CITY OF WESTMINSTER

Carbon Emissions Analysis, Pathways, and Action Plan

February 2021

V2.0

Anthesis

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INTRODUCTION

Council Context

In September 2019 Westminster City Council (WCC) declared a Westminster wide climate emergency, aiming to become carbon neutral across the city by 2040.

This report was commissioned by Westminster City Council with the aim of informing WCC's carbon reduction strategy and action planning in response to this target.

Report Overview & Scope

- **Chapters 1 & 2** of this report defines the current context, the impact of COVID-19, our research process, and Westminster's current emissions profile.
- **Chapter 3** defines a series of future emissions pathways for the city, including a "carbon budget" based on academic research at the Tyndall Centre for Climate Change Research. We also provide recommendations on prioritisation of carbon reduction actions moving forward.
- **Chapter 4** provides an analysis and recommended course of actions to aid delivery of the city's 2040 targets following a programme of stakeholder engagement.

The scope of this report includes emissions resulting from solid, liquid and gaseous energy consumed by the City of Westminster's buildings, transport and industry. WCC has also set a target of achieving carbon neutrality within its own operations by 2030. This report explores the City of Westminster's emissions. A more detailed analysis of the city's green spaces and land use has also been carried out and can be found alongside the Natural Environment analysis in Chapter 5.

Objectives

1. Provide a better understanding of the city's current carbon footprint using a location-based accounting approach;
2. Use this information in collaboration with key local stakeholders to define actions necessary to meet the city's ambitious goals using forward-looking models.

This will help Westminster by:

- Providing the basis for city-wide collaboration that can deliver transformative change and benefit to the city;
- Increasing confidence in the mandate for climate action, aiding development of a robust local strategy which can deliver objectives over a long term cycle.

01 Context

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01 – CONTEXT
CONTEXT

Local and national policy

Scientific consensus shows that, in order to avoid the most catastrophic impacts of climate change, a temperature rise of more than 3°C above pre-industrial levels must be avoided. Instead, global leaders should aim to keep temperature rises to no more than 2°C, or ideally 1.5°C. In 2015, the UK adopted the Paris Agreement as part of a joint pledge by members of the European Union, committing to:

- Strengthening the global response to the threat of climate change by keeping global temperature rise this century well below 2°C above pre-industrial levels.
- Encouraging efforts to limit the temperature increase even further to 1.5°C.

Tackling the climate crisis is a long-standing issue in the UK, reflected in legally binding emissions reduction targets in the 2008 Climate Change Act. This was updated in 2019 with an updated and more ambitious target of net zero carbon emissions nationally by 2050.

In September 2019, WCC passed a Climate Emergency motion to achieve a net zero carbon city by 2040, acknowledging their unique position as an inner London local authority with significant numbers of inbound visitors. A key aspect of the motion mandated new campaigns designed to encourage local stakeholders and residents to work towards a zero emissions, more resilient city.

A call to action

Westminster's Climate Emergency declaration was issued following the Intergovernmental Panel on Climate Change (IPCC) special report on the impacts of global warming of 1.5°C above pre-industrial levels, published in October 2018. The report found that in order to remain within a 1.5°C increase, governments must cut greenhouse gas emissions by 45% by 2030 against a 2010 baseline. Since the first IPCC report was published in 1990, global emissions have increased 60%.

Another key finding of the report states that at current rates, it is likely that the Paris Agreement target of limiting warming below 1.5°C will be surpassed as early as 2030. In their 2019 Emissions Gap Report, the UN Environment Programme found that the current Nationally Determined Contributions were likely to result in a 3.2°C temperature rise by 2100.

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

01 – CONTEXT
CLIMATE CHANGE AND COVID-19

A "New Normal"?

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 operate.

During the peak of the lockdown in April 2020, researchers observed a global daily emissions decrease of around 17% compared to 2019 levels. Nearly half of these changes came about due to a reduction in surface transport usage, the result of government policies designed to ensure citizens to stay at home.

Rather than suggest society shut down entirely in order to achieve emissions reductions, this period serves as an indicator as to what can be achieved when ambitious and necessary policy decisions are taken. Government, businesses and local communities have been forced to coordinate and cooperate on an unprecedented scale, with the result being significant changes to the way we live and work.

These emissions reductions are temporary and will be reversed as the UK recovers from lockdown, but future emissions can be dramatically shaped by the nature of the economic recovery.

How did travel change during the first national lockdown?

Mode of travel	Use of transport modes on the first weekday after…		
	…the start of the first national lockdown. (March 2020)	…pubs, restaurants, hairdressers first reopen. (July 2020)	…workers encouraged back to offices, schools reopen. (September 2020)
Car	44%	79%	91%
Rail	20%	19%	33%
Tube	9%	19%	33%
TfL bus	22%	37%	54%
Cycling	85%	138%	115%

Figures are percentages of an equivalent day, prior to the COVID-19 pandemic.

Source: DfT

01 – CONTEXT
CLIMATE CHANGE AND COVID-19

Working towards a Green Recovery

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

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

An opportunity to define a 'new normal'?

The ongoing social distancing measures offer 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.

> ***"... ensuring a future for the planet must be a core element in rebuilding society after lockdown measures are lifted."***
>
> UN Secretary General António Guterres

01 – CONTEXT
CLIMATE CHANGE AND COVID-19

What does COVID-19 mean for Westminster's climate change ambitions?

On the surface, COVID-19 dominates decision making, and some local authorities have seen resources usually allocated to the climate emergency shift to meet the immediate demands of responding to the pandemic. Revenues have been adversely affected, and social distancing measures can present barriers to public consultation on climate action planning measures. However, the prospect of a Green Recovery also presents opportunities for climate action, particularly if decision makers can build on the behavioural and economic changes ushered in by the response to the pandemic.

Local Impacts and opportunities

Through carrying out this work, we have found evidence that the pandemic, and the response to it, present a number of opportunities to positively embed climate action within Westminster. These include:

- **Homeworking** - Restrictions on office working have created a rapid shift in perception of working from home. Further research is needed, but this could present a substantial opportunity to reduce impacts associated with office spaces and commuting. Similarly, increased working from home presents an opportunity to encourage home retrofits and renewable energy generation, but may adversely impact Westminster's local economy due to reduced footfall.
- **Uptake of active transport** - When workers have travelled into the office, they are doing so by bicycle in increasing numbers. The proportion of cyclists increased two- or even three-fold during the summer months in 2020. Some regions are seizing this opportunity to create wider cycle lanes and walking spaces.
- **Low employment** - The economic challenges ahead are expected to lead to record low employment. Nickie Aiken MP commented in September that up to 50,000 jobs may be at risk as a result of reduced retail trade in the West End. Investing in the low carbon economy presents a viable opportunity for the creation of secure jobs across a range of industry sectors.
- **Lobbying National Government** - As policymakers shape the economic recovery, local government is in a unique position to influence government policy in the pursuit of a green recovery. In turn, this could stimulate low carbon activities across the city.

Building the case for action

In shaping the recovery from COVID-19, decision makers have the opportunity to capture the benefits of a low carbon economy like never before, and build resilience against future shocks including potentially climate-related service disruption. Central to these benefits are economic opportunities. Investing in low carbon technology provides opportunity to stimulate both the local economy (for example, local traders delivering building retrofit), and on a broader scale, better positions the UK economy to take advantage of a burgeoning international market for sustainable goods.

As the low carbon economy grows, we continue to see positive impacts in other areas, termed "co-benefits". For example, homeowners rolling out retrofit are known to experience lower energy bills and an improved standard of living. Similarly, in reducing road traffic, citizens are able to live heathier, safer lives. Understanding these co-benefits further builds the case for climate action- we provide further details later in the report.

02 Current Emissions Profile

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02 – CURRENT EMISSIONS PROFILE
EMISSIONS PROFILE

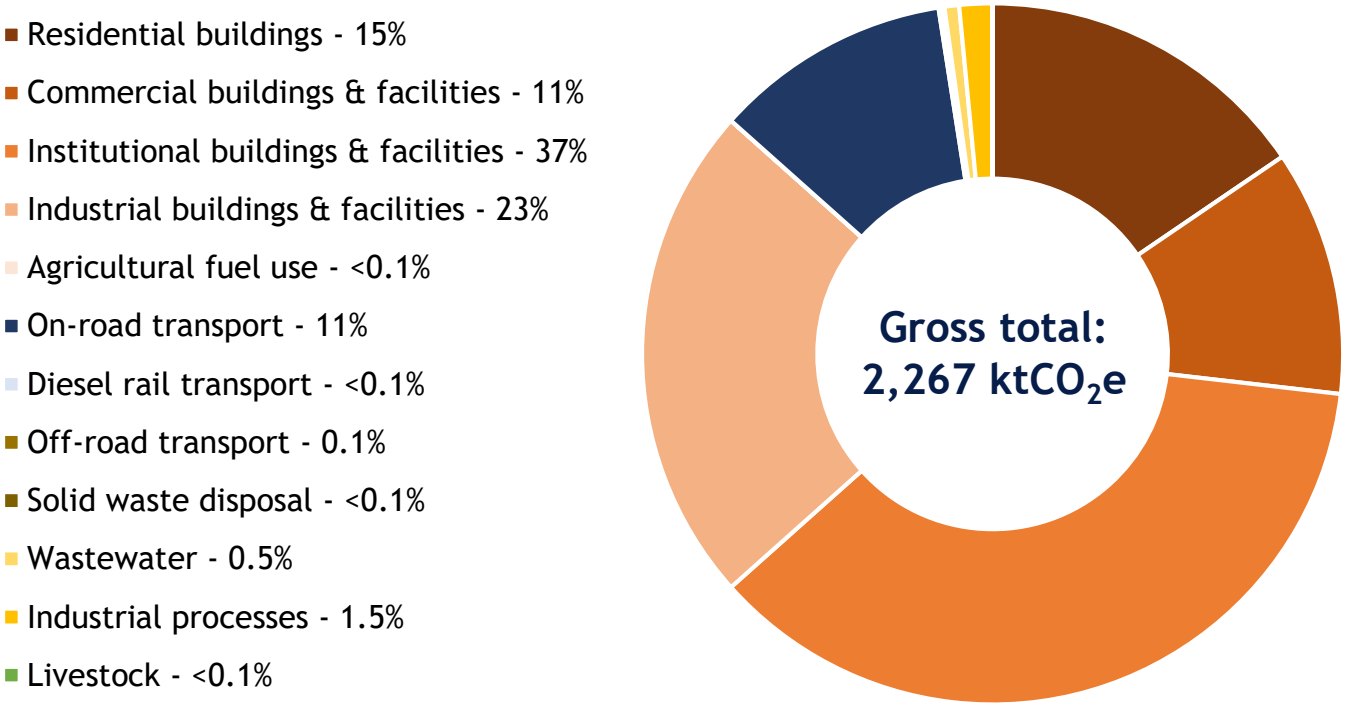
An *emissions profile* provides a snapshot inventory of the greenhouse gas emissions within a defined boundary. The profile opposite represents emissions within the area administered by Westminster City Council. It has been compiled from the most recently available data, which is published two years in arrears.

In 2017, Westminster's energy system was responsible for emissions totalling 2,267 $ktCO_2e$. The majority resulted from buildings & facilities (86%) and transport (11%).

The underlying data for this profile comes from a range of sources – most notably government datasets for energy consumption. Appendix 2 provides links and sources to many of these.

Not all subsectors can be neatly summarised as a "slice" of this chart.[1] The sectors included here are those required by the Global Protocol for Community-scale Greenhouse Gas Emission Inventories.

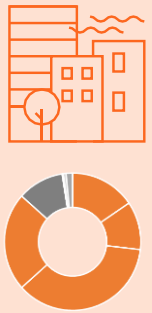
Figure 2.1: SCATTER emissions inventory for Westminster, 2017. Only direct and indirect emissions have been included.



1 – See Appendix 3 for the full data table, as well as the data table from the BEIS Local Authority CO_2 inventory.

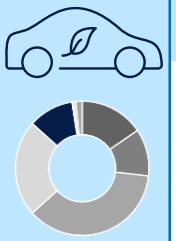
02 – CURRENT EMISSIONS PROFILE
UNDERSTANDING WESTMINSTER'S EMISSIONS

Profile subsectors



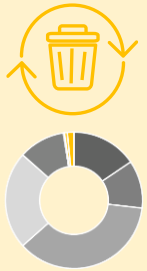
86% of emissions in Westminster come from buildings:

- Industrial buildings & facilities: Larger industrial facilities, including factories, warehouses and workshops associated with manufacturing and engineering.
- Institutional buildings & facilities: Public sector buildings including schools, health centres, hospitals, leisure centres, Council buildings etc.
- Commercial buildings & facilities: Buildings from which commercial businesses operate e.g. shops, shopping centres, offices, restaurants etc.
- Residential buildings: Domestic households of all tenure types.



11% of emissions come from transport:

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



<2% of emissions come from waste disposal & industrial processes:

- Solid waste disposal: Incorporates various waste streams across commercial, industrial and municipal sources.
- Wastewater: Scaled directly from national wastewater data by population.
- Nationally-scaled processing emissions associated with heavy industry, such as minerals, iron & steel and chemicals.

A more detailed analysis of land use and sequestration potential within Westminster can be found on page 104.

02 – CURRENT EMISSIONS PROFILE
LONDON UNDERGROUND

Emissions from the London Underground within Westminster

- Within SCATTER, energy consumption associated with the Tube falls within buildings energy consumption.
- The London Emissions and Greenhouse Gas Inventory (LEGGI) has been employed as an alternative dataset, providing an estimate of emissions resulting from Underground trains (and other electrified passenger rail).
- LEGGI records electricity consumption for different transport modes broken down by London borough.
- **The resulting analysis indicates that electricity consumption from the trains themselves is very small - the equivalent of around 5% of the total emissions from electricity consumption in Westminster's buildings.**
- Our LEGGI analysis does **not** account for the energy used to provide power to the Underground stations themselves, e.g. lighting, appliances, ventilation and so on. This means that the figure quoted here is an underestimate of the true carbon impact of the Underground network within Westminster. The contribution from these other end uses of energy is on a comparable scale of emissions (i.e. $ktCO_2e$).

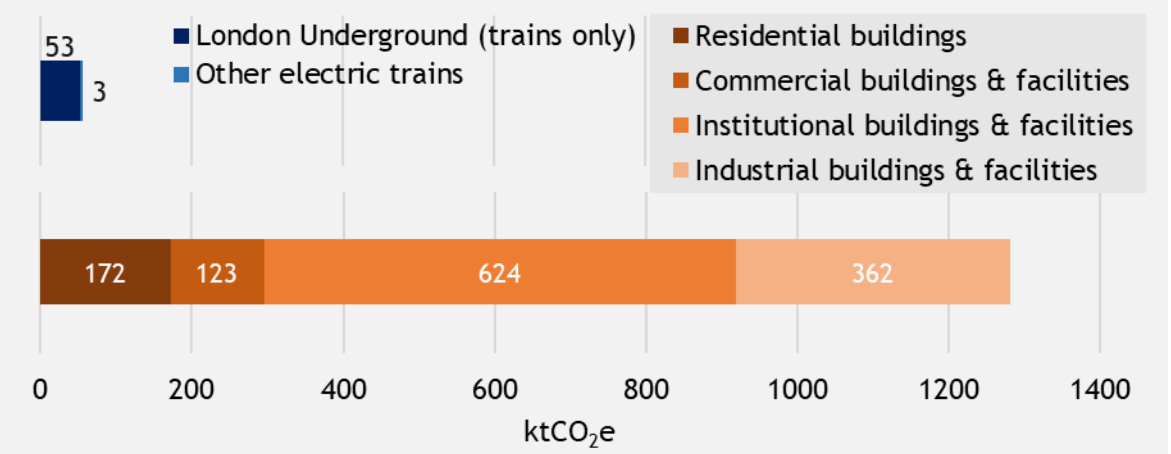


Figure 2.2: LEGGI-estimated emissions arising from electrified rail transport within Westminster. These can be compared against the **indirect** emissions from buildings as defined by SCATTER.

Westminster is home to more Underground stations than any other London borough (32), 11 more than the second-placed borough (Brent, 21) and almost double the third-placed (Camden, 17).

03 Future Emissions Pathways

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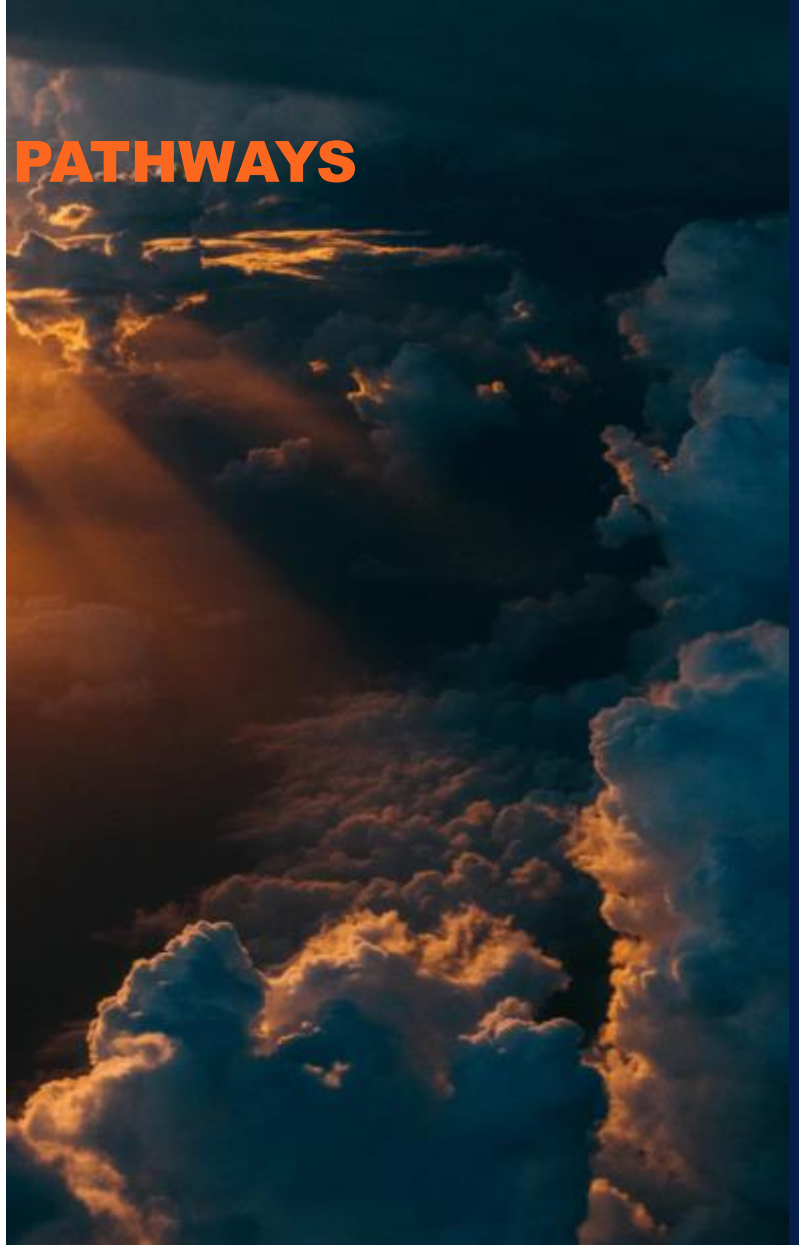
03 – FUTURE EMISSIONS PATHWAYS
CARBON BUDGETS

The current emissions profile offers the baseline from which to measure Westminster's progress toward net zero.

However, we must also be mindful of the fact that once emitted, greenhouse gases can remain in the atmosphere for extended periods of time. For example, for any given quantity of CO_2 emitted, a large proportion is absorbed by the oceans within a few decades, but around 20% can be expected to remain in the atmosphere for many hundreds of years.

This means it is also important to consider Westminster's *cumulative* year-on-year emissions. The Paris Agreement aims of remaining *"…well below 2°C"* of warming dictate an upper limit of greenhouse gas emissions that are allowed.

We can join these two concepts together in the form of a *carbon budget*. A budget-based approach is valid in line with international dialogue undertaken at COP meetings and underpins the Paris Agreement. It is also approved by the SBTI and C40 Cities as the method for calculating emissions trajectories at a city and regional level.



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

03 – FUTURE EMISSIONS PATHWAYS
APPLYING CARBON BUDGETS

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

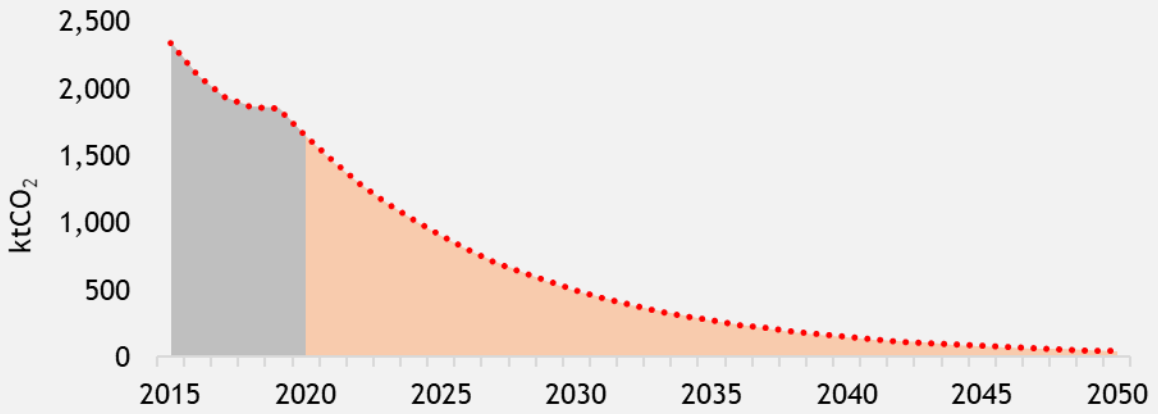
Emissions now mean impacts later: The most crucial element of this approach is understanding the importance of cumulative carbon emissions. As discussed, once emitted, carbon dioxide remains in the atmosphere for many years, contributing to increasing the average global temperature. Therefore, the carbon budget does not reset; it represents a fixed upper limit to emissions.

These two things mean that whilst the year that Westminster becomes zero-carbon is important, the *annual reductions rate* of emissions is also crucial.

The Tyndall Centre for Climate Change Research, based at the University of Manchester, have translated Paris Agreement targets into a fixed emissions 'budget' for each local authority. For Westminster, their research indicates:

- A recommended annual reduction rate for Westminster is defined as 11.3% by the Tyndall Centre analysis.
- A carbon budget of 14,168 $ktCO_2$ for the period 2020-50 based on this reduction rate.

Figure 3.1: Graph showing historic emissions (grey dotted line), cumulative historic emissions (grey area), Tyndall Centre's recommended reduction pathway of 11.3% annual reduction (red dotted line), and the carbon budget for Westminster (beige area).



To put this 11.3% reduction rate into context:

- between 2005 and 2017, the highest annual reduction rate for any year was 15%;
- the average annual reduction rate in that period was much lower, at just over 4%;
- provisional estimates for global emissions in 2020 indicate that despite the lockdown measures throughout the year, emissions only fell around 9%.

1 – See Appendix 4 for more details on how the Tyndall Centre break down the global carbon budget.

