NET ZERO SOLIHULL: GREEN PAPER

NetZeroSolihull CO_2

February 2021

Anthesis | West Midlands Combined Authority | UK CENTRAL SOLIHULL | Solihull METROPOLITAN BOROUGH COUNCIL

CONTENTS

INTRODUCTION

Green Paper Overview & Scope

This report was commissioned by Solihull Metropolitan Borough Council (SMBC), who have committed to a net zero carbon emissions ambition of 2041 in-line with the West Midlands Combined Authority (WMCA) ambition.

The Green Paper sits within a larger scope of work which culminates in a Net Zero Action Plan for Solihull. A comprehensive overview of the Net Zero Action Plan process is detailed on page 4.

- **Chapters 1 & 2** of this report define the current context, the impacts of COVID-19 and a review of Solihull's projects and strategies to date.
- **Chapter 3** outlines the emissions baseline for the Borough utilising the SCATTER Inventory Tool.
- **Chapter 4** shows a future emissions pathway for the Borough defined by a range of measures within the SCATTER Pathways Tool.
- **Chapters 5, 6 & 7** identify specific intervention measures for Solihull across the energy system and assess these interventions based on a number of specified criteria.
- **Chapter 8** concludes this report and identifies the next steps of the Net Zero Action Plan process.

The data provided in this report is indicative and highlights the scale and speed of change needed to meet the Borough's 2041 ambition.

The Council will use this work to help inform the nature and extent of action as part of the Low Carbon Energy Framework project, a key element in the Council's response to the Climate Emergency.

Green Paper Objectives

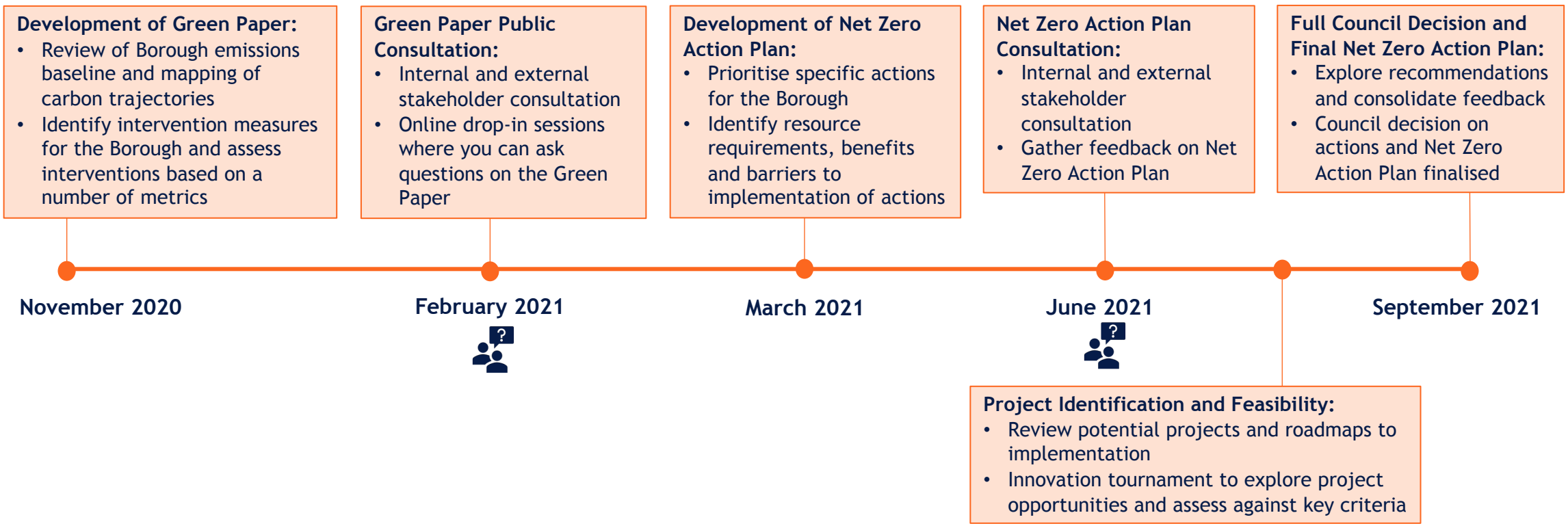
1. Provide a better understanding of the Borough's carbon footprint;
2. Use this information to inform the urgency and scale of action required to remain in line with the Paris Agreement and the 2041 ambition;
3. Identify and assess a number of emissions reduction interventions for Solihull; and
4. Inform discussion on Solihull's journey to net zero and help shape the Borough's response in the next stage of developing the Solihull Net Zero Action Plan.

This will help Solihull by:

- Providing a more informed evidence base for future action plan development;
- Increasing confidence in the mandate for climate action, aiding development of a robust local strategy which can deliver objective over a long-term cycle.
- Making the most of the benefits of reducing emissions, including better air quality, greener natural environments, warmer homes as well as cost savings and new green jobs.

OVERVIEW OF NET ZERO ACTION PLAN PROCESS

The Council's corporate priorities on low carbon growth and the development of the annual Climate Change Prospectus (formerly Green Prospectus) has enabled the progression of Solihull's net zero agenda to date. This Green Paper sits within a larger scope of work detailed below along with current expected timescales for each stage (please note timings may change):



01

BACKGROUND & CONTEXT

Anthesis

A CALL TO ACTION

A growing consensus

It is now widely agreed that climate change poses an unprecedented threat, and that action is required across all aspects of society. The recognition of urgency is no longer just a message from environmental groups, but is now being reiterated across a variety of sectors:

- **UK Local Authorities:** The majority of Local Authorities in the UK have now declared a climate emergency, including almost all local authorities within the WMCA. Climate Emergency Declarations were first issued following the IPCC's special report, published in October 2018.
- **UK Climate Strike action:** In June 2019, the WMCA Board declared a climate emergency inspired by the Youth Strike 4 Climate movement. Over 3,000 people, including Silhillians, attended a climate strike in Birmingham last year.
- **Global Businesses:** Nearly 800 companies globally are setting Science Based Targets. As part of the lead up to COP26, the campaign 'Race to Zero' was launched across businesses, cities and nations.

Dangerous Impacts

The UK Climate Projections Report is the latest generation of national climate projections in the UK which helps to predict the changes that will occur with future climate change. The main trends from the projections are increasing warmer, wetter winters and hotter, drier summers along with an increase in the frequency and intensity of extreme weather events.

Communities in Solihull are already seeing more extremes in weather events, with flooding being a particular issue. The Solihull Lodge area has been particularly prone to flooding for many years, with the most recent deluge in February 2020 following Storm Dennis.

In the 2018 Emissions Gap Report, the UN identified local action as a key driver for change: *"…non-state and subnational action plays an important role in delivering national pledges. Emission reduction potential from non-state and subnational action could ultimately be significant, allowing countries to raise ambition."*

OVERVIEW OF POLICY CONTEXT

Commitments have been made and targets have been set at all levels of government in response to the growing consensus and evidence around climate change. Below is a recap of the commitments that have been made on a global scale down to a local scale.

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 reduction in GHG emissions of 45% by 2030.

As part of the Paris Agreement, the EU and its member states committed to a minimum of 40% reduction in emissions by 2030. In December 2019, the EU agreed to set a target of becoming carbon neutral by 2050. As the UK exits the EU, it is anticipated a new Nationally-Determined Contribution for the UK, separate from the EU commitment, to be announced ahead of COP26 in late 2021.

The Climate Change Act 2008 introduced a legally binding target for the UK to reduce GHG emissions by 80% by 2050 against a 1990 baseline. In June 2019, the target was updated to reach net zero by 2050.

In July 2019, the West Midlands Combined Authority (WMCA) set an ambition of reaching net zero emissions no later than 2041. Interim targets of a 36% reduction in emissions by 2022 and a 69% reduction by 2027 have also been set to ensure constant progress.

In October 2019, Solihull Metropolitan Borough Council acknowledged the climate emergency and unanimously agreed on a statement of intent acknowledging their duty to respond to the urgent call for action. The Council pledged ambitions to achieve net zero emissions for the Council by 2030 and for the Borough by 2041, in-line with WMCA ambition.

COVID-19 AND A GREEN RECOVERY

COVID-19 & Climate Change

The global disruption and impacts of the COVID-19 pandemic have forced governors, businesses and citizens to radically reassess their policy decisions, operations and lifestyles.

The ongoing restrictions offer the chance to reflect on what is important to local communities. This time also presents the opportunity to shift our collective values and review the demands of "emergency action" in a climate context. Local and national commitments to emissions reductions have not changed as a result of the COVID-19 crisis and the cost of delaying action has been felt in many countries during the pandemic. Decisiveness will be required in the wake of this crisis, to lead a recovery which revolves around the resilience, health and sustainability of local communities.

The next few years will be pivotal for climate change mitigation as we enter the decisive decade for action. The urgency of the situation is growing as we approach planetary tipping points and are held to account as a nation against international climate targets.

A Green Recovery

To maintain the prospect of meeting the commitments set out in the Paris Agreement, it is essential that government policies in response to the economic crisis avoid locking nations into carbon intensive pathways, and instead steer economies towards a resilient *Green Recovery*. In May 2020, the Committee on Climate Change called for government to use the economic recovery as an opportunity to accelerate the shift towards a low-carbon economy. This would stimulate jobs, stabilise future economic resilience, and mitigate climate related risks. Business and health professionals are also making similar calls.

The C40 Cities group has published an overview of principles which it recommends should inform this Green Recovery. Decisiveness will be required as we recover from this crisis, responding with policy that is centred around the resilience, health and wellbeing of local communities.

Solihull has outlined the need to address climate change and greening of the local economy in its Economic Recovery Plan and continues to support the work of the WMCA with its Green Recovery Plan.

SOLIHULL ECONOMIC RECOVERY & GROWTH PLANS

The refresh of Solihull's Economic Strategy aims to put more of a focus on delivering balanced environmental and social, as well as economic growth outcomes, focusing on inclusive growth.

This table shows the linkages between interventions and co-benefits explored within the Green Paper and the objectives and outcomes identified in Solihull's Economic Recovery Plan. This highlights the interdependency of social and economic recovery in Solihull with the transition towards a net zero Borough.

	Objectives and Outcomes	Link to interventions and co-benefits
People	• Unemployment and under-employment minimised, including amongst disadvantaged groups and communities	• Job creation and reduction of inequalities through several interventions identified e.g. building retrofit to improve energy efficiency
	• School and college leavers move on to education, employment and training	• Skills gap in new and emerging green jobs sectors will need targeted support to develop opportunities for training
	• Health and well-being improved	• Increasing green spaces and local tree cover is associated with health and well-being benefits
	• Workforce skills developed to meet current and future demand including via apprenticeships	• New industries and technologies in the low-carbon sector are backed by government support schemes
Business & Sectors	• Business failure rate minimised and jobs safeguarded	• Government funding schemes in the low-carbon sector can support financial stability and job creation
	• Achievement of recovery and growth plans for major assets, including Birmingham Airport, NEC, Jaguar Land Rover	• Major assets in Solihull can support localised collective action such as co-ordinated waste management practices and logistics opportunities
	• Supply chains safeguarded and made more resilient	• Businesses and public sector organisations can demonstrate leadership by embedding sustainable procurement policies
	• Businesses digitally empowered and opportunities for remote working realised	• Improvements to digital connectivity are crucial in reducing overall travel emissions, congestion and fuel use
Investment Projects & Places	• HS2 Interchange site - early health and innovation campus opportunity as part of the UKC Hub development	• The development of the HS2 Interchange as an opportunity to showcase innovation in low-carbon energy and transport
	• Successful reopening and strong recovery of Solihull Town Centre and other local centres	• The Town Centre redevelopment could demonstrate best practice low-carbon heating and support job creation
	• Kingshurst Village Centre successfully redeveloped	• Opportunities for better active and public transport use
	• Visitor/Tourism economy recovery and opportunities for growth realised	• Opportunity to showcase Solihull as attractive to visitors and businesses through sustainability innovation

Source: COVID-19: Solihull's Economic Recovery Plan: 'Supporting whilst seizing opportunities from a crisis'

WMCA'S GREEN RECOVERY PLAN

In June 2020, the WMCA approved a Green Recovery Plan in response to the COVID-19 pandemic. The plan continued to support the WMCA #2041 strategy and outlined specific green recovery priorities which included the following:

- Retrofitting old and cold homes to make them more energy efficient and help tackle fuel poverty
- Drafting of a Circular Economy Routemap providing a regional approach to resource efficiency. This is part of a wider approach to waste reduction
- Accelerating the transition to EVs by rolling out charging infrastructure at scale and future-proofing the regional automotive sector through supporting a shift to EV manufacturing
- Announcing a green innovation challenge for SMEs to find solutions to climate change challenges
- Supporting the growth of natural capital and green neighbourhoods as during the pandemic, we have seen how important access to green spaces has been for individuals physical and mental health ; and
- Facilitating active transport initiatives, for example pop-up cycles lanes and pavement widening.

> ***"The plan helps to give clear direction of how to achieve a green and inclusive economic recovery from Coronavirus"***
>
> **West Midlands Mayor, Andy Street**

The WM2041: A programme for implementing an environmental recovery can be accessed here.

02

WORK TO DATE

Anthesis

SOLIHULL'S PROJECTS AND STRATEGIES

Relevant local projects

- **Town Centre Energy Network -** The Solihull Town Centre Energy Network project aims to generate 50% of heat from low carbon and renewable sources. The project is expected to be completed in early 2023 provides an opportunity for significant carbon savings through connecting existing buildings to the low-carbon heating supply with potential for future expansion. This could enable significant carbon reduction in building heat demand and support the town center's low carbon growth.
- **UK Central Hub -** The UK Central Hub area covering Birmingham Airport, JLR, the NEC and Birmingham international station has the potential for driving large scale increases in energy demand but also provides significant opportunities to demonstrate best practice in sustainability. This regeneration could provide an opportunity for embedding low carbon innovation and driving local economic benefits.
- **HS2 Railway and Interchange -** The new HS2 Interchange Station serving Solihull and the West Midlands will have strong links to local roads and the UK motorway network, with significant opportunities to integrate low carbon travel across the area, as well as some challenges to ensure a low environmental impact and implement sustainable practices within the site.
- **Arden Cross -** Arden Cross sits alongside Birmingham Airport, the NEC, Birmingham Business Park and Jaguar Land Rover. The site provides an opportunity for public and private sector collaboration for sustainable mixed-use development.

03

EMISSIONS BASELINE REVIEW

SOLIHULL'S CURRENT EMISSIONS PROFILE

In 2017, Solihull's energy system was responsible for net emissions totalling 1,338 $ktCO_2e$. The majority resulted from buildings & facilities (57%) and transport (39%).

The current emissions profile for the area administered by Solihull Metropolitan Borough Council is shown opposite, based on the SCATTER tool calculations. This covers 3 greenhouse gases: carbon dioxide, nitrous oxide and methane and relates to the 2017 reporting year. While the embodied carbon associated with creating products used in Solihull is an important consideration, this emissions profile only covers emissions generated within the Borough, as this follows the same boundaries set out by UK Government.

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

Aviation emissions relating to air travel at Birmingham Airport have been excluded from the emissions profile and are detailed separately in Appendix 6.

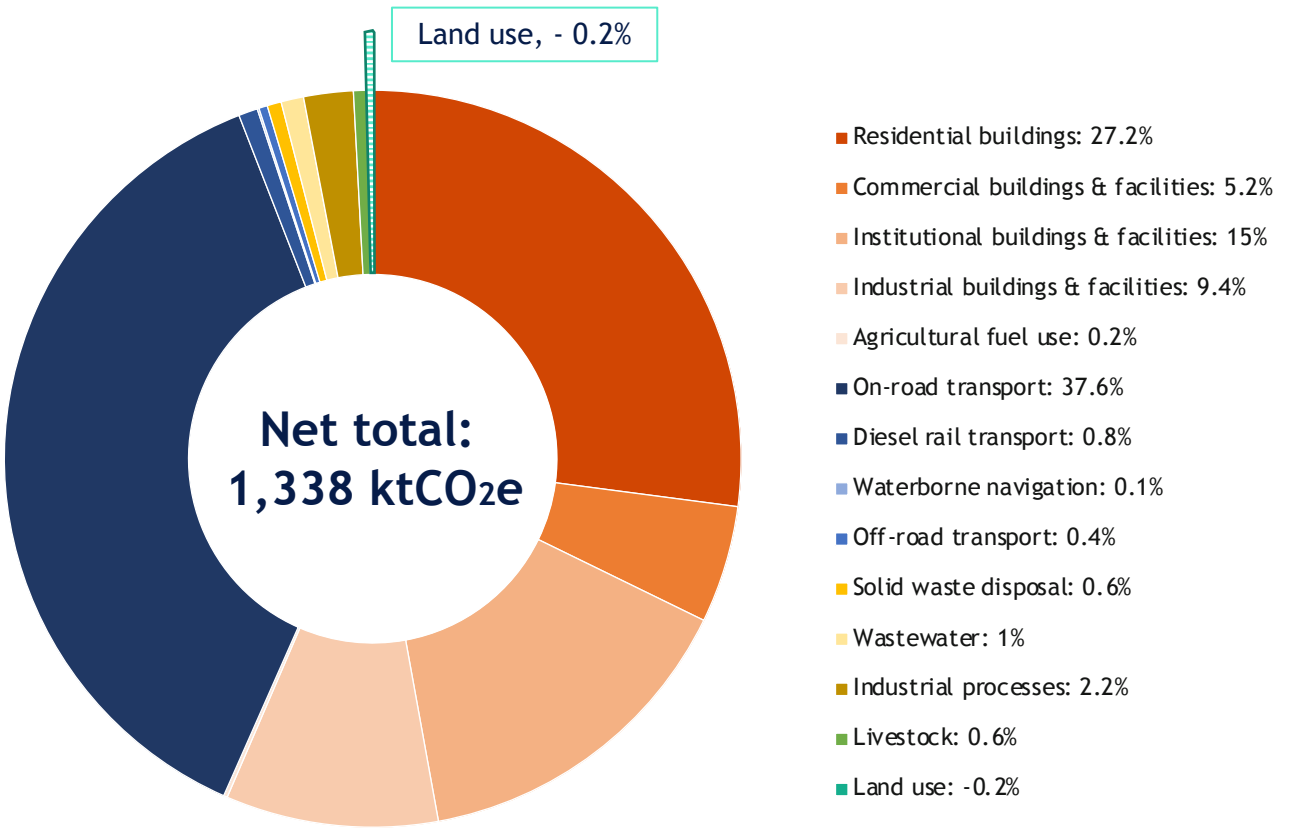
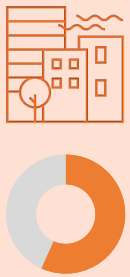


Figure 1: SCATTER emissions inventory for Solihull, 2017.

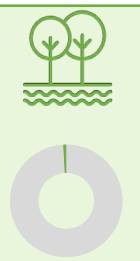
SCATTER EMISSIONS SUBSECTORS

The tables below outline the sources of emissions included in each sector:



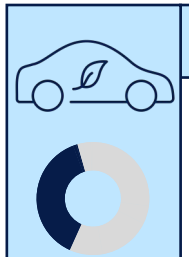
57% of emissions in Solihull come from buildings

- Residential buildings: Domestic households of all tenure types.
- Institutional buildings & facilities: Public sector buildings including schools, collages and educational buildings, health centres, hospitals, leisure centres, Council buildings etc.
- Industrial buildings & facilities: Larger industrial facilities, including factories, warehouses and workshops associated with manufacturing and engineering.
- Commercial buildings & facilities: Buildings from which commercial businesses operate e.g. shops, shopping centres, offices, restaurants etc.
- Agricultural fuel use: Fuel consumption from off-road transportation in the agricultural sector. This does not include direct emissions from livestock or fertiliser.



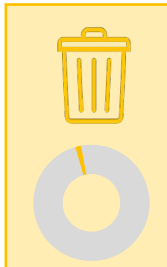
0.6% of emissions in Solihull come from livestock and land use acts as a net carbon 'sink' of 0.2%

- Livestock: Including emissions from both dairy and non-dairy cattle as well as other farm livestock.
- Land use: These emissions estimations rely heavily on DEFRA estimations on land use types and include emissions produced as well as sequestration. Only CO_2 is considered for land use, so the figure quoted for sequestration is likely to be an underestimate.



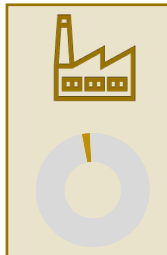
39% of emissions in Solihull come from transport

- On-road transport: Emissions from all forms of on-road passenger vehicle, including cars, vans, motorcycles, buses and taxis. Aviation and shipping fuels are excluded.
- Rail: Emissions from diesel-fuelled rail transport. Emissions from electricity consumption within the rail sector are included in the commercial and industrial sectors as it is not possible to separate these emissions.



2% of emissions in Solihull come from waste disposal

- Solid waste disposal: Incorporates various waste streams across commercial, industrial and municipal sources.
- Wastewater: Scaled directly from national wastewater data by population.



2% of emissions in Solihull come from industrial processes

- Nationally industrial processing emissions associated with heavy industry, such as minerals, iron & steel and chemicals have been scaled down for Solihull.

KEY HEADLINES OF BOROUGH EMISSIONS BASELINE

1. **Solihull's SCATTER emissions inventory** states that Solihull's energy system (scope 1 & 2) was responsible for net emissions totalling 1,338 $ktCO_2e$, the majority of which resulted from buildings and facilities (57%) and transport (39%). Scope 3 emissions excluding aviation are estimated at 332.5 $ktCO_2e$.
2. **Aviation emissions from air travel at Birmingham Airport** are excluded from the SCATTER emissions profile on page 14. If aviation emissions were to be accounted for, they would contribute an additional 158.7 $ktCO_2e$ for scope 1 emissions and 112.6 $ktCO_2e$ for scope 3 emissions. Aviation emissions relating to flights landing and taking off at Birmingham Airport have been reported separately in Appendix 6 as SMBC has limited influence over aviation emissions which require national and international changes. Aviation emissions estimations have also been reported by Birmingham Airport within their Sustainability Strategy which has been reviewed further in Appendix 6, though some differences exist in the calculation methods.
3. **Solihull Council's own emissions** account for less than 1% of total Borough emissions and it is an area where the Council have the most control. The Council have made great progress reducing emissions by 51% from 18,724 tCO_2 in 2009/10 to 9,114 tCO_2 in 2019/20 and have committed to a net zero ambition of 2030. See Appendix 7 for further information on Solihull Council's own emissions.

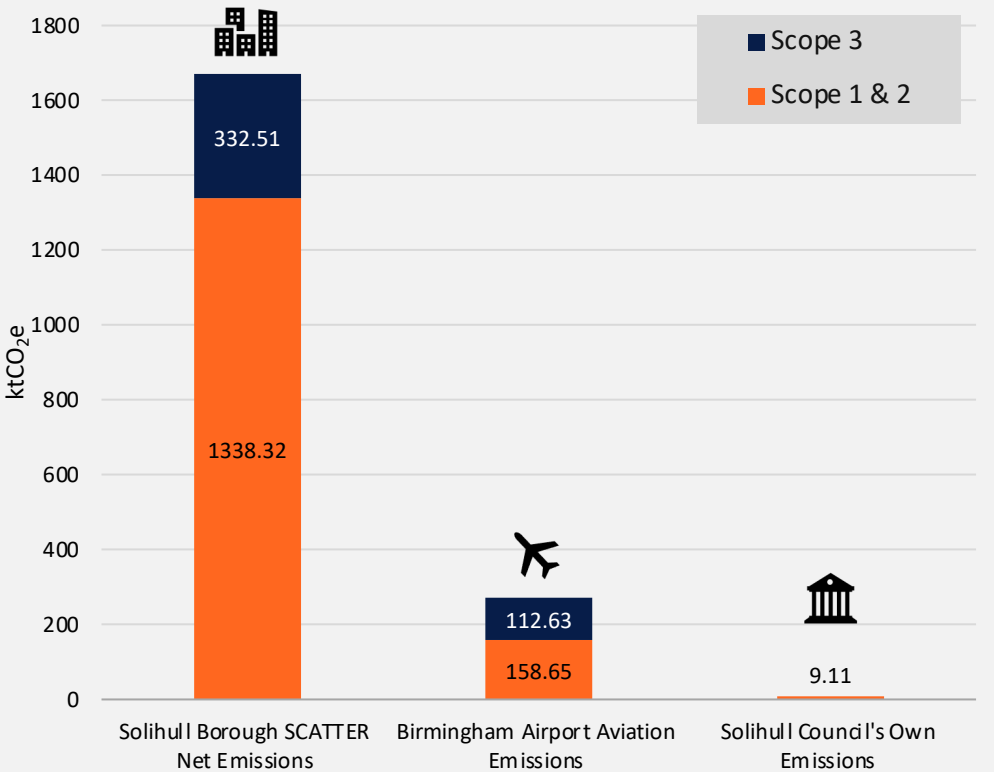


Figure 2: Summary of Solihull Borough Emissions detailing the SCATTER emissions output, aviation emissions from Birmingham Airport and the Council's own emissions.

04

CARBON TRAJECTORIES

Anthesis

SCATTER PATHWAYS TOOL

Introduction

This chapter explores different potential carbon trajectories using the SCATTER Pathways Tool. The carbon trajectories aim to provide an idea of the type of interventions available and the scale of changes required to meet specific milestones. The carbon budget approach, discussed in Appendix 8, will also be modelled for comparison. The carbon trajectories will be used as an evidence-base to inform the interventions and Solihull's Net Zero Action Plan.

Interpreting this analysis

SCATTER is one of many information sources 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 SCATTER pathways are intended to act as 'lines in the sand' for Solihull. They 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.

Solihull's progress towards its ambitious carbon neutral ambition can be guided by "checkpoint" targets at 2025 and 2030. SCATTER pathways run from 2018 up to 2050 to reflect national targets for decarbonisation, though 2041 remains the key milestone for Solihull and WMCA's net zero ambition.

