other degrees in Agriculture and Rural Studies.

SUSTAINABLE FARMING PRACTICES (CONT.)
APRICOT CENTRE

Considerations
It is unlikely that current agricultural workers will be able to take a year out to study.

Co-benefits
The expansion of regenerative agricultural methods will increase biodiversity, flood and drought resilience and potentially sequester carbon. The Centre also expands post-18 education provision and equips workers with additional skills.

SUSTAINABLE FARMING PRACTICES
CORNWALL COUNCIL

Project summary
Cornwall Council is working with 6 of its dairy farms in a biomethane pilot to enclose their slurry lagoons and enable the biomethane produced to be collected. The biomethane will then be converted and used as fuel for the council's 77 road maintenance vehicles. This will prevent methane being released into the atmosphere from the farm slurry. The remaining digestate can be used as a soil conditioner, removing the need for artificial fertilisers.

Council role
The council project managed and fully funded the pilot.

Carbon savings
The pilot will prevent 16,591 tonnes of CO_2e from being released every year. The project's plans to transition 77 trucks to biomethane fuel will save a further 752 tonnes CO_2e per year.

Each council pothole repair unit converted to fugitive biomethane could reduce CO_2e emissions by five tonnes per year, which is equivalent to the amount of carbon five native broadleaf trees to offset over their lifetime (approximately 100 years).

Co-benefits
This project could generate enough income, over 20 years, to cover the Council's £1.58m capital and borrowing costs. Farmers will receive income from biogas sales, save on energy and fertiliser bills, have access to better slurry storage and be responsible for reduced environmental impacts from methane, NOx and ammonia.

4.4 Agriculture & Land Use
Case Studies – Equality Implications

Below we have assessed the implications of low-carbon actions in the context of different co-benefits and equality considerations.

Intervention	Potential positive co-benefits	Equality implications
Tree cover and urban greening	○ Public health: Provision of shade and cooling. Physical and mental health benefits associated with exposure to green space. ○ Economic security: Improved quality of place in developed commercial areas.	○ Low-income: Green infrastructure projects may require use of existing spaces and services less likely to be found in poorer areas; these projects should also be considerate of areas associated with climate risk.
Land use management	○ Council services: Improved land quality in terms of water retention and ecosystem development. ○ Economic security: Improved land value. ○ Local environment: Improved resilience to extreme weather events and shocks.	○ Businesses: Lack of information on climate risk may lead to developments or projects on sensitive and/or risk-prone areas.
Sustainable farming practices	○ Local environment: Supportive of local biodiversity, reducing transmission of disease. ○ Economic security: Safeguards long-term supply chains and commercial viability. ○ Local environment: Improves soil, air and water quality.	○ Remote communities: Established agricultural practices may be required to change, which may require upskilling and/or knowledge sharing among the agricultural sector. ○ Businesses: Upfront costs may be a barrier to changing practices.

NFU Three Pillar Approach for Net Zero – full case studies can be found here.

Alongside COP26, the NFU published a series of case studies demonstrating their members' commitment to playing their role in achieving net zero.
Activities were grouped along three pillars:
- productivity improvements and better resource use
- farmland carbon storage
- boosting renewable energy

A number of these examples relate directly to the cattle-dominant industry found in Cheshire East, with farmers reporting co-benefits around:
- Financial savings from using local muck rather than bought-in artificial fertilisers
- Improved water retention having adopted new land use measures
- Better collaboration and relationship building with local farmers

A description of these categories can be found in Appendix 7.

4.5 Waste and Industry

4.5 Waste And Industry
Introduction

Scope of Section

This sub-chapter is focused on emissions from waste disposal as well as emissions associated with industrial processing.

Waste emissions are created through landfill and combustion. These have been calculated from collected waste statistics, the emissions for which are assigned at the point of generation as opposed to its treatment.

Industrial processing in this context relates to the production of chemicals, minerals and metal products. Emissions from industrial buildings are covered under the section on non-domestic buildings. Industrial process emissions are assigned to Cheshire East based on the consumption of energy for industrial purposes. This is then split out to the final end-uses of metal, mineral and chemical processing.

Current contexts

- **Approximately 35% of energy consumed by the industrial sector is electricity:** Due to the unique energy demand profiles of industrial processing, electrifying heavy industry is more challenging than other sectors. Emissions are also created in significant quantities through the processing of products themselves, captured in the data opposite.
- **Government data shows that in 2019/20 57% of collected household waste was sent for recycling, compared to 38% for non-household waste:** Data also suggests that over 40% of collected waste is sent to energy recovery facilities, with approximately 3% sent to landfill.

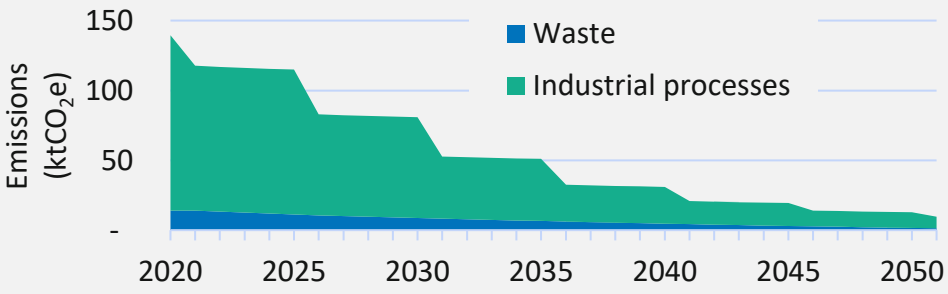


Figure 4.5.1: Cheshire East's waste emissions along the SCATTER High Ambition Pathway, 2020-50.

Outcomes

- **90%** reduction in emissions from waste by 2045
- **14ktCO$_2$e** of waste emissions remaining at 2045

At a glance: SCATTER interventions for this sector

Waste

- Reducing the quantity of waste
- Increased recycling rates

Industrial processes

- More efficient industrial processes
- Shifting industrial processes onto low-carbon fuels

4.5 Waste And Industry
SCATTER Interventions

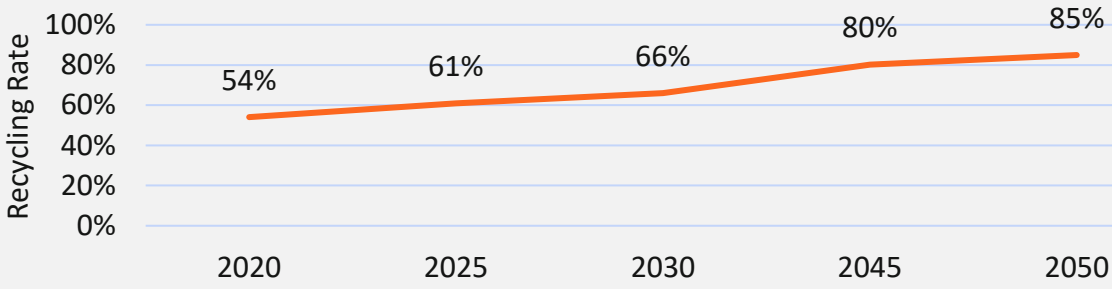
Reducing the quantity of waste

Avoiding the creation of waste in the first instance is the most effective means of reducing emissions associated with disposal as well as along supply chains. The reductions quoted in SCATTER cover waste from households, commercial and industrial usage, construction and demolition.

Increasing recycling rates

After considering the reduction in the quantity of waste outright, the second SCATTER intervention considers the emissions implications of this waste being diverted away from landfill/combustion and recycled instead.

SCATTER's trajectories for recycling rate incorporate EU targets, with the High Ambition pathway subsequently projecting a more rapid transition to increased rates followed by increasing levels in tandem with a more circular economy.



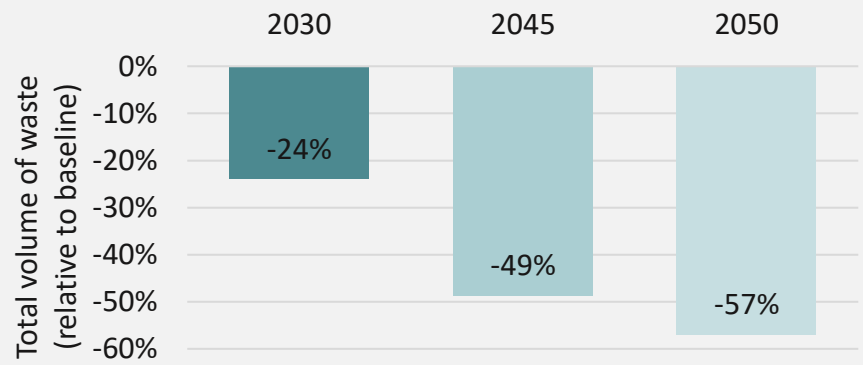


Figure 4.5.2 (top): Modelled change in Cheshire East's recycling rate.

Figure 4.5.3 (left): Changes in the outright volume of waste collected by weight.

Current Context 2020	By 2045
• According to 2019/20 data, the average household in Cheshire East creates over 1,100kg of waste each year	• Total volume of waste falls by 49% relative to baseline levels • Recycling rate reaches 80% across all waste streams

