## Birmingham City Council

**Carbon Emission Reduction Study for the City of Birmingham** 

June 2020





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### **Introduction and Context** Council Commitment

### Introduction

This work is being commissioned by Birmingham City Council (BCC) on behalf of the Route to Zero (R20) Task Force.

### Aim

The aim of this body of work is to support Birmingham's response to the Climate Emergency. Birmingham has an ambitious target to achieve net zero carbon emissions across the city by 2030, and the evidence outlined by this scope of work serves to understand the main drivers for emissions and identify the best methods for reducing emissions in line with this target.

#### Council context

On 11 June 2019, Birmingham City Council <u>declared a climate emergency</u> and established a Climate Emergency Task Force. The ambition was set for the Council and city to become net zero carbon by 2030, or as soon as possible thereafter as a 'just transition' allows – ensuring protection and buy in from communities. This is the city's 'route to zero' (R20). On 25 June 2019, the Council's Cabinet agreed to add a new priority to the Council Plan which states that Birmingham will be a city that takes a leading role in tackling climate change. Within the Notice of Motion, the council acknowledged:

- The findings of the Intergovernmental Panel on Climate Change (IPCC) report '<u>Global warming of 1.5</u>°' published on 8 October 2018.
- Given the planet is currently heading for 3-4°C warming, keeping to 1.5°C requires a radical shift across energy, land, industrial, urban and other systems to reduce emissions, unprecedented in history for the breadth, depth and speed of change required.
- All governments (national, regional and local) have a duty to limit the negative impacts of Climate Breakdown and in recognising this local government should not wait for national government to change their polices.
- The impact of climate change will not just be felt in far-away lands or coastal areas, the impact on Birmingham residents of increased extreme weather events, including flooding, droughts and heatwave is likely to be profound, with increasing risks to both life and property.

The Council agreed to various actions, and with particular relevance to this commission to:

- i) Ensure the Council has a robust evidence base to support recommendations for carbon reduction interventions.
- ii) Identify potential carbon reduction interventions in line with BCC's 2030 citywide target.
- iii) Understand the relative positive and negative social and environmental impacts.
- iv) Explore the viability of these interventions and the risk posed if the interventions were not undertaken

Anthesis' report will support each of the points above and ultimately seeks to better inform actions taken hereafter.



### **Introduction and Context** The Need to Act

#### A growing consensus

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

- UK Local Authorities: As of 2020, 68% of Local Authorities have declared a Climate Emergency.<sup>1</sup>
- UK Climate Strike action and increased media profile: In 2019 schools and businesses demonstrated unprecedented levels of support for climate action. This has been mirrored enhanced scrutiny and coverage on climate related issues, including legal challenges brought to councils by Client Earth warning councils of their legal obligation to take climate action. The latest YouGov polls also listed climate change as the third most important public concern.
- Global Businesses: Climate change has become more common on the agenda of businesses with more organisations making ambitious emission reduction targets. Nearly 800 companies globally are setting <u>Science Based Targets</u> and over 700 companies are supporting the <u>TCFD</u> by better disclosing climate related information for investors. It was also recently announced that UK banks will be stress tested for climate risks.<sup>2</sup>
- Internationally: The decade began with record breaking temperatures and drought leading to massive bushfires in Australia. This followed a year where record numbers of fires were observed in the Amazon rainforest in Brazil.

### Locally felt disruption

- The UK has also seen new extremes with last summer providing the highest ever recorded temperature in England.<sup>3</sup>
- Birmingham is already at risk from severe flooding and has suffered from a series of flood events in recent years.
- The flooding events in June 2016 caused significant damage in the city with 23 areas reporting internal property damage and significant transport disruption.<sup>4</sup>
- These events are likely to become more frequent/severe with climate change, posing a significant economic, social and environmental threat.

The next few years will be pivotal for climate change mitigation, combined with resilient adaptation to a changing climate. 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. There must be a decade of unprecedented and disruptive action if we are to limit dangerous temperature rise.

- 2 https://www.ft.com/content/a5177bee-2176-11ea-b8a1-584213ee7b2b
- 3 https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-extremes



<sup>1 -</sup> https://www.campaigncc.org/councils\_climate\_emergency

### **Introduction and Context** COVID-19 recovery

#### Leading a sustainable recovery

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

The ongoing lockdown offers the chance to reflect on the way that we operate as a society. 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.

The cost of delaying action on the pandemic has been felt in many countries. Similar decisiveness will be required as we recover from this crisis, respond in a way that is centred around the resilience, health and wellbeing of local communities. UN Secretary General Antonio Guterres acknowledged this in a statement in April 2020: *"... ensuring a future for the planet must be a core element in rebuilding society after lockdown measures are lifted".* 

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.

The impacts of the pandemic have forced significant changes in the way cities operate across all sectors:

- Transport: Cycling and walking have now taken priority and to allow for social distancing, pedestrian and cycle access has encouraged the uptake of pavement widening, cycle path creation and reduced vehicle access. The <u>Birmingham Emergency</u> <u>Transport plan</u> aims to enable increased active travel across the city. As a result of the sharp increase in working from home and reduction in vehicle use, there have been huge improvements in air pollution in cities. Conversely, due to huge reductions in public transport usage during and coming out of lockdown, there will be difficulties in funding public transport.
- Energy demand: Many commercial and institutional buildings are temporarily shut down and will be operating at reduced capacity when they reopen to adhere to social distancing measures. Due to isolation measures, citizens are now forced to spend more time at home, requiring higher energy use in homes.
- Waste: Domestic household waste will likely increase as more food is consumed at home due to closing of restaurants and cafes.
- Natural capital: There is increased need for access to parks and green spaces during lockdown, especially for those in flats and homes without gardens, to ensure availability of open spaces for socially distanced exercise.

In addition, the pandemic has highlighted existing inequalities in society: those in low-paid jobs or zero hour contracts, ethnic minorities, older populations and those from a lower socioeconomic status are far more likely to be impacted by the pandemic either from a health or income perspective. It is therefore even more imperative that the way we rebuild the economy and reshape our cities coming out of the pandemic is inclusive of these vulnerable communities and follows the pillars of the just transition.



### **Introduction and Context** The Need to Act

Birmingham Mail (May 2018)

**I** Dramatic photos show the severe flooding in Birmingham

Birmingham Mail (February 2020)

| Flood alerts and flood warnings in place for Birmingham

Birmingham Mail (September 2019)

Full list of Birmingham roads flooded amid Met Office 'danger to life' rain weather warning



### Introduction and Context The Need to Act

#### Global emissions performance: A shift in the wrong direction

The UN Environment Programme published their 2019 Emissions Gap Report, which found that the Nationally Determined Contributions were insufficient to ensure that global temperature rises stays below 1.5 °C, and that nations must triple their efforts in order to meet even a 2°C target. It also found that global emissions had increased in 2018 after a period of stability between 2014 and 2016.

A key finding of the report is that: '...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.'

Research by the Global Carbon Project issued in December 2018 reported that since 1990, there has been a 43% increase in total radiative forcing – the warming effect on the climate – by long-lived greenhouse gases.

In November 2019, the World Meteorological Organization reported that during 2018 concentrations of  $CO_2$  peaked at 407.8 parts per million – a level last seen 3 million years ago when average global temperatures were 2-3 °C warmer.

The above evidence makes clear that immediate and drastic action is required to avoid global warming to dangerous levels, whilst encouraging sub-national policy measures and action as a necessary means of reducing emissions.



Figure 1: Chart showing possible global emissions scenarios for 2015-2050 Source: UN environment programme interactive Emissions Gap Report



Emissions Gap Report Global Carbon Project research World Meteorological Organization publication 7

## 1. Governance





### **1. Governance** Climate Change Obligations





1- The Paris Agreement and IPCC 1.5 Report 2 - The INDC of the European Union 3 - The Climate Change Act 4 - West Midlands Climate Action Plan

### **1. Governance** Policy and Stakeholders Summary





### 1. Governance **Birmingham City Council**



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## 2. Delivering Change





### **2. Delivering Change** What can the Council do?

### Council control vs influence

This section explores the potential for the Council to enact change, appreciating the limited control but considerable influence it has on a wide range of critical stakeholders.

By comparing the overall emissions attributable to the Council's activities and operations with emissions across the city, we can begin to understand the scale of direct control that the Council has over the city's emissions.

- Emissions directly related to Council Scope 1, 2 and 3 activities and operations represent 417,772 tCO<sub>2</sub>e, just 8% of the total emissions of the city.
- Note that there is some overlap between the Council's Scope 3 emissions and the emissions of the city.
- Although the direct emissions that the Council controls or has strong influence over is relatively small, the Council still has an important role in stimulating and influencing action across the city.

The following pages of this section will explore the influencing ability of the Council and the potential actions the Council should consider to encourage the transition to a net zero city, beyond the Council's own operations. Through using its influencing powers, the Council can demonstrate leadership, provide direction and encourage a positive knock-on effect to businesses, third sector organisations, educational institutions and individuals to take climate action.



#### Figure 2: Council vs city Emissions

"Cities and local authorities are well placed to understand the needs and opportunities in their local area, although there are questions over whether they have sufficient resources to contribute strongly to reducing emissions. They have important roles on transport planning, including providing high-quality infrastructure for walking and cycling, provision of charging infrastructure for electric vehicles, and ensuring that new housing developments are designed for access to public transport." <u>Committee on Climate Change</u>



### **2. Delivering Change** What can the Council do?

### Using the Council's influence

Key ways of influencing emissions outside of the Council's direct control are listed to the right, adapted from Ashden's <u>Climate Action</u> <u>Co-Benefits Toolkit</u>.

Birmingham City Council will need utilise their influencing power to act as a catalyst for enabling change across other key stakeholder groups in the city such as:

- Businesses
- Third-sector organisations
- Academic institutions
- Residents of Birmingham

As well as other key stakeholder groups outside of the city, including:

- Other levels of government
- Visitors to Birmingham
- Investors
- Wider public



Birmingham City Council can lead by example in the city and demonstrate the benefits of decarbonisation to other stakeholders. The Council can share their knowledge and experiences and can ask partners to replicate their efforts.

#### Partnership:

There is an opportunity to leverage existing partnerships to ensure the delivery of multiple benefits from interventions. There is also a key role in partnering with businesses to support their carbon reduction actions.

#### Communication:

Birmingham City Council can be a key information source for climate change action in the city. It is essential the good communication channels are developed to spread information about the need to act, what can be done and to facilitate knowledge sharing.

### Lobbying:

Birmingham City Council alongside local authorities, businesses and community groups can lobby national and regional governments for funding and more ambitious national policies.

#### Planning

There are opportunities with a future review and update of the Birmingham Development Plan to incorporate greater carbon reduction measures into new developments. Where argued not viable, supplementary information and training can be provided.

#### Signposting:

The Council have a unique role as a trusted source of information to be able to recommend business in the low carbon industry. They can also utilise their networks to signpost useful resources for other stakeholders.

#### Health and Social Care:

The council should work alongside health and social care providers to deliver interventions that have multiple benefits.



### 2. Delivering Change Re-thinking Council Influence

### The Council cannot do this alone

This chart illustrates that BCC's influence is varied and complex across the different activities that occur within their own operations and also across the city. Influence bandings are based on Anthesis' judgment following discussion with officers, and are by no means definitive. The examples that relate to each banding are intended to highlight opportunities for BCC to apply their influence in areas or ways previously not fully explored (e.g. by using 'convening power' and/or policy).

Influence extends beyond the city boundary, whereby BCC's demand (and supply) of goods and services is likely to result in emissions from supply chains around the world. Such emissions are referred to as consumption based emissions. The quantification and consideration is beyond the direct scope of this commission, but may still be influenced by the Action Plan.

#### Table 1: Council influence bandings

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Influence	Description
Direct Control	Emissions sources are directly owned or operationally controlled by the Council, such as council buildings or council fleet.
Stronger	Owners and operators of emissions sources are clearly defined but are not directly operated by the Council. For example, emissions related to commercially leased buildings that the council owns but does not operate.
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 city, such as major businesses within city boundaries.
Weaker	Owners and operators of emissions sources are not clearly defined, influence limited to lobbying central government or trade associations. For example, national planning policy limited the extent of improvement to new build energy efficiency.



### **2. Delivering Change** City-wide Priorities

### Where to start?

- Ultimately every sector requires action, it is not an option to only pick specific ones. However, the Council only has a finite amount of resource so may need a basis upon which to prioritise action.
- Across each of the sectors analysed, there are roles for both the council and other stakeholders to act.
- Priorities and timing of activities are a matter of judgement (there is no right or wrong), and this can really vary from council to council, and from city to city. However, we have set out below come factors that may be useful in BCC's prioritisation of action. These should be considered by BCC when formulating the plan that follows this work.

#### Speed & magnitude carbon reduction

Urgently reducing carbon is the ultimate aim of efforts from all Climate task force and sub-groups.

Sector priorities: Looking at the various sectors analysed, reducing energy demand is typically the most financially efficient way of saving carbon (compared to renewable energy supply). However, we acknowledge that as demand for heating and cooling are likely to increase over the coming decades supply still needs to be considered.

Sector projects: Appraising the relative carbon impact and timing of specific carbon saving projects (see Chapter 4).

#### Playing to your strengths

Local delivery partners: Every sector will have a range of sub-sectors or stakeholders that are relevant to delivery. Identifying engaged, supportive partners is a pre-requisite to carbon reduction project development.

**Existing expertise:** We have identified lots of positive activities that have taken place in the city to date. The ability to use already established groups and/or scale up existing initiatives may inform priorities.

Local geography: Birmingham is geographically unique, and may lend itself better to certain reduction measures than others based on it's physical characteristics.

### Timing

**Cumulative impact:** It is important to consider the future cumulative carbon legacy of decisions made to today i.e. the emissions produced over the operational life of assets or projects.

**Disruption:** Many low carbon projects can carry an element of short term disruption before longer term gain can be realised.

Skills development: Retrofit of buildings is commonly cited as an area that is lacking; therefore activities that can stimulate this sooner rather than later will be beneficial (if not necessary) in the longer term.

**Funding:** Various source of funding may be available for specific types of projects.

**Technology costs:** Councils have a major role to play in stimulating demand and helping to bring costs of low carbon technology down.

Waiting for this to happen may compromise carbon targets and cost savings for other stakeholders within the city.

#### Other Co-benefits

Given that all measures highlighted in this report promote a range of other benefits (e.g. social, health, economic).

Alignment with other strategic or political priorities in certain sectors may also influence priority here.

### **2. Delivering Change** Funding Mechanisms

BCC needs to continue to build project specific business cases for investment into a low carbon transition as financing will be one of the key barriers to achieving the net zero ambition. The table below outlines the different types of funding that could be utilised in order to deliver BCC's Climate Action Plan. Note, this list is not exhaustive and other private funding mechanism outside of the council's control may also apply. **BCC should actively explore which may be relevant.** 

Table 2: Potential funding mechanisms to support city-wide carbon reduction.

Туре	Description	Examples
National Level Funding	There are a variety of national initiatives that could be utilised to provide funding for climate change projects including: ECO funding, Salix Finance.	<u>Southampton City Council-</u> worked with <u>Salix Finance</u> (interest free government funding) to deliver energy efficiency projects in eight of their schools.
European Funding	There are several EU grants available to support climate change projects including: LIFE Climate Action, European regional development fund (ERDF), European social fund (ESF).	Homes as Energy Systems (HAES) – ERDF and Retrofit Works Project, Greater Manchester.
Section 106	A financial contribution used to mitigate the impact of new developments on infrastructure and communities.	<u>Waltham Forest</u> – using Section 106 funding from new developments to improve walking and cycling infrastructure
Community Infrastructure Levy	A charge which can be levied by local authorities on new development in their area to deliver infrastructure. (Tariff-based). BCC is currently making use of this to support the growth aspirations for the city.	<u>City of London</u> - allocated to broad infrastructure spending priorities: public realm and local transport improvements (40%); social and community enhancements (10%); and open spaces (5%).
Workplace Car Parking Levy. <sup>1</sup>	This could be an annual fee paid by businesses with 10+ parking spaces. BCC is currently investigating the possibility of its use to support sustainable transport infrastructure.	Nottingham City Council - introduced a parking levy which has been used to fund extensions to the existing tram system.
Crowdfunding and Municipal Community Bonds	See <u>Financing for Society: Local Authority Guide</u> for information about crowdfunding as a potential model of finance for the public sector.	Swindon City Council – used a crowdfunding platform to raise a total of £4.3m to operate a solar park.
Local Taxation	Explore opportunities to leverage local taxation.	<u>Various Councils</u> nationally are considering how Business Rates could better stimulate lower carbon action and investment. No published info at present.
Revenue Generation Projects	Potential to generate finance from renewable energy or 'Clean Air Zone' charges for most polluting vehicles.	<u>Telford &amp; Wrekin Council</u> 4MW ground mounted solar farm, on agricultural land owned by the council. Generates a profit of approximately £150k/year over 25 years.
Local initiatives	There may be other local initiatives from organisations or institutions in the region	<u>ATETA</u> - University of Birmingham provides free access for SMEs to its team of Knowledge Exchange Fellows to aid adoption of zero carbon energy technologies.
Community Infrastructure Levy Workplace Car Parking Levy. <sup>1</sup> Crowdfunding and Municipal Community Bonds Local Taxation Revenue Generation Projects Local initiatives	<ul> <li>A charge which can be levied by local authorities on new development in their area to deliver infrastructure. (Tariff-based). BCC is currently making use of this to support the growth aspirations for the city.</li> <li>This could be an annual fee paid by businesses with 10+ parking spaces. BCC is currently investigating the possibility of its use to support sustainable transport infrastructure.</li> <li>See Financing for Society: Local Authority Guide for information about crowdfunding as a potential model of finance for the public sector.</li> <li>Explore opportunities to leverage local taxation.</li> <li>Potential to generate finance from renewable energy or 'Clean Air Zone' charges for most polluting vehicles.</li> <li>There may be other local initiatives from organisations or institutions in the region</li> </ul>	City of London - allocated to broad infrastructure spending priorities: public realm and local transport improvements (40%); social and community enhancements (10%); and open spaces (5%).Nottingham City Council - introduced a parking levy which has been used to fund extensions to the existing tram system.Swindon City Council - used a crowdfunding platform to raise a total of £4.3m to operate a solar park.Various Councils nationally are considering how Business Rates could better stimulate lower carbon action and investment. No published info at present.Telford & Wrekin Council 4MW ground mounted solar farm, on agricultural land owned by the council. Generates a profit of approximately £150k/year over 25 years.ATETA - University of Birmingham provides free access for SMEs to its team of Knowledge Exchange Fellows to aid adoption of zero carbon energy technologies.

### **3. Current and Future Emissions Profile** Baseline Validation





## 3. Current Emissions Profile – Birmingham City Council's Own Emissions Summary

- The analysis of Birmingham City Council's own emissions focused on six key emissions sources, including: Buildings & Other Assets, Vehicle Fleet, Business Travel, Employee Commute and Procurement Spend.
- An **operational control approach** to GHG accounting has been used for the analysis of emissions from owned/leased buildings and assets. In reference, the GHG Protocol define operational control as an organisations 'authority to introduce and implement its operating policies at the operation' (GHG Protocol, 2019).
- Under this approach, assets owned by BCC but leased out to third parties fall into Scope 3 as activities are outside of the direct control of BCC. Assets that are leased to BCC by a third party, or fully owned and operated by BCC will fall into Scope 1 and 2 as BCC has direct control over their operation.
- The table below provides further detail of the operational control approach that has been applied and the rationale behind the inclusion/exclusion of key entities.

Buildings / Asset	Operational Control	Owned	Scope
Schools	×	$\checkmark$	Scope 3
Social Housing	×	$\checkmark$	Scope 3
Commercial Properties	×	$\checkmark$	Scope 3
Leased (BCC are the Lessor) to a third party e.g. Museums	×	$\checkmark$	Scope 3
Leased (BCC are the Lessee) from a third party e.g. Shelforce	✓	×	Scope 1 & 2
Owner Occupied	$\checkmark$	$\checkmark$	Scope 1 & 2

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Table 2: Accounting Judgements



#### Definitions

- Scope 1 (Direct emissions): All direct GHG emissions from the activities of an organisation or under their control. For BCC, this primarily relates to natural gas for heating and fuel used by owned or controlled vehicles.
- Scope 2 (Indirect emissions): GHG emissions occurring as a consequence of the use of grid-supplied electricity, heat, steam and/or cooling within the city boundary. For BCC, this relates to purchased electricity.
- Scope 3: All other GHG emissions that occur outside the Birmingham City boundary as a result of activities taking place within the boundary. For BCC, Scope 3 emissions include schools, housing, procurement activities and employee commuting.

### 3. Current Emissions Profile – Birmingham City Council's Own Emissions Summary

### Total footprint – Further analysis

- Procurement spend is the largest emissions source, accounting for **80%** of the council's total emissions and relates to services that the council procures to support services across the city, such as road or building maintenance.
- The operation of buildings; electricity, gas and water account for another **17%** of the Council's Scope 1, 2 and 3 emissions. The operational control of these buildings are different depending on the letting arrangement in each and hence, the impacts are split across Scope 1, 2 and 3.
- Mobile Supplies (highways) mainly consists of street lighting, contributing 17,881 tCO<sub>2</sub>e of emissions.
- Building emissions only account for buildings where utilities are purchased through Birmingham City Council's Corporate Procurement Service.
- At the time of writing, data was not available on the emissions associated with waste and bereavement fleet.

#### <u>Glossary</u>

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Mobile Supplies: demand from Unmetered Supplies (UMS) for example street lighting, speed cameras and communal lighting.

WTT: 'Well-to-tank (WTT) fuels conversion factors should be used to account for the upstream Scope 3 emissions associated with extraction, refining and transportation of the raw fuel sources to an organisation's site (or asset), prior to combustion.' (DEFRA, 2019)

T&D: '*Transmission & Distribution (T&D) factors should be used to report the Scope 3 emissions associated with grid losses (the energy loss that occurs in getting the electricity from the power plant to the organisations that purchase it)*.'(DEFRA, 2019)

Emission Source		2018/19 tCO2e
Scope 1		
Buildings and other assets	Owned and Occupied Building Natural Gas Building Oil	7,007 0
Vehicle Eleet	Fleet Adult Social care & Health	588 unknown
	Fleet Bereavement	unknown
Scope 1 Total		7,595
Scope 2		
	Owned Building (Highways) Elec	617
Buildings and other assets	Mobile Supplies (Highways) Elec	14,588
	Owned and Occupied Building Elec	8,805
	Leased and Occupied Building Elec	83
Scope 2 Total		24,093
Scope 3	De il line National One	0.404
	Building Natural Gas	2,404
Social Housing	Building Electricity	2,986
		1,123
	Building Natural Gas	13,116
Schools	Building Electricity	8,141
		3,974
	Building Water	219
	Building Natural Gas	1,642
Commercial Properties		1,049
Dragurament	WII + I&D Dresurement (Supply Chain)	505
Procurement	Water	334,801
Water	Water	291
Owned buildings and other assets	UMS (WTT + T&D)	3,485
	Grev Elect	533
Mobile Emissions	Business Travel	70
	Commuting	7,831
Scope 3 Total		386,084
Table 3: Total BCC emissions breakdown by s	cope and sector (tCO <sub>2</sub> e)	20

### **3. Current Emissions Profile – Birmingham City Council's Own Emissions** Direct Emissions (Scope 1) and Indirect Emissions (Scope 2)

### Scope 1 - Further analysis

- The analysis of Birmingham City Council's Scope 1 emissions focused on two key emissions sources: Buildings and Fleet.
- Scope 1 emissions account for 7,595  $tCO_2e$  (92% Building Gas, 8% Fleet) which corresponds to approximately 2% of the Council's total footprint.
- The top 10 buildings for gas consumption account for 31% of the total emissions from gas. This consists of a variety of building types including Leisure and wellbeing centres, crematoriums, Alexander Stadium, depots and care centres.

#### Scope 2 - Further analysis

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- The analysis of Birmingham City Council's Scope 2 emissions focused on two key emissions sources: Buildings and Mobile Supplies.
- Scope 2 emissions account for 24,093 tCO<sub>2</sub>e which corresponds to approximately 6% of the Council's total footprint.
- The biggest source of indirect emissions were electricity used in mobile supplies accounting for 61% of indirect emissions. 95% of emissions from mobile supplies come from street lighting.
- The remaining Scope 2 emissions (39%) come from electricity used in buildings, including highways, leased and council-owned buildings. Of this, the top 10 buildings account for 29% of all building electricity emissions.



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### 3. Current Emissions Profile – Birmingham City Council's Own Emissions **Other Emissions (Scope 3)**

■ Water (<1%) Travel (2%)

### Scope 3 - Further analysis

- The analysis of Birmingham City Council's own Scope 3 emissions focused on five key emissions sources: Social Housing, Schools, Commercial Properties, Procurement and travel.
- Scope 3 emissions account for 386,084 tCO<sub>2</sub>e which corresponds to approximately 92% of the Council's total footprint.



The Council's other emissions are largely associated with procurement spend, accounting 87% of Scope 3 GHG emissions.



Schools account for 7% of the Council's Scope 3 emissions (25,451 tCO<sub>2</sub>e), followed by



Social Housing which accounts for 2% (6,512  $tCO_2e$ ).

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Commercial Properties are responsible for <1% of emissions (3,197 tCO<sub>2</sub>e).