Additional information on SCATTER can be found in Appendix 2 & 3.

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. It is intended to serve as an evidence base to help Solihull understand their current influence and offer challenge as to whether this influence can be applied in new, innovative and more ambitious ways.

Considerations in SCATTER

Considered in SCATTER

- All current known technologies for emissions reduction
- Measures across all key sectors
- 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

An assessment of these considerations and policy drivers are included in Chapters 6 and 7.

SCATTER PATHWAYS TOOL

Key

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

SCATTER High Ambition Pathway: Assumes Solihull goes significantly beyond national policy and National Grid assumptions, across both energy supply and demand measures.

Paris-aligned Pathway: 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 Solihull, based on research by the Tyndall Centre for Climate Change Research – see Appendix 8.

The graph below shows two possible future emissions pathways for Solihull as modelled by the SCATTER Pathways Tool, compared against the Tyndall Centre's recommended 13.6% annual reduction pathway.

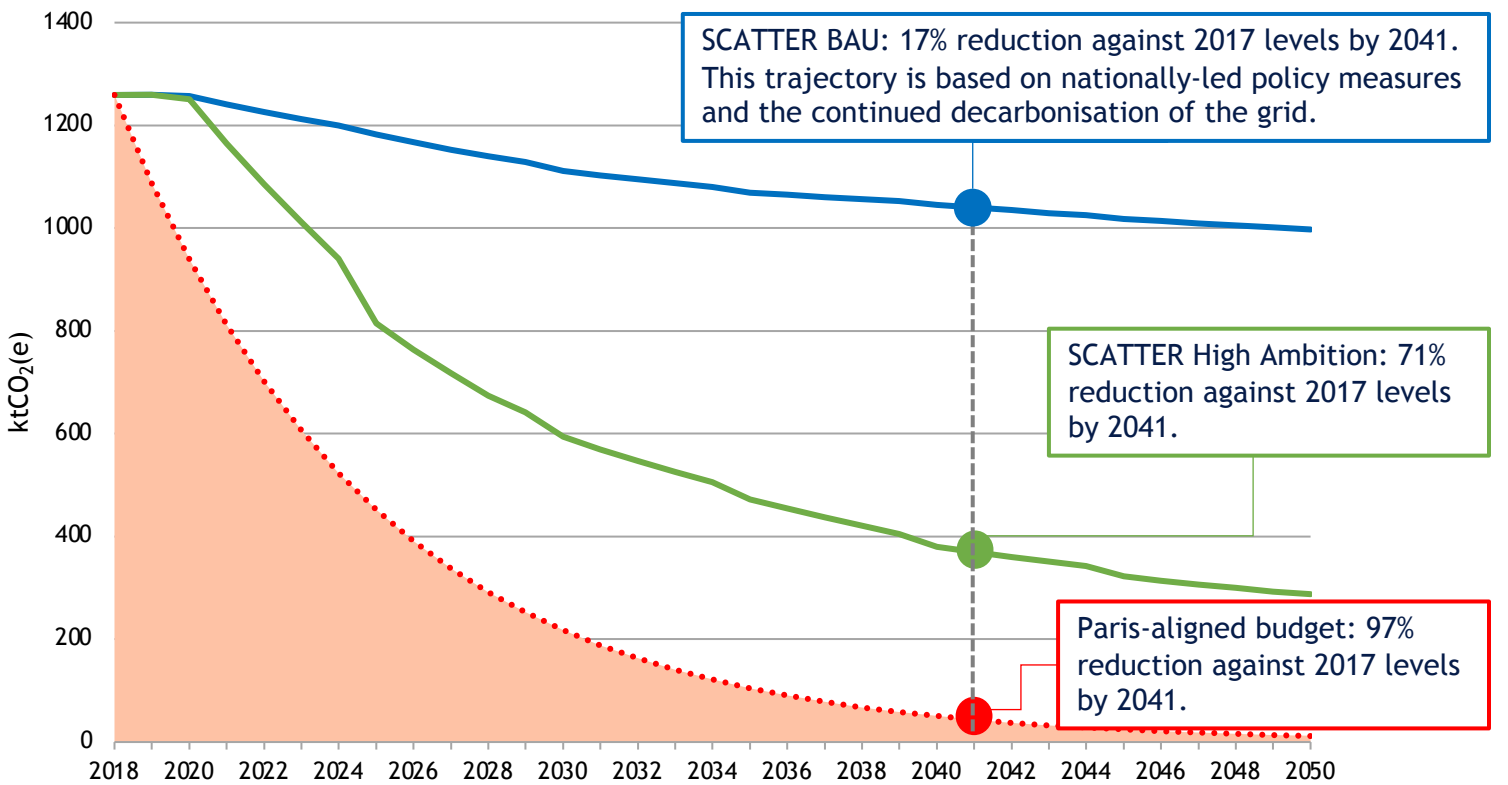


Figure 3: Future emissions pathways (2018-2050) as modelled by the SCATTER tool compared against a pathway representative of the Tyndall Centre's recommended annual reduction rate.

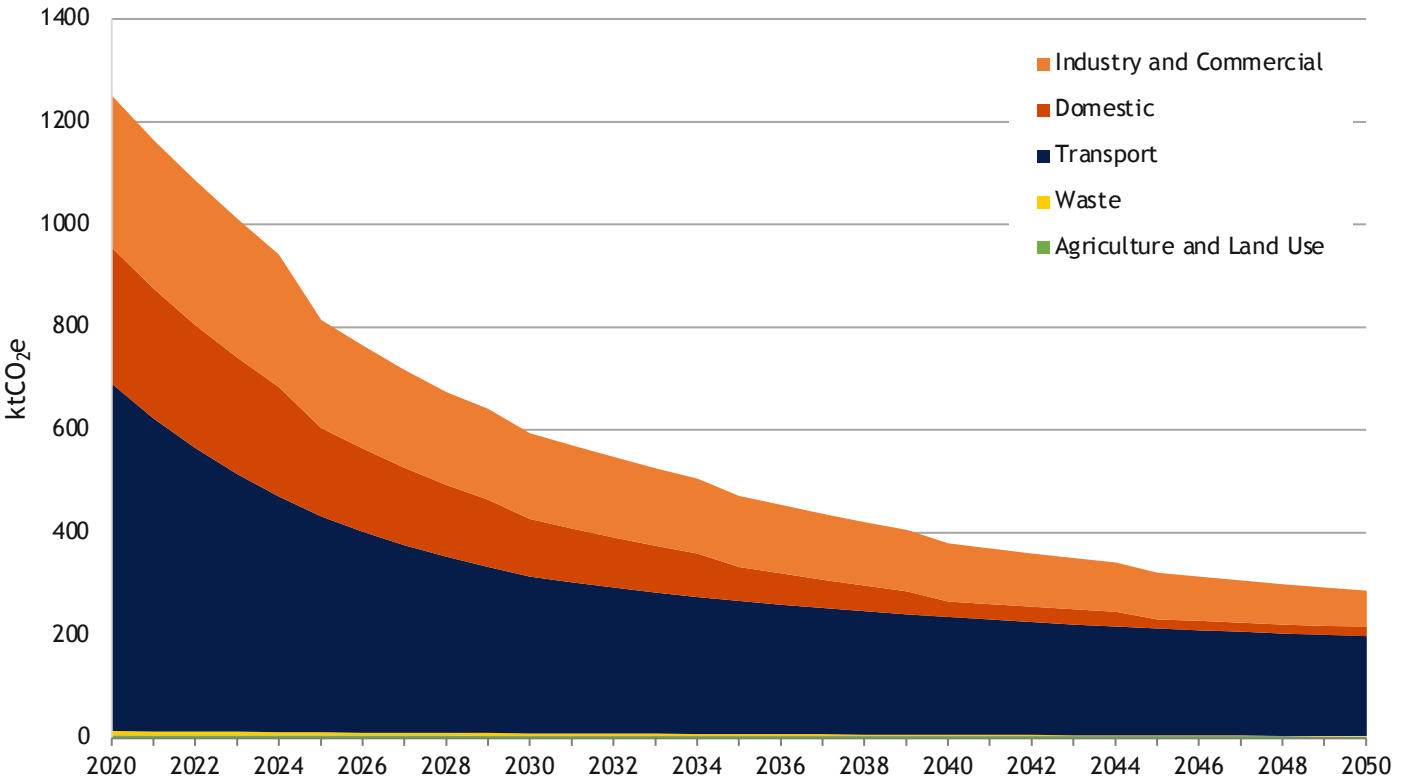
HIGH AMBITION SCATTER PATHWAY TRAJECTORY

Despite applying the most ambitious interventions in the SCATTER tool, emissions remain in the energy system at 2050.

Aggressive and urgent emissions reductions interventions are demanded by the High Ambition Pathway. The scale of the actions necessary to reduce emissions by 53% in 2030 requires radical step changes across almost every area of activity within the Borough. Chapter 6 of this report defines these interventions. They can be thought of as falling into two groups; interventions focused on reducing energy *demand*, and interventions focused on decarbonising energy *supply*. However, with increased electrification of cars, and building systems etc., future electricity demand is likely to rise. This modelling follows electrification assumptions from the UK's Future Energy Scenarios.

Adoption of the High Ambition Pathway still does not achieve Solihull's ambition of carbon neutrality by 2041. Discussions around closing the "gap to target" can be found on page 22.

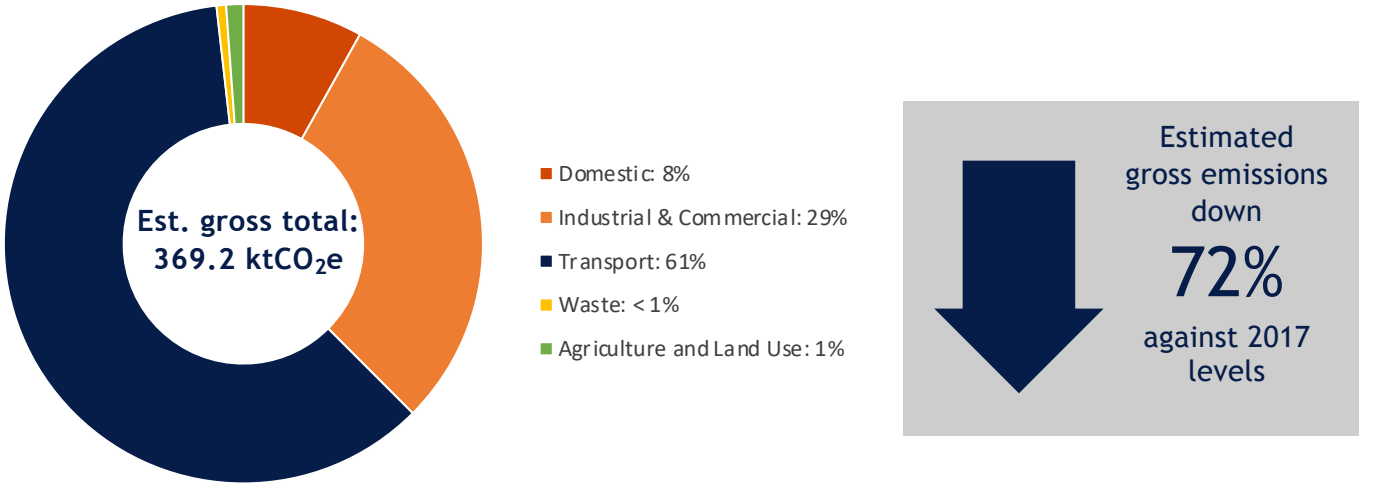
Figure 4: SCATTER high ambition pathway for Solihull, broken down by sector. Shaded areas correspond to residual emissions.



HIGH AMBITION PATHWAY: 2041 SUMMARY

Adoption of the High Ambition Pathway interventions delivers emissions reductions of 72% by 2041.

Figure 5: Estimated 2041 emissions profile (top). Emissions reductions in key sectors under the High Ambition Pathway (bottom).

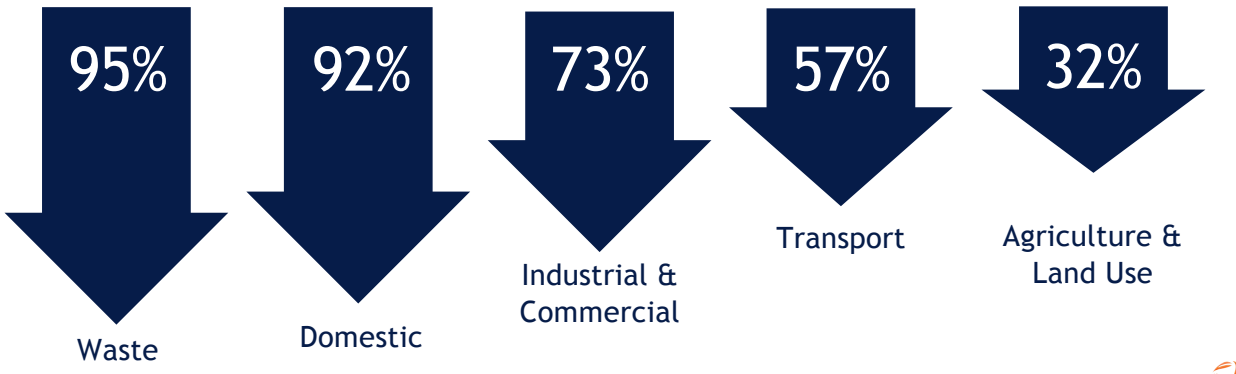


By 2041, the emissions profile for Solihull is predicted to look very different from today.

Concerted local actions can have a significant effect on district emissions, resulting in reductions of around 72%. Transport emissions dominate the 2041 profile whilst reductions in building energy consumption have shown significant decreases in the sector's emissions.

Despite the aggressive actions described, hard-to-remove emissions in industry and freight transport persist. Whilst emissions from the domestic and waste sectors are massively reduced, the scale of improvement is not enough to reach net zero by 2041 or meet Solihull's carbon budget limit of 95% reductions by 2041. Further ambition and a variety of additional technological and nature-based solutions will need to be considered to close this gap. These are explored on the next page.

By sector:



THE GAP TO TARGET

How can we go beyond High Ambition?

Despite the successful implementation of the Chapter 7 interventions, some emissions are "left over". Defining the scale and nature of the gap to target is an important process to meeting reductions targets and goals. Even along the High Ambition Pathway, Solihull is left with an emissions gap of **369.2 $ktCO_2e$** to meet the net zero 2041 ambition and a gap of **362.9 $ktCO_2e$** to meet the Paris Agreement-aligned target.

Tackling these residual emissions can be challenging and require Solihull to embrace more radical measures in some areas.

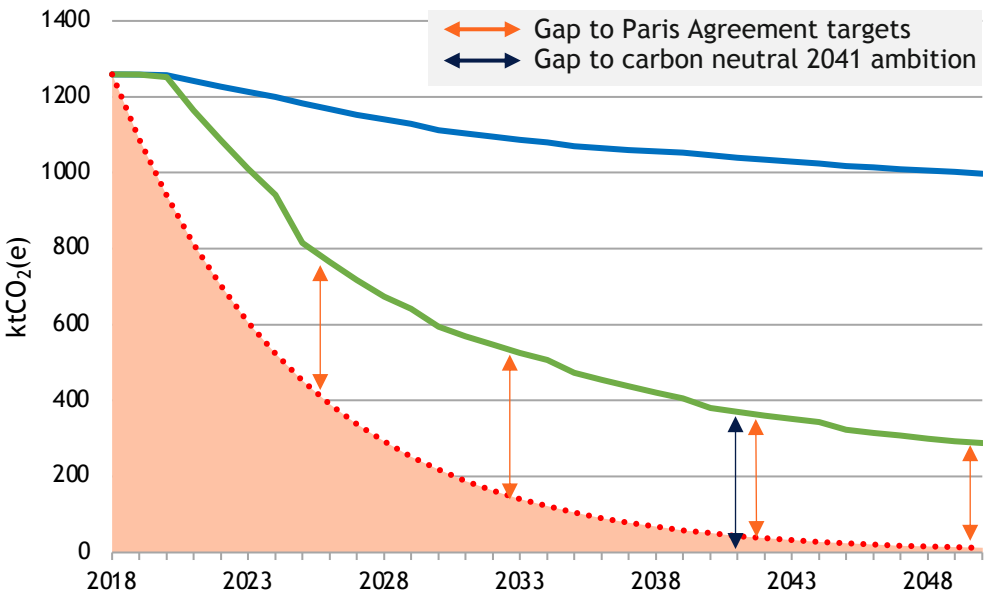
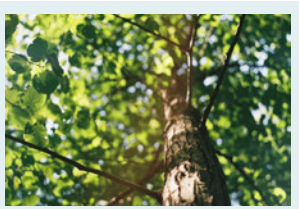


Figure 6: SCATTER Pathways, with indicators given for the gap to target.

Closing the gap

Technological innovation & 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. However, no "silver bullet" transformational technology should be relied upon or anticipated.

Accelerated & increased deployment: Solihull may consider action 'above and beyond' SCATTER interventions 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. Solihull may also seek to meet 2041 ambitions for implementation at an earlier date in order to accelerate emissions reductions. It is important to approach this with an understanding of the challenge associated with reaching the maximum ambition level presented in SCATTER, and the dependency on such developments.



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.

05

IDENTIFYING INTERVENTIONS

Anthesis

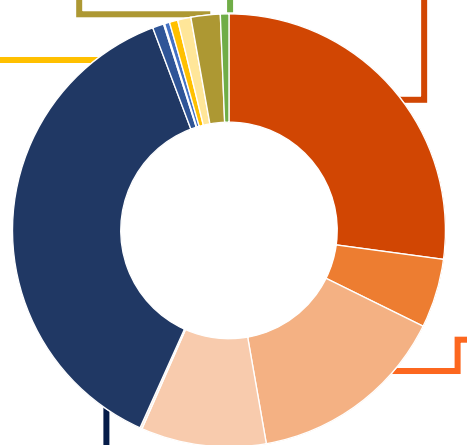
SCATTER INTERVENTIONS

The interventions that will be assessed will initially be taken from the measures considered in the SCATTER pathways tool (summarised opposite). Activity in each of these areas underpins the pathways' trajectories.

Measures have been grouped into different sectors, which also link directly to the sectors described within the annual emissions profile.

Each group of measures has some sort of activity focused on *demand-side* reductions, switching to electrified systems, or greening energy *supply*.

The SCATTER measures are not exhaustive, but help to define "*what needs to happen*" rather than answering the question of *"how will Solihull get there?"*.



Natural Environment
- Increased tree coverage
- Land management
- Livestock management
- Tree planting

Domestic Buildings
- Shifting off gas heating systems
- Appliance and lighting efficiency
- Shifting from gas to electric for cooking
- More energy efficient homes and new-builds

Industrial Processes
- More efficient processes
- Shifting off oil fuels

Waste
- Producing less waste
- Increased recycling rates

Non-domestic Buildings
- More energy efficient heating
- Shifting off gas heating systems
- Appliance and lighting efficiency
- Shifting from gas to electric for cooking

Transport
- Travelling shorter distances
- Driving less
- Switching to electric vehicles
- Improving freight emissions
- International aviation & shipping

Energy Supply
- Increased solar PV
- Increased biomass
- Increased solar thermal
- Increased wind
- Increased tidal, wave & hydro

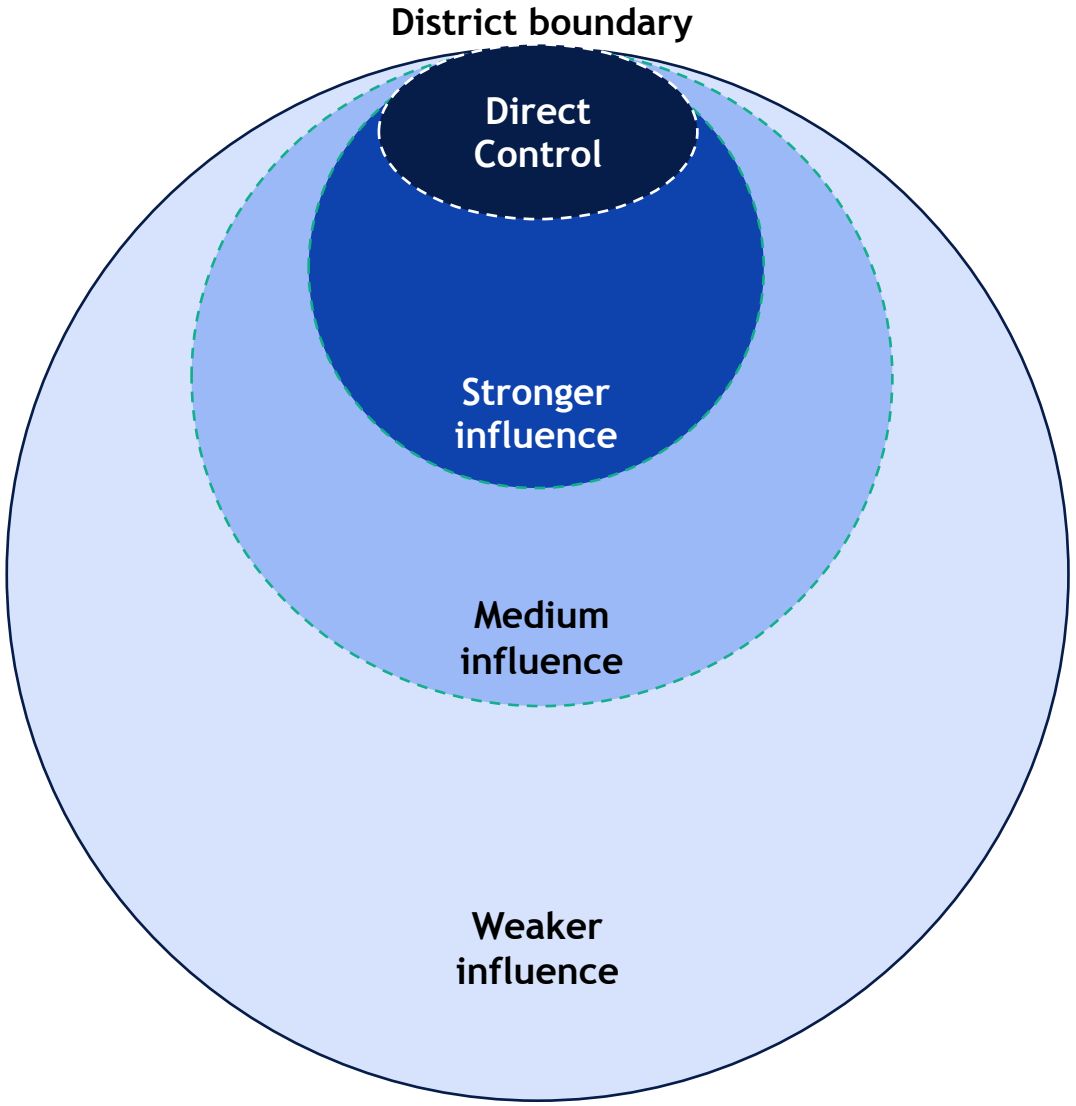
THE COUNCIL'S INFLUENCE

The chart opposite illustrates that Solihull Council's influence is varied and complex across the different activities that occur within their own operations and also across the Borough.

Influence bandings are based on Anthesis' judgment and are by no means definitive. They are intended to highlight opportunities for Solihull to apply their influence in new ways or in areas previously not fully explored.

Note that influence also extends beyond the district boundary, whereby Solihull's demand (and supply) of goods and services drive emissions in supply chains around the world. Such emissions are referred to as consumption based emissions (relative to the UK produced emissions totals).

Influence	Description
Direct Control	Emissions sources that are directly owned or operationally controlled by the Council, e.g. Council buildings and fleet.
Stronger	Owners and operators of emissions sources are clearly defined but are not directly owned or operated by the Council, e.g. emissions relating to procurement or council-led activities.
Medium	Emissions sources do not relate to council owned or operated assets, procurement or council led activities, however some convening power may exist with specific actors in the district, e.g. emissions from local stakeholders across sectoral networks and partnerships.
Weaker	Owners and operators of emissions sources are not clearly defined, influence limited to lobbying central government or trade associations, e.g. National Grid decarbonisation, vehicle levies.



Influence bandings: Note that diagram above is illustrative only and not to scale.

SUMMARY OF INTERVENTIONS

The following tables describe the scale of each interventions required to realise the emissions reductions shown in the High Ambition Pathway (green line, Figure 3) for Solihull. All reductions are against a 2017 baseline unless stated otherwise. The purpose of this analysis is to understand the scale and speed of change needed to meet the High Ambition Pathway.