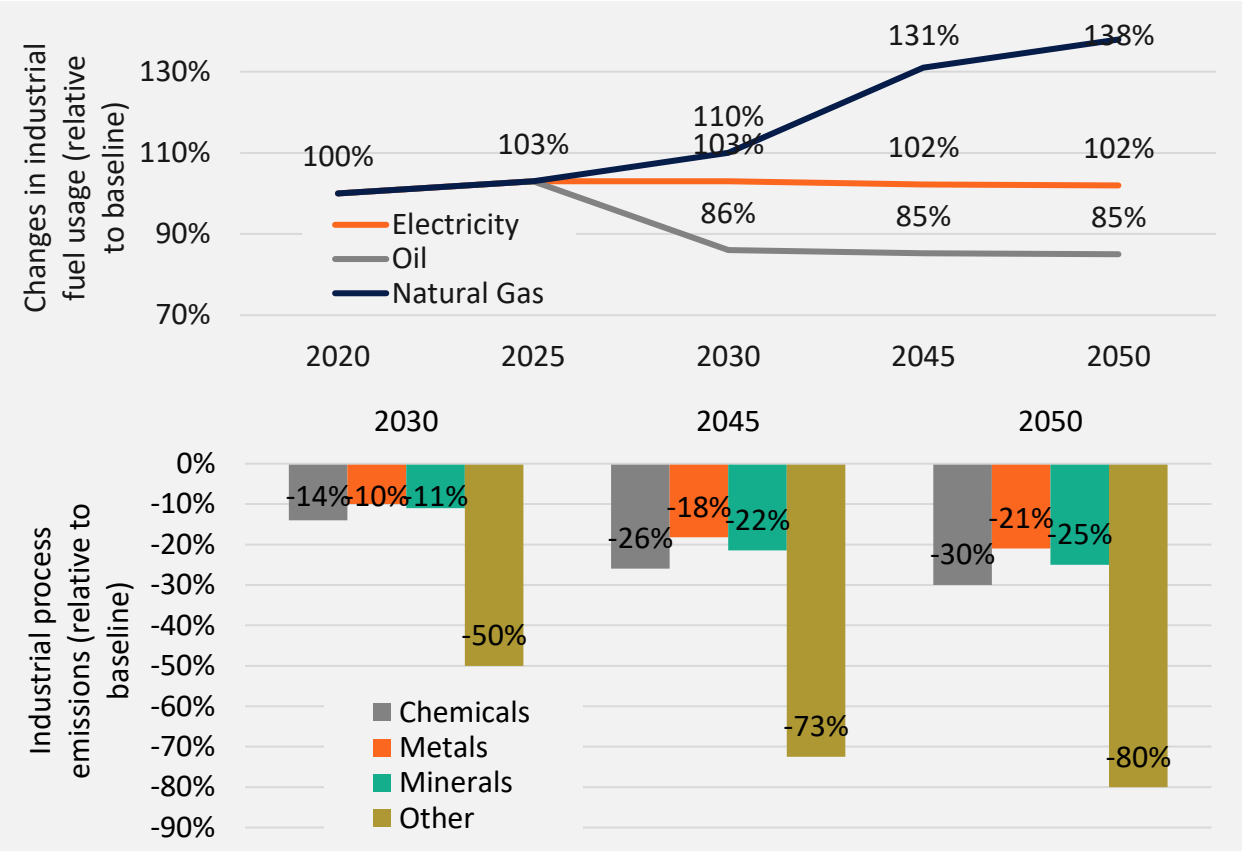
4.5 Waste And Industry
SCATTER Interventions

More efficient use of materials

This intervention models reductions in process emissions resulting from a reduction in the production index of each industry type. Separate trajectories are shown for chemical, metal and mineral sectors as well as a fourth "other" category which captures miscellaneous heavy industry.

Using low-carbon fuels where possible

The second intervention related to industrial processes considers changes in the types of fuels used for industrial processes. The unique demand profiles of industrial processing in many cases prohibit the use of renewable energy sources and a transition to natural gas in this sector is projected within the High Ambition to meet this demand. The majority fuel source in the sector remains electricity under this scenario.



Current Context 2020	By 2045
• Industrial carbon emissions in the UK have halved since 1990 • Since 1990 the chemical sector has improved its energy efficiency by 35%	Process emissions reduced: • 26% for chemicals • 18% for metals • 22% for minerals • 73% other industries

Figure 4.5.4 (top): Changes to fuel usage in the industrial sector.
Figure 4.5.5 (left): Reductions in process emissions across different industries.

4.5 Waste And Industry
Carbon Savings And Indicative Costs

Notes for waste & industrial process sectors

- Mitigating direct emissions from waste disposal offers savings potential at a relatively low end when compared to other interventions across the borough.
- Improved efficiencies in industrial processes and transitioning away from the heaviest fossil fuels offers a significant opportunity for emissions savings.
- Considered purely in terms of gate fees for waste disposal, achieving higher recycling rates is likely to bring significant cost savings compared to current rates, assuming gate fees remain roughly consistent in future years.
- Industrial process costs are taken at a very high level from government projections between a high-ambition case (representative of SCATTER) and a business-as-usual case.
- This is scaled down for Cheshire East according to its national share of industrial process emissions.

For descriptions of types of cost, please see page 32.

SCATTER Intervention	Cumulative Emissions Savings (2020 - 2045)
• Reducing the quantity of waste • Increasing the rate of recycling	**76 $ktCO_2e$**
• More efficient use of materials • Using low carbon fuels where possible	**494 $ktCO_2e$**

Costed measure	Type of cost	Cost to 2045 (£m)
Industrial processes	Capex	27
Waste disposal gate fees	Marginal capex	-150

Figure 4.5.6: Carbon savings for SCATTER interventions along the High Ambition pathway. Table of indicative costings for the implementation of electrification measures and modal shift changes. Negative values indicate cost savings.

4.5 Waste And Industry
Officer Insights

SCATTER Intervention	Barriers	Enablers	Implementation Considerations
Reducing the quantity of waste	*"The UK Government has not yet launched the Deposit Return Scheme legislation"*	*"The council has previously conducted waste prevention campaigns"* *"The council has existing relationships with the Salvation Army to collect textiles"*	*"The council has waste prevention volunteers who can influence their communities and earn rewards for their volunteering hours"*
Increasing recycling rates	*"3% of waste is sent to landfill currently due to reduced recycling operations weekends"* *"Recycling demand is influenced by commodity prices"*	*"The council owns the main waste and recycling processing site"* *"The council's processing facility has capacity to expand collections and generate income from commercial collection"*	*"A mill is currently being developed to recycle materials to create cardboard in the borough"* *"There is an opportunity to collect commercial waste in rural areas on the margins of collection routes"*
Shifting from fossil fuels and more efficient processes	*"The council's influence on large industry may be limited"*	*"Waste collected in the borough is shredded and transferred to an Energy-to-Waste plant, which is currently a heat and power plant to a cement works"*	*"The council has greater influence over SMEs"* *"The council's sustainability commission can support businesses"*

4.5 Waste And Industry
Actions Library

The below tables show potential actions that deliver progress towards the SCATTER intervention milestones:

Impact area	Example actions	Case studies
	Reducing the quantity of waste	
Encourage residents and businesses to reduce waste	• Organise a food waste campaign using community growing projects and education in schools • Signpost zero waste cafes and plastic free business to residents to encourage behaviour change to low waste services • Provide better incentives to commercial sites and workplaces to adopt improved waste management measures	Newham Borough Council (page 92)
Improve the council's waste collection and waste management	• Consider decreasing the number of general waste collections and increasing recycling collections, and ensure suitable waste storage is provided • Consider banning single use plastics within the Council's buildings and events and develop a Plastic Free Strategy across the organisation	Durham County Council (page 92)
	Increasing recycling rates	
Support residents and businesses to improve recycling rates	• Where feasible, ensure households across Cheshire East have access to a food waste bin • Support community groups to develop sharing/circular economy e.g., repair café, library of things, community fridge, food redistribution centres • Work with Household Waste Recycling Centres (HWRCs) to enable individuals without a car to safely access the site and dispose of their household waste and recycling • Expand networks facilitating the donation of edible surplus food to food banks across the borough • Encourage businesses to segregate their waste including their commercial organic waste to reduce food waste through incentives and sharing best practice • Develop a circular economy roadmap for the borough, mapping material flows within the area to identify opportunities for circularity and co-location	Bracknell Forest Council (page 93) The Three Mid Kent Councils (page 93)

4.5 Waste And Industry
Actions Library

The below tables show potential actions that deliver progress towards the SCATTER intervention milestones:

Impact area	Example actions	Case studies
Shifting from fossil fuels and more efficient processes		
Clean growth and low-carbon technology	• Work collaboratively with the Cheshire and Warrington Local Enterprise Partnership to deliver the industrial strategy, particularly focusing on the clean growth challenge • Develop an economic growth vision and strategy to attract investors and investment in low carbon technologies and industries, building on opportunities for a green recovery	East Devon District Council and Devon County Council (page 94)
Support industry to decarbonise	• Set guidance and provide training for promoting zero and low-carbon infrastructure when assessing industrial/commercial planning applications • Develop a forum through which industry can achieve sustained collaboration, showcase leading examples of industrial decarbonisation and signpost carbon reduction support • Encourage local industry to measure and understand emissions, develop a carbon reduction strategy and share best practice by providing support and guidance in collaboration with regional approaches	Worcestershire County Council (page 94)

4.5 Waste And Industry
Case Studies

DECREASED WASTE VOLUMES
DURHAM COUNTY COUNCIL

Project summary
Durham County Council has created its own single use plastic pledge, which it follows as an organisation and encourages others to follow also. 300 organisations and individuals have signed up to the pledge. This includes SMEs, schools and Durham University.
The pledge includes three commitments:

- To ensure unnecessary single use plastics are reduced and ultimately eliminated across their buildings, services and activities
- To support schools, communities and residents in tackling the problem
- To support a single use plastics network within the county

Carbon savings
Removing plastic overshoes from council leisure centres and pools is saving an average of 2.4 tonnes of waste a year.

Council role
The council partnered with organisations including Beamish Museum, The Environment Agency and Northumbrian Water. Resources and responsibility are shared collectively within different service areas, with different departments changing their own area of work.

DECREASED WASTE VOLUMES
NEWHAM BOROUGH COUNCIL

Project summary
Newham Borough Council worked with Keep Britain Tidy to launch the Better Streets Initiative. Better Streets aimed to reduce the number of fly-tipping incidents; to educate and inform residents about fly-tipping and its impact; to measure the impact of each element of the programme with a view to expanding successful initiatives across the borough.

Initial reductions in fly-tipping of at least 64% on average with longer-term reductions averaging at least 50% lower than pre-trial levels.

Co-benefits
The initiative can lead to positive effects on wellbeing through improvement environments.

4.5 Waste and industry
Case studies

INCREASED RECYCLING
BRACKNELL FOREST COUNCIL

Project summary
Bracknell Forest Council awards households points for each collection of uncontaminated recyclables. The scheme uses smartcards which are used to redeem the points from council-run premises, such as leisure centres. Points can also be donated to charitable causes.

Co-benefits
The scheme has raised awareness of recycling and increased engagement with residents, helping Bracknell Council to promote other initiatives. The scheme also provides free access through recreational and sporting activities through points accumulation, improving health and wellbeing.

Council role
The council is responsible for administration and funding the cost of the incentive activities, such as days designated for dropping off electrical waste items. The council partnered with SUEZ recycling.

INCREASED RECYCLING
MID KENT COUNCILS

Project summary
The councils addressed the variations in services including differences in materials collected for recycling, frequency of collection, containment and delivery arrangements to be more consistent. Average recycling rates across East and Mid Kent have risen from 31.41% in 2010/11 to 45.30% in 2014/15.

Co-benefits
The scheme enabled a predicted net benefit of £60 million saving over the period 2010/11 to 2022/23.

Council role
The Mid Kent group (formed in 2011) is comprised of a similar cluster of three districts: Ashford Borough Council, Maidstone Borough Council and Swale Borough Council, also working with Kent County Council. Both clusters are a subset of the Kent Resource Partnership (KRP).