Carbon budget – at a glance

The 2020-2050 energy system carbon budget for Westminster is just under 14,200 $ktCO_2$

A consistent annual emissions reduction rate of 11.3% is recommended to stay within budget

At 2017 rates, the entire carbon budget will be used up within 8 years

By 2040, 93% of the budget is used up provided Westminster achieves the recommended annual reduction rate

03 – FUTURE EMISSIONS PATHWAYS
CARBON BUDGET SCOPE

Emissions covered by this budget

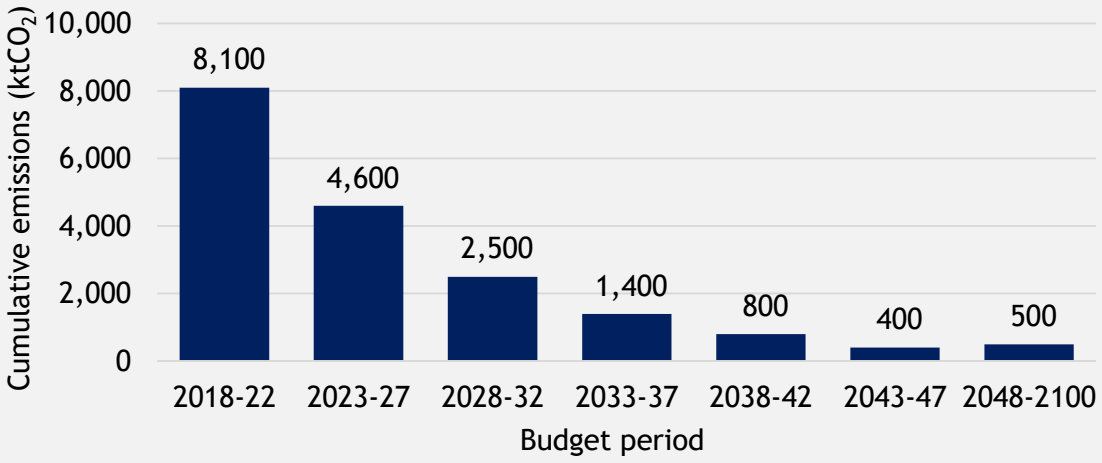
The Tyndall Centre carbon budget has a different scope to the emissions profile within SCATTER:

- **Land use, land use change and forestry** is not incorporated into this budget analysis.
- **Only CO_2 emissions are assessed** – contributions from all other greenhouse gases are excluded. Given the dominance of stationary energy emissions within Westminster, the exclusion of other GHGs does not bear significant ramifications for the budget analysis.
- **Aviation and shipping are treated differently.** Given the nature of these emissions, this research accounts for emissions in this sector at the national level, as opposed to the regional level. The extent of a potential "emissions rebound" as the aviation industry recovers post-COVID remains uncertain.
- **This budget can be defined as *energy-only*,** which means that the budget accounts for emissions from energy use within Westminster.
- **Figures are based on BEIS datasets** and so the same caveats apply as in Chapter 2 around the differences between this research and the SCATTER data.

Budget Milestones

These slight differences in scope mean that direct comparisons of this budget with the cumulative emissions from SCATTER Pathways trajectories (explored in the following pages) should be taken as estimates only. Nevertheless, viewing Westminster's emissions profile in line with the global carbon budget allows for direct tracking of progress in line with UK Government's commitment to the Paris agreement.

Figure 3.2: The chart below gives the budget in terms of the periods set out in government reporting frameworks. The period 2048-2100 indicates the prevalence of a very small level of emissions from hard-to-remove sectors. Tyndall Centre analysis allows for a small proportion of the budget (<5%) in the second half of the century.



03 – FUTURE EMISSIONS PATHWAYS
SCATTER PATHWAYS MODEL

Overview

SCATTER Pathways is one of many information sources designed to help local authorities inform priorities for emissions reduction. It is intended to focus on the 'what' rather than the 'how'.

The modelled pathways are intended to act as 'lines in the sand' for Westminster. They serve as an indication of whether the adoption of certain interventions can drive the transition to a low carbon economy and help to guide target-setting and key performance indicators. SCATTER pathways run up to 2050, though "checkpoint" interventions have been given for 2025 and 2030 to guide progress towards Westminster's 2040 zero-carbon target.

It is also 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.

SCATTER Pathways is now available as a free-to-use online tool for local authorities following a systems update in Spring 2020.

Basic principles

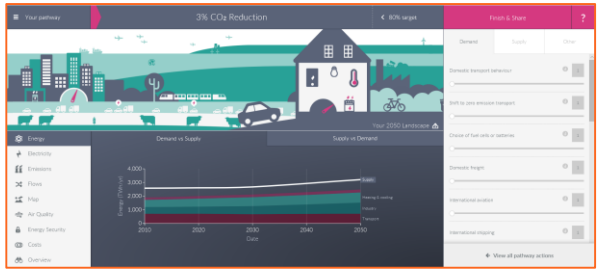
Sir David MacKay's "Sustainable Energy - Without Hot Air (2009)" provides the basis for the pathways modelling. As a scientific advisor to the Department for Energy & Climate Change (DECC),[1] MacKay's work led to the development of the 2050 Pathways Calculator.

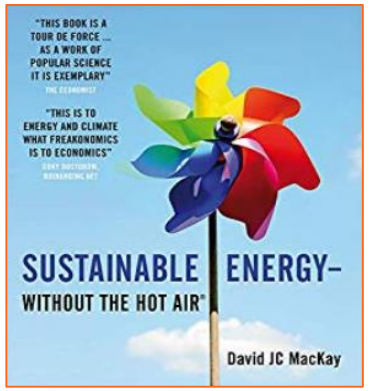
1 – DECC responsibilities were reformed into BEIS in 2016

Two key modifications were made by Anthesis:

1) We scaled it down for sub-national regions: Scaling assumptions and localised data sets were built into the tool so that results were representative of cities and local authority regions, rather than the UK as a whole.

2) We pushed ambition further: Technologies within the tool were reviewed and updated where judged to be out of date and constraining ambition. Given that almost a decade had passed between MacKay's publication and the release of the 2050 Pathways tool, we sought the counsel of a technical panel to make these updates. The technical panel comprised subject matter experts from Arup, BEIS, Electricity North West, GMCA, The Business Growth Hub, The Energy Systems Catapult, The Tyndall Centre and Siemens.





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

03 – FUTURE EMISSIONS PATHWAYS
SCATTER PATHWAYS

Reviewing carbon reduction pathways helps us to understand the impact of differing levels of action, or inaction, in relation to goals set, and in the context of macro-factors such as grid-decarbonisation and policy.

The graph opposite shows two possible future emissions pathways modelled by the SCATTER tool, compared against a pathway representative of the Tyndall Centre's recommended annual reduction rate. The full list of measures which influence these pathways is given in Appendix 5.

In Chapter 5 we also detail what "High Ambition" looks like for each SCATTER measure. In Chapter 4, we discuss how to prioritise your actions, and address the gap between the reductions achieved in the high ambition pathway, and the recommended pathway.

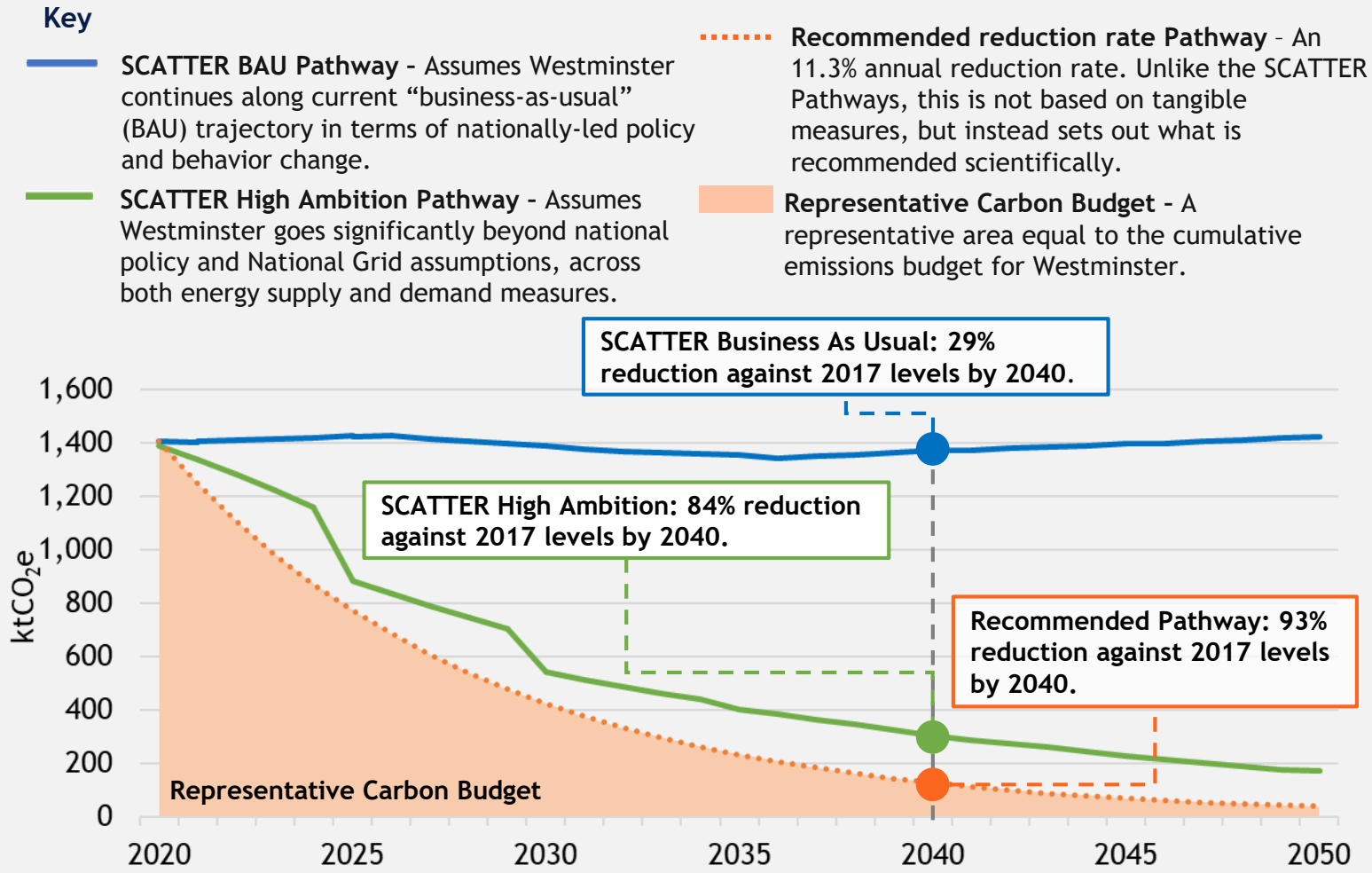


Figure 3.3: SCATTER Pathways for Westminster.

04 – SHAPING YOUR RESPONSE
UNDERSTANDING WESTMINSTER'S PATHWAYS

The changes required within Westminster to achieve even an 84% reduction in emissions by 2040 requires significant activity across almost every area of Westminster.

Observations from the SCATTER Pathways

- **Trends in emissions reductions will slow down along a BAU pathway:** Historic emissions trends have been largely positive, with reductions driven by the decarbonisation of the electricity grid and the phasing out of coal from the energy fuel mix. Based on historic BEIS datasets, Westminster's emissions fell 30% between 2005 and 2017. Emissions savings from grid decarbonisation are expected to bottom out as the grid becomes fully "greened", and after factoring in population growth and other factors, the pathway flattens out.

- **Energy demand reduces:** The National Grid's Future Energy Scenarios (FES) indicates that under all scenarios that meet the UK's net zero by 2050 target that electricity demand still increases. This includes their "Leading the Way" scenario, which illustrates the fastest credible rate of decarbonisation. On the other hand, SCATTER's High Ambition Pathway assumes that electricity demand reduces due to improvements to efficiency.[1] Factors such as increased electrification of heating technologies and transport are naturally big drivers for the increase.

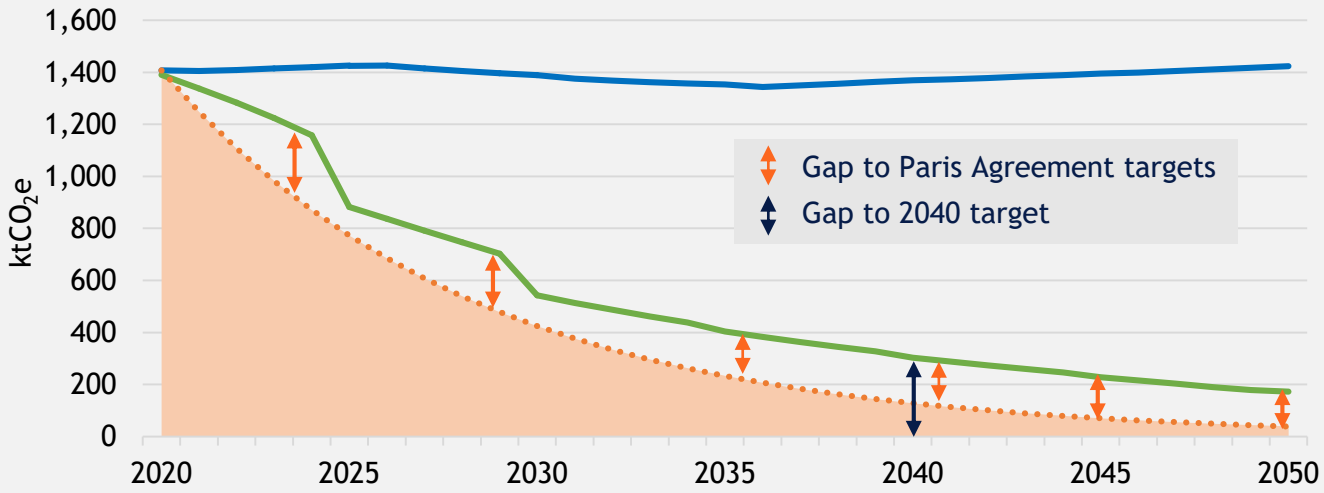
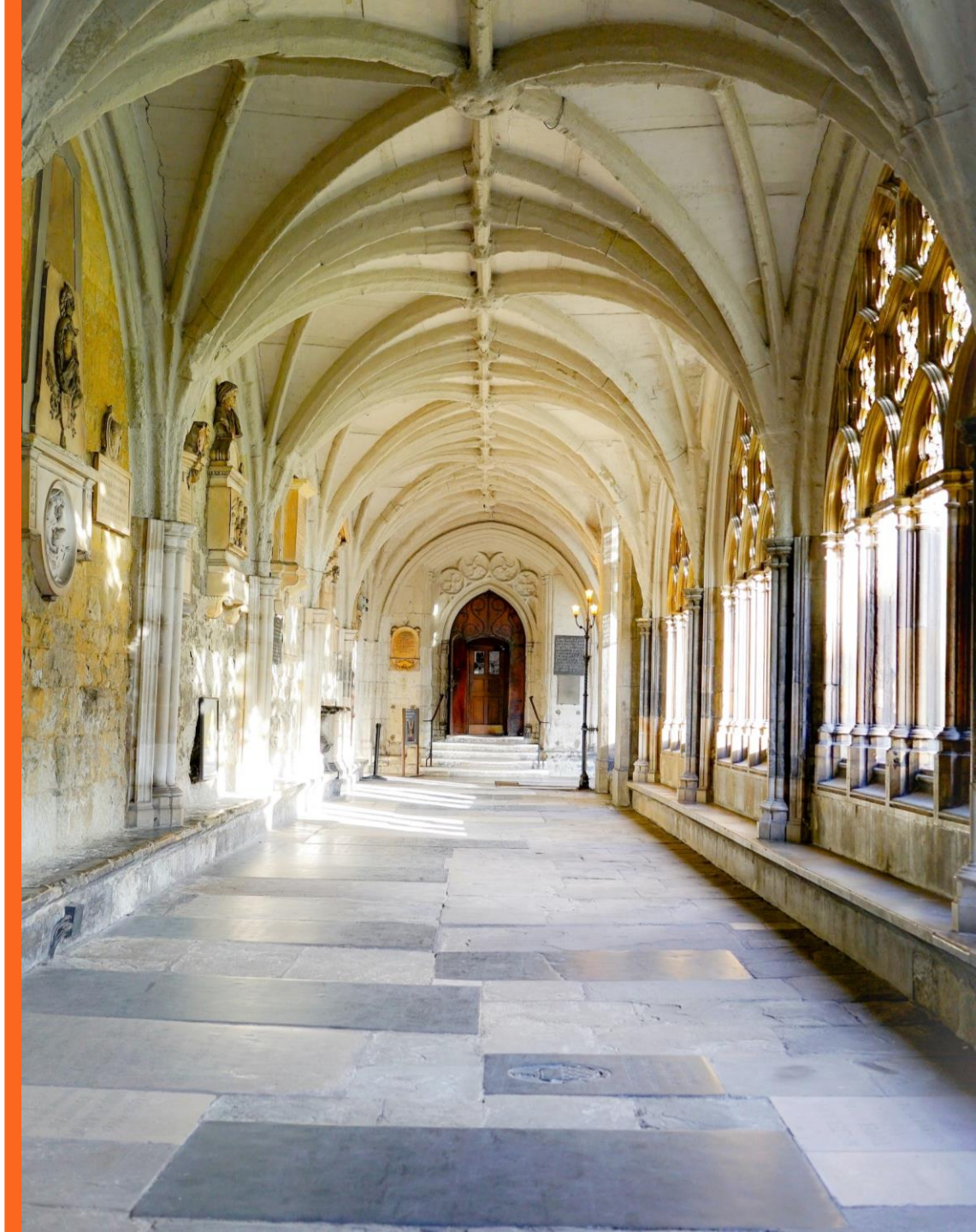


Figure 3.4: SCATTER Pathways for Westminster, highlighting residual emissions as a "gap to target".

- **Adoption of the High Ambition Pathway does not achieve Westminster's target of carbon neutrality by 2040.** Figure 3.4 highlights the gap that exists between the SCATTER High Ambition Pathway and the science-based reductions required by the recommended pathway. These emissions are referred to as residual emissions. Such gaps are often identified when reviewing the impact of a planned set of emissions reduction initiatives against a target, and illustrate that aggressive and urgent emissions reductions interventions are demanded by the High Ambition Pathway. Ways of tackling residual emissions are outlined later in this chapter.

1 - N.B. this optimism for demand reduction is consistent with the legacy 2050 Pathways tool.

04 Shaping Westminster's response



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04 – SHAPING WESTMINSTER'S RESPONSE
PRIORITISING ACTION

Being able to confidently prioritise actions is key for stakeholders in Westminster as they begin to coordinate actions and projects. Emissions reduction activities can be thought of as falling into two main categories; interventions focused on reducing energy *demand* and interventions focused on decarbonising energy *supply*. More broadly, it can be helpful to refer to a hierarchy of actions (below) when considering new initiatives:

1. **Reducing demand** should always come first. This avoids placing too much reliance on long-term, higher risk renewable supply infrastructure to deliver the emissions savings, safeguarding carbon budgets in the process.
2. **Low carbon energy systems** represent the next step in terms of value for money, while also offering a number of co-benefits.
3. **Decarbonising energy supply-** Higher risk infrastructure projects tend to be more expensive and require more political will to get off the ground. As high profile initiatives are visible to many, they can as a signal of intent and inspire action outside your direct control.
4. **Offsetting-** Residual emissions can be tackled through a transparent strategy of carbon offsetting. Despite its criticisms and limitations, offsetting is an important and valid mechanism that can help meet carbon neutrality goals.

Naturally, the potential carbon impact of actions is also a key consideration when prioritising action. Application of the SCATTER model enables us to understand the relative savings achievable across the variety of possible interventions, and again places a focus on demand reduction as a priority.

In Chapter 5, we present recommended actions in line with the SCATTER interventions outlined across 6 key sectors. Actions are presented in sequence of recommended priority level:

1. At the highest level, actions are presented in **Priority Groups** aligned with their associated SCATTER intervention. Those priority groups offering the biggest potential carbon savings are recommended for action first.
2. Within each priority group, we sequence the suggested actions in line with a practical consideration of their nature as **Enabling** or **Carbon Reduction** Actions. Where prudent, the hierarchy across the page is again considered.

Further detail on the prioritisation method can be found in Appendix 7.

Making Transformational Change

Despite the gap to target, the importance of taking dramatic action to reach the High Ambition pathway cannot be understated. Following this hierarchy helps maximise the impact of actions (both carbon savings and other co-benefits), and minimises costs. While important in addressing the gap to target, offsetting is considered the last option – this is generally most costly and less likely to foster the payback or co-benefits seen in other local initiatives.

04 – SHAPING WESTMINSTER'S RESPONSE
CONSIDERING CO-BENEFITS

Co-benefits are defined as the positive effects that a policy or measure aimed at one objective (i.e. Action Planning Opportunities) might have on other objectives.

Considering the associated *co-benefits* of a given measure when action planning can be crucially important. Co-benefits can be useful in helping stakeholders build the case for action. Actions associated with the top of the hierarchy on page 22 are considered more likely to offer direct co-benefits, retained within the city. It is widely accepted that decarbonising will offer co-benefits across a variety of spheres. These include:

ECONOMIC

- Reduced consumer energy bills through improved efficiency
- Costs associated with installing new generation assets, new grid connections works can be minimised

SOCIAL

- Health benefits of increased active transport
- Efficient public transport maximises social benefits

ENVIRONMENTAL

- Ecosystem more resilient
- Quality of place improvements

The action plan in Chapter 5 details co-benefits associated with taking action in each emissions sector. Some examples of this include:

Improved heating efficiency

- Better standard of living for residents in Westminster
- Improved public health as a result of warmer homes
- Helping tenants (residents/ businesses) become resilient to future energy price rises.
- Increase in employment opportunities associated with energy renovation projects
- Increases the value of the buildings

Driving less

- Less traffic, less pollution, less NO_2, less damage to children's cardiovascular systems (causing asthma, etc)
- Cleaner streets
- Reduced pressure on local roads
- Encourages safer driving practices
- Reduction in mileage can also reduce fuel costs

Local technology improvements

- Encourages growth of local businesses
- Can create education opportunities and increase employment
- Pioneering new technologies could increase localised investment in industry
- Businesses will likely see cost and energy use savings through improved efficiency of processes

04 – SHAPING WESTMINSTER'S RESPONSE
COSTINGS – DEFINITIONS

What do we mean by 'cost'?

Throughout the action planning points in Chapter 5, where possible, we have included indicative costs. Owing to a lack of direct data, this is often calculated through a 'by proxy' approach based on secondary research. It is important to note that expenditure can cover a number of types of financial metrics, and that these can mean very different things:

Capital costs	Operational / 'Revenue' costs
For example, the cost of EV, that is then recognised on a balance sheet and depreciated over its useful economic life	For example, monthly energy bills or asset maintenance that reduce the organisation's annual surplus (profit)

Resource / time costs	Savings / payback
Typically a type of operational cost, but expressed in units of time or full time employees, as a reallocation of an existing role may be possible	Many low carbon costs result in direct and indirect benefits, many of which are financial. It is important that any savings or payback periods are considered. This will give critical balance to the investment appraisal process

Who actually incurs the cost?

We are seeing an emergence of alternative forms of finance that can help accelerate carbon savings but reduce the burden on needing to make significant capital outlays. For example, we are seeing many technology providers offer to provide capital investment to councils and other end users (at no cost to the council / commercial tenant), in return for a share of the operational return. In this scenario, the beneficiary may not need to make any outlay (other than perhaps legal fees or time relating to contractual matters). An example of technology provider and a district network operator (DNO) supporting low carbon capital investment at no cost to the tenant can be found here. Energy Service Companies or 'ESCo's are commonly able to offer this service if access to finance is limited.

Cost considerations are a natural priority for stakeholders when choosing which actions to undertake. Stakeholders may seek to calculate a carbon saving per pound spent (£/tCO_2) to offer a basis for prioritising measures against each other. Comparisons may also be made against the price of purchasing carbon offsets. We advise against applying this approach to inform decision making in isolation, and if the method is applied, users must ensure any comparisons are fair, and on 'like-for-like' terms. Below we outline the challenges applying a "£/tCO_2" comparison method.