Solihull 2041

Sector	Measure	By 2030	By 2040	By 2050
Domestic Buildings	More energy efficient homes & new builds	• 3,500 households “medium” retrofit • 28,100 households “deep” retrofit • 7,200 new houses built to Passivhaus standards	• 6,200 households “medium” retrofit • 49,750 households “deep” retrofit • 10,350 new houses built to Passivhaus standards	• 8,900 households “medium” retrofit • 71,400 households “deep” retrofit • 13,500 new houses built to Passivhaus standards
Domestic & Non-Domestic Buildings	Improved energy efficiency	• 21% domestic reduction • 17% non-domestic reduction	• 32% domestic reduction • 28% non-domestic reduction	• 43% domestic reduction • 40% non-domestic reduction
Domestic & Non-Domestic Buildings	Shifting from high carbon gas heating systems	• 47% of domestic heating systems are low-carbon or electric • 39% of non-domestic heating systems are low-carbon or electric	• 74% of domestic heating systems are low-carbon or electric • 60% of non-domestic heating systems are low-carbon or electric	• 100% of domestic heating systems are low-carbon or electric • 80% of non-domestic heating systems are low-carbon or electric
Domestic & Non-Domestic Buildings	Shifting to low carbon and energy efficient cooking and lighting systems	• 31% reduction in domestic energy demand for appliances, lighting and cooking • 29% increase in domestic electric fuel use for cooking • 11% reduction in non-domestic energy demand for appliances, lighting and cooking • 10% increase in non-domestic electric fuel use for cooking	• 52% reduction in domestic energy demand for appliances, lighting and cooking • 57% increase in domestic electric fuel use for cooking • 18% reduction in non-domestic energy demand for appliances, lighting and cooking • 22% increase in non-domestic electric fuel use for cooking	• 73% reduction in domestic energy demand for appliances, lighting and cooking • 84% increase in domestic electric fuel use for cooking • 25% reduction in non-domestic energy demand for appliances, lighting and cooking • 33% increase in non-domestic electric fuel use for cooking

SUMMARY OF INTERVENTIONS CONTINUED

Solihull 2041

Sector	Measure	By 2030	By 2040	By 2050
Transport	Travelling shorter distances	• 25% reduction in total distance travelled per person	• 25% reduction in total distance travelled per person	• 25% reduction in total distance travelled per person
Transport	Driving less	• 6% reduction in road transport use • 17% increase in rail transport	• 13% reduction in road transport use • 34% increase in rail transport	• 19% reduction in road transport use • 50% increase in rail transport
Transport	Switching to electric vehicles	• 89% of cars are EV or HEV • 100% of buses and trains are electric	• 95% of cars are EV or HEV • 100% of buses and trains are electric	• 100% of cars are EV or HEV • 100% of buses and trains are electric
Transport	Improving freight emissions	• 9% reduction in road freight mileage • 71% reduction in energy used per mile travelled	• 16% reduction in road freight mileage • 73% reduction in energy used per mile travelled	• 22% reduction in road freight mileage • 75% reduction in energy used per mile travelled
Waste	Producing less waste	• 24% reduction in the volume of waste	• 40% reduction in the volume of waste	• 57% reduction in the volume of waste
Waste	Increased recycling rates	• 50% increase in recycling rates	• 94% increase in recycling rates	• 137% increase in recycling rates
Industry	Shifting from fossil fuels	• 14% reduction in oil fuel usage • 3% increase in electricity consumption • 10% increase in natural gas usage	• 15% reduction in oil fuel usage • 3% increase in electricity consumption • 24% increase in natural gas usage	• 15% reduction in oil fuel usage • 2% increase in electricity consumption • 38% increase in natural gas usage
Industry	More efficient processes	Process emissions reduced: • 14% for chemicals • 10% for metals • 11% for minerals • 50% other industries	Process emissions reduced: • 22% for chemicals • 16% for metals • 18% for minerals • 65% other industries	Process emissions reduced: • 30% for chemicals • 21% for metals • 25% for minerals • 80% other industries

SUMMARY OF INTERVENTIONS CONTINUED

Solihull 2041

Sector	Measure	By 2030	By 2040	By 2050
Renewable energy supply	Solar PV	• Local PV: 244.8 MW installed capacity • Large-scale PV: 16.3 MW installed capacity	• Local PV: 376 MW installed capacity • Large-scale PV: 25.5 MW installed capacity	• Local PV: 507.2 MW installed capacity • Large-scale PV: 34.6 MW installed capacity
Renewable energy supply	Other renewable technologies (solar thermal, small-scale wind, anaerobic digestors etc.)	• Other renewable technologies: 25.5 MW installed	• Other renewable technologies: 27.6 MW installed	• Other renewable technologies: 29.6 MW installed
Natural Environment	Forest coverage & tree planting	• Tree planting outside of woodlands increases by 30% from 2017, equivalent to 1,690 hectares	• 24% increase in forest coverage • Tree planting outside of woodlands increases by 40% from 2017, equivalent to 1,820 hectares	• Tree planting outside of woodlands increases by 50% from 2017, equivalent to 1,950 hectares
Natural Environment	Land use management	• Maintaining existing green spaces	• 2% decrease in grassland and 5% decrease in cropland to increase forestland and carbon sequestration potential • Maintaining existing green spaces	• 2% decrease in grassland and 5% decrease in cropland to increase forestland and carbon sequestration potential • Maintaining existing green spaces
Natural Environment	Livestock management	• 12% reduction in livestock numbers	• 30% reduction in livestock numbers	• 48% reduction in livestock numbers

06

IDENTIFYING METRICS

Anthesis

INTRODUCING THE INTERVENTION CRITERIA

Anthesis have identified the following metrics to be used in the assessment of interventions. The following pages explain each of the metrics used and the approach taken to the interventions' assessment.

Hierarchy of actions
Metric: Categories of priority, reduced demand, electrification, decarbonizing energy supply.

Impact on emissions reduction
Metric: Emissions saved to 2040 in tCO_2e

Estimated capital cost
Metric: Relative categories of cost (Highest, Medium & Lowest)

Timescale
Metric: Key timelines based on key policy drivers

Co-benefits and considerations
Metric: Quantitative and qualitative review of economic, social and environmental co-benefits.

Support of Net Zero Growth and COVID-19 recovery
Metric: Review of implications of the COVID-19 pandemic

The resource and personnel requirements for the intervention
Metric: Internal and external stakeholder requirements

Opportunities for innovation
Metric: Highlight key areas with future innovation potential

PRIORITISING ACTION

What

It can be helpful to consider the ways to prioritise actions and the ideal order in which to approach interventions according to maximise the potential carbon reduction benefits. This ideal hierarchy also needs to be considered alongside other priorities and funding opportunities.

Why

Below are key factors to consider when prioritising actions :

1. Reducing demand should be prioritised

This avoids placing too much reliance on long-term, higher risk renewable supply infrastructure to deliver the emissions savings that are so urgently required, safeguarding carbon budgets in the process.

2. Future demand is hard to predict accurately - but decarbonising the energy supply is the next highest priority.

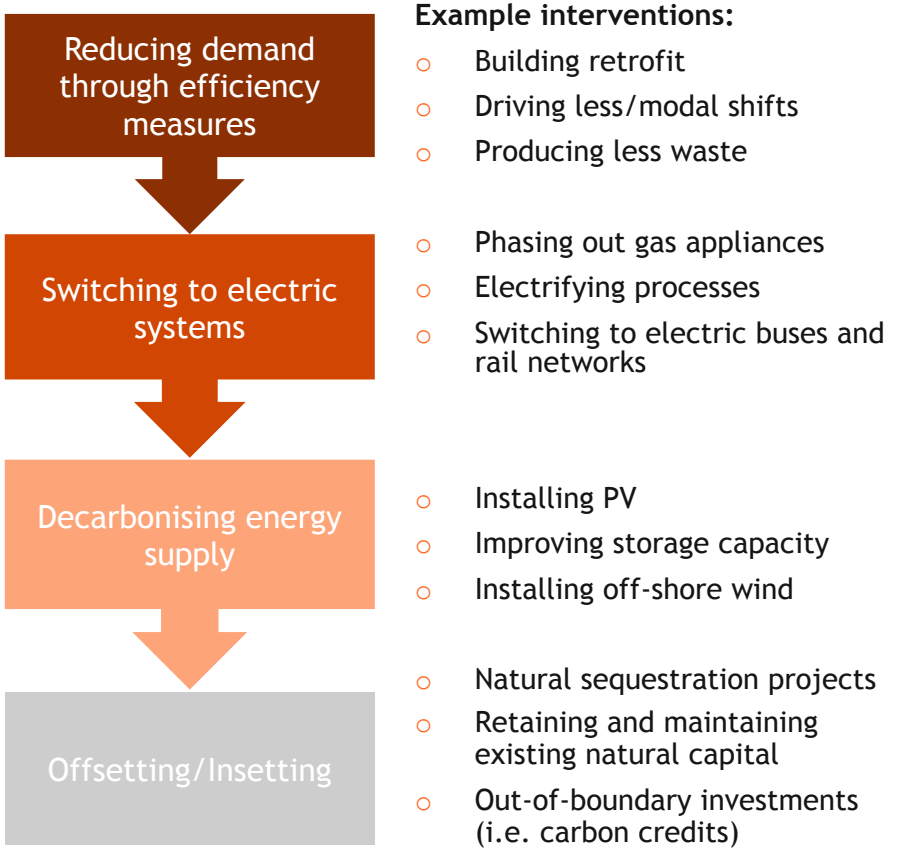
SCATTER's High Ambition Pathway assumes that electricity demand reduces due to improvements to efficiency of operation. Factors such as increased electrification of heat and transport are naturally big drivers for the increase, but incentives and opportunities for demand reduction and energy efficiency measures are still significant and could slow or tip trends in the other direction.

3. Offsetting is the final step to addressing any residual emissions.

Having implemented a programme of demand- and supply-side measures, residual emissions can be tackled through a transparent, well-defined strategy of *carbon offsetting* in order to reach the 2041 ambition.

How

To assess prioritisation, we will refer to the defined hierarchy of actions below. The following is an idealised version of that; Council influence and that of key local stakeholders may allow for some initiatives to be implemented before/in parallel with others.



CO_2 CARBON EMISSIONS SAVINGS

What

One of the first metrics to assess is the emissions reduction impact of interventions by estimating the potential cumulative emissions (tCO_2e) that could be saved between 2020 and 2040.

Why

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

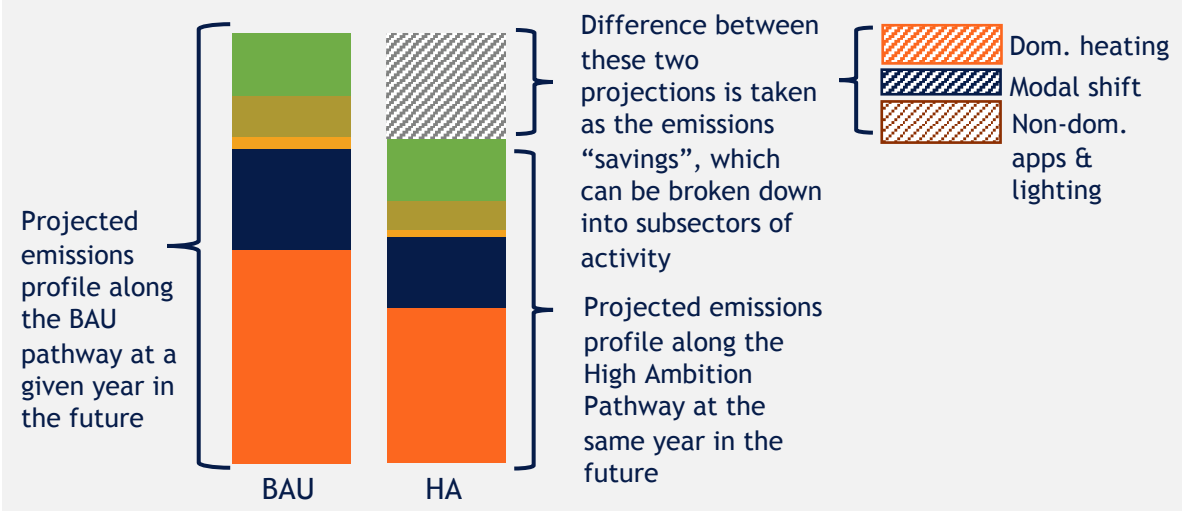
How

Energy supply - In order to isolate the impact of supply-side measures, a pathway of business-as-usual installation of renewables was created within SCATTER, with all demand-side measures kept at high ambition levels. The emissions were then compared along this hybrid pathway to the High Ambition Pathway, with the difference taken as savings directly from energy supply measures.

Non-SCATTER Interventions - There will be additional interventions outside of the tool which will need to be included, for which we will use a combination of desktop research and case studies to estimate emissions reduction potential.

How

SCATTER Interventions - Using the SCATTER "High Ambition" and "Business as Usual" scenarios we can estimate emissions savings, broken down into different categories. This is done by comparing the projected emissions along each pathway from different subsectors (e.g. domestic lighting or commercial heating) for each year, and defining the difference between them. A visual representation of this method is given below.



The categories of emissions savings are broken down slightly differently to the SCATTER interventions. 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. This is illustrated below:

Interdependent SCATTER interventions	Common savings subcategory	Example activity that meets both interventions
1. Domestic heating technologies 2. Hot water demand	Domestic space heating & hot water	Installation of an efficient household heat pump

ESTIMATED COST

What

Estimated costs of each intervention have been considered, within the following scope:

- Only capital cost was assessed at this stage;
- Operational costs are not presented here but can have a significant impact on the business case and indicate whether there is a 'payback' and over what period, we know that some high costs will have a significant payback;
- Scale of intervention will have a big impact on costs;
- Variety of financing mechanisms and actors who may play a role in financing.

At this stage costs are estimated but not exact, as the high-level nature of interventions means that they can be achieved through a variety of actions. Further detail on costs including payback opportunities will be explored in the Net Zero Action Plan.

Why

Costings are provided as categories of cost to understand the relative financial needs for each intervention area. These serve as a comparative scale to support more detailed discussions on the financial mechanisms and actors involved in the implementation of the measures. The comparative scale of costs can also help prioritization of interventions and serve as a starting point for discussions on financing mechanisms.

How

Based on the capital cost of typical actions for each intervention, costs are defined in groupings to provide an idea of their relative scale. As actions have not been defined at this stage, however selected examples of potential actions have been used to define the cost category for each intervention area. The mechanism by which these costs are covered is also not prescribed currently, and it is likely there will be a number of different actors including businesses, national and regional government who will play a role in funding these interventions.

£££ Highest	Interventions with the highest relative capital cost
££ Medium	Interventions with the median average capital cost
£ Lowest	Interventions with the lowest average capital cost

Where interventions have a range of costs associated depending on the technology, a range of cost categories has been used (e.g., Medium to Highest)

TIMESCALE

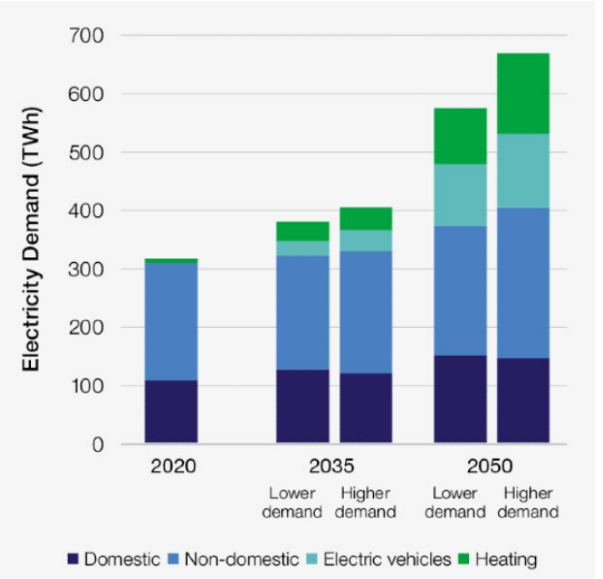
What

As relevant national policies can drive action forward within specific timescales, this criterion seeks to explore key policy drivers that can support scaling up of interventions.

How

This criterion has been assessed through research into relevant national policy timelines and how these may support implementation of the interventions identified.

BEIS data shows the significant impact that the shift to electrification will have, doubling electricity demand by 2050, and the role of displacing petrol and diesel across heating and transport.



Source: BEIS Energy White Paper

Why

There will be several CONSIDERATIONS to determine the timescale at which each action should be undertaken such as technological feasibility, governance and policy limitations and priorities.

In general, demand reduction actions should be prioritised, to ensure efficiency of processes, but in reality, many other CONSIDERATIONS such as governance and behaviour change will come into play.

It is important to frame these interventions within a wider UK government policy context as these policy changes can have significant impact on the ability of local government to provide support to individuals and businesses in implementing measures.

Timescale is also an important consideration during action planning process as some measures will need to sequenced, for example:

- Shift to electrification technology will see the greatest emissions reduction benefits when grid decarbonisation is maximised.
- Technology advances and innovation may have larger roles in the net zero journey going forward, but measures need to be implemented in the meantime to reduce the cumulative impact of carbon.
- Feasibility of implementing some measures at scale may require significant scaling of resources such as jobs which may not exist currently.

RESOURCE AND PERSONNEL REQUIREMENTS

What

The interventions are defined at a Borough level but reducing these emissions will require a unified and collaborative approach from multiple stakeholders in the area. When considering implementation, the resource and personnel requirements for both the Council and Borough as a whole need to be considered.

How

To assess this, we will look at both what is required from the Council for each intervention and who other potential stakeholders to engage could be. This will draw upon findings from the stakeholder engagement sessions carried out with officers and examples provided by other Local Authorities. It will also take into consider existing policy frameworks and networks in the region.

Why

We recognise that the Council cannot achieve net zero 'alone', so identifying the roles others will need to play is important. This could include, businesses, citizens, national government, the combined authority (WMCA), the Greater Birmingham and Solihull Local Enterprise Partnership (GBSLEP), other public institutions etc.

The first aspect to assess is the Council's current emissions reduction progress and the further internal action that is needed. For instance, evaluating the Council's owned building stock or further expansion of the Council's EV Pool Car Fleet project). Addressing the Council's own contribution first enables the council to demand similar levels of action from other organisations in the area. Following this, the role of the council in engaging and influencing others can be explored by defining stakeholders and assessing what is needed from each group. Local Authorities are in a good position to understand the needs of the area and the different stakeholders to engage.

Who are the key stakeholders?
What is needed from each stakeholder?
How can the Council influence this?

Ways of influencing emissions outside the Council:

CO-BENEFITS AND CONSIDERATIONS

What

It can also be helpful to consider the added co-benefits of a given measure when action planning. A co-benefit is a positive result in one area brought about by a given policy or measure aimed at an objective in another area.

Where relevant and significant, an assessment of any potential considerations have also been included. These refer to any areas where implementing interventions may have negative knock-on consequences that will need to be mitigated.

How

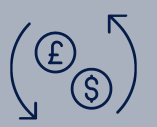
A qualitative assessment of potential co-benefits for each intervention has been included, bringing together a variety of resources (e.g. Ashden Co-benefit toolkit) and findings from internal stakeholder discussions with SMBC. Local datasets have been used and referenced where available to provide additional context. Where possible, quantitative information has been provided on the potential for job creation, economic opportunities or health benefits.

Any potential considerations have been identified through desktop research and from stakeholder engagement discussions.

Why

Considering co-benefits is useful in helping stakeholders build the case for action. Those which are more likely to offer direct co-benefits, retained within the Borough should be prioritised. It is widely accepted that decarbonising will offer co-benefits across a variety of spheres. These include:

ECONOMIC



- Consumer energy bills are reduced
- Costs associated with installing new generation assets, new grid connections and grid reinforcements works can be minimised

SOCIAL

- Health benefits associated with increased active transport (walking and cycling)
- Increased efficiency of public transport maximises social benefits

ENVIRONMENTAL

- The ecosystem becomes more resilient
- Quality of place improvements

NET ZERO GROWTH AND COVID-19 RECOVERY

What

This evidence base is being developed during an uncertain time period and the impact of COVID-19 presents both challenges and opportunities for emissions reduction. Therefore, the links between interventions and COVID-19 recovery have been identified to understand the impact that these measures may have in supporting this recovery, across the economy, society and environment.

How

For each intervention, possible barriers and opportunities in relation to COVID-19 and the green recovery have been identified. This builds on the framework set out by the Committee on Climate Change in May 2020 outlining six key principles to rebuild the UK after the COVID-19 pandemic whilst delivering a stronger, cleaner and more resilient economy.

This assessment also links interventions where relevant to the UK Government's Ten Point Plan for a Green Industrial Revolution which outlines over £5 billion to support a green recovery. This plan mobilises £12 billion – and potentially more than three times as much from the private sector – to place green jobs at the heart of our economic revival and will have significant implications on the net zero journey for Solihull.

Why

It is important to consider links to current context and at present COVID-19 is dominating decision making, some local authorities have seen resources usually allocated to the climate emergency shift to meet the immediate demands of responding to the pandemic. Therefore, it is important to recognise where COVID-19 recovery can both act as a barrier and enabler for climate change action.

Revenues have been adversely affected, and social distancing measures can present barriers to public consultation on climate action planning measures.

Barriers

- Shift in resources and staff moved to COVID response
- Shift in priorities and funding
- Social distancing preventing citizen engagement

However, the prospect of a Green Recovery also presents short- and long-term opportunities for climate action, particularly if decision makers can build on the behavioural and economic changes ushered in by the response to the pandemic. Examples are included below:

Enablers

- Shift to home working
- Uptake in Active Transport
- Engagement with nature
- Green recovery – low carbon infrastructure and job creation

OPPORTUNITIES FOR INNOVATION

What

Addressing carbon emissions through the measures explored in this report has a variety of opportunities for innovation – new mechanisms or ideas used to resolve old problems. Innovation can come in different forms, for example:

- **Technological innovation:** new technologies developed to help reduce emissions;
- **Social innovation:** new ways of working collaboratively with communities or other local actors to reduce emissions;
- **Financial innovation:** new models of financing which can help secure funding for low carbon projects.

How

Upcoming innovation opportunities in the intervention area have been researched, using case studies from other leading councils and businesses in the UK and internationally where relevant.
Key technologies applied and potential emerging technologies have been explored to understand how they can support in decarbonisation and bringing in additional co-benefits locally.

Why

Innovation is key for addressing the gap to target and for finding solutions specific to the challenges faced in Solihull. Innovation can support by driving local economic opportunities such as increased funding and job creation, whilst demonstrating Solihull as a leader and an attractive place for businesses to invest in.

Case Studies - Using examples from other councils and best practice further strengthens the case for action if others have been able to demonstrate application and success. Knowledge sharing is key for driving ambition and action from other stakeholders. It is important to consider both innovative technologies as well as approaches and policies:

- Key technologies – Looking at which key or emerging technologies have been applied to reduce emissions
- Key approaches – Considering innovative policies, frameworks or governance to drive action to reduce emissions

07

INTERVENTIONS ASSESSMENT

Anthesis

INTRODUCTION TO INTERVENTION ASSESSMENT

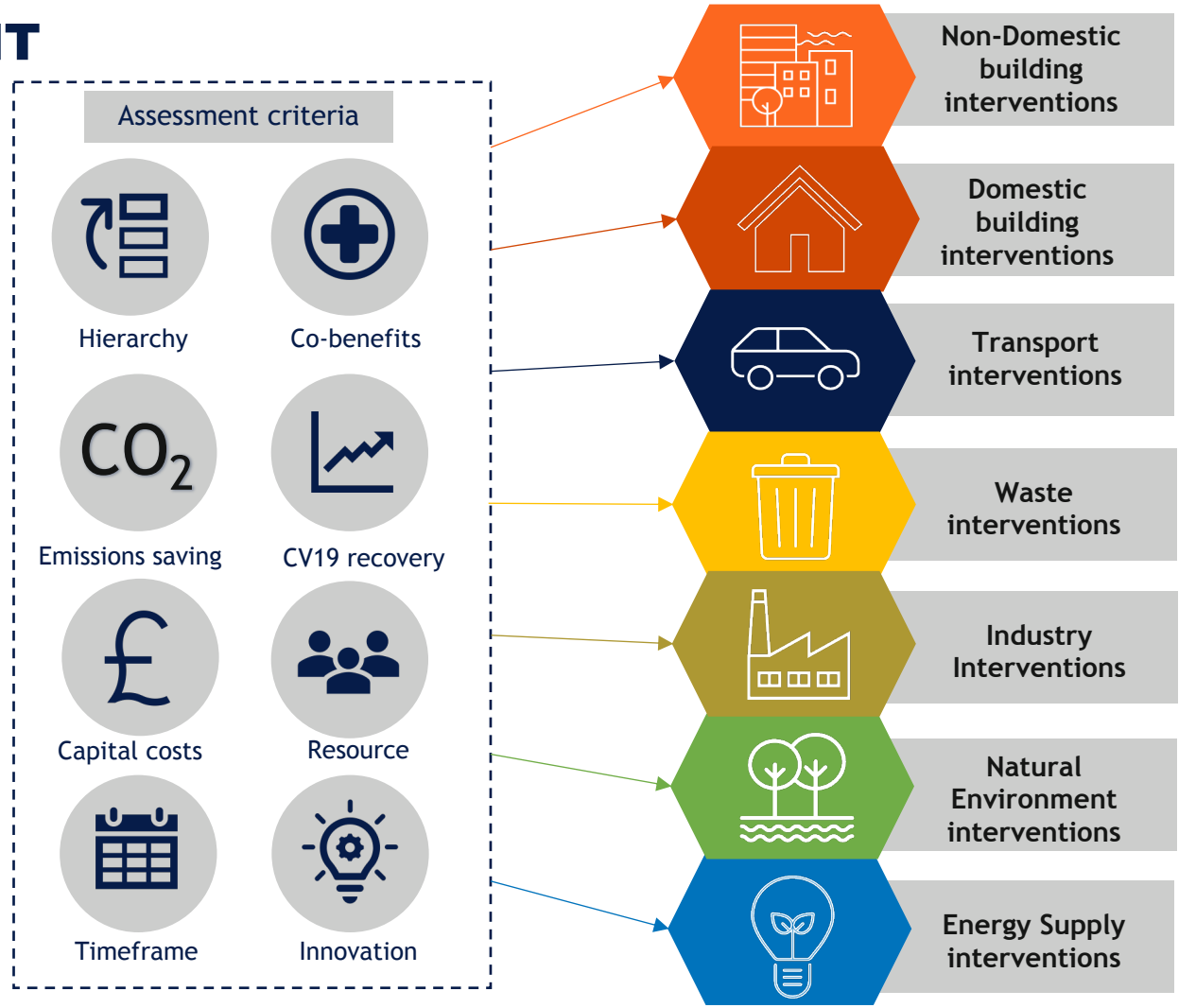
This section of the report will bring the SCATTER interventions outlined in Chapter 5 together with the criteria for assessing the intervention in Chapter 6. Each of the interventions assessed have been set at the maximum ambition level in SCATTER, defining ***what is needed*** in order to meet the high ambition pathway shown on page 19.

Aims of this chapter:

The aim of this chapter is to provide further information on the magnitude of impacts and the scale of change that is required to implement the interventions. This analysis is the first step towards prioritising interventions and provides the evidence base to drive ambitious action. This chapter provides a high level assessment of interventions which will be used to feed into a more detailed action plan in the later stages of this project.