Funding
The capital investment from the consolidation was recovered through operational costs savings.

4.5 Waste And Industry
Case Studies

INDUSTRIAL PROCESSES
WORCESTERSHIRE COUNTY COUNCIL

Project summary
Worcestershire County Council administers the Business Energy Efficiency Programme for SMEs across the West Midlands. The programme provides free energy and resource efficiency reviews and grants of up to £20,000 and funds lighting, refrigeration, energy storage and management, and energy efficient equipment that leads to process improvements.

Co-benefits
Business can reduce energy costs due to increased energy efficiency.

Council role
Worcestershire County Council administers the programme between the regional councils and Shropshire Chambers of Commerce.

Funding
The project is receiving up to £2.1m of funding from the European Regional Development Fund.

INDUSTRIAL PROCESSES
EAST DEVON & DEVON COUNCILS

Project summary
East Devon District Council and Devon County Council have collaborated to support the development of the Exeter and East Devon Enterprise Zone programme. Projects include Exeter Science Park, which provide accommodation for up to 100 jobs in STEMM sectors in a building which has net-zero operational emissions.

Co-benefits
The collaboration has helped to create jobs and a skilled workforce for the future including in Science, Technology, Engineering, Maths, and Medicine sectors (STEMM) and green industries.

Council role
Collaboration alongside local education institutions as well as partners from the private sector and other public sector organisations.

Funding
East Devon invested £1.1m in the development of the Ada Lovelace Building as part of the Exeter and East Devon Enterprise Zone programme.

4.5 Waste And Industry
Case Studies – Equality Implications

It is crucial that Cheshire East considers strategic objectives that extend beyond carbon reductions when action planning. These include reducing inequality, improving public health and encouraging economic security. Below we have assessed the implications of low-carbon actions in the context of different co-benefits and equality considerations.

Intervention	Potential positive co-benefits	Equality implications
Reducing the quantity of waste and improving recycling rates	○ Public health: Reduction in transmission of illness due to reduction in flow of waste into the environment. ○ Local environment: Improved air quality and reduced water and land contamination. Reduction in use of natural resources to develop products. ○ Economic security: More circular local economy provides financial relief to lower-income residents and businesses. Opportunities for investment in circular economy business.	○ Businesses: Sanctions for waste management and collection may disproportionately impact some sectors and geographic areas more negatively. ○ Low-income residents: Opportunities for reducing waste may be minimal if access to low or no waste goods and services is expensive. ○ Vulnerable/disabled residents: These communities may need more products in daily life such as the use of disposable items and mobility equipment and should not be negatively impacted by waste reduction measures.
Shifting from fossil fuels and more efficient industrial processes	○ Local environment and public health: Improved air quality and reduced water and land contamination. ○ Economic security: Reduced demand for raw materials yields cost savings through efficiency gains. Improved efficiency of processing can reduce energy demand resulting in lower bills for businesses.	○ Businesses: Changes to established methods and modes of working may mean that some businesses require a different profile of worker's skills, which may lead to changes in jobs.

4.6 Energy Supply

4.6 Energy Supply
Introduction

Scope of Section

This sub-chapter is focused on the parts of the SCATTER model that deal with energy generation. The availability of low-carbon electricity is crucial to the success of decarbonising Cheshire East. This includes both the decarbonisation of the incumbent supply (i.e. the national grid) as well as the creation of much more renewable energy sources locally that can support increased demand for electricity as a result of the transition to electrified heating and transport.

SCATTER treats Cheshire East in "island mode" and considers the amount of installed technology required to meet local demand with local generation. In order to do this, a baseline level of renewables are modelled in the borough, which differs from the *actual* level of installed capacity. This is shown below in Figure 4.6.1. SCATTER models growth in a range of renewable energy technologies. The specific technology that ultimately delivers this supply is ultimately flexible, however, and the statistics given in this section are not prescriptive of the *type* of technology that must be installed, but is more so representative of the *scale* of capacity required to meet local demand.

Current contexts

- **Solar PV is the dominant technology within the local renewable sector, accounting for over 80% of all installed capacity:** There are over 5,400 PV installations as of 2021, with the mean installed capacity per site approximately 10kW. A typical household installation is between 4-6kW.
- **Sewage gas and other gaseous renewables are also significant in the borough:** These larger sites are responsible for almost half of all renewable generation currently in Cheshire East. Anaerobic digestion, sewage gas and landfill gas sites generated an equivalent amount of power as solar PV in 2021.

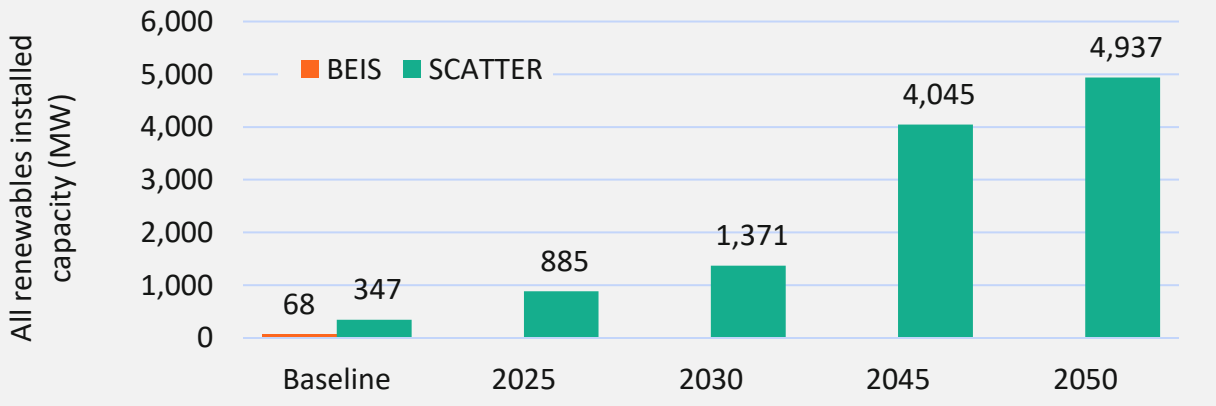


Figure 4.6.1: Cheshire East's local renewable energy installations as projected within SCATTER, 2020-2050.

At a glance: SCATTER interventions for this sector

Small-scale technologies
- Local PV
- Onshore wind

Large-scale infrastructure projects
- Offshore wind

4.6 Energy Supply
SCATTER Interventions

Energy generation within SCATTER

A variety of technologies are modelled within SCATTER's High Ambition pathway, based on the National Grid's Two Degrees Scenario as published in the Future Energy Scenarios (FES). The FES Two Degrees scenario projects growing levels of generation across different technologies, usually scaled to a specific area (i.e. MWh generated per hectare). SCATTER uses this approach, plus data on the projected future energy demand for Cheshire East – which is influenced by various interventions – to define how much of each technology is required locally to meet that demand. Technology splits within SCATTER are not necessarily based on local geographic contexts and it should be noted that the milestones in future years represent the scale required to locally meet the increased demand for electricity as much as possible. It is likely that a broad range of technologies and solutions will be required; SCATTER is only one potential future distribution of these.

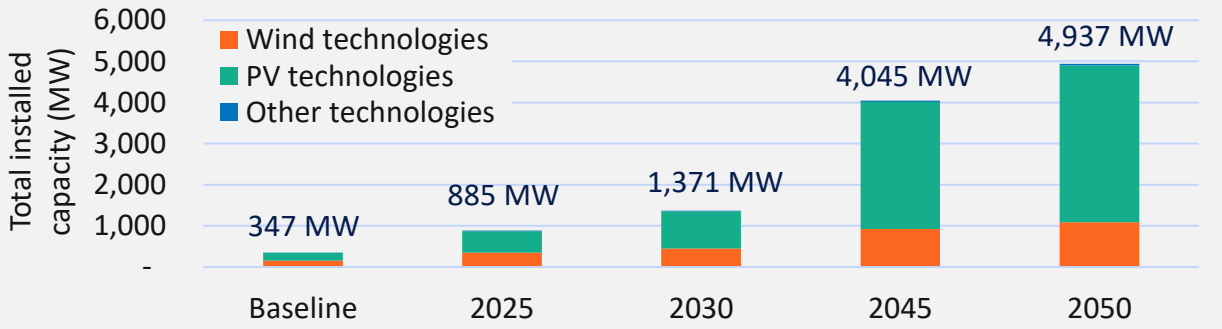


Figure 4.6.2: Cheshire East's local renewable energy capacity as projected within SCATTER, 2020-2050. A more detailed breakdown is given in Appendix 4.

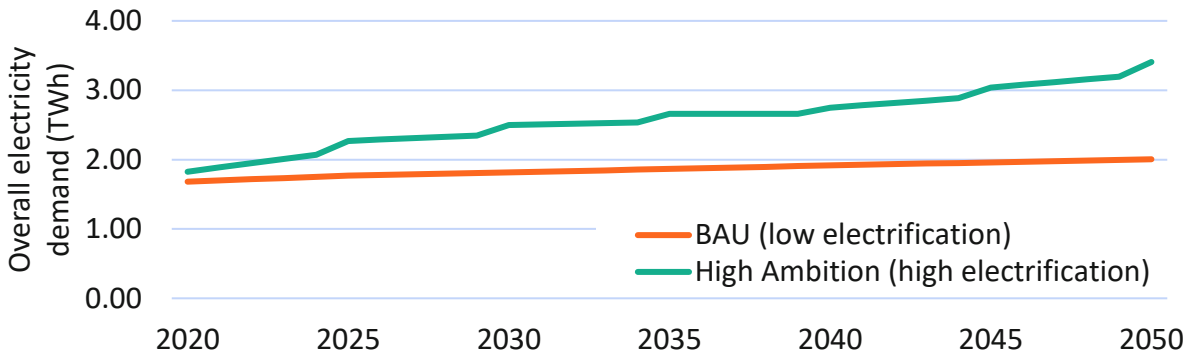
Type of technology	Current installed capacity	By 2045
Local wind: smaller scale wind turbine installations	• 0.4 MW across 17 sites • 740 MWh generation	304 MW
Large onshore: wind turbines managed by major power producers		180 MW
Large offshore: wind turbines managed by major power producers		435 MW
Local PV: smaller scale PV installations	• 55 MW across 5,500 sites • C. 46,000 MWh generation	1,547 MW
Large scale PV: installations managed by major power producers		1,540 MW
Hydro: small- and large-scale installations	• 0.2 MW across 5 sites	30 MW

4.6 Energy Supply
SCATTER Interventions

Notes for energy sector

- Directly comparing supply-side savings and demand-side savings can lead to double counting in many cases. Shown opposite in Figure 4.6.3 is the impact of High Ambition interventions on the overall demand for electricity, compared to the business-as-usual case.
- Rapidly scaling up the provision of locally available renewables has significant implications for almost all other interventions described in this study, across building heating systems, electrification of transport and divestment from fossil fuels for industrial purposes.
- Costs shown below in Figure 4.6.x are based on government estimates for the cost of installation (capex) and maintenance (opex) for different renewable technologies. These are given in literature as a £/MW and/or £/MWh value and have been scaled to Cheshire East according to the outputs from SCATTER on how much of each technology is required to meet demand locally.
- Capex estimates include pre-development costs, construction and infrastructure. Opex estimates include fixed maintenance, insurance and connections upgrades.