04 – SHAPING WESTMINSTER'S RESPONSE
CONSIDERING THE COST OF ACTION

Challenges associated with comparing direct actions

- **Cost 'category' needs to be compared like for like:** As illustrated earlier, costs are categorised as capital, revenue, and/or other resources & time. Comparing a revenue cost of offsetting against just a capital cost of an investment in buildings does not tell the full story.
- **Include savings & co-benefits:** Many direct actions and projects also offer direct and indirect financial savings which need to be included. Over time, this will reduce the lifetime cost of the investment and may pay-back. Offsets do not currently offer any form of direct payback.
- **Timeframe needs to be compared like for like:** Comparing capital costs against 1 year of offsets would be misleading – the cumulative total of the offset would need to be equal to the lifetime of the capital asset. For example, if a building has a 50 year lifespan, the capital cost less revenue cost savings (on energy bills) would need to be compared to 50 x the annual offset cost.
- **Additionality of cost needs isolating:** Some investments may have needed to happen anyway; for example you may be required to make capital expenditure on assets that are coming to the end of their life. So considering how to decouple additional 'low carbon' spend from planned maintenance is important. For example, if a gas boiler needs replacing, it is important to look at the *additional* cost of a low-carbon heat pump relative to a gas boiler, rather than the cost of a heat-pump in isolation.
- **Consider other co-benefits:** The nuances of co-benefits and indirect savings of climate action are hard to quantify and could go unrepresented in a cost comparison, with the district standing to miss these if offsetting is prioritised. Often, health and productivity benefits go un-measured.

Challenges when comparing to offsetting prices

- **Diverse range of price and quality:** There exists a broad range in offset prices and quality offsetting options, making it difficult to find a single point of comparison.
- **Prices of UK based offsets are increasing:** Demand for offsetting is increasing, pushing up the price of UK based certified offsets up.
- **Annual cost without ROI:** Offsets are required to be purchased every year, and typically offer no return on investment (if out of the district boundary).
- **Negative public perceptions:** Offsets should typically be applied by councils as a "last resort" or temporary measure, where there is a lack of alternative technologies, or speed of implementation is a factor.
- **Diversion of co-benefits:** Many existing certified schemes may divert public money and co-benefits of actions outside of the district.

These points further illustrate why we advise prioritising direct actions over offsetting.

04 – SHAPING WESTMINSTER'S RESPONSE
TACKLING RESIDUAL EMISSIONS

The hierarchy provided earlier in this chapter illustrates how carbon reduction activities can be prioritised by stakeholders in Westminster. Produced in line with SCATTER, the specific actions laid out in Chapter 5 detail suggested measures to which this process can be applied. These measures should be examined as a priority in order to deliver projects offering the biggest impact, best value, and most co-benefits in the borough. Nevertheless, action will be required 'beyond' the SCATTER actions in order to address the Gap to Target. These could be tackled through:

Offsetting & Insetting

A transparent, well-defined strategy of carbon offsetting could be deployed. This would emphasise nature-based solutions such as such as tree planning and restoration of other ecosystems. There are shortcomings to applying offsets, particularly for councils looking to retain benefits inside their boundary. To address these issues, organisations may also choose to explore *Authority Based Insetting*. Offsetting opportunities as they apply to Westminster are explored in Section 5.6.

Other technologies such as Carbon Capture and Storage (CCS) and Negative Emissions Technologies (NETS) may also be considered.

Technological innovation & marginal improvements

Marginal technology efficiency improvements may continue over time, dramatically increasing potential in both reducing consumption, and green energy generation. For example, increasing electrification of freight vehicles in combination with improved grid electricity factors could dramatically reduce transport emissions.

However, no 'silver bullet' or transformational change in low carbon technology is anticipated in the next 5-10 years, or should be relied upon.

Accelerated and increased deployment

Westminster may also look to actively go 'above and beyond' a number of the SCATTER interventions outlined in this report, particularly where the marginal improvements come to fruition. An example of this may be in the shifting of current policy attitudes. Most notably this is necessary in heritage building planning policy, which will be essential in delivering the necessary progress given the Westminster context.

It is however important to approach this with an understanding of the challenge associated with reaching the maximum ambition level presented in SCATTER.

05 Sector Profiles and Actions

Anthesis

INTRODUCTION

This chapter provides the basis for the strategic response to the Climate Emergency. It is intended to underpin the delivery of projects and actions within Westminster by offering the relevant actors in-depth analysis and recommendations. These are based upon outputs from the SCATTER Pathways tool and a programme of stakeholder engagement with representatives from key organisations in each sector.

SCATTER Pathways - defining targets for a zero-carbon trajectory

The SCATTER Pathways tool models future emissions pathways based upon defined activity across different measures within Westminster. The more ambitious the level of defined activity in each area, the closer the emissions trajectory tracks towards zero carbon. When taken together, these interventions define future emissions projections (i.e. the blue and green lines on page 19).

Within this chapter, the activities described are those which correspond to the High Ambition pathway.

The defined targets indicate *what is needed* to achieve carbon reductions. Targets for each measure are given at "checkpoint" milestones of 2025 and 2030 to guide progress in the near term, as well as for the "endpoint" years of 2040 and 2050. Endpoint targets are aligned to Westminster's local target and the UK's national target for carbon neutrality.

Conversations around *how to get there* are also provided. This includes an overview of key policies and stakeholder views, and discussion of recommended actions to be taken in each sector. These recommendations are the result of desk-based research in addition to a programme of local stakeholder engagement.

Action Planning Measures

Within each sector, we present recommended actions for WCC and wider stakeholders. Measures may be focused on *demand-side* reductions, such as switching to electrified systems, or greening of the energy *supply*. Naturally, some measures carry more "weight" within the model than others,[1] which encourages prioritisation of certain activities. Carbon savings for different activities have been considered as part of this analysis (see the 'Benefits of Action' page in each sector).

A summary of our approach to prioritisation of the actions is outlined in Chapter 4, and detailed further in Appendix 7. Additional detail on each of the actions, including indicative costs and implementation steps, are also provided in a supplementary Action Planning spreadsheet.

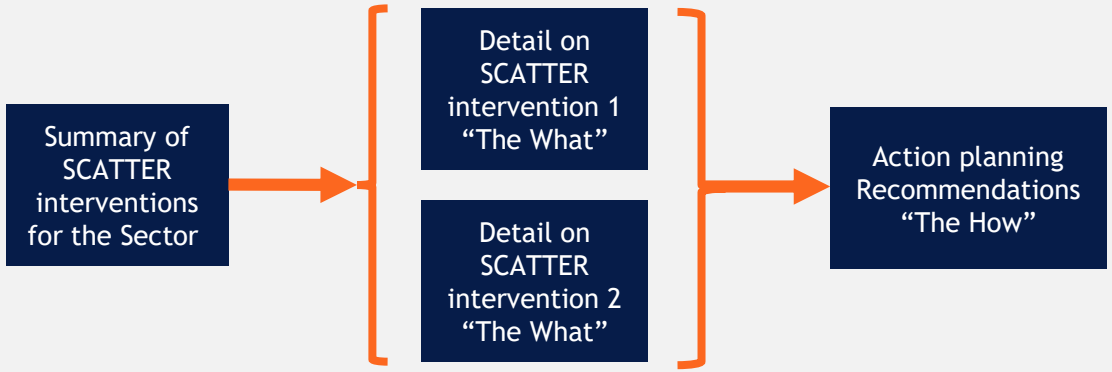


Figure 5.1: Illustration of detail provided on SCATTER intervention pathways and action planning. In each sector, we provide a summary of the SCATTER interventions, before providing a "deep dive" on each. Later, we provide our Action Planning recommendations for the sector, in line with the opportunities identified in SCATTER. In this example, there are two interventions.

1 - For example, improvements to building energy efficiency garner more significant carbon savings than increased tree coverage.

NAVIGATING THIS CHAPTER

Navigating this chapter

The following sector specific subchapters are comprised of the following information:

- **Background:** Introductory contexts within each sector.
- **Key plans and policies:** A summary of relevant current plans and policies, at the national, GLA and Westminster levels.
- **SCATTER Pathways analysis:** Outputs from the SCATTER Pathways tool which, when taken together, define the High Ambition Pathway.
- **Key Stakeholder Perspectives:** Based on the outputs of a programme of stakeholder engagement, we provide a summary of key themes, and suggested opportunities from the group. These inputs helped to shape the action plan.
- **Action Planning Opportunities:** Recommended actions based on our SCATTER research and stakeholder views are provided in order of priority, along with relevant case studies. Full detail on the action planning points is available in a supplementary spreadsheet. Our approach to prioritisation of the actions is outlined in Appendix 7.
- **Benefits of Action:** We provide an indication of the influence of given measures on reducing carbon emissions. For an explanation of the method, please see Appendix 6. We also provide a summary of the potential co-benefits associated with action in this area.
- **Recommended Priorities for Action:** Based on the action plan, we provide an overview of goals and priority next steps for action, by stakeholder group.

The full range of measures considered as part of the SCATTER Pathways tool is summarised in Appendix 5.

Figure 5.2: Sectors considered in SCATTER discussed in this report. Click the icon above for quick links to that section.

5.1 Non-domestic buildings

Anthesis

5.1 – NON-DOMESTIC BUILDINGS BACKGROUND

Scope of section

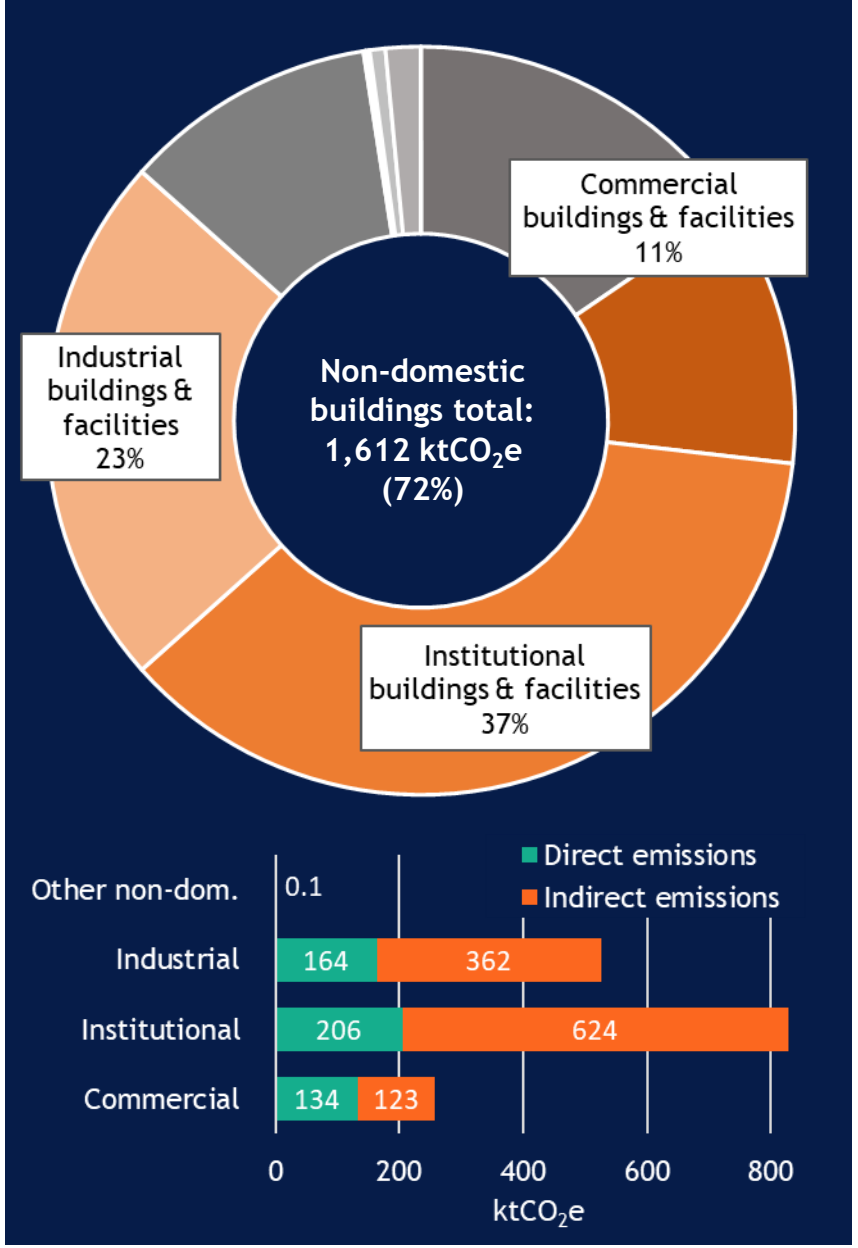
Emissions from non-domestic buildings represent a significant proportion of Westminster's emissions and tackling energy consumption and fuel usage in this sector is a priority for the city. This section discusses the measures relating to commercial, institutional and industrial buildings as well as suggesting actions for accelerated progress in reducing their carbon impact.

Buildings emissions cover only the emissions produced either within the building during use (direct) or emissions associated with the grid-supplied electricity (indirect). The life cycle cost of the building is **not** covered here.

Current contexts

WCC has redefined its own GHG baseline, as well as completing annual monitoring and performance reviews as an organisation. Efficiency improvements at the WCC sites with the largest energy consumption have been procured via the GLA's Energy Retrofit Accelerator programme. A review of the energy performance of investment portfolio assets and a review of renewable energy feasibility across corporate assets is also underway.

WCC has strong regional links through the London Boroughs Energy Group (LBEG), a collaborative forum for public sector Energy Managers. There is a good awareness of the current stock performance and the steps that could be taken to reduce the carbon impact of existing stock. The large numbers of listed buildings and significant conservation area coverage pose large challenges for the city as it seeks to address stationary energy consumption.



N.B.: "Non-domestic" includes commercial, industrial and institutional buildings, as well as any small contributions from agricultural buildings and fuel use (defined "other non-dom.").

5.1 – NON-DOMESTIC BUILDINGS
KEY PLANS AND POLICY

National

- The UK Green Building Council was set up in 2013 to investigate and recommend new ways forward to reach zero-carbon buildings
- Salix Finance offers 100% interest-free capital across Great Britain to deliver energy-saving measures across public sector organisations
- MEES consultation for privately-rented non-domestic buildings closed in January 2020
- The Government's preferred target is that non-domestic property owners in the private sector achieve EPC band B ratings by 2030 across all properties
- UK Green Building Council Advancing Net Zero programme provides guidance to the construction and property sectors

GLA

- Draft new London Plan will replace previously published versions and cover 2019-2041
- London's draft 'Be seen' plan is a requirement for all major development proposals to monitor and report on their actual operational energy performance for up to 5 years after the development is complete
- London's draft whole life-cycle carbon assessment guidance
- GLA's latest Energy Planning Guidance is available and has been updated for 2020 to support planners and developers.
- London Energy Transformation Initiative (LETI) network

Westminster

- Westminster City Plan 2040 is currently in the 'Examination in Public' stage. This is aligned with the New London Plan, and once completed will form part of Westminster's development plan.
- City Plan 2040 Policy 37 (Energy): WCC will promote zero carbon development and expects all development to reduce on-site energy demand and maximise the use of low carbon energy sources
- City Plan 2040 Policy 39 (Design): New development will incorporate exemplary standards of high quality, sustainable and inclusive urban design
- The London Plan requires developers set a carbon price for offsetting any shortfall in onsite emissions

5.1 – NON-DOMESTIC BUILDINGS
SCATTER PATHWAYS MEASURES

High Ambition Pathway

The first group of measures relate to energy used within Westminster's commercial, industrial & institutional buildings.

As discussed in the hierarchy of actions, activities can be split between reducing the gross *demand* for energy and ensuring that the technologies used are compatible with zero-carbon energy *supply*.

The levels of activity described correspond with the High Ambition Pathway described on page 19. These targets represent the most ambitious within SCATTER.

We can see the effects of these activities on overall emissions by looking at a sector-by-sector breakdown of the High Ambition Pathway (see opposite). It is worth acknowledging that the emissions reductions are made possible by the successful delivery of renewable energy supply (see section 4.4).

Energy consumption from the electric rail sector is counted within the non-domestic buildings sector within SCATTER. This means that Tube stations & the trains themselves should be assessed within this section, rather than within the transport sector.

Non-domestic building measures summary

- **Improved building efficiency:** see page 34
- **Improved appliance & lighting efficiency:** see page 35
- **Shifting off gas heaters:** see page 36
- **Shifting off gas for cooking:** see page 37

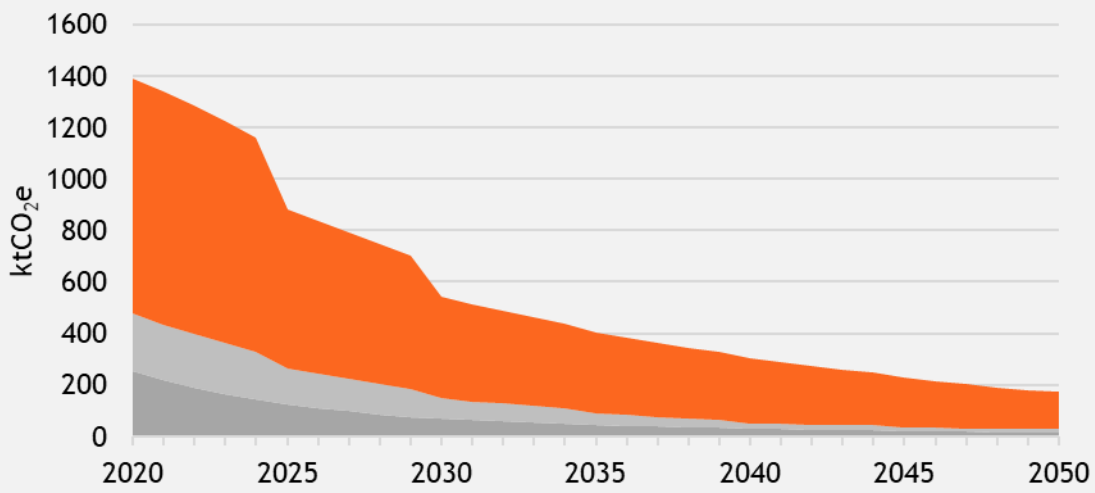


Figure 5.3: SCATTER High Ambition Pathway, broken down by sector. Non-domestic building emissions are highlighted orange.

5.1 – NON-DOMESTIC BUILDINGS
IMPROVED BUILDING EFFICIENCY
SCATTER INTERVENTION

This measure describes energy demand reduction for space heating and hot water heating as a result of improvements to building fabric and positive behaviour changes.

"Retrofit" in this context refers to insulation, draughtproofing, double glazing and so on, as opposed to the installation of renewable energy technologies. The demand-side reductions are focused on changes to the building fabric, which are considered separately to any changes to electrified systems (see later in section 5.1 & section 5.4).

These forecast reductions in demand take into account improvements to the efficiency of new water heating systems. Reductions are applied to whatever fuel the building is using i.e. accounting for more efficient gas boilers as well as electrical heating systems.

This measure considers a broad spectrum of building types. Emissions reductions are calculated in terms of an overall reduction in net energy demand, without prescribing specific targets for numbers of buildings to be retrofit.

Key Milestones

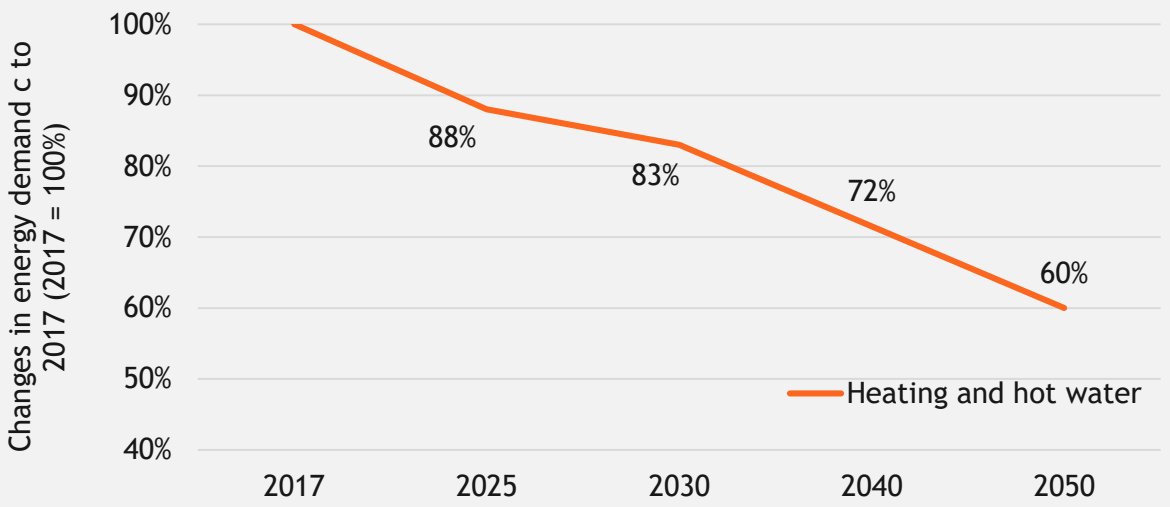


Figure 5.4: Modelled changes in energy demand for space heating and hot water. Reductions are made relative to a 2017 baseline.

2025	12% reduction in overall energy demand for space heating and hot water.
2030	17% reduction in overall energy demand for space heating and hot water.
2040	28% reduction in overall energy demand for space heating and hot water.
2050	40% reduction in overall energy demand for space heating and hot water.

5.1 – NON-DOMESTIC BUILDINGS
IMPROVED APPLIANCE AND LIGHTING EFFICIENCY
SCATTER INTERVENTION

This measure considers the reduction in energy demand due to the installation of more efficient lighting and appliances, including electrical devices.

This also considers all types of cookers and catering equipment, regardless of their source fuel. The transition towards electric systems for cooking is considered separately to the reduction in demand (e.g. through improved efficiency of gas systems).

Energy demand reductions are applied to whatever fuel the building is using, such as mains electricity or gas-fired CHP. Lighting, cooling and appliances use approximately 45% of the total building's day to day use energy, heating and hot water use approximately 46% of the total building's day to day use of energy.[1]

Key Milestones

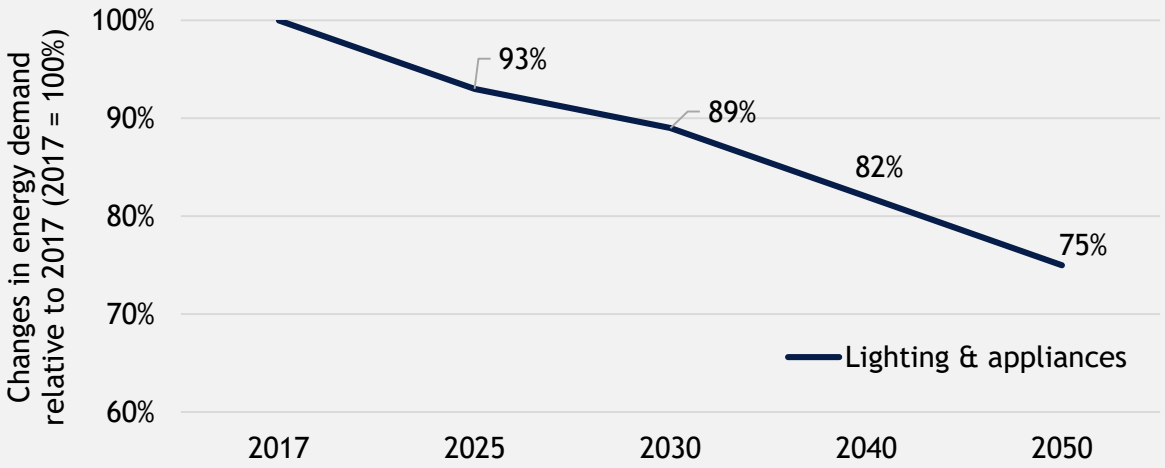


Figure 5.5: Modelled changes in the energy demand for lighting and appliances in non-domestic buildings against a 2017 baseline.