The Net Zero Action Plan will provide a more granular look at the individual actions Solihull Council can take toward achieving the interventions in this chapter.

Figure 9: Sectors considered in SCATTER discussed in this report.



7.1 NON-DOMESTIC BUILDINGS

Anthesis

NON-DOMESTIC BUILDINGS INTERVENTIONS SUMMARY

Summary of non-domestic interventions

The SCATTER interventions in the non-domestic (commercial, industrial and institutional) buildings sector are listed below and explored in more detail on the following pages:

- Improved energy efficiency: see page 43. Improvements to energy use practices and buildings, including improvements to building fabric.
- Shifting from high carbon gas heating systems: see page 44. This measure is not limited to electrification in terms of switching to electric heaters but refers to the uptake of non-fossil fuel sources for heating including heat pumps, district heating and combined heat and power networks (CHP). The impact of the fuel mix will be heavily influenced by the increased availability of renewable energy and resources that can be utilised in Solihull. Hydrogen technology is not modelled in the tool due to the limited availability of large-scale data.
- Shifting to low carbon and energy efficient cooking and lighting systems: see page 45. Reduction in energy demand through more efficient lighting and appliances, including electrical devices, and all forms of lighting and cooking. This intervention also includes the uptake of electrical cooking systems and discontinuation of gas cookers.

Emissions savings from interventions

The table below summarises the SCATTER measures & interventions at 2040, as well as providing details on cumulative carbon savings.

Intervention	By 2040	Cumulative emissions savings 2020-2040
Improved energy efficiency	28% reduction in energy demand for heating, cooling & hot water	Non-domestic space heating, cooling and hot water: **1,092,276 tCO_2e**
Shifting from high carbon gas heating systems	60% of non-domestic heating systems are low-carbon or electric	
Shifting to low carbon and energy efficient cooking and lighting systems	18% reduction in non-domestic energy demand for appliances, lighting and cooking 22% increase in electric fuel use for non-domestic cooking	Non-domestic lighting, appliances & cooking: **465,375 tCO_2e**

Please note that the lifecycle or embodied carbon of buildings is not considered here. Whilst it is important to address the emissions associated processes like the production of materials and the construction of buildings it warrants a separate analysis and strategy, beyond the scope of this paper.

IMPROVED ENERGY EFFICIENCY

PRIORITISING ACTION

Reducing demand

ESTIMATED CAPITAL COST

£££ Highest

RESOURCES & PERSONNEL

Council: All staff involved in efficiency measures in council offices and buildings. Improvements can be made to the Council's own buildings.

Borough: This intervention will require significant action from other stakeholders in the Borough (businesses, schools, hospitals, leisure and retail) and all those who own or occupy non-domestic buildings.

TIMESCALE

All non-domestic rented buildings are to be EPC 'B' rated by 2030.[1] The volume of non-domestic buildings requiring improvements in energy efficiency means this will likely be a long-term measure. In the shorter term, funding was previously available through the Public Sector Decarbonisation Scheme and although this scheme has now closed.

OPPORTUNITIES FOR INNOVATION

Passivhaus buildings are a type of design standard that maximise comfort whilst using little energy for heating and cooling. Typically, Passivhaus involves high levels of insulation, high performance windows, airtight building fabric and mechanical ventilation for heat recovery.[1]

CO-BENEFITS

Economic

- Energy efficiency in commercial buildings increases worker productivity by up to 10% [3]
- If Solihull invested in all profitable energy efficiency and low carbon options for schools, hospitals and offices the Borough would save £13m a year in energy bills [4]
- Buildings will be greater protected against future energy price rises as well as being more physically resilient to heatwaves [5]

Social

- Energy efficiency in commercial buildings improves the health and wellbeing of individuals, with employee sick days decreasing by up to 40% [3]
- Creation of jobs for low carbon engineers and the upskilling of residents

Environmental

- Improved green & blue infrastructure – Energy efficiency improvements may be one aspect of more sustainable building design, which could also incorporate principles such as enhancing surrounding natural assets and integrating green infrastructure.

CONSIDERATIONS

Increasing the density of urban structures can reinforce an urban climate effect, thereby increasing summer heat stress and demand for cooling.[6] Smart systems and thermostats coupled with energy management behaviour change measures can help reduce impacts. Considerations must also be made for skills & workforce requirements needed to enable this shift. Any additional construction must consider the environmental impact on the existing land e.g. avoiding loss of mature trees.

COVID-19 AND ECONOMIC RECOVERY

Energy demand has decreased in office spaces whilst there has been a shift to homeworking, however this must be balanced with a subsequent increase in home energy. Point 7 of the Government's Ten Point Plan for a Green Industrial Revolution outlines the need for increased energy standards in non-domestic buildings and outlines further funding through the Public Sector Decarbonisation Scheme.[7]

SHIFTING FROM HIGH CARBON GAS HEATING SYSTEMS

PRIORITISING ACTION

Electrification

ESTIMATED CAPITAL COST

£££ Highest

RESOURCES & PERSONNEL

Council: Council-owned buildings should switch to these systems

Borough: This intervention will require significant action from other stakeholders in the Borough and all those who own or occupy non-domestic buildings. Additional engagement with the GBSLEP.

TIMESCALE

In 2021, UK Government will consult over new regulations to phase out fossil fuels in off-grid homes, businesses, and public buildings, and an end date on the use of remaining fossil fuel heating systems.[1]

OPPORTUNITIES FOR INNOVATION

Heat networks or district heating is a way of distributing heat from a central source and delivering to multiple buildings in the area. This method of distribution can support a shift to low carbon energy supply as it provides an opportunity to exploit larger scale renewables and recovered heat.[2] Industrial waste heat recovery can also provide low-carbon heating options for buildings.

CO-BENEFITS

Economic

- Protection from future fossil fuel price increases [3]
- Less reliance on a centralised system of heat and power, mostly generated by fossil fuels making the energy network less vulnerable [3]
- As an example, CHP typically has an efficiency of over 80% and operators typically save around 20% on energy bills [4]

Social

- Heat pumps can help to reduce the air pollution caused by heating. They do not emit NOx, SOx or particulate matter (PM) locally [5]

Environmental

- Reduced damage to the environment from harmful air pollutants

CONSIDERATIONS

Disruptive installation process as heat pumps can be difficult to install, costly and require significant work and disruption to properties.[6] Considerations will also need to be made to ensure new technology costs do not prevent accessibility for lower-income communities and to ensure a just transition.

COVID-19 AND ECONOMIC RECOVERY

Point 7 of the Government's Ten Point Plan for a Green Industrial Revolution outlines that the Government aims to install 600,000 heat pumps per year to 2028.[7]

SHIFTING TO LOW CARBON AND ENERGY EFFICIENT COOKING AND LIGHTING SYSTEMS

PRIORITISING ACTION

Reducing Demand & Electrification

ESTIMATED CAPITAL COST

Lowest

RESOURCES & PERSONNEL

Council: All staff involved in using appliances and saving energy. The council should assess appliances and procure low-carbon items.

Borough: This intervention will require significant action from other stakeholders in the Borough including businesses, schools, hospitals, retail and commercial cooking providers to reduce energy demand.

TIMESCALE

Energy efficient appliances are already available, and paybacks can be realised quickly. UK Government will consult on the role of 'hydrogen ready' appliances in 2021.[1] However, there is some uncertainty over the role hydrogen will play in decarbonisation and the speed of the shift in comparison electric heating systems.

OPPORTUNITIES FOR INNOVATION

As businesses are in recovery mode, consolidation of commercial buildings may support cost savings. Innovation in smart technology to improve the efficiency of appliances and lighting is likely to help better manage energy usage.

CO-BENEFITS

Economic

- Energy efficiency in commercial buildings increases worker productivity by up to 10% [2]
- Financial savings on energy bills and the utilization of less energy means that additional upfront costs are paid back quickly and offer savings in the long run [3]

Social

- Gas cookers can be less safe to use and research suggests there are some health impacts from increased indoor air pollution [4]

Environmental

- Energy efficient appliances can also save water [5]

CONSIDERATIONS

A rebound effect may occur where energy users increase their demand with the perception that their increased demand is made allowable by the efficiency measure. [6] Considerations must also be made for skills & workforce requirements needed to install and maintain new technologies.

COVID-19 AND ECONOMIC RECOVERY

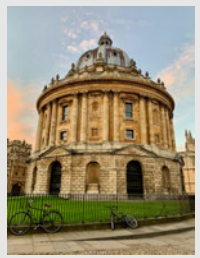
As many individuals have been working from home for the majority of the year, there has been a reduction in the demand for lighting and appliances in offices, shifting the energy demand to more inefficient homes. Many non-domestic buildings have also remained open with less capacity, continuing to use energy.

NON-DOMESTIC BUILDINGS INTERVENTION CASE STUDIES

Figure 7: Image of the St Sidwell's Point Passivhaus Leisure Centre expected to open at the end of 2021.[1]

Exeter Passivhaus Leisure Centre is part of Exeter City Council's city centre master plan and is set to be a world first Passivhaus Leisure Centre. It is the first commercial Passivhaus development from the council who have delivered several domestic schemes. The design includes 70% saving on energy costs when compared to a current good practice pool and a 50% reduction in water use. Local news reports suggest that the leisure centre will cost c.£44 million.[1]

Southampton District Energy Scheme delivers energy to over 45 energy users, both residential and commercial. The scheme is currently saving around 10,000 tonnes of CO_2 emissions per annum, using heat from a large-scale combined heat and power (CHP) plant, supplemented by geothermal energy and conventional boilers.[2]



Oxford City Council upgraded their internal air conditioning systems which was estimated to save 161 tCO_2/year and repaid its £45,000 spend in 1.2 years through reduced energy costs.[3]

SMBC has been working to implement the Ashden programme into local schools and academies across Solihull. Dickens Heath Primary School, Langley School and Shirley Heath School have benefited from energy audits, training and energy efficiency improvements.

SMBC secured £6,590,500 from the government's Heat Networks Investment Project (HNIP) to support plans to build a local energy network in Solihull. The Town Centre Energy Network, which will utilise low carbon and renewable energy, will distribute heat from a single energy centre directly into the town centre's buildings.

7.2 DOMESTIC BUILDINGS

Anthesis

DOMESTIC BUILDINGS INTERVENTIONS SUMMARY

Summary of domestic interventions

The SCATTER interventions in the domestic buildings sector are listed below and explored in more detail on the following pages:

- Improved energy efficiency in homes & new builds: see page 49. Changes in the energy demand for heating and cooling of domestic buildings. Different retrofit options are considered for existing households, as well as the performance of new builds. Expected growth in new homes is included in these estimates.

- Shifting from high carbon gas heating systems: see page 50. This measure is not limited to electrification in terms of switching to electric heaters but refers to the uptake of non-fossil fuel sources for heating including heat pumps, district heating and combined heat and power networks (CHP). The impact of the fuel mix will be heavily influenced by the increased availability of renewable energy. Hydrogen technology is not modelled in the tool due to the limited availability of large-scale data.

- Shifting to low carbon and energy efficient cooking and lighting systems: see page 51. Reduction in energy demand through more efficient lighting and appliances, including electrical devices, and all forms of lighting and cooking. This intervention also includes the uptake of electrical cooking systems and discontinuation of gas cookers.

Emissions savings from interventions

The table below summarises the SCATTER measures & interventions by 2040, as well as providing details on cumulative carbon savings.

Intervention	By 2040	Cumulative emissions savings 2020-2040
Improved energy efficiency in homes & new builds	6,200 households “medium” retrofit , 49,750 households “deep” retrofit, 10,350 new houses built to Passivhaus standards 32% reduction in energy demand for heating, cooling & hot water	Domestic space heating, cooling and hot water: **2,743,350 tCO2e**
Shifting from high carbon gas heating systems	74% of domestic heating systems are low-carbon or electric	
Shifting to low carbon and energy efficient cooking and lighting systems	52% reduction in domestic energy demand for appliances, lighting and cooking 57% increase in electric fuel use for domestic cooking	Domestic lighting, appliances & cooking: **377,793 tCO2e**

Please note that the lifecycle or embodied carbon of buildings is not considered here. Whilst it is important to address the emissions associated processes like the production of materials and the construction of buildings it warrants a separate analysis and strategy, beyond the scope of this paper.

IMPROVED ENERGY EFFICIENCY IN HOMES AND NEW BUILDS

PRIORITISING ACTION

Reducing Demand

ESTIMATED CAPITAL COST

£££ Highest

RESOURCES & PERSONNEL

Council: Domestic retrofit of own households and improvement to social housing stock. Guidance needed for tenants.

Borough: This intervention will require significant action from the residents of Solihull to make improvements to their homes. This will also require local businesses to provide the services and skills to deliver home energy improvements.

TIMESCALE

WMCA has set out ambitious plans to retrofit 50,000 homes in the region by the end of 2022[1] and the Solihull draft Local Plan includes a policy that from 2025 all new dwellings will be net zero carbon. UK Government aim for as many existing homes as possible to hit EPC Band C by 2035, with 80-90% of homes across the UK will require some form of retrofitting by 2050.[2]

OPPORTUNITIES FOR INNOVATION

Energiesprong is a type of net zero energy retrofit which means a home generates the total amount of energy required for its heating, hot water and electrical appliances. It is achieved by using new technologies such as prefabricated facades, insulated rooftops with solar panels, smart heating, and ventilation and cooling installations.[3]

CO-BENEFITS

Economic

- If Solihull invested in all the profitable energy efficiency and low carbon options, households in the area would save £24m a year from their energy bills [4]
- Households will have greater protection against future energy price rises as well as being more physically resilient during heatwaves [5]

Social

- Improving the energy efficiency of homes can reduce ill-health, children living in inadequately heated households are more than twice as likely to suffer from conditions such as asthma and bronchitis than those living in warm homes [5]
- Significant skills gap to deliver home retrofits at scale

Environmental

- Energy efficiency improvements may be one aspect of more sustainable building design, which could also incorporate principles such as enhancing surrounding natural assets.

CONSIDERATIONS

In some situations, there are risks of negative health outcomes from installations that reduce ventilation because they can exacerbate indoor air pollution (from tobacco, smoke, radon or dust mites) and increase the risk of overheating in the summer.[6] Considerations must also be made for skills & workforce requirements needed to enable this shift as well as the associated costs of installing systems which could prevent access and lead to further social inequalities. Fuel poor households should be prioritised for energy efficiency support. Energy efficiency improvements should consider compatibility with low carbon heating systems (see overleaf).

COVID-19 AND ECONOMIC RECOVERY

Point 7 of the Government's Ten Point Plan for a Green Industrial Revolution outlines the extension of the green homes grant and a commitment to further funding of the Social Housing Decarbonisation Scheme. The Government have strengthened energy efficiency requirements for private sector landlords and has extended ECO to 2026.[7]

SHIFTING FROM HIGH CARBON GAS HEATING SYSTEMS

PRIORITISING ACTION

Electrification

ESTIMATED CAPITAL COST

££ Medium

RESOURCES & PERSONNEL

Council: Installing heat pumps and electrified systems in social housing stock.

Borough: Requires residents to install electrified systems and developers to incorporate this into new builds.

TIMESCALE

UK Government are committing £122 million of funding towards a new Heat Network Transformation Programme and will implement local authority zoning by 2025.[1] Embedding low carbon heating requirements in planning policy will ensure long-term futureproofing of new builds. Gas boilers installed in new houses will be banned by 2025.

OPPORTUNITIES FOR INNOVATION

Hydrogen is a light and energy dense fuel that produces no greenhouse gases when burned and it has been identified as an important potential fuel for transitioning to net zero.[2] HyDeploy is a trial underway at Keele University to blend up to 20% volume of hydrogen with natural gas.[3] This explores utilising the existing gas network to supply homes.

CO-BENEFITS

Economic

- Protection from future fossil fuel price increases
- Heat pumps require minimal maintenance and can lower fuel bills depending on the fuel replaced and the additional energy efficiency measures delivered alongside [4]

Social

- Provides access to a heat supply for homes that are not connected to the gas grid. 7% of properties in Solihull are not connected to the gas network which is approximately 6,600 properties [5]
- Heat pumps can help to reduce the air pollution caused by heating. They do not emit NOx, SOx or particulate matter (PM) locally [6]
- Job creation for low carbon engineers

Environmental

- Reduced damage to the environment from harmful air pollutants

CONSIDERATIONS

Shift to electric heating systems can be costly and replacement of existing systems will only be feasible if long term benefits can be seen. Shifts in heating systems should ideally be carried out alongside energy efficiency improvements to maximise benefits, particularly in fuel poor households where electrification could increase bills if carried out without efficiency improvements. It is important that this intervention considers just transition principles to ensure the high cost of systems does not leave people behind. Considerations also need to be made for different options for low-carbon heating to identify the best fit[7] and for skills & workforce requirements.

COVID-19 AND ECONOMIC RECOVERY

Point 7 of the Government's Ten Point Plan for a Green Industrial Revolution outlines that the Government aims to install 600,000 heat pumps per year to 2028.[8] Point 2 of the Government's Ten Point Plan outlines driving the growth of low carbon hydrogen and there is a potential for heating homes to be explored.[8]

SHIFTING TO LOW CARBON COOKING AND LIGHTING SYSTEMS

PRIORITISING ACTION

Reducing demand & electrification

ESTIMATED CAPITAL COST

£ Lowest

RESOURCES & PERSONNEL

Council: Improve energy efficiency of appliances used by council and within social housing. Provide guidance and support for tenants.

Borough: Requires residents to invest in energy efficient appliances and switch their cooking systems.

TIMESCALE

UK Government will consult on the role of 'hydrogen ready' appliances in 2021. By the mid-2030s, all newly installed heating systems are expected to be low carbon or to be appliances that can be converted to a clean fuel supply. The timing of shifting to low-carbon systems will need consideration for age of products and be largely driven by national policy and the maturity of the market.

OPPORTUNITIES FOR INNOVATION

Hydrogen and other low carbon fuels will drive significant opportunities for innovation in cooking systems, as with scaling up the electrification of appliances. Increased uptake of app-controlled lighting and appliances can provide opportunities for better management of energy usage and opportunities for smart technology-led solutions to behaviour change.

CO-BENEFITS

Economic

- Financial savings on energy bills, using less energy means that additional upfront costs are paid back and offer savings in the long run. Time of use tariffs may also offer savings [2]

Social

- Gas cookers can be less safe to use and research suggests there are some health impacts from increased indoor air pollution [3]
- Scaling up hydrogen solutions in the UK could create 75,000 jobs by 2035 [4]

Environmental

- Some energy efficient appliances can also save water [5]

CONSIDERATIONS

Upgrading appliances when current products are still working is not always the most sustainable option[6] and old appliances must be disposed of and recycled in an appropriate way. The embodied carbon of new appliances must also be considered against the reduced operational carbon e.g., the carbon produce during the manufacturing of appliances or transportation.[7] Considerations must also be made for skills & workforce requirements needed to install and maintain new technologies.

COVID-19 AND ECONOMIC RECOVERY

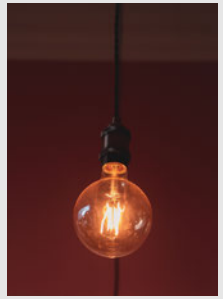
IEA research suggests that COVID-19 has had both positive and negative impacts on energy intensity of appliances. Individuals are purchasing more appliances to perform services outside of their usual working environment with household appliance use generally increasing. However, the recession may lead to lower rates of appliance replacement in the next 1-2 years.[8]

DOMESTIC BUILDINGS INTERVENTION CASE STUDIES

Figure 8: Image of Energiesprong retrofit of housing in Nottingham.[1]

The Nottingham housing association was the first in the UK to pilot net zero retrofit of social housing using **Energiesprong**. They undertook a pilot project to improve 10 inefficient homes and deliver a more comfortable indoor climate for residents.[1]

Manchester Housing Providers Partnership are a collective of over a dozen social landlords that have pledged to support the City's net zero target. Various members have embarked on the development of zero carbon strategies and asset management plans as a result (with further actions planned).[2]



Southampton City Council's energy provider CitizEn Energy has been providing free low energy LED light bulbs for installation in vacant council homes. The Council plans to install them in 100 homes overall.[3]

Figure 9: Image of Solihull housing.[4]

Solihull Community Housing are building 7 bungalows to Passivhaus standard to reduce carbon emissions and fuel poverty. The properties will be of a high energy efficiency rating and will utilise local labour, contributing social value to the borough.[4]

7.3 TRANSPORT

Anthesis

TRANSPORT INTERVENTIONS SUMMARY

Summary of transport interventions

The SCATTER interventions in the transport buildings sector are listed below and explored in more detail on the following pages:

- Travelling shorter distances: see page 55. A change in the overall mileage travelled per passenger across all forms of transport. Increases in population are also considered in this measure.
- Driving less: see page 56. Changes to the mode by which passengers travel, defined by miles travelled. These are broken down into car (which includes petrol, diesel, hybrid and electric vehicles), active (walking and cycling) and public (train and bus).
- Switching to electric vehicles: see page 57. Considers the speed of the uptake of electric cars, trains and buses and phasing out of petrol and diesel vehicles. The impact of this measure is influenced by both the demand-side reductions and grid supply from renewable energy supply. The tool does not consider hydrogen-fuel vehicles, but an exploration of the role of new technologies has been provided.
- Improving freight emissions: see page 58. Considers changes to both the fuel efficiency and mode of travel for freight and commercial journeys.
- Reducing aviation emissions: see page 59. Considers the reduction of scope 1 aviation emissions.

Emissions savings from interventions

The table below summarises the SCATTER measures & interventions by 2040, as well as providing details on cumulative carbon savings.

Intervention	By 2040	Cumulative emissions savings 2020-2040.
Travelling shorter distances	25% reduction in total distance travelled per person	On road: **3,205,350 tCO2e**
Driving less	13% reduction in road transport use, 34% increase in rail transport	
Switching to electric vehicles	95% of cars are EV or HEV, 100% of buses and trains are electric	
Improving freight emissions	16% reduction in road freight mileage, 73% reduction in energy used per mile travelled	Freight emissions*: **-35,133 tCO2e***
Reducing aviation emissions	Department for Transport "Low" scenario - covering 'lower economic growth worldwide with restricted trade, coupled with higher oil prices and failure to agree a global carbon emissions trading scheme'	International aviation and shipping: **74,683 tCO2e**

* Emissions increase slightly due to modal shift of freight

TRAVELLING SHORTER DISTANCES

PRIORITISING ACTION

Reducing demand

ESTIMATED CAPITAL COST

££ Medium

RESOURCES & PERSONNEL

Council: All staff involved in land-use planning. Officers time to develop and run active travel campaigns and encourage utilisation of public transport.

Borough: This intervention will require significant action from all stakeholders within the Borough, including businesses, WMCA, schools, community groups, taxi drivers and residents.

TIMESCALE

The government's National Planning Policy Framework was revised in June 2019 and details the importance of promoting sustainable travel from the earliest stages of plan-making and development proposals. This ensures that opportunities to promote walking, cycling and public transport use are identified and persued.[1]

OPPORTUNITIES FOR INNOVATION

The Transport for New Homes project combines visiting new housing developments across the UK with research into the planning landscape behind them to determine transport opportunities in new developments. Their 2018 report identifies several recommendations for innovation, including a need for planners to choose several smaller brownfield sites connected to existing urban areas, rather than larger single sites.[2]

CO-BENEFITS

Economic

- Encourages residents to shop locally and engage in local activities, thereby boosting local economy spending
- Saving households money as they don't need to own a car or have lower petrol costs

Social

- Less NO_2 and pollution from vehicle exhaust fumes leads to health benefits, poor air quality has been linked to around 40,000 deaths a year in the UK [3]
- Reduction in transport poverty as active and public transport modes can improve accessibility [4]

Environmental

- Considerable improvements in air quality and noise reduction from vehicles increases an individual's quality of life [5]
- Reduction of traffic congestion
- Significant reduction in emissions as travelling shorter distances can support the uptake of active travel modes

CONSIDERATIONS

It is important to consider the potential longer-term changes in ways of working as a result of the COVID-19 pandemic and whether homeworking and less business travel will somewhat continue.

COVID-19 AND ECONOMIC RECOVERY

Lockdown has seen an increase in individuals travelling shorter distances. One of the biggest impacts has been the reduction in passenger transport demand, due to a combination of government lockdowns and fears of contracting and spreading the virus when using mass transport modes.[6]

DRIVING LESS

PRIORITISING ACTION

Reducing demand

ESTIMATED CAPITAL COST

£££ Highest

RESOURCES & PERSONNEL

Council: All staff involved in transport planning. Officers time to develop and run campaign to encourage active travel.

Borough: This intervention will require significant action from all stakeholders within the Borough. Cohesion needed with TfWM and surrounding local authorities to ensure adequate public transport links.

TIMESCALE

The UK Cycling and Walking Investment strategy notes the following targets for 2025: double cycling, increase walking activity to 300 stages per person per year, increase the percentage of children that usually walk to school from 49% to 55%.[1] A household travel survey indicated that 57% of daily trips made by Solihull residents are shorter than 5km, a total of 320,000 trips every day which are a short walk or cycle.

OPPORTUNITIES FOR INNOVATION

The utilisation of small scale, short-range micromobility options, such as e-bikes and electric scooters are becoming increasingly popular within urban environments to improve first and last mile transit access. E-bike technologies are continuously improving, and engineers have now developed a second-generation e-bike, which is remarkably lighter than its predecessors.[2]

CO-BENEFITS

Economic

- Increasing active travel could save the NHS £17bn within 20 years by reducing the prevalence of conditions such as type 2 diabetes, dementia, heart disease and cancer [3]
- Cycling UK predicts that doubling traffic in congested conditions could cost over £15b a year [4]
- Revenue opportunities in large & longer-term vehicle parking areas, such as the NEC and Birmingham Airport

Social

- Less damage to children's cardiovascular systems causing asthma - the cost to the economy of pre-mature deaths related to poor air quality is estimated to be £54bn a year [3]
- Improving air quality can also help to reduce health inequalities, air pollution levels have been found to have strong association with deprivation levels [3]

Environmental

- Sustainable transport reduces the number of vehicles on the road creating a higher quality of life, 40 towns in the UK reach or exceed air pollution limits [3]
- Driving less reduces the demand for land used for roads and car parking, providing an opportunity for more green spaces.