For descriptions of types of cost, please see page 32.



Costed measure	Cost to 2045 (£m)	
	Capex	Opex
Small-scale PV	1,218	238
Large-scale PV	364	309
Onshore wind	179	124
Offshore wind	578	923
Hydro	29	17

Figure 4.6.3 (above): Projected changes in overall electricity demand along BAU and High Ambition pathways.

Figure 4.6.4 (left): Carbon savings for SCATTER interventions along the High Ambition pathway. Table of indicative costings for the implementation of electrification measures and modal shift changes. Negative values indicate cost savings.

4.6 Energy Supply
Actions Library

The below tables show potential actions that deliver progress towards the SCATTER intervention milestones. In the case that these link forwards to a case study, please click the link given in the final column of the table to read more details on example projects of this type.

Impact area	Example actions	Case studies
	Increase solar PV capacity	
Maximise installation of solar panels on properties	• Evaluate the opportunities for solar panels within the borough's social housing • Investigate suitable opportunities for installing solar panels on council-owned buildings or ground mounted on council owned land where feasible • Collaborate with local training colleges and educational centres to build skills and capacity within the local workforce to install solar panels • Consult with residents on the benefits of installing solar panels and the potential opportunities from initiatives like solar streets • Provide a solar map for businesses and residents to indicate how appropriate their building is for rooftop solar panels	Cambridgeshire County Council (page 103)
	Increase wind capacity	
Maximise installations of wind turbines	• Conduct a renewable energy feasibility study to evaluate the opportunities for wind turbines across the borough • Install wind turbines on council owned land where opportunities are identified by the feasibility study • Explore opportunities to invest in the development of a wind farm within or outside of the borough • Collaborate with local training colleges and educational centres to ensure skills and capacity within the local workforce to install wind turbines • Consult with landowners on the benefits of installing wind turbines and encourage them to install them on private land • Provide a wind map for businesses and residents to indicate how appropriate their land is for turbines	Bristol City Council (page 104) Caerphilly County Council (page 102)

4.6 Energy Supply
Actions Library

The below tables show potential actions that deliver progress towards the SCATTER intervention milestones. In the case that these link forwards to a case study, please click the link given in the final column of the table to read more details on example projects of this type.

Impact area	Example actions	Case studies
	Increase the capacity of renewable technologies	
Opportunities for renewable energy generation are identified and barriers are reduced	• Review renewable potential across the borough and identify barriers through a renewable energy feasibility study • Use policy to prioritise the key strategic sites identified in the feasibility study to overcome the barriers identified • Increase the requirements for renewables in the new Local Plan • Coordinate action with Electricity North West on initiatives to significantly increase the demand on electricity for heating/ power (as opposed to fossil fuels) and to identify opportunity areas for investment	Bristol City Council (page 104)
Support businesses to maximise renewable energy installations	• Explore a Power Purchase Agreement for renewable energy supply with other organisations. If this in not possible, ensure any excess demand not met by council owned renewables is from (3rd party) purchased renewables • Explore ways to expand on or develop opportunities around large-scale energy storage solutions in collaboration with key businesses • Provide support for SMEs to access funding and collaborate on energy projects through a shared platform • Develop business-owned renewable technology projects in commercial areas through collaboration and partnerships	Warrington Borough Council (page 102)
Support residents, schools and community groups to maximise renewable energy installations	• Support community energy projects and provide guidance to local residents and schools through an awareness raising program to promote renewable installation • Provide support for residents and schools such as grants, loans or subsidies to install renewable technology • Encourage community renewable technology projects, such as through the co-operative ownership model	Barnsley Metropolitan Borough Council (page 104) River Bain Hydro Project (page 103)

4.6 Energy Supply
Case Studies

SOLAR PV
WARRINGTON BOROUGH COUNCIL

Project summary
Warrington Borough Council has purchased a 34.7MW hybrid solar PV farm in York from Gridserve. The Council also purchased a second solar PV farm from Gridserve in Hull. Gridserve will operate and maintain the farms.

Co-benefits
The site uses 30MW of battery storage to help balance the grid. Warrington Borough Council aims to make significant revenue from the energy produced from the York site whilst using energy generated from the Hull site to meet all of the council's own energy demand.

The revenue predicted to be generated includes an operating surplus of over £100m over 30 years, which the council aims to invest in essential services. The use of community municipal bonds for funding enables the financial benefits to be shared with local residents who may have contributed.

Funding
Warrington Borough Council used Community Municipal Bonds to fund the purchase of the sites. The direct cost to the council was approximately £12,000 in legal costs, and 15-20 hours of staff time. The minimum bond amount was £5.

WIND
CAERPHILLY COUNTY COUNCIL

Project summary
Caerphilly County Council is exploring investing in an onshore wind farm through a shared partnership model with a private green energy company. The proposed site will consist of up to seven turbines with an installed operational capacity of up to 30MW.

Council role
The council would contribute to building costs and receive a return in revenue.

Co-benefits
The Council will maximise benefits to the local community through the partnership's project, potentially through the creation of local green jobs and cheaper energy.

4.6 Energy Supply
Case Studies

SOLAR PV
CAMBRIDGESHIRE COUNTY COUNCIL

Project summary

Cambridgeshire County Council has developed a 70-acre, 12MW solar farm. Building commenced in 2016 and went live in January 2017. The farm produces enough energy to power 3,000 homes. In its first year, it over-performed the expected electricity generation by 5%.

Council role

The council coordinated local research and industrial assets including Cambridge University, Anglia Ruskin University and a growing renewable technology sector for the project. The council also drew on its in-house upskilled staff who had previously identified a framework for the council's energy infrastructure investments.

Co-benefits

The site returns a net £0.35m revenue per year for the council, which will increase to £1m once funding loans are repaid. Year 1 raised £50,000 above the project income per annum. The council has used the revenue towards funding for adult social care services.

Funding & carbon savings

The Triangle Solar Farm was funded via the Public Works Loan Board and funding from the Contracts for Difference renewable auction and the European Regional Development Fund. The solar farm is projected to save around 135,000 tCO_2e over its 25-year lifetime.

HYDRO
RIVER BAIN

Project summary

The River Bain Hydro project is a community-owned hydropower scheme in the Yorkshire Dales. The scheme comprises a 45kW reverse Archimedean screw hydropower installation. The project was developed through a partnership by a community interest company and River Bain Hydro Ltd, an industrial and provident society (IPS) set up to own and manage the scheme.

Co-benefits

Local residents benefit from the profits of the project's income from electricity generation. The project generates £30,000 revenue per annum through the Feed-In Tariff.

Funding

The project cost £850,000. 40% was raised through shareholders who invested in the scheme, including individuals, the public sector and corporate bodies. Grants were used for £100,000 of the cost, including from CO_2 Sense and Yorkshire Dales National Park Authority's Sustainable Development Fund, alongside a Charity Bank loan.

4.6 Energy Supply
Case studies

SOLAR PV
BARNSLEY METROPOLITAN BOROUGH COUNCIL

Project summary
Energise Barnsley is a registered community benefit society that installs solar PV and battery storage. Small-scale solar PV has been installed at over 300 sites totalling 1.5MW, with 90 batteries installed at residential sites. 16 non-domestic sites have also had installations. The scheme works on demand-side response, peer-to-peer trading, asset management and community funding.

Council role
Barnsley Metropolitan Borough Council are a partner in the project and a custodian trustee. The project generated significant income from the Feed-In Tariff, which no longer applies to new installations. Additionally, Energise Barnsley own the solar PV assets, not the council nor residents.

Co-benefits
75% of homes which received installations were bungalows inhabited by elderly individuals, with 25% of all residents on pre-payment meters, helping to reduce energy pressures on vulnerable groups. The provision of a renewable energy source reduced energy bills by 30% from the solar panels and a further 20% from the battery storage, saving over £40,000 in energy costs in 2014-15 alone.

Funding
The project cost £2 million and has been funded by a £800,000 retail bond and a £1.2 million loan from an ethical lender (Charity Bank). Local residents were able to invest in the scheme and have benefitted from the returns – 60% of the community bond is owned by local residents.

WIND
BRISTOL CITY COUNCIL

Project summary
Bristol City Council owns two wind turbines at a former Shell Tank site, which will generate 14.4GWh per annum.

Council role
The council hired specialists to study impacts on bird populations and worked closely with Natural England to ensure their monitoring requirements were met. The council also had a dedicated communications team to generate local support. As the council was applying to its own planning committee for permission, any decision made by the committee would be binding, with no recourse to appeal. Consequently, the application had to pre-empt objections.

Co-benefits
The site is set to generate £1 million each year from Feed-In Tariffs (FITs), Levy Exemption Certificates and electricity sales.

Funding
The set-up cost was budgeted at £9.4m. The council funded the project through borrowing, with the costs to be recouped within 20 years, since the site provides returns of £1m each year. The Council's self-funded Building Management Unit also contributed to the set up of the project.

4.6 Energy Supply
Case studies

Below we have assessed the implications of low-carbon actions in the context of different co-benefits and equality considerations.

Intervention	Potential positive co-benefits	Equality implications
Increasing coverage of domestic renewables	○ Council services and economic security: Increased grid resilience and energy security. Increased ability to cope with increases in future energy prices. Can provide long term return on investment and reduced energy bills for consumers.	○ Remote communities: Can support these communities with increased energy security and reliability. ○ Low income: In homes that are rented, residents do not wield the authority to install renewable infrastructure, but landlords do not recoup capital investment through reduction in bills.
Increasing coverage of non-domestic renewables	○ Economic security: Increased grid resilience and energy security. Improved asset value and means of income for businesses and other stakeholders.	○ Businesses: Likely to incur significant upfront costs not only in the installation of renewable technology but also new electrical infrastructure to manage decentralized power.
Increasing coverage of large-scale renewable infrastructure	○ Council services: Creation of new jobs for installation and maintenance. ○ Local environment: Reduction in air pollution associated with fossil-fuel based energy generation. ○ Economic security: Cheshire-wide infrastructure likely to incur much lower maintenance costs than centralized grid system.	○ Remote communities: Council and business will need to engage with local communities and reach agreement with landowners that considers current usage (e.g. as agricultural land). ○ Businesses: Agricultural businesses will require support to enable large scale renewable installations.