2025	7% reduction in lighting, appliance & cooking energy demand
2030	11% reduction in lighting, appliance & cooking energy demand
2040	18% reduction in lighting, appliance & cooking energy demand
2050	25% reduction in lighting, appliance & cooking energy demand

1 – Per BEIS analysis.

5.1 – NON-DOMESTIC BUILDINGS
SHIFTING OFF GAS HEATERS
SCATTER INTERVENTION

This measure describes the transition away from fossil fuel-source heating technologies in favour of less carbon-intensive systems. In particular, the High Ambition Pathway fuel mix represents a transition to heat pumps and combined heat and power networks (CHP).[1]

This endpoint fuel mix offers the most significant emissions reductions, though it should be noted that the impact of this measure on emissions is heavily influenced by the availability of renewable energy. CHP systems can be fed by fully renewable technologies (e.g. solar thermal) but still offer significant carbon savings when compared against heating systems.

The more rapidly the electricity grid can decarbonize, the greater the impact on emissions from transitioning to electrified heating systems. If the grid is slow to decarbonize the emissions factor for electricity will remain high and emissions savings will be diminished.
Switching to an electrified heating system can also provide incentive to property owners to install on-site electricity generation technologies (such as solar PV).

The WCC-owned Pimlico District Heating Undertaking (PDHU) is a heat network providing energy to over 3,200 homes and 50 business premises, including three schools. The PDHU is currently undertaking a feasibility review for replacement of gas-source CHP with a water source heat pump.

Key Milestones

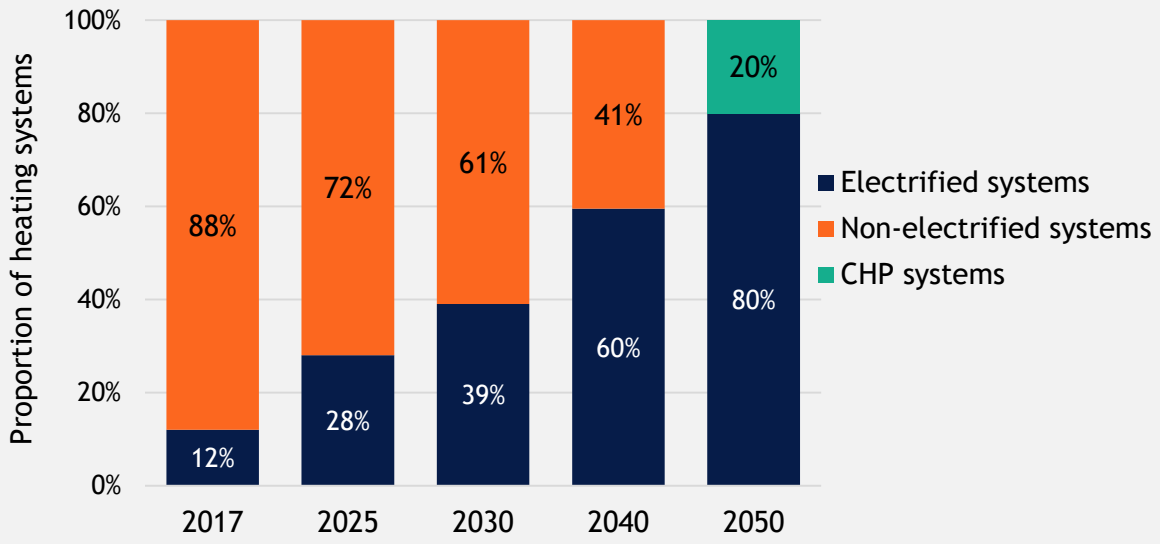


Figure 5.6: Modelled changes in the technology mix for non-domestic heating technologies. Figures may not sum to 100% due to rounding.

2025	28% of non-domestic buildings have electrified heating systems.
2030	39% of non-domestic buildings have electrified heating systems.
2040	60% of non-domestic buildings have electrified heating systems.
2050	80% of non-domestic buildings have electrified heating systems.

1 – Within SCATTER, no modelled technology mixes contain any hydrogen-fuelled systems.

5.1 – NON-DOMESTIC BUILDINGS
SHIFTING OFF GAS FOR COOKING
SCATTER INTERVENTION

This measure describes the uptake of electrical cooking systems and discontinuation of gas cookers.

The measure accounts for a transition to fully electrified systems by 2050. For the most part, the uptake of electrified cooking systems directly reduces other fossil fuel usage, though this does constitute an overall increase in electricity consumption.

As with the heating systems measure, the projected change towards electric systems delivers emissions savings in tandem with decarbonization from the grid.

Key Milestones

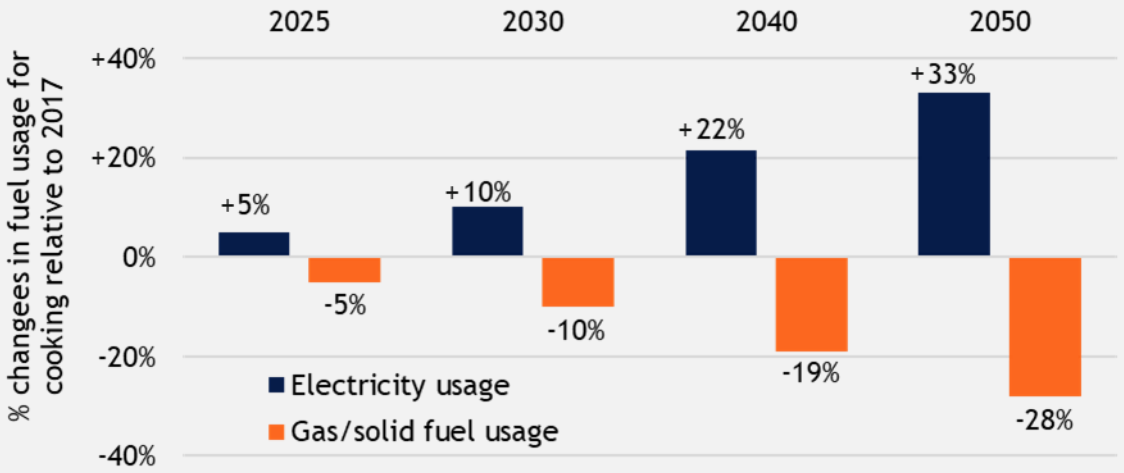


Figure 5.7: Modelled changes in non-domestic cooking energy demand. The transition can be thought of as a direct swap between gas/solid fuel systems and electrified systems.

2025	5% increase in electricity usage for commercial catering; 5% decrease in gas & solid fuel usage.
2030	10% increase in electricity usage for commercial catering; 10% decrease in gas & solid fuel usage.
2040	22% increase in electricity usage for commercial catering; 19% decrease in gas & solid fuel usage.
2050	33% increase in electricity usage for commercial catering; 28% decrease in gas & solid fuel usage.

5.1 – NON-DOMESTIC BUILDINGS
KEY STAKEHOLDER PERSPECTIVES

On the 5th November, stakeholders in the planning, management, and utilisation of non-domestic buildings in Westminster shared their views on action in the sector across three action areas:

Reducing energy demand

Knowledge sharing
Key issue: Limiting of understanding of demand reduction to a small number of specialists. Suggested opportunities:
- Initiating resource repository and training
- Utilise links with academic institutions such as University College London
- Establishing working groups for wider stakeholders

Performance measurement and transparency
Key issue: There is a need for better data to measure and incentivise action to inform spending. Suggested opportunities:
- Standardising the method of assessing the investment impact
- Improve the quality of estate management and energy consumption data

Navigating heritage building policy
Key issue: Increased costs of retrofit due to heritage policy restrictions and a lack of ability to influence tenants. Suggested opportunities:
- Review planning policy and clarifying best practice
- Incentivise regulation-exceeding projects
- Engage with tenants to improve understanding of the motivation for action
- Explore "Green Clauses" in lease terms

Access to finance
Key issue: Accessibility of green grants is often a challenge. Suggested opportunities:
- Improve guidance on the funding application process
- Develop a shared resource to streamline the process
- Apply an 'Energy Hierarchy' on projects to identify priority actions

Decarbonising building energy supply

Technology application
Key issue: Concerns over the perceived costs of acting too soon, or "backing the wrong" technology. Suggested opportunity:
- Share best practice and key drivers of projects

Collaboration
Key issue: Lack of collaboration, which can improve the allocation of capacity and streamline costs. Suggested opportunities:
- Establish working groups to identify the benefits of collaboration, forming partnerships with Green Energy Cooperatives and other 'on the ground' initiatives
- Expand existing partnerships

Reducing embodied carbon

Technology
Key issue: The lack of widely-spread knowledge around low carbon technologies. Suggested opportunities:
- Planning briefings to communicate to planners and the construction industry, ensuring concepts such as embodied carbon are considered in the earliest stages of a project

Performance management and transparency
Key issue: It was felt that targets for embodied carbon are perceived to be easier to implement than in retrofit. Suggested opportunities:
- Aligning targets in construction with WCC
- Engage with organisations such as London Energy Transformation Initiative and the Green Building Council.
- A consistent, digital reporting dashboard or portal could aid comparability and sharing of mutual learning, accelerating change

5.1 – NON-DOMESTIC BUILDINGS

ACTION PLANNING

Priority	Goal	Action	Stakeholder Responsible
Priority 1: Improve Building Efficiency (Higher Carbon Impact Potential)	1) a) City-wide collaboration on building efficiency is improved and greater capacity is built within partner organisations to reduce their own emissions	Create a resource repository of good practice relating to energy efficiency in partnership with local stakeholders, with the aim of providing clearer detail on how property portfolios can demonstrate low environmental impact and follow good practice in sustainability. (WCC)	Westminster City Council
		Set up a mechanism through which stakeholders can achieve sustained collaboration.	Collective Action
	1) b) Businesses are financially supported and better-informed to improve the energy efficiency of their properties	Include and promote carbon reduction measures (i.e. energy efficiency measures) within Westminster's existing business support programmes. (WCC)	Westminster City Council
		Simplify and increase access to green finance, such as Government grants. (WCC)	Westminster City Council
	1) c) Policy is implemented that enables and encourages low-carbon retrofitting of non-domestic heritage buildings	Review heritage policy to remove barriers to retrofit of heritage non-domestic buildings. Aim to create more flexible, progressive heritage planning policy which takes into account carbon reduction targets. Approve more planning requests for retrofit and energy efficient installations. (WCC)	Westminster City Council

Case Study

The Energy Technology List is a government list of energy efficient plant and machinery to help organisations select equipment with a high standard of energy efficiency, thereby reducing operational costs.

Energy Technology List
ECA SCHEME

Case Study

The Re:fit programme is a procurement initiative for public bodies wishing to implement energy efficiency measures and saved 10,000 tCO_2 in 2019-20.

refit energy savings. guaranteed.

5.1 – NON-DOMESTIC BUILDINGS

ACTION PLANNING

Priority	Goal	Action	Stakeholder Responsible
Priority 2: Shift off Gas Heaters & Improve Heating Efficiency (Higher Carbon Impact Potential)	2) a) All businesses operating across the city are more accountable for their carbon emissions performance	Introduce standardised performance measurement and transparency requirements for new / all commercial developments to report on operational energy performance beyond the 5 years laid out in the new London plan.	Collective Action
	2) b) All internal council policies are aligned with net zero targets	Mandate the installation of electrified heating systems within council's own buildings. (WCC)	Westminster City Council
Priority 3: Improve Lighting & Appliance Efficiency (Higher Carbon Impact Potential)	3) a) Policies to reduce new-build carbon emissions are followed and energy efficiency improvement opportunities are maximised	Enforce higher standards than part L for all new buildings and expansions of existing dwellings.	Collective Action
	3) b) All non-domestic building lighting is upgraded to energy efficient LED lighting	Implement mass roll out of energy efficient lighting, the most frequent improvement recommendation in non-domestic EPCs because of quick paybacks and low costs found while doing these upgrades.	Collective Action

Case Study

In Seattle, USA, all new and substantially altered city-owned buildings will not be able to use fossil fuels such as natural gas for heating, cooling, cooking or other purposes.

5.1 – NON-DOMESTIC BUILDINGS
BENEFITS OF ACTION

Carbon savings estimates

The chart in Figure 5.8 describes the estimated carbon savings related to the actions described in this chapter. In summary:

- Emissions savings are calculated relative to the BAU scenario within SCATTER.
- The most significant measures relate to improving building efficiency to reduce energy demand.
- Industrial buildings data returns savings based on fuel consumption rather than activity.

Carbon savings are underpinned by the provision of low-carbon electricity (see section 5.4 for more analysis on the importance of renewable energy in cultivating carbon savings).
A full methodology for these calculations can be found in Appendix 6.

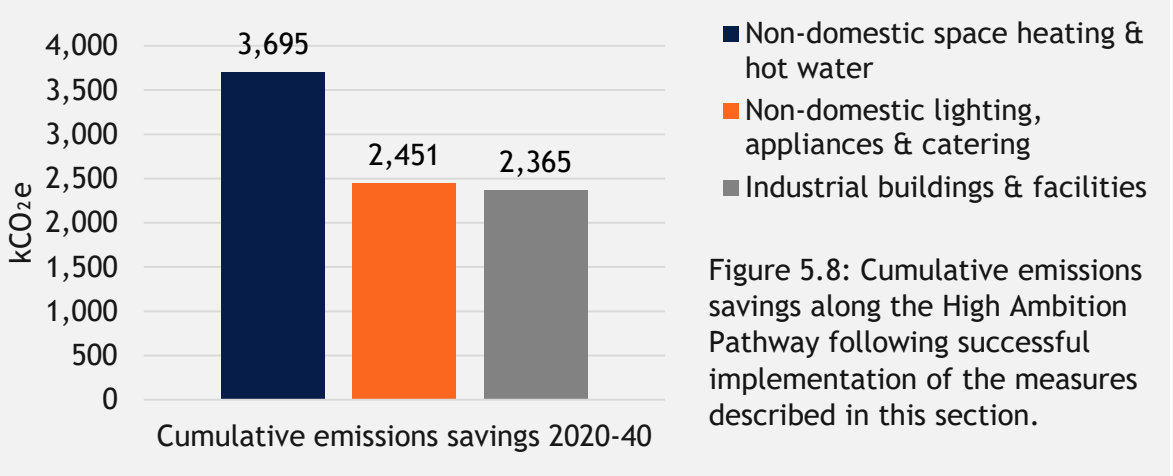


Figure 5.8: Cumulative emissions savings along the High Ambition Pathway following successful implementation of the measures described in this section.

Associated co-benefits

Health benefits
Energy efficiency in commercial buildings has been shown to improve the health and wellbeing of people working in the buildings:

- Employee Sick Days decreases with 0-40%. [1]

Financial benefits
Energy efficiency in commercial buildings increases worker productivity and property value while decreasing energy costs, tapping into new levels of cost savings for companies:

- Maintenance Costs can be reduced with 9-14% [1]
- Employee Productivity increases with 1-10% [1]
- Employee Sick Days decreases with 0-40% [1]
- Improving the energy efficiency of buildings can reduce energy bills for organisations and businesses. 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 [2]
- 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 [2]
- Buildings will be greater protected against future energy price rises as well as being more physically resilient during heatwaves.[2]

1. Deep Energy Retrofit Guide for Public Buildings (Lohse & Zhivov, 2019)
2. Ashden 31 Actions on Climate: No. 3-8

5.1 – NON-DOMESTIC BUILDINGS
RECOMMENDED PRIORITIES FOR ACTION

Westminster City Council:

Direct Control:

- Foster city-wide collaboration with greater capacity for partnerships
- Implement policy that enables and encourages retrofitting of heritage buildings
- Align all internal policies with net zero targets

Influence:

- Provide supplementary planning guidance to developers for net zero
- Enforce higher energy efficiency standards than Part L for all new buildings and expansions of existing dwellings (the Association for Environmentally Conscious Buildings standard outlines roughly a 75% reduction, and Passivhaus provides roughly a 90% reduction)
- Hold businesses accountable for their emissions
- Financially support businesses to improve the energy efficiency of their properties

Businesses:

- Build city-wide collaboration and showcase leading examples of decarbonisation to other businesses
- Encourage updates to policy to facilitate retrofit of Heritage properties
- Engage with Westminster City Council's business support programme
- Follow policies to reduce new-build carbon emissions
- Maximise energy efficiency improvement opportunities

Residents:

- Help campaign for total life costs of buildings to be net zero emissions
- Refer to council for support in retrofit, explore financial incentives

National Government:

- 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

Greater London Authority:

- Provide additional support for the upgrade of historical buildings
- Lobby for the rise of standards for the whole of the UK as this will lower scaled emissions
- The GLA is already promoting the reduction of carbon in non-domestic buildings. Continue to support the improvement of new build properties and the increase of standards from part L of the building regulations

Other Partners:

- **Westminster Property Association** - continue to engage with WCC to ensure a joined-up approach
- **University of Westminster and University College London** - engage with WCC to contribute to content used to train businesses to reduce energy demand
- **Local Green Energy Cooperatives** - Expand on any existing partnerships with businesses

5.2 Domestic buildings

Anthesis

5.2 – DOMESTIC BUILDINGS BACKGROUND

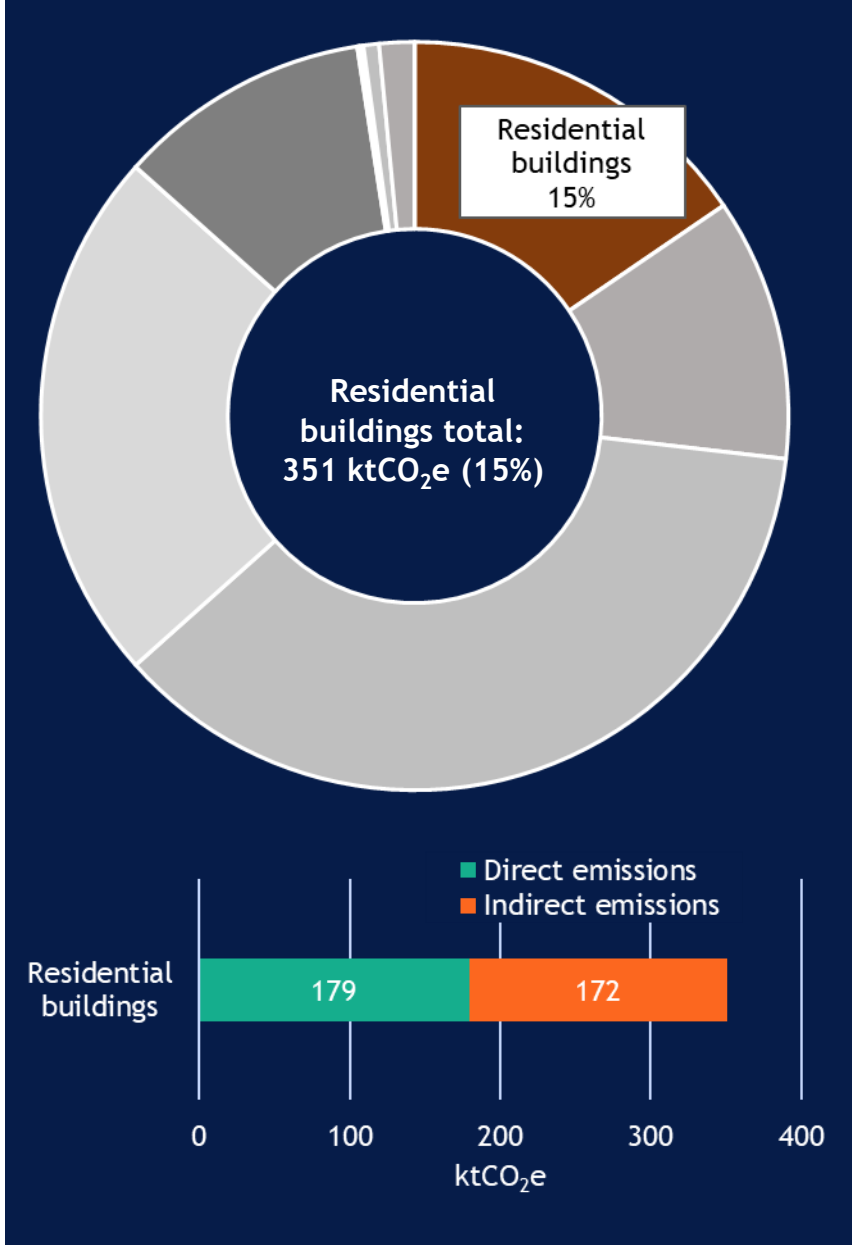
Scope of this section

Domestic households within Westminster are the second classification of buildings described within this report. Residential buildings emissions represent 15% of the city's direct and indirect emissions, a larger proportion of emissions than on-road transport. This section discusses measures related to all domestic dwelling types, covering private households, social housing and all rented dwellings.
As with non-domestic buildings, the emissions analysed here are those associated with energy consumption within the buildings themselves and not any life-cycle costs.

Current contexts

Council-owned domestic buildings carry high standards for installed heating systems and insulation standards. Significant numbers of Council-owned or managed households have cavity wall insulation installed and/or double glazing. WCC also has a strong data base on which to diagnose and manage retrofit programmes, though progress can be limited by the high proportion of households that are listed or in conservation areas. WCC does have plans to utilise the Green Homes Grant in upgrading c.200 of its worst-performing properties.

The majority of buildings included in this scope are not managed (or owned) by the council, meaning partnerships with the wider community are essential to meet net zero by 2040. In Westminster, 31% of households that carry an EPC are C-rated, with just over half of all recorded properties being rated D or lower.
Upgrading the policy and legal requirements for the private rented sector, external social housing providers and homeowners must all form part of the interventions discussed within this section.



5.2 – DOMESTIC BUILDINGS
KEY PLANS AND POLICY

National

- Gas boilers will be banned in **new** homes from 2025- see Future Homes Standard
- Clean Growth Strategy set targets to upgrade as many houses to EPC band C by 2035 (2030 for all fuel-poor households)
- Third phase of the Energy Company Obligation (ECO3) will conclude in 2022
- The Future Homes Standard provides an update to Part L of the building regulations
- Minimum energy efficiency standards (MEES) in the private rented sector and non-domestic property prevents landlords from letting properties rated below EPC Band E
- Green Homes Grant offers up to £5,000 for homeowners and landlords

GLA

- The Mayor of London's Warmer Homes Programme provides free heating, insulation and ventilation improvements for low-income Londoners who own their own homes or rent privately.
- London Plan Chapter 5 Be Lean; Be Clean; Be Green sets out further carbon emission reductions beyond national policy for both domestic and non-domestic dwellings.
- Section 106 Planning Requirements sets out legal requirement for building standards
- 2018 Energy Assessment Guidance stipulates a least a 35% on-site reduction beyond Part L 2013. Policy SI 2 of the New London Plan has the same goal.

Westminster

- Westminster's Decent Homes grant funds up to £8,000 for low income homes to improve their energy efficiency
- Standards around heating systems currently under review, with potential for an electric heating systems standard being explored

5.2 – DOMESTIC BUILDINGS
SCATTER PATHWAYS MEASURES

High Ambition Pathway

The first group of measures relate to energy used within Westminster's residential and domestic buildings of all types and tenures.

They follow similar prescriptions to that of the non-domestic buildings. The first two measures consider demand-side reductions, whilst the second two consider the effects of electrification.