CONSIDERATIONS

Increase in number of cycling related road accidents, although there is an argument for increased 'safety in numbers' [5], highlighting the need for safer infrastructure and cycle safety training for drivers.

COVID-19 AND ECONOMIC RECOVERY

The government advised that individuals should walk or cycle where possible. Capacity on public transport remains limited given the requirements for social distancing. In May, the government outlined a £2b package to support active travel and help the country emerge from the coronavirus crisis. The Emergency Active Travel Fund package included £225 million to enable local authorities to reallocate road space to walking and cycling, with pop-up cycle lanes and other temporary measures.[6]

ELECTRIFYING VEHICLES

PRIORITISING ACTION

Electrification

ESTIMATED CAPITAL COST

£££ Highest

RESOURCES & PERSONNEL

Council: EV/ULEV Programme Officer and all staff involved in transport infrastructure. Council's own EV strategy for pool car fleet.

Borough: This intervention requires significant action from businesses and residents. Businesses encouraged to switch company cars to EV, residents to invest in EV or HEV. Coordination with surrounding local authorities to ensure EV charging infrastructure is abundant.

TIMESCALE

Government commitment to phase-out of diesel and petrol cars brought forwards by 10 years. Announcement in November 2020 outlining the end of the sale of new petrol and diesel cars in the UK by 2030.[1]

OPPORTUNITIES FOR INNOVATION

Innovation within EV technology has been constant. The development of longer ranges is a key area for technological development. Renault's New Master Z.E. panel van can cover up to 74 miles on a single charge, developing technology gives the potential for vehicles to cover hundreds of miles on a single charge.[2]

CO-BENEFITS

Economic

- Electric vehicles are often cheaper to run per mile and can offer substantial fuel savings [3]
- Tax benefits for companies who chose electric vehicles [3]
- The Committee on Climate Change suggests annual savings of up to £8 billion per year when switching to low-carbon vehicles [4]

Social

- Less NO2 and pollution for pedestrians, reduce hazardous pollutants originating from road vehicles that have severe impacts on resident health
- Give those who rely on public transport access to cleaner vehicles through utilising electric buses

Environmental

- Reduction in noise pollution especially in urban centers [5]

CONSIDERATIONS

The production and extraction of materials can have environmental and social impacts through the supply chain if not properly managed. Batteries for EVs can require rare elements such as lithium and cobalt, which has raised environmental and ethical issues in countries where these elements are mined.[5]

COVID-19 AND ECONOMIC RECOVERY

As part of Point 4 of the government's Ten Point Plan for a Green Industrial Revolution, the PM has announced £1.3bn investment in EV charge points across England, £582m in grants for those buying ULEV and nearly £500m to be spent in the next 4 years on mass-scale production of electric batteries in strong manufacturing basis (Midlands and North East).[6]

IMPROVING FREIGHT EFFICIENCY

PRIORITISING ACTION

Reducing demand

ESTIMATED CAPITAL COST

£££ Highest

RESOURCES & PERSONNEL

Council: Dedicated personnel needed to engage with companies with highest fleet numbers and Highways England.

Borough: Significant action from freight companies, all businesses and surrounding local authorities.

TIMESCALE

The government and major trade bodies including the Freight Transport Association and the Road Haulage Association, have agreed a new industry-wide voluntary target for reducing HGV GHG emissions by 15% by 2025, from 2015 levels.[1] The Government's long-term goal is the development and deployment of zero emission HGVs utilising hydrogen technologies.

OPPORTUNITIES FOR INNOVATION

Logistics processes within freight transport have huge opportunities for innovation in new technologies and low carbon fuels. Recent growth of consumer involvement in supply chains has shone a spotlight on this sector and the continued rise of instant deliveries and individual shipments is likely to push businesses to establish new ways of working.

CO-BENEFITS

Economic

- An increase in rail freight would lead to regional economic benefits in Yorkshire and the Humber, the North West and the Midlands especially [2]

Social

- OLEV has awarded over £300m in grants for ultra low emissions technologies, which will support the creation of 12,000 jobs by 2030 [3]
- Reducing on-road freight vehicles can help reduce traffic congestion and improve air and noise quality
- An increase in rail freight transportation will result in improvements in service and accessibility for passenger railway [2]

Environmental

- One freight train can remove up to 76 HGVs from the road, reducing congestion and reducing air pollution as a tonne of rail freight emits 76% less CO_2 than a tonne of road freight [2]

COVID-19 AND ECONOMIC RECOVERY

When comparing ONS national data from October 2019 and October 2020, online food sales increased by 99.2%, department stores increased by 87.2% and other non-food sales increased by 89.7%. Online sales have reached much higher levels over the course of the pandemic, resulting in an increase in the number of delivery drivers.[4]

REDUCING AVIATION EMISSIONS

SMBC has limited influence over Birmingham Airport, however aviation emissions do need to be addressed as the airport forms an important part of Solihull's local economy.

PRIORITISING ACTION

Reducing demand

ESTIMATED CAPITAL COST

£££ Highest

RESOURCES & PERSONNEL

Council: Work with Birmingham Airport to reduce emissions and support the airport's Sustainability Strategy to 2030.

Borough: Residents and businesses operating within Solihull to reduce number of flights and utilise other transportation modes for domestic travel.

TIMESCALE

The government have established the Jet Zero Council as a sector-wide partnership to accelerate the development and adoption of net zero aviation technologies. In July 2020, the government invested £15m into FlyZero, a 12-month study to design and develop zero-emissions aircraft which could be in operation by 2030.[1] Key members of the UK aviation industry have pledged to achieve net zero emissions by 2050.[2]

OPPORTUNITIES FOR INNOVATION

Airbus are committed to developing, building and testing alternative-propulsion systems powered by electric, hydrogen and solar technology to enable the decarbonisation of the aviation industry.[3] In 2017, Airbus launched the E-Fan X demonstrator which has helped to pave the way for an industry-wide decarbonisation movement.

CO-BENEFITS

Economic

- A reduction in demand for domestic and international aviation encourages staycations and individuals to holiday within the UK, providing a boost to local economies. The summer of 2020 saw a surge in staycation bookings, which generated a £24bn boost for the UK economy [4]

Social

- There are many health benefits to flight reduction, including improved sleep and decreased radiation exposure for residents living within the vicinity of an airport

Environmental

- In addition to releasing carbon emissions, planes produce contrails, soot and also nitrous oxides, which all have the capacity to trap additional heat at flight altitude. Reducing flight travel will help to reduce the release of these global warming substances in the atmosphere.
- Reducing aviation mileage can also help to reduce noise pollution.
- Improvements to air traffic management can help to reduce fuel burn at landing and take off, reducing local air pollution at airports.

COVID-19 AND ECONOMIC RECOVERY

Reduced demand for air travel due to travel restrictions - businesses able to adapt in the future with less business travel due to increased use of videoconferencing platforms and public uncertainty over travel safety guidelines. Currently, increases in aviation use for freight are being experienced as Brexit impacts access to freight via the Eurotunnel.

TRANSPORT INTERVENTION CASE STUDIES

Poundbury in Dorset is a development designed around people rather than cars. The key to its success is having a layout of connected streets coupled with offices, small shops, cafes and pubs integrated within homes. The effect is that Poundbury has an authentic small town feel rather than a car dependent suburb.[1]

Edinburgh City Council's Electric Vehicle Framework outlines that in residential developments where there are 10+ parking spaces, every 6 spaces should include an electric vehicle charging point. The policy also calls for provisions to be made for infrastructure to allow all new individual dwellings with a driveway or garage to have vehicle chargers in the future.[2]

As part of **Solihull's** UK Central programme and piloted by Transport for the West Midlands and local transit firms, the **Low Carbon Future Mobility** project aims to use technology to reduce carbon emissions from short journeys, such as adopting low carbon delivery services. SMBC is looking to collaborate with local businesses on delivering shopping and food, especially as demand increases during the coronavirus pandemic.

Waltham Forest Council launched their 'mini-Holland' project after winning TfL funding in 2014, a bold initiative to improve air quality and reducing congestion. Over five years, Waltham Forest delivered substantial infrastructure changes throughout the borough, including the introduction of modal filters closing 43 roads to cars, 91 blended crossings and an additional 24km of stepped cycle track.[1]

The Royal Mail has made two ultra low emission vehicle announcements in the last year. The first was the trial of large electric delivery vehicles (up to 7.5 tonnes), supplied by Oxfordshire-based manufacturer Arrival. These vehicles will deliver mail from central London to sites around the south east of England. The second was the purchase of 100 Peugeot Partner electric vans, which are already in active duty around the UK.[3]

7.4 WASTE

WASTE INTERVENTIONS SUMMARY

Summary of waste interventions

The SCATTER interventions in the waste sector are listed below and explored in more detail on the following pages:

- Reduce the quantity of waste: see page 63. Considers changes in the overall weight of waste produced across all streams from domestic, commercial and industrial activity. Reducing the quantity of waste is a priority when examining the waste hierarchy: reduce, reuse, recycle.

- Increasing recycling rates: see page 64. Considers the different destinations for waste streams.

The Borough will continue to build on current levels of waste recycling, composting and generating energy from waste across all waste streams.

Emissions savings from interventions

The table below summarises the SCATTER measures & interventions by 2040, as well as providing details on cumulative carbon savings.

Intervention	By 2040	Cumulative emissions savings 2020-2040
Reduce the quantity of waste	40% reduction in the volume of waste	Solid waste disposal: **26,066 tCO_2e**
Increasing recycling rates	94% increase in recycling rates	

REDUCING THE OVERALL QUANTITY OF WASTE

PRIORITISING ACTION

Reducing demand

ESTIMATED CAPITAL COST

Lowest

RESOURCES & PERSONNEL

Council: All of council waste team and those responsible for managing waste contracts.

Borough: Collective action needed by all across the Borough, including residents, schools and businesses.

TIMESCALE

The Government's 'Our Waste, Our Resources' strategy on food waste outlines the goal of eliminating food waste sent to landfill by 2030 and a target of municipal landfill waste to be 10% or less by 2035.[1]

OPPORTUNITIES FOR INNOVATION

Innovation opportunities for developing alternatives to plastic such as packaging inspired by nature. Growth of social enterprises such as London Library of Things, saving 15,900 kg of waste from going to landfill by borrowing rather than buying.

CO-BENEFITS

Economic

- Lower council costs associated with waste collection and disposal due to decreased quantities of waste [2]
- WRAP estimates that in the UK alone, over 2 million tonnes of fresh produce in the supply chain are lost or wasted each year and that action to reduce or prevent this waste, could save between £400 million and £500 million a year.
- Free up consumers' financial resources for potentially more economically productive endeavours - consuming less will use fewer financial resources to purchase products that become waste [2]

Social

- Encourage social inclusion through community volunteer schemes, e.g., foodbanks and community kitchens
- Improves access to reduced price goods for lower income families [2]

Environmental

- Protects ecosystem and wildlife through the reduced need for raw material extraction
- Reduction in road traffic associated with waste collection vehicles
- Reduction in pollution from waste treatment

COVID-19 AND ECONOMIC RECOVERY

Local authorities have reported large increases in household waste arisings during the Covid-19 outbreak and huge falls in commercial waste arisings, according to the results of the latest Association of Environment, Economy, Planning and Transport (ADEPT) Covid-19 waste impacts survey.[3]

INCREASING RECYCLING RATES

PRIORITISING ACTION

Reducing demand

ESTIMATED CAPITAL COST

££ Medium

RESOURCES & PERSONNEL

Council: All of council waste team and those responsible for managing waste contracts.

Borough: Collective action needed by all across the Borough, including residents, schools and businesses.

TIMESCALE

The Government's waste strategy outlines the goals of a 75% recycling rate for packaging by 2030 and a 65% recycling rate for municipal solid waste by 2035 in line with 25 Year Environment Plan.[1] Brexit is likely to have a significant impact on waste management and recycling through regulation changes and availability and costs of certain waste disposal activities.

CO-BENEFITS

Economic

- Recycling acts as an input into economic activity
- Organisations developing innovation in biodegradable and reusable products can benefit from Government grants such as the Plastics Research and Innovation Fund
- Lambeth Council pointed out in 2017 that "it is 6 times cheaper to dispose of recycled waste than general refuse". The more you recycle the more money is saved, which is great for households, businesses and local public services [2]

Social

- Friends of the Earth estimate that if a target of 70% recycling rate is reached across the UK it could create 50,000 new UK jobs with 30,000 of the new jobs in recycling directly and 20,000 in supply chains and the wider economy [2]

Environmental

- Recycling reduces the need to grow, harvest or extract new raw materials from the Earth. That in turn lessens the harmful disruption and damage being done to the natural world [2]

OPPORTUNITIES FOR INNOVATION

Opportunities for innovation in scaling up recycling for hard-to-recycle plastics and creating new recyclable or biodegradable packaging. Additional innovation opportunities relating to community level waste initiatives.

COVID-19 AND ECONOMIC RECOVERY

According to data from the Local Government Association (LGA), 8 in 10 English councils have reported a rise in the volume of paper, cardboard, plastic and glass being collected since the national lockdown began.[3]

WASTE INTERVENTION CASE STUDIES

Cheshire West & Chester Council has finished top of the Eunomia Recycling Carbon Index 2020, making it the highest scoring council in England, Wales and Northern Island in terms of avoided carbon emissions in 2018/19. Cheshire West & Chester Council saved 120kg CO_2e per capita and improved performance was largely due to a 3% increase in curbside collected recycling tonnage.[1]

Figure 10: London's Library of Things has 6 locations across London

London's Library of Things project promote a 'borrow not buy' movement for rarely-used items to discourage waste. 80% of household items are used less than once per month and 90% of borrowers say they now have more money to spend on things important to them. The most popular items to borrow at the London Library of Things are sewing machines, bread makers, steam cleaners and cordless hedge trimmers.[2]

The **Birmingham & Solihull Industrial Symbiosis (BASIS)** project connects a network of small and medium sized businesses, charities and academic to institutions to allow organisations to share waste and other resources that are useful to others. This process aims to reduce the amount of waste generated in the region, efficiently use resources, support cost savings and identify potential investment opportunities while reducing energy and waste disposal costs.[3]

7.5 INDUSTRY

INDUSTRY INTERVENTIONS SUMMARY

Summary of industry interventions

The industrial sector represents a relatively small proportion of emissions in Solihull, and most of the action in this area will be delivered through WMCA and the GBSLEP in collaboration with SMBC. The SCATTER interventions in the industry sector are listed below and explored in more detail on the following pages:

- Shifting from fossil fuels: see page 68. Considers change to the energy consumption in industrial processes and activity. Trajectories measure the changing fuels used – and what proportion of processes can be powered with electricity and natural gas rather than heavier oil fuels.

- More efficient processes: see page 69. Considers annual reductions in process emissions via a reduction in the production index of various industries. Separate trajectories are included for chemical, metal and mineral sectors, with all other industrial activity grouped together (labelled as “other” industry).

Emissions savings from interventions

The table below summarises the SCATTER measures & interventions by 2040, as well as providing details on cumulative carbon savings.

Intervention	By 2040	Cumulative emissions savings 2020-2040
Shifting from fossil fuels	15% reduction in oil fuel usage, 3% increase in electricity consumption, 24% increase in natural gas usage	Industrial buildings & facilities (also includes savings from building fabric improvements): **623,536 tCO_2e** Industrial processes: **90,708 tCO_2e**
More efficient processes	Process emissions reduced: 22% for chemicals, 16% for metals, 18% for minerals, 65% other industries	

SHIFTING FROM FOSSIL FUELS

PRIORITISING ACTION

Reducing demand

ESTIMATED CAPITAL COST

£££ Highest

RESOURCES & PERSONNEL

Council: Work closely with WMCA and GBSLEP to support businesses with accessing regional and national funding for low to zero carbon product and process development for small-scale industry.

Borough: Businesses to work with GBSLEP to develop low carbon action plans.

TIMESCALE

The Industrial Energy Transformation Fund was announced in the autumn budget of 2018. The fund will support businesses with high energy use to transition to a low carbon future. It will help companies cut their energy bills and carbon emissions through investing in energy efficiency and low-carbon technologies. The IETF has a UK-wide budget of £315m over five years to 2024.[1]

OPPORTUNITIES FOR INNOVATION

The government's Clean Growth Action Plan includes ambitions to phase out the installation of high carbon forms of fossil fuel heating in new and existing businesses off the gas grid during the 2020s and support the recycling of heat produced in industrial processes. [2]

CO-BENEFITS

Economic

- A shift in resources from imported fossil fuels to UK investment could stimulate further economic activity [3]
- Shifting from finite fossil fuels to other energy sources may lead to more stable energy prices

Social

- Innovation in low-carbon energy for the industrial sector will provides an opportunity for job creation: The UK government announced investments of £162 million of public funds will be available to support shifting the industrial sector away from carbon intensive fossil fuel use, which has the potential to create high-skill, low-carbon jobs

Environmental

- Reductions in fossil fuel extraction can lead to biodiversity benefits. During the extraction phase of fossil fuel exploitation, biodiversity is impacted directly through land conversion, degradation and noise pollution from drilling exploratory wells and surveying leading to habitat destruction [4]

COVID-19 AND ECONOMIC RECOVERY

Point 10 of the governments Ten Point Plan for a Green Industrial Revolution outlines £1 billion Net Zero Innovation Portfolio which includes actions to support the shift away from fossil fuel energy reliance for the industrial sector. This green financing will support research and development into innovative technologies in line with the net zero transition while creating jobs and supporting the economic recovery.[5]

MORE EFFICIENT PROCESSES

PRIORITISING ACTION

Electrification

ESTIMATED CAPITAL COST

££ Medium

RESOURCES & PERSONNEL

Council: Ensure that the council has a programme in place for supporting efficiency improvements with local industry.

Borough: Businesses to review procurement policy and ensure products and services are sourced with a view of reducing overall supply chain emissions. Identify areas where efficiencies in production can be improved e.g., adoption of a circular economy model.

TIMESCALE

The UK Government Climate Change Levy has been extended by a further 2 years until March 2025. supports industrial businesses who meet agreed energy or carbon reduction targets to benefit from tax reductions of an estimated £200 million, in return for meeting agreed energy or carbon reduction targets. The Industrial Clusters Mission is expected to support the delivery of 4 low-carbon clusters by 2030 and at least one fully net zero cluster by 2040.[1]

OPPORTUNITIES FOR INNOVATION

Recovery of industrial process heat can provide low-carbon heat supply. Artificial intelligence could support industrial sector organisations in helping to find inefficiencies and optimise processes. Industry 4.0 is a concept based on the use of technology for efficient production, such as the Internet of Things (IoT) and cyber-physical systems.[2]

CO-BENEFITS

Economic

- Improved efficiency of operations – businesses will likely see cost and energy use savings through improved efficiency of processes
- Opportunities for tax discounts under the Climate Change Levy
- Increased local investment in the low carbon sector - pioneering new technologies could increase localised investment in industry

Social

- Innovation in process efficiency can support job creation – UK Government estimates CCUS and hydrogen innovation in industry could create 60,000 jobs by 2030 [3]
- Advancements in technology through the use of AI and industrial internet of things (IoT) can also help to improve worker safety in factories [4]

Environmental

- Reduced emissions as a result of more efficient industrial processing will also help improve air quality
- Improving the efficiency of industrial processing can result in reductions in waste materials

COVID-19 AND ECONOMIC RECOVERY

Reference to improving industrial process efficiency is limited within the Government's 10-point recovery plan with a heavy reliance on new technologies such as hydrogen. Manufacturers have called on Government to provide better financial incentives for companies to invest in energy efficiency measures to aid a green recovery from COVID-19.[5]

INDUSTRY INTERVENTION CASE STUDIES

Teesside Collective is a collective project aimed to create one of Europe's first clean industrial zones. The area has one of the highest concentrations of industry in the country and the cluster of industries are working together to develop carbon capture and storage. The group is made up of five large industrial companies in the region and has the potential to help to retain the UK's industrial base, attract new investments and jobs as well as meet the UK's climate change targets.[1]

The City of Manchester have used their borough-wide target as a short-hand way of indicating the scale of change needed for a variety of suppliers, businesses and organisations within the city. Some businesses have subsequently sought a SBTi certified target aligned with the city's ambition.[2]

7.6 NATURAL ENVIRONMENT

Anthesis

NATURAL ENVIRONMENT INTERVENTIONS SUMMARY

Summary of natural environment interventions

The SCATTER interventions in the natural environment sector are listed below and explored in more detail on the following pages:

- Increased tree coverage & tree planting: see page 73. Considers the increase in the proportion of land which is forest cover. Considers changes to the coverage of trees outside of woodland, through new trees being planted and maintenance of existing trees.
- Land use management: see page 74. Considers changes to green belt, grassland and cropland coverage.
- Livestock management: see page 75. Considers reductions in livestock numbers.

Its important to note that land and livestock management practices differ greatly across the agricultural sector and the degree to which land and trees can act as carbon 'sinks' will be determined by different practices used.

Emissions savings from interventions

The table below summarises the SCATTER measures & interventions by 2040, as well as providing details on cumulative carbon savings.

Intervention	By 2040	Cumulative emissions savings 2020-2040
Increased tree coverage & tree planting	24% increase in forest cover Tree planting outside of woodlands (including lone trees, hedges, and small woodlands) increases by 40% from 2017 to 1,820 hectares Assumes existing and new trees will be maintained over the period	Land use: **14,491 tCO2e**
Land use management	2% decrease in grassland and 5% decrease in cropland to increase forestland and carbon sequestration potential Maintaining existing green spaces	
Livestock management	30% reduction in livestock numbers, through shifts in diet	Livestock: **12,912 tCO2e**

INCREASED TREE COVERAGE & TREE PLANTING

PRIORITISING ACTION

Insetting/Offsetting

ESTIMATED CAPITAL COST

£ Lowest

RESOURCES & PERSONNEL

Council: Ensure that the council increases tree coverage on its own land and land that it manages.

Borough: Work with developers as well as schools, leisure centers and community groups to deliver effective tree management and planting. Businesses to explore opportunity for tree planting and integrating green infrastructure onto property.

TIMESCALE

The Conservative manifesto promised to increase tree planting to 30,000 hectares per year across the UK by 2025, building on the announcement of the £640m Nature for Climate Fund to support tree planting and peatland restoration.[1]

OPPORTUNITIES FOR INNOVATION

The Committee on Climate Change estimates agroforestry across the UK (planting trees on agricultural land, while maintaining their primary use), could deliver 6 $MtCO_2e$ in savings by 2050.[2] Green roofs and green walls provide additional opportunities for greening built up urban areas.

CO-BENEFITS

Economic

- On average, house prices increase between 5-18% when a property is associated with mature trees [3]
- Reduction in building energy costs as trees lower temperatures and shade buildings in the summer

Social

- Increasing good quality green space projects locally can support job creation
- Good quality green space can reduce health inequalities reduce social isolation, especially in older people

Environmental

- Trees can reduce noise pollution by up to 6-8 decibels [4]
- Trees can also help to reduce temperature by providing natural cooling thus helping to mitigate the impact of heatwaves [5]
- Increased tree coverage leads to biodiversity benefits
- Native trees provide many ecosystem services, such as improving water quality, water management (reducing flooding) and soil retention and stability [6]

CONSIDERATIONS

It is important to consider what type of trees are being planted (short life span vs longer, native vs non-native species) and whether species of tree are best suited to the surrounding land.[7] There is limited green space available in densely populated urban neighbourhoods to plant trees, existing street trees suffer from shrinking budgets and simple neglect resulting in street tree disappearance.[8]

COVID-19 AND ECONOMIC RECOVERY

In June 2020, a government consultation ran for 12 weeks to update England's Tree Strategy. The new strategy will set out policies to expand tree cover, support woodland management and increase public engagement with trees and woodlands. The government's updated tree strategy will play its full part as we build back better and secure a fair, green and resilient recovery from the coronavirus pandemic.[9]

LAND USE MANAGEMENT

PRIORITISING ACTION

Reducing Demand

ESTIMATED CAPITAL COST

££ Medium

RESOURCES & PERSONNEL

Council: All staff involved in land use planning and natural capital. Ensure that the council protects and enhances natural capital on its own property and that which it manages.

Borough: Businesses to review land holdings and explore opportunity of integrating green infrastructure onto property. Schools to increase opportunities for children to engage with natural environment.

TIMESCALE

A new review of Public Health England's Improving Access to Greenspace strategy was released in March 2020 and provides a list of recommendations for local government.[1]

OPPORTUNITIES FOR INNOVATION

Biochar is a useful by-product of the biomass energy generation process which can be used to support soil health and as a carbon storage mechanism due to its long decomposition cycle.[2]

CO-BENEFITS

Economic

- If everyone had access to sufficient green space, the benefits associated with increased physical activity could save the health system £2.1 billion per year [3]

Social

- Green spaces can provide a space for communities to engage, which can improve community cohesion, walkability or neighbourhoods, reduce crime levels and develop a connection to local place
- Children living in areas with good access to green spaces have lower prevalence of obesity (11-19%) compared with children limited access to green spaces
- Those living closer to green space in urban areas have been found to experience lower stress, anxiety and depression [4]

Environmental

- Increased biodiversity - trees and green spaces can create habitats, support species and increase biodiversity

COVID-19 AND ECONOMIC RECOVERY

Point 9 of 10 point plan is protecting our natural environment outlining: the creation of new National Parks and Areas of Outstanding Natural Beauty; acceleration of vital work needed to restore our natural ecosystem with the establishment of 10 long-term Landscape Recovery projects over the next four years; the establishment of a new Environmental Land Management scheme as we leave the EU and move away from the Common Agricultural Policy and investment of £5.2bn in a six-year programme for flood and coastal defences.[5]

LIVESTOCK MANAGEMENT

PRIORITISING ACTION

Reducing Demand

ESTIMATED CAPITAL COST

££ Medium

RESOURCES & PERSONNEL

Council: Dedicated personnel to work with Solihull's farming community to mitigate livestock GHG emissions through better agricultural practices, animal husbandry and land use management.