Energy Local Clubs – decentralised energy

Energy Local is a community interest company which has successfully launched small-scale "clubs" that deliver locally-generated electricity to residents at a market-beating tariff. Instead of power being sold to suppliers and then bought back via the grid at a higher price, members can access the supply at cost price, alleviating a significant proportion of residents' bills. More recently Energy Local has partnered with mid-level suppliers to grow their offering.

Repowering – skills building through renewable energy

Repowering focuses the energy transition within community context by providing skills training for young adults around community engagement and marketing in the context of renewable energy. Repowering creates community benefit societies, which invest in renewable energy and training for residents and then uses proceeds from power generation to part-fund administrative costs.

5 Developing an Action Plan

5. Developing An Action Plan
Introduction

Developing actions into a comprehensive plan will require various considerations beyond solely emissions reductions (see Figure 5.1a). It is also true that the council will need to mobilise a significant coalition of partners to achieve the scale of behavioural change and project delivery for Cheshire East to reach its target (see Figure 5.1b).
This chapter of the report focuses on best practice and case studies on the following areas:

- Defining the council's role in action planning
- Encouraging activity within existing networks and partnership building
- Developing inclusive and collaborative methods of engagement with stakeholders across the borough
- Monitoring and reporting progress on the borough's progress

Political will and public opinion

Physical infrastructure limitations

Availability of skills

Timescale of delivery

Timely access to capital at scale

Capacity and resource across the council

Equity implications

Stakeholder group	Networks within Cheshire East
Local government	Cheshire East Council, town and parish councils
Businesses	Chamber of Commerce, Local Enterprise Partnership, Cheshire Leaders Forum, NFU
Third sector	Housing providers, public health, education sector
Residents	Community action groups, local branches of environmental organisations
National government	Members of Parliament

Figure 5.1a (top): Table of common considerations beyond carbon reduction that influence action planning development.
Figure 5.1b (bottom): Non-exhaustive list of the different stakeholders required to mobilise to achieve the ambitious action required to meet the borough's 2045 target.

5. Developing An Action Plan
Stakeholder Roles

Local authorities are typically directly responsible for less than 5% of the total emissions in their area. The scale of change required to achieve the borough's 2045 target means that every business and resident will have a role to play in making the borough sustainable, prosperous and healthy.

- Businesses and the third sector organisations must act in a way that not only reduces their direct emissions impact but also supports the borough's ambitions for Net Zero. It is the business community's role to invest in sustainable solutions that support an innovative, ambitious transition to new ways of working. In turn, they can influence behaviour change among their employees, customers and networks alongside their supply chains to take meaningful climate action. They can support the creation of new inclusive, local jobs for the future.
- Residents must make changes in how they live and move which can help reduce emissions. They can shape and create neighborhoods that meet their daily needs close to home. Residents can create demand for sustainable products and services with their consumer choices and have a powerful voice to call for change from their employers, companies, local and national governments. By talking about climate change with others, residents in Cheshire East can help encourage others to act.
- National government aims to reduce emissions by 78% by 2037 compared to 1990 levels. The 2021 Net Zero Strategy states that by 2035, the sale of gas boiler will be ended, and the UK will have a fully decarbonised power system. National government policy will have significant influence over the success of the borough's local ambitions through policy and funding decisions.

The role of Cheshire East Council will take many forms. Shown below in Figure 5.2 is a breakdown of the different functions the council can play. These have been listed according to the "degree of influence" which describes the extent to which those roles can directly impact emissions in the borough. When defining actions to undertake, it is useful to consider this level of influence and associated impact.

Degree of influence over emissions	Council role
Strongest	• Setting a best practice low-carbon example across the council's own operations
High	• Working with strategic partners locally to deliver projects (e.g. using local suppliers for procurement and commissioning) • Encouraging carbon reduction measures through policy decisions
Medium	• Bringing together stakeholders to act collectively in partnership • Linking climate action to other objectives in the borough • Lobbying national government for greater ambition
Weaker	• Providing education and guidance to stakeholders and residents • Sharing resources as a trusted source of information

5. Developing An Action Plan
Climate Partnerships

Climate partnerships bring together the council and external stakeholders to focus on climate change mitigation and adaptation. This is captured by CDP's model for City-Business Climate Alliances (CBCA), which serve to *"co-create solutions to drive down emissions and adapt to climate change."* Climate partnerships bring a range of benefits including the sharing of resources and experience as well as engagement with local communities leading to increased awareness. Partnerships are where specific authority-based insetting (ABI) projects are likely to be identified, in addition to common barriers and enablers to greater action.

Leveraging existing networks into climate partnerships

The CBCA model from CDP sets out a roadmap for convening stakeholders with the specific intention of accelerating action on reducing emissions. Consistently throughout engagement with council officers, it was stressed that existing networks can and should be repurposed to incorporate elements of climate action. This means that climate action is centred within existing networks and relationships as opposed to being an "add-on". Adopting principles from the CBCA model, existing networks within Cheshire East could be harnessed for the following:

✓ **Assess climate goals at a partner level**
- Measure existing emissions context for each partner
- Define granular goals for partnerships consistent with local targets

✓ **Understand maturity and skills of different partners**
- Build understanding of partner needs for support in the context of sustainability
- Connect partners across relevant sectors that "plug gaps" in understanding

✓ **Deliver low-carbon actions consistent with group priorities**
- Maximise the use of structures that support functioning group activities (e.g. geographical clustering)
- Design and communicate sustainability actions within the context of existing group priorities

✓ **Create and activate partnership plans**
- Pool knowledge and best practice
- Use mechanisms of implementation for low-carbon initiatives that could connect community groups with businesses, such as Authority Based Insetting
- Communicate with the public consistently and openly

Insights from officer workshop
- Existing groups like the Cheshire Leaders Forum can and should be involved in this response to act as a decentralised source of trusted knowledge and expertise on sustainability.
- Chambers of Commerce, Local Enterprise Partnerships and relationships with large businesses (e.g. Bentley and AstraZeneca) are also important networks to test climate partnerships with.
- The council should leverage activities already happening within small-scale community groups by connecting best practice across local groups.
- Cheshire East's 2045 target should help achieve other borough-wide goals on reducing inequality and improving public health; prioritising projects which meet overlapping objective areas should inform policy development.

5. Developing An Action Plan
Council-business Collaboration Case Studies

London Business Climate Leaders (LBCL)

- **Background:** LBCL is a partnership with the Greater London Authority and 11 prominent London businesses who represent annual turnover of £192bn to help meet their zero-carbon targets.
- **Current status:** Each partner has committed to time-bound, measurable targets around waste generation, renewable energy procurement and company vehicles within the city.
- **Point of emphasis:** *Accurate emissions impact assessments*: The group is working to reduce their carbon emissions specifically from London-based operations and work in collaboration across a wide range of emissions sectors.

Zero Carbon Oxford Partnership (ZCOP)

- **Background:** ZCOP was created from Oxford City Council's Zero Carbon Oxford Summit where partners came together to commit to the target of Net Zero by 2040. This partnership will compliment the pre-existing Project LEO, one of the UK's most ambitious and wide-ranging energy trials.
- **Current status:** ZCOP published the 2040 Net-Zero Action Plan in July 2021 which draws on emissions modelling and workshops to define near- and mid-term priorities for action.
- **Point of emphasis:** *Action planning with a large group of stakeholders:* Actions were drawn from the existing pipelines of ZCOP partners to build on existing activity as well as external research. Following workshops, actions common to multiple partners were grouped and reviewed against strategic aims. This was followed by a round of interviews with partners to define specific implementation steps, roles and identify gaps in actions.

Shropshire's Climate Action Partnership (SCAP)

- **Background:** SCAP is a not-for-profit organisation with the main objective of representing the entire the borough to ensure that Shropshire achieves its Net Zero goal by 2030.
- **Current status:** The SCAP published their action plan in 2021 having originally been founded the year prior. Their plan is a public-facing document focused across the county's emissions.
- **Point of emphasis:** *Identifying stakeholder strengths and stimulating action from new partners:* The partnership brings together universities, the Centre for Sustainable Energy, the Chamber of Commerce, Shropshire Wildlife Trust and numerous other stakeholders who hold significant influence within the county. Businesses and individuals can sign up using an online form which defines low-carbon "attributes" for those wishing to get involved. Actions within the plan are organised according to different stakeholders, with a thread of collaborative ownership throughout i.e. the plan is not written from the perspective of any one group, but representative of the Partnership's views as a whole.

5. Developing An Action Plan
Council-business Collaboration Case Studies

Manchester Climate Change Partnership (MCCP)

- **Background:** MCCP is a network of around sixty members from ten different industry sectors within Manchester, responsible for overseeing and coordinating climate change action within the city. Collectively, members are responsible for around 20% of the city's direct emissions.
- **Current status:** Since its inception in 2018, MCCP has developed terms of reference for members as well as defined a series of partner-specific action plans in line with the city's short-term climate targets.
- **Point of emphasis:** *Using existing networks to amplify resources and guidance on sustainability:* The recent BeeNetZero programme provides practical advice on emissions reduction for SMEs leverages existing networks and "connector" organisations (the Local Enterprise Partnership and ERDF-funded Business Growth Hub). Using the LEP and Business Growth Hub provides a means of reaching a large business population.

Climate partnerships – inclusive community engagement

Another crucial consideration in the development of Cheshire East's action plan is the incorporation of *people-centred climate action.* Regions which consider the contexts and views of residents in action plan development have reported significant additional co-benefit potential compared to those that don't. Optimizing the overlap between low-carbon activities and other social goals for the borough was repeatedly identified as a priority by council officers.

People-centred climate action

The WRI defines people-centred climate action as doing three things:

- Identifying and unlocking social and economic benefits;
- Targeting those benefits to further equity;
- Ensuring a just, well-managed transition away from a high-carbon economy.