Travel which comprises business travel, grey fleet and staff commuting also contributes 8,434 tCO<sub>2</sub>e which is 2% of Scope 3 emissions

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### **3. Current Emissions Profile – Birmingham City Council's Own Emissions** Other Emissions (Scope 3) - Procurement

#### Procurement Spend - Further analysis

• The largest emissions source for both the Council's Scope 3 and the total council footprint is produced through procurement spend.

Construction and Mains Power make up over 50% of emissions from

procurement activities, their total is greater than the combined Scope 1

and 2 emissions from BCC.



This analysis was based on the data that was available at the time of writing. Some notes on data gaps have been provided in Section 6: Monitoring and Reporting.

#### Method

Emissions have been calculated using DEFRA input/output emissions factors matched to broad procurement spend categories. For a more concise analysis of consumption-based emissions from supplier activities more granular data would be required to establish precise emission sources.

The 'Unmapped' category relates to spend that was not possible to map to a DEFRA category so alternative weighted method was applied.



- Construction (31%)
- Mains Power (25%)
- Sewage And Refuse Services (10%)
- Health And Social Work (10%)
- Other Service Activities (6%)
- Unmapped (5%)
- Legal, Consultancy and other business activities (5%)
- Education (2%)
- Furniture and Other Manufactured Goods (2%)
- Wholesale Distribution (1%)
- Electrical Machinery (1%)
- Ancillary Transport Services (1%)
- Hotels, catering and pubs (1%)
- Road Transport (1%)
- Recreational Services (1%)

### **3. Current Emissions Profile – Birmingham City Council's Own Emissions** Other Emissions (Scope 3) - Procurement

#### Procurement Spend – Top 10 emitters

- Analysis of the contribution of the top 10 suppliers shows that they account for 67% of carbon emissions and 52% of procurement spend.
- Please note this assigns the top 10 highest emitters based on the council's Scope 3 consumption based emissions rather the city-wide territorial-based emissions.
- All suppliers with a procurement spend over £10 million are in the top 25 for associated carbon emissions.

### Figure 9: Contribution of Top 10 suppliers





### **3. Current Emissions Profile – Birmingham City Region's Emissions Direct and Indirect Emissions**

The figures and charts presented below summarise the production<sup>1</sup> (or territorial) emissions relating to area administered by Birmingham City Council, using Anthesis' SCATTER Greenhouse Gas Inventory tool. BEIS also provides Local Authority CO<sub>2</sub> Emissions data publicly, however the SCATTER tool inventory provides a more complete picture of current emissions and has therefore been prioritised. The BEIS dataset for Birmingham and the differences between the two inventories are explored in Appendix 2



services within the city that were produced outside of the city boundary.

### **3. Current Emissions Profile – Birmingham City Region's Emissions** Tyndall Centre Research

#### Introduction

The Tyndall Centre for Climate Change Research is a research organisation based at the University of Manchester, whose research aims to translate the Paris Agreement targets of limiting temperature change below 1.5°C into a finite carbon 'budget' for each local authority. A temperature increase of 1.5°C is the result of a given concentration of atmospheric greenhouse gases.

- The carbon budget for the Birmingham City region<sup>1</sup> between 2020-2100 is  $\rm 27.5\,MtCO_{2}$
- A consistent annual emissions reduction rate of -12.8% is needed to adhere to this budget
- If Birmingham's emissions were to remain at today's levels, the finite carbon budget would **run out in 7 years**.

**The budget is finite:** A global carbon budget represents the finite emissions that can be emitted before the 1.5°C threshold for greenhouse gas concentration is crossed. This global budget can subsequently be scaled down to a national level, and finally, a regional level. A more complete description of this approach can be found in Appendix 4.

The impact is cumulative: Once emitted, carbon dioxide remains in the atmosphere for many years, contributing to increasing the average global temperature. The carbon budget does not reset each year; it represents a finite limit to emissions. If the carbon budget were a monthly payday check paid on Friday, it would be spent before lunchtime the following Monday.



A key omission from this budgeting analysis is emissions from aviation and shipping and the budget considers only the region's energy system. This type of budget is termed 'energy-only' and also excludes emissions from land use, land change and forestry, as well as cement manufacturing. Further explanation of the treatment of these sources in the research is provided in Appendix 4.



### **3. Current Emissions Profile – Birmingham City Region's Emissions** Deriving the Birmingham Carbon Budget

### Birmingham's budget

The carbon budget (25.7  $MtCO_2$  for the period 2020-2100) sets out a finite emissions limit that the should not be exceeded in order that Birmingham remains in line with the Paris Agreement. The budget itself is derived from a 'scaling-down' approach – a full methodology is <u>available to view</u> 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 Birmingham 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.

Table 4: Birmingham City Carbon Budget, Tyndall Centre analysis<sup>1</sup>

Carbon Budget Period	Recommended Carbon Budget (MtCO <sub>2</sub> )
2018 - 2022	17.4
2023 - 2027	9.0
2028 - 2032	4.6
2033 - 2037	2.3
2038 - 2042	1.2
2043 - 2047	0.6
2048 - 2100	0.6

### Aviation and shipping

Aviation and shipping emissions are deducted at the UK level, **not** at the Birmingham City level.

Future changes in the growth of aviation emissions are forecasted from government projections.

Within SCATTER, the emissions from aviation are modelled as being fixed up until 2030, followed by a linear reduction to full decarbonisation in the sector until 2075.



### **3. Current Emissions Profile – Birmingham City Region's Emissions** Deriving the Birmingham Carbon Budget

Global "well below" 2°C emissions budget <sup>1</sup>				
Global energy-only emissions budget		Global LULUC cement proces emissions	F <sup>2</sup> & ssing	
Rest of the world energy-only emissions budget (c. 99.4%)	ly emissions 0.6%) UK emissions budget (c. 0.6%)			
<i>Bars/boxes in the diagram are not to sized scale of budgets</i>	UK aviation & shipping <sup>3</sup>	UK energy- only budget		
		Birmingham energy-only budget	Birmingham LULUCF budget	

The chart to the left is a visualisation of the process of arriving at the carbon budget for Birmingham under the Tyndall Centre's analysis and demonstrates the level of exclusions form the energy-only carbon budget.

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 15% emissions reduction rates for Birmingham 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.



# 3. Current Emissions Profile – Birmingham City Region's Emission Pathways

### Summary

7

6

Figure 13: Birmingham Carbon Budget and Pathways for the City-Wide Energy System, annotated. This chart displays the modelled emissions trajectory using the interventions included in the SCATTER model. **BEIS/SCATTER Overlap:** The SCATTER model base year is 2015\*. More recent data has since been published by BEIS (grey dotted line), enabling early comparison (shaded region). Actual performance has been slightly worse than SCATTER predicted.

SCATTER Level 1: Assumes minimal action beyond current, national policy (where sufficiently defined by sector or measure) and nationally led decarbonisation of the electricity grid. This will still require a significant level of effort locally.

**SCATTER Level 4**: Assumes that the region goes significantly beyond national policy and grid decarbonisation, across both energy supply and energy demand measures. This does not include any use of CCS technology.

**Tyndall Paris Aligned Pathway**: Unlike the SCATTER pathways, this is based on climate science, not tangible energy supply and demand measures within the region. This Pathway is one way of allocating a finite, carbon budget (the area underneath). **Alternatively, the same budget would last 7 years at current emissions levels**.





## 4. Sectoral Analysis: Introduction





### **4. Sectoral Analysis** Structure

The following information and analysis will be used by Birmingham City Council to inform a **SMART Action Plan** in response to their climate emergency declaration.

The following chapters are split by the major sectors in the city with the addition of council influencing and strategy components. Key sectors are identified based on the large emissions sources for city and potential areas for opportunity. Each sector explores carbon reduction interventions that have the greatest opportunity for impact, along with their feasibility and wider co-benefits of their implementation. Sectors and actions should not be viewed in isolation and there is a need to co-ordinate and co-operate across sectors to achieve the necessary reductions. There are **significant interlinkages between the recommended interventions** which can have both negative and positive impacts on other interventions.



**Anthesis** 

#### Key elements to each Sector

- **Background** Provides the current context and recognises the actions that have already been undertaken.
- Relevant Plans and Policies An at a glance summary of some of the key plans, policies and strategies in place at national, regional and local level. This should be used to identify key policy gaps.
- Measures and Interventions Based on SCATTER pathways tool to provide an indication of the scale of change required. The following tables provide proxies for the nature and extent of Birmingham specific measures. These are all assumed in order to track the green SCATTER Level 4 (L4) pathway Interventions as shown on page 29 unless stated otherwise. Where relevant, these have been linked to key recommended next steps for action.
- Governance Structure Reflection on governance structure to deliver changes in this sector.
- **Co-benefits** The co-benefits are reducing emissions from this sectors are presented here to help strengthen the case for action beyond just climate change.
- Stakeholder Analysis Actions are grouped by stakeholders including the council, businesses, key partners and residents. This demonstrates that action is required at all levels of governance. The council also has role to facilitate and encourage the actions of all other stakeholders.
- Key Recommended Next Steps Includes some suggestions of what can be done now to work towards the SCATTER targets, plus an idea of resourcing and examples of best practice. These are not intended to be an exhaustive list. This is separated into actions specifically for the council and actions for the council to carry out in the wider city. Indicative potential costs of each measure have been provided where possible. Due to limitations of budget and scope, this is not comprehensive cost analysis but provides an indication of relevant financial costs based on publicly available data. As such, we advise:
  - Associated assumptions are reviewed and fully understood by the Council
  - No reliance by the council (or any other party) should be placed on these figures due to the inherent limitations in assumptions – these are simply intended to help inform relative priority of actions and how more robust estimates could be performed.
- References A full list of references and sources of information are provided in the appendices.

### **4. Sectoral Analysis** Carbon Equivalents

#### Visualising Carbon Dioxide

Throughout our analysis we have provided metrics in tonnes of Carbon Dioxide (CO<sub>2</sub>) or Carbon Dioxide Equivalent (CO<sub>2</sub>e).

To help paint the picture of the scale, below are some examples of the equivalent impact of 1 tonne of CO<sub>2</sub>:



**CO<sub>2</sub>e:** This allows the comparison and inclusion of other GHGs (e.g. nitrous oxide and methane) as well as carbon dioxide. It represents the corresponding amount of carbon dioxide that would be required to produce the same level of radiative forcing and thus warming as these other GHGs.



### 4. Sectoral Analysis: Internal Council Behaviour Change





### **Internal Council Behaviour Change** Background



This section explores the action the Council can take in facilitating internal behaviour change.

#### Progress to date:

- Declared a Climate Emergency and established a Climate Emergency Task Force in June 2019.
- Internal communications encouraging response to the climate emergency citizen survey.
- Posters in meeting rooms encouraging turning off lights (not universally applied).
- Transport team have shared information to encourage uptake of more sustainable modes of transport (e.g. celebrating cycle to work day) through Birmingham Connected bulletins, Yammer and other social media.
- Technology investment has begun to migrate to Microsoft Online and use Microsoft Teams to support remote working.
- Staff travel survey conducted in 2019.

### Local Plans

- <u>Council Plan 2019 Update</u> Describes actions taken and plans for the future to tackle climate change. Includes details of the climate emergency task force which will support the council to move to a low carbon future.
- <u>Route to Zero (R20)</u> The Route to Zero (R20) Task Force was created in autumn 2019 and brings together Members and officers from the Council and key partners and stakeholders from across the region.
- Staff Handbook opportunity to incorporate climate change targets and expected behaviours into handbook.
- Sustainable travel guidance opportunity to add in carbon considerations around travel mode, necessity and accommodation.
- Onboarding and professional development process Potential to incorporate carbon targets and training into these processes.

### National Resources

Guidance for individuals has been published by various Organisations. Please find a selection of recommendations, more focused on individual behaviours, that could inform council staff behaviours:

- Friends of the Earth What can I do to stop climate change link.
- BBC 10 simple ways to act on climate change link.
- The Grantham Institute, Imperial College London 9 things you can do about climate change link.





### **Internal Council Behaviour Change** What is needed from Stakeholders?

#### Birmingham City Council:

- Develop a strategy for council behaviour change outlining a long term vision, key priorities, actions and delivery.
- Deliver a council-wide education plan including formalised training in order to raise awareness.
- Data collection and monitoring of current demand e.g. energy usage, travel and productions and waste in order to establish a baseline, monitor programme and allow feedback to staff members.
- Develop incentivisation schemes for green champions or departments that lead the way in reducing emissions.
- Ensure progress and example of success are effectively communicated amongst the council and with the wider public.

### Council Staff:

- Engage with policies and initiatives developed by the Climate Emergency Task Force.
- Calculate your own carbon footprint and consider your role in carbon reduction delivery.
- Participate in training and develop individual goals for carbon reduction.
- Integrate learnings from training and engagement within your decision making.
- Communicate and share what you have learnt with peers, both internally and externally.

### Local Media Channels:

• Report the success and progress of the council to local residents.

#### Other Partners:

- Local Environmental Groups Continue to challenge the council and members to act.
- **R20 Task Force** Use their networks to widen engagement and action, share learnings and leverage collective lobbying influence..
- Commonwealth Games Organising Committee Draw investment for sustainable travel options, waste infrastructure and to inspire and educate Council staff.
- Unions, e.g. Birmingham UNISON Consider developing a Climate Change agreement with Birmingham council and support staff in delivering ambitious carbon reduction.





### **Internal Council Behaviour Change** Delivery





#### Co-benefits:

- Knowledge sharing Staff can take what they have learnt into their communities and spread the message beyond the Council.
- Increased climate action Education may increase the buy-in of council staff to more ambitious policies and strategies.
- Talent acquisition Having progressive sustainability policies can help to attract and hire the best talent.<sup>1</sup>
- Personnel management Encouraging staff to use active travel modes can reduce absenteeism.<sup>2</sup>
- Health and wellbeing More flexible working has been associated with a better work-life balance which supports improved heath and wellbeing.<sup>3</sup>
- **Financial benefits** Behaviour change can result in increased efficiency of energy use and waste management within the council which can provide cost savings.


### **Internal Council Behaviour Change** Key Recommended Next Steps

**Anthesis** 

Source	Carbon Reduction Measure	Costs and Resources
	Develop a strategy for reducing staff and council's own emissions alongside ambitions for the city.	Additional staff resources.
	Facilitate competitions between departments in low carbon behaviours or provide each department with a carbon budget.	Additional staff resources
	Develop a monitoring and communication campaign to reduce energy use.	Carbon Trust estimates that the cost of a campaign is 1-2% of an annual energy bill. <sup>1</sup>
Source	Develop a monitoring and communication campaign to reduce waste and increase recycling.	Additional staff resources
		£10 per applicant certification. <sup>2</sup>
Source	Deliver education programme such as <u>Carbon Literacy</u>	Volunteers to deliver training.
	<u>Iraining</u> to all staff and members and incorporate training into new starter process	Carbon Literacy Project are developing a Local Authorities toolkit to provide guidance on designing of training. <sup>2</sup>
	Continue to review departments suitable for home working and update HR policy to enable flexible working. This has been accelerated due to the COVID-19 lockdown measures.	Within existing staff resources.
	Ensure staff have continued access, training and support for using remote technology and develop a plan for sustained remote working coming out of lockdown.	Within existing staff resources.
Council behaviour changes	Conduct a updated staff commuting survey and regularly review business travel to target actions and develop guidance on sustainable travel	Within existing staff resources.

#### Examples of good practice:

HOME Manchester is recognised as a platinum carbon literate organisation. 100% of staff are trained in carbon literacy and all new starters are trained within 6 months of joining.

Islington city Council raising awareness amongst staff of energy efficiency measures will save £43,000 and 196 tCO per year.

<u>Stockport Council and Stockport UNISON</u> have signed a Joint Environment and Climate Change Agreement to support a just transition to a low carbon economy.



# 4. Sectoral Analysis: Council Strategy and Engagement





### **Council Strategy and Engagement** Background



This section represents the council's role in facilitating change with external organisations such as businesses and the public

#### Progress to date:

- Declared an aspiration for the city to be net zero carbon by 2030 or soon after as a just transition allows; ensuring communities are engaged in the process; protecting employment; ensuring a just transition and reducing existing inequalities in the city.
- A pledge to seek, with the WMCA, powers and resources from the UK Government to help Birmingham deliver the 2030 net zero carbon ambition.
- Declared a Climate Emergency and established a Climate Emergency Task Force in June 2019.
- Policies and projects including the Birmingham Development Plan and Birmingham Connected supporting the reduction of carbon emissions to mitigate against climate change in planning and development, sustainable transport, heating and powering the city, research and partnerships.
- All new procured buses in the city centre from 2025 to be zero emission, as well as identifying key city areas to be zero-emission.
- £33 million EU funded Business Growth Programme successfully delivering since July 2016, with £36 million of private sector investment generated and 1,461 new jobs.
- <u>Birmingham Youth Strike 4 Climate</u> There have been several climate strikes and lobbying from young people in Birmingham seeking climate justice.

#### **Regional Plans**

• <u>West Midlands Industrial Strategy</u> – Includes commitments to use innovative solutions to address urban challenges like air quality, flood water management, overheating in urban areas and climate change adaptation, and; continue to reduce carbon emissions while driving productivity to meet the current targets, through the actions in this strategy.

### Local Plans

- <u>Route to Zero (R20)</u> The Route to Zero (R20) Task Force was created in autumn 2019 and brings together Members and officers from the Council and representatives from the West Midlands Combined Authority, the NHS, higher education, business, faith communities, the third sector, young climate strikers, climate campaigners, and other key partners and stakeholders.
- <u>The Council Plan 2019 Update</u> States that Birmingham will be a city that takes a leading role in tackling climate change. This commitment will embed climate action in the council's decision-making process to make sure that all service areas contribute to the R20 journey.
- <u>Council Plan 2019 Update</u> Describes actions taken and plans for the future to engage with the community and other stakeholders. Key aspirations include:
  - Working with businesses in the city to help them grow and ensure sustainability.
  - Attracting international investment to the city.
- <u>Birmingham Business Charter for Social Responsibility</u> Sets out social, environmental and economic guidelines for procurement that BCC will uphold and suggests for all businesses and third party organisations to uptake.
- <u>Working Together in Birmingham's Neighbourhoods</u> policy statement (White Paper) sets out a number of commitments with the aim of improving neighbourhood working.
- <u>Community Cohesion Strategy</u> (2018) Outlines the council's goals for Birmingham to build inclusive and resilient communities. The guiding principles include strategic partnerships across the city to empower neighbourhoods and support the ambitions of young people



### **Council Strategy and Engagement Delivery**





#### Co-benefits:1

- **Relationship building:** Strengthens the relationship and ties between the council and communities, schools and businesses.
- **Resilience:** Facilitating the development of skills for local people can help reduce unemployment and protect against it as the economy shifts to a low carbon economy. It can also help to protect businesses as the market changes.
- **Community empowerment-** Encouraging projects such as community renewables can increase community autonomy, empowerment and resilience by providing local control over finances. Community action can also deliver a strengthened connection to place and the community.
- Greater buy-in to climate policies- Engagement helps to build consensus, which may enable the council to deliver more ambitious low carbon policies.
- Just transition There is an opportunity as the economy decarbonises to deliver a sustainable and inclusive job market, which could ultimately help to tackle inequality.
- Supply chain benefits Businesses encouraged to adopt stricter sustainability standards as a result of procurement requirements will benefit from increased efficiency, resilience and cost savings.

### **Council Strategy and Engagement** What is needed from Stakeholders?

#### Birmingham City Council:

- Develop a Climate Change Strategy and Action Plan and ensure that climate change is consider in every policy, plan and strategy document.
- Improve communication of information on climate change e.g. through branding and website development.
- Use procurement to influence businesses and suppliers to minimise their carbon footprint.
- Develop partnership with businesses, sharing experiences and providing guidance.
- Increase engagement with communities and residents by providing guidance and resources the need to act and what they can do. Provide funding to community groups involved in green initiatives.
- Work closely with schools to minimise their footprint and provide workshops and education channels for students.

#### **Businesses:**

- Partner with the Council and commit to reducing carbon emissions.
- Develop own climate change strategies, science-based targets and action plans.
- Work with staff members to at all levels of the business to encourage behaviour change. Consider carbon literacy training for all staff.
- Attend training sessions and networks run by the Council
- Consider the opportunities of a low-carbon economy and areas to upskill workforce.
- Support local communities to deliver carbon reduction measures

#### National Government:

- Provide funding for apprenticeship and training in the low carbon industry
- Provide incentives and guidance for businesses to reduce carbon footprints
- Provide greater funding to local councils to implement climate change strategies
- Support schools to decarbonise

#### West Midlands Combined Authority:

- Work with Birmingham City Council to localise campaigns
- Facilitate knowledge sharing between 10 district local authorities.
- Continue to develop regional campaigns.
- Provide funding for further carbon reduction projects.

#### Local residents:

- Attend engagement sessions run by the council
- Find out what your role is and actions to take as an individual
- Get involved in local community groups that raise awareness about climate change.
- Lobby MPs, Councillors and Business to act.

### Other Partners:

- Local Community Groups continue educating and raising awareness amongst communities and campaigning for action from organisations in the city.
- **Commonwealth Games Committee** work with to promote green travel, recycling and community engagement.
- Universities: Birmingham, Aston, City Provide thought leadership and research



### **Council Strategy and Engagement** Key Recommended Next Steps

Source	Carbon Reduction Measure	Capital Costs and Resources
	Explore divesting from fossil fuel investments in the council pension fund.	Potential to carry out in house or £5,000 consultancy costs. <sup>1</sup>
Council Stratogy	Embed carbon reduction into every decision and policy, particularly core strategies such as the Local Plan.	Within existing staff resources. Currently developing an Investment Appraisal Criteria (see Chapter 5)
Council Strategy	Develop a SMART Action Plan and monitoring system and share experiences with other businesses and other organisations	Additional staff resources.
	Update planning policy and investigate opportunities planning function to drive carbon reduction. Impacts would span various sectors (transport, buildings, natural environment).	Additional staff resources.
	Change Procurement Policy to incorporate carbon neutral consideration including through social value and more rigorous carbon criteria.	Within existing staff resources. <sup>2</sup>
Council Procurement and Commissioning	Work with all commissioned services and major procurements to ensure they have carbon reduction policies in place.	Additional staff resources. <sup>2</sup>
	Establish monitoring systems commissioned suppliers to account on their carbon performance.	Additional staff resources

#### Examples of good practice:

<u>Cheshire East Council</u> have developed a Climate Action Plan in response to their climate emergency declaration to reduce both Council 's own and city-wide emissions.

**Cornwall Council** developed a Responsible Procurement Policy which includes its commitment to environmental sustainability. They also have a Supply Chain Development Programme in order to inform suppliers about the tender process and are improving communication between the council and the market.

Waltham Forest Council are the first Local Authority in the UK to pledge to divest its pension funds away from oil, gas and coal.

Lambeth Council have introduced mandatory carbon reporting<sup>1</sup> as part of their procurement process and have written to engage all current suppliers with the net zero challenge.





### **Council Strategy and Engagement** Key Recommended Next Steps

Source	Carbon Reduction Measure	Capital Costs and Resources
	Work with WMCA localise campaigns and policies	Within existing staff resources.
	Develop a brand and communications around the climate change programme.	<£5,000 <sup>1</sup> development and additional staff resources
Source Council External Engagement	For major planning applications and development, include a requirements on carbon reduction and management measures	Additional staff resources.
	Prepare a strategy for community engagement over climate change issues and work with community champions	Additional staff resources.
Council External Engagement	Host a citizens assembly to engage local people.	Dependent on venue but minimum staff time plus set up costs.
	Form partnerships with businesses to report and reduce emissions and support them to access funding	Additional staff resources. <sup>2</sup>
	Encourage businesses to run training in low carbon industries.	Within existing staff resources.
	Work with schools to deliver engagement activities and <u>LESS CO2</u> schools.	Additional staff resources. <sup>2</sup>
	Develop website content and materials to be a hub of information for businesses and communities on city climate action.	Within existing staff resources and budgets.

#### Examples of good practice:

<u>West Sussex County Council</u> have developed a campaign called Make the West Sussex Climate Pledge. They have a had 1,164 pledges so far.

London Climate Business Leader's Initiative – the citybusiness alliance defines new means of collaborative action between business and government. This encourages those organisations defining emissions reductions targets to disclose progress publicly

Leeds Climate Commission brings together key organisations and actors from the region's public, private and third sector. The aim is to provide advice, monitor progress, foster collaboration and share best practice.

Oxford Citizen's Assembly facilitated a public response to Climate Emergency Declarations which encouraged local engagement with the agenda.





# 4. Sectoral Analysis: Buildings





### **Buildings** Interventions Summary





#### Decreasing building energy demand and electrifying our heating systems

The following measures describe the modelling around reducing the energy demand for heating within domestic and nondomestic buildings:

- Improved insulation: The rollout of deep retrofit measures which drive down the demand for heating in our homes. Measures include: loft insulation, wall insulation (for both cavity and solid walls), superglazing and draughtproofing.
- **Commercial space heating and cooling:** Improvements to commercial practices which reduce energy demands for heating and cooling, including but not limited to improvements to building fabric.
- **Decarbonisation of heating**: Considering the uptake of non-fossil fuel sources for heating within homes and commercial properties, including heat pumps, district heating and combined heat and power networks (CHP).
- Appliance and lighting efficiency: Considers the reduction in energy demand from more efficient lighting and appliances, including white goods, electrical devices and all forms of lighting.
- Average temperature of the home: Considers the reduction in energy demand corresponding to the reduction in average temperature of the home. 'Average' denotes the **annual** average across all homes and implies the use of smart control technologies rather than changes to comfort levels and/or healthy temperatures.
- Electrification of cooking: Models the uptake of electrical cooking systems and discontinuation of gas cookers

The total estimated savings potential of buildings by 2050 is 48 million  $tCO_2e$ , with 75% of these savings deliverable in the domestic sector.