Borough: Behaviour change shifts to reduce meat consumption, partnership with schools. Land-owners and farmers - work with environment agency to better manage soil, explore new livestock management approaches.

TIMESCALE

The CAP has been one of the main drivers of land use and management and has caused significant environmental damage. The Government's 25 Year Environment Plan details the need for a Green Brexit that puts environmental policy at the heart of England's domestic and international priorities, farming and agricultural policy is a key focus area.[1]

CO-BENEFITS

Economic

- Diets with relatively low amounts of beef, lamb and pork are associated with lower risks of cardiovascular disease, stroke and certain types of cancer, reducing the strain on the NHS and saving public money [3]

Social

- Improving consumers knowledge on the impacts of growing their food can help improve connection to local land and community well-being

Environmental

- Reduction in livestock allows for a change in land use to support biodiversity and carbon storage from land [4]
- The CCC estimates low-carbon farming practices such as controlled release fertilisers, improving livestock health and slurry acidification can help reduce GHG emissions from soils and livestock by up to 10 $MtCO_2e$ by 2050 [2]

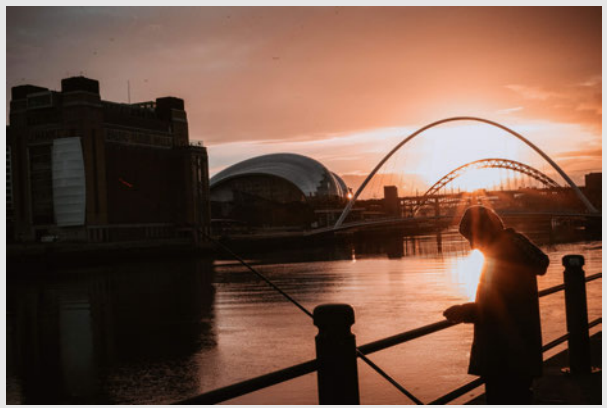
OPPORTUNITIES FOR INNOVATION

Designing livestock diets and feed ingredients/supplements to improve nutrients whilst reducing methane emissions could offer potential improvements on the efficiency of livestock.[2]

COVID-19 AND ECONOMIC RECOVERY

There is currently no evidence to indicate that the Sars-CoV-2 virus can affect livestock but the recent mink-associated mutuations may raise concerns.

NATURAL ENVIRONMENT INTERVENTION CASE STUDIES



Newcastle City Council's Green Infrastructure Delivery Framework highlights the co-benefits of green and blue infrastructure, particularly building on strategies to reduce flood risk. The Green Infrastructure Strategy identifies priorities for green infrastructure protection, enhancement and new provision. Green Infrastructure Assets include accessible urban green space, natural and semi natural habitats, transport links (cycleways and footpaths), wildlife corridors, street trees and green roofs.[1]

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 459,929 trees and involved 12,538 people. It is aiming to plant 3 million trees and bring 2,000 hectares of unmanaged woodland back into community use.[2]

Nottingham's Good Food Partnership, which was part funded by Nottingham City Council, work to promote the sustainability of Nottingham's local food system and work towards a circular food economy, reducing the ecological footprint of the food system and aim for zero edible food waste.[3]

Hinckley and Bosworth Borough Council is seeking Government support for its ambitions to extend the National Forest across Leicestershire, in line with the region's carbon neutrality goals. The council will be working to find grants to buy land and engage with local landowners to provide tree planting space.

Solihull's Wildlife Ways Project sees £16.8 million part-funded by the European Regional Development Fund support the planting of over a thousand trees from 2018-2020. The project will continue to support Solihull's goal of 250,000 trees over the next 10 years. The **WMCA Virtual Forest** allows individuals from the public to record trees they plant across the region enabling better tracking of collective efforts.

7.7 ENERGY SUPPLY

Anthesis

ENERGY SUPPLY INTERVENTIONS SUMMARY

Summary of energy supply interventions

Though demand reduction is ideally prioritised, increases in renewables will still be needed to meet current and future energy demands, through:

- Increase solar photovoltaics capacity: see page 79. Solar PV refers to electricity produced from converting sunlight into energy. Both large scale and "local" PV are considered for Solihull. Local capacity is defined as power generated from sources that are not Major Power Producers.

- Increase the capacity of other renewable technologies: see page 80. This covers other potential renewable technologies, beyond solar, that could be explored in Solihull. Some key technologies to consider are: **solar thermal, anaerobic digestion, sewage & landfill gas, municipal solid waste generation** and **plant biomass**. Where a given technology is deemed unfeasible within a given area (e.g., the prescribed level of wind may not be assessed as feasible) the residual capacity is assumed to be taken up by other technologies (i.e. additional solar). As in the local technologies measure, the prescribed capacity in each technology type is flexible and any reduced capacity in one type is assumed to be made up for by another technology type.

SMBC is currently undertaking a Renewable Energy Study which will inform the strategy for increasing local renewable energy generation.

Emissions savings from interventions

The table below summarises the SCATTER measures & interventions by 2040, as well as providing details on cumulative carbon savings.

Intervention	By 2040	Cumulative emissions savings 2020-2040
Solar photovoltaics	Local PV: 376 MW installed capacity Large-scale PV: 25.5 MW installed capacity	Energy Supply: **2,057,344 tCO2e**
Other renewable technologies	Other renewable technologies (solar thermal, anaerobic digestion, biomass): 27.6 MW installed capacity Declining usage of biomass having displaced fossil fuel sources in power stations	

SOLAR PHOTOVOLTAICS

PRIORITISING ACTION

Green Energy Supply

ESTIMATED CAPITAL COST

£££ Medium to Highest

RESOURCES & PERSONNEL

Council: The council can install solar PV on their own buildings or install ground-mounted solar panels.

Borough: This intervention will also require businesses, other landowners and residents to install solar on their property which may require officer time to co-ordinate with others.

TIMESCALE

The price of solar is decreasing - Solar and batteries have also seen rapid cost reductions: PV modules and battery prices have both fallen by over 80% since 2010.[1]

OPPORTUNITIES FOR INNOVATION

Solar battery storage is an important part of the uptake of renewable technologies, as it can help to balance supply and demand.[2] Storage can also support financing by enabling local organisations sell back energy to the grid.

CO-BENEFITS

Economic

- Reduce your electricity costs - By generating your own power, you can cut your annual electricity bill by up to £400 [3]
- Building large-scale wind and solar power plants is cheaper than building and running new gas plant, and could be cheaper than running existing gas plant between now and 2050, when accounting for the costs of carbon [4]

Social

- Fuel poverty reduction: Reduction in fuel poverty through improving access to low cost energy [5] in council housing stock such as Solihull Community Housing

Environmental

- Renewable energies like solar also help to reduce air pollution and damage to ecosystems

CONSIDERATIONS

Solar farms require land - brownfield sites are preferred, and ecological impacts need to be considered. Variable renewable generation poses a challenge in maintaining a secure supply of energy and grid re-inforcement.[6] Considerations must also be made for skills & workforce requirements needed to enable a shift to increased solar PV and the maintenance of these technologies.

COVID-19 AND ECONOMIC RECOVERY

CCC: Strengthening energy system networks: Post-COVID-19 economic recovery presents an opportunity for governments, regulators and the industry to work together to accelerate these investments. Fossil fuel use may also be disincentivised as part of the recovery.[7]

OTHER TECHNOLOGIES

PRIORITISING ACTION

Green Energy Supply

ESTIMATED CAPITAL COST

£££ Medium to Highest

RESOURCES & PERSONNEL

Council - The council can own the renewable technology themselves and install on their own land if available as well as continuing to build on larger scale opportunities such as energy from waste heat.

Borough – The Council can work with groups of businesses to fund local scheme for connected energy opportunities or support a community renewables scheme. Large scale installations may require support from national or regional government.

TIMESCALE

Nearly £3 million of Government money is being given to projects across the West Midlands delivering renewable energy technologies to locally. This will help to highlight the region as a hub for low carbon energy over the next 5 years.

OPPORTUNITIES FOR INNOVATION

Community Energy Projects can support collective action to reduce, purchase, manage and generate energy such as solar thermal, wind turbines or hydroelectric generation.[1] Opportunities for utilising waste from the anaerobic digestion process as fertiliser can help support circular economy processes.

CO-BENEFITS

Economic

- Creation of jobs and upskilling of local people. In the UK, low carbon and renewable energy activities generated £46.7 billion turnover in 2018, directly employing 224,800 people (full-time equivalents).[2]
- Solar thermal is supported under the Green Homes Grant which incorporates funding for skills and training. [3]

Social

- Community energy schemes have benefits such as increased autonomy, empowerment and resilience by providing a long term income and local control over finances. With smart metering technology, there is also the potential to offer local people discounted energy linked to local energy generation [4]

Environmental

- Reduced pollution and harm to environment – Wind, solar and hydropower produce little or no air pollution which reduces damage to ecosystems [5]

CONSIDERATIONS

It is important to minimise negative impacts on communities reliant on the fossil fuel sector so investment in renewables should be targeted in these areas.[6]
Windfarms – potential objections due to risk posed to birds and the perceived negative visual impact. The planning process has an important role in responding to these concerns.[7]

COVID-19 AND ECONOMIC RECOVERY

Point 1 of the Government's Ten Point Plan is Advancing offshore wind - By 2030 the UK government plans to quadruple offshore wind capacity.[3]
Point 3: Delivering New and Advanced Nuclear Power - UK Government see nuclear as a reliable source of low carbon electricity.[3]

ENERGY SUPPLY INTERVENTION CASE STUDIES

Figure 11: Image of the solar installation on Portsmouth City Council industrial units.[1]

Portsmouth City Council now has 738 solar PV panels installed alongside a ten-unit battery system· Batteries are a key component of the new solar installation on one of the city council's industrial estate. It can store 135kWh of electricity enough to power the average house for 2 weeks) and can be used at time of the day when electricity costs are higher.[1]

Northumberland County Council have approved the development of an energy-producing anaerobic digester at North East Grains, a cooperative of about 80 farming businesses. The facility will have an overall capacity of generating 500KW and surplus generation will be fed back to the National Grid. Additionally, the site will allow for 3 new jobs to be created in the area, while supporting the region's environmental goals.[2]

Solihull Hospital benefited from installations of solar panels rated at 250kVA, saving over 10% on their current energy expenditure, while supporting on carbon reduction commitments.

08

CONCLUSIONS & NEXT STEPS

Anthesis

PATHWAYS TO NET ZERO FOR SOLIHULL

Conclusions

Achieving Solihull's ambition of net zero by 2041 will require rapid and significant shifts from current activities across all sectors. SMBC will need to work in close collaboration with the West Midlands Combined Authority (WMCA) and the Greater Birmingham and Solihull Local Enterprise Partnership (GBSLEP) to deliver the ambitious changes needed to meet the region's net zero goal. While this journey will require action from all actors across the Borough, there are also huge opportunities during this transition.

- Our modelling shows that the interventions described here will not suffice in Solihull achieving its net zero 2041 ambition and that **further action** will be needed from emerging technologies, pushing ambition further and certified insetting/offsetting mechanisms.

- Maximising the opportunities with **existing and future projects** such as the heat network and new developments will be crucial in delivering associated social, environmental and economic benefits.

- Both **behaviour change and technology shifts** will need to be implemented at scale in order to achieve the High Ambition scenario for Solihull – this aligns with recent analysis by the CCC that estimates 43% of UK emissions cuts on its main route to net-zero require a degree of behaviour change combined with low-carbon technologies.

- The impact of advances in **new and emerging technologies** such as low-carbon fuels must be closely monitored as they could provide potential economic benefits to Solihull while helping 'close the gap' to net zero. However, while the Government's 10 Point Plan heavily focuses on new technology, a fair and green transition to net zero will not be achievable without **significant behaviour change shifts**.

- It will be important to consider the **connectivity of interventions** across sectors, in particular the balance between reducing demand and balancing low-carbon energy supply. If energy supply can be located in high demand areas, there can be additional circular economy benefits.

- **Collective action** from businesses, third sector, academia and the wider public in collaboration with the Council is imperative to meet the Borough's net zero ambition and no one entity can reach this goal on their own.

NEXT STEPS

Solihull Net Zero Action Plan

Each intervention area described in this report can be achieved through a variety of actions. Depending on the Council's level of influence to change behaviour or policy, SMBC may need to work with others to influence and implement the measures described.

The next step in the action planning process is to begin identifying and scoping these necessary actions, in line with SMBC's inclusive growth plans. The council has a variety of levers to consider, for example:

- **Lobbying** national government
- Working with **WMCA** to support regional strategies
- **Collaborating** with other local authorities to enable greater collective influence
- Providing better **information and signposting** to the public
- Developing **incentives** and local policies
- **Convening** local businesses to identify mutual opportunities

In the development of Solihull's Net Zero Action Plan, levers such as those described above will be explored to better understand specific actions the council can implement. This will also include a more detailed analysis of the costs associated and the relevant stakeholders who will need to be engaged.

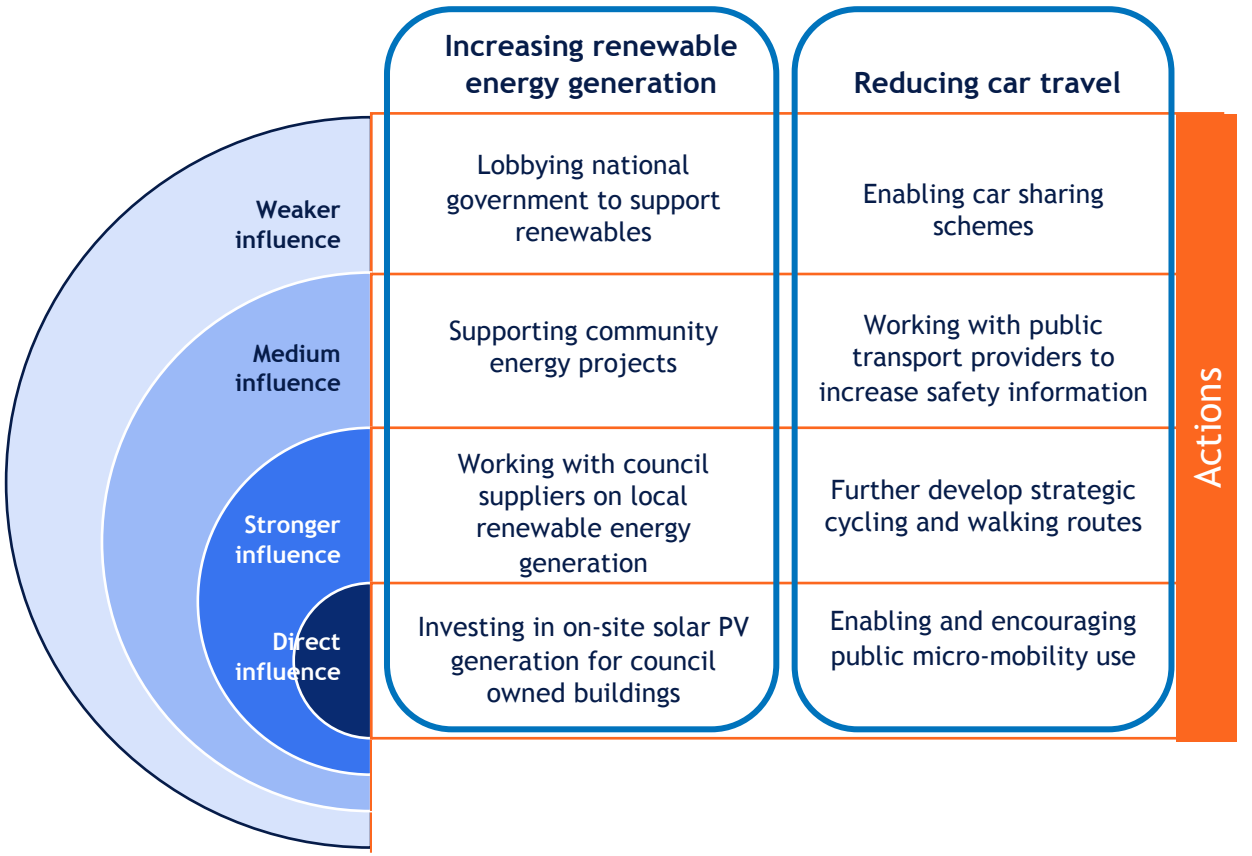


Figure 12: Two select interventions have been highlighted here to show that many different actions can support the delivery of any single intervention using the varying degrees of council influence. Please note the actions listed here are for illustrative purposes only and the Net Zero Action Plan will identify specific actions in the next stages of the project.

09

APPENDICES & REFERENCES

Anthesis

APPENDICES CONTENTS

APPENDIX 1: GLOSSARY OF TERMS

AFOLU – Agriculture, forestry & land use.

BEIS – UK Government Department for Business, Energy and Industrial Strategy, the successor to the Department for Energy & Climate Change (DECC).

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.

Carbon dioxide equivalent (CO_2e) – the standard unit of measurement for greenhouse gases. One tonne of CO_2 is roughly equivalent to six months of commuting daily by car or burning 1-2 bathtubs' worth of crude oil. "Equivalent" means that other greenhouse gases have been included in the calculations.

Carbon Neutral/ Net Zero - these two terms typically mean the same thing in the context of CO_2-only emissions. Whilst emissions are reduced overall, those that remain (e.g. from industrial and agricultural sectors) are then *offset* through carbon dioxide removal from the atmosphere. This removal may occur through technology such as carbon capture and storage (CCS) technologies, or through natural sequestration by rewilding or afforestation.

Carbon offset - defined by the IPCC as a reduction in emissions of carbon dioxide or other GHGs made in order to compensate emissions made elsewhere.

Carbon sink – a process or natural feature that removes carbon from the local atmosphere (e.g. trees or wetlands). The carbon is said to be *sequestered* from the atmosphere.

Climate Emergency – a situation in which urgent action is required to reduce or halt climate change and avoid potentially irreversible environmental damage resulting from it.

Decarbonisation – the process of changing our activities and industry practices to create an economy that sustainably reduces emissions of carbon dioxide.

Deep/Medium Retrofit – the aim of retrofit is to drive down the energy demand for heating and hot water in buildings; typical measures include things like insulation for floors, windows and ceilings and improved ventilation. Medium retrofit represents a 66% reduction in energy demand and a deep retrofit represents an 83% reduction in energy demand.

Energy system - the consumption of fuel, heat and electricity across buildings, transport and industrial sectors, from solid, liquid and gaseous sources.

Gross emissions – the emissions total before accounting for local carbon sinks.

IPCC – Intergovernmental Panel for Climate Change.

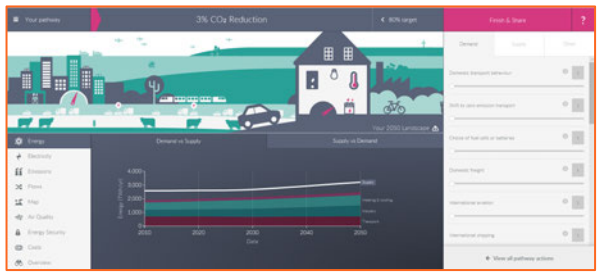
Indirect emissions – GHG emissions occurring as a consequence of the use of grid-supplied electricity, heat and/or cooling within the city boundary.

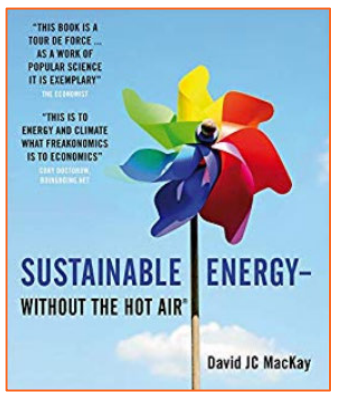
Insetting/Offsetting – the action of compensating for carbon emissions by utilising an equivalent or unrelated carbon dioxide saving elsewhere. Insetting refers to more local activity within a 'sphere of influence'.

LULUCF – Land use, land use change & forestry.

SCATTER – Anthesis-developed tool which is used to set emissions baselines and reductions targets. See the SCATTER website for more information.

APPENDIX 2: WHAT IS SCATTER?





Above: the 2050 DECC calculator; Left: MacKay's book

What is SCATTER?

Basic principles

Sir David MacKay's 'Sustainable Energy - Without The Hot Air (2009)" provides the basis for the pathways modelling. As a scientific advisor to the Department for Energy & Climate Change (DECC),[1] MacKay's work led to the development of the 2050 Pathways Calculator. Two key modifications were made by Anthesis:

1. We scaled it down for sub-national regions: Scaling assumptions and localised data sets were built into the tool so that results were representative of cities and local authority regions, rather than the UK as a whole.
2. We pushed ambition further: Technologies within the tool were reviewed and updated where judged to be out of date and constraining ambition. Given that almost a decade had passed between MacKay's publication and the release of the 2050 Pathways tool, we sought the counsel of a technical panel to make these updates. The technical panel comprised subject matter experts from Arup, BEIS, Electricity North West, GMCA, The Business Growth Hub, The Energy Systems Catapult, The Tyndall Centre and Siemens.

Many other sector specific aspects of modelling treatment and assumptions have required consideration and interpretation as we have applied the model to various cities and local authorities.

[1] DECC responsibilities were reformed into BEIS in 2016.

APPENDIX 3: SCATTER FAQ'S

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.

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 Solihull.
- 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.

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

APPENDIX 4: WORK TO DATE ON SOLIHULL'S EMISSIONS BASELINE

Overview

Following Solihull's Climate Emergency Declaration, a Baseline Research Report was produced to identify the emissions profile of the Borough. The report primarily utilised the BEIS local authority emissions dataset and SCATTER was used to detail dependency of fuel types for each sector. The key findings of the report were as follows:

- Net emissions for the Borough in 2017 totalled 1339.4 $ktCO_2$
- 99% of the Borough's emissions sit within three sectors: transport (49%), domestic buildings (25%) and industrial & commercial buildings (26%)
- Between 2005 – 2017, Solihull's total carbon emissions reduced by 20% overall
- Domestic emissions and Industrial & Commercial emissions have reduced since 2005 by 35% and 26% respectively, largely due to the decarbonisation of the grid
- Transport emissions have reduced by a much lower rate of 3% since 2005, with emissions from motorways increasing by 4% between 2005-2017

See Appendix 2 for the BEIS local authority CO_2 inventory dataset.

Gaps in data

- Waste and industrial processes – data not available
- Land Use, Land Use Change & Forestry (LULUCF) – included in the net Borough emissions total but limited review in the Baseline Research Report
- The BEIS Local Authority CO_2 dataset accounts for CO_2 emissions only, therefore other GHG's including methane (CH_4) and nitrous oxide (N_2O) are excluded from this baseline

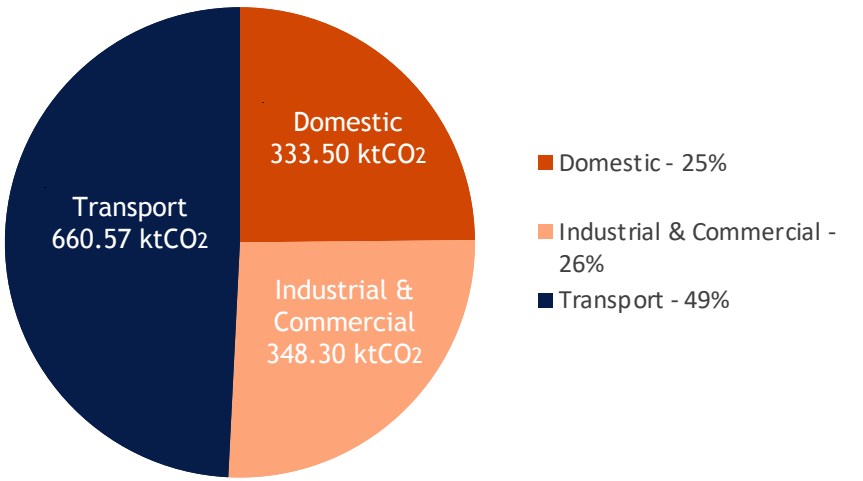


Figure 1: Solihull Borough's Emissions Profile as detailed in the baseline research report. This chart utilises data from the BEIS 2017 local authority dataset. LULUCF net emissions of (-3.0) are excluded from this chart, but included in the net emissions total for the Borough.

APPENDIX 4: WORK TO DATE ON SOLIHULL'S EMISSIONS BASELINE CONTINUED

Review

The analysis performed by SMBC on the Borough-wide emissions is mainly informed by BEIS local authority carbon dioxide (BEIS LACO2) statistics. However, it is also possible to use SCATTER to provide an area-wide footprint. Both datasets are still useful but provide different context:

- BEIS LACO2 data – The BEIS dataset has the benefit of including historical emissions and with each data release updates to the method are applied retrospectively to enable continued historical comparisons.
- SCATTER – The inventory produced by SCATTER includes other GHGs, such as methane and nitrous oxide, and includes additional sector emissions including waste and livestock emissions.

See Appendix 9 for a more detailed overview of the key difference between the BEIS LACO2 data and SCATTER data for Solihull.