Opposite is a representation of domestic building emissions through time according to successful implementation of the High Ambition Pathway described on page 19. Once again, the caveat applies that emissions reductions are made possible by the successful delivery of renewable energy supply (see section 5.4).

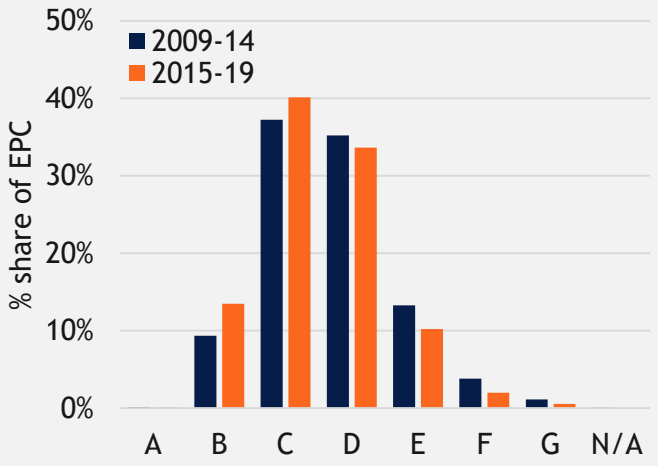


Figure 5.9: EPC ratings for Westminster from the last ten years, split into five year segments.
The proportion of ABC-rated properties increased by seven percentage points between these two periods, indicating improvement to overall energy efficiency within the city.

Non-domestic building measures summary

- **Improved heating efficiency:** see page 47
- **Improved appliance and lighting efficiency:** see page 48
- **Shifting off gas heaters:** see page 49
- **Shifting off gas for cooking:** see page 50

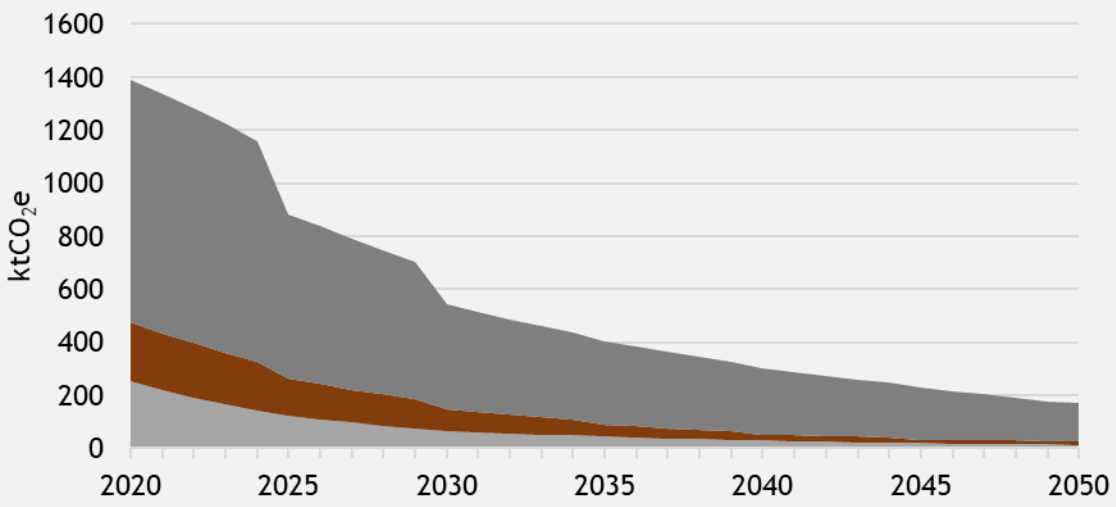


Figure 5.10: SCATTER High Ambition Pathway, broken down by sector. Domestic buildings emissions are highlighted in maroon.

5.2 – DOMESTIC BUILDINGS
IMPROVED HEATING EFFICIENCY
SCATTER INTERVENTION

This measure considers changes to the energy demand for heating homes, in both existing properties (through retrofit) and newly built homes.

The aim of retrofit is to drive down the energy demand for heating and hot water in buildings; typical measures include insulation for floors, windows and ceilings as well as improved ventilation. Currently household retrofit is led largely by government-supported schemes, such as ECO (and more recently the Green Homes Grant). ECO retrofit measures vary, though around two thirds involve some form of insulation. SCATTER models future energy demand based on the uptake of two "modes" of retrofit:

- Medium – a 66% reduction in annual average energy demand (through inner wall insulation).
- Deep – an 83% reduction in annual average energy demand, (through inner & external wall insulation).

Given the large conservation areas in Westminster, it is acknowledged that the retrofit measures here may not be suitable for all properties (i.e. inner/external wall insulation may not be feasible in all properties) but in this instance it is assumed the necessary reductions to demand are made through alternative means.

New builds must also be constructed to extremely high energy performance standards.[1] SCATTER forecasts an increase in the number of households of around 35% on the existing number. The High Ambition Pathway demands these new builds meet PassivHaus standard.

Key Milestones

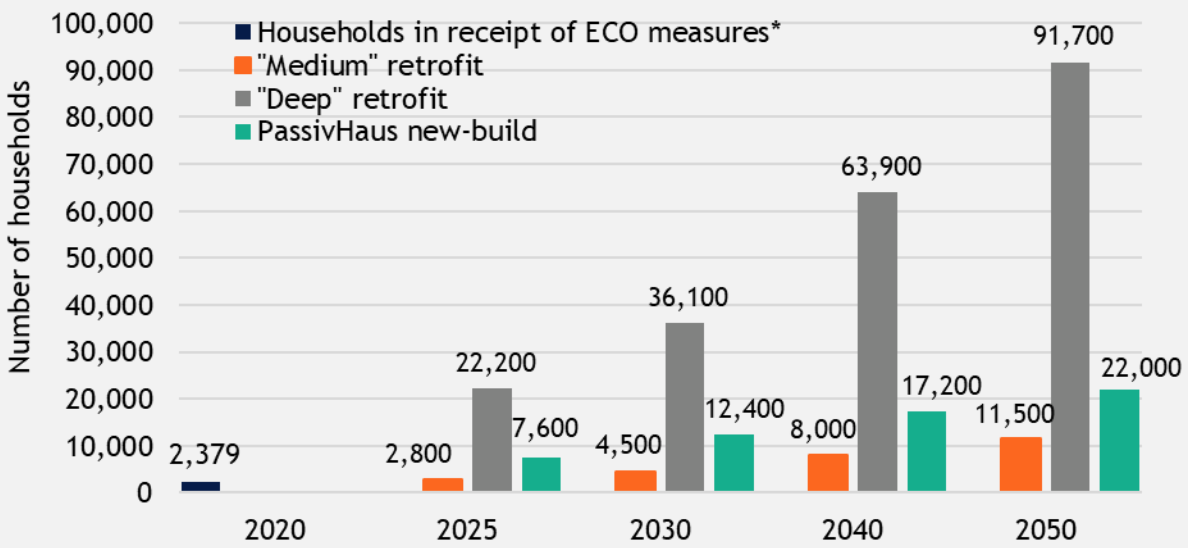


Figure 5.11: Retrofit rates and new-build standards. *ECO measures are included as a proxy for comparison, though the average improvements to energy demand fall well short of medium retrofit in practice.

2025	2,800 households have received "medium" retrofit measures; 22,200 households have received "deep" retrofit.
2030	4,500 households have received "medium" retrofit measures; 36,100 households have received "deep" retrofit.
2040	8,000 households have received "medium" retrofit measures; 63,900 households have received "deep" retrofit.
2050	11,500 households have received "medium" retrofit measures; 91,700 households have received "deep" retrofit.

1 – The Association for Environmentally Conscious Buildings deems a "high performance" building as requiring 25% of the average energy demand for heating. PassivHaus standards are typically 10% of the average demand.

5.2 – DOMESTIC BUILDINGS
IMPROVED APPLIANCE AND LIGHTING EFFICIENCY
SCATTER INTERVENTION

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

As in the non-domestic measures, the transition towards electric systems is considered separately – demand reductions are applied to whatever fuel the building is using.

Reductions in this area are anticipated through the uptake of newer, more efficient devices (e.g. smart-controlled technology) as well as positive changes in behaviour.

Key Milestones

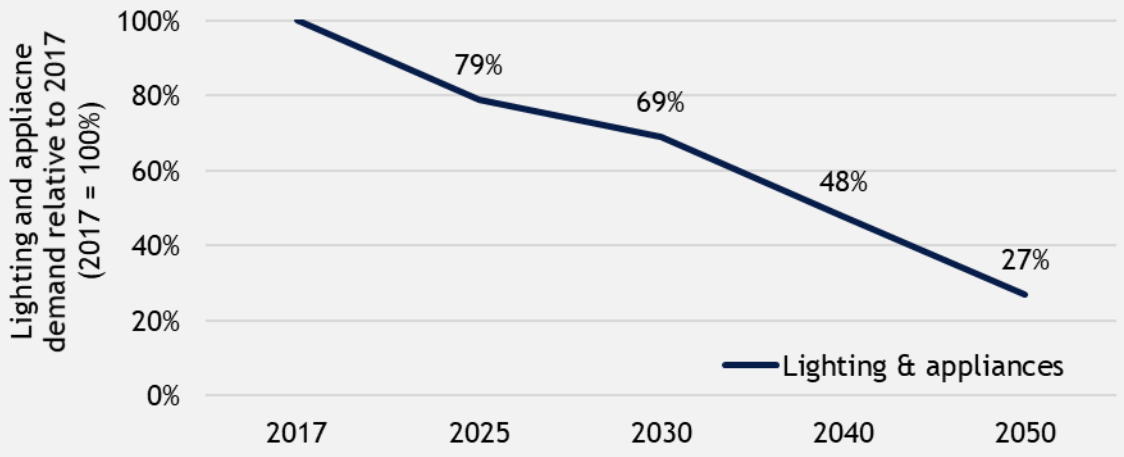


Figure 5.12: Changes in the energy demand for lighting, appliances and cooking relative to a 2017 baseline.

2025	21% reduction in energy demand for domestic lighting and appliances
2030	31% reduction in energy demand for domestic lighting and appliances
2040	52% reduction in energy demand for domestic lighting and appliances
2050	73% reduction in energy demand for domestic lighting and appliances

5.2 – DOMESTIC BUILDINGS
SHIFTING OFF GAS HEATERS
SCATTER INTERVENTION

This measure models the emissions savings resulting from the increased uptake of non-fossil fuel sources for heating.

For domestic properties, the High Ambition Pathway fuel mix is projected to adopt a transition to fully electric-sourced technologies. These are split for the most part between air- and ground-source heat pumps, with a smaller contribution from resistive heaters.

This projected technology mix offers the most significant carbon savings, but it is acknowledged that the transition away from gas and solid fuel systems may also involve CHP (e.g. the PDHU). The most important consideration is the transition onto systems which operate on renewable or electric fuels; future CHP technologies will have a role to play in this transition.

The impact of this transition on emissions savings is heavily influenced by the increased availability of renewable energy. The same principles apply to domestic heating as in the non-domestic case around reducing the carbon factor of the energy supply through rapid growth of renewable energy technologies.

Key Milestones

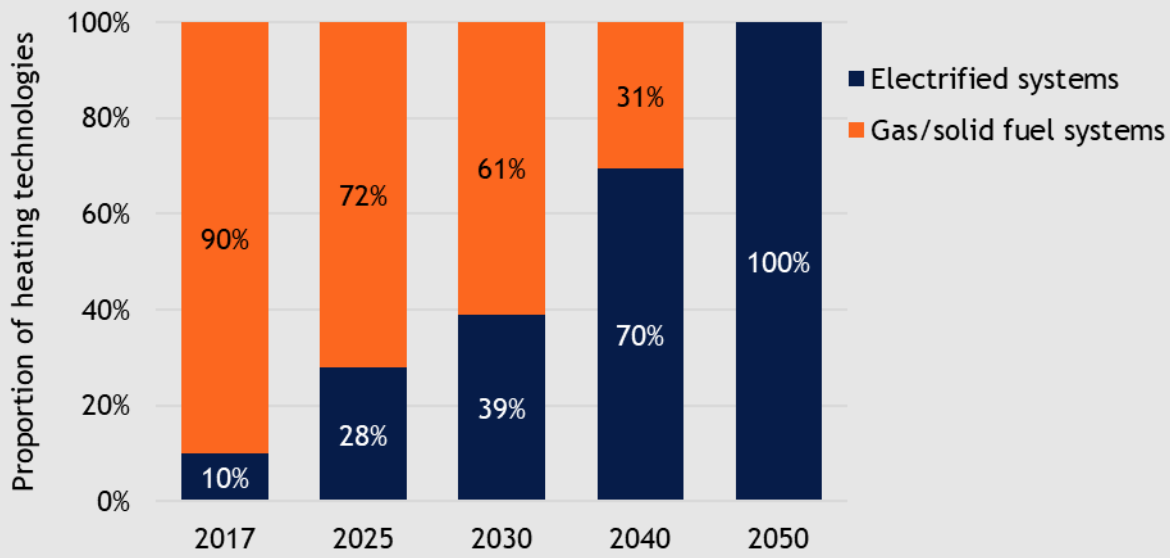


Figure 5.13: Modelled increase in the proportion of domestic heating systems that are electrified. Figures may not sum to 100% due to rounding.

2025	28% of households have electrified heating systems.
2030	39% of households have electrified heating systems.
2040	70% of households have electrified heating systems.
2050	100% of households have electrified heating systems.

5.2 –DOMESTIC BUILDINGS
SHIFTING OFF GAS FOR COOKING
SCATTER INTERVENTION

This measure models the uptake of electrical cooking systems and discontinuation of gas cookers within domestic homes.

Like the non-domestic intervention, the uptake of electrified cooking systems directly reduces other fuel usage, with some efficiency improvements also reducing the fossil fuels used for cooking. The decoupling between the direct transition in energy demand from gas- and solid-fuel systems to electric can also be attributed to efficiency gains and improvements.

As with the heating systems measure, the projected change towards electric systems delivers emissions savings in tandem with decarbonization from the grid.

Key Milestones

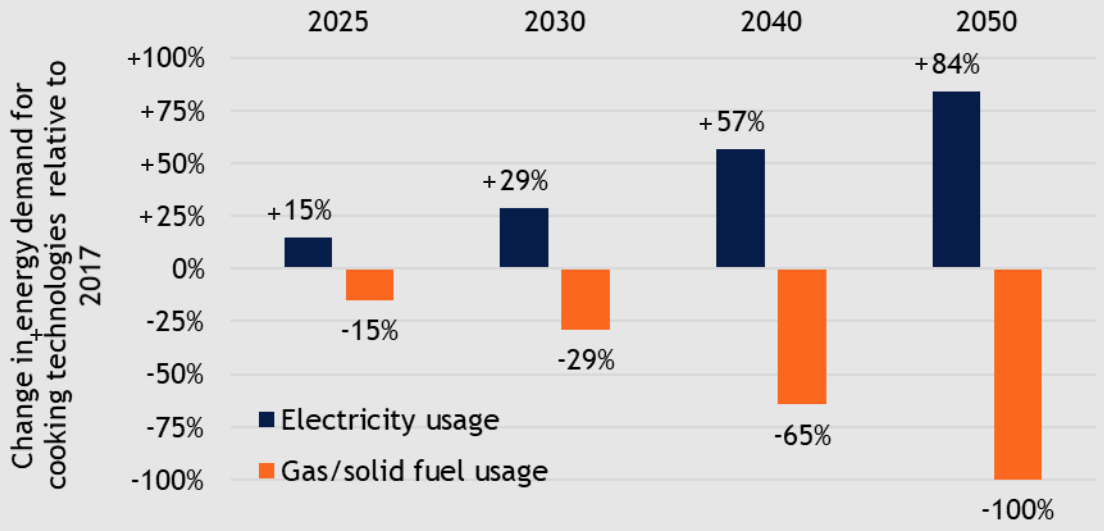


Figure 5.14: Modelled changes in the fuel usage for domestic cookers. By 2050, all cookers will be electrified under this scenario.

2025	15% increase in electricity usage for domestic and cooking; 15% reduction in use of gas/solid fuels
2030	29% increase in electricity usage for domestic and cooking; 29% reduction in use of gas/solid fuels
2040	57% increase in electricity usage for domestic and cooking; 65% reduction in use of gas/solid fuels
2050	84% increase in electricity usage for domestic and cooking; 100% reduction in use of gas/solid fuels

5.2 – DOMESTIC BUILDINGS
KEY STAKEHOLDER PERSPECTIVES

On the 26th November, stakeholders in the planning, management, and utilisation of domestic buildings in Westminster shared their views on action in the sector across four action areas:

Improved energy efficiency: New build fabric

Embodied carbon is not currently considered

Key issue: A perceived lack of new builds considering embodied carbon emissions. Suggested opportunities:

- Consider embodied carbon as part of the planning decision making process
- Use a lifecycle approach to determine if demolishing or retrofit is the best option

Improved energy efficiency: Behaviour change

Embracing behaviour change

Key issue: An opportunity was identified to capitalise on interest from resident groups to reduce emissions. Suggested opportunities:

- Develop knowledge hubs, mailing lists and shared resources
- Work with children to teach practical actions and inspire action
- Offer tailored support to building and household type

Shifting to low carbon energy supply

Decarbonisation of heat

Key issue: Many buildings are deemed hard to treat and have complex ownership structures. Suggested opportunities:

- Reduce VAT on low-carbon technology and insulation as an incentive
- Offer Capital Grant funding for heat pumps
- Share knowledge of stakeholders' grant eligibility better e.g. through a central information store
- Address the current siloed approach to installation

Improved energy efficiency: Existing home fabric

Heritage policies

Key issue: heritage policies place constraints on implementation of low carbon measures, such as costs. Suggested opportunities:

- Help those with the ability to update planning policy to understand current issues
- Demonstrate the carbon and cultural benefits of protecting heritage buildings
- Prioritise collaboration between planners, developers and heritage groups

Tenant/landlord relationships

Key issue: The complexity of the relationship between tenants and landlords is hindering action on retrofit. Suggested opportunities:

- Share financial knowledge and case studies for low carbon measures to inspire landlords.
- Prioritise properties already undergoing building works to minimise disruption
- Ensure sustainability is considered in line with other key factors such as safety

Knowledge gaps

Key issue: A lack of specialist knowledge and understanding of current building stock performance, hindering action. Suggested opportunities:

- Increase leadership by Westminster Property Association to build knowledge
- Assess current building performance to identify the most cost-effective measures
- Develop a shared resource listing new and emerging energy efficiency products

Energy and cost modelling

Key issue: Some perceived SAP calculations (used in EPC ratings) to be incomplete and understating emissions. Others felt that certain methods such as Passivhaus are overstated, when there may be lower cost opportunities. Suggested opportunities:

- Develop a better solution and monitoring system for accurate emissions and energy use

5.2 – DOMESTIC BUILDINGS

ACTION PLANNING

Priority	Goal	Action	Stakeholder Responsible
Priority 1: Improve Building Efficiency (Higher Carbon Impact Potential)	1) a) Policy enables the retrofitting of heritage buildings to be maximised	Review heritage policy to remove barriers to retrofit of heritage domestic buildings and create more flexible, progressive heritage planning policy which takes into account carbon reduction targets. Approve more planning requests for retrofit and energy efficient installations. (WCC)	Westminster City Council
	1) b) Remaining on-site emissions are required to be mitigated through offsetting	Strengthen offsetting obligations for new-builds which mitigate remaining on-site emissions. (WCC)	Westminster City Council
	1) c) Tenants are empowered to report non-compliance and poor performance	Raise awareness of Minimum Energy Efficiency or Energy Performance Certificate Standards for private landlords and set up a system where tenants could anonymously report landlords who do not meet them.	Westminster City Council

Case Study

The Sutton Housing Partnership will trial an airtight wrap, a super-insulated facade and roof to transform 8 properties across London into low maintenance, net-zero carbon homes.

Sutton Housing Partnership

5.2 – DOMESTIC BUILDINGS

ACTION PLANNING

Priority	Goal	Action	Stakeholder Responsible
Priority 1: Improve Building Efficiency (Higher Carbon Impact Potential)	1) d) Landlords are better supported to achieve or exceed all legal efficiency standards	Communicate energy efficiency standards, behaviours and activities in the private rental sector by offering advice and resources to those looking to improve property energy efficiency. (WCC)	Westminster City Council
		Explore voluntary licensing schemes for private landlords, "Property MOTs", to meet all legal standards and provide support for landlords to achieve or exceed them. For example, the London Landlords Accreditation Scheme.	Collective Action
		Better enforce minimum energy efficiency standards (MEES) in the private rental sector to capture non-compliances and provide support to tenants where needed. (WCC)	Westminster City Council
	1) e) All EPC rated G-D properties are helped to achieve EPC ratings A-C	Treat worst-performing properties; identify stock with EPC rating D, E,F,G and maximise ECO3 and Green Homes Grant Government funding available for retrofit and first-time central heating.	Collective Action
	1) f) All new-build domestic developments in Westminster are net-zero	Create ambitious new standards for new developments aiming for net zero with all new developments required to exceed current London energy efficiency standards.	Collective Action
		Require homes built on council land to be Passivhaus standard or similar. (WCC)	Westminster City Council

Case Study

Cornwall Council will no longer provide gas in its new homes and piloted the use of ground source heat pumps at Tolvaddon Energy Park.

5.2 – DOMESTIC BUILDINGS

ACTION PLANNING

Priority	Goal	Action	Stakeholder Responsible
Priority 2: Improve Lighting & Appliance Efficiency (Medium Carbon Impact Potential)	2) a) Energy efficiency regulations are periodically raised to drive energy efficiency in homes	Raise MEES periodically to reflect a transition towards energy efficient homes.	Collective Action

Case Study

Local Energy Advice Partnership works in close partnership with Local Authorities and Housing Associations across the country to offer eligible residents a free energy and money saving advice service.

5.2 – DOMESTIC BUILDINGS

ACTION PLANNING

Carbon savings estimates

The chart in Figure 5.15 describes the estimated carbon savings related to the actions described in this chapter. In summary:

- Emissions savings are calculated relative to the BAU scenario within SCATTER.
- As in the non-domestic case, the savings from reducing heating demand and switching to electrified heating systems far outweigh the savings from improved appliance efficiency.

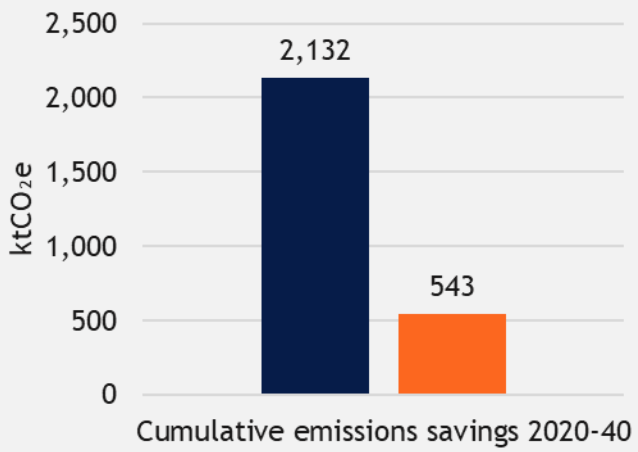


Figure 5.15: Cumulative emissions savings along the High Ambition Pathway following successful implementation of the measures described in this section.