## **Anthesis**

### **Buildings** Background

#### Progress to date:





### **Buildings** Relevant Plans and Policies

### National

- Building Regulations specify minimum levels of energy efficiency and carbon emissions rates required for new buildings. EPCs are used to compare energy efficiency of homes.
- The government recently consulted on interim building standards for new homes effective in 2020, ahead of a Future Homes standard in 2025. Changes could remove local authority powers to impose higher energy efficiency standards than those in Building Regs<sup>1</sup> The proposals are to cut energy use in new homes by either 20% or 31%, compared to the 50% reduction recommended by some industry experts <sup>2</sup>
- <u>BEIS Heat Decarbonisation Study</u> seeks to provide an overview of the different options for heat decarbonisation and identify issues.
- Minimum energy efficiency standards in the Private Rented Sector prohibit landlords from letting properties if they are rated below EPC Band E  $^{\rm 3}$
- The <u>Energy Company Obligation</u> (ECO) drives the delivery of energy efficiency improvements in fuel poor households. Funded by energy suppliers, the current programme, ECO3, can support a range of measures depending upon the household tenure <sup>4</sup>:
- **Owner Occupied** insulation (solid wall, cavity wall, roof, floor, draught proofing) glazing, efficient heating systems, first time central heating, district heating
- Private Rented Sector (EPC rating A-D) insulation (solid wall, cavity wall, roof, floor, draught proofing), first time central heating, district heating
- **Private Rented Sector (EPC rating E,F,G)** solid wall insulation, first time central heating, district heating, renewable heating
- Social Housing insulation (solid wall, cavity wall, roof, floor, draught proofing) glazing, first time central heating, district heating

### Regional

<u>West Midlands 2041</u> - West Midlands Combined Authority is consulting on five high level actions, including more low carbon 'eco' housing across the region. Planning powers are held locally, but ambition could be constrained without regional agreement on new build standards that exceed national policy. <u>West Midlands Industrial Strategy</u> – A vision to maximise the clean growth opportunities presented by the region's skills, infrastructure and history of innovation. Whilst not detailed in the strategy there is scope to support the skills and infrastructure needed to overcome barriers and deliver retrofit at scale <sup>5</sup>

### Local

Birmingham Development Plan 2031 - Includes a range of relevant policies:

- TP3 New developments will be required to reduce CO2 emissions and water consumption
- TP3 Future requirement for all new non-residential built developments in excess of 1,000 sq. m. gross permitted floorspace or being developed on a site having an area of 0.5 ha or more to meet BREEAM standard excellent, unless commercially unviable
- TP4 The use of low and zero carbon energy sources and technology will be promoted and supported
- TP4 The use of CHP and district heating will be promoted

<u>Route to Zero (R20)</u> - On 11 June 2019 the Council declared a climate emergency. The ambition was set for the Council and city to become net zero carbon by 2030, or as soon as possible thereafter as a 'just transition' allows.

<u>The Council Plan 2019</u> states that Birmingham will be a city that takes a leading role in tackling climate change. This commitment will embed climate action in the council's decision-making process to make sure that all service areas contribute to the R20 journey.

<u>Property Strategy 2018/19–2023/24 (BCC)</u> – Strategy for management of non-domestic property assets, excluding schools and transport. States that the full portfolio should "Have a low environmental impact and follow good practice in sustainability"

Extending your home: Home extensions design guide: Supplementary planning document – encourages residents to improve energy efficiency as part of home improvements

<u>Fuel Poverty Action Plan</u> – in development under the Financial Inclusion Strategy and the Health and Wellbeing Board's sub-forum on health inequalities.

The <u>Birmingham Big City Plan</u> is a 20-year City Centre Masterplan is a framework for the future development and regeneration of the city centre.



### **Buildings** SCATTER Interventions: Domestic Buildings



			SCATTER L4 Pathway		
Measure	Selected Current Context Indicators	2025	2030	2050	
a) Improved insulation	16.2% fuel poor households in Birmingham in 2017 (c. 69,692) <sup>1</sup> 68% of EPC-rated homes have a rating of D or below. <sup>2</sup> 233 Watts/°C average heat loss per house (Referred to in the legacy 2050 Pathways tool as thermal leakiness. See definition opposite)	Solid wall insulation retrofits at a rate of 3,708 households per year Loft insulation at a rate of 9,228 households per year Superglazing at a rate of 8,412 households per year. <sup>3</sup> New builds to PassivHaus or equivalent standard 183 Watts/°C average heat loss per house (21% reduction in thermal leakiness)	Solid wall insulation retrofits at a rate of 3,805 households per year Loft insulation at a rate of 9,491 households per year Superglazing at a rate of 8,633 households per year New builds to PassivHaus or equivalent standard 158 Watts/°C average heat loss per house (32% reduction)	The vast majority of households eligible for retrofit have been treated, but continued superglazing at a rate of 8,895 households per year. New builds to PassivHaus or equivalent standard 58 Watts/°C average heat loss per house (75% reduction)	th
b) Reduction of average temperature <sup>3</sup>	Current annual average temperatures across the whole house are approximately 17.3°C <sup>4</sup>	16.8°C	16.7°C	16.0°C	

#### What is 'thermal leakiness'?

Thermal leakiness is a measure of how well a house **retains heat**. A house with high thermal leakiness will not retain heat very easily and will be more expensive to keep warm. Thermal leakiness varies across the ambition thresholds within SCATTER and depends on three variables, all of which will impact the Watts/°C metric:

 Thermal conductivity of the building fabric (i.e. .'U-values' of ceilings, floors, walls and windows).
 Ventilation (i.e. effectiveness of draught-proofing).
 Temperature difference with the outside (i.e. the average temperature of the home based on the occupant's preference or use of thermostat).

For a full list of retrofit measures see Appendix 8, for a list of EPC ratings see Appendix 9



### **Buildings**

### **SCATTER Interventions: Domestic Buildings**

See Appendix 10 for further detail on the type of heating technologies assumed within SCATTER

Measure	Selected Current Context Indicators		SCATTER L4 Pathway	
Measure	Selected Gullent Gontext Indicators	2025	2030	2050
Measure         c) Decarbonisation of heat         Estimated carbon saving (from the saving t	389,796 domestic gas meters installed (c. 88% of properties) <sup>1</sup>	33% of household stock have a new heating system	48% of household stock have a new heating system	94% of household stock have a new heating system
	Gas boilers will be banned in new homes from 2025.	Majority of heating systems are gas boilers (both old and new), with some heat pumps <sup>2</sup> (14%)	Majority of heating systems are gas boilers (both old and new), with an increased share of heat pumps (26%).	delivered by heat pumps (77%) with gas boilers only responsible for 12% of total demand.
Estimated carbon saving (fro hea	om the above space heating & water measures -insulation, at demand & heat electrification)	2,369,726 tCO <sub>2</sub> e	5,043,170 tCO <sub>2</sub> e	20,933,320 tCO <sub>2</sub> e
d) Appliance & lighting efficiency	Consumption by domestic lighting decreased 7% between 2015 and 2018 <sup>3</sup>	Average demand per household is 2.42 MWh (20% reduction relative to 2015)	Average demand per household is 2.12 MWh (30% reduction relative to 2015)	Average demand per household is 0.93 MWh (69% reduction relative to 2015)
e) Electrification of cooking	47% electrified <sup>4</sup>	69% electrified	76% electrified	100% electrified
Estimated carbon saving (fro	om the above domestic lighting, appliances, and cooking).	2,941,595 tCO <sub>2</sub> e	5,279,085 tCO <sub>2</sub> e	15,314,525 tCO <sub>2</sub> e

#### Estimated carbon savings:

- All savings are cumulative and estimated in relation to 2017 emissions levels.
- The base year of SCATTER is 2015 and so the trend in BEIS data from 2015- 2017 has been applied to the SCATTER data in order to predict the 2017 emissions level.





### **Buildings** SCATTER Interventions: Non-Domestic Buildings

Measure	Selected Current Context Indicators	SCATTER L4 Pathway			
Measure	Selected Guirent Context Indicators	2025	2030	2050	
f) Commercial space heating & cooling	62% of EPC-rated commercial 'lodgements' are rated D or lower <sup>1</sup>	16% reduction in commercial heating and cooling demand against 2015 levels	24% reduction in commercial heating and cooling demand against 2015 levels	45% reduction in commercial heating and cooling demands against 2015 levels	
g) Electrification of heat	89% gas and oil-fired boilers (2015) <sup>2</sup>	58% gas and oil-fired boiler	47% gas and oil-fired boiler	Demand met entirely by heat pumps, resistive heaters and district heating.	
Estimated carbon saving	g (from the above space heating & hot water & cooling measures)	1,039,858 tCO <sub>2</sub> e	2,168,304 tCO <sub>2</sub> e	9,002,845 tCO <sub>2</sub> e	
	National consumption by non-domestic lighting,	7% reduction	10% reduction	24% reduction	
h) Appliances & lighting	h) Appliances & lighting computers and commercial motors fell 1.7% between 2015 and 2018 <sup>3</sup>		Non-domestic demand is 277 GWh	Non-domestic demand is 235 GWh	
i) Energy used for cooking	24% electrified <sup>2</sup>	46% electrified	57% electrified	100% electrified	
Estimated carbon saving	(from the above commercial lighting, appliances, and cooking)	474,293 tCO <sub>2</sub> e	864,863 tCO <sub>2</sub> e	2,613,094 tCO <sub>2</sub> e	

See Appendix 10 for further detail on the type of heating technologies assumed.



### **Buildings** Delivery



#### **Fuel Poverty**

Birmingham contains four of the five LSOAs with the highest levels of fuel poverty, anywhere in the country, with as much as 55% of homes considered to be in fuel poverty 1

The latest Marmot review found that in the West and East Midlands, over 20% of homes fail to meet the Decent Homes Standard, compared to 16% in the South East and 11% in the North East. 2



### Co-benefits:

- Health benefits: Improving the energy efficiency of homes can reduce ill-health:
  - Nearly half of households living in the most energy inefficient homes are in fuel poverty.<sup>3</sup>
  - 10% of excess winter deaths are directly attributable to fuel poverty <sup>4</sup>
  - The BRE estimate that the cost to the NHS of ill-health due to poor housing is £2.5 billion/year, with excess cold the dominant hazard.<sup>5</sup>
  - Children living in inadequately heated households are also more than twice as likely to suffer from conditions such as asthma and bronchitis than those living in warm homes.<sup>6</sup>
  - Those living in homes with lower temperatures (15°C versus 21°C) are also more likely to suffer from mental health problems. <sup>6</sup>

**Financial savings-** Improving the energy efficiency of buildings can reduce energy bills for organisations and individuals.

- In a single street of 100 'average' homes, the combined spend on energy will be around £140,000 a year. Cost effective energy efficiency measures could save each household on average £280 per year, money that could then potentially be spent in the local economy.<sup>7</sup>
- Similarly, a secondary school or college spending £100,000 a year on energy could save around £20,000 a year through implementing low cost energy efficiency measures.<sup>7</sup>
- **Resilience:** Households will be greater protected against future energy price rises as well as being more physically resilient during heatwaves.<sup>7</sup>
- Job creation: Creation of jobs and upskilling of local people. Two-thirds of jobs in the low carbon and renewable energy economy are in energy efficiency products sector.<sup>7</sup>



Figure 14 - Fuel poverty by LSOA (Map: Anthesis)

### **Buildings**

### What is needed from Stakeholders?

#### Birmingham City Council:

- **Direct Control-** Ensure all council-owned buildings, including housing stock improve energy efficiency standards and consider opportunities to carry out deeper retrofits alongside upgrades of buildings.
- Stronger Influence Work in partnership with other council buildings such as leisure centres and schools to improve their energy efficiency.
- Medium Influence Utilise the R20 Task Force to encourage and support all other stakeholders to improve energy efficiency of their properties and explore ways to facilitate action.

### West Midlands Combined Authority:

- Continue to set high levels of ambition and policies for carbon reduction in homes through the WMCA 2041 Action Plan.
- Continue to work in partnership with each of the seven local authorities in the region to deliver mass retrofit programmes and facilitate the deployment of low carbon energy and heat networks.
- Lobbying of national government to provide funding for retrofitting in the region and to develop high standards for building regulations and planning policies.

#### National Government:

- Develop progressive planning policies and more stringent building regulations which ensure new developments will be built to the highest energy efficiency standards and take into account the whole life running costs.
- Provide regulatory commitment to 'deep retrofit' as part of the route to net zero.
- Provide funding and incentives to support councils, businesses and individuals to retrofit buildings.
- Address contradictions that dis-incentivise improvements e.g. business rates increases that penalises investment in renewable energy technology.

#### Businesses:

- Measure and report on energy usage and efficiency of buildings.
- Retrofit offices and commercial buildings to higher energy efficiency standards.
- Procure more energy efficient appliances.
- SMEs to access support on energy efficiency and working in low carbon via University programmes such as EBRI, ATETA and ARLI and at STEAMhouse.

#### Other Partners:

- Sustainable Homes Action Partnership (SHAP) Implement proposed 3 year £150m fuel poverty programme for the region <sup>1</sup>
- **RSLs** Ensure all social housing is a pathway to zero carbon
- R20 Task Force Use their networks to widen engagement and action, share learnings and leverage collective lobbying influence
- Energy Capital provide clear framework for delivery of regional energy networks
- Universities: Birmingham, Aston, City Provide thought leadership and research
- **Birmingham Community Healthcare NHS Trust** investigate budget pooling to achieve shared objectives and deliver preventative actions. Decarbonise assets
- Greater Birmingham and Solihull LEP Develop strategy to promote "mass customisation" and support low cost retrofit in the region <sup>2</sup>

#### Community groups:

- Promote the use of smart technology amongst the community
- Consider collective retrofit of whole streets to take advantage or economies of scale

#### Local Residents:

- Purchase energy efficient appliances and lighting e.g. LED bulbs.
- Upgrade home insulation e.g. draught-proofing, wall/ loft insulation, double glazing
- Sign up for a smart meter to monitor energy usage
- Consider deeper retrofit when doing renovations or an extending
- For those in rental properties, seek properties with higher EPC ratings and question landlords on energy efficiency.



Source	Carbon Reduction Measure	Costs and Resources	Examples of good practice:
	a&b) Review investment plans for stock with EPC rating E,F or G (15% of social housing <sup>1</sup> ) to maximise ECO3 funding available for wall, roof, floor insulation, glazing and first time central heating installed by April 2022. These present 'quick win' opportunities that should be taken as a priority. See further info on ECO on page 56)	Within existing resources. Officer time.	Copenhagen City Region - One of the world's largest here networks, supplying reliable and affordable low carbor hear to 1 million residents. The 160km long pipe networ captures heat from across the city region from a combination of biomass CHP (70%), energy from wast (25%) and back up boilers (5%). It is linked to the local
	a-e) Engage with social housing providers as they will have influence over a significant proportion of properties and can independently help to support the city's goal. See MHPP Case Study as an example	Within existing resources. Officer time	municipal networks via heat exchangers NEA trialled 9 different home battery storage systems The findings address key considerations across batter systems, user considerations and product evolution. Savings ranged from 20p to £1.20 per day.
Domestic Properties - Council	a-f) Introduce total cost of occupation approaches to procurement evaluation of new build projects to include not only the initial costs of investment but also the ongoing maintenance and the day to day running costs. These models support investing more up front to secure long-term cost savings and quality outcomes	Within existing resources. Officer time.	
	c) Contact <u>ECO obligated utilities</u> direct to secure a strategic funding partner	Within existing resources. Officer time	
	g) Investigate feasibility of decarbonising heat supply to Cambridge and Crescent Towers by connecting BDEC network to the Tyseley Energy Park and Tyseley Energy from Waste plant	Resources would be needed to manage contractual considerations between parties (BCC, Engie, Veolia, Cogent) Pipeline would need to be constructed. Commercial arrangements would determine who would build own and operate it, recovering investment costs through operation <sup>2</sup>	MHPP – Manchester Housing Providers Partnership are 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).



Source	Carbon Reduction Measure	Costs and Resources	
Domestic Properties - Council	a-e) Review asset management plans and align with zero carbon. This may involve shifting the timing of planned maintenance and calculating the just the additional cost of replacing assets with alternative technologies or performing other efficiency work (relative to what was planned to be incurred already). Stock modelling platforms may support the quantification of costs for technologies required.	Zero carbon stock modelling platforms require separate commission; varying degrees of sophistication available (see case studies overleaf). Asset management plan review could be performed by existing officers or commissioned for between £10-20,000.	ł
	a-e) Re-evaluate the case for solar PV given the introduction of the <u>smart export guarantee</u> and technological advances in home battery storage	Existing CSE reports on solar PV potential	

#### Examples of good practice:

IRT DEFam – Stock modelling platform that is helping registered providers to better understand their emissions from existing stock and run scenarios as to how certain measures may save in the future.





Source	Carbon Reduction Measure	Costs and Resources	Examples of good practice:
	a&b) Utilise powers under <u>ECO3 Local Authority Flexible Eligibility</u> to enable the Council to qualify private sector residents as eligible for funding and increase homes able to access funded energy efficiency improvements, working with energy companies.	Within existing resources. Officer time to draft Statement of Intent and sign off referrals. Lead generation and management could be provided by a third party partner	Torridge District Council's Heat Devon scheme, launched 2018, has seen 1,500 homes receive ECO funded improvements. Of these 83% have
	a&b) Utilise existing EPC and fuel poverty data to develop a segmented approach to improvement, initially targeting areas of high need and high opportunity	Haringey (population 271,000) is funding a team of 15 staff, at a cost of £525,000 a year, to achieve improvements to C or better in 86,000 non-council owned homes over next 15 years, or 5,700 a year. <sup>1</sup>	been eligible via Local Authority Flexible Eligibility. The scheme, lead by Happy Energy, has delivered over £30million of customer lifetime bill
	a&b) Be a trusted source of advice for deep retrofit and low carbon technologies through exemplar projects, supporting investment from home owners.	Budget allocated for exemplar projects. May require additional funding for communication strategy and support	savings <sup>3</sup>
Domestic	a&b) Revisit 2007 "Extending your home" SPD through the Birmingham Design Guide to improve recommendations on insulation and energy efficiency.	Within existing resources Officer time.	education campaign to help landlord understand relevant housing standar regulations. They have also develope a responsible landlord scheme to
properties – non Council.	a&b) Subject to government consultation outcomes, require new homes to meet net zero emissions and be future-proofed against climate impacts (e.g. over-heating, floods)	Within existing resources Officer time.	alongside this, as well as a 'Cornwall Rental Standard' that details all key regulations.
	<ul> <li>a-e) Better communicate energy efficiency standards, behaviours and activities in the private rental sector by:</li> <li>Offering advice and financial support to those looking to improve property energy efficiency</li> <li>Effectively enforce Minimum Energy Efficiency Standards</li> </ul>	Proposed minimum of one officer to lead in coordinating efforts including lobbying central government, sourcing additional funding, referring cases for enforcement (c.£50,000 per annum)	Exeter City Council has developed over 103 certified Passivhaus* homes and have multiple other low energy projects in the pipeline including a leisure centre, swimming pools, offices and
	a-e) Explore opportunities for private rental sector policies as a high priority sector for energy efficiency improvement.	Within existing resources. Officer time.	care homes.
	a-e) Develop a Sustainable Design and Construction SPD to dispel cost misconceptions (see Passivhaus Trust case study), promote whole life cost models and support higher development standards	Within existing resources. Officer time.	Passivnaus Trust offer a range of resources on cost-benefit. One <u>source</u> suggests a Passivhaus only costs 8%- 4% more to build, and is <u>cheaper</u> <u>overall</u> when comparing overall build
🔰 ANU	IESIS		and operational costs over lifetimes.

### **Buildings** Domestic Sector Funding Opportunities

EPC data indicates that there is still considerable opportunity for simple insulation measures across the housing stock (all tenures). Where households are on a low income or vulnerable to the effects fuel poverty, ECO funding may be available. Realising all potential energy saving opportunities recorded in the EPCs could reduce domestic  $CO_2$  emissions by over 95% <sup>1</sup>

Improvement opportunity	Homes
Solid wall insulation	38%
Underfloor insulation	37%
Pitched roof insulation (<100mm existing)	26%
Cavity wall insulation	15%

Table 5: Improvement opportunity of homes in Birmingham







Datasets can be mapped and overlaid to prioritise and identify clusters (Source: Anthesis).

The maps clearly show the scale of challenge for treating uninsulated solid walls relative to uninsulated cavity walls.

Targeting areas with high rates of fuel poverty and occurrence of uninsulated solid walls produces clear clusters that could be targeted for area based schemes



Source	Carbon Reduction Measure	Costs and Resources	Examples of good practice:
	f) Implement standardised monitoring plus annual reporting of energy use and results of Display Energy Certificates (as applicable) at all council sites, including those not covered by centrally procured energy contracts.	Proposed one officer to lead in coordinating efforts (c.£50,000 per annum)	<b>Cambridgeshire County Council</b> adopted the Re:fit framework to increase energy efficiency, reduce CO2 emissions and improve the condition of its buildings. The estimated potential of this scheme is to deliver 1.2MtCO2 savings over the lifetime of the project. The
Source Council buildings and estate	f-i) 3-year portfolio plans to detail achievement of reduction in line with budget and include a way of assessing and monitoring the carbon impact of actions.	Dependent on the size, complexity, age, operations, conditions of each portfolio Investment grade audits can be commissioned per building ranging £2,000-£5,000. <sup>1</sup>	project is available to schools and public sector buildings across the county. <u>Welsh Government</u> Planning Policy requires projects with a floor area greater than 1000m <sup>2</sup> to achieve a
Council buildings and	g) Investigate the potential to decarbonise the heat supply to council offices, for example by connecting BDEC network to the Tyseley Energy Park and Tyseley Energy from Waste plant.	Within existing resources. Officer time for investigation of potential sites. Pipeline would need to be constructed. Commercial arrangements would determine who would build own and operate it, recovering investment costs through operation <sup>2</sup>	BREEAM Very Good rating and those receiving core funding from the Welsh Government to achieve an Excellent rating.
estate	g) Investigate the potential of implementing combined heat and power networks across the city, and identify opportunities where the Council can work with both public and private sector bodies regionally to maximise CHP systems.	Officer time.	
	f-i) Build climate change targets into the Property Strategy 2018/19 – 2023/24. Allocate a carbon reduction target to each portfolio matching the city's carbon budget.	Within existing resources. Officer time.	
	f-i) Provide clearer detail on how property portfolios will demonstrate low environmental impact and follow good practice in sustainability.	Within existing resources. Officer time.	



Source	Carbon Reduction Measure	Costs and Resources	
	f) Develop and implement a pathway for increased measurement and reporting of i) energy demand and ii) improved energy efficiency in privately owned commercial buildings.	Team of three officers to provide outreach to business and manage project (£150,000 per annum) <sup>1</sup> The Carbon Trust has a free carbon footprint tool for SMEs.	
Commercial and industrial	f) Use energy monitoring and EPC data to drive a segmented approach, tackling those with largest impact and biggest opportunity.	Officer time to complete analysis / outsource	
	f) Explore the potential for introducing requirements for new commercial developments to report on operational energy performance, and as part of that, on space heating demand	Officer time.	7
	f-i) Showcase leading examples of decarbonisation from key commercial players to spread knowledge and promote ambition and joint working.	Utilise connections within the R20 Task Force	
	f-i)Engage with businesses and embed energy efficiency into business support programme – link to University business support programmes.	Officer time.	
	h) Explore options for mass roll out of energy efficient lighting, the most frequent improvement recommendation in non-domestic EPCs in the city (21%).	Officer time.	

#### Examples of good practice:

Greater Manchester – Decarbonising Greater Manchester's Existing Buildings sets out a plan for addressing the contribution of existing buildings to the city region's carbon footprint. This is in the context of the 5 Year Environment Plan, setting am ambition to be carbon neutral by 2038. The plan includes recommendations for taking action, including decarbonising commercial buildings.

Carbon Trust Green Business Fund – Since 2016 hundreds of small businesses have been helped to identify an average potential £8,230 saving on their energy spend.

Welsh Government Planning Policy requires projects with a floor area greater than 1000m<sup>2</sup> to achieve a BREEAM Very Good rating and those receiving core funding from the Welsh Government to achieve an Excellent rating.