Sector	Solihull Baseline Research Report
Net total emissions	**1,339 $ktCO_2$**
Commercial & Industrial Emissions	348.30 $ktCO_2$
Residential Emissions	333.50 $ktCO_2$
Transport Emissions	660.57 $ktCO_2$
Waste	No data included
Industrial Processes	No data included
LULUCF	-3.0 $ktCO_2$

Sector	SCATTER Analysis
Net total emissions	**1,338 $ktCO_2e$**
Commercial, Industrial and Institutional buildings	396.9 $ktCO_2e$
Residential Emissions	363.66 $ktCO_2e$
Transport Emissions	520.35 $ktCO_2e$
Waste	21.63 $ktCO_2e$
Industrial Processes	29.22 $ktCO_2e$
AFOLU	5.86 $ktCO_2e$

Table 1 & 2: Sector breakdown for SMBC baseline report (left) and the breakdown according to SCATTER (right)

There are a number of general differences between the BEIS LACO2 and SCATTER datasets:

- The biggest discrepancy between the Baseline Report data and SCATTER is within the transport sector. SCATTER and BEIS LACO2 utilise different data to calculate transport. SCATTER uses published fuel data and applies current-year emissions factors, whereas the BEIS data calculations scale down national emissions in each transport area. Specifically, for road transport, BEIS data splits total emissions across road type; SCATTER uses fuel consumption for on-road transport per local authority.
- Waste and Industrial Process emissions are not included in BEIS LACO2 data, whereas these emissions are calculated in SCATTER.
- 'Rural' emissions are treated differently within BEIS LACO2 and SCATTER. Agriculture, Forestry and Other Land Use (AFOLU) and Land Use, Land Use Change & Forestry (LULUCF) categories are derived from different underlying data sets.
- Greenhouse gases included: The BEIS LACO2 dataset accounts for CO2 emissions only whereas SCATTER utilises a CO2 equivalent value (CO2e) accounting for other GHGs on the basis of their global warming potentials. SCATTER includes methane (CH4) and nitrous oxide (N2O).

APPENDIX 5: DATA TABLES FOR SCATTER AND BEIS PROFILES

Sector	Scope 1 & 2 Emissions, $ktCO_2$
Industry and Commercial Electricity	154.7
Industry and Commercial Gas	146.6
Large Industrial Installations	0.3
Industrial and Commercial Other Fuels	34.9
Agriculture	3.4
Domestic Electricity	82.3
Domestic Gas	240.8
Domestic 'Other Fuels'	8.9
Road Transport (A roads)	105.3
Road Transport (Motorways)	319.9
Road Transport (Minor roads)	198.3
Diesel Railways	11.2
Transport Other	23.6
LULUCF Net Emissions	-3.2
Grand Total	**1,327.0**

Sub Sector	Direct (Scope 1) $ktCO_2e$	Indirect (Scope 2) $ktCO_2e$
Residential buildings	235.14	128.52
Commercial buildings & facilities	45.09	24.02
Institutional buildings & facilities	78.96	121.40
Industrial buildings & facilities	54.85	70.37
Agriculture	2.18	0.0037
Fugitive emissions	NO	0
On-road	503.01	IE
Rail	11.23	IE
Waterborne navigation	1.07	IE
Aviation	158.6	IE
Off-road	5.03	0
Solid waste disposal	8.34	0
Biological treatment	NO	0
Incineration and open burning	NO	0
Wastewater	13.29	0
Industrial process	29.22	0
Industrial product use	0.00	0
Livestock	8.55	0
Land use	-2.69	0
Other AFOLU	NE	0
Electricity-only generation	NO	0
CHP generation	0.72	0
Heat/cold generation	NE	0
Local renewable generation	0	NO
Sub-total	**994.00**	**344.32**
Net total	**1338.32**	

Notes:

- BEIS data (far left) and SCATTER data (near left) are compiled using different methodologies.
- 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.
- Figures for land use and aviation were omitted from the profile given in Section 1. The gross totals described in the emissions inventory have been adjusted to reflect this.

IE = Included Elsewhere
NE = Not Estimated
NO = Not Occurring
= included as part of profile
= excluded as part of profile

APPENDIX 6: BIRMINGHAM AIRPORT AVIATION EMISSIONS

If Scope 1 aviation emissions were to be included in Solihull's emissions baseline, they would contribute an additional 158.65 $ktCO_2e$

Why is aviation excluded from the SCATTER emissions baseline?

Birmingham Airport is located within the boundary of Solihull; however aviation emissions have been excluded from the SCATTER emissions profile on page 16 in line with the approach SMBC took in their baseline report. Emissions from aviation have been presented separately because:

- SMBC has a 7% stake in the airport, therefore limited influence.
- Aviation emissions are a global issue and therefore need to be addressed at a global scale.
- Aviation emissions remain within the national UK carbon budget but are not scaled down to sub-national budgets.

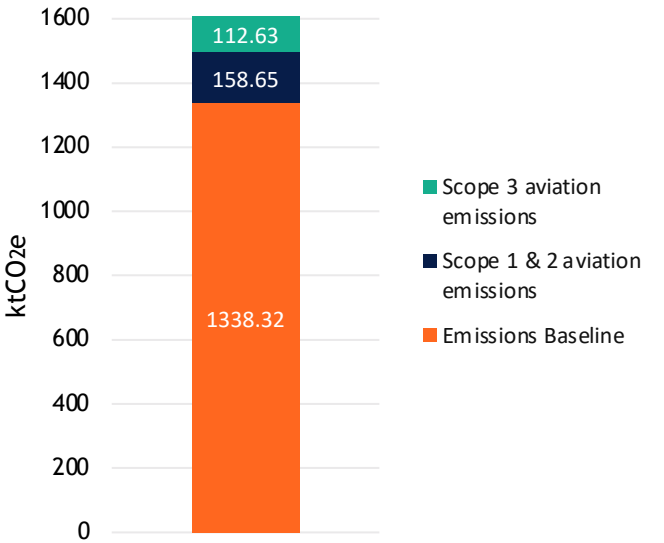
Birmingham Airport identify their Scope 3 emissions as 259,216 tCO_2e and Scope 1 & 2 as 16,691 tCO_2e. Differences in accounting methods mean there is a slight variance in these figures comparatively.

How are aviation emissions calculated?

Data for aviation emissions was extracted from the Greenhouse Gas Inventories Report: 1990-2017 for Aviation Spirit and Aviation Turbine Fuel. This gave total emissions for landing and take-off and cruise phases of UK flights.

Scope 1 emissions - Landing and take-off emissions are used as a proxy for flights that take off and land within the boundary of the local authority area. Landing and take-off emissions have been allocated to UK airports based on the percentage of total aircraft movements.

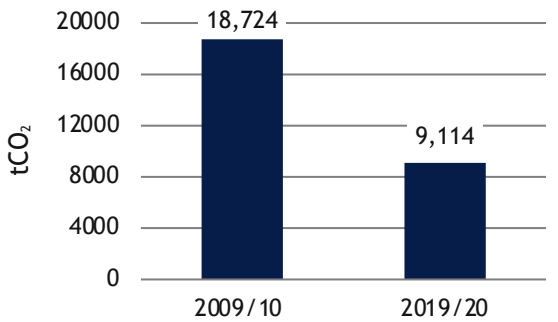
Scope 3 emissions - Cruise impacts were allocated to local authorities based on percentage of population, assuming that flying is uniformly distributed across the whole population. Cruise tonnes of fuel were calculated from the total impacts using BEIS fuel emission factors.



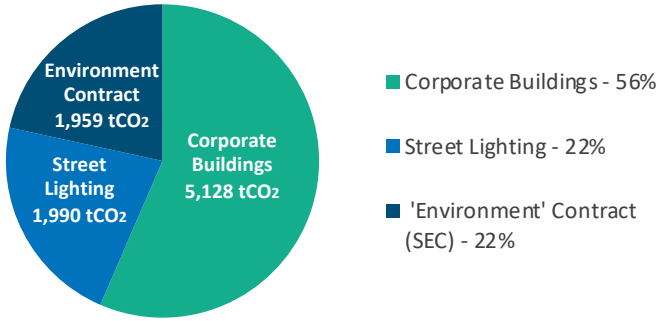
Birmingham Airport Profile

- Birmingham Airport is the 7th largest airport in the UK with around 12.5 million passengers and 100,000 air transport movements in 2018/19.
- The Airport has committed to become a net zero carbon airport by 2033, focusing on airport operations (Scope 1 and 2) and minimising the use of offsets.
- The Airport has a Sustainability Strategy and Carbon Management Plan.

APPENDIX 7: COUNCIL'S OWN EMISSIONS



(Above) Reduction in council emissions from 2009/10 to 2019/20. (Below) Breakdown of council emissions 2019/20.



Solihull Council has committed to reducing its own emissions. Since 2014, the Council has published Annual Carbon Reports overseen by the Carbon Management Group.

Summary

Solihull Council's own emissions account for less than 1% of total Borough emissions and it is an area where the Council have the most control. The Council have made great progress reducing emissions by 51% from 18,724 tCO_2 to 9,114 tCO_2 since 2009/10 and have committed to net zero emissions by 2030.

The Council has focused on reducing emissions from the three main areas outlined below which account for approximately 90% of all emissions:

- Street lighting: the operation of streetlights on all roads managed by the Council, including A roads, minor roads and residential roads;
- Corporate properties: Council offices, public buildings such as libraries, operational areas such as depots, and leisure facilities;
- Strategic Environment Contract: Collection of domestic waste and recycling, and management of parks, verges and open spaces.

The remaining 10% of emissions is from travel & transport, including corporate vehicles and vehicles used by contractors on Council services.

Emissions resulting from the Councils operations have steadily decreased due to a number of factors including energy efficiency and generation projects in corporate buildings, the installation of LED bulbs for street lighting across the Borough and changes in vehicle operations. The Council's Corporate Asset Management Strategy outlines the priorities for the council to deliver Solihull's low carbon future and making the most of its people and physical assets.

APPENDIX 7: COUNCIL'S OWN EMISSIONS CONTINUED

Other emission sources to consider:

- ***Procurement:*** This is usually a significant emissions source for Council's so should be estimated. In addition, actions to reduce emissions from procurement may also help to reduce emissions in the borough if those businesses are based locally.
- ***Other buildings:*** The Council have already stated their intention to incorporate Schools and Solihull Community Housing.
- ***Other transport:*** In addition to this, SMBC are looking to include transport emissions in future baseline reports. This could be expanded to also include business travel and employee commuting.
- ***Waste:*** The Council could also report on the emissions as a result from the waste that they produce.

Review

Whilst the emissions from the council's own operational emissions have been calculated as less than 1% of the borough it is still important to address. This is because the Council can lead by example and demonstrate to others in the borough the kind of approach they should be taking. Therefore, it is important that the council's emissions baseline is as complete as possible and transparent in the data and boundaries used.

Recommendations

It is recommended that when reporting on council's own emissions that the council align with international reporting standards in the Greenhouse Gas Protocol in order to ensure best practice, accountability and transparency. Aligning with the GHG protocol would include the following consideations:

- Scopes of emissions – Emissions can be categorised into different scopes based on where they occur. It can be useful to breakdown your footprint by scope as this may guide your approach to emissions reduction.
- More transparency on emissions included or excluded - Although the main emission sources may have been covered in the baseline footprint, it is necessary to state why other emission sources may not be included.
- Consider influence and boundaries – There are different approaches available when defining the 'boundary' of emissions. For instance, when it comes to buildings that you lease out i.e. you own but do not operate the building. The recommendation is to use the approach which best reflects your ability to influence emissions. It is important to consider this so that emissions do not 'slip through the net'.

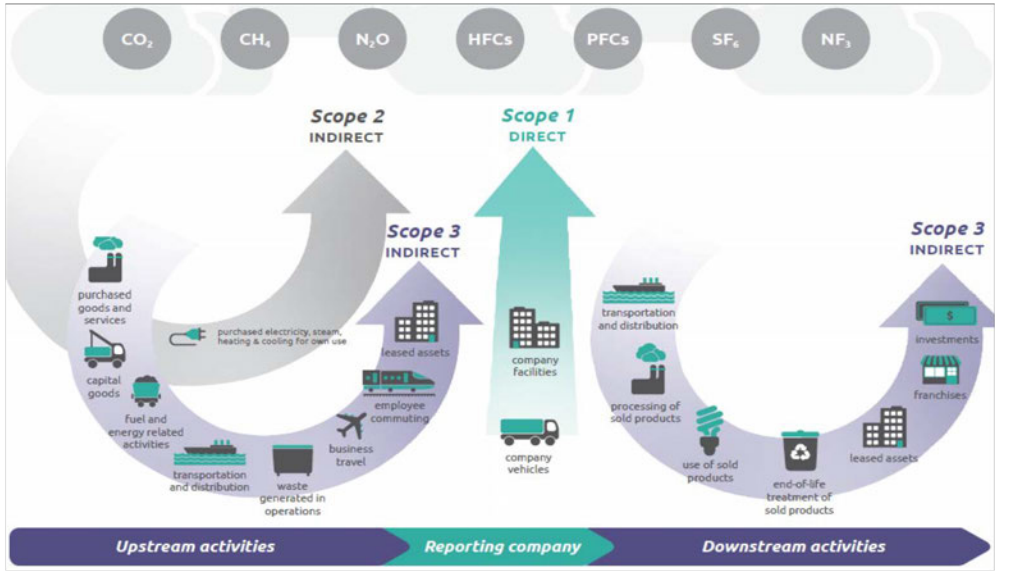


Diagram shows the Greenhouse Gas Protocol emission scopes.

APPENDIX 8: SOLIHULL'S CARBON BUDGET

The current emissions profile offers the baseline from which to measure progress towards reducing emissions to carbon neutral by 2041.

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

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

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

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.

Solihull's carbon budget at a glance

The energy system carbon budget for Solihull between 2020 – 2100 is 8,000 $ktCO_2$

A consistent annual emissions reduction rate of 13.6% is needed to align with this budget

At 2017 rates, Solihull will exceed its carbon budget within 7 years

By 2041, emissions must be reduced by more than 95%

APPENDIX 8: SOLIHULL'S CARBON BUDGET CONTINUED

Between 2005 and 2017, the highest annual reduction rate for any year was 8.4%. The average annual reduction rate was much lower, at just over 4%. The challenge of achieving average annual reductions of 13.6% highlights the ambitious action required to meet the Paris Agreement targets.

The dotted red line gives a visual representation of the 13.6% average annual reduction required to keep Solihull within budget. The total area under the red dotted line represents the total carbon budget. Historic emissions are denoted in the grey region of the graph, with the beige area representing cumulative carbon emissions which add up to the 8,000 $ktCO_2$ total.

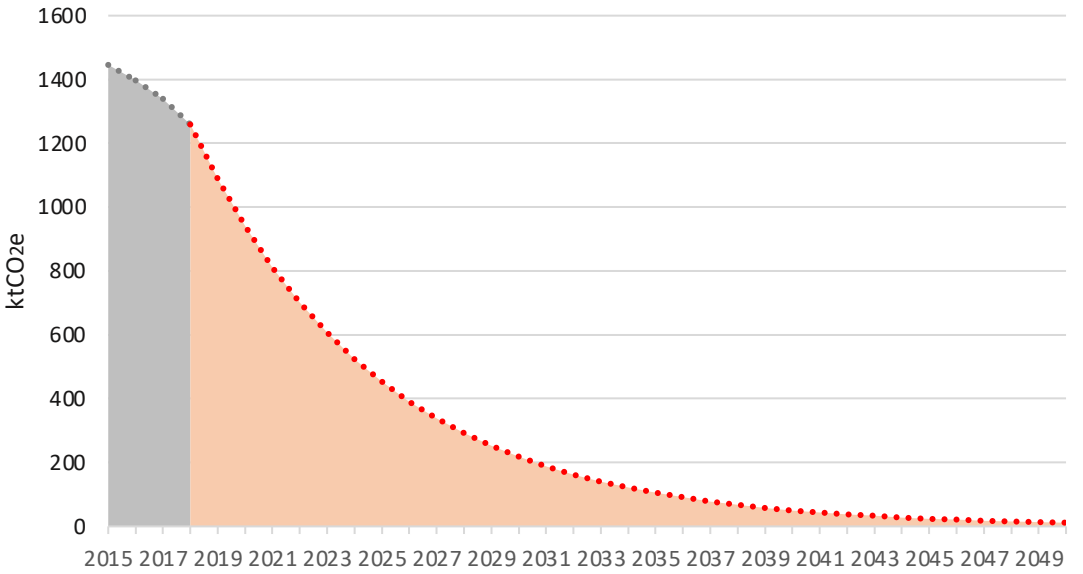
Setting a carbon budget

The Tyndall Centre for Climate Change Research, based at the University of Manchester, have translated the Paris Agreement targets of limiting temperature change below 1.5°C into a fixed emissions 'budget' for each local authority. There are two key ideas underpinning their research:

The carbon budget is a fixed amount: A global budget 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. See Appendix 6 for more details on how the Tyndall Centre break down the global carbon budget.

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.

This means that the year that Solihull becomes zero-carbon is considerably less important than the annual reductions rate of emissions.



Graph showing historic emissions (grey dotted line), cumulative historic emissions (grey area), Tyndall Centre's Paris-aligned reduction pathway of 13.6% annual reduction (red dotted line), and the carbon budget for Solihull (beige area).

APPENDIX 8: SOLIHULL'S CARBON BUDGET CONTINUED

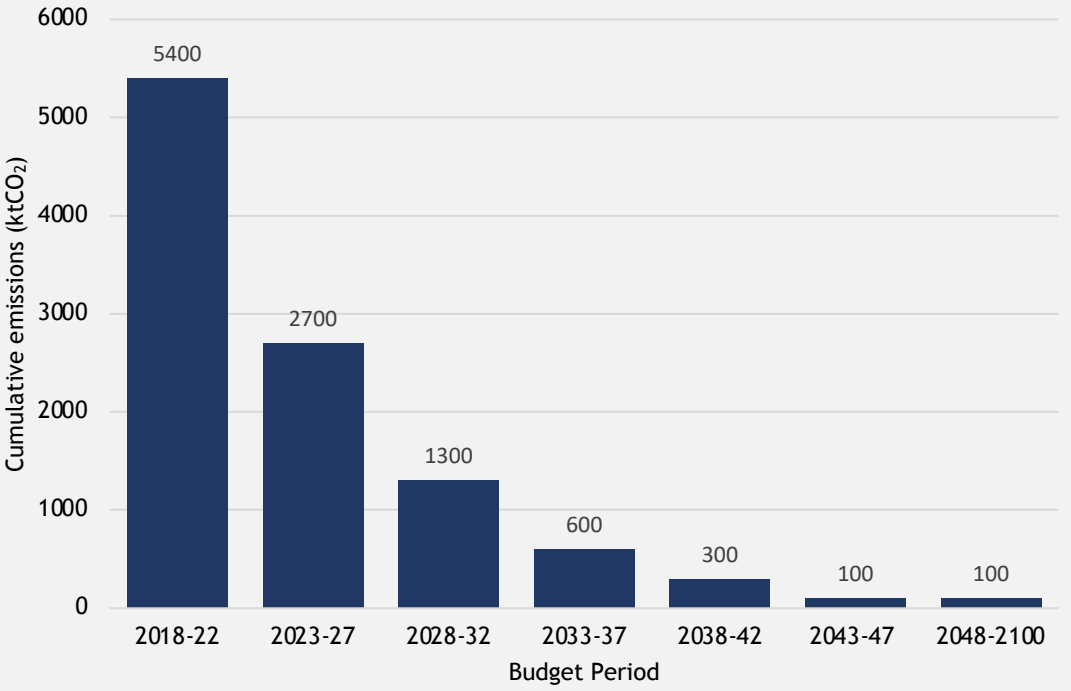
Emissions covered by this budget

The Tyndall Centre carbon budget has a different scope to the emissions profile within SCATTER:

- This budget can be defined as energy-only which means that the budget accounts for emissions from within Solihull's energy system.
- Land use, land use change and forestry is not incorporated into this budget analysis.
- Only CO_2 emissions are assessed and contributions from all other greenhouse gases, such as methane and nitrous oxide, are excluded.
- Aviation and shipping emissions are omitted given the nature of these emissions. Responsibility is not attributed to individual authorities but is instead accounted for at the UK level as a "national overhead". The Tyndall Centre analysis assumes that UK emissions from aviation remain constant up until 2030, followed by a steady reduction towards net zero carbon by 2075. Whilst emissions from aviation in 2020 have been significantly reduced, the extent of a potential "emissions rebound" post-COVID remains uncertain.

Budget Milestones

These 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.



The chart above allocates Solihull's carbon budget in terms of the 5-year carbon budgeting periods identified in the UK Climate Change Act.

APPENDIX 9: DERIVING THE CARBON BUDGET

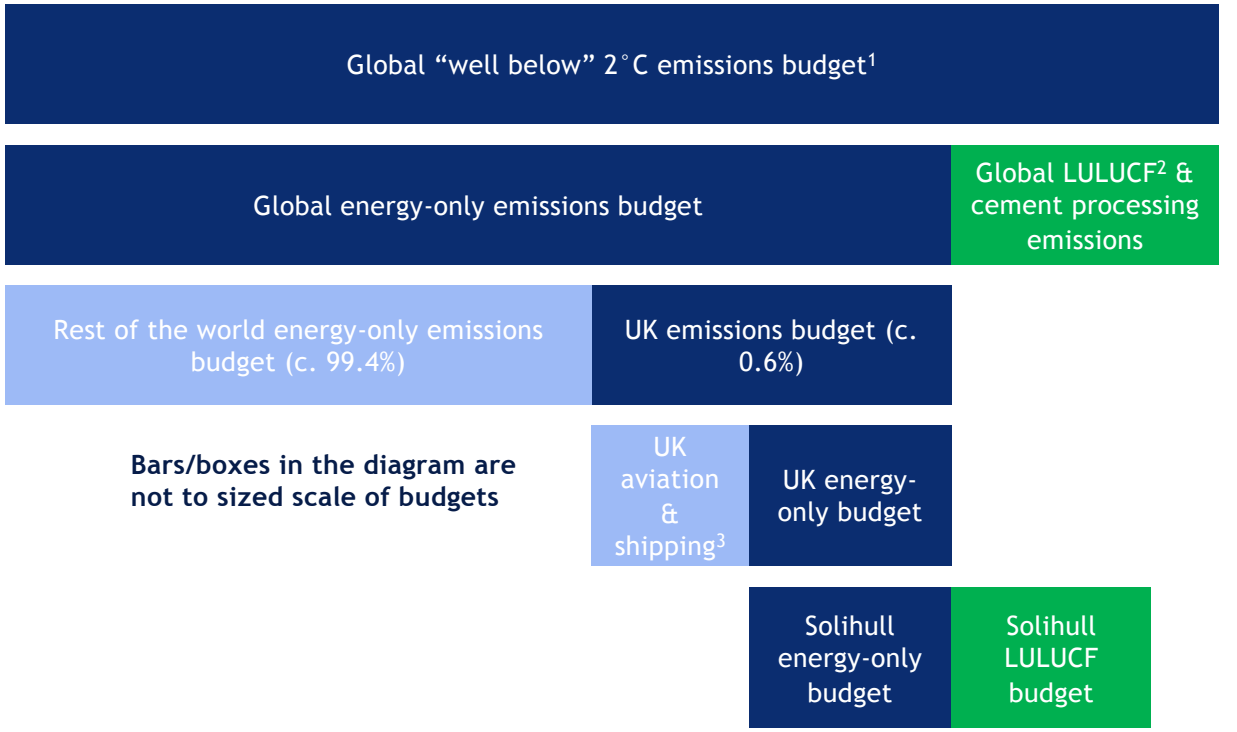
Solihull's carbon budget

The carbon budget sets out a finite emissions limit that the should not be exceeded in order that Solihull remains in line with the Paris Agreement. The budget itself is derived from a 'scaling-down' approach – a full methodology is available to view in the full print version of the Tyndall Centre's research. The Tyndall Centre for Climate Change Research have based this budget on a 2°C global average temperature rise, on the basis that:

1. The Paris Agreement commits us to limiting warming to this level.
2. Global modelling for both 1.5°C and 2°C assume planetary scale negative emissions.

Negative Emissions Technologies (NETs)

NETs remain a highly speculative and uncertain development and are leaned upon heavily in IPCC models. Large-scale NETs are not likely to be viable within the boundary of Solihull due to the profile of emissions. If research, development and demonstration of NETs shows that they may work at scale, and then they are rolled out globally at unprecedented rates, 1.5°C may theoretically be achievable. However this is only made possible if rapid, deep 2°C mitigation begins now and additional feedbacks do not occur.



1 - Budget derived from IPCC AR5 synthesis report and represents a 66-100% probability of global warming not exceeding 2°C ("well below"). Due to the inertia in our energy systems and the amount of carbon we have already emitted, the Paris 1.5°C commitment is now only likely to be viable if negative emissions technologies (NETs) prove to be successful at a global scale. If the 13.6% emissions reduction rates for Solihull are achieved and NETs are deployed at the scales assumed in the global models, then the targets adopted may be considered as a 1.5°C compatible. This also expressly assumes that other carbon cycle feedbacks, such as methane released due to melting permafrost etc., do not occur, and that an overshoot of 1.5°C does not result in increased feedbacks that further accelerate warming at lower budgets than the IPCC budgets currently estimate.

2 - Land Use, Land Use Change & Forestry

3 - UK Aviation & Shipping is accounted for at the national level. If emissions due to aviation and shipping increases, then a smaller proportion of the UK-wide budget is available for the energy-only budget and vice versa.