A recently published paper on this topic from CDP builds on this definition further, establishing that people-centred climate action *"considers people's needs as a central part of the assessment, target-setting, planning and implementation stages of action."* This process suggesting that action should:

- Identify vulnerable groups most in need of support
- Analyse local experiences and the needs and capacities of different communities
- Engage with people in a transparent and deliberative process
- Give agency to socially and economically marginalised groups
- Use lessons learned by those facing climate risks to deliver just adaptation strategies which unlock social and economic benefits

5. Developing An Action Plan
Inclusive Community Engagement

The roles that residents can play in implementing the action plan are widely varied. The council should adopt these *people-centred* principles and involve residents at the following stages of development and delivery:

- **Assessment:** Conducting a climate risk and vulnerability assessment (CRVA) is a means of identifying the groups that will be most severely impacted by climate change in Cheshire East. Tools such as the Anthesis/Cheshire East Town and Parish toolkit are also valuable resources to galvanise action at the sub-borough level for specific groups.
- **Target-setting & planning:** Citizen's assemblies can offer locally specific details on resident priorities and interests and have been used throughout the UK to coordinate actions with residents. There are many examples of this mechanism being practically applied, but in particular the work carried out by Southwark Council provides a useful case study on making this an inclusive and representative process.
- **Implementation:** To implement actions once designed, there are multiple means through which residents can remain involved and consulted on progress. These are explored in more detail overleaf.

Benefits of designing people-centred climate actions

Around two thirds of CDP-reporting cities are taking "people-centred" climate action. Of those cities, the following co-benefits have been reported:

- 85% of cities reported public health benefits
- 85% identified social benefits such as increased food security
- 84% saw economic benefits, including improved productivity
- Cities are five times more likely to realise job creation as a co-benefit of climate change
- 75% of cities reported improved environmental benefits such as improved green space and soil quality

Council-resident collaboration – case studies

Climate vulnerability and risk assessments: identifying vulnerable groups in need of support

- **Background:** The UK government is required to publish a national climate change risk assessment every five years under the terms of the Climate Change Act. This identifies material risks arising from current and predicted changes to the UK climate. Risks are split into sectors similar to those used to report emissions data, with an additional analysis of the impacts on people, wellbeing and health.
- **Current status:** Translating national analysis into a locally-specific assessment is not yet widespread among local authorities and there are limited case studies. Kent & Medway and Trafford have in recent years conducted research into the likely impacts of climate change on residents in terms of health and wellbeing. DEFRA's ADEPT framework offers best practice guidance and suggested actions relating to adaptation, many of which relate directly to the identification of vulnerable groups within local authorities.
- **Point of emphasis:** The Global Covenant of Mayors have also set out key steps to developing climate vulnerability assessments. Part of this best practice specifically defines assessing climate impacts for the elderly, medically vulnerable and those with low incomes.

5. Developing An Action Plan
Inclusive Community Engagement

Southwark Citizen's Jury: engaging in a transparent and deliberative process

- **Background:** A period of engagement with selected residents helped the council to determine the priorities of local people. The jury was asked to consider what needs to change in the borough to tackle the climate emergency in a fair way for local people and nature.
- **Current status:** The jury's findings and priorities were reported back to the council following the conclusion of the process. Ultimately 88% of the recommendations were added to the council's action plan.
- **Point of emphasis:** Engaging in a transparent and deliberative process. Members of the jury were specially selected to achieve a representative group of age, gender, ethnicity, socio-economic class and existing views on climate change. Prioritisation of transparency and communication on council progress encouraged this plan to be updated "live" on a dedicated web app which encourages ongoing feedback between residents and the council.

Camden Climate Investment: analysing local experiences and the needs and experiences of local groups

- **Background:** Camden Climate Investment (CCI) is an innovative community municipal investment scheme which allows residents to directly invest in projects that form part of the council's 2020-25 Action Plan.
- **Current status:** In late summer 2022, CCI reached its £1m fundraising target, which will now be spent on priority projects in the borough. Investors will receive their initial capital back within five years.
- **Point of emphasis:** Actions within the council's plan were heavily informed by the UK's first Citizen's Assembly, conducted using similar principles as were eventually used in the Southwark Citizen's Jury. CCI then allowed residents and businesses to invest directly in priority projects identified through development of the Plan.

Brighton & Hove Energy Services Co-operative (BHESCo): giving agency to local residents to make change

- **Background:** BHESCo is a not-for-profit social enterprise. It historically focused on community-based installations of renewable energy technology but offers a range of projects and services focused on household energy efficiency.
- **Current status:** ZCOP published the 2040 Net-Zero Action Plan in July 2021 which draws on emissions modelling and workshops to define near- and mid-term priorities for action.
- **Point of emphasis:** Giving agency to local residents to make change. Projects are conceived and designed by local people with implementation usually carried out by local contractors. The council has both devised similar projects for residents (such as the Solar Together group-buying scheme) but als works directly in partnership with BHESCo (such as through the ABI scheme).

5. Developing An Action Plan
Recommendations

Partnership building recommendations for the council

- **Improve visibility of organizational emissions performance:** Stakeholders/ networks are likely to have a good understanding of their emissions impact and those that don't should be encouraged to do so as a priority measure. This exercise can then support the development of more data-driven goals and actions. CDP offer business "scans" of specific organisations which provide an initial emissions screening of an organisation.

- **Identify the specific materials and resources that can be disseminated through existing networks:** Council officers were keen to point out that integrating low-carbon actions within existing networks may require some upskilling among stakeholders to ensure they communicate the "right" messages and themes. The council's action plan should consider exactly what these materials are for different networks.

- **Map existing stakeholders by their needs and attributes:** The council should identify potential sustainability leaders within networks that have specialist skills and resources. This will help to identify needs and opportunities to connect different groups together, particularly in the context of resident groups. As well as their absolute emissions impact, the potential to influence further groups should be taken into account when engaging stakeholders.

- **Use the momentum of the People's Panel on cost of living to test priority actions with the public:** The council should finalise its action plan development with the input of residents using a representative body of local people to feed back recommendations and improvements to the collective ideas.

5. Developing An Action Plan
Monitoring and Reporting

Measuring the progress of actions defined within any action plan must also incorporate some degree of "impact" analysis in quantitative terms. Broadly, progress towards the borough's emissions targets will be recorded by changes in the emissions data benchmarked by tools such as SCATTER. Using this data in isolation brings with it two challenges:

1. Emissions data is published two years in arrears, which means that there is a meaningful time lag between project delivery and analysis of its impact
2. Emissions data is not provided at a granular level which captures the impacts of specific actions, particularly if multiple projects make emissions reductions in the same area

This motivates the need for key performance indicators (KPIs) that record "live" data which acts as a more useful proxy for progress. The council (or whichever stakeholder is responsible for analysis of a given action) can then track year-on-year progress using these defined proxies and indicators.

A direct example of this might be analysis of Energy Performance Certificate (EPC) ratings for domestic buildings. Whilst an imperfect measure of the emissions created by the domestic housing sector, EPCs provide a useful marker for the energy efficiency of the borough's households and can be assessed for trends towards more energy efficient buildings on an annual basis.

KPIs have been suggested which benchmark progress towards the different SCATTER subsectors detailed in this report. Assessing the changes in these indicators provide further context to the city's climate action. A list of these potential indicators has been given in Appendix 8. It should be noted that the council will likely wish to amend and shape these indicators as their plan develops to implementation and according to stakeholder views.

Disclosing publicly

This chapter has discussed the application of a number of concepts, including the Council-Business Alliance and people-centred climate action. The council and its partners are strongly encouraged to design a transparent monitoring and reporting framework, which allows for open reporting of progress towards its goals.

The steps towards achieving that following the design of an action plan include:

- Establishing commitment from partners to play their part in terms of reporting
- Assigning accountability both internally within the council and across networks
- Identifying current and future data for the specific progress towards certain goals and actions and setting out what is required to properly assess these

The final piece of this framework is the disclosure of progress in an accessible and transparent way. Whilst project managers may monitor progress internally, it is also crucial for the continued buy-in and public mandate that the council reports its progress publicly and transparently.

There are a range of solutions available in terms of reporting public data through the CDP-ICLEI Unified Reporting System, the Global Covenant of Mayors and including update reports, as well as digitally-enabled solutions involving online dashboards and apps. Some of these have been referenced in the above case studies.

6 Recommendations and Next Steps

6. Recommendations and Next Steps

Recommendations

This report sets out a menu of options for Cheshire East Council, outlining the measures that need to be achieved, and when they should be implemented, in order to achieve the borough-wide target.

Establish improved data collection practices for suppliers

- Engage with main suppliers identified in analysis of council contracts: Undertake a more detailed assessment of the council's Scope 3 emissions which accounts for the specific activities carried out by suppliers and contractors. This will allow a more accurate assessment of the council's procurement emissions based on real activity data as opposed to industry-wide emissions factors.
- Establish the role of procurement to support partnership building**:** Exploring the relationship between local suppliers and their impact on borough-wide emissions is a valuable means through which the council can foster collaboration in reaching the 2045 target.

Identify priority actions for decarbonisation

Throughout this report various suggested actions have been quoted, each of which have an important role to play in delivering progress towards carbon neutrality. We recommend the following areas be prioritised for action given their significant impact on the borough's footprint, as well as their associated co-benefits and potential for stimulating positive holistic change:

- Improve building energy efficiency through fabric retrofits in domestic and non-domestic buildings;
- Focus on modal shifts and charge point infrastructure to lower barriers associated with the transition away from petrol and diesel cars;
- Scale up the availability of locally-available renewables, in particular solar and wind, which may provide valuable opportunities for landholders;
- Identify means through which the borough can adopt low-carbon agricultural practices at scale to mitigate the impact of livestock on emissions and maximise the potential for sequestration through land use.

Considering cost, carbon and prioritisation

The costs presented in this report are intended to act as a guide to give a sense for the scale of investment required at the borough-wide level. The current analysis doesn't allow full consideration of the nuances of who pays (i.e. the split between the council, and other stakeholders), and equally, where savings will be made.

The case studies define where and how different projects have been financed and the specific role of the council in delivering more granular, specific initiatives. The council's role will vary dramatically between projects and sectors, which may include investing in projects with the intention of stimulating the market so that others can follow suit.

Given the number of potential actions required and possible limitations in resource, the council may seek to prioritise action in certain areas. Our recommendations for prioritisation are based on a high level analysis. In seeking to confirm next steps, particularly at a more granular level, we recommend the council undertake a comprehensive analysis of all the actions, including other factors such as action impact, timescale, and complexity.

6. Recommendations and Next Steps

The scale and speed of the interventions outlined in this report are significant and involve all areas of the borough. While achieving the SCATTER High Ambition Pathway would result in a 74% reduction in emissions by 2045, the borough would still not reach carbon neutrality by this time. Step-change style shifts in behaviour and technology will be needed to meet the 2045 timeline.