Associated co-benefits

Health benefits

Improving the energy efficiency of homes could reduce ill-health among the residents of Westminster:

- Within the private rented sector - nearly half (45.7%) of households living in the most energy inefficient homes are in fuel poverty.[1]
- 10% of excess winter deaths are directly attributable to fuel poverty.[2]
- The BRE estimate that the cost to the NHS of ill-health due to poor housing is £2.5 bn/year, with excess cold the dominant hazard.[3]
- 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.[4]
- Those living in homes with lower temperatures (15°C versus 21°C) are more likely to suffer from mental health problems.[4]

Financial benefits

Improving the energy efficiency of buildings can reduce energy bills for individuals:

- In a single street of 100 'average' homes, the combined spend on energy is typically 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.[5]

1. Minimum Energy Efficiency Standards in the Private Rented Sector (Energy Saving Trust, 2019)
2. Hills J. Getting the measure of fuel poverty: Final Report of the Fuel Poverty Review. London: 2012
3. The Cost of Poor Housing to the NHS (BRE Trust, 2015)
4. NCB Fuel Poverty Report
5. Ashden No. 3-8

5.2 – DOMESTIC BUILDINGS
RECOMMENDED PRIORITIES FOR ACTION

Westminster City Council:

Direct Control:

- Use policy to maximise the retrofitting of heritage buildings
- Retrofit council-owned homes to a net zero standard
- Review investment plans for the council's own domestic stock

Influence:

- Require residual on-site emissions to be mitigated through offsetting
- Support landlords to achieve or exceed legal efficiency standards
- Require all new-build domestic properties to be net-zero
- Periodically raise minimum energy efficiency standards (MEES)
- Empower tenants to report non-compliance and poor performance

Businesses:

- Build all new domestic properties to a net-zero standard
- Other businesses must take advantage of any grants provided by the government or local authorities to help residents upgrade and improve the efficiency of domestic dwellings

Local Residents:

- Strive to increase the efficiency of their properties to the highest possible standard, taking advantage of any government grants and loans
- Mitigate residual on-site emissions through offsetting
- Tenants should engage landlords on improving the energy efficiency of their properties and report non-compliance

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

Greater London Authority:

- Continue to support the improvement of new build properties and raising standards for new development, aiming for net zero.

Other Partners:

- **Community Groups-** Promote the use of smart technology amongst the community. Consider collective retrofit of whole streets to take advantage of economies of scale.
- **Heritage England-** Engage WCC on heritage building policies
- **Landlords** - Engage with WCC support and educational campaigns, achieve the minimum energy efficiency standards and empower tenants
- **Westminster Property Association** - Help build knowledge across the sector

5.3 Transport

Anthesis

5.3 – TRANSPORT BACKGROUND

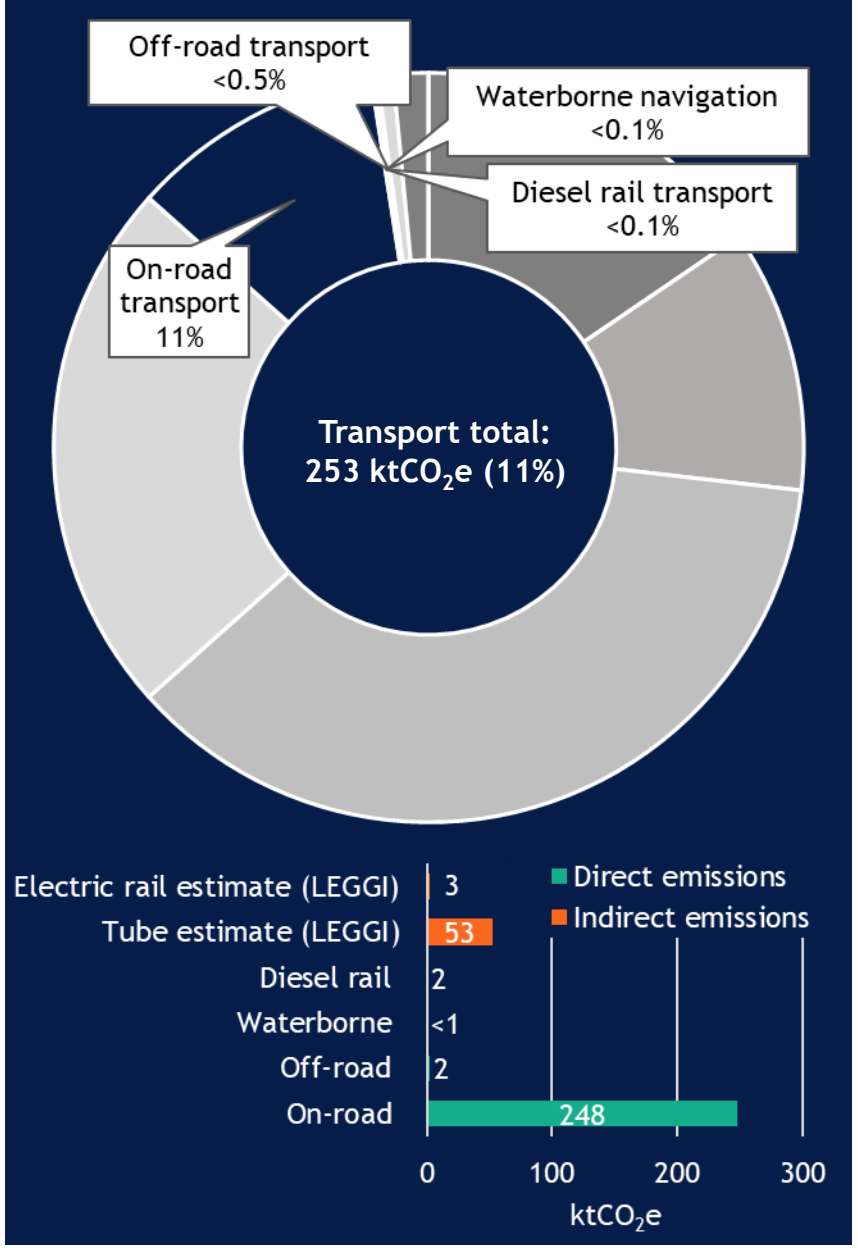
Scope of this section

The next section assesses SCATTER targets which treat transport emissions. On-road transport represents a notable proportion of Westminster's total emissions (11%), but relative to emissions from the built environment these are much lower proportionally than the average local authority. The reader is reminded that the emissions associated with energy consumption of Tube trains falls under stationary energy emissions.

Current contexts

The arrival of the Elizabeth Line (expected 2022) and redevelopment of Victoria Coach Station create opportunities to further integrate transport services, cut congestion and promote active travel and public transport usage in place of private vehicles. As COVID-19 lockdown restrictions were lifted, WCC opened up 11km of additional cycle routes and 800 temporary cycle spaces, complementing existing networks.

In October 2021, the whole borough will become part of the ULEZ, requiring minimum emission standards Euro IV (Petrol) and Euro VI (Diesel) for cars and vans, and Euro VI for larger vehicles. There are 485 EV charging points across Westminster - the highest rate per capita of any UK authority. Westminster also recorded the second highest number of ULEV registrations within the GLA as of the start of 2020. Parking surcharges for diesel vehicles resident permit discounts incentivise the transition to ULEVs. Car-club providers have committed to plans to make their whole fleet electric by 2025.



LEGGI estimates are not included within SCATTER but have been listed here for comparison.

5.3 – TRANSPORT
KEY PLANS AND POLICY

National

- The UK Transport Decarbonisation Strategy is under consultation and expected late 2020
- The Road to Zero Strategy 2018 sets out new measures to establish the UK as a world leader in development, manufacture and use of zero emission road vehicles, including plans to end the sale of new fossil fuel road vehicles
- 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
- Moving Forward Together strategy commits bus operators to only purchase ultra-low or zero carbon buses from 2025

GLA

- Mayor's Transport Strategy 2018 aims for 80% of all London journeys to be completed on foot, by bike or public transport by 2041
- The Strategy is supported by action plans on walking, cycling and freight & servicing
- Vehicle usage and emissions within London are regulated via TfL's Low Emission Zone, Ultra Low Emission Zone and Congestion Charge Zone
- Through the Transport Strategy, the Mayor is committed to supporting boroughs to create town centre Zero Emission Zones and plans to create a central London ZEZ from 2025
- TfL initiatives include expansion of electric bus fleet and zero emission capable standards

Westminster

- The draft City Plan 2040 covers policies for walking and cycling, public transport and infrastructure, parking and freight
- Westminster Local Implementation Plan 2019/22 covers implementation of TfL strategy
- The Westminster Walking Plan, Cycling Strategy, and the emerging Movement Strategy support increased active travel
- The Green City Action Plan 2015 aims to address noise and air pollution, support sustainable transport and reduce carbon
- EV infrastructure expansion is supported by the Electric Vehicle Strategy
- WCC's Freight, Servicing and Deliveries (FSD): Strategy & Action Plan 2020-2040 aims to achieve reductions in freight vehicle numbers and emissions

5.3 – TRANSPORT
SCATTER PATHWAYS MEASURES

High Ambition Pathway

The next group of measures relate to energy used within Westminster's transport networks to travel across the city. The key measures here are broadly focused on two areas; changing the means by which we travel and rapidly reducing the number of fossil-fuel vehicles on our roads.

We can think of the first two measures (travelling shorter distances and driving less) as effectively reducing the *demand* for transport. Switching to electric vehicles is the equivalent of switching to a more sustainable form of fuel for energy *supply*, once again highlighting the need for a rapid grid decarbonisation.

Opposite is a representation of transport emissions through time according to successful implementation of the High Ambition Pathway described on page 19.

Transport measures summary

- **Travelling shorter distances:** see page 61
- **Driving less:** see page 62
- **Switching to electric vehicles:** see page 63
- **Reducing freight emissions:** see page 64
- **International aviation and shipping:** see page 65

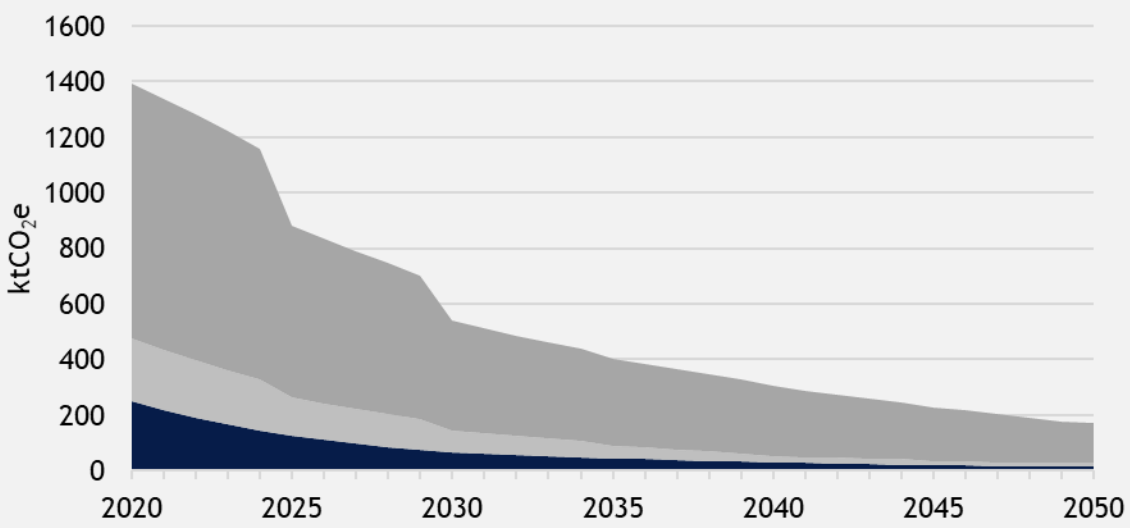


Figure 5.16: SCATTER High Ambition pathway, broken down by subsector. Transport emissions are shaded in navy blue.

5.3 – TRANSPORT
TRAVELLING SHORTER DISTANCES
SCATTER INTERVENTION

This measure considers changes in the overall mileage travelled per passenger across all forms of transport. This measure models the reduction in total travel demand – across all transport modes – per person.

Travelling shorter distances can be achieved in a number of ways. The COVID-19 lockdown forced large numbers of people to find remote working solutions, drastically reducing the footfall of commuters into Westminster.

The future of physical office working remains uncertain, as many businesses become receptive to the additional flexibility of a working pattern which incorporates home-working as standard. As much as 30% of the workforce will be working from home multiple days a week by the end of 2021, according to estimates from US-based firm Global Workplace Analytics.

Changes to transport infrastructure, public transport services and traffic management can also drive reductions in the average distance travelled per person. Increases in population are also taken into account within this measure.

Key Milestones

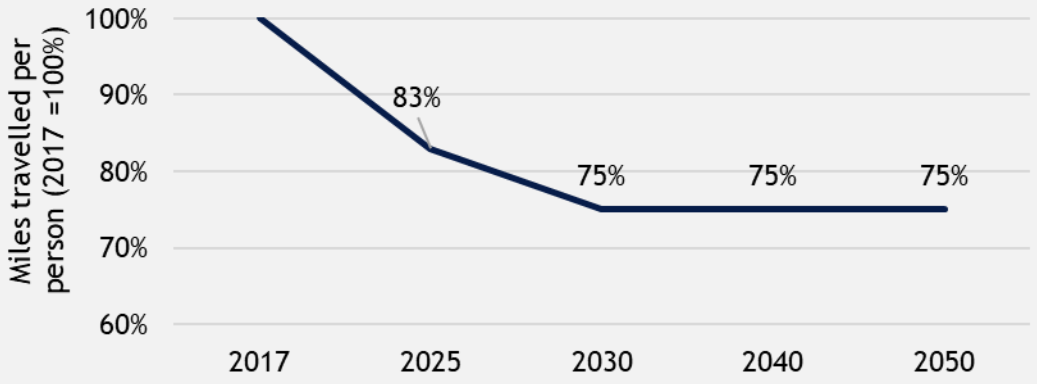


Figure 5.17: Modelled changes in the overall annual mileage travelled per person.

2025	17% reduction in total distance travelled per individual per year
2030	25% reduction in total distance travelled per individual per year
2040	25% reduction in total distance travelled per individual per year
2050	25% reduction in total distance travelled per individual per year

5.3 – TRANSPORT
DRIVING LESS
SCATTER INTERVENTION

This measure considers changes to the mileage share of different travel modes by which passengers travel.

The mode of travel can be broken down into different groups; private vehicle (i.e. on-road transport such as cars, either as passenger or driver), public transport (including buses, trains and the Tube) and active transport (i.e. walking & cycling). Westminster's specific contexts around commuter footfall and inner London public transport links represent a different baseline modal share than a typical local authority, outlined in the graph below.

In Figure 5.19 (opposite) a weighted modal share distribution was used to more accurately reflect the different baseline case for Westminster.

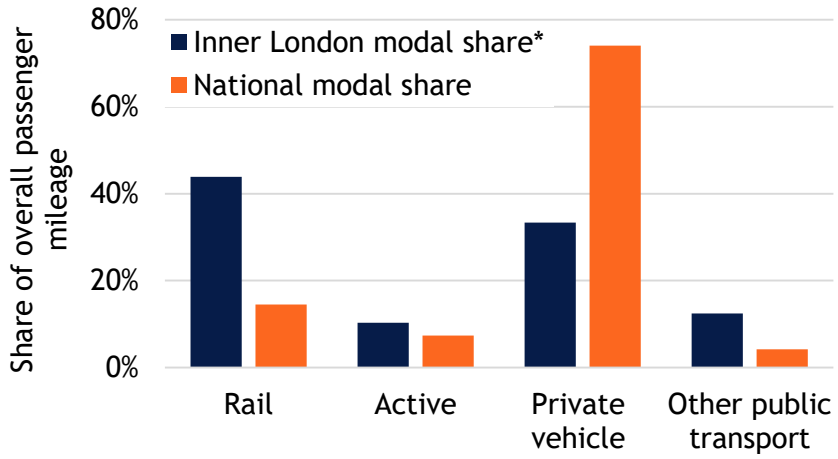


Figure 5.18: Modal share (used within SCATTER) taken from DfT datasets for urban conurbations. *estimate made from the London Travel Demand Survey based on the average mileage per passenger on a typical day.

Key Milestones

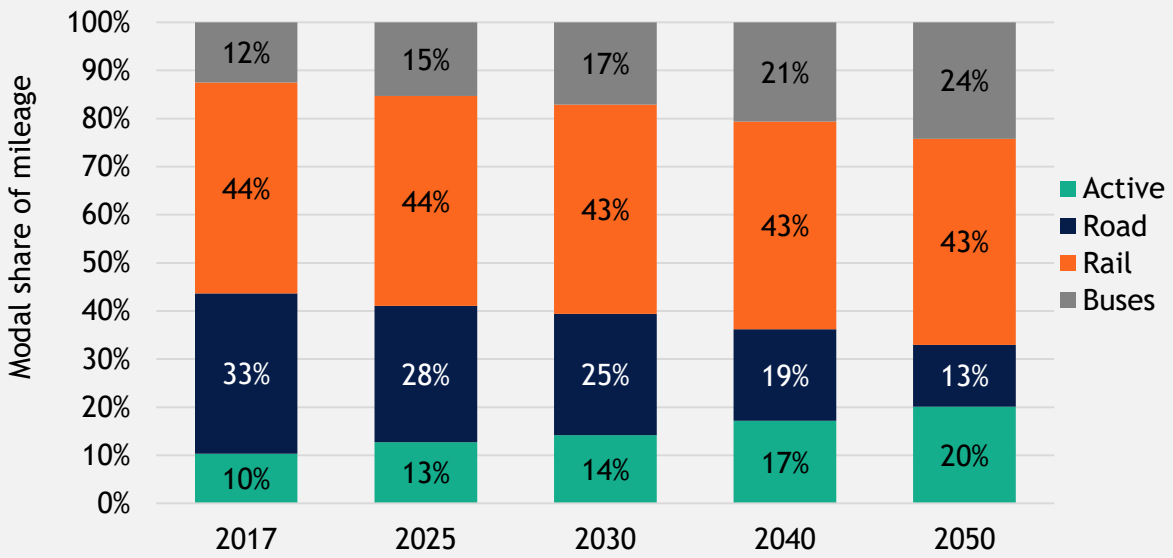


Figure 5.19: Modal share changes according to SCATTER. The 2017 baseline case scenario from SCATTER was weighted using the London Travel Demand Survey data.

2025	Slight increases to active and bus transport at the expense of on-road private vehicle transport
2030	+4% modal share of active transport; +5% modal share of bus transport; -8% modal share of private road transport
2040	+7% modal share of active transport; +9% modal share of bus transport; -14% modal share of private road transport
2050	Modal share of active and bus transport has doubled against current levels; proportion of rail remains stable; car share has fallen to 13%

5.3 – TRANSPORT
SWITCHING TO ELECTRIC VEHICLES
SCATTER INTERVENTION

This measure considers the transition of our fossil fuel vehicles to electric cars, trains and buses and the phasing out of petrol and diesel vehicles.

One of the most important steps to reducing transport emissions and improving air quality in Westminster is the transition to electric vehicles. As with other measures around electrification, the success of the switch to EV relies heavily on grid decarbonisation and renewable electricity supply.

The tool does not consider hydrogen-fuelled vehicles, which are currently in use on some bus routes around London and offer a viable alternative to electric and hybrid vehicles. Whilst tailpipe emissions from hydrogen-fuelled vehicles are zero, the production of the hydrogen itself must also draw on renewable energy sources in order that hydrogen be considered zero emissions in the same sense as electric vehicles.

Transport glossary

EV - electric vehicle
HEV - hybrid electric vehicle
ULEV - ultra low emissions vehicle (currently defined as a vehicle which emits <75 gCO_2/km travelled)
ICE - internal combustion engine (i.e. petrol and diesel vehicles)
LCV - light commercial vehicle (<3.5 tonnes)
HGV - heavy goods vehicle (>3.5 tonnes)

Key Milestones

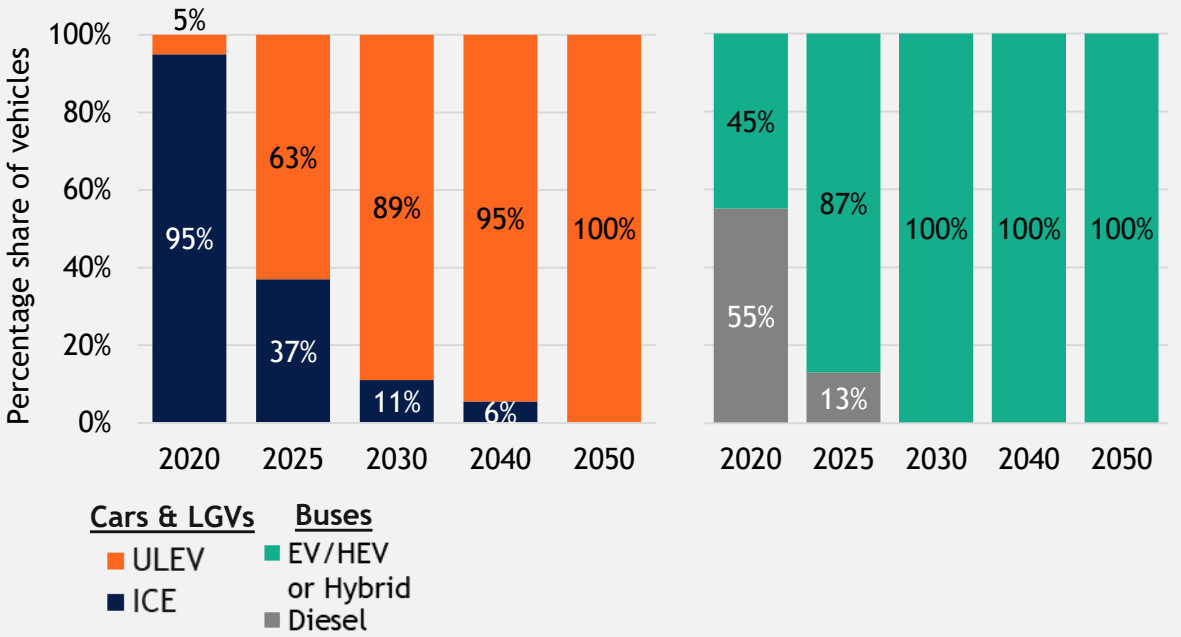


Figure 5.20: Transitioning away from fossil-fuel powered road vehicles. Note that not all figures sum to 100% due to rounding.

2025	63% of cars in use are electric or hybrid; 87% of buses are electric or hybrid. Across the country, 100% of diesel rail is replaced with electric
2030	89% of cars in use are electric or hybrid; 100% of buses are electric or hybrid
2040	94% of cars in use are electric or hybrid
2050	100% of cars in use are electric or hybrid

5.3 – TRANSPORT
REDUCING FREIGHT EMISSIONS
SCATTER INTERVENTION

This measure considers improvements to freight emissions, through both fuel efficiency and modal shift. Limitations to existing electric battery technology for larger vehicles mean that within SCATTER, electric vehicles for HGVs are only modelled after 2040. SCATTER considers three factors which improve freight emissions:

- Improved journey efficiency: reducing the mileage travelled by goods vehicles.
- Improved efficiency of freight vehicles themselves i.e. a reduction in energy used per mile travelled as more fuel-efficient (and eventually, electric) vehicles are used.
- A modal shift from road freight to waterborne transport.

As illustrated in Figure X below, the high volume of LGVs operating in Westminster compared to the national average necessitates that action is best focused on transport associated with "Last Mile" freight.