NON-DOMESTIC INTERVENTION ASSESSMENT REFERENCES

Improved energy efficiency (page 43)

[1] Department of Business, Energy & Industrial Strategy. (2019). Non-Domestic Private Rented Sector Minimum Energy Efficiency Standards: Trajectory to 2030. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/839362/future-trajectory-non-dom-prs-regulations-consultation.pdf

[2] Passivhaus Trust. Available from: https://www.passivhaustrust.org.uk/what_is_passivhaus.php

[3] Lohse & Zhivov. (2019). Deep Energy Retrofit Guide for Public Buildings, Springer International Publishing

[4] University of Leeds. (2017). PCANcities. Available from: https://pcancities.org.uk/energy-and-carbon/solihull

[5] Ashden (2020). Climate action co-benefits: Cutting carbon and improving people's lives. Available from: https://ashden.org/wp-content/uploads/2020/09/CAC-Chapters-all_new-brand.pdf

[6] Climate Exchange. (2012). Potential win-wins and conflicts or trade-offs between climate change mitigation and adaptation. Available from: https://www.climatexchange.org.uk/media/1582/mitigation_adaptation_synergies_report-final_12_17_10.pdf

[7] Department of Business, Energy & Industrial Strategy. (2020). The Ten Point Plan for a Green Industrial Revolution. Available from: https://www.gov.uk/government/publications/the-ten-point-plan-for-a-green-industrial-revolution

Shifting from high carbon gas heating systems (page 44)

[1] Department for Business, Energy & Industrial Strategy. (2020). Energy White Paper: Powering our Net Zero Future. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/945899/201216_BEIS_EWP_Command_Paper_Accessible.pdf

[2] Committee on Climate Change. (2016). Next Steps for UK Heat Policy. Available from: https://www.theccc.org.uk/publication/next-steps-for-uk-heat-policy/

[3] Ashden (2020). Climate action co-benefits: Cutting carbon and improving people's lives. Available from: https://ashden.org/wp-content/uploads/2020/09/CAC-Chapters-all_new-brand.pdf

[4] Department for Business, Energy & Industrial Strategy. (2020). Guidance: Combined heat and power. Available from: https://www.gov.uk/guidance/combined-heat-and-power

[5] Heat Pump Association. (2019). Delivering Net Zero: A Roadmap for the role of heat pumps. Available from: https://www.heatpumps.org.uk/wp-content/uploads/2019/11/A-Roadmap-for-the-Role-of-Heat-Pumps.pdf

[6] GreenMatch. (2020). Heat Pumps: 7 Advantages and Disadvantages. Available from: https://www.greenmatch.co.uk/blog/2014/08/heat-pumps-7-advantages-and-disadvantages

[7] Department of Business, Energy & Industrial Strategy. (2020). The Ten Point Plan for a Green Industrial Revolution. Available from: https://www.gov.uk/government/publications/the-ten-point-plan-for-a-green-industrial-revolution

Shifting to low carbon and energy efficient cooking and lighting systems (page 45)

[1] Department for Business, Energy & Industrial Strategy. (2020). Energy White Paper: Powering our Net Zero Future. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/945899/201216_BEIS_EWP_Command_Paper_Accessible.pdf

[2] Lohse & Zhivov. (2019). Deep Energy Retrofit Guide for Public Buildings, Springer International Publishing

[3] Ashden (2020). Climate action co-benefits: Cutting carbon and improving people's lives. Available from: https://ashden.org/wp-content/uploads/2020/09/CAC-Chapters-all_new-brand.pd

[4] Khalid and Foulds (2020).The social dimensions of moving away from gas cookers and hob. Available from: https://d2e1qxpsswcpgz.cloudfront.net/uploads/2020/05/KhalidFoulds_Gas-cookers-and-hobs_published.pdf

[5] Energy Saving Trust: Home Appliances. Available from: https://energysavingtrust.org.uk/advice/home-appliances/

[6] UK Green Building Council. (2020). Energy performance targets for net zero carbon offices: Technical report and summary of consultation responses. Available from: https://www.ukgbc.org/wp-content/uploads/2020/01/Energy-performance-targets-for-offices-technical-report.pdf

Non-domestic Buildings Intervention Case studies (page 46)

[1] Passivhaus Trust, 2019. St Sidwell's Point targets world first. Available from: https://passivhaustrust.org.uk/news/detail/?nId=824

[2] Engie, 2020. The Southampton District Energy Scheme. Available from: https://www.engie.co.uk/energy/district-energy/southampton/

[3] Department of Energy & Climate Change, 2015. A guide to financing energy efficiency in the public sector. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/394893/update_to_financing_public_sector_energy_efficiency1.pdf

DOMESTIC INTERVENTION ASSESSMENT REFERENCES

Improved energy efficiency in homes & new builds (page 49)

[1] WMCA News. (2020). Available from: https://www.wmca.org.uk/news/ambitious-plan-launched-to-retrofit-50-000-homes-across-the-west-midlands/
[2] Reuters. (2020). Energy efficiency gap in buildings 'is undermining UK's bid to reach net-zero'. Available from: https://www.reutersevents.com/sustainability/energy-efficiency-gap-buildings-undermining-uks-bid-reach-net-zero
[3] Energiesprong. Available from: https://energiesprong.org/about/
[4] University of Leeds. (2017). PCANcities. Available from: https://pcancities.org.uk/energy-and-carbon/solihull
[5] Ashden (2020). Climate action co-benefits: Cutting carbon and improving people's lives. Available from: https://ashden.org/wp-content/uploads/2020/09/CAC-Chapters-all_new-brand.pdf
[6] Jennings et al (2020). Mapping the co-benefits of climate change action to issues of public concern in the UK: a narrative review. Available: https://www.thelancet.com/action/showPdf?pii=S2542-5196%2820%2930167-4
[7] Department of Business, Energy & Industrial Strategy (2020). The Ten Point Plan for a Green Industrial Revolution. Available from: https://www.gov.uk/government/publications/the-ten-point-plan-for-a-green-industrial-revolution

Shifting from high carbon gas heating systems (page 50)

[1] Department for Business, Energy & Industrial Strategy. (2020). Energy White Paper: Powering our Net Zero Future. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/945899/201216_BEIS_EWP_Command_Paper_Accessible.pdf
[2] Committee on Climate Change (2018). Hydrogen in a Low Carbon Economy. Available from: https://www.theccc.org.uk/wp-content/uploads/2018/11/Hydrogen-in-a-low-carbon-economy.pdf
[3] About HyDeploy. Available from: https://hydeploy.co.uk/
[4] Energy Saving Trust. Available from: https://energysavingtrust.org.uk/advice/air-source-heat-pumps/
[5] Department for Business, Energy & Industrial Strategy. (2020). MSOA estimates of properties not connected to the gas network. Available from: https://www.gov.uk/government/statistics/msoa-estimates-of-households-not-connected-to-the-gas-network
[6] Heat Pump Association. (2019). Delivering Net Zero: A Roadmap for the role of heat pumps. Available from: https://www.heatpumps.org.uk/wp-content/uploads/2019/11/A-Roadmap-for-the-Role-of-Heat-Pumps.pdf
[7] GreenMatch. (2020). Heat Pumps: 7 Advantages and Disadvantages. Available from: https://www.greenmatch.co.uk/blog/2014/08/heat-pumps-7-advantages-and-disadvantages
[8] Department of Business, Energy & Industrial Strategy. (2020). The Ten Point Plan for a Green Industrial Revolution. Available from: https://www.gov.uk/government/publications/the-ten-point-plan-for-a-green-industrial-revolution

Shifting to low carbon cooking and lighting systems (page 51)

[1] Department for Business, Energy & Industrial Strategy. (2020). Energy White Paper: Powering our Net Zero Future. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/945899/201216_BEIS_EWP_Command_Paper_Accessible.pdf
[2] Ashden (2020). Climate action co-benefits: Cutting carbon and improving people's lives. Available from: https://ashden.org/wp-content/uploads/2020/09/CAC-Chapters-all_new-brand.pdf
[3] Khalid and Foulds. (2020).The social dimensions of moving away from gas cookers and hob. Available from: https://d2e1qxpsswcpgz.cloudfront.net/uploads/2020/05/KhalidFoulds_Gas-cookers-and-hobs_published.pdf
[4] Infrastructure Intelligence. (2020). Unlocking a low carbon hydrogen economy. Available from: http://www.infrastructure-intelligence.com/article/dec-2020/unlocking-low-carbon-hydrogen-economy
[5] Energy Saving Trust: Home Appliances. Available from: https://energysavingtrust.org.uk/advice/home-appliances/
[6] Energy Saving Trust. Available from: https://energysavingtrust.org.uk/how-get-most-out-your-kitchen-appliances/
[7] Product Sustainability Forum. (2012). Reducing the environmental and cost impacts of electrical products. Available from: https://www.wrap.org.uk/sites/files/wrap/PSF%20EP%20Priority%20Products%20Part1%20Results%20Final.pdf
[8] IEA (2020). Energy Efficiency 2020: Fuel Report. Available from: https://www.iea.org/reports/energy-efficiency-2020/appliances

Domestic Buildings Intervention Case Studies (page 52)

[1] Nottingham Energiesprong project. Available from: https://www.energiesprong.uk/projects/nottingham
[2] Manchester Housing Providers Partnership: Zero Carbon Group. Available from: https://www.mhpp.info/carbon-reduction
[3] Southampton City Council News. (2020) Available from: https://www.southampton.gov.uk/news/article.aspx?id=tcm:63-429012
[4] Solihull Community Housing Delivery Plan 2019/20. Available from: https://www.solihullcommunityhousing.org.uk/wp-content/uploads/2019/08/Delivery_Plan_1920_final.pdf

TRANSPORT INTERVENTION ASSESSMENT REFERENCES

Travelling shorter distances (page 55)

[1] Ministry of Housing, Communities & Local Government (2019). National Planning Policy Framework. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/810197/NPPF_Feb_2019_revised.pdf

[2] Transport for New Homes (2018). Transport for New Homes Project Summary and Recommendations. Available from: https://www.transportfornewhomes.org.uk/wp-content/uploads/2018/07/transport-for-new-homes-summary-web.pdf

[3] Ashden Climate Solutions in Action (2020). Climate Action Co-Benefits Toolkit: A toolkit for city regions and local authorities. Available from: https://ashden.org/wp-content/uploads/2020/09/CAC-Chapters-all_new-brand.pdf

[4] Department for Transport (2019). Transport for inequality: An evidence review for the Department for Transport. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/843487/Transport_and_inequality_report.pdf

[5] European Environment Agency (2020). Improving air quality improves people's health and productivity. Available from: https://www.eea.europa.eu/signals/signals-2020/articles/improving-air-quality-improves-people2019s

[6] International Energy Agency (2020). Changes in transport behaviour during the Covid-19 crisis. Available from: https://www.iea.org/articles/changes-in-transport-behaviour-during-the-covid-19-crisis

Driving less (page 56)

[1] Department for Transport (2017). Cycling and Walking Investment Strategy. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/918442/cycling-walking-investment-strategy.pdf

[2] Cycling News (2020). The rise of the e-bike and its role in post-lockdown commuting. Available from: https://www.cyclingnews.com/features/the-rise-of-the-e-bike-and-its-role-in-post-lockdown-commuting/

[3] Ashden (2020). A toolkit for city regions and local authorities. Available from: https://ashden.org/wp-content/uploads/2020/09/CAC-Chapters-all_new-brand.pdf

[4] Cycling UK (2020). Increase in congestion would cost everyone in the UK £2,000 a year. Available from: https://www.cyclinguk.org/press-release/increase-congestion-would-cost-everyone-uk-ps2000-year-charity-warns

[5] Royal Society for the Prevention of Accidents (2020). Accident rates. Available from: https://www.rospa.com/road-safety/advice/cyclists-and-motorcyclists/accident-rates

[6] Department for Transport (2020). Active Travel Fund: Local Transport Authority Allocations. Available from: https://www.gov.uk/government/publications/emergency-active-travel-fund-local-transport-authority-allocations

Electrifying vehicles (page 57)

[1] Department for Transport (2020). Government takes historic step towards net-zero with end of sale of new petrol and diesel cars by 2030. Available from: https://www.gov.uk/government/news/government-takes-historic-step-towards-net-zero-with-end-of-sale-of-new-petrol-and-diesel-cars-by-2030

[2] Renault UK (2020). Available from: https://www.renault.co.uk/electric-vehicles/master-ze.html

[3] Ashden (2020). A toolkit for city regions and local authorities. Available from: https://ashden.org/wp-content/uploads/2020/09/CAC-Chapters-all_new-brand.pdf

[4] CCC (2019). Net Zero The UK's contribution to stopping global warming. Available from: https://www.theccc.org.uk/publication/net-zero-the-uks-contribution-to-stopping-global-warming/

[5] House of Commons Library (2020). Electric Vehicles and Infrastructure. Available from: https://commonslibrary.parliament.uk/research-briefings/cbp-7480/

[6] Department of Business, Energy & Industrial Strategy (2020). The Ten Point Plan for a Green Industrial Revolution. Available from: https://www.gov.uk/government/publications/the-ten-point-plan-for-a-green-industrial-revolution

TRANSPORT INTERVENTION ASSESSMENT REFERENCES

Improving freight efficiency (page 58)

[1] Department for Transport (2018). The Road to Zero. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/739460/road-to-zero.pdf
[2] Rail Delivery Group National Rail (2019). Rail Freight: Delivering for Britain. Available from: https://www.raildeliverygroup.com/files/Publications/2019-05_rail_freight_delivering_for_britain.pdf
[3] Innovate UK (2015). The Low Carbon Vehicles Innovation Platform. Available from:
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/458740/CO089__LCV_IP_SEP15_Brochure_FINAL.pdf
[4] ONS (2020). Retail sales, Great Britain: October 2020. Available from: https://www.ons.gov.uk/businessindustryandtrade/retailindustry/bulletins/retailsales/october2020

Reducing aviation emissions (page 59)

[1] Department of Business, Energy & Industrial Strategy (2020). The Ten Point Plan for a Green Industrial Revolution. Available from: https://www.gov.uk/government/publications/the-ten-point-plan-for-a-green-industrial-revolution
[2] Edie (2020). UK aviation launches net-zero commitment for 2050 but won't cap growth. Available from: https://www.edie.net/news/6/UK-aviation-launches-net-zero-commitment-for-2050/
[3] Airbus (2020). Zero emissions: bringing cleaner technology to aerospace. Available from: https://www.airbus.com/innovation/zero-emission.html
[4] Travelodge (2020). Available from: https://www.travelodge.co.uk/press-centre/press-releases/We%E2%80%99re-all-going-Summercation-year

Transport Intervention Case Studies (page 60)

[1] Ashden (2020). A toolkit for city regions and local authorities. Available from: https://ashden.org/wp-content/uploads/2020/09/CAC-Chapters-all_new-brand.pdf
[2] Edinburgh Council (2018). Electric Vehicle Infrastructure: Business Case. Available from: https://democracy.edinburgh.gov.uk/Data/Transport%20and%20Environment%20Committee/20181004/Agenda/item_71_-_electric_vehicle_infrastructure_business_case.pdf
[3] Department for Transport (2018). The Road to Zero. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/739460/road-to-zero.pdf

WASTE INTERVENTION ASSESSMENT REFERENCES

Reducing the overall quantity of waste (page 63)

[1] Department for Environmental, Food & Rural Affairs and Environment Agency (2018). Our Waste, Our Resources: A Strategy for England. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/765914/resources-waste-strategy-dec-2018.pdf

[2] WRAP (2020). The environmental, social and economics benefits of waste prevention. Available from: https://www.wrap.org.uk/content/environmental-social-and-economic-benefits-waste-prevention

[3] ADEPT (2020). Covid-19 Waste Survey Results. Available from: https://www.adeptnet.org.uk/covid-19-waste-survey-results

Increasing recycling rates (page 64)

[1] Department for Environmental, Food & Rural Affairs and Environment Agency (2018). Our Waste, Our Resources: A Strategy for England. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/765914/resources-waste-strategy-dec-2018.pdf

[2] Friends of the Earth (2018). 7 Benefits of Recycling. Available from: https://friendsoftheearth.uk/sustainable-living/7-benefits-recycling

[3] ADEPT (2020). Covid-19 Waste Survey Results. Available from: https://www.adeptnet.org.uk/covid-19-waste-survey-results

Waste Intervention Case Studies (page 65)

[1] Circular, (2020). Cheshire West & Chester Council tops Eunomia's recycling carbon index. Available from: https://www.circularonline.co.uk/news/cheshire-west-chester-council-tops-eunomias-recycling-carbon-index/

[2] London Library of Things (2020). Available from: https://www.libraryofthings.co.uk/

[3] Birmingham 2022 Commonwealth Games (2017). Birmingham & Solihull Industrial Symbiosis. Available from: https://www.birmingham2022.com/united/community-projects/birmingham-solihull-industrial-symbiosis-basis/

INDUSTRY INTERVENTION ASSESSMENT REFERENCES

Shifting from fossil fuels (page 68)

[1] Department for Business, Energy & Industrial Strategy (2019). Designing the Industrial Energy Transformation Fund. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/789078/designing-industrial-energy-transformation-fund-informal-consultation.pdf

[2] Department for Business, Energy & Industrial Strategy (2018). The UK Carbon Capture, Usage and Storage (CCUS) Development Pathway: An Action Plan. Available from: https://www.gov.uk/government/publications/the-uk-carbon-capture-usage-and-storage-ccus-deployment-pathway-an-action-plan

[3] Committee on Climate Change (2019). Net Zero – The UK's contribution to stopping global warming. Available from: https://www.theccc.org.uk/publication/net-zero-the-uks-contribution-to-stopping-global-warming/

[4] Business Live (2020). £800m carbon capture pot bring Humber's biggest Budget wish closer to home. Available from: https://www.business-live.co.uk/economic-development/800m-carbon-capture-pot-brings-17904816

[5] Harfoot et al, (2018). Present and future biodiversity risks from fossil fuel exploitation. Available from: https://conbio.onlinelibrary.wiley.com/doi/full/10.1111/conl.12448

[6] Department of Business, Energy & Industrial Strategy (2020). The Ten Point Plan for a Green Industrial Revolution. Available from: https://www.gov.uk/government/publications/the-ten-point-plan-for-a-green-industrial-revolution

More efficient processes (page 69)

[1] Department of Business, Energy & Industrial Strategy (2020). Energy White Paper: Powering our net zero future. Available from: https://www.gov.uk/government/publications/energy-white-paper-powering-our-net-zero-future/energy-white-paper-powering-our-net-zero-future-accessible-html-version

[2] Department for Business, Energy & Industrial Strategy (2019). Industrial Strategy: Artificial Intelligence Sector Deal. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/702810/180425_BEIS_AI_Sector_Deal__4_.pdf

[3] PTC (2019). Ways Industry 4.0 Technology Can Improve Safety. Available from: https://www.ptc.com/en/blogs/ar/4-ways-technology-can-improve-worker-safety

[4] EON (2020). Towards a Net Zero UK Manufacturing Sector. Available from: https://www.makeuk.org/-/media/files/resources-and-knowledge/towards-a-net-zero-carbon-uk-manufacturing-sector.pdf

Industry Intervention Case Studies (page 70)

[1] Institution of Civil Engineers (n.d). Teesside Collective: A new industrial future for the UK. Available from: https://www.ice.org.uk/ICEDevelopmentWebPortal/media/Documents/Disciplines%20and%20Resources/Case%20Studies/Teesside_Collective_-_ICE_website_case_study.pdf

[2] Manchester Climate Change Board (2019). Draft Manchester Zero Carbon Framework 2020 – 2038. Available from: https://www.manchesterclimate.com/sites/default/files/Draft%20Manchester%20Zero%20Carbon%20Framework%202020-38.pdf

AGRICULTURE & LAND USE INTERVENTION ASSESSMENT REFERENCES

Increasing tree coverage & tree planting (page 73)

[1] Department of Business, Energy & Industrial Strategy (2020). The Ten Point Plan for a Green Industrial Revolution. Available from: https://www.gov.uk/government/publications/the-ten-point-plan-for-a-green-industrial-revolution

[2] Committee on Climate Change (2018). Land use: Reducing emissions and preparing for climate change. Available from: https://www.theccc.org.uk/wp-content/uploads/2018/11/Land-use-Reducing-emissions-and-preparing-for-climate-change-CCC-2018-1.pdf

[3] Forestry Commission England (2010). The case for trees in development and the urban environment. Available from: https://www.forestresearch.gov.uk/documents/2677/eng-casefortrees.pdf

[4] GreenBlue Urban (2015). Trees as Sound Barriers. Available from: https://greenblue.com/gb/trees-as-sound-barriers/

[5] Ashden (2020). A toolkit for city regions and local authorities. Available from: https://ashden.org/wp-content/uploads/2020/09/CAC-Chapters-all_new-brand.pdf

[6] The Woodland Trust (2019). Woodland indicators by parliamentary constituency. Available from: https://www.woodlandtrust.org.uk/media/43913/woodland-indicators-by-parliamentary-constituency.pdf

[7] The Woodland Trust (n.d). Which species to plant? Available from: https://www.woodlandtrust.org.uk/plant-trees/advice/choose/

[8] The Woodland Trust (n.d). The Street Trees Project. Available from: https://www.woodlandtrust.org.uk/protecting-trees-and-woods/street-trees/

[9] Department for Environment, Food & Rural Affairs (2020). Consultation launched on the England Tree Strategy. Available from: https://www.gov.uk/government/news/consultation-launched-on-the-england-tree-strategy

Land use management (page 74)

[1] Public Health England (2020). Improving access to greenspace: A new review for 2020. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/904439/Improving_access_to_greenspace_2020_review.pdf

[2] Houses of Parliament (2010). POSTNOTE Biochar. Available from: https://www.parliament.uk/globalassets/documents/post/postpn358-biochar.pdf

[3] Ashden (2020). A toolkit for city regions and local authorities. Available from: https://ashden.org/wp-content/uploads/2020/09/CAC-Chapters-all_new-brand.pdf

[4] Department for Environment, Food & Rural Affairs (2019). 25 Year Environment Plan. Available from: https://www.gov.uk/government/publications/25-year-environment-plan

[5] Department of Business, Energy & Industrial Strategy (2020). The Ten Point Plan for a Green Industrial Revolution. Available from: https://www.gov.uk/government/publications/the-ten-point-plan-for-a-green-industrial-revolution

Livestock management (page 75)

[1] Department for Environment, Food & Rural Affairs (2019). 25 Year Environment Plan. Available from: https://www.gov.uk/government/publications/25-year-environment-plan

[2] Centre for Innovation Excellence in Livestock (2020). Net Zero Carbon & UK Livestock. Available from: https://www.cielivestock.co.uk/wp-content/uploads/2020/09/CIEL-Net-Zero-Carbon-UK-Livestock_2020_Interactive.pdf

[3] Ashden (2020). A toolkit for city regions and local authorities. Available from: https://ashden.org/wp-content/uploads/2020/09/CAC-Chapters-all_new-brand.pdf

[4] FAO (2019). Biodiversity and the livestock sector. Available from: http://www.fao.org/3/ca5565en/ca5565en.pdf

Agricultural & Land Use Intervention Case Studies (page 76)

[1] Newcastle City Council (2018). Green Infrastructure Delivery Framework. Available from: https://www.newcastle.gov.uk/sites/default/files/planning/green_infrastructure_delivery_framework_final_2019.pdf

[2] Greater Manchester City of Trees (2020). About City of Trees. Available from: https://www.cityoftrees.org.uk/about-city-trees

[3] Nottingham Good Food Partnership (2020). Welcome to NGFP. Available from: https://www.nottinghamgoodfoodpartnership.co.uk/about-ngfp

ENERGY SUPPLY INTERVENTION ASSESSMENT REFERENCES

Solar Photovoltaics (page 79)

[1] Committee on Climate Change (2020). Reducing UK emissions: 2020 Progress Report to Parliament. Available from: https://www.theccc.org.uk/publication/reducing-uk-emissions-2020-progress-report-to-parliament/
[2] Good Energy (2020). Available from: https://www.goodenergy.co.uk/blog/2020/07/03/barriers-to-battery-storage-are-slowing-the-shift-to-zero-carbon/
[3] EON (2020). Available from: https://www.eonenergy.com/spark/solar-energy-advantages-and-disadvantages.html
[4] Committee on Climate Change (2019). Net Zero: Technical Report. Available: https://d423d1558e1d71897434.b-cdn.net/wp-content/uploads/2019/05/Net-Zero-Technical-report-CCC.pdf
[5] Office for National Statistics (2020). Low carbon and renewable energy economy, UK: 2018. Available from: https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/finalestimates/2018
[6] Jennings et al (2020). Mapping the co-benefits of climate change action to issues of public concern in the UK: a narrative review. Available from: https://www.thelancet.com/action/showPdf?pii=S2542-5196%2820%2930167-4
[7] Committee on Climate Change (2020). COVID recovery letter. Available from: https://d423d1558e1d71897434.b-cdn.net/wp-content/uploads/2020/05/CCC-to-Prime-Minister-Boris-Johnson-Covid-19-recovery-002.pdf

Other technologies (page 80)

[1] Department for Business, Energy & Industrial Strategy (2015). Community Energy Guidance. Available from: https://www.gov.uk/guidance/community-energy
[2] Office for National Statistics (2020). Low carbon and renewable energy economy, UK: 2018. Available from: https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/finalestimates/2018
[3] Department for Business, Energy & Industrial Strategy (2020). Green Homes Grant. Available from: https://www.gov.uk/guidance/apply-for-the-green-homes-grant-scheme
[4] Ashden (2020). A toolkit for city regions and local authorities. Available from: https://ashden.org/wp-content/uploads/2020/09/CAC-Chapters-all_new-brand.pdf
[5] IRENA (2020). Available from: https://www.irena.org/benefits#:~:text=Wind%2C%20solar%20and%20hydropower%20produce,rates%20than%20most%20conventional%20fuels.
[6] Jennings et al (2020). Mapping the co-benefits of climate change action to issues of public concern in the UK: a narrative review. Available from: https://www.thelancet.com/action/showPdf?pii=S2542-5196%2820%2930167-4
[7] Committee on Climate Change (2013). The Fourth Carbon Budget Review Part 2: the cost-effective path to the 2050 target.

Energy Supply Intervention Case Studies (page 81)

[1] Portsmouth Council (2020). New Solar and Tesla Batteries help to make Portsmouth Greener. Available from: https://www.portsmouth.gov.uk/2020/10/23/new-solar-and-tesla-batteries-help-to-make-portsmouth-greener/
[2] Northumberland Gazette (2020). New Northumberland plant turning farming waste into energy approved. Available from: https://www.northumberlandgazette.co.uk/news/politics/council/new-northumberland-plant-turning-farming-waste-energy-approved-2933733

Disclaimer

Anthesis (UK) Limited has prepared this report for the sole use of the client (Solihull Metropolitan Borough 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.