**Oracle Anthesis** 

# 4. Sectoral Analysis: Transport





### Transport Background

### Progress to date:

Draft Birmingham Transport Plan (2020) is about providing a sustainable, green, inclusive, go-anywhere network. Under the plan:

- Metro network is being extended, connecting the city centre with Edgbaston and Digbeth including HS2 at Curzon Station.
- Various new rail stations opening 2020/21, including rebuild of University Station, increasing capacity from 500,000 to several million; Midlands Rail Hub by 2028, linking two halves of the Birmingham Rail network – Birmingham New Street and Snow Hill
- Clean Air Zone 'Brum Breathes' within the ring-road being implemented Summer 2020.
- Currently tendering for update of electric vehicle charging network.
- Sprint routes will include a cross-city bus concept is being explored, sending buses all the way through the city and onwards, rather than stopping and turning.
- Cycling and walking investment plan for active travel in place, including widening pedestrian walkways and resurfacing towpaths; Cycle hire scheme across the West Midlands is currently being procured. £15m has been spent on the Birmingham Cycle Revolution (BCR) up-grading cycle paths, including two-way cycle paths on the main commuter routes such as Selly Oak to the city centre).
- Public transport use increased in 2015
- Transport for West Midlands (TfWM) are currently looking at the use of demand responsive transport (such as shared dial-a-ride and door-to-door services) at developments including Langley and Peddimore.
- Consolidation sites for freight have been considered but are not yet commercially attractive. BCC is currently applying for funding for cargo bikes to give to businesses on an indefinite basis to encourage them to move away from cars and trucks.
- Council-owned fleet is currently under review to get rid of old pool cars and remove staff parking under main office building.
- The intention is to replace 70 of 169 BCC-owned diesel Refuse Collection Vehicles (RCVs) £12m budget looking to award a contract to a company developing EVs.
- Currently tendering for an update of the city-wide electric vehicle charging network.





3% of Birmingham residents usually cycle to and from work and 3% of all trips are made by bike.<sup>3</sup>



Currently 50 Public EV Charging points in Birmingham.<sup>4</sup>



### **Transport** Relevant Plans and Policies

#### National

#### Regional

The Government's Transport Decarbonisation Plan (to be published in 2020) will take a coordinated, cross-modal approach to deliver the transport sector's contribution to our decarbonisation targets.

The Department for Transport has recently published strategies to reduce carbon emissions across transport, including the £1.5 billion Road to Zero, Maritime 2050 and the Clean Maritime Plan as well as the Aviation 2050 green paper, and upcoming aviation strategy which will be published early next year.

The government announced (early 2020) its intention that the ban on selling new petrol, diesel or hybrid cars in the UK will be brought forward from 2040 to 2035 at the latest.

<u>TfWM Movement for Growth</u> (accessed 2020) is a set of policies and plans for the WM transport system designed to complement the WMCA Strategic Economic Plan

<u>TfWM Park and Ride work</u> (accessed 2020) Information on the park and ride expansion and development programme

<u>TfWM Zero Carbon 2041</u> (2020) details 74 measures aimed at increasing the rate of greenhouse gas reduction each year to achieve the target of net zero greenhouse gas emissions by 2041

<u>TfWM future mobility</u> (accessed 2020) promotes strategic actions to deliver a mobility eco-system befitting of a rapidly evolving world

HS2 Connectivity Programme (2015) to ensure the benefits from the Birmingham HS2 high speed rail link hub are spread as far as possible across the region

WM Congestion Management Plan (2018) aims to address and mitigate issues around increase road usage through improving capacity, improving efficiency and managing demand

<u>TfWM Cycling Charter</u> (2014) outlines the key principles for regional partners to deliver the full potential of the region's active transport

Birmingham Airport Masterplan (2018) for developing the airport as an international hub for the Midlands and one of Europe's leading regional airports



### **Transport** Relevant Plans and Policies

#### Local

<u>The Sprint network</u> is a scheme comprised of seven routes improving connectivity across the region with rapid, enhanced bus routes on their own segregated lanes, linking key residential and employment areas whilst improving connectivity (accessed 2020) The <u>Draft Parking Supplementary Planning Document (SPD)</u> includes revised parking

Expansion plan and investment programme portal for the tripling in size of the tram network (accessed 2020)

Birmingham Development Plan (2017) has clear policies on sustainable transport

<u>Birmingham Walking and Cycling Strategy and Infrastructure Plan</u> (2020) sets out plans for active transport initiatives

<u>The Birmingham Transport Plan 2031 (2020)</u> describes what the city needs to do differently to meet the demands of the future

The <u>Birmingham Big City Plan</u> is a 20-year City Centre Masterplan. Not a statutory planning document, but has been endorsed as a framework for the future development and regeneration of the city centre.

<u>Birmingham Clean Air Zone</u> – details on the zone and the targeted action being taken to improve air quality (accessed 2020)

Details on short-term exemptions from the clean air zone charges, and additional support and incentives (accessed 2020)

Details on EV charging plans for Taxis, PHVs, and public use (accessed 2020)

The <u>Draft Parking Supplementary Planning Document (SPD)</u> includes revised parking standards for new developments which reflect new national planning guidance and support the delivery of the Birmingham Development plan, the city's Clean Air Strategy and the forthcoming Birmingham Transport Plan (2020)

The introduction of a <u>Workplace Parking Levy</u> is being scoped as part of a Full Business Case analysis



Figure 17: Map of the Sprint Network 2020



### **Transport** SCATTER Interventions: Modal Shifts



Moqquro	Selected Current Context Indicators	SCATTER L4 Pathway			
MedSure		2025	2030	2050	
a) Distance reduction	<ul> <li>85% of trips within West Midlands are not to city centre.</li> <li>6% are to Birmingham city centre. Access to the city centre for private cars to be limited with no through trips.1</li> <li>Increasing numbers of residential units (estimated 12,800 new homes) in the city centre.<sup>2</sup></li> </ul>	Overall travel demand drops 17% relative to 2015 levels	Overall travel demand drops 25% relative to 2015 levels	Overall travel demand drops 25% relative to 2015 levels	
b) Significant modal shifts	Growth by 2031 is also expected to generate an estimated 1.2 million additional journeys on Birmingham's transport network every day A quarter of all car journeys undertaken by Birmingham residents are for less than a mile. <sup>2</sup>	6% reduction in car transport share against 2015 levels Modal share of public transport (rail & bus) is 18% Modal share of active transport (walking & cycling) is 6%	10% reduction in car transport against 2015 levels Modal share of public transport (rail & bus) is 20% Modal share of active transport (walking & cycling) is 6%	22% reduction in car transport against 2015 levels Modal share of public transport (rail & bus) is 29% Modal share of active transport (walking & cycling) is 9%	
Estimated carbon savings are incorporated overleaf as they are interlinked with the passenger vehicles remaining on the road.					
c) Modal shift of freight and increase in efficiency	Data from vehicle licensing suggests there are 4,260,000 LGVs and 528,300 HGVs on the road. <sup>3</sup> 71% of freight emissions in the UK are from road. <sup>4</sup>	Road freight is 99% diesel <sup>5</sup>	Road freight is 98% diesel	Road freight is 96% diesel	
Estimated carbon savings (from changes to road freight)		755,293 tCO <sub>2</sub> e	1,730,404 tCO <sub>2</sub> e	6,434,667 tCO <sub>2</sub> e	

Refer to Appendix 11 for further information on assumptions on other modes of transport.



### **Transport** SCATTER Interventions: Decarbonising Transport

Transport Glossary EV – Electric Vehicle PHEV – Plug-in Hybrid Electric Vehicle HEV – Hybrid Electric Vehicle ULEV – Ultra Low Emission Vehicle



Magaura	Calested Ourrent Contact Indiastors	SCATTER L4 Pathway		
Measure	Selected Current Context Indicators	2025	2030	2050
d) Phase out of fossil fuel cars and shift to zero carbon cars	Ongoing issues with electrification of black cabs: driver-ownership, cost to replace, etc. There are currently 50 public EV charging points in Birmigham. <sup>1</sup>	51% EV, 13% PHEV/HEV, 36% petrol/diesel	75% EV, 14% PHEV/HEV, 11% petrol/diesel	100% of cars are EV.
e) Phase out of fossil fuel buses and shift to zero carbon buses	<ul> <li>There are over 4,000 buses and coaches licensed in Birmingham, and around 2,300 buses operating in the West Midlands<sup>2</sup></li> <li>Transition to Euro VI engines. Further vehicles with Euro IV and V engines could be retrofitted with clean technology to reduce emissions.</li> <li>H<sub>2</sub> bus orders approved by city council for 22 new zero-emission buses (~£500k each) to run on key routes <sup>3</sup></li> </ul>	48% EV, 40% PHEV/HEV, 12% petrol/diesel	76% EV, 24% PHEV/HEV	100% of buses are electric
Estimated carbon savings (from above road transport changes)		3,727,711 tCO <sub>2</sub> e	7,848,932 tCO <sub>2</sub> e	27,068,375 tCO <sub>2</sub> e
f) Rail electrification, with a view to clean electricity use g) Hydrogen powered rail	Some electrification of lines. Seen as more long term. Birmingham to Trent Valley recently completed. Snow Hill Line – no current proposals but is a want. Investigating hybrid trains e.g. Sutton Park Line. UK's first hydrogen train, HydroFLEX, will be tested on the mainline railway following a successful proof-of-concept <sup>4</sup>	Rail is 100% electrified	Rail is 100% electrified	Rail is 100% electrified
Estimate	d carbon savings (from above rail transport changes).	454,938 tCO <sub>2</sub> e	864,863 tCO <sub>2</sub> e	2,431,375 tCO <sub>2</sub> e



### **Transport** Delivery



### Co-benefits

- Health benefits Sustainable transport has multiple health benefits through reducing air pollution and increasing physical activity:
  - Poor air quality has been linked to around 40,000 deaths a year in the UK.<sup>1</sup> Up to 900 people die annually in Birmingham as a result of air pollution.<sup>2</sup>
  - The cost to the economy of pre-mature deaths related to poor air quality is estimated to be £54bn a year.<sup>1</sup>
  - The main air quality issue in Birmingham is elevated levels of nitrogen dioxide (NO<sub>2</sub>) and particulate matter, particularly within the City Centre area as a result of road traffic emissions.<sup>2</sup>
  - Improving air quality can also help to reduce health inequalities air pollution levels have been found to have strong association with deprivation levels.<sup>3</sup>
  - Distance reduction will encourage more active travel as walking and cycling become a more viable choice. Increasing physical activity could save the NHS £17bn within 20 years by reducing the prevalence of conditions such as type 2 diabetes and heart disease.<sup>4</sup>
- **Reduced congestion** Sustainable transport reduces the number of vehicles on the road, improving transport flows.
- Financial benefit of electric vehicles Electric vehicles are often cheaper to run per mile and so can offer substantial fuel savings. For instance, electric cars typically cost £2-£4 to fully charge, for a range of 100 miles whereas a petrol or diesel car costs £12-£18 to drive 100 miles.<sup>5</sup>
  - There are also tax benefits for companies who chose electric vehicles. Under the plans, zero emission, 100% electric cars will pay no company car tax in 2020/21, 1% in 2021/22 and 2% in 2022/23.
  - Pure electric vehicles are usually cheaper to for individuals or companies to service and maintain compared to equivalent vehicles with internal combustion engines.



Figure 18: Birmingham Air Quality Management Zone<sup>6</sup>

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### **Transport**

### What is needed from Stakeholders?

### Birmingham City Council:

- **Direct Control** Develop strategy and relevant policies to ensure council fleet, business travel and staff commuting are low or zero emissions. Provision of sustainable transport infrastructure including for walking and cycling.
- Stronger Influence Work with strategic partners including schools, taxis and businesses to reduce emissions from their transport sector. Work with planning policy and develop guidance and standards to support transport infrastructure.
- Weaker Influence- Provide guidance to business and residents on reducing travel, low emission vehicles and modal shift. Ensure the infrastructure is in place to support this.
  - Connect activities with other travel to work areas, not just city areas
  - Facilitate clearer overall approach, and align charges and incentives to addressing freight deliveries and emissions, including delivery drivers.

### Businesses:

- Business park responsive demand management e.g. route planning via booking systems for employees to maximise efficiency. E-share cars, car-pools.
- Use planning application approvals, and S106 requirements for buses, walking, cycling etc. Work more with big employers like JLR. Workplace parking levy to encourage modal shift in Clean Zone. Create a travel plan and hierarchy for methods of low-emission business travel and carry out staff commuting survey.
- Develop training for staff and business on travel and scale of its carbon impact.
- Provide facilities that enable staff members to cycle e.g. cycle parking, lockers and showers and consider developing a cycle to work scheme.
- Provide incentives and rewards for staff who opt for low-emission travel.
- Train drivers on green driving techniques and invest in telematics system to help optimise routes.
- Switch company cars to electric or low emission vehicles.
- Review HR policy to enable working from home.

Anthesis

• Airport and HS2. Work to eliminate need for UK domestic flights from Birmingham, and improve connections to London.

WMCA (Transport for West Midlands; West Midlands Rail Executive)

- Link-up strategy to address cross-city emissions and last-mile delivery with regional distribution centres, especially around Rugby and Daventry
- Develop strategy and incentives to shift more HGV based freight to rail and boat
- Coordinate efforts to reduce taxi emissions through joined-up approach to licensing from local authorities
- Midlands Connect review freight links to Felixstowe and other ports, and strategy for reducing road and air freight from East Midlands and other airports.

### National Government:

- Finance/subsidise the replacement of high-polluting buses and vehicles and introduce a scrappage scheme
- Provide funding for electric or zero emission buses
- Provide funding and incentives for EV charging point installation
- Support research and development into other low-carbon fuels e.g. hydrogen and greener aviation technologies
- Support Local Authorities and City regions to implement low emission zones.
- Provide funding for the development of walking and cycling infrastructure.
- Assess the use of smart technology on motorways to reduce emissions; Highways England to provide greater clarity
- Continue to deliver rail electrification and hydrogen power where feasible alternative

### **Other Partners**

- **Taxi-drivers** trade in diesel vehicles, consider switching to electric given the potential for a clean air zone. Communicate with the council over future transport plans.
- Schools encourage children to walk or cycle to school as well as educate on road safety.
   Ensure facilities are available at schools for children to use active transport e.g. bike racks.
   Develop communication with parents over the benefits of active travel and anti-idling.

### Community groups:

- Cycling and walking forums continue to promote cycling and walking
- Create community walking buses to schools.
- Housing development responsive demand management

### Local Residents:

• Opt to walk or cycle where possible and opt to use public transport for longer journeys.

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• Invest in an electric or low-emission car and share car journeys where possible.



### Transport Key Recommended Next Steps

Source	Carbon Reduction Measure	Costs and Resources	
Council's own transport	a) Equip all drivers of council vehicles with the necessary knowledge to more appropriately plan journeys in order to minimise disruption and maximise carbon saving.	The Energy Saving Trust currently offer subsidised driver training programmes. Investment in telematics may be required to monitor mileage. One telematics platform Appy Fleet estimates £48 per vehicle (based on £4 per driver, per month) <sup>4</sup>	
	<ul> <li>b) Work with Council Behaviour Change task force to reduce emissions from staff commute, including encouraging car-sharing, active travel and public transport.</li> </ul>	Within existing resources.	
	d) Review and update fleet management plan: Specify that for certain categories of vehicle, only Ultra-Low-Emission Vehicles (ULEV) are permitted	EV have a lower whole life costing for EVs e.g. Comparing an EV and ICE pool car over 5 years saves around £3,300. Comparing an EV and ICE van over 3 years saves around £3,100.	
	d) Implement strategic plan to introduce low emission vehicles into the HGV fleet (including waste and highways).	No accurate projected costs are available at this time. <sup>3</sup>	
	d&e) Review opportunities for the installation of EV charging points on council premises.	50kW charging point: £17,000-£33,000. <sup>2</sup>	

#### Examples of good practice:

<u>Glasgow City Council</u> are aiming for all of their fleet vehicles to be emission free by 2029. This includes the conversion of 23 gritters to dual fuel hydrogen.

Leeds City Council have electrified 16% of their total van fleet. It is estimated that these vehicles will travel 450,000 miles per year leading to fuel savings of £13,500 per year and savings of 52 tCO<sub>2</sub> to 2020.

 $\label{eq:constraint} \begin{array}{l} & \mbox{Oxford City Council} \mbox{All registered drivers at the council} \\ & \mbox{were required to complete the EST smarter driving} \\ & \mbox{course. This achieved a 17\% reduction in fuel use in the} \\ & \mbox{first year. This level of reduction could save the council} \\ & \mbox{an estimated } \pounds 69,000 \mbox{ and } 150tCO_2. \mbox{ per year.} \end{array}$ 





### Transport Key Recommended Next Steps

Source	Carbon Reduction Measure	Costs and Resources		
City-wide transport	a) Facilitate the setting-up of shared vehicle tracking, freight and distribution hubs for deliveries across the City and into the city using low- carbon vehicles. Provide clearer signage and restrictions on selected routes to reduce emissions	Officer time to facilitate with partners, and review opportunities.	Examples of good practice Nottingham City Council has introduced a Workplac Parking Levy to tackle traffi congestion. Money raised has helped to fund extensions to the tram	
	a) Review planning guidelines to support creation of high-density, mixed use communities that encourage public and active travel use. Review planning for car-club parking to encourage uptake	Within existing resources.		
	a) Request developers through planning conditions (linked to policies in the BDP and Parking SPD) to include charge points and incorporate infrastructure for low-carbon travel e.g. segregated cycle lanes	Within existing resources.	system, as well as the redevelopment of Nottingham Station.	
	b) Further encourage cycling through accelerating strategic high-quality walking and cycle routes	Variable on type of cycle route; range from £0.1-2m per km. <sup>2</sup> Resurfacing existing cycle paths (such as those in green areas or along waterways) are c. £0.18m per km. Multi-lane signalized junctions can cost up to £2m per km.	TfL are aiming to deliver th greenest taxi fleet in the world. They plan to do this through introducing new licensing requirements for new taxis to be Zero Emission Capable (ZEC), providing grants for ZEC vehicles and reducing vehicle age limits.	
	b) Further roll out of emissions-based parking permits & charges for most polluting vehicles	Set up costs will depend on the system chosen; a congestion charge could potentially generate income Officer time to review opportunities.		
	b) Active campaign to limit short trips to discourage people driving for commute and school run	Additional staff resources. Officer time to develop and run campaign.		
	d) Encourage taxi companies to move to low emission vehicles by supporting grants and by providing incentives	Additional staff resources. Coordination with other local authorities	Edinburgh City Council's Electric Vehicle Framewor	
	e) Enable the rapid shift to electric vehicles through increased EV charging and facilitate through bus fleet, and LGV/HGV licensing	Funding is available to local authorities at 75% leaving £2,500 per charge point for the LA to fund. <sup>1</sup> £10 million fund about to buy new, or retrofit existing vehicles to latest emissions standards	developments where ther are 10+ parking spaces, every 6 spaces should include an electric vehicle	



# 4. Sectoral Analysis: Waste





### Waste Interventions Summary



#### Improving waste streams and improving the efficiency of industrial processes

The following measures within the waste sector are defined within the tool:

- Waste reduction: An overall reduction in the weight of waste produced across all streams, for both commercial properties and domestic homes.
- o Recycling rates: Models the different destinations for waste streams.

The in-boundary emissions impacts will largely relate to treatment (if it occurs in boundary) and transport. However, it is important to note that there are other emissions impacts associated with waste that may occur outside of the authority boundary. For example, in the production process associated with the item that has been consumed.

Where such emissions occur outside of the city boundary; the associated embodied emissions are not be accounted for here - these would only be reflected using consumption-based accounting which relies on methodologies outside of the scope of SCATTER.



### Waste Background

#### Progress to date:

### Council operations:

- Birmingham City Council (BCC) offices have segregated waste practices in place
- 250,000 tonnes of waste is collected per year 1.
- 55-60,000 tonnes of commercial waste collected by BCC (other by private operators)<sup>2</sup>.
- Green waste from council controlled areas such as parks and street trees, is chipped and sold to an Energy from Waste (EfW) plant in Worcester.

### City-wide:

- Twin-streamed collection is applied, which means that BCC segregate some but not all waste.
- No food collection scheme currently exists, but will be implemented in line with national policy over the coming years.
- Food accounts for 35-40% of current waste stream<sup>1</sup>.
- Municipal general refuse collection is currently weekly and fortnightly for recycling (paper one week, plastic, glass, tin the next).
- BCC charge for services to collect green and bulk waste, which is collected fortnightly.
- All recycling is processed in the UK with exception that the rolled Aluminium produced is exported to Germany to be used. Only plastics that cannot be recycled are burned.
- Commercial waste is usually mixed, with no current legislation that enforces segregation.
- Waste cooking oil is handled by private operators.
- Residual waste is incinerated at a Veolia (EfW) plant in the city.
- Green waste from households is collected by Veolia composted outside of the city in Coventry.
- The existing waste services contract guarantees a certain tonnage to the EfW plant, where profits are shared on the sale of energy from waste generated.
- Volume of EfW expected to decreased by further increasing the volume of recyclate; however this will still leave a proportion of waste for incineration.
- Contract will be renewed for the 2024-2034 period; which may serve as an opportunity to enhance low carbon activities upon renewable.





27% of household waste recycled in Birmingham in 2016/17<sup>1</sup>

# 🕑 Anthesis

1https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\_dat a/file/664563/industrial-strategy-white-paper-web-ready-version.pdf 2 – Interview DS BCC 20/2 71



### Waste Relevant Plans and Policies

#### Regional

**Defra WMCA work** This is looking at all waste management options across West Midlands Combined Authority (WMCA).

- This will map current waste streams and what this could look like if streamlined across the combine authority. All cities currently use incineration.
- The project is led by the Local Partnerships, with WRAP involved
- It will look at where the waste will go.
- Target by 2030 is to achieve a household recycling rate of 55% (from 43% in 2019) across the West Midlands.<sup>1</sup>

#### Local

#### Waste Strategy 2017<sup>3</sup>

Headline targets include:

- Achieving 70 per cent recycling by 2040 (compared to annual figure of 26.8 per cent in 2016/17).
- Reduce waste generated per person by 10 per cent (from 2014/15 baseline of 345kg) by 2025.
- Eliminate landfill waste by 2040 (currently approx. 7.5 per cent annually).

#### National

Our Waste, Our Resources: A strategy for England (2018) Aims to support the 25 year Environment Plan and sets out how the country will preserve resources by minimising waste, promoting resource efficiency and moving to a circular economy. Includes:

- Work towards eliminating food waste to landfill by 2030
- Work towards all plastic packaging placed on the market being recyclable, reusable or compostable by 2025
- Eliminate avoidable waste of all kinds by 2050

Waste and recycling: making recycling collections consistent in England (2019) – The government are working with local authorities, waste management businesses and others to implement a more consistent recycling system in England. The measures are expected to come into effect in 2023.



 https://www.birmingham.gov.uk/blog/birmingham-blog/post/11/waste-strategy-2017-2040-why-we-need-to-change
 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\_data/file/664563/industrialstrategy-white-paper-web-ready-version.pdf

<sup>1.</sup> https://www.sustainabilitywestmidlands.org.uk/roadmap-to-2030/resource-efficiency/
# Waste SCATTER Interventions: Waste



Mooquro	Selected Current Context Indicators	SCATTER L4 Pathway		
wiedSure	Selected Gullent Context Indicators	2025	2030	2050
a) Waste reduction <sup>1</sup>	1402,337 tonnes of household waste collected in Birmingham in 2017/18. <sup>1</sup> The volume of household waste collected has increased by 7% from 2014/15 levels. <sup>2</sup>	8% decrease in household waste	11% decrease in household waste	20% decrease in household waste
b) Increased recycling <sup>3</sup>	Mixed recycling rates across the cities – some wards up to 45%. Others below 10% with high contamination. <sup>3</sup> In 2017/18, 21% of household waste and 19% of non- household waste collected was sent for recycling, composting or re-use. <sup>4</sup>	41% household recycling rate	50% household recycling rate	85% household recycling rate
Estimated carbon saving (from the above waste treatment)		212,386 tCO <sub>2</sub> e	593,374 tCO <sub>2</sub> e	3,267,323 tCO <sub>2</sub> e



1 - Percentages are defined in terms of weight, not volume. Other categories within SCATTER include Commercial and Industrial waste, Construction & Demolition waste, Sewage Sludge and Landfill Gas.

2 - Local Authority Collected and Household Waste Statistics 2014/15 - 2017/18, England

3 - Interview Darren Share 20/2

4 - Waste destinations consist of 'recycling' (one category), 'landfill', 'composting', and 'incineration or EfW'. \Updates made to the original DECC Pathways Calculator in respect of EU Waste Directive 2035 Targets.

# Waste Delivery





#### Co-benefits:

- Job creation: Friends of the Earth estimate that if a target of 70% recycling rate is reached it could create 50,000 new UK jobs.
- **Protects eco-systems and wildlife**: Through reduced need for raw material extraction and minimises pollution.
- Financial benefits: Lower costs associated waste collection and disposal and potential to generate income e.g. composting.



# Waste What is needed from Stakeholders?

#### Birmingham City Council:

- **Direct Control-** Ensure that the council leads by example and has a strategy for monitoring and improving its own waste management.
- **Stronger Influence-** Work in partnership with Schools, Leisure Centre and top procurement suppliers to develop waste strategies.
- Medium Influence- Encourage and support other stakeholders, including businesses and organisations to adopt a circular economy strategy. Educate and engage with residents and communities over waste and recycling.

#### West Midlands Combined Authority:

- Work on delivering anaerobic digestion plants.
- Continue to work with Local Authorities to develop communications campaigns with the public and businesses.

#### National Government:

- Develop a national level framework for recycling.
- Provide funding for Research and Development into anaerobic digestion and energy from waste plants.
- Develop incentives for businesses to encourage recycling and waste reduction.

#### Other Partners:

- Sustainability West Midlands Work across organisation to develop waste strategy and action plan.
- Schools- use momentum from Plastic free campaigns to educate children on recycling and waste reduction.