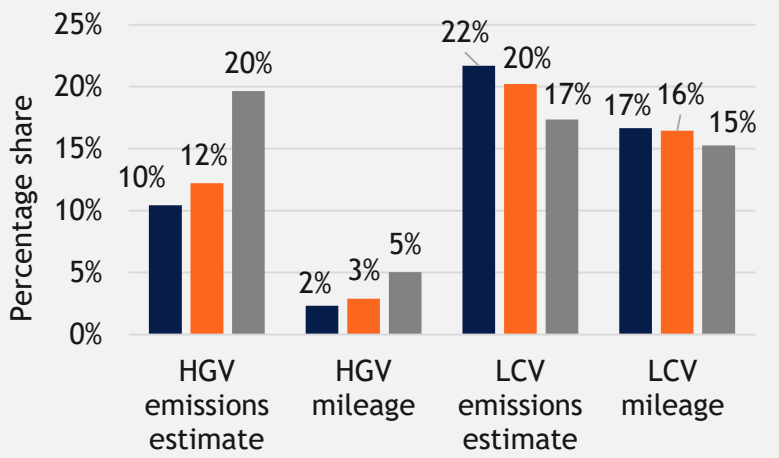


Figure 5.21: Comparing Westminster's freight contexts against the GLA & national picture. Westminster demonstrates a much higher reliance on LCV as opposed to HGV.

Key Milestones

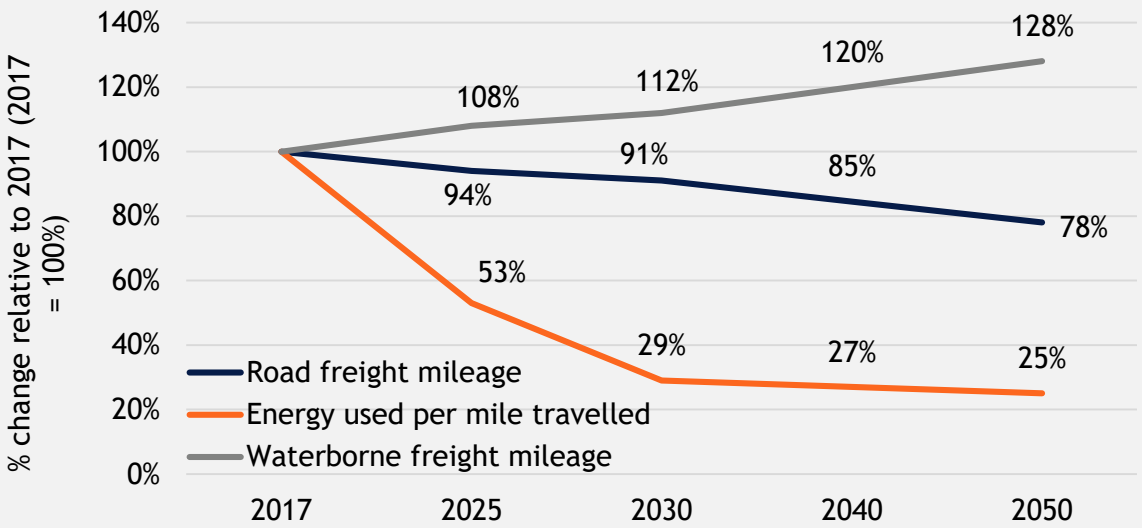


Figure 5.22: Modelling changes to freight emissions.

2025	8% increase in waterborne freight mileage; 6% decrease in road freight mileage; 47% increase in efficiency
2030	12% increase in waterborne freight mileage; 9% decrease in road freight mileage; 71% increase in efficiency
2040	20% increase in waterborne freight mileage; 15% decrease in road freight mileage; 73% increase in efficiency
2050	28% increase in waterborne freight mileage; 22% decrease in road freight mileage; 75% increase in efficiency

5.3 – TRANSPORT
INTERNATIONAL AVIATION AND SHIPPING
SCATTER INTERVENTION

SCATTER also considers changes to international aviation and shipping. Here we have applied government projections for improvements to aviation emissions as well as changes in fuel use at UK ports.

The Department for Transport (DfT) "central" forecast for aviation was modelled within SCATTER, which represents the baseline trajectory for aviation emissions in the UK. The DfT scenarios model various factors related to aviation, including passenger mileage, fleet mix, fuel mix and other efficiencies. These scenarios were projected pre-COVID-19 and any attempt to forecast changes in the aviation industry following this year's pandemic must acknowledge a much higher degree of uncertainty. The responses of different countries to the pandemic and the respective support for the aviation internationally will vary greatly. The International Air Transport Association's chief economist commented that he does not anticipate the airline industry to recover to pre-pandemic levels until 2024.

Trajectories for international shipping have been modelled based on assumptions used in the DECC 2050 Pathways calculator for fuel use from marine bunkers. These are also based on a fixed fuel mix and derive from DfT scenarios, before being applied to fuel usage at UK coastal ports.

Key Milestones

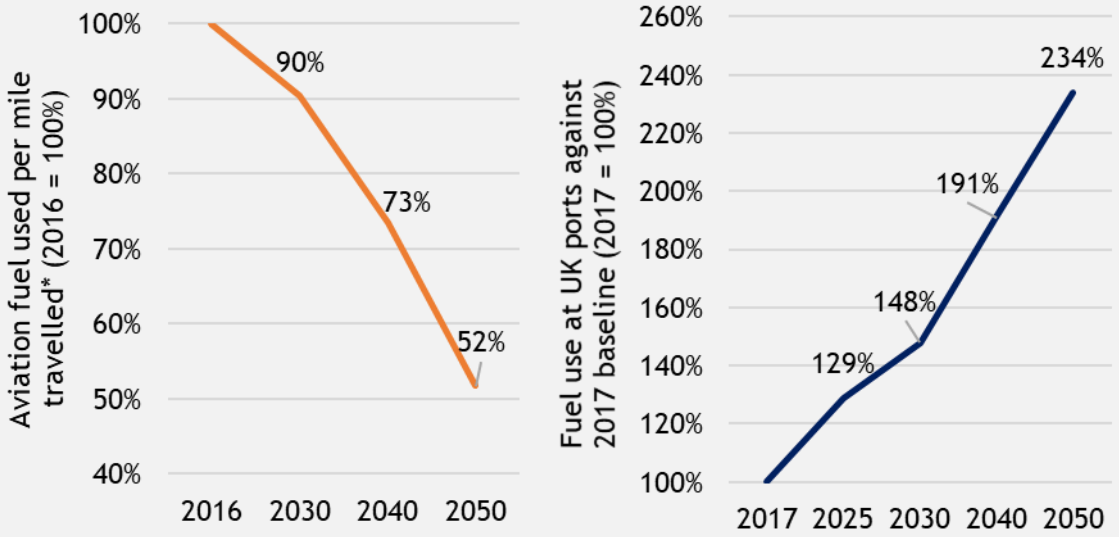


Figure 5.23: Forecasts for changes in the energy intensity of aviation transport and changes to the use of waterborne freight. Changes are relative to a baseline year.

2030	10% improvement in aviation fuel efficiency; 48% increase in fuel use at UK ports
2040	27% improvement in aviation fuel efficiency; 91% increase in fuel use at UK ports
2050	48% increase in aviation fuel efficiency; 134% increase in fuel use at UK ports

5.3 – TRANSPORT
KEY STAKEHOLDER PERSPECTIVES

On the 19th November, stakeholders in the planning, management, and utilisation of transport in Westminster shared their views on action in the sector across three action areas:

Encouraging behaviour change

Reducing car journeys

Key issue: Millions of trips that could be cycled or walked as still taking place, suggesting that the migration to EV should be used as a chance to reduce the overall number of vehicles. Suggested opportunities:

- Car clubs could be better promoted and incentivised by employers
- Disincentivise car ownership by increased charging for on-street parking & permits

Educating citizens

Key issue: Citizens' understanding of the importance of, and opportunities around, active travel. Suggested opportunity:

- Build citizen understanding through public information campaigns

Improving road safety

Key issue: Many people perceive safety as the biggest barrier to them undertaking more active travel. Suggested opportunity:

- Improve cycling infrastructure of segregated cycle lanes and pedestrianised spaces, building on temporary changes seen due to COVID-19.

Considering building design and providing facilities for active travel

Key issue: New build design could better accommodate active transport, such as secure storage in new build flats. Suggested opportunities:

- Use policy to implement active travel minimum requirements for facilities
- Engage with businesses to repurpose office space for cycle facilities

Switching to Electric Vehicles (EV)

EV infrastructure is key

Key issues: Perceived inadequate existing EV charging and parking infrastructure, prohibitive planning policy and lack of developer incentives. Suggested opportunities:

- Link policy to new-build design standards to help encourage rollout by developers
- Incentivise commercial developments to incorporate EV infrastructure
- Discuss opportunities for leaders to share best practice and share knowledge

Reducing vehicle numbers

An alternative approach identified was that reducing general private vehicle usage should be prioritised to ease congestion and reduce reliance on new EV infrastructure.

Reducing freight and logistics emissions

Delivery consolidation schemes offer great potential

Key issues: Lack of space for new distribution centres in central London, and a lack of communication between businesses. Suggested opportunities:

- Improve collaboration and pooling resources through a working group
- Consolidate on a sub-regional basis so that co-location sites can be found
- Explore opportunities to repurpose land to consolidate deliveries
- Use technology to accelerate delivery consolidation and develop partnerships
- Educate businesses on the financial benefits of resource hubs and cargo bikes

Citizen and business behaviour change

Key issue: High demand for deliveries in Westminster. Suggested opportunities:

- Help citizens make more sustainable choices, such as choosing slower delivery
- Explore opportunities between locally proximate businesses to coordinate and consolidate deliveries and using landlords to initiate discussions between tenants.

5.3 – TRANSPORT

ACTION PLANNING

Priority	Goal	Action	Stakeholder Responsible
Priority 1: Modal Shift (Higher Carbon Impact Potential)	1) a) Policy and Council initiatives enable and incentivise more walking and cycling	Enhance measures associated with the ULEV zone to further disincentivise driving. (WCC)	Westminster City Council
		Define the potential for more walking and cycling infrastructure to promote modal shift. Explore creation of traffic free areas or zones. This may enable safer, more available and improved active travel infrastructure.	Collective Action
		Include requirements in building and planning policy which further incentivise active travel, such as the provision of secure storage and drying rooms. (WCC)	Westminster City Council
Priority 2: Switch to Electric Vehicles (Higher Carbon Impact Potential)	2) a) Sufficient EV infrastructure is provided	Increase the number of EV charging infrastructure installations and incentivise installations by developers and landlords. Develop planning and heritage policy to facilitate EV infrastructure.	Collective Action
	2) b) Public and private-hire transport is electrified	Encourage TFL to accelerate the switch to electric buses in Westminster beyond current commitments. (WCC)	Westminster City Council
		Incentivise EV for private hire vehicles, accelerating the shift away from Internal Combustion Engine vehicles. Identify potential for better EV charging infrastructure to support this transition.	Collective Action

Case Study

Tower Hamlets' Breathe Clean Challenge urged everyone who lived or worked in Tower Hamlets to ditch their car for June 2019 and walk or cycle more to reduce air pollution and get healthier.

Case Study

Oslo, Norway has designated 1,300 of its 6,500 parking spaces in car parks for BEVs, which also have charging points. Additionally, the city is working with housing cooperatives to install thousands more charging points outside homes.

5.3 – TRANSPORT

ACTION PLANNING

Priority	Goal	Action	Stakeholder Responsible
Priority 3: Improve Freight Emissions (Higher Carbon Impact Potential)	3) a) Delivery methods are consolidated and efficient to reduce on-road emissions	"Reduce, Remode, Retime" coordinate with WCC's Freight, Servicing and Deliveries (FSD) Strategy and Action Plan to reduce the impacts associated with freight vehicles in Westminster. This will include consideration of the feasibility of local distribution hubs for home deliveries across Westminster which utilise low-carbon "Last Mile" deliveries.	Collective Action
	3) b) Supply chains are as low carbon and local as possible	Encourage local stakeholders to consider the sustainability of their supply chains.	Collective Action
		Update procurement policies to reflect carbon considerations, including scope for carbon insetting (or in-boundary offsetting). (Opportunities for this may also apply in other sectors, such as Energy Supply, where business can ensure all electricity is procured from renewable sources).	Collective Action
Priority 4: Reduce Aviation & Shipping Impacts (Medium Carbon Impact Potential)	4) a) Aviation-related emissions are minimised	If necessary, understand the carbon impacts of a new runway at Heathrow, and discourage business air travel possible.	Collective Action
		Understand in more detail Westminster's businesses and residents' contribution to national aviation emissions.	Collective Action

Case Study

Climate Perks works with climate-conscious employers to offer at least two paid "journey days" per year to staff who travel on holiday by train, coach or boat instead of flying.

climate perks

5.3 – TRANSPORT
BENEFITS OF ACTION

Carbon savings estimates

The chart in Figure 5.24 describes the estimated carbon savings related to the actions described in this chapter. In summary:

- Emissions savings from transport are related to the declining usage of petrol vehicles **only** i.e. they are an overestimate since they have not been offset by the transition to EV, which in the near-term still carries a carbon cost ahead of the grid becoming decarbonized.
- The uptick in electricity consumption associated with EV usage is measured in the stationary energy sector.
- Emissions savings are weighted heavily towards the 2030s as this is the timeframe of greatest contrast against BAU uptake of EV.

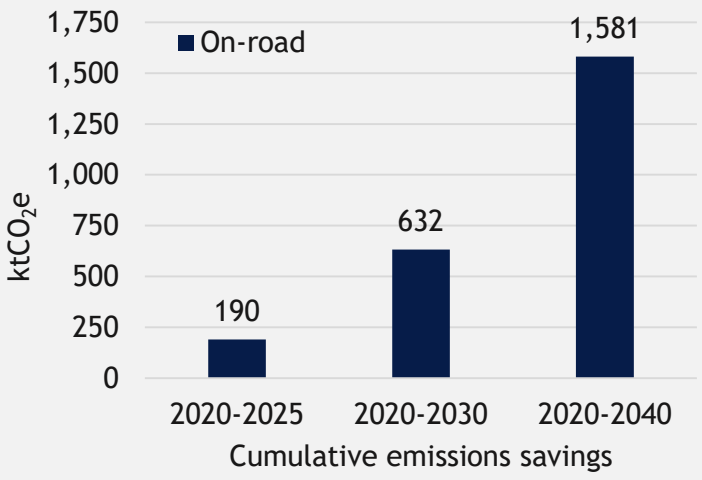


Figure 5.24: Cumulative emissions savings along the High Ambition Pathway following successful implementation of the measures described in this section.

Associated 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.[1]
- The cost to the economy of pre-mature deaths related to poor air quality is estimated to be £54bn a year.[2]
- Improving air quality can also help to reduce health inequalities – air pollution levels have been found to have strong association with deprivation levels.[2]
- 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.[3]

The benefits of a fall in aviation on local communities are also well documented- this includes improved air quality and reduced noise. [4]

Financial benefits

- 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 £13 to £16 to drive 100 miles.[5]
- 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.[5]
- Pure electric vehicles are usually cheaper to service and maintain compared to equivalent vehicles with internal combustion engines.[5]

1. Ashden 31 Climate Actions No. 16-25
2. Health Matters: Air Pollution (Public Health England, 2018)
3. Jarret et al, 2012. Effect of increasing active travel in urban England and Wales on costs of the National Health Service.
4. Numerous sources, including UK Parliamentary Paper on Aviation and the Environment
5. Energy Saving Trust

5.3 – TRANSPORT
RECOMMENDED PRIORITIES FOR ACTION

Westminster City Council:

Direct Control:

- Create policies that enable and incentivise pedestrians and active travel, including pushing for the enhancement of the ULEV zones and creation of traffic free areas.
- Provide sufficient EV infrastructure

Influence:

- Create policies that prioritise pedestrians and incentivise active travel
- Encourage local stakeholders to consider the sustainability of their supply chains
- Refer to WCC's Freight, Servicing and Deliveries (FSD) Strategy & Action Plan, and the "reducing, remoding, retiming" hierarchy in seeking to consolidate delivery methods.

Businesses:

- Support the roll out of EV infrastructure on privately owned land
- Shift to EVs for private hire vehicles
- Investigate shared procurement of services e.g. waste collections, and require use of low emission vehicles for procured services
- Consolidate delivery methods and explore shared distribution hubs
- Facilitate the setup of local distribution hubs for home deliveries
- Collaborate with stakeholders across the city to explore flight reduction campaigns and measures.
- Use supply chains that are as low-carbon and local as possible

National Government:

- Lead the transition to zero carbon vehicles, provide certainty and encourage EV manufacturers to allocate vehicles to UK market
- Confirm new emission standard regime post-Brexit and end to sales of petrol and diesel vehicles
- Provide financial support for funding gaps left by TfL
- Explore options for a campaign to limit short car trips

Greater London Authority:

- Continue to implement pan-London vehicle emissions standards, with clear pathway to zero carbon emissions
- Continue to promote roll out of cycle-friendly infrastructure

Local Residents:

- Continue to model low car ownership and high rates of active travel
- Be aware of local impacts of online deliveries and PHV: be more flexible in delivery options e.g. wider timeslots, not next day, to allow delivery companies to operate more efficiently.
- Where possible, avoid driving for commuting and the school run
- When travelling further afield, explore alternatives to flight
- Consider "miles travelled" in food purchase decisions and buy locally

Other Partners:

- **Schools-** encourage children to walk or cycle to school as well as educate on road safety. Ensure facilities are encourage active transport
- **TFL-** Explore more rapid electrification of the bus fleet. Encourage Taxi companies to move to low emissions vehicles through licencing incentives.

5.4 Renewable Energy Supply

Anthesis

5.4 – RENEWABLE ENERGY SUPPLY BACKGROUND

Scope of section

Throughout the sections of this chapter on buildings and transport, reference has been made of the importance of providing decarbonised electricity to Westminster. The following analysis provides details for the scale and ambition required to meet Westminster's energy consumption with renewable sources.

The method by which SCATTER apportions local renewable capacity is based upon the scaling up of installed capacity in a given local authority. These are based on the National Grid's Two Degrees Scenario and weighted according to current installed capacity.

Current contexts

Westminster lags behind peer authorities in the GLA in terms of installed capacity for renewable energy technologies, with an installed capacity per unit area rating at well under 50% of the average value.

The energy usage density within Westminster does make it a favourable location for the development of heat networks (such as the PDHU) and this has been reflected in recent plans (e.g. Decentralised Energy Masterplan, City Plan 2040). Waste heat from the Tube and locally linked high-consumption sites provide significant opportunities to access otherwise wasted energy.

The installation of renewable technologies such as PV is made significantly more difficult after accounting for the large conservation area coverage across Westminster and the large numbers of listed buildings.

Inner London borough	Installed renewable capacity (kW)				Renewable capacity per unit land area (kW/km²)
	Solar PV	Local wind	Organic Fuels*	Total	
Camden	2,046	-	-	2,046	94
Greenwich	4,562	21	-	4,583	91
Hackney	2,404	-	-	2,404	126
Hammersmith and Fulham	730	-	-	730	43
Islington	2,479	6	130	2,615	176
Kensington and Chelsea	613	4	-	617	50
Lambeth	2,279	-	-	2,279	84
Lewisham	3,750	-	35,000**	38,750	1,097
Southwark	4,035	14	385	4,434	148
Tower Hamlets	2,568	6	-	2,574	119
Wandsworth	2,120	6	-	2,126	60
Westminster	1,201	-	1,195	2,396	109
Inner London average	2,399	5	1,601	5,463	242
GLA Average	3,673	342	8,233	12,248	259

Current installed renewable capacity within Inner London boroughs
*encompasses anaerobic digestors, sewage & landfill gas, municipal solid waste generation and plant biomass.
**Capacity from SELCHP, which also services Greenwich, Bromley & Westminster. This capacity has been weighted to these boroughs in any averaging calculations.

5.4 – RENEWABLE ENERGY SUPPLY
KEY PLANS AND POLICY

National

- The UK's National Planning Policy Framework (2019) states as a core planning principle that planning should support the transition to a low carbon future, and stipulates requirements for renewable energy projects
- UK National Energy and Climate Plan sets out integrated climate and energy objectives, targets, policies and measures for the period 2021-2030
- Contracts for Difference scheme is the governments principal mechanism for encouraging investment in larger scale renewables
- The Renewable Heat Incentive and Smart Export Guarantee reward the use of community and domestic scale renewable energy technologies
- UK Energy White Paper published December 2020

GLA

- Policy 5.2 of the current London Plan 2015 requires major domestic developments to meet the zero-carbon standard, achieving a 100% improvement on Building Regulations (Part L 2013), with a minimum 35% improvement on site
- Policy SI2 of the draft new London Plan 2019 will require all major development to be net zero-carbon and achieve a minimum 35% improvement on Building Regulations 2013 standards, with strict criteria on when offsetting via borough level funds is allowed
- The Mayor's Solar Action Plan sets the ambition for London to have 1GW of installed solar capacity by 2030 and 2GW by 2050

Westminster

- The draft City Plan 2040 Policy 37 states that major developments should demonstrate how local carbon reduction targets will be achieved. Any shortfall in carbon reduction targets must be met off-site or via a locally managed carbon offset payment
- The Carbon Offset Fund provides funding to local groups for low carbon energy schemes
- The Community Infrastructure Levy is a charge that can be applied by local authorities on new developments to support developments in local infrastructure, including renewable supply.

5.4 – RENEWABLE ENERGY SUPPLY
SCATTER PATHWAYS MEASURES

High Ambition Pathway

The measures described so far across the buildings, transport and industry sectors are heavily influenced by the provision of renewable electricity from zero-carbon sources.

SCATTER considers a wide range of renewable technologies. Of these, some can be implemented locally, whilst others require an out-of-boundary delivery (e.g. offshore wind). Acknowledging that Westminster represents an extreme case in terms of space limitations, it should be noted that SCATTER's projections for installed capacity are made with the objective of meeting in-boundary demand for electricity up to 2050. Preference for given technologies and the necessity for out-of-boundary investment to meet these targets may far part of Westminster's response to meeting this demand.

The suggested capacities are scaled to Westminster by energy consumption, except where stated otherwise. Naturally, some technologies will be much more feasible than others to provide a stable renewable energy supply within Westminster.

<0.03% **Proportion of Westminster's electricity consumption that was met by in-boundary renewable energy sources[1] in 2017**

Renewable energy measures summary

- **Local technologies:** see page 75
- **Large scale technologies:** see page 76
- **Other technologies:** see page 77

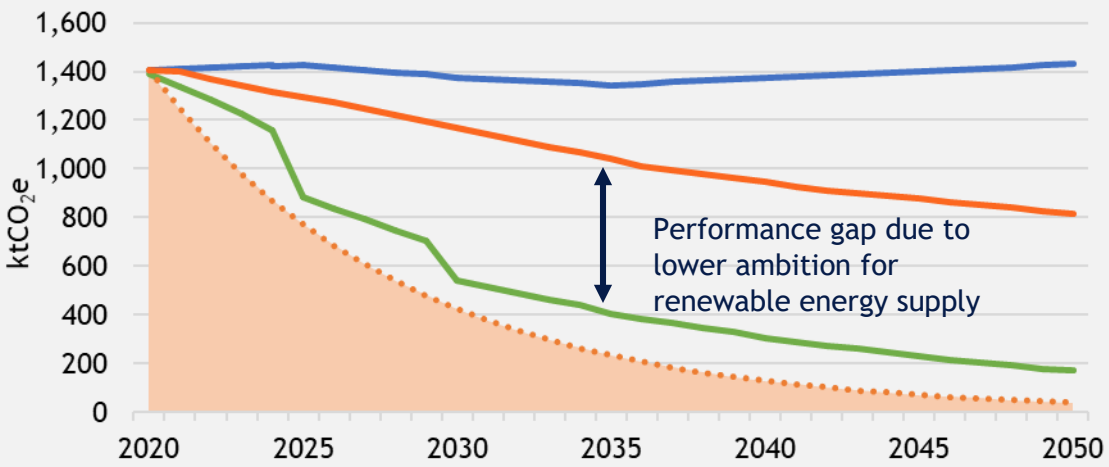


Figure 5.25: Highlighting the importance of energy supply measures. The green line tracks the High Ambition Pathway and the blue line the BAU. The orange line tracks a High Ambition scenario for all measures **except** those which relate to renewable energy sources (termed a Low Capacity scenario).