In planning next steps, Cheshire East Council should consider the following:

- **Confirm your priority action areas:** In this report, we give recommendations on how the council could prioritise action and develop its action plan, focussing on carbon impact. Several other metrics are also given for consideration, including the council's role and ability to influence each action.
- **Work together with other stakeholders:** The council is not expected (or able) to achieve the goals of the plan alone and must use its role in the community to lead others. Officers consistently fed back that existing networks and groups can be leveraged and "buy in" to this agenda to push action further and faster. There may also be additional partnerships specifically focused on climate that are needed to help accelerate and focus action.
- **Consider the impacts of climate action holistically** when making the case for climate action: Climate action offers significant co-benefits to the local economy, communities and environment in virtually all cases. Many offer a return on investment or operational cost savings, which also bolster the case for action.
- **Continue to consider a variety of funding streams** to support financing local carbon reduction initiatives including community investment schemes and government grants.
- **The importance of monitoring and reporting on your progress**: This is vital in ensuring action is coordinated and sustained. This should include assigning and tracking responsibility against each action and tracking impact to ensure the actions are having the desired effect.
- **Going beyond the SCATTER High Ambition Pathway** is a necessity in order to reach the borough's carbon neutral goal. Nevertheless, the interventions outlined in this report should be prioritised, as the evidence base behind them ensures these savings can be achieved most quicky and reliably.

Gap to target and carbon offsetting/insetting

Even with the successful implementation of the interventions outlined, by 2045 Cheshire East will likely still contend with residual emissions in hard-to-treat areas. Particularly this may include isolated settlements and buildings that are difficult to reach in terms of low-carbon heat and modern energy efficiency. There will also likely be residual emissions from freight and agriculture, which will need to be appropriately managed. Developing an approach on how the borough will offset or explore the use Authority Based Insetting as a method will be an important consideration.

Appendices

Appendix 1 – SCATTER FAQs

What do the different sectors and subsectors represent within the SCATTER Inventory?

- **The Direct Emissions Summary and Subsector categories** are aligned to the the World Resource Institute's Global Protocol for Community-Scale Greenhouse Gas Emission Inventories ("GPC"), as accepted by CDP and the Global Covenant of Mayors.
- **The BEIS Local Emissions Summary** represents Local Authority level data published annually by the Department for Business Energy & Industrial Strategy (BEIS).
- **Stationary energy** includes emissions associated with industrial buildings and facilities (e.g. gas & electricity).
- **IPPU** specifically relates to emissions that arise from production of products within the following industries: iron and steel, non-ferrous metals, mineral products, chemicals. These are derived from DUKES data (1.1-1.3 & 5.1).
- **Waterborne Navigation and Aviation** relate to trips that occur within the region. The figures are derived based on national data (Civil Aviation Authority & Department for Transport) and scaled to Cheshire East.

The full methodology is available at http://SCATTERcities.com/pages/methodology

How does SCATTER treat future energy demand?

Future demand is hard to predict accurately. The National Grid's Future Energy Scenarios (FES) indicates that under all scenarios that meet the UK's net zero by 2050 target (including "Leading the Way", which illustrates the fastest credible rate of decarbonisation) electricity demand still increases. On the other hand, SCATTER's High Ambition Pathway assumes that electricity demand reduces due to improvements to efficiency of operation.[1] Factors such as increased electrification of heating technologies and transport are naturally big drivers for the increase, but incentives and opportunities for demand reduction and energy efficiency measures are still significant and could slow or tip trends in the other direction.

What do the different emissions categories mean within SCATTER?

Direct = GHG emissions from sources located within the local authority boundary (also referred to as Scope 1). For example petrol, diesel or natural gas.
Indirect = GHG emissions occurring as a consequence of the use of grid-supplied electricity, heat, steam and/or cooling within the local authority boundary (also referred to as Scope 2).
Other = All other GHG emissions that occur outside the local authority boundary as a result of activities taking place within the boundary (also referred to as Scope 3). This category is not complete and only shows sub-categories required for CDP / Global Covenant of Mayors reporting.

1 – It should be noted that this optimism for demand reduction is consistent with the legacy 2050 Pathways tool.

Appendix 2 – SCATTER Inventory

Notes:

- SCATTER calculates a territorial emissions profile and therefore excludes emissions from goods and services generated outside the borough (also referred to as consumption emissions).
- Within the SCATTER model, national figures for emissions within certain sectors are scaled down to a local authority level based upon a series of assumptions and factors.
- The inventory data presented here relates to the 2019 reporting year as emissions are reported two yeas in arrears

IE	Included Elsewhere
NE	Not Estimated
NO	Not Occurring
	Included as part of profile
	Excluded as part of profile

Sub Sector	DIRECT Scope 1 tCO_2e	INDIRECT Scope 2 tCO_2e	OTHER Scope 3 tCO_2e	TOTAL tCO_2e
Residential buildings	489,754	172,839	NO	762,406
Commercial buildings & facilities	81,945	105,763	26,969	214,676
Institutional buildings & facilities	65,779	22,964	12,074	100,817
Industrial buildings & facilities	256,705	128,838	65,752	451,296
Agricultural fuel use	34,678	4	8,254	42,937
Fugitive emissions	54,057	-	NE	54,057
On-road	942,413	IE	405,099	1,347,512
Rail	14,473	IE	3,444	17,917
Waterborne navigation	13,009	IE	IE	13,009
Aviation	NO	IE	211,286	211,286
Off-road	9,408	IE	NE	9,408
Solid waste disposal	7,323	-	IE	7,323
Biological treatment	NO	-	IE	-
Incineration and open burning	1,729	-	IE	1,729
Wastewater	6,945	-	NO	6,945
Industrial process	125,404	-	NE	125,404
Industrial product use	0	-	NE	0
Livestock	301,822	-	NE	301,822
Land use	9,482	-	NE	9,482
Other AFOLU	NE	-	NE	-
Electricity-only generation	NO	-	NO	-
CHP generation	NO	-	NO	-
Heat/cold generation	NO	-	NO	-
Local renewable generation	30	NO	NO	30
TOTAL:	**2,414,923**	**430,408**	**832,693**	**3,678,055**

Appendix 3 – Carbon budget analysis

What is a carbon budget?

A carbon budget is a fixed limit of cumulative emissions that are allowed over a given time in order to keep global temperatures within a certain threshold.

The Tyndall Centre Carbon Budget

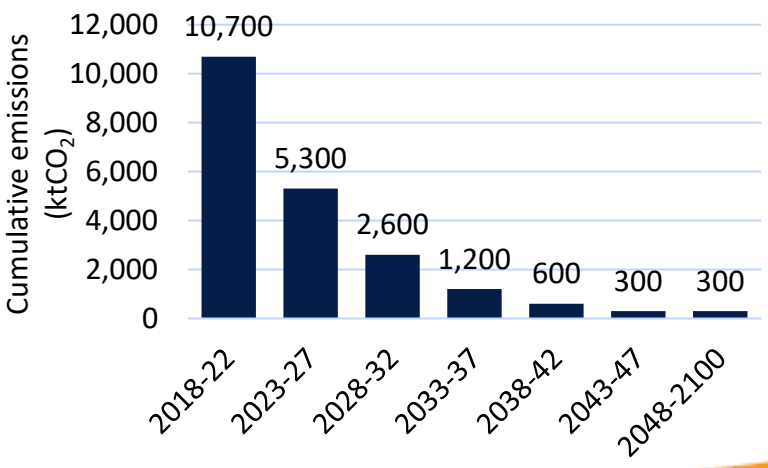
The Tyndall Centre for Climate Change Research, based at the University of Manchester, have translated the Paris Agreement targets of limiting temperature change below 2°C into a fixed emissions 'carbon budget' for each local authority. There are two key ideas underpinning their research:

1. The carbon budget is a fixed amount: A global emissions limit represents the total emissions allowed before the 1.5°C threshold for greenhouse gas concentration is crossed. This global "budget" can then be scaled down to a national level, and finally, a regional level.

2. Emissions now mean impacts later: The most crucial element of this approach is understanding the importance of cumulative carbon emissions. Once emitted, carbon dioxide remains in the atmosphere for many years, contributing to increasing the average global temperature. The carbon budget does not reset; it represents a fixed upper limit to emissions. These two principles mean that the annual reduction rate of emissions becomes very important. Cumulative emissions and the scale & speed of action in the short-term are crucial in meeting the targets of the Paris Agreement.

Results for Cheshire East

- To keep Cheshire East aligned with the Paris Agreement, emissions should be reduced by 13.6% each year.
- Between 2005 and 2017, the average annual emissions reduction rate in Cheshire East was around 3%, highlighting the ambitious action required to meet the Paris Agreement targets.
- If Cheshire East continues along a business-as-usual pathway, the carbon budget (2020 – 2100) will be exceeded before 2030 and this could happen as soon as 2026.
- By 2041, 5% of the budget remains, provided that Cheshire East achieves the recommended annual reduction rate.



The chart opposite above describes the carbon budget targets based on the recommended annual reduction rate. Slight differences in scope mean that direct comparisons of this budget with the cumulative emissions from SCATTER Pathways trajectories (detailed in Chapter 5) should be taken as an estimate only.

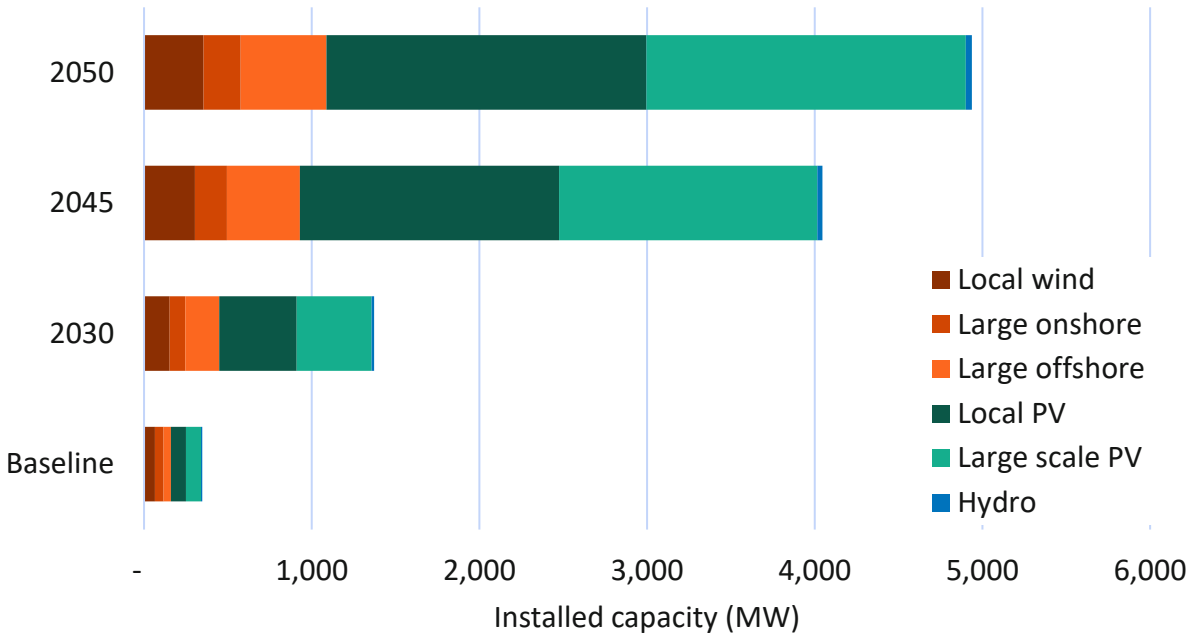
Appendix 4 – Current context sources

Unless stated otherwise, current contexts relate to 2020, which is used to reflect the starting point of the pathways. The table below gives data sources for current contexts quoted in the report.