#### Businesses:

- Adopt a circular economy model and develop a strategy for waste reduction and recycling.
- Review procurement policy and ensure products are sustainably sourced.
- Review process to identify areas where efficiencies in production can be improved,.
- Encourage volunteering with local organisations involved in food growing and redistribution.

#### Community groups:

- Disconnect between big projects and investments, and communities and SMEs and society. Social benefits as a result of decarbonisation including wellbeing.
- Local food growing and redistribution groups- continue to offer volunteering opportunities and educate individuals on food waste.
- Support local Plastic Free and associated campaigns such as Refill.

#### Local Residents:

- Support businesses which offer sustainable products.
- Adopt the waste hierarchy at home and in the workplace.
- · Get involved and volunteer with local food redistribution groups



## Waste Key Recommended Next Steps

Source	Carbon Reduction Measure	Costs and Resources
Council Waste	a&b) Lead by example and report on waste and recycling and develop a council's own strategy.	0.5 FTE.
	a) Develop continued community engagement strategy on waste reduction in the home	Within officer time.
	a) Develop a 'waste heroes' competition to highlight best practice from local businesses reducing waste.	0.5 FTE.
City-wide waste	b) Develop a waste strategy in line with WMCA and improve recycling reporting for the city.	0.5 FTE.
City wide waste	b) Utilise road-level data (logging degree of contamination from last 12 months) to launch communication/educational campaign on recycling with support of community leaders.	Based on the experience of a large number of UK local authorities, effective communications costs a minimum of £1.00 pe household for ongoing communications.
	b) Develop anaerobic digestion plants to treat food waste which is likely to be segregated in the future.	Officer time to coordinate with business and other local authorities.

#### Examples of good practice:

Cheshire West and WRAP case study resulted in: - Recycling rates increasing from 34% in 08/09 to 48% in 09/10. - Participation in the service rose from 82% to 96% following the introduction of the new service. - By diverting an additional 3,302 tonnes of waste from landfill to recycling, Cheshire West would have saved 23 ktC02e p.a.

Loughborough Food Waste Processing projects aim to improve the reliability of anaerobic digesters.



# 4. Sectoral Analysis: Industry





# **Industry** Interventions Summary



#### Improving the efficiency of industrial processes

The following industrial measures are defined within the tool:

- o Industry efficiency: Changes in sectoral emissions through improvements to equipment efficiency and process development.
- Electrification of industry: Increasing the degree of electrification of industrial processes (including chemical, metal and mineral processing).
- o Carbon capture and storage: Uptake of carbon capture and storage technology across industrial sectors and processes.
- **Reducing oil production:** Reduced demand for oil and petroleum products against baseline levels, assuming no changes to the operational processes at refineries themselves.

Where such emissions occur outside of the city boundary; the associated embodied emissions are not be accounted for here - these would only be reflected using consumption-based accounting which relies on methodologies outside of the scope of SCATTER.



# Industry Background

#### Progress to date:

- Birmingham is a global centre for industry and commerce and the West Midlands is the UK's largest centre for manufacturing and engineering. Its distinctive strengths include low carbon transport innovation, data-driven health and life sciences, and globally competitive supply chain firms.
- Advanced manufacturing and engineering particularly automotive is a defining strength of Greater Birmingham's economy, employing more than 36,500.<sup>1</sup>
- Supply chain capabilities encompass a range of technologies and sectors including advanced digital design, composites, manufacturing metrology, metal precision manufacturing, advanced robotics, low emissions vehicles, research and development on batteries, energy storage, powertrains, and light-weighting.<sup>1</sup>
- BCC previously spent 75 million on a 'green bridge' programme helping businesses to be 'greener', invest in more efficient equipment and bring manufacturing in house, reducing energy and waste.
- BCC has engaged with vehicle engineering companies to help identify higher emissions/older vehicles to try and encourage them to upgrade.
- BCC is working with partners in construction industry and the rail college and Make UK to upgrade employee skills in line with the requirements of a low carbon economy.
- Greater Birmingham & Solihull Local Enterprise Partnership (GBSLEP) are currently developing the region's Low Carbon & Environmental Technology Action Plan.<sup>2</sup>

Note- Energy used for heating and appliances in industrial buildings is addressed in the Buildings Sector.



Greater Birmingham<sup>1</sup>



# **Industry** Relevant Plans and Policies

#### Regional

#### West Midlands Local Industrial Strategy (2019)

- Low Carbon industry-led steering group will be a platform for the region's stakeholders to oversee the development, prioritisation and implementation of the Low Carbon & Environmental Technology Action Plan interventions, giving businesses the opportunity to inform and influence future regional and LEP policies.
- The Action Plan is part of the West Midlands Industrial strategy.

#### National

#### Industrial strategy

- Industrial Strategy: Building a Britain fit for the future (updated 2018).
- <u>The Clean Growth Strategy</u>: Leading the way to a low carbon future, BEIS (October 2017, as amended April 2018).
- <u>The Route to Clean Growth</u>, Using Industrial Strategies to drive change, Localis and Green Alliance (November 2019).

#### Local

<u>Greater Birmingham & Solihull Local Enterprise Partnership (GBSLEP)</u> – Outlines that key sectors and technologies are an important core priority with a focus on:

- Stimulating demand led innovation
- Developing the competitiveness of supply chains
- Growing markets for inward investment
- Taking advantage of opportunities arising from emerging and enabling technologies



# Industry SCATTER Interventions: Industry

The Energy Intensity of Industry has been treated with the minimum level of ambition within the tool. Higher levels of ambition imply the adoption of carbon capture and storage (CCS) technologies, which have no precedent within Birmingham. A recent progress report into the UK's zero carbon ambitions and the role of breakthrough technologies states that government cannot assume that CCS will be running at scale by 2050. However, it is important that this does not constrain ambition in emissions reduction from industry.

Moosuro	Selected Current Context Indicators	SCATTER L1 Pathway		
IVICASUIC	Selected Current Context Indicators	2025	2030	2050
a) Industry efficiency	Per BEIS figures, total emissions from industry and commercial sources decreased 33% between 2011-17. <sup>1</sup>	Stabilises at 35% reduction in emissions from industry.		
b) Electrification of industry	35% of UK industrial energy consumption in 2018 was electric <sup>1</sup>	No significant changes in the electrification of industrial energy consumption.		
c) Carbon Capture and Storage (CCS) on industry	UK government is investing £20m in supporting the construction of carbon capture, use and storage technologies at industrial sites across the UK <sup>2</sup> However, there are no technological CCS facilities in the region.	No CCS technology uptake within the city.		
Estimated Carbon Saving (from the above industrial processes)		1,434,497 tCO <sub>2</sub> e	2,457,563 tCO <sub>2</sub> e	6,668,804 tCO <sub>2</sub> e
d) Oil production	No oil wells in the city. <sup>3</sup> ESSO Birmingham Oil terminal is located in the boundary.	18% reduction in oil production relative to 2015 levels	36% reduction in oil production relative to 2015 levels	77% reduction in oil production relative to 2015 levels

1- https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\_data/file/820647/DUKES\_1.1.5.xls

2- https://www.businessgreen.com/bg/news-analysis/3067118/the-time-is-now-government-unveils-plans-for-uks-first-carboncapture-and-usage-project



# Industry Delivery





# **Industry** What is needed from Stakeholders?

#### Birmingham City Council:

- **Direct Control-** Ensure that the council has a programme in place for supporting efficiency improvements and low-to zero carbon product and process development for small-scale industry in the city.
- Stronger Influence- Work through the planning application process to encourage the provision of low-carbon and green infrastructure and installation of renewable energy at sites and installations in the city.
- Medium Influence- Encourage and support other stakeholders to prioritise and develop low-carbon infrastructure and products.

#### West Midlands Combined Authority:

- Build on the West Midlands Local Industrial Strategy to develop a more radical zero carbon agenda
- Work on delivering and prioritising zero and low-carbon industrial strategy across all sectors

#### National Government:

- Provide and expand funding for Research and Development into zero and low-carbon products and processes.
- Expand and prioritise incentives for businesses to develop and procure zero and low carbon products and services, and to develop process efficiency improvements.

#### **Businesses:**

Zero carbon agenda needs to be radical and fundamental.

- Review procurement policy, and ensure products and services are sourced with a view to reducing overall supply chain emissions.
- Review process to identify areas where efficiencies in production can be improved.
- Adopt a circular economy model and develop a strategy for waste reduction and recycling.
- Work with LEP to develop and deliver Low Carbon & Environmental Technology Action Plan.

#### Community groups:

- Build connections between big projects and investments, and communities and SMEs.
- Campaign and communicate social benefits as a result of decarbonisation, including wellbeing.

#### Local Residents:

- Support businesses which offer zero-carbon and low-carbon products and services.
- Adopt practices at home, though consumption and travel, and in the community, to reduce personal carbon footprint.

#### Other Partners:

• Sustainability West Midlands - Work across organisations to develop efficiency, zero and low-carbon, and waste reduction strategies and action plans



# Industry Key Recommended Next Steps

Source	Carbon Reduction Measure	Costs and Resources	Examples
City-wide Industry	a) Through WMCA industrial strategy: encourage industry to report emissions, risks and opportunities, and develop a strategy.	Officer time to coordinate with business and other local authorities	Stoke-on-Trent is integration of the second state of the second st
	a) Support the setting up of forum for industry.	Officer time to set up group and facilitate knowledge sharing	voluntary group that maintain robust
	a) A requirement to pursue clean growth should be written into guidance on local industrial strategy to identify opportunities for low carbon investment.	Officer time to coordinate with business and other local authorities	
	b) Set guidance and provide training for promoting zero and low-carbon infrastructure when assessing industrial/commercial planning applications.	Officer time to facilitate with partners to provide training and guidance for Councillors and Planning Officers.	

#### Examples of good practice:

<u>Stoke-on-Trent</u> is integrating waste heat from local ceramics producers into district heating, providing a new source of revenue for industry and establishing related training programmes at its local college.

Ireland's Large Industry Energy Network is a voluntary group that is working to develop and maintain robust energy management.



# **4. Sectoral Analysis: The Natural Environment**





# **Natural Capital** Interventions Summary



#### Protecting and enhancing the city's natural capital

Natural capital refers to natural features, such as water, green space and trees from which people, society and the economy derive value. Such features provide a wide range of benefits, including improved health and wellness, enhanced community interactions, regulation of extreme heat and flooding, and increased property prices. In order for such benefits to be realised, natural assets must be managed effectively.

Recognising Birmingham's urban context and social challenges, we identify the following interventions:

- Managing existing tree stock: The ongoing effective management of trees is necessary in order for them to continue to be a net sink of carbon. Doing so will require overcoming challenges associated with a range of factors including planning urban development and managing pests and diseases. The enforcement of Tree Preservation Orders (TPOs) will continue to be an important component of our management response.
- New tree planting: In order to both sequester more carbon and provide more equitable natural capital benefits to the people of Birmingham, tree planting on a massive scale is required. Where necessary, we will also have to consider alternative interventions such as green roofs and walls to increase natural coverage where it is needed.

Implementing these measures will require the delivery of the Urban Forest Management Policy, which is recognised in the Birmingham Tree Policy Review (2018), as well as new actions including the development of a 'City-wide Tree Planting Strategy'.



# The Natural Environment Background

#### Progress to date

- The city is one of Britain's greenest over 1/5<sup>th</sup> of area consists of green space (parks, nature reserves, allotments, golf courses and playing fields)<sup>1</sup>.
- There are around 1,000,000 trees in the city<sup>2</sup>. Of this, around 124,000 are in parks and green spaces, 74,000 are street trees, and the remainder are in woodlands<sup>3</sup>.
- There are 1,398 hectares of woodland (equivalent to 2,097 football pitches) within Birmingham's 591 parks and open spaces<sup>2</sup>.
- Research published in 2017 suggests that tree cover in Birmingham is 19 ± 1.48%<sup>4</sup> and the most recent data indicates a higher figure of 21.26%<sup>5</sup>. While good relative to the UK average, is below the level of many major world cities<sup>6</sup>.
- Some wards have in excess of 45% tree cover, while others have less than 10%<sup>5</sup>. There is a distinct correlation between lack of trees/ green infrastructure and the worst instances of issues including air quality, heat islands, flood risk, and social deprivation<sup>6</sup>.
- Minimum tree canopy cover for urban locations in the UK to realise co-benefits is 20%<sup>4</sup>. Birmingham's Tree Policy goes further than this and recognises the need to achieve 25-30 % cover target in the longer-term to adapt to climate change (e.g. extreme heat and precipitation).
- We estimate that all trees in Birmingham sequester annually over 45,500 t CO2.7
- Birmingham and Black Country Nature Improvement Area, which encompasses Birmingham, is unique nationally in that it is almost entirely urban<sup>8</sup>.
- The Wildlife Trust works with over 60 organisations and has made significant improvements in the regional landscape including creation/ improvement of woodland, grassland, heathland and hedgerow (see right).



Estimated tree cover of 21.26%<sup>5</sup>

# >45,500 tonnes CO<sub>2</sub>

The amount of carbon dioxide sequestered annually by the city of Birmingham's existing stock of 1 million trees (including street/ highways trees, woodlands and trees in parks, cemeteries/ crematoria, schools, gardens, etc.)<sup>7</sup>

#### Birmingham & Black Country NIA achievements (2012-2016) include:

- 250 sites improved for nature
- 111 hectares of woodland/improved created
- 78 hectares of grassland improved/created
- 6 hectares of heathland improved/created
- 6.5 kilometres of hedgerow habitat improved/created
- 8.5 kilometres of wetland corridor improved/created<sup>7</sup>



# **The Natural Environment** Relevant Plans and Policies

#### National

<u>The 25 Year Environment Plan</u> - The '25YEP' sets out the UK Government's goals for improving the environment over the next 25 years. It includes commitments to create new forests/ woodlands, incentivise tree planting, explore innovative finance for afforestation; and increase protection of existing trees. The associated draft <u>Environment Bill</u> mandates that planning permission be dependent on new developments achieving a biodiversity net gain of at least 10%.

Land use: Policies for a Net Zero UK (2020) – CCC report sets out the policies and actions required to deliver the land sector's contribution to the UK net zero target including converting 22% of agricultural land (mostly from livestock) to forestry.

#### Woodland Trust Emergency Tree Plan for the UK – Recommends Local Authorities:

- Write an Emergency Tree Plan to identify land for trees.
- Protect existing native woodland and trees.
- Set annual expansion targets for tree/ woodland cover.
- Ensure all development land includes a minimum 30% tree canopy cover.

#### Regional

**#WM2041: Our Actions to Meet the Climate Challenge – Green Paper** - Outlines the WMCA's plans for climate mitigation, adaptation and social equity. Includes plans to invest in tree planting. Includes plans for a Natural Capital Investment Plan.

Birmingham and Black Country Nature Improvement Area Ecological Strategy 2017 – 2022 <sup>-</sup> Aims to protect Core Ecological Areas (least developed); enhance Linking Areas (matrix of 'connecting tissue' in the landscape); and create new sites in Opportunity Areas (intensively used green space incl. parks and agricultural land). The Wildlife Trust is working with >60 partners in the region to achieve its strategy.

#### Local

Adopted Birmingham Development Plan 2031 - A framework to guide development and regeneration in Birmingham until 2031, including commitments on natural capital.

<u>Green Living Spaces Plan</u> – Works towards achieving the vision of Birmingham as a leading green City. Applied natural capital valuation manage ecosystem services and provides guidance for future development and investment (sits under the BDP, above).

<u>Climate Change Adaption Action Plan</u> - Ensures the City is prepared for future climate impacts and extreme weather events, recognizing that a certain amount of disruption from physical climate change including extreme heat and flooding is inevitable.

#### **<u>Birmingham Tree Policy</u>** – Recommendations include:

- Ensuring 25-30% urban tree cover for climate change adaptation.
- Mandating tree valuation and exploring a 'Birmingham Tree Bank' financed by removal penalties to help fund tree planting.
- Raising capital through green bonds (e.g. linked to flood risk mitigation).
- Ensuring all major planning applications incorporate consideration of 'greening'.
- Developing an Urban Tree Management Strategy and renew every 5 years.
- Exploring formation of a region-wide Birmingham Forest Group.

**Birmingham Health Economic Assessment & Natural Capital Accounts** – Focused on valuation of the flow of services (incl. property value uplift, health benefits, biodiversity, flood mitigation, global climate regulation etc.) that stem from parks and green spaces.

Nature Conservation Strategy for Birmingham - Provides comprehensive advice and direction regarding nature conservation resources and practical guidelines for action.

<u>The Naturally Birmingham Project</u> - Designed to help councils find sustainable ways to manage and fund parks and open spaces across entire towns and cities.



# The Natural Environment Interventions: Natural Environment



Mooguro	Selected Current Context Indicators	Possible targets [SCATTER thresholds not presented]		
Weasure	2025		2030	2040
a) Managing existing tree stock	There are around 1,000,000 trees in Birmingham which, if managed effectively, will continue to be a net sink of carbon.	1,000,000 trees/ 34,000 ha tree canopy cover/ 45,500 tCO <sub>2</sub> / yr <sup>-1</sup>	1,000,000 trees/ 34,000 ha tree canopy cover/ 45,500 tCO <sub>2</sub> / yr <sup>-1</sup>	1,000,000 trees/ 34,000 ha tree canopy cover/ 45,500 tCO <sub>2</sub> / yr <sup>-1</sup>
b) New tree planting	Present average tree cover is 21.26%, but some wards have <10% cover. Increasing this to a minimum of 25% in any ward would increase the average to 27.41% in the long-term (i.e. by 2070).	225,324 new trees/ 135 ha or 0.51% additional cover/ 481 tCO <sub>2</sub> / yr <sup>1*</sup>	450,649 new trees/ 513 ha or 1.94% additional cover/ 1,087 tCO <sub>2</sub> / yr <sup>-1*</sup>	450,649 new trees/ 999 ha or 1.62% additional cover/ 2,266 tCO <sub>2</sub> / yr <sup>-1*</sup>
Estin	nated carbon saving from the above	45,481 tCO <sub>2</sub> / уг <sup>1</sup>	46,087 tCO <sub>2</sub> / yr <sup>1</sup>	47,266 tCO <sub>2</sub> / yr <sup>-1</sup>

\*Note the sequestration potential of new tree planting is relatively low during early stages of tree growth as tree volume and thus CO2 uptake through respiration are relatively low. As trees grow larger the sequestration rate increases substantially. By 2070, this new planting could sequester >10,500 t CO2/ yr<sup>-1</sup> while increasing tree canopy cover by 5.37%.

#### Estimated carbon savings:

- The method of estimating carbon savings differs in this instance as SCATTER is only used to predict energy system savings.
- We modelled the carbon sequestration of the city's current tree population of 1,000,000 trees based on sequestration rates estimated in an empirical study from a comparable urban tree population<sup>1</sup>. Note that in order to realise the potential sequestration benefits identified here, green waste relating to the tree population must be managed effectively for sequestration.
- We then assessed the carbon impact of planting enough trees to increase canopy cover to a minimum of 25% in any one ward in the long term. This is in recognition that urban tree cover must be a minimum of 25-30% in order to mitigate climate change impacts from heat and precipitation<sup>6</sup>. Our calculations assume that the newly planted trees with achieve a per tree canopy cover area similar to that observed within the city's current tree population towards the end of the century. In the nearer term (i.e. to 2040), tree canopy cover is expect to grow in line with estimates from specialist arborists. The full benefits of this planting in terms of both tree cover and carbon sequestration will not be realised for decades, but these efforts nonetheless represent essential long-term investment in the city's development.



# The Natural Environment Delivery



Figure 22 : Trees and green space adjacent to a residential development in Birmingham.<sup>3</sup>

#### Co-benefits of Natural Capital:<sup>1</sup>

- Financial benefits: Increases in house prices between 5%-18% when a property is associated with mature trees.
- Liveability: Trees and other vegetation can reduce noise pollution (up to 6-8 decibels) and act as a visual barrier. It can also improve comfort in urban areas by reducing wind speed and air turbulence.
- **Community:** Green space can provide a space for communities to engage, which can improve community cohesion, walkability of neighbourhoods, reduce crime levels and develop a connection to local place.
- **Resilience:** Trees and vegetation can reduce surface run-off and reduce flood risk. They can also help to reduce temperature and the urban heat island effect.
- Benefits for child development: Research suggests that exposure to nature can improve cognitive development and concentration.
- **Biodiversity:** Trees and green spaces can create habitats, support species and increase biodiversity.
- Health: there are multiple health benefits of green spaces and trees:
  - Certain trees and other vegetation can improve air quality by intercepting harmful pollutants.
  - Green space can encourage physical activity: the cost of physical inactivity to the local economy has been estimated at £21.9 million<sup>2</sup>.
    - 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.
  - There are also significant mental health benefits including helping to alleviate stress, anxiety and depression.<sup>1</sup>



# **The Natural Environment** What is needed from Stakeholders?

#### Birmingham City Council:

- **Direct Control** Ensure that the council protects and enhances natural capital on its own property and that which it manages, including through the development and delivery of an Emergency Tree Plan.
- Stronger Influence Work with Developers as well as Schools and Leisure Centres to deliver effective tree management and planting and other nature-based solutions (e.g. biochar and soil improvement) on their premises.
- Medium Influence Carry out a spatial analysis to identify opportunities for investment in Green Infrastructure including tree planting. Partner with land holders to enhance and protect natural capital stock and support and engage business and communities to consider Green Infrastructure.

#### National Government:

- Develop ambitious planning policies and targets (such as biodiversity net gain) to ensure natural climate solutions are integrated into new developments.
- Provide funding for natural capital investments including through innovative new finance schemes.

#### **Businesses:**

- Encourage volunteering with local organisations involved in food growing and redistribution and those involved in natural capital solutions.
- Review land holdings and explore opportunity for tree planting and integrate green infrastructure onto property.

#### WMCA:

- Continue to work with the West Midlands Environment Board and Natural Capital Roundtable to develop and deliver the 25 Year Natural Capital Plan.
- Develop and deliver the Virtual Forest resource in order to assist community, individual, and private sector actors in engaging in tree planting activities.

#### Community Groups:

• Continue to work with local community groups to green neighbourhoods or invest in natural capital, including through running tree planting events.

#### Local Residents:

- Get involved and volunteer with local food growing, urban agriculture and community planting schemes.
- Avoid removing gardens and trees when converting driveways and building extensions
- Plant trees in line with guidance in own back gardens
- Increase engagement with the natural environment.

#### Other Partners:

- Schools Increase opportunities for children to engage with the natural environment.
- · Land Owners and Farmers -
  - Work with environment agency and other organisations to better manage soil
  - Explore new land and livestock management approaches to reduce carbon emissions.
  - Explore the use of government and alternative sources of finance opportunities for forestry on current livestock land.



# The Natural Environment **Key Recommended Next Steps**

Source	Carbon Reduction Measure	Costs and Resources
	a) Protect and manage existing trees and woodland.	Existing staff and contractor cost.
	a&b) Manage Green Waste Effectively for Carbon Sequestration.	3.0 FTE staff costs to support green waste initiatives such as compost and <u>biochar</u> .
City Council Land	b) Identify and cost opportunities for new tree planting.	Current costs per 30 trees are around £41. Street trees cost £2-5k per tree if planted properly. Ongoing costs for tree maintenance range from £60-£140 pa. Costs could be bourn in part by a Tree Bank funded by developer who remove trees (e.g. using a valuation technique such as CAVAT - Capital Asset Valuation for Amenity Trees).

#### Examples of good practice:

Greater Manchester's City of Trees worked with Viridor, the the initiative:

"Street Trees provide a range of environmental benefits urban cooling due to climate change, reducing the risk of flooding and capturing carbon. They are a positive way we can contribute to improving the local streetscape."

The Stockholm Biochar Project sequesters carbon by turning park and garden waste into biochar. The biochar substitutes for finite planting materials, such as peat, clay, project plans to produce 7,000 tonnes of biochar by 2020.



1 – Image by Bjorn Embrén. <u>https://www.biochar-journal.org/en/ct/77</u> 92

# **The Natural Environment** Key Recommended Next Steps

Source	Carbon Reduction Measure	Costs and Resources
	a) Carry out ongoing inventory and report on tree abundance, diversity and cover statistics.	Existing staff resource and volunteer resources.
	a) Expand Enforcement of Tree Preservation Orders.	1.0 FTE
Private land	a) Ensure that existing guidance on protection and enhancement of natural capital is communicated effectively in the context of the Environment Bill and Biodiversity Net Gain.	Existing staff resource.
	a&b) Develop a city-wide Emergency Tree Plan.	Consultancy fee.
	a&b) Work with other landholders including developers to maximise the potential for tree planting and land management.	1.0 FTE
	b) Develop a Natural Capital Investment Plan including plans for a Tree Bank and Green Bonds.	Consultancy fee.
	b) Facilitate community sequestration schemes.	0.5 FTE
	b) Mandate that developers include within all developments <i>either</i> a minimum of 30% tree canopy cover; <i>or</i> a minimum 50% coverer of 'soft landscape' (incl. trees, green roofs, green walls, etc.).	Existing staff resource.

#### Examples of good practice:

The London city of Ealing's detailed report <u>Valuing</u> Ealing's Urban Trees provides the information necessary for the production of a comprehensive city management plan for Ealing's urban forest and to inform the council's tree strategy through providing baseline data for wardlevel monitoring.

The report also calculated replacement and amenity costs of trees across the city to establish a baseline for pricing tree replacement schemes within the city's planning process.





# **The Natural Environment** Key Recommended Next Steps

Source	Carbon Reduction Measure	Costs and Resources
Beyond Birmingham	b) Work with the WMCA to identify opportunities for investment on new woodland/ tree planting that retain benefits for the people of Birmingham.	Existing staff resource.
Beyond Birmingham	<ul> <li>b) Explore how offsetting any residual emissions from Birmingham's in regions beyond the combined authority can realise benefits for the people of Birmingham.</li> <li>This may include looking at UK national schemes such as the Woodland Carbon Code and the Peatland Code and estimating costs and timing of such initiatives.</li> <li>We advise strong caution in exploring offsetting more generally, as these should not displace or compensate for any 'lower ambition' actions. On the contrary, it is likely that such measures may be required 'in addition to' everything else. Local, natural environment offsets may however, present Birmingham with some wider socio- economic opportunities as the city seeks to mobilise and implement the full extent of measures directly 'in-boundary', as a first priority.</li> </ul>	Consultancy fee

Leeds City Council, in partnership with Yorkshire Wildlife Trust and volunteers from the Environment Agency, Leeds City Council, Yorkshire Water, The Conservation Volunteers, Craven Conservation Group and SCAPA, a local manufacturer, are delivering a natural flood management pilot involving tree planting.

This £500,000 pilot programme, funded by the Council, uses natural methods to slow the flow of water from upstream in the catchment. This includes land management to reduce water run-off, woodland creation to increase tree canopy cover and river and flood plain restoration so that the landscape can hold more water in times of flood. Hundreds of trees have been planted as part of the trial.



Cheshire East are currently exploring local based offsets or 'insets' as a way of stimulating benefit inregion and helping to off-set the council's direct footprint.



# 4. Sectoral Analysis: Energy Supply





# **Energy Supply** Interventions Summary



#### Meeting demand with green energy

The measures across the buildings, transport waste & industry sectors are primarily focused on the reduction of demand for energy, as well as the adoption of technologies which are powered by electricity as opposed to fossil fuels (e.g. natural gas).

A crucial factor in transforming these measures into carbon emissions reductions is the adoption of **renewable electricity supply**, which sits across all sectors.

The tool considers a wide range of renewable technologies:

- o Solar PV: Capacity from solar photovoltaic (PV) cells, either as roof-mounted arrays or at ground-level.
- Onshore wind: Capacity from onshore wind turbines. The added capacity from offshore wind turbines is treated at the national level.
- **Bioenergy supply:** Capacity from bioenergy which is both imported from out-of-boundary sources (as both feedstock and energy supply) and from in-boundary biomass stations.
- Solar thermal: Capacity from solar thermal technology, which differs from solar PV, but is still treated as a solar array on rooftops.
- Hydro: Capacity from hydroelectric power stations.
- Wave, tidal and tidal stream: Capacity from wave, tidal & tidal stream sources. Treated at the national level.
- Storage: Storage and battery technology capacity.

#### SCATTER Level 4 Pathway targets

The future capacities stated are based on national estimates within the Legacy DECC 2050 Pathways Calculator, scaled down to Birmingham. We acknowledge that the extent of increase in certain technologies may not be feasible due to geographical and/or physical constraints of the city. However, where capacities are not met, energy supply from these sources may need to compensated by other cities elsewhere in the UK, (in addition to their own ambitious targets); so it is important that Birmingham contributes as much as possible to safeguard lower energy prices and carbon targets.



# Energy Supply Background

#### Progress to date

- Main focus is on energy from waste and heat decarbonisation.
- Energy supply contracts for BCC are up for renewal in the next 2 years, and a renewable tariff will be considered.
- Council buildings and offices in the centre are on the Birmingham District Energy Company (BDEC) heat network (Gas CHP).
- Engie operate the district heat scheme, BDEC, and potential for continued investment is being explored.
- Exploration of connecting Tyseley Energy Park (TEP) up to supply waste heat, and potential decommissioning of existing gas CHP if supplying to the BDEC heat network is being considered.
- Working with UK Government BEIS decarbonising heat in cities project over 18 months to develop a heat strategy for Birmingham.

Feasibility studies have been done on several schemes for heat networks. Heat network opportunities include<sup>1</sup>:

- HS2/Curzon Street 150 hectares, including 4,000 homes and 36,000 jobs. The estimated thermal generation required for the initial phases is 15MWth.
- Snow Hill station encompassing 200,000sq.m of new office floor space, 4,000 new residential units and the creation of 10,000 jobs.
- Smithfield redevelopment site, 34-acre mixed development 2,000 new homes, 3,000 new jobs, estimated thermal generation required is 26MWth.
- Birmingham City University land redevelopment, estimated that the existing heat requirements will need to be increased by 6MWth generation.
- Langley & Peddimore, Fort Parkway redevelopment sites, heat requirements is circa 250,000MWh/pa, investment of between £20m to £25m.
- Tyseley estimate heat demand including the transmission pipe to the city centre is circa 93,000MWh/pa, with a total investment potential of circa £30m.

- Greater Icknield Port Loop, estimated heat load of new developments would be circa 54,000MWh/pa with an estimate investment potential of £31m.
- Commonwealth Games 2022, post Games Village, 1,400 new homes.
- Energy Innovation Zones (EIZ's) near BCC: UK Central in Solihull; and Tyseley Energy Park (TEP).
- Low and zero emission refuelling hub. Looking at use of biodiesel.
- CoGen biomass plant 10MW output, private wire, will produce Hydrogen for buses.
- Close to finishing procurement of Hydrogen bus operator for 20 buses.
- Injection of Hydrogen into the gas grid being considered.
- Veolia Efw plant, very old, inefficient; new Tyseley plant to be built concerns that this has been put out to the market to keep as an incinerator, without capacity to take off the waste heat.
- Food waste will need to segregated and will become a separate feedstock in future years potential for Anaerobic Digestion but some volume loss to incinerator at TEP
- Poor grid infrastructure. Hard to find suitable locations for EV.
- Roll out of EV infrastructure with £2.92m government funding.
- Secured an EV partner and close to finalising contract. 394 charge points over 2 years as first phase. Rapid chargers targeting taxis, commercial Strategic locations taxis / communities, outer ring roads and arterial routes.
- Running a behaviour change programme with schools covering carbon reduction, energy saving, renewables, air quality for schools under BCC control.

### GWh of energy generated in 92.5 Birmingham from renewable sources in 2018<sup>2</sup>



 Birmingham's Energy Baseline (2019) Perform Green
 Based on 2018 data from: https://assets.publishing.service.gov.uk/government/uploads/system/uploa ds/attachment\_data/file/743822/Renewable\_electricity\_by\_Local\_Authority\_ \_2014-2017.xlsx

# **Energy Supply** Relevant Plans and Policies

#### National

- Smart Export Guarantee (SEG), 2020 -The smart export guarantee (SEG) is an obligation set by the government for licensed electricity suppliers to offer a tariff and make payment to small-scale low-carbon generators for electricity exported to the National Grid, providing certain criteria are met.
- The Domestic Renewable Heat Incentive (RHI) was designed to drive uptake of renewable heat technologies. Since 2014, those who install eligible heat generating technologies can receive quarterly payments for seven years for the amount of renewable heat their system produces9. The RHI is only funded for new applicants to 2021.
- UK <u>National Energy and Climate Plan</u> sets out integrated climate and energy objectives, targets, policies and measures for the period 2021-2030.

#### Regional

<u>A Regional Energy Strategy for the West Midlands (2018)</u>- Brings together energy mapping into a high level strategy for the regions energy capital. It outlines how Birmingham fits within the region from an energy and low carbon perspective.

<u>Greater Birmingham and Solihull Local Enterprise Partnership</u> (GBSLEP)- sets out the aim for Birmingham's LEP to deliver jobs and growth for the city region. No direct reference to renewable energy or clean growth.

#### Local

<u>Power to the People. An Integrated Approach to Clean Energy and Climate Innovation (</u>2019) University of Birmingham – Part of the project to develop an Energy Innovation Zone, which explores potential scenarios, barriers and opportunities

#### Birmingham's Energy Baseline (2019)<sup>1</sup>

Strategic study on delivery mechanisms required for Birmingham's decentralised energy plans (2016)<sup>1</sup>

<u>Birmingham Solar PV Study report (2016)</u> – Aims to help BCC prepare for a renewable energy future by mapping out potential areas for PV installation.

<u>Birmingham Clean Air Zone</u> – The government as said Birmingham needs a clean air zone, it is expected to be introduced in 2020.

<u>EVs and charging</u> – Birmingham has been awarded funding for 197 EV charging points from the Office for Low Emission Vehicles. This will mean the decommissioning of the current 36 charging points in the city and upgrading them with new facilities. Work is expected to begin in 2020.



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# **Energy Supply** Interventions: Renewable Energy Supply



Measure Selected Current Context		SCATTER Level 4 Pathway			
Wicdourc	Indicators	2025	2030	2050	
a) Solar PV	28.4 MW installed capacity, (7,071 sites) generating 27.6 GWh <sup>1</sup>	<ul> <li>2.56 km<sup>2</sup> of PV arrays across roof space (equivalent to arrays on 34% of households)<sup>2</sup></li> <li>0.87 GW installed capacity</li> <li>660 GWh generated per year</li> </ul>	<ul> <li>3.61 km<sup>2</sup> of PV arrays across roof space (equivalent to arrays on 46% of households)</li> <li>1.23 GW installed capacity</li> <li>930 GWh generated per year</li> </ul>	<ul> <li>8.18 km<sup>2</sup> of PV arrays across roof space (equivalent to arrays on 60% of households, with a further</li> <li>3.06 km<sup>2</sup> of ground mounted and commercial property installations)</li> <li>2.78 GW installed capacity</li> <li>2,100 GWh generated per year</li> </ul>	•
Estimated carbon saving		785,322 tCO <sub>2</sub> e	1,766,783 tCO <sub>2</sub> e	9,320,951 tCO <sub>2</sub> e	

#### Estimated carbon savings

- The method for estimating carbon savings is different from that used previously as this is addressing supply.
- Savings are cumulative over the period 2019-2050, relative to 2018.
- Emissions savings are estimated by applying the 2018 national grid factor average of 248g/kWh to the difference between the most recent year's data (2018) generation output and future generation output at each of the yearly milestones (and interim years). We acknowledge that the grid factor is likely to reduce over time, meaning that savings are likely to materially higher than if compared to a later base year. The 2018 value has been used to avoid double counting the input of renewables.
- It is not appropriate to sum any savings presented from renewable supply with savings achieved on the demand side of the energy system, as this is may result in double counting.

# **Energy Supply** Interventions: Renewable Energy Supply

Selected Current Context		SCATTER Level 4 Pathway			
Measure	Indicators	2025	2030	2050	
		110 turbines installed	162 turbines installed	409 turbines installed	
b) Onshore wind	0.006 MW installed capacity, generating 11 MWh per year. <sup>1</sup>	276 MW installed capacity	406 MW installed capacity	1023 MW installed capacity	
		(2.5 MW per turbine)	(2.5 MW per turbine)	(2.5 MW per turbine)	
Estim	ated carbon saving	ed carbon saving 818,376 tCO <sub>2</sub> e 1,813,891 tCO <sub>2</sub> e		9,880,871 tCO <sub>2</sub> e	
c) Bioenergy supply (heat & electricity)	1 installation of anaerobic digestion with 0.9 MW installed capacity, generating 4.9 GWh per year. <sup>1</sup> Other bioenergy sources generate 60 GWh per year.	161 MW installed capacity	171 MW installed capacity	264 MW installed capacity	
Estim	ated carbon saving	1,409,960 tCO <sub>2</sub> e	2,503,783 tCO <sub>2</sub> e	6,516,308 tCO <sub>2</sub> e	
d) Solar thormal	Estimated 0.015 MW	0.8 km <sup>2</sup> of panels installed	13 km <sup>2</sup> of panels installed	3.2 km <sup>2</sup> of panels installed	
	installed capacity.	45.2 MW installed capacity	70.6 MW installed capacity	176 MW installed capacity	
Estim	ated carbon saving	463,028 tCO <sub>2</sub> e	1,119,885 tCO <sub>2</sub> e	6,652,390 tCO <sub>2</sub> e	

#### A note on supply technologies

SCATTER estimates values for the installed capacity of each supply technology, by taking a nationally assumed capacity figure (L1 was aligned to the 2017 National Grid's Future Energy Scenario, Two Degrees) and scaling down to region based on a local authority's size proxy (e.g. population, number of households, land area). This serves as an indicator for the nature and extent of renewable supply required to future demand.

SCATTER does not account for the geographies and local contexts unique to a given local authority, which we acknowledge play a very important role in the viability of a given technology.

# **Energy Supply** Interventions: Renewable Energy Supply

The following energy technologies operate within the SCATTER tool but have very little or no precedent nationally in terms of capacity or installations. Given Birmingham is approaching these technologies from a 'standing start' they are treated with the minimum ambition level within the tool (L1). For these or any of the supply technologies referenced in this section, if the technology is not feasible in the city boundary to the extent suggested, then the residual capacity is simply assumed to occur outside the boundary (with no impact to the emissions estimates).

#### A note on 'emergent technologies'

Due to funding constraints, SCATTER cannot currently model the potential impacts of new and emergent technologies that have yet to become established, so these emissions reductions measures are largely excluded from the tool.

Measure	Selected Current Context Indicators	SCATTER Level 1 Pathway			
WedSure	Selected Guirent Context Indicators	2025	2030	2050	
e) Hydro power	No installed capacity as of 2018.	24.4 MW installed peak capacity25.6 MW installed peak capacity71.7 MW installed capacity		71.7 MW installed peak capacity	
	Estimated carbon saving for hydro power	132,583 tCO <sub>2</sub> e	234,569 tCO <sub>2</sub> e	642,737 tCO <sub>2</sub> e	
f) Wave, tidal and tidal No installed capacity as of 2018.		Energy generation fr	om wave, tidal stream and tid GWh by 2050 (29,000 GWh na	al wave grows steadily to 360 ationally).	
Estimated	Estimated carbon saving for wave, tidal and tidal stream power		1,404,938 tCO <sub>2</sub> e		
g) Sewage gas and Municipal Solid Waste (MSW)	10.5 MW installed sewage gas (at 1 site) generating 38,555 MWh, and 41.2 MW installed MSW capacity (at 3 sites) generating 21,413 MWh <sup>1</sup>	nd By 2030, TEED/TEP could supply ~50,000 people with ~500 GWh of heat a ~100 GWh of electricity per year <sup>2</sup>			
h) Storage	<ul> <li>Development at TEP (WMCA) - transition hubs with battery storage.</li> <li>PassivHaus trials - could include battery storage trials.</li> <li>Mines (Staffordshire) could be potential for heat and pump storage Heat storage of waste heat generated 24/7 - use of thermal batteries; phase change materials - release the heat when needed.</li> </ul>	2.39 GW storage capacity in standby generators	2.45 GW storage capacity in standby generators	2.65 GW storage capacity in standby generators	



# **Energy Supply** Delivery



local control over finances.<sup>1</sup>

employing 209,500 people (full-time equivalents).<sup>2</sup>

cost energy in council housing stock.<sup>2</sup>

fuel price increases.

**Revenue generation**: Potential to reduce utility bills and generate a long-term source of income. Local projects such as community energy schemes can generate income for local people. This also has benefits such as increased autonomy, empowerment and resilience by providing a long term income and

Economic resilience: Local energy resilience and protection against future fossil

**Job creation**: Creation of jobs and upskilling of local people. In the UK, low carbon and renewable energy activities generated £44.5 billion turnover in 2017, directly

Fuel poverty reduction: Reduction in fuel poverty through improving access to low

Co-benefits:



Figure 22: Mapping Birmingham's solar potential<sup>3</sup>



# The potential for energy efficiency and renewable energy Ashden Climate Action Co-Benefits Toolkit s - https://www.cse.org.uk/projects/view/1331

# **Energy Supply** What is needed from Stakeholders?

#### Birmingham City Council:

- **Direct Control** Ensure that council buildings are supplied by renewable energy firstly through installation on their own premises and then by ensuring the remaining supply is from green energy providers.
- Stronger Influence- work in partnership with Schools, Leisure Centres and partner businesses to install low carbon energy sources.
- Medium Influence encourage and support other stakeholders in installing their own low carbon energy sources through helping to identify opportunities and providing guidance. Use the planning approval process to request renewable energy installations on commercial buildings.

#### WMCA:

- Continue to set high levels of ambition for carbon reduction through the regional frameworks.
- Continue to work closely with each of the local authorities that make up the city region.
- Lobbying of national government to provide funding in the region and to develop ambitious policies.

#### National Government:

- Develop progressive policies which stimulate the development of renewables and ensure the stability and certainty of renewable incentive tariffs.
- Invest in Research and Development of renewable and low carbon technology.
- Provide funding to support councils, businesses and individuals to install renewables.

#### Community groups:

- Community Renewables- Local groups and schools should explore the opportunity to partner with BCC/Energy Company and install community energy projects such as solar panels. Stakeholder engagement as part of BEIS project and baseline mapping. A lot of groups, hard to pull together.
- Crowd funding small energy projects could be supported through crowd funding.

# **Orthesis**

#### Businesses:

- Install renewable energy technology and consider supporting local communities to do the same.
- Ensure remaining energy supply, outside of own-generation, is purchased from renewable sources.
- Explore the potential of a Power Purchasing Agreement (PPA) alongside other local businesses and organisations, as a way of securing a financially beneficial deal.
- Explore the support available through the <u>Business Growth Hub</u>.
- SMEs to explore potential grants available for installing renewable technologies.
- Businesses can also play an important role in training and up-skilling local people to install and maintain low carbon technologies.
- Develop networks for knowledge and skills sharing.
- Facilitate energy, distribution, and transport pooling networks on Fort Parkway industrial zone EIZ where there are large industrial users such as iDunlop, Rolls Royce engines, Esso, and Jaguar Land Rover

#### Other Partners:

- Western Power Distribution- It is important that the local District Network Operator (DNO) is involved in energy projects and that communication channels are developed early on to ensure the electricity grid can accommodate the design and connection to the grid.
- Energy Companies- Support the council and business to increase renewable energy generation, e.g. ENGIE, Cadent gas distribution network <u>https://cadentgas.com/home</u>
- BCC are part of the Commonwealth Games development group. Sustainability and energy statements required for all aspects
- Academy Development Programme required schools to look at energy generation and use of renewable energy e.g. heat pumps.
- Birmingham Smart City Alliance- Development of a smart and connected city.

#### Local Residents:

- Install renewable energy at your own residence or change provider to a renewable energy sources.
- Plan for when your heating system will be changed and consider moving to heat- 103 pump technology.

# **Energy Supply** Key Recommended Next Steps

Source	Carbon Reduction Measure	Costs and Resources	Examples of good practice:
Council energy supply	a-e) Develop an investment plan for renewables to 'self supply' electricity (as well as heat network) to council buildings, estate and assets.	<ul> <li>1MW heat pump has a one-off cost of £0.8m but income can be generated through RHI.<sup>1</sup></li> <li>Warrington Council invested £62m in a solar farm and storage with an operating surplus generated over the lifetime of the farm.<sup>1</sup></li> </ul>	Warrington city Council own <u>two solar farms</u> outside of the city. Enough energy is generated to power a town and it is expected to generate income for the local authority
	<ul> <li>a-e) Ensure any excess demand not met by council owned renewables is from (3rd party) purchased renewables.</li> <li>Challenge the 'quality' (i.e. how additional) of green energy</li> <li>Explore the potential of a PPA with other local organisations</li> </ul>	Negligible. The cost of switching to a 100% renewable energy provider can be cheaper than an alternative energy provider. <sup>2</sup> Council resourcing time to facilitate PPA.	Swindon Council developed a wholly owned subsidiary of the council, delivering the first renewable energy community Individual Savings <u>Account (</u> ISA) attracting local investment of £2.4m, a widely praised project. Kent's Cleve Hill Solar Farm produces enough
City-wide energy supply	a-e) Deliver community energy projects and provide guidance to local residents and schools	Additional staff resource.	power for 91,000 homes and generates over £1n a year for local authorities.
	a-d) Incorporate renewable energy and heat network opportunities into the local plan and provide guidance to developers. Request installation in commercial building upgrades through the planning approval process	Within existing staff resources.	
	a-d) Work to align the energy strategy and spatial strategy to ensure energy policies can be implemented.	Within existing staff resources.	
	a-d) Conduct up to date feasibility study into the potential for alternative renewable sources.	Feasibility and engagement campaign £20,000- £30,000.²	
	a-d) Deliver support for SMEs to access funding and skills for energy projects.	Additional staff resource.	

**Anthesis** 

1 – <u>Ashden</u> 31 Actions for Councils 2 – Based on Anthesis knowledge and Industry Experience

# 5. Hydrogen





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"Producing hydrogen in low-carbon ways and using it to meet challenging demands (e.g. for heat in industrial processes, for heating buildings on colder winter days and for heavy transport) is likely to be an important part of the next stage of the UK's energy transition."

**Committee on Climate Change** 





# **5. Hydrogen** Introduction

Hydrogen has been discussed as an alternative fuel source for some time and whilst it has promised much, little to date has been widely delivered or implemented.<sup>1</sup> Nevertheless, it remains a topic of interest and is often cited as part of a low carbon future.

Hydrogen can be used in a fuel cell to generate electricity. It does not involve combustion but an electrochemical reaction and can run indefinitely providing there is a fuel source and oxygen<sup>2</sup>. Hydrogen can also be burned in any engine or boiler but the fuelling system must be hydrogen specific. Despite its high abundance on earth, hydrogen is not readily accessible as it bound in molecules. This means it has to be extracted. The most common method currently used is natural gas reforming which involves steam reacting with hydrocarbons (from fossil fuels) to produce hydrogen. It is also possible to use electrolysis to extract hydrogen from water.

#### Hydrogen Potential

Hydrogen has been identified as a having a role in the green energy transition because of its properties as a light, storable, energy dense fuel which produces no direct carbon emissions when it is used (however the production of hydrogen itself can emit carbon).<sup>3</sup> There are several qualities cited in support of its development:

- Compliments electrification Hydrogen could have a role in decarbonising sectors which are difficult to electrify.
- Storage potential Hydrogen is potentially a leading option for storing the energy generated from renewables.<sup>3</sup>
- Versatility It has been identified as a potential fuel source in a variety of sectors including Transport, Buildings, Industry and Power Generation.

#### Figure 23: Examples of headlines on hydrogen

# It is time to unlock the potential of hydrogen

Hydrogen energy industry looks to grow in Wales

### UK Hydrogen Taskforce launched

### Hydrogen will never be a full solution to our green energy problems

# Key reports:

- International Energy Agency -The Future of Hydrogen
- International Renewable Energy <u>Agency -</u> Hydrogen: A Renewable Energy Perspective
- <u>Committee on Climate Change</u>
   <u>-</u>Hydrogen in a low carbon economy
- <u>UK FIRES -</u> Absolute Zero

#### Case Study: <u>HyDeploy</u>

This UK based project aims to demonstrate the benefits of injecting 20% volume of hydrogen into the existing natural gas network to heat homes.

- In the first phase of its development, hydrogen in being injected into the private gas network at Keele University. This trial is currently ongoing.
- Following on from this, the goal is to carry out a larger demonstration on a public gas network in the North East

HyDeploy argue that this is a safer and greener alternative to the natural gas we use now. They estimate that if this 20% injection was rolled out across the country it would save 6 million tonnes of  $CO_2$  per year.



# 5. Hydrogen Introduction

#### Limitations

Despite its identified potential, there are several limitations to using hydrogen which explain why it has not been deployed widely:

- Limited commercial viability At present in the UK, hydrogen is not commercially competitive due to the limited production and technology available to create a market for hydrogen.<sup>1</sup>
- Not currently low carbon –Less than 0.1% of global production of hydrogen comes from electrolysis, it is almost entirely supplied by natural gas and coal.<sup>2</sup> This means that global hydrogen production has an emissions footprint greater than the UK.<sup>2</sup> Producing hydrogen through electrolysis from renewable electricity involve losses in electricity<sup>3</sup> (Figure 24). Fuel cells have an electrical efficiency of up to 60% and there is currently limited surplus of renewable energy available to supply this.<sup>1</sup> It has been suggested the hydrogen could also be produced through Carbon Capture and Storage however this is itself yet to be developed at scale.<sup>3</sup>
- Technical feasibility There are safety risks associated with the deployment of hydrogen that would have to be addressed such as leakage issues (it is a smaller molecule than natural gas), ignition temperature and NOx production.<sup>1</sup> Energy carriers such as ammonia and liquid organic hydrogen carriers also have a variety of safety considerations.<sup>1</sup>

Whilst there is growing research into a blending hydrogen into the gas network, this would still involve some level of natural gas and so would have a much smaller emissions saving.<sup>1</sup> A 100% switch to hydrogen from natural gas would require new infrastructure and new appliances in homes.

Figure 24: Illustration of the losses from electrolysis to produce hydrogen, dependent on application (Source: Absolute Zero)





#### Birmingham Hydrogen Analysis:

In the subsequent pages, Anthesis have provided a simplified theoretical model output of the potential for hydrogen in Birmingham based on publicly available reports. The contribution of hydrogen is considered in addition to the most ambitious SCATTER projection (see Figure 25) in line with the CCC's advice. The aim is to provide a highlevel overlook of hydrogen potential by comparing the carbon intensities of alternative sources and does not go into detail on the objects or technologies replaced. The model considers time-frame and availability of hydrogen/implementation.