Data source	Notes
EPC statistics	Data for domestic buildings
Off-gas statistics	Data for domestic buildings
Fuel poverty statistics	Low income, low energy efficiency (LILEE) is the new government definition for fuel poverty. A household is considered fuel poor if living in an efficiency band of D or below, and when they spend the required amount to heat their home they are left with a residual income below the official poverty line.
Energy Company Obligation	Data for number of installations at domestic sites
Display Energy Certificate	Data for non-domestic buildings
Building Energy Efficiency Survey	Information on various energy end uses in UK non-domestic buildings
BEIS emissions	Government published data on emissions at local authority level
NTS9903	DfT statistics on trip habits. Data quoted is from 2018/19 in order to capture pre-pandemic habits that are more representative of “typical” activities
DfT	Data cache for vehicle mileage statistics
Agricultural economy	Information on the extent of farmed land and livestock
Woodland Trust	Tree coverage per parliamentary constituency
Local authority waste collection	Quantity of collected waste for domestic and non domestic sources

Appendix 5 – Energy generation breakdown

The graph below shows a more detailed breakdown of the installed capacity of different technologies, summarised in Figure 4.6.2.



Year	Local wind	Large onshore	Large offshore	Local PV	Large scale PV	Hydro
Baseline	64	52	43	91	88	8
2030	153	93	203	461	447	14
2045	304	190	435	1,547	1,540	30
2050	354	222	512	1,909	1,904	35

Appendix 6 – Carbon savings methodology

Estimating emissions savings

Using the SCATTER "High Ambition" (HA) and "Business as Usual" (BAU) 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.

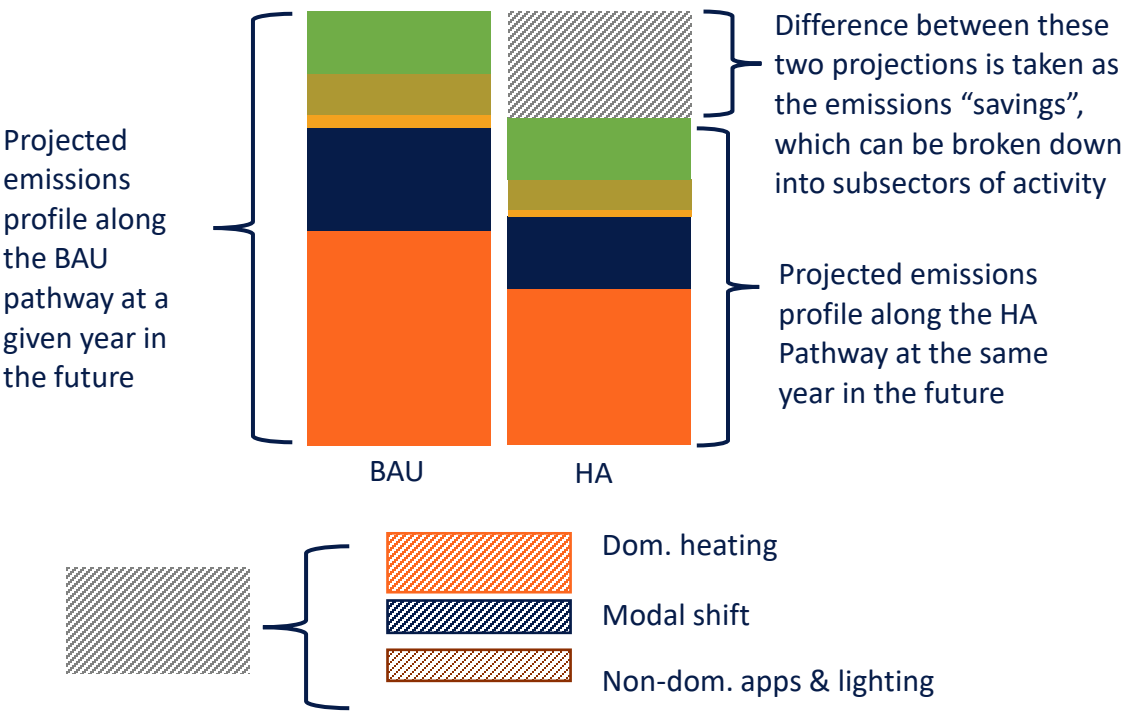
Which areas of activity have been estimated?

The categories of emissions savings are broken down slightly differently to the SCATTER interventions, meaning that the savings are grouped slightly differently. This is because of the interdependency of the SCATTER interventions, where more than one intervention contributes to the same savings subcategory. Since one action can contribute to more than one SCATTER intervention target, the savings from multiple separate interventions may be combined into one subcategory.

Interdependent SCATTER interventions	Common savings subcategory
1. Domestic heating technologies 2. Hot water demand	Domestic space heating & hot water

Example activity that meets both interventions

Installation of an efficient household heat pump



Appendix 7 – Co-benefit considerations

The tables below define the different categories for which co-benefit implications have been considered. For each sub-sector in Chapter 4, typical actions have been considered in the context of the categories in each row of the table.

Protected characteristics

The definition opposite for vulnerable/disabled people as part of an impacted group captures some, but not all, of the protected characteristics defined in the Equality Act (2010). Additional characteristics include:

- Age
- Gender
- Sexual orientation
- Race
- Religion
- Disability
- Pregnancy & maternity
- Gender reassignment

Identifying intersectionality between these characteristics and factors such as income and health are an important consideration in how actions are designed. Overlaps can and should be identified using different data and actions tailored accordingly.

Category	What is being considered?
Public health	Physical and mental health implications for the general public, including the implications for public healthcare services.
Local environment	Air, water and soil quality. Provision of green infrastructure and support of biodiversity. Climate resilience and implications for climate adaptation.
Economic security	Opportunities and/or challenges for private sector businesses in terms of market, reputational and technological risks. Employment and productivity of local workforce.
Council services	Implications for changes to public services and infrastructure (housing, energy, waste, telecommunications)

Impacted group	Who is being considered?
Low-income	Households and workers who live on less than 60% of the UK's median income, per the UK government definition.
Vulnerable/ disabled	Residents with long-term medical needs (physical, mental or otherwise) which may hinder their ability to participate on equal terms with wider society. It be the case that individuals do not necessarily self-define as vulnerable and/or disabled.
Businesses	The professional community within Cheshire East; local tradespeople and commercial enterprises. Sectors may be defined against specific actions.
Remote communities	Residents in the borough that live in a very rural environment e.g. not connected to mains gas supplies and/or very small settlements.

Appendix 8 – Data for performance indicators

In Chapter 5, we make recommendations that the council track progress against its actions through the use of proxy data. These are shown in the tables below.

Climate Action Area	Data proxy for progress	Potential source for tracking progress
Domestic lighting, appliances, and cooking	Gas & electricity sales data	Sub national gas consumption Sub national electricity consumption *Local data on electrification of cooking systems requires a more specific research*
Domestic space heating and hot water	New build data EPC ratings Fuel poverty statistics Gas network statistics Utilities data Renewable Heat Incentive (RHI) installations	New build dwelling statistics EPC Fuel Poverty ECO measures Gas network Sub national gas consumption Sub national electricity consumption RHI
Non-domestic heating and cooling	Non-domestic EPC ratings Final energy consumption (fuel type) Gas & electricity sales data	EPCs for non-domestic properties Sub-national energy consumption Sub national gas consumption Sub national electricity consumption
Non-domestic lighting, appliances, and catering	Gas & electricity sales data	*Local data on electrification of cooking systems requires more specific research*
Volume of Waste & Recycling	Tonnes of Household and Commercial waste sent for recycling	Collected waste statistics Council-held statistics
Local renewable technologies	Renewable electricity (installations, capacity and generation) Ofgem Feed-in Tariffs (FIT) Installation Report	Regional Renewable statistics FiT Quarterly Stats *Large scale installations may require further research*

Appendix 8 – Data for performance indicators

SCATTER subsector	Data proxy for progress	Potential source for tracking progress
Domestic freight	Licensed vehicles by body type Road transport energy consumption	VEH0105 Fuel Consumption Statistics
Domestic passenger transport - Demand	Licensed vehicles by body type Road transport energy consumption Licensed ultra low emission vehicles Ultra low emission vehicles registered for the first time (by region) EV charging points	VEH0105 Fuel Consumption Statistics VEH0132 VEH0172 Electric vehicle charging device statistics
International aviation & shipping	National data on passengers and freight movement	Airport Data
Agriculture and land use	Land and crop areas, livestock populations and agricultural workforce Green Space Map	Structure of agricultural industry OS Map Green Space *Local data on the agricultural sector requires a more specific research*
Tree planting outside woodlands	Tree surveys	i-Tree
Industrial processes	Electricity consumption in the industrial sector Actions towards less carbon-intensive industrial processes	DUKES Energy Consumption by final user Industrial Decarbonisation and Energy Efficiency Roadmap Action Plan

Disclaimer

Anthesis (UK) Limited has prepared this report for the sole use of the client (Cheshire East Council) and for the intended purposes as stated in the agreement between Anthesis and the client under which this report was completed. Anthesis has exercised due and customary care in preparing this report but has not, save as specifically stated, independently verified information provided by others. No other warranty, express or implied, is made in relation to the contents of this report. The use of this report, or reliance on its content, by unauthorised third parties without written permission from Anthesis shall be at their own risk, and Anthesis accepts no duty of care to such third parties. Any recommendations, opinions or findings stated in this report are based on facts and circumstances as they existed at the time the report was prepared. Any changes in such facts and circumstances may adversely affect the recommendations, opinions or findings contained in this report.