The modelling has focused on public transport and domestic heat as two potential areas for hydrogen usage. Analysis of the potential of hydrogen in industry has not been carried out due to limitations in process data available and incompatibility to the modelled SCATTER scenario.

We acknowledge inherent limitations in assumptions applied – these are simply intended to help inform relative priority of actions and how more robust estimates could be performed.
# **5. Hydrogen** Public Transport Modelling

There is a possible role for hydrogen in decarbonising heavy duty transport modes such as buses and trains which may be more difficult or expensive to electrify. Using fuel cells in buses and trains could also have limited hydrogen infrastructure requirements.<sup>1</sup>

## Methodology

**Availability** - Scenarios have been extracted from SCATTER pathways alongside "Tyseley Energy Park Energy Strategy report" produced by SIEMENS (2019)

- Moderate (current) ambition anticipates an initial hydrogen production of 0.7kt/year = 22 buses and 2 trains.
- High ambition aligns to an initial 1.9kt/year of hydrogen production = 50 buses and 6 trains.
- Rail is expected to make significant improvements in the high ambition SCATTER scenario. Once the emissions for rail have been reduced to zero, the remaining hydrogen has been allocated to bus travel.

**Timeframe** – Deployment starts from 2030 onwards<sup>2</sup> and then applies a yearly implementation rate of 0.2 to 2050.

**Implementation** – The model assumes a 5-fold increase in hydrogen availability by 2050 including other sources as well as Tyseley Energy Park.

## Results

Anthesis

- The graphs presented show the residual emissions of the whole transport sector, with the potential contribution of hydrogen highlighted in darker green.
- The moderate ambition scenario further reduces emissions after electrification by 22% and the high ambition scenario by 78%.
- In comparison to a business as usual scenario for Birmingham, electrification and modal shift reduces 2050 emissions by 57% and hydrogen reduces by a further 9%. The bulk of the reductions would be achieved through demand and electrification measures.
- The key limiting factor in this analysis was the availability of hydrogen. The model considers locally produced hydrogen as this would have the lowest footprint and avoids some of the issues with transporting hydrogen.

Figure 25: Moderate ambition hydrogen scenario for Birmingham's transport sector only

1000

900 800

700

600

500

400

300

200

100

1000

900

800 700

600

500

400

300

200

100

0

2020

2025

Hydrogen savings

KtCO<sub>2</sub>e

0

2020

KtCO<sub>2</sub>e

Figure 26: High ambition hydrogen transport scenario for Birmingham's transport sector only

1 –Committee on Climate Change – <u>Hydrogen in a Low Carbon Economy</u> 2 - "Tyseley Energy Park Energy Strategy report"\_

2040

2045

– – – No hydrogen scenario

2050

109

2035

Residual emissions

2030

## **5. Hydrogen** Domestic Heating Modelling

Hydrogen has been identified as a potential fuel source for heating in domestic properties, particularly in meeting the demand for low carbon heat during higher demand periods in winter. This is because of its potential to be blended with natural gas or make use of the extensive gas network currently used.

### Methodology

Timeframe - Implementation year of 2030.

**Implementation** – Assumes 20% of heating demand is supplied by hydrogen in 2050 and the implementation rate is linear.

Carbon Intensity for hydrogen assumed to be 122 gCO<sub>2</sub>e/kwh<sup>1</sup>. This is based on the best technologies currently available and reiterates the fact that hydrogen production is currently carbon intensive. Further reductions to this factor may be possible through future technologies such as carbon capture and storage. However, it is extremely difficult to predict the success/penetration of these technologies so a constant carbon factor has been applied in this analysis.

## Results

Anthesis

- The results of this modelling scenario show that the emissions from domestic heating sector would actually increase with the adoption of current hydrogen fuel technology.
- This in part down to the fact this model does not predict a future carbon intensity reduction of hydrogen and from 2030 it is expected to be worse than the fuel mix of SCATTER's most ambitious projection (see Table 5).
- Whilst this may decrease over time, the results demonstrate the importance of other technologies in a low carbon transition and that hydrogen at its current level of development cannot displace already established and at scale technologies.
- The key limiting factor is the carbon intensity of the production of hydrogen for domestic properties.

#### Figure 27: Hydrogen used in domestic heating scenario



### Table 5: Emissions factors for hydrogen in domestic properties

Scenario	2050 carbon intensity
SCATTER Level 4	0.01468
+ 20% hydrogen supply	0.03717

# 5. Hydrogen Summary

- The results from these simplified models of hydrogen potential further highlight the barriers faced by limited supply of hydrogen and carbon intensive methods of hydrogen production.
- In light of the limitations discussed, the <u>Committee on Climate Change</u> suggest that hydrogen should be considered **selectively** where electrification is not feasible. This includes the following sectors:
  - Domestic heating
  - Transport HGVs including buses and Trains
  - Heavy Industry
- Whilst this means there is a potentially important role for hydrogen in the low carbon energy transition, it is still very much in development and significant rollout and savings will not be realised in the short term.
- Therefore, for the time being Birmingham City Council should support the research and trialling of hydrogen and prepare infrastructure for future adoption.
- Given the urgency of the climate emergency, this **must be balanced** with the roll-out of already established and readily available green technology such as electric cars, heat pumps and electric heating systems.





# 6. Monitoring and Reporting





# **Monitoring and Reporting** Introduction

This section seeks to provide a process for the continued monitoring and reporting of GHG emissions data for BCC and Birmingham City. The purpose of monitoring and reporting is to ensure there is a defined method for checking progress on key indicators towards the ambitious goals set out by BCC.

- Council emissions profile: Ensuring there is an internal process, responsibility and timeline for monitoring and reporting on the council's carbon footprint in line with the council's net zero carbon by 2030 ambition
- City-wide emissions profile: Ensuring there is an process, responsibility and timeline for monitoring and reporting on the city's emissions profile, to enable progress to be tracked towards the net zero carbon by 2030 ambition

In order to facilitate the above and ensure that progress is made towards the goals, there will need to be continued data collection procedures in place across all sectors and themes outlined in the report. The next pages of this section dive into the requirements for data collection in addition to the processes for assessing and reporting across the two inventory boundaries.







Sustainable

development

in environmental,

social, and/or

due to mitigation actions



GHG effects, i.e., change in GHG emissions, due to effects, i.e., changes mitigation actions economic conditions.

Progress made toward implementing mitigation actions

Figure 28: Monitoring and Reporting on mitigation actions Source: WRI Measurement, Reporting and Verification (MRV) types



## **Monitoring and Reporting Council Emissions**

## Monitoring

It will be vital for continued annual measurement of BCC's activities in the key areas of operation in order to understand if the projects underway have had the desired impact of reducing the council's emissions. Whilst monitoring specific emissions reductions from specific programmes or projects is more difficult, tracking key indicators will enable continued monitoring of key emissions drivers for BCC.

## Reporting

Typically, council emissions profiles are not reported to external bodies and are used as an internal line in the sand to track progress against defined goals and identify areas for efficiency and reduction potential. Reporting on progress on emissions reduction can also be useful in demonstrating leadership from the council to citizens and businesses. This capitalises on the ability of BCC to influence the decisions and activities of external individuals and organisations to reflect the ambition in their own operations. The method uses the Greenhouse Gas Protocol (Corporate Standard).



- From Anthesis' data collection, it was possible to identify key gaps and inefficiencies in databases, including:
- 1) Access to more readily available fleet data.
- 2) Better categorised contracts and a strategic review of procurement data3) Lack of clarity on gas supply for leased buildings. Only electricity was visible in
- the data; either because heat is all electrified or BCC do not pay the bills. 4) Regularly conducted, consistent staff travel surveys.
- Current year context: Training

Tools and training will be provided to help enable and empower staff to better monitor key metrics and associated impacts.





# **Monitoring and Reporting City-wide Emissions**

By preparing an updated annual city-wide emissions inventory aligned with the city-wide inventory provided in Chapter 3, progress towards the net zero ambition for the city can be monitored over time.

### Monitoring

SCATTER provides a GHG inventory for emissions across the city based on publicly available datasets following guidance from the Global Protocol for City-wide GHG Emissions (GPC). The continued collection and calculation of this data into tonnes of carbon dioxide equivalent for all major sectors across the city will be essential to monitor progress. Should the calculation methodology or data sources change, it will be vital to recalibrate previous inventories in order to ensure data is comparable over time.

## Reporting

The SCATTER inventory is prepared in the format aligned to the Global Covenant of Mayors for Climate and Energy (GCoM), under the Common Reporting Framework, of which Birmingham City Council is a signatory. It will be important for BCC to continue reporting the latest city-wide inventory to GCoM as this will:

- Allow progress to be verified externally
- Demonstrate leadership to other cities and local authorities
- Support peer-to-peer learning through the GCoM network





### Monitoring and Reporting on Actions

Whilst there are no defined guidelines for monitoring and reporting on actions undertaken by councils to support the low carbon transition, it is advised to track key metrics to support monitoring of progress on each action.

*"It is vital for good governance of our strategy that the effectiveness of individual actions and their overall impact are regularly monitored and reported on. In order to do this we will continue the activities of our Climate Change Steering Group which comprises senior personnel from relevant departments.*"

Their task will be to oversee and coordinate individual actions, to monitor cost effectiveness and  $CO_2$  savings and to recommend changes to initiatives and the overall programme as required. "Climate Change Strategy for Warrington



# 6. Monitoring and Reporting

Chapter	Monitoring and Reporting on Carbon Reduction Measure	Key metric(s)	Costs and Resources
	Develop a monitoring and communication campaign to reduce energy use.	Energy use data (kWh)	Carbon Trust estimates that the cost of a campaign is 1-2% of an annual energy bill. <sup>1</sup>
Council	Develop a monitoring and communication campaign to reduce waste and increase recycling, including paper.	Volumes of waste generated (kg) Volume of waste recycled (kg)	Additional staff resources
	Develop a SMART Action Plan and monitoring system and share experiences with other businesses and other organisations	As above	Additional staff resources.
	Establish monitoring systems and better holding commissioned suppliers to account on their carbon performance.	Whether supply has measured footprint (Y/N) in tCO <sub>2</sub>	Additional staff resources.
	Define a process for undertaking regular staff travel and commuting surveys to allow better monitoring of internal travel methods.	Distance travelled (km) Modes of travel	Additional staff resources.
	Introduce a fleet management system and telematics to monitor pool car usage and mileage.	Mileage and vehicle types	If data is not available, then investment in telematics may be required to monitor mileage
	Implement standardised monitoring plus annual reporting of energy use and results of Display Energy Certificates (as applicable) at all council sites, including those not covered by centrally procured energy contracts.	Energy use data (kWh) Number of DEC in place	Proposed one officer to lead in coordinating efforts (c.£50,000 per annum).
Buildings	Develop and implement a pathway for increased measurement and reporting of i) energy demand and ii) improved energy efficiency in privately owned commercial buildings.	Energy use data (kWh) Energy efficiency measures	Team of three officers to provide outreach to business and manage project (£150,000 per annum) The Carbon Trust has a free carbon footprint tool for SMEs.
	Use energy monitoring and EPC data to drive a segmented approach, tackling those with largest impact and biggest opportunity.	Number of houses and EPC rating of houses	Officer time to complete analysis / outsource.



# 6. Monitoring and Reporting

Chapter	Monitoring and Reporting on Carbon Reduction Measure	Key metric(s)	Costs and Resources
	Define a process for monitoring renewable energy developments including small scale installations.	Installed capacity (MW) Energy generation (MWh) Number of installations	Additional staff resources.
Energy	Report on the progress of current heat network projects.	Number and scale of projects Installed capacity (MW)	Officer time.
Review and monitor current and future developments for potential localised renewable energy supply.		Number and scale of projects Installed capacity (MW)	Additional staff resources.
Transport	Define a process for undertaking regular travel and commuting surveys of the public.	Mode of travel Distance travelled (km) Number of journeys	Additional staff resources.
Transport	Monitor and report on the uptake of EVs and installation of EV charging infrastructure across the city	Number of EVs and types Number of EV charge points Type of EV charge points	Officer time.
Natural Environment	Natural Environment Monitor and measure progress towards afforestation through land-use surveys.		Fee for land-use surveys.
Monitor the outcomes of community sequestration schemes.		Number of trees	Officer time.
	Continue to monitor and report on collected and recycled waste across the city.	Volumes of waste generated (kg)	Officer time.
Waste	Develop incentives for businesses to monitor and report on the waste they generate.	Volume of waste recycled (kg)	Officer time.
Industry	Work with WMCA to engage with key industrial businesses to recommend monitoring and reporting of their emissions and energy use.	Tonnes of carbon dioxide (tCO <sub>2</sub> ) Energy use data (kWh)	Officer time.



# Appendices





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## **Appendix 1** Data Tables for SCATTER Inventories

IE= Included ElsewhereNE= Not EstimatedNO= Not Occurring

**Anthesis** 

Sub Sector	Direct, KtCO2e	Indirect, KtCU <sub>2</sub> e	
Residential buildings	1005.2	561.3	
Commercial buildings & facilities	178.1	97.4	
Institutional buildings & facilities	287.6	492.2	
Industrial buildings & facilities	222.0	285.3	
Agriculture	1.0	0.0	
Fugitive emissions	0.0	n/a	
On-road	1220.3	IE	
Rail	28.4	IE	
Waterborne navigation	3.4	NO	
Aviation	NO	IE	
Off-road	12.2	IE	
Solid waste disposal	41.3	n/a	
Biological treatment	0.0	n/a	
Incineration and open burning	0.0	n/a	
Wastewater	70.9	n/a	
Industrial process	70.9 n/a		
Product use	0.0	n/a	
Livestock	0.3	n/a	
Land use	-17.6	n/a	
Other AFOLU	0.0	n/a	
Electricity-only generation	366.9	n/a	
CHP generation	2.1	n/a	
Heat/cold generation	NO	n/a	
Local renewable generation	3.8 n/a		
Sub-total	otal 3123.9 1436.2		
Grand total	4560.1		

### SCATTER data

- The table to the right shows a breakdown of emissions for Birmingham City's 2017 footprint.
- The inventory pie charts presented on page 25 do not include agriculture and land use processes as these typically have a negative value for emissions. However , they are presented in this data table.
- 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.
- For more information on SCATTER methodology refer to the following appendices or <a href="https://scattercities.com/">https://scattercities.com/</a>.

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# Appendix 2

## **BEIS Emissions Summaries**

Sector	Scope 1 & 2 Emissions, ktCO <sub>2</sub>
Industry and Commercial Electricity	645.4
Industry and Commercial Gas	588.1
Large Industrial Installations	15.7
Industrial and Commercial Other Fuels	122.8
Agriculture	1.6
Domestic Electricity	402.5
Domestic Gas	1,028.3
Domestic 'Other Fuels'	23.5
Road Transport (A roads)	407.7
Road Transport (Motorways)	213.2
Road Transport (Minor roads)	718.8
Diesel Railways	31.6
Transport Other	23.0
LULUCF Net Emissions	-3.8
Grand Total	4,218.4

## Differences from SCATTER

- BEIS also provide data on greenhouse gas emissions at a local authority level.
- The BEIS data (above) and SCATTER data (previous page) show different totals and sectors because they are compiled using different methodologies. The SCATTER model and BEIS datasets are for the 2017 reporting period. See Appendix 3 for a further summary of the difference in methodology.



Transport (33%)



# Appendix 3 SCATTER Frequently Asked Questions

# What do the different emissions categories mean within the SCATTER Inventory?

**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 <u>CDP</u> / <u>Global</u> <u>Covenant of Mayors</u> reporting.

The BEIS Local Emissions Summary does not differentiate between direct/indirect/other (or the various 'scopes').

# **Anthesis**

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 <u>Global</u> <u>Protocol for Community-Scale Greenhouse Gas Emission</u> <u>Inventories ("GPC")</u>, as accepted by <u>CDP</u> and the <u>Global</u> <u>Covenant of Mayors</u>.
- The BEIS Local Emissions Summary represents Local Authority level <u>data</u> 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 <u>DUKES</u> 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 the area administered by Birmingham City Council.
- The full methodology available on request at http://SCATTERcities.com.

# Why does the BEIS summary differ from the SCATTER summary?

- The BEIS summary **represents**  $CO_2$  **only**; SCATTER also includes emissions factors for other greenhouse gases such as Nitrous Oxide (N<sub>2</sub>O) and Methane (CH<sub>4</sub>). These are reported as a CO<sub>2</sub> 'equivalents (e)'.
- The BEIS summary **does not provide scope split**; SCATTER reports emissions by scope 1, 2, and 3 (i.e. direct, indirect or other categories).
- The BEIS summary categories are not directly consistent or mapped to the BEIS LA fuel data which is available as a separate data set. 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 with regards to road transport, BEIS data splits total emissions across road type; SCATTER uses fuel consumption for onroad transport per LA.
- Different treatment of 'rural' emissions i.e. Agriculture, Forestry and Other Land Use (AFOLU) and Land Use, Land Use Change & Forestry (LULUCF) categories are derived from different underlying data sets and have been explored further within Section 5 of this report.

## **Appendix 4** Deriving the Birmingham carbon budget

## Aviation and shipping

Aviation and shipping emissions are deducted from the budget at the UK level, **not** at the Birmingham City region level. Therefore, the carbon budget allocated to Birmingham under the Tyndall Centre analysis does not include aviation emissions.

The Tyndall Centre analysis assumes the UK emissions from aviation as remaining constant up until 2030, followed by a linear reduction to full decarbonisation in the sector until 2075. These aviation assumptions are at odds with current market trends, <u>which indicate</u> that worldwide emissions from flights rose by 32% between 2013 and 2018. Similarly, Airbus <u>recently reported</u> they anticipate the number of commercial planes in operation to double by 2038.

With government predictions expecting significant growth in aviation and shipping emissions, this would erode the remaining UK budget available for local authorities, requiring even greater reductions in other emissions in order to keep within the 1.5 °C budget. It is therefore recommended that local and national governments work collaboratively to consider strategies that limit emissions growth from aviation and shipping.

For the avoidance of doubt; Tyndall Centre Research does not suggest that action to reduce Aviation and Shipping is limited to the national level.

By 2035, emissions must reduce by over 90% against 2015 levels to remain in budget

### **Budget milestones**

The table below gives the cumulative emissions totals and percentage reductions against 2015 baselines for Birmingham:

Table 6: Birmingham City region Carbon Budget, Tyndall Centre analysis

Year	Reduction in emissions against 2015 levels
2020	25%
2025	62%
2030	81%
2035	90%
2040	95%
2045	98%
2050	99%



# Appendix 5 The SCATTER Model



**SCATTER 'Level 1' Pathway** – Assumes the selected region doesn't take much action beyond current, national policy and nationally led decarbonisation of the electricity grid.<sup>1</sup>

SCATTER "Level 4" Pathway – Assumes the selected region goes significantly beyond national policy and National Grid assumptions, across both energy supply and demand measures. Many assumptions aligned with the legacy DECC 2050 Pathways calculator 'Level 4'. See Appendix 4 for further details.

**Tyndall Paris Aligned Budget** – The finite, cumulative amount that the region should emit between now and 2050, based on research performed by the Tyndall Centre for Climate Change Research.<sup>2</sup>

**Tyndall Paris Aligned Pathway** – The yearly totals that must reduce 12.8% on average each year to keep within the budget. Note: Unlike the SCATTER Pathways, this does not specify what tangible measures could achieve this pathway, rather, it sets out what science (IPCC<sup>3</sup>) indicates we need to aim for.

# **Anthesis**

### Exploring the SCATTER trajectory

The pathways graph on the left shows two possible future emissions pathways over time, as modelled by the SCATTER pathways tool. This tool focuses on energy system (fossil fuel consumption) emissions reductions within Birmingham. The pathways do not represent reductions outside of the BCC city boundary (i.e. consumption-based emissions). While the tool SCATTER tool chart demonstrates a timeline to 2050, the reductions shown to 2030 are expected as a result of the described emissions reduction measures.

### Closing the gap

Gaps exists between the SCATTER Level 4 Pathway and the Tyndall Paris Aligned Pathway / zero carbon axis is because modelling assumptions are based on present day evidence & judgment. Such assumptions are not intended to constrain the future ambition to close the gap. In addition, there is a gap between the net zero ambition for 2030 and the expected trajectory for level 4 ambition. To close this gap, there will need to be consideration for offsetting measures either in-boundary or out-of-boundary, using negative emissions technologies or further natural carbon sequestration beyond what has been described.

Both Pathways can be compared against the Tyndall Centre for Climate Change Research's Paris Aligned Budget. This is derived from climate science<sup>3</sup> and applies a method for scaling down global carbon emissions budgets that are 'likely' to keep temperature change "well below 2°C and pursuing 1.5°C", to local authority regions. Unlike the SCATTER pathways, this is based on climate science, not tangible energy supply and demand measures in region. The cumulative nature of CO<sub>2</sub> reinforces the need for to take a 'budget' approach, where any annual shortfalls accumulate over time. This Pathway is just one way of allocating a finite, carbon budget (the area underneath the curve). Alternatively, the same budget will last only 7 years if emissions remain at current levels. This highlights the need for urgent action **now**.

- 2 This is based on information not yet publicly available, however the method is broadly comparable with work performed for the Greater Manchester Combined Authority and the City of Manchester. Contact c.w.jones@tyndall.ac.uk for further information.
  - 3 Intergovernmental Panel on Climate Change, <u>1.5°C Special Report</u>, 2018

4 – Data is published 2 years in arrears, 2017 published data is represented on the graph as the SCATTER Pathways tool had not been updated at the time of writing. % Reduction figures presented do reflect the 2018 published BEIS data

<sup>1 –</sup> The BAU carbon intensity of electricity tracks the National Grid Future Energy Scenario (FES) "2 Degrees", 2017), on the basis that this was aligned with the legislated targets at the time the SCATTER tool was developed.

# **Appendix 5** The SCATTER Model

## About the model

SCATTER is intended to serve as one of many information sources to help users inform their priorities for emissions reduction. Specifically with reference to the forward-looking pathways modelling element, it is intended to focus on the 'what' rather than the 'how'. It is important to note that SCATTER does not intend to prescribe certain technologies or policies, and similarly does not intend to discount other methods of arriving at the same outcome, just because they do not feature in the model. The SCATTER pathways serve as 'lines in the sand' and give users an indication of whether they are likely to be on-target or off-target for a carbon neutral trajectory through the adoption of interventions to drive the transition to a low carbon economy.

Naturally, technologies, assumptions and approaches to energy models are evolving all the time, and we would welcome the opportunity to receive feedback and/or collaborate on refinements of SCATTER in the future. Please share any feedback with <u>scatter@anthesisgroup.com</u>.

### **Basic principles**

Sir David MacKay's 'Sustainable Energy - Without Hot Air (2009)" underpins the basis for the pathways modelling. As a scientific advisor to the Department for Energy & Climate Change (DECC), now BEIS, MacKay's work led to the development of the 2050 Pathways calculator. An open source, Microsoft Excel version of this tool was published by DECC which we used as the foundation for SCATTER.

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: Technology specifications changes were reviewed and updated where judged to be out of date and constraining ambition. Given that almost a decade had passed since 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. We also referenced the 2050 Wiki page during the course of the update.

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.





# Appendix 6 Supply & Demand

The energy system has two main components; energy supply, and energy demand. In this report, the term 'energy system' relates to energy in the form of solid, liquid and gaseous energy that is used to provide fuel, heat and electricity across buildings, transport and industrial sectors. Energy must be supplied to each of these sectors, in order to meet the demand for energy that the sectors require. Demand drives the amount of supply we need, and actors such as businesses, residents and public services all play a part in contributing to this demand.

Future demand is hard to predict. Recently published analysis within the National Grid's Future Energy Scenarios (FES) 2019 indicates that even under a scenario that meets the UK's net zero by 2050 (Two Degrees), electricity demand still increases. SCATTER's L4 Pathway on the other hand (consistent with the legacy 2050 Pathways tool), assumes that electricity demand still reduces overall. 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.

### Reducing demand should always come first.

**Economically**, this usually makes sense, whether at an individual, organizational or city level. For example, energy bills can reduce and at a city level, costs associated with installing new generation assets, new grid connections and grid reinforcement works and be minimised.

Socially, there are benefits if citizens can be better off if they shift to healthier forms of transport just as walking & cycling, or increase efficiency of journeys by car sharing.

#### Table 7: FES & SCATTER Demand side assumptions at 2030 and 2050.

Source	Change in current <sup>1</sup> demand		
	2030	2050	
FES Two Degrees (2019)	▲ 5%	▲ 48%	
SCATTER Level 4 (L4) Pathway	▼ 25%	▼ 45%	

Environmentally, emissions savings can often be achieved much quicker by implementing various demand side behaviour changes or 'quick win' efficiency measures. This can help safeguard carbon budgets and avoid placing too much reliance on slower, riskier, renewable supply infrastructure to deliver the emissions savings so critically required.

The potential for demand reduction is still huge. The International Energy Agency (IEA) estimated that efficiency measures (i.e. demand side reduction), could contribute 40% towards our emissions targets<sup>2</sup>.



# **Appendix 7** Summary list of modifications between SCATTER and DECC Pathways Calculator

Measure	Updated from original Pathways Calculator?
Energy generation & storage	
Onshore wind	Ν
Biomass power stations	Υ
Solar panels for electricity	Ν
Solar panels for hot water	Ν
Storage, demand shifting & interconnection	Ν
Geothermal	Ν
Hydro	Ν
CCS	Ν
Bioenergy sourcing	
Increase in land used to grow crops for bioenergy	Υ
Reduction in quantity of waste	Ν
Increase the proportion of waste recycled	Υ
Bioenergy imports	Ν
Transport	
Reducing distance travelled by individuals	Ν
Shift to zero emission transport	Ν
Choice of fuel cell or battery powered zero emission vehicles	Ν
Freight: Shift to rail and water and low emission HGVs	Ν

Measure	Updated from original Pathways Calculator?
Domestic buildings	
Average temperature of homes	Ν
Home insulation	Υ
Home heating electrification	Υ
Home heating that isn't electric	Ν
Home lighting & appliances	Ν
Electrification of home cooking	Ν
Commercial buildings	
Commercial demand for heating and cooling	Y
Commercial heating electrification	Υ
Commercial heating that isn't electric	Ν
Commercial lighting & appliances	Ν
Electrification of commercial cooking	Ν
Industrial processes	
Energy intensity of industry	Y

#### Notes on updates to the SCATTER model

- Updates flagged do not include scaling to local region it is assumed that this happened for all measures. They relate to instances where the upper threshold of the ambition has been pushed further(i.e. at Level 4)
- Updates exclude alignment of Level 1 ambition to the National Grid FES (2017)
- Note that bioenergy source did not have material bearing on the model due to assumptions linked to bioenergy shortfalls (i.e. it is assumed that bioenergy would be sourced from outside of region, or another renewable source would be used). Waste assumptions may however drive more sustainable consumption behaviours.

# **Appendix 8** Domestic Retrofit Measures Assumed Within SCATTER

Retrofit Measure	Number of households retrofitted per annum					
Year	2025	2030	2035	2040	2045	2050
Solid wall insulation	3,708	3,805	3,878	5,080	41	41
Cavity wall insulation	188	266	269	1,561	-	-
Floor insulation	4,231	4,342	4,425	5,796	4,474	4,474
Superglazing	8,412	8,633	8,798	11,524	8,895	8,895
Lofts	9,228	9,491	9,672	13,013	-	-
Draughtproofing	555	771	781	4,338	43	43

### Domestic retrofit assumptions

- This data is included within SCATTER but is not directly linked to the emissions calculation in the model (it was used to inform cost assumptions in the original legacy DECC 2050 Pathways calculator).
- The numbers shown are the minimum assumed measures for the L4 Pathway, as ambition was pushed further than the legacy DECC tool to which this table relates.
- 2050 household levels are predicted to be 533,520, derived from non-region specific growth assumptions in legacy DECC Pathways tool.
- Household is defined as per <u>https://www.gov.uk/guidance/definitions-of-general-housing-terms#household</u>
- The average heat loss per home includes new builds (at PassivHaus standard), which will contribute to lowering the average over time.
- For further detail, please refer to Section D of the DECC 2050 Pathways guidance:



# **Appendix 9** Energy Performance Certificates (EPCs)

Non-domestic EPC ratings for Birmingham, 2008-19			
EPC rating	Number of lodgements		
А	193		
A+	1		
В	1503		
С	4983		
D	5487		
Е	2976		
F	1137		
G	1236		
Not Recorded	9		
Total number of lodgements	17,525		

Domestic EP Birminghar	Domestic EPC ratings for Birmingham, 2008-19				
EPC Rating	Number of lodgements				
А	142				
В	8161				
С	74521				
D	147106				
E	84764				
F	18192				
G	5455				
Not Recorded	5				
Total number of lodgements	338,346				

Er	nergy Performance Certificates
•	Energy Performance Certificates provide an energy efficiency ratin from A (most) to G (least) and are valid for 10 years. It provides information on a properties energy use and typical energy costings Defining in terms of 'lodgements' allows direct comparison betwee domestic and non-domestic property.
	EPC rating.
•	Live reporting on the EPC ratings of all properties (both domestic a non-domestic) can be found at:
	https://www.gov.uk/government/statistical-data-sets/live-tables-centergy-performance-of-buildings-certificates#epcs-for-all-propertien non-domestic-and-domestic



## Appendix 10 Domestic & Commercial Heating and Hot Water Systems Assumed Within SCATTER

Heating and hot water systems share, as a % of households (domestic)					Heating and (commercia	
Technology package	2020	2025	2030	2040	2050	Technology
Gas boiler (old)	44%	37%	31%	19%	6%	Gas bo
Gas boiler (new)	39%	34%	28%	17%	6%	Gas bo
Resistive heating	7%	7%	7%	7%	7%	Resistiv
Oil-fired boiler	6%	6%	5%	3%	1%	Oil-fire
Solid-fuel boiler	2%	2%	2%	1%	0%	Solid-fu
Stirling engine $\mu$ CHP	-	-	-	-	-	Stirling er
Fuel-cell $\mu$ CHP	-	-	-	-	-	Fuel-ce
Air-source heat pump	1%	9%	18%	35%	52%	Air-source
Ground-source heat pump	-	4%	9%	17%	26%	Ground-s pu
Geothermal	-	-	-	-	-	Geot
Community scale gas CHP	1%	0%	0%	0%	0%	Communi C
Community scale solid- fuel CHP	-	-	-	-	-	Communit fue
District heating from power stations	-	0%	1%	2%	3%	District he power

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eating and hot water systems share, as a % of households commercial)							
echnology package	2020	2025	2030	2040	2050		
Gas boiler (old)	45%	37%	30%	15%	0%		
Gas boiler (new)	16%	13%	11%	5%	0%		
Resistive heating	18%	16%	14%	11%	7%		
Oil-fired boiler	8%	7%	5%	3%	0%		
Solid-fuel boiler	-	-	-	-	0%		
Stirling engine $\mu$ CHP	-	-	-	-	0%		
Fuel-cell $\mu$ CHP	-	-	-	-	0%		
Air-source heat pump	9%	17%	26%	43%	60%		
Ground-source heat pump	4%	9%	13%	21%	30%		
Geothermal	-	-	-	-	0%		
Community scale gas CHP	-	-	-	-	0%		
Community scale solid- fuel CHP	-	-	-	-	0%		
District heating from power stations	0%	1%	1%	2%	3%		

### Heat supply assumptions

- Domestic (left) and commercial (right) share of heating technologies assumed within SCATTER
- Matrix is unchanged from original DECC Pathways Calculator. It is acknowledged newer technologies or fuel sources such as hydrogen are not reflected in this tool.

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# **Appendix 11** Transport Assumptions

Projection of modal share of transport (units: % of passenger-km)					
Mode	2015	2050 BAU	2050 L4		
Walking	4%	4%	4%		
Bicycles	1%	1%	5%		
Cars, Vans, and Motorcycles	80%	80%	62%		
Buses	5%	5%	19%		
Railways	9%	9%	10%		
Travel demand relative to 2015	100%	100%	75%		

Ambition level (units: Pax* / vehicle-km) @ 2050						
Mode	2015	2050 BAU	2050 L4			
Cars, Vans, and Motorcycle s	1.56	1.56	1.65			
Buses	11.32	11.32	18.00			
Railways	0.32	0.37	0.42			

### **Transport Modal Assumptions**

This shows the underlying assumptions around the share of different transport modes and passenger numbers in 2050.

- The comparison between 2050 BAU and 2050 Level 4 pathway shows the need to reduce the share of car transport and shift to modes such as buses, bicycles and railways.
- The final row outlines that an overall reduction in distance travelled (regardless of mode) is also required
- Pax refers to any peoples, persons and occupants (i.e. passengers)



# **Appendix 12**

## **Intervention Estimated Carbon Savings**

Sector	Мозенго	Estimated cumulative carbon savings (tCO <sub>2</sub> e)			
	Inteasure	2025	2030	2050	
Domestic buildings	Reduce demand for domestic space heating & water through insulation, reduced heat demand & increased heat electrification.	2,369,726	5,043,170	20,933,320	
	Increase efficiency and electrification of domestic lighting, appliances, and cooking.	2,941,595	5,279,085	15,314,525	
Non-Domestic buildings	Reduce demand for non-domestic space heating & water through insulation, reduced heat demand & increased heat electrification.	1,039,858	2,168,304	9,002,845	
	Increase efficiency and electrification of commercial lighting, appliances, and cooking	474,293	864,863	2,613,094	
Transport	Road freight electrification and shift to rail freight	755,293	1,730,404	6,434,667	
	Phase out of fossil cars and buses and shift to electric vehicles Distance reduction Signiant modal shifts – increasing public transport use	3,727,711	7,848,932	27,068,375	
	Rail electrification	454,938	864,863	2,431,375	
Waste	Waste reduction and increase in recycling	212,386	593,374	3,267,323	
Industry	Improved industrial processes efficiency and electrification Carbon Capture and Storage	1,434,497	2,457,563	6,668,804	
Natural capital	Managing existing tree stocks and new tree planting	319,943*	551,629*	1,514,681*	
<b>Anthesis</b>					

### Estimated carbon savings:

- All savings are cumulative and estimated in relation to 2017 emissions levels.
- The base year of SCATTER is 2015 and so the trend in BEIS data from 2015 - 2017 has been applied to the SCATTER data in order to predict the 2017 emissions level.

\*Measures cumulative sequestration by existing and newly planted trees in line with the model underpinning data presented under Interventions: Natural Environment (Page 90).

## Appendix 12

## **Intervention Estimated Carbon Savings**

Sector	Measure	Estimated cumulative carbon savings (tCO <sub>2</sub> e)			
0000	Weasure	2025	2030	2050	
Energy supply	Increase solar PV capacity	785,322	1,766,783	9,320,951	
	Increase onshore wind capacity	818,376	1,813,891	9,880,871	
	Increasing bioenergy supply (heat & electricity)	1,409,960	2,503,783	6,516,308	
	Increasing solar thermal capacity	463,028	1,119,885	6,652,390	
	Increasing hydro power generation	132,583	234,569	642,737	
	Increasing wave, tidal and tidal stream power generation	1,404,938			
	Increasing hydrogen production for transport	57,000			

#### Estimated carbon savings

- The method for estimating carbon savings is different from that used previously as this is addressing supply.
- Savings are cumulative over the period 2019-2050, relative to 2018.
- Emissions savings are estimated by applying the 2018 national grid factor average of 248g/kWh to the difference between the most recent year's data (2018) generation output and future generation output at each of the yearly milestones (and interim years). We acknowledge that the grid factor is likely to reduce over time, meaning that savings are likely to materially higher than if compared to a later base year. The 2018 value has been used to avoid double counting the input of renewables.
- It is not appropriate to sum any savings presented from renewable supply with savings achieved on the demand side of the energy system, as this is may result in double counting.



# **Appendix 13** Glossary of Terms

AFOLU - Agriculture, forestry & land use.

BEIS – UK Government Department for Business, Energy and Industrial Strategy.

**Carbon dioxide equivalent (CO\_2e)** – the standard unit of measurement for greenhouse gases. One tonne of  $CO_2$  is roughly equivalent to seven months of commuting daily by car between Lewes & Brighton 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. 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 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.

**Co-benefit:** The positive effects that a policy or measure aimed at one objective might have on other objectives.

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

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

**EPC** – Energy Performance Certificate. An assessment which measures the energy efficiency of a building on a scale from A (most efficient) to G (least efficient).

EV – short for electric vehicle. A vehicle powered by an electric battery.

**Fuel poverty** – a person is considered to be in fuel poverty if they are a member of a household living on a lower income in a home which cannot be kept warm at reasonable cost. Statistically this has been defined as needing to spend amore than 10% of its income to maintain adequate heating.

**GHG** – Greenhouse gases; gases which when released into the atmosphere contribute to the greenhouse effect.

**HEV -** short for hybrid electric vehicle. A vehicle powered by some combination of electric and fossil fuel sources.

ICE - short for internal combustion engine. A vehicle powered by petrol or diesel fuel.

IPCC – Intergovernmental Panel for Climate Change.

LULUCF – Land use, land use change & forestry.



# **Appendix 13** Glossary of Terms

**Natural Capital:** This refers to the 'stocks' of renewable and non-renewable natural resources available to society. It refers to nature in the context of the five capitals model in economics (i.e. financial, manufactured, social, human and natural capital). It is associated with monetary or other valuation and accounting techniques. Examples include soil, water, and forests.

**NET** – negative emissions technology. Technologies which remove carbon dioxide from the atmosphere. Typically used in reference to technologies that differ from sequestration from natural capital.

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

**Science-based target** - a goal for emissions reduction developed in line with the scale of reductions required to keep global warming below a given temperature threshold (typically 1.5°C or 2°C) from pre-industrial levels.

**TCFD** – Taskforce for Climate-related Financial Disclosures. A corporate initiative which develops voluntary, consistent climate-related financial risk disclosures for use by companies in providing information to investors and other stakeholders.

**T&D** – Transmission and Distribution. The different stages of carrying electricity from the generator/power plant to a home or business for usage.

**Thermal leakiness -** Thermal leakiness is a measure of how well a house **retains heat**. A house with high thermal leakiness will not retain heat very easily and will be more expensive to keep warm. Thermal leakiness is dependent on thermal conductivity of the

building fabric (i.e. .'U-values' of ceilings, floors, walls and windows), ventilation (i.e. effectiveness of draught-proofing) and the temperature difference with the outside (i.e. the average temperature of the home based on the occupant's preference or use of thermostat).

**ULEV** – short for Ultra Low Emission Vehicle. Currently defined as a vehicle which emits less than 75 grams of  $CO_2$  per kilometre (g/km).

**WTT** – well to tank. An average of all GHG emissions released into the atmosphere from the production, processing and delivery of fuel.



## **Appendix 14**

## Sector Analysis: Internal Council Behaviour Change and Council Strategy and Engagement- References

#### Internal Council Behaviour change

#### Delivery

- Job seekers target companies putting sustainability into practice
- 2 Impact of the Cycle to Work Scheme
- 3 https://employeebenefits.co.uk/does-flexible-working-improve-mental-wellbeing/

#### Key Recommended Next Steps:

- 1– <u>Ashden 31</u> Actions for Councils
- 2 Based on email correspondence with the Carbon Literacy Project (05/12/19).

#### Council Strategy and Engagement

**Delivery** 1 - Ashden <u>Climate Action Co-Benefits Toolkit</u>

**Key Recommended Next Steps (page 1)** 1 – Based on Anthesis knowledge and experience. 2 – <u>Ashden 31</u> Actions for Councils

Key Recommended Next Steps (page 2) 1 – Based on Anthesis knowledge and experience. 2 – Ashden 31 Actions for Councils



## **Sectoral Analysis: Buildings - References**

#### Background: Current Context

- 1. https://www.birmingham.gov.uk/news/article/418/birmingham\_reveals\_ten\_year\_housing\_plan plus stakeholder interview
- 2. https://www.gov.uk/government/statistics/household-energy-efficiency-statistics-headline-release-january-2020. Based on 411.000 households in Birmingham
- 3.https://www.birmingham.gov.uk/news/article/273/sport\_and\_recreation\_moves\_to\_the\_next\_level\_as\_new\_northfield\_leisu
- recentre opens to public
- 4. https://www.engie.co.uk/wp-content/uploads/2016/12/birmingham-district-energy-cpc-online.pdf
- 5. https://www.building.co.uk/focus/bes-birmingham-or-bust/5078012.article plus internal 2018 HECA report
- 6.https://www.birmingham.gov.uk/news/article/539/connected\_for\_warmth\_scheme\_to\_provide\_free\_central\_heating\_in\_bir mingham?utm\_content=&utm\_medium=email&utm\_name=&utm\_source=govdelivery&utm\_term=

#### 7. BCC HECA Report 2018

- 8. https://www.birmingham.gov.uk/downloads/file/5433/adopted\_birmingham\_development\_plan\_2031
- 9. https://www.birmingham.gov.uk/news/article/418/birmingham\_reveals\_ten\_year\_housing\_plan
- 10. https://www.birmingham.gov.uk/downloads/download/155/birmingham\_curzon\_hs2\_masterplan\_for\_growth
- 11..https://epc.opendatacommunities.org/
- 12. https://www.gov.uk/government/statistical-data-sets/live-tables-on-energy-performance-of-buildings-certificates

#### Background: Relevant Plans and Policies

 $1.\ https://www.gov.uk/government/consultations/the-future-homes-standard-changes-to-part-l-and-part-f-of-the-building-regulations-for-new-dwellings$ 

- 2. https://www.bioregional.com/news-and-opinion/future-homes-standard-lets-not-waste-the-biggest-opportunity-we-have-for-the-uk-to-show-climate-leadership-in-2020
- 3. https://www.gov.uk/guidance/domestic-private-rented-property-minimum-energy-efficiency-standard-landlord-guidance
- 4. https://www.ofgem.gov.uk/publications-and-updates/eco3-measures-table
- 5. https://s3-eu-west-1.amazonaws.com/media.cp.catapult/wp-content/uploads/2020/01/30170148/HIP-Retrofit-Towardsa-Sector-Wide-Roadmap---2020-WEB.pdf

#### SCATTER Interventions: Domestic Buildings (1)

- 1. Sub-regional Fuel Poverty Data England
- 2. https://www.gov.uk/government/statistical-data-sets/live-tables-on-energy-performance-of-buildings-certificates
- 3. Reductions may be achieved through better heating controls (i.e. 'Smart thermostats') that zone the heat, as opposed to reducing comfort
- 4. ECUK (2017) Table 3.16: Internal and external temperatures 1970 to 2012

### SCATTER Interventions: Domestic Buildings (2)

1. Assuming 1 meter per household based on MSOA estimates of properties not connected to the gas network 2015- 2018 2. Air-source and ground-source heat pump technology

3.https://www.gov.uk/government/uploads/system/uploads/attachment\_data/file/820753/2019\_Electrical\_Products\_Tables\_\_xlsx

4. Based on legacy SCATTER assumptions

#### SCATTER Interventions: Non-Domestic Buildings

1. See Appendix 10; a 'lodgement' is assumed to represent the same unit as 'household' (for domestic buildings) and allows comparison between the two different sector's properties.

2. Based on SCATTER legacy tool.

3.https://www.gov.uk/government/uploads/system/uploads/attachment\_data/file/820753/2019\_Electrical\_Product s\_Tables.xlsx

#### **Buildings - Delivery**

<u>https://www.gov.uk/government/collections/fuel-poverty-sub-regional-statistics</u>
<u>https://www.health.org.uk/sites/default/files/upload/publications/2020/Health%20Equity%20in%20England\_The%</u>
<u>20Marmot%20Review%2010%20Years%200n\_full%20report.pdf</u>
<u>https://energysavingtrust.org.uk/about-us/news/minimum-energy-efficiency-standards-private-rented-sector</u>

- 4. https://s3-eu-west-1.amazonaws.com/media.cp.catapult/wp-content/uploads/2020/01/30170148/HIP-Retrofit-Towards-a-Sector-Wide-Roadmap-%E2%80%93-2020-WEB.pdf
- 5. https://www.bre.co.uk/filelibrary/pdf/87741-Cost-of-Poor-Housing-Briefing-Paper-v3.pdf
- 6. https://www.ncb.org.uk/sites/default/files/uploads/documents/ncb\_fuel\_poverty\_report.pdf
- 7. https://www.ashden.org/programmes/co-benefits

#### What is needed from Stakeholders

1. https://shapuk.files.wordpress.com/2019/02/turning-housing-into-homes-fit-for-2050-shap-research-summary-report-february-2019.pdf

2. https://s3-eu-west-1.amazonaws.com/media.cp.catapult/wp-content/uploads/2020/01/30170148/HIP-Retrofit-Towards-a-Sector-Wide-Roadmap---2020-WEB.pdf

#### Key Recommended Next Steps - Domestic - Council

1. https://epc.opendatacommunities.org/

2. https://www.birmingham.ac.uk/Documents/college-eps/energy/Publications/power-to-the-people.pdf

#### Domestic, Non-council

- 1. https://www.ashden.org/programmes/top-31-climate-actions-for-councils
- 2. https://www.ofgem.gov.uk/environmental-programmes/eco

3. Happy Energy

#### Domestic Sector Funding Opportunities

1. https://epc.opendatacommunities.org/

#### Key Recommended Next Steps- Council buildings and estate

1. Based on Anthesis industry experience and judgement.

2. https://www.birmingham.ac.uk/Documents/college-eps/energy/Publications/power-to-the-people.pdf

#### Key Recommended Next Steps - Commercial and industrial

1. Based on Anthesis industry experience and judgement.



## **Sector Analysis: Transport - References**

#### Background

- Birmingham Transport Plan:

https://www.birmingham.gov.uk/info/20013/roads\_travel\_and\_parking/2032/draft\_birmingham\_transport\_plan

2. <u>https://www.birmingham.gov.uk/info/20076/pollution/1278/air\_pollution\_affecting\_me\_and\_my\_family</u>

3. Birmingham's Energy Baseline (2019) Perform Green

4. <u>https://www.sustrans.org.uk/media/2950/bike-life-birmingham-2017.pdf</u>

5. https://www.zap-map.com/location-search/birmingham-charging-points/

#### SCATTER interventions: Modal Shift

- 1 JM BCC interview 13/2/2020
- 2 Draft\_Birmingham\_Transport\_Plan.pdf
- 3 https://www.gov.uk/government/statistical-data-sets/all-vehicles-veh01

4 - Department for Transport Statistics - Table TRA3105 Heavy goods vehicle traffic by axle configuration and road category in Great Britain, 2015

5 – SCATTER assumptions in this area do not include hydrogen as freight fuel and are left unmodified from the legacy DECC 2050 Pathways calculator

#### SCATTER interventions: Decarbonising Transport

1 - <u>https://www.zap-map.com/location-search/birmingham-charging-points/</u>

2 - https://www.wmca.org.uk/media/1366/west-midlands-low-emission-delivery-plan\_elementenergy-for-transport-for-westmidlands\_july2016.pdf

Siemens ALL\_TEP\_Energy\_Strategy\_Report\_Final.pdf

4. https://www.porterbrook.co.uk/news/mainline-testing-of-uks-first-hydrogen-train-gets-green-light



#### Delivery

1 - Ashden Climate Action Co-Benefits Toolkit

2 – Birmingham 2019 Air Quality Annual Status Report (ASR)

3- Energy Savings Trust

4 – Go Ultra Low

5 - <u>https://www.birmingham.gov.uk/info/20076/pollution/1763/a\_clean\_air\_zone\_for\_birmingham/2</u>

6 - <u>https://energysavingtrust.org.uk/sites/default/files/reports/4868\_EST\_A4\_Plug in fleet best practice</u> <u>guide.pdf</u>

#### Key Recommended Next Steps (page 1)

1 - Energy Savings Trust compare EV and ICE pool car

2 - CNEX low emission van guide – 50 kW charging point can charge an electric van in <1 hour

#### 3 -

https://static1.squarespace.com/static/5ae87244b105982d79d73cf5/t/5be2dbac0e2e72e2e81ba15c/15415 94076246/ERCV+Final+Report.pdf

#### 4 - Appy Fleet

#### Key Recommended Next Steps (page 2)

1 – <u>Ashden</u>31 Actions for Councils

2 - Cycle route costings

## **Sector Analysis: The Natural Environment - References**

#### Background

I- Birmingham Local Development Plan 2018.

https://www.birmingham.gov.uk/info/20054/planning\_strategies\_and\_policies/78/birmingham\_development\_plan

2 - Birmingham City Council 2019.

https://www.birmingham.gov.uk/news/article/448/birmingham\_bids\_to\_become\_a\_tree\_city\_of\_the\_world

3 - Birmingham City Council, unpublished data.

4 - Diock et al 2017.

https://www.researchgate.net/publication/322337570\_The\_Canopy\_Cover\_of\_England%27s\_Towns\_and\_Cities\_baselining\_and\_se tting\_targets\_to\_improve\_human\_health\_and\_well-being

5 - Canopy Cover Project 2017. <u>https://www.forestresearch.gov.uk/research/i-tree-eco/urbancanopycover/</u>

6 - Birmingham Tree Policy 2018. <u>https://www.birmingham.gov.uk/download/downloads/id/9309/birmingham\_tree\_policy.pdf</u>

7 – Based on the estimated number of trees in Birmingham being 1,000,000 (as discussed <u>here</u>), which includes trees on public and private land including street/ highways trees, woodlands and trees in parks, cemeteries/ crematoria, schools, gardens, etc. An aggregate tree sequestration factor (0.046 t CO2/ yr<sup>-1</sup> per tree) was derived from data presented from a <u>study</u> at Leeds University, which used i-Tree Eco to perform tree surveys and calculate carbon storage and sequestration for campus 1450 trees with a similar taxonomic composition to the Birmingham tree population.

8 - BBC Wildlife Trust 2017. <u>https://www.bbcwildlife.org.uk/sites/default/files/2018-10/NIA%20Ecological%20Strategy%202017-</u> 22%20Technical%20Report.pdf

#### Interventions

1- Guan et al 2019. https://leaf.leeds.ac.uk/wp-content/uploads/sites/86/2019/08/i-Tree-Report-2019-v1.42.pdf 2 - Birmingham Tree Policy 2020. https://www.birmingham.gov.uk/download/downloads/id/9309/birmingham\_tree\_policy.pdf

#### Delivery

1 - https://www.cityoftrees.org.uk/why-trees

2 - https://www.sportbirmingham.org/uploads/city-profile-birmingham-18.pdf

3 - https://btfl.org.uk/2019/07/14/tree-city-of-the-world



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