1 – SCATTER Inventory, BEIS renewable energy statistics

5.4 – RENEWABLE ENERGY SUPPLY

LOCAL TECHNOLOGIES

SCATTER INTERVENTION

The first measures consider the local installation of solar and wind capacity within Westminster's boundary. As mentioned in the section's scope - estimates here are made based on National Grid scenarios and scaled according to the growth of existing installations.

Where a given technology is deemed unfeasible within a given area (e.g. the prescribed level of wind may not be assessed as feasible) the residual capacity is assumed to be taken up by other technologies (i.e. additional solar).

The dominant technology at the local level within Westminster is solar PV, with a very small contribution from wind. Both have been considered at the local scale, deliverable on households or commercial/public sector buildings as well as on the large-scale. According to the Energy Saving Trust, the typical household array capacity is between 2-4 kW. The current average square metre of solar PV panel provides a capacity in the region of 0.15-0.20 kW of energy.

On the other hand, a typical full-size onshore wind turbine has a capacity of around 2.5 MW, though these are not realistically feasible in the local area. Smaller *micro-wind* turbines have much smaller capacities, typically no greater than 0.02 MW.

Key Milestones

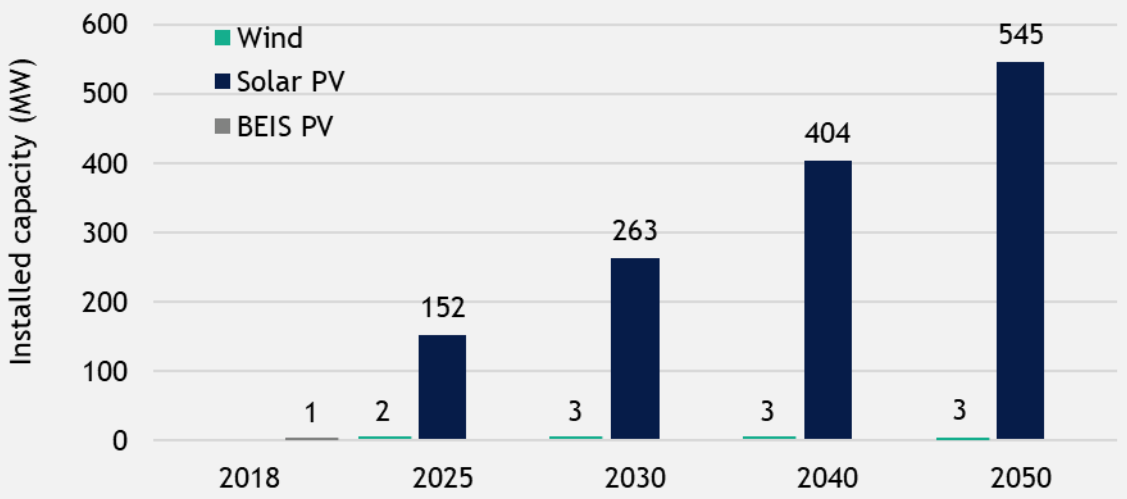


Figure 5.26: Modelled changes in installed capacity of local renewables. BEIS renewable statistics indicate a total current installed capacity of 1.2 MW for solar PV.

2025	Local PV capacity grows to 152MW by 2025, small-scale local wind generation grows to 1.1MW
2030	Local PV capacity grows to 263MW by 2030, small-scale local wind generation grows to 2.2MW
2040	Local PV capacity grows to 404MW by 2040, small-scale local wind generation grows to 2.7MW
2050	Local PV capacity grows to 545MW by 2050, small-scale local wind generation grows to 3.2MW

5.4 – RENEWABLE ENERGY SUPPLY
LARGE SCALE TECHNOLOGIES
SCATTER INTERVENTION

Alongside local installations, SCATTER also considers the installation of large-scale renewable energy projects. These are necessary to meet the energy demands of the city and aim to reduce the overall carbon grid factor of the national grid.

The technologies described opposite are theoretically based on out-of-boundary installations delivered and/or managed in partnership with Major Power Producers.

As was true in the local technologies measure, the prescribed capacity in each technology type is flexible and any reduced capacity in one type is assumed to be made up for by another technology type.

Warrington Borough Council have invested heavily in out-of-boundary hybrid solar farms.

WBC's model for investment in large-scale renewable installations is a useful example of subsidy-free renewable power generation between local government and local stakeholders.

Key Milestones

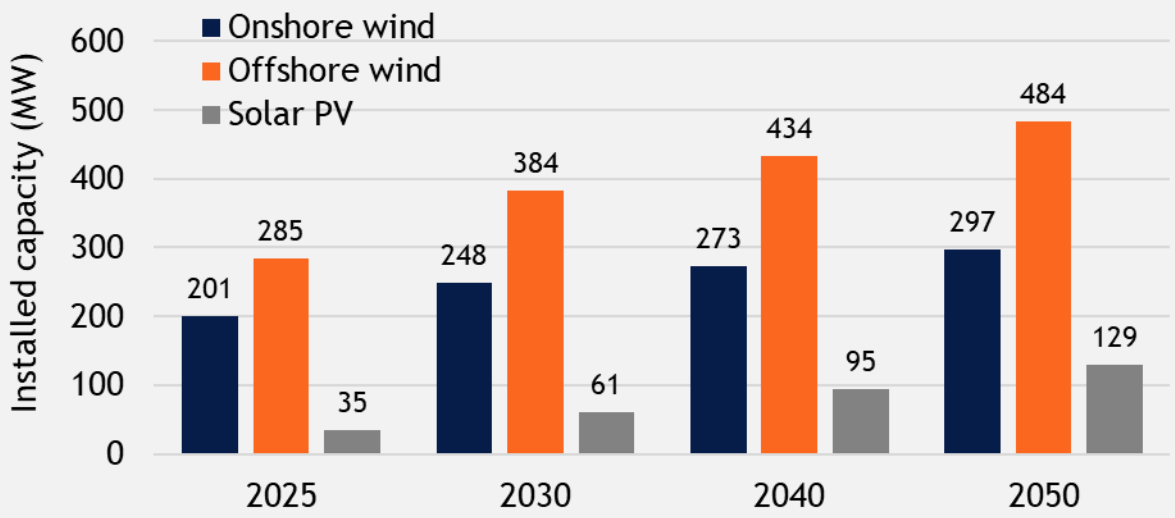


Figure 5.27: Modelled changes in installed capacity of large-scale renewables, deliverable out-of-boundary.

2025	Onshore wind capacity increases to 201MW, offshore wind capacity increases to 285MW and solar PV capacity increases to 35MW
2030	Onshore wind capacity increases to 248MW, offshore wind capacity increases to 384MW and solar PV capacity increases to 61MW
2040	Onshore wind capacity increases to 273MW, offshore wind capacity increases to 434MW and solar PV capacity increases to 95MW
2050	Onshore wind capacity increases to 297MW, offshore wind capacity increases to 484MW and solar PV capacity increases to 129MW

5.4 – RENEWABLE ENERGY SUPPLY
OTHER TECHNOLOGIES
SCATTER INTERVENTION

SCATTER also considers other renewable technologies, including wave, tidal and hydroelectric power. Only local authorities with existing installed capacity or significant inland water area are included in the scope of those technologies. To this end, very small amounts of small-scale hydroelectric projects have been identified as suitable across Westminster.

Biomass within SCATTER is assumed to displace fossil fuels as an energy source for generation in power stations. The combustion of solid biomass fuels (e.g. plant or animal biomass) still releases greenhouse gases into the atmosphere, albeit with a much smaller impact than that of coal or natural gas.

For the High Ambition pathway, generation **in power stations** from solid biomass fuels is modelled to increase fourfold by 2025, before dropping off to very low levels by 2050. Without the coupling of biomass generation to carbon capture and storage technology, there will always be residual emissions associated with the consumption of solid biomass fuels. The phasing out of coal and natural gas follow trajectories in the National Grid Two Degrees scenario.

Key Milestones

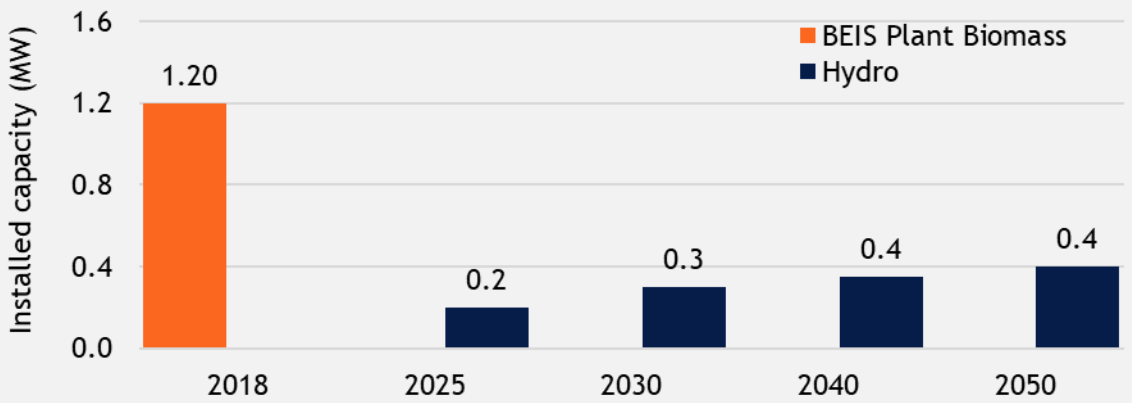


Figure 5.28: Small-capacity local technologies beyond solar and wind.

2025	Local hydro capacity grows to 0.2MW
2030	Local hydro capacity grows to 0.3MW
2040	Local hydro capacity grows to 0.4MW

Urban micro-hydropower

Archimedes screws can be installed in rivers and weirs and are used in Edinburgh, the River Thames, and Bristol. Tidal turbines are another form of micro-hydropower with a greater output than wind turbines due to the density of water. A New York tidal turbine project is currently underway in the East River and will benefit from the proximity to the sites of usage reducing the need for transmission infrastructure.

5.4 – RENEWABLE ENERGY SUPPLY
KEY STAKEHOLDER PERSPECTIVES

On the 12th November, stakeholders in energy management, energy supply, and the built environment in Westminster shared their views on action at a local level:

Knowledge sharing and collaboration

Key issue: A skills and knowledge shortage within organisations. Suggested opportunities:

- Improve engagement with other developers, councils and knowledge District Network Operators
- Help distribute information to businesses and provide expert support
- Develop a design guide for effective retrofit of heritage sites

Heritage buildings

Key issue: The perceived lack of flexibility in regulations and buy-in and ambition from national policymakers, the skill gap in retrofitting heritage buildings, and additional costs. Suggested opportunities:

- Build citizen understanding through public information campaigns
- Improve training on retrofitting heritage buildings
- Improve access to funding to tackle additional costs.

Access to finance

Key issue: Access to the finance to kickstart ambitious retrofit programmes and upgrading electricity infrastructure. Suggested opportunity:

- Improve collaboration in gaining access to finance programmes

Tenant/landlord relationship

Key issue: Perceived lack of clarity around who is responsible for making changes. Suggested opportunities:

- Identify ways to record and consolidate tenant requirements and requests
- Encourage tenants to ach through incentives, such as paying for energy audits to identify opportunities for renewable energy or offer green leases

Communal heat networks

Key issue: Lack of utilisation of heat networks. Suggested opportunities:

- Share knowledge around site development to boost the case for heat networks
- Address restrictive policies which hinder the expansion of heat networks

Planning policy

Key issue: Lack of ambition in current national policy. Suggested opportunities:

- Ensure investment criteria for the Community Infrastructure Levy is rigorous and aligned with the Net Zero target
- Review investment criteria for Section 106 Carbon offset charges
- Develop a collaborative group or thinktank to identify how building regulations can better facilitate implementation
- Develop planning documents such as the Environmental Supplementary Planning document to be released in April 2021.

Short Term Operating Reserve Programme (STOR)

Key issue: Concern that the STOR inhibits the city from meeting its climate change targets. Suggested opportunities:

- Assess information regarding the number of STOR operatives and the carbon intensity of activity to inform discussion
- Use the information to assess what policy approach may be adopted to address the concern

5.4 – RENEWABLE ENERGY SUPPLY
ACTION PLANNING

Priority	Goal	Action	Stakeholder Responsible
Priority 1: Increase Local Renewable Technologies (Higher Carbon Impact Potential)	1) a) City-wide renewable energy opportunities are identified	Pay for energy audits and other feasibility studies to identify opportunities for renewable supply. (WCC)	Westminster City Council
	1) b) Policy maximizes opportunities for installation of renewable energy	Review heritage policy and identify opportunities to enable approval of more planning requests for renewable energy installations. (WCC)	Westminster City Council
		Incorporate renewable energy and heat network opportunities into the local plan. Encourage commercial property upgrades within planning policy. (WCC)	Westminster City Council
	1) c) Communities and SMEs are better empowered to access and install low-carbon energy	Support community energy projects and provide guidance to local residents and schools.	Collective Action
		Provide support for SMEs to access funding and skills for energy projects. Facilitate better access to finance, such as the Carbon Offset Fund.	Collective Action
Priority 2: Support Large Scale Technologies outside Westminster (Higher Carbon Impact Potential)	2) a) The Council's entire energy mix is renewable	Ensure any excess demand not met by council owned renewables is from (3rd party) purchased renewables. (WCC)	Westminster City Council

Case Study

Islington Sustainability Energy Partnership supports organisations in the borough who want to reduce energy costs, cut carbon emissions and manage their environmental impacts, providing advice, events and resources for members.

Islington Sustainable Energy Partnership
Make it count

5.4 RENEWABLE ENERGY SUPPLY BENEFITS OF ACTION

Carbon savings estimates

The chart in Figure 5.29 describes the estimated carbon savings related to the actions described in this chapter. In summary:

- Savings from supply-side measures have been calculated from comparison between the Low Capacity & High Ambition cases shown on page 19.
- Supply-side savings should not be directly compared with demand-side savings (see full methodology in Appendix 6).
- Savings along the High Ambition pathway are impacted significantly by the implementation of renewable energy supply.

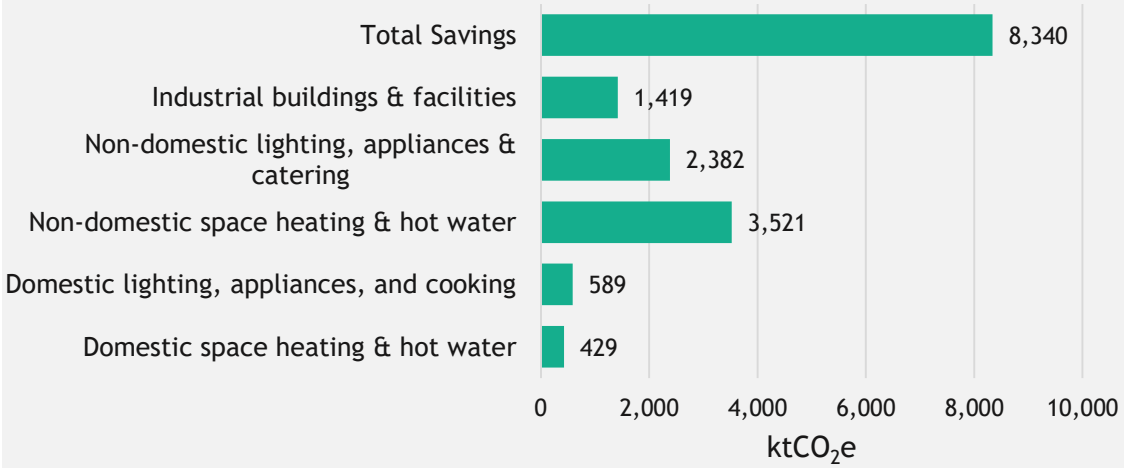


Figure 5.29: Estimated emissions savings from supply-side measures across different stationary energy subsectors.

Associated co-benefits

Health benefits
Green energy has multiple health benefits through reducing air pollution. Poor air quality has been linked to around 40,000 deaths a year in the UK.[1]

Financial benefits
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 local control over finances.[2]

- Local energy resilience and protection against future fossil fuel price increases.[3]
- Creation of jobs and upskilling of local people. In the UK, low carbon and renewable energy activities generated £46.7 billion turnover in 2018, directly employing 224,800 people (full-time equivalents).[3]
- Fuel poverty reduction: Reduction in fuel poverty through improving access to low-cost energy in council housing stock.[3]

1. Health Matters: Air Pollution (Public Health England, 2018)
2. Social & Economic Benefits of Community Energy Schemes (National Trust, 2013)
3. UK Low Carbon & Renewable Energy Economy (Office for National Statistics, 2020)

5.4 – RENEWABLE ENERGY SUPPLY
RECOMMENDED PRIORITIES FOR ACTION

Westminster City Council:
Direct Control:
- Identify city-wide renewable energy opportunities and use policy to maximise them, such as incorporating heat network opportunities into the local plan
- Review policy to maximise opportunities for installation of green energy in heritage buildings
- Integrate renewable energy such as solar thermal, PV or heat pumps in local authority owned buildings
- Switch energy supply to 100% renewable tariff

Influence:
- Empower communities and SMEs to access and install low-carbon energy

Businesses:
- Identify opportunities to install renewables onsite, for example utilising roof-spaces
- Switch to 100% renewable energy tariffs
- Work with other stakeholders, including WCC, to gain access to funding and skills needed for renewable supply projects

Local Residents:
- Switch to 100% renewable energy tariffs
- Utilise funding available from Westminster Carbon Offset fund or London Community Energy fund for community renewables
- Consider the case for renewable and low carbon energy supply during domestic retrofit e.g. solar thermal, PV, heat pumps

National Government:
- Mandate the use of renewable energy or connection to locally available heat networks
- Provide a stable policy environment that makes low carbon energy commercially viable
- Remove perceived incentives within building rates that penalise the investment in onsite renewables

Greater London Authority:
- Continue to set high levels of ambition for carbon reduction through local frameworks.
- Lobby national government to provide funding in the region and to develop ambitious policies

Other Partners:
- **Energy Companies and District Network Operators -** Support the council and business to increase renewable energy generation
- **Schools, Leisure Centres and other infrastructure-** switch to 100% renewable tariffs
- **Community Groups** - Explore opportunities to access and install low-carbon energy

5.5 Waste

Anthesis

5.5 – WASTE BACKGROUND

Scope of section

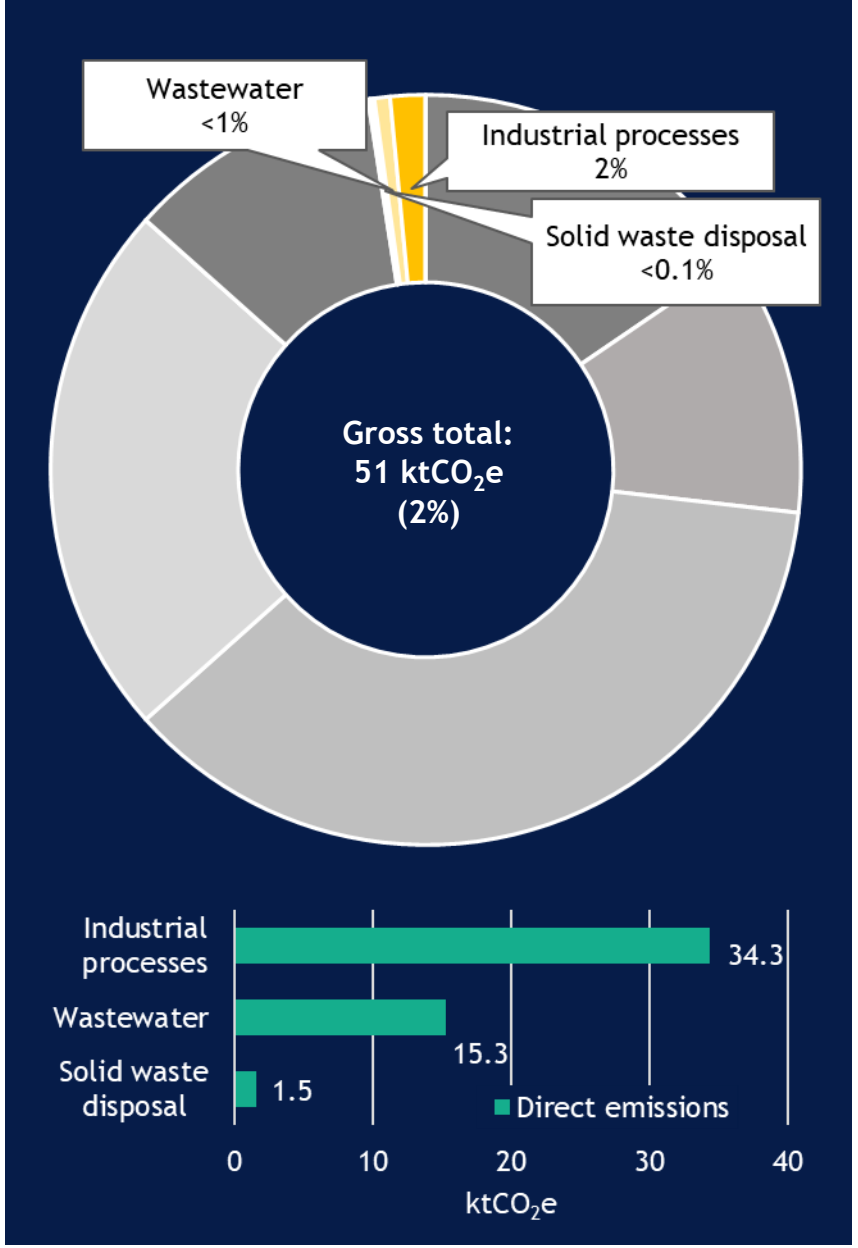
Waste management and waste disposal represents a much smaller proportion of Westminster's emissions than the other areas previously discussed within this chapter. The measures described here relate to all waste streams; reuse, open and closed-loop recycling, combustion and composting & landfill.

Also considered in this section are industrial processing emissions, which relate to emissions arising from heavy industry such as minerals processing as well as metals & chemical manufacturing. It is acknowledged that the apportionment of these emissions to Westminster may not be reflected by activities directly in-boundary and discussion of the emissions in this sector have been kept to waste disposal.

Current contexts

Westminster is one of the worst-performing local authorities nationally in terms of recycling rate. Figures from DEFRA indicate a recycling rate below 20% for household and non-household waste, against a national average of around 43% across England.

The SELCHP energy recovery facility in Lewisham handles much of Westminster's waste, providing low-carbon heat for just over 3,000 homes in Southwark. Other waste streams from within Westminster travel as far as 70 miles to reach its disposal location, though the GLA does has plans for all waste to be disposed of in London by 2026.



5.5 – WASTE
KEY PLANS AND POLICY

National

- Our Waste, Our Resources: A strategy for England (2018) to support the 25-year Environment Plan. 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 and waste management businesses to implement a more consistent recycling system in England. The measures are expected to come into effect in 2023

GLA

- The London Plan sets out that boroughs should provide sufficient capacity to manage the volumes of waste apportioned in the plan

Westminster

- Westminster City Plan sets out their plan for waste, aiming for 100% of waste produced in London will be managed in London
- The Municipal Waste Strategy (2014) sets out how municipal waste (i.e. household waste only) will be managed between 2016-2031
- A new Waste Strategy is currently being developed by the Council

5.5 – WASTE
SCATTER PATHWAYS MEASURES

High Ambition Pathway

The following measures relate to emissions arising from in-boundary waste disposal. We can think of reducing the quantity of waste as a *demand-side* reduction, linking it to more efficient waste collections and saved costs associated with waste processing. Increasing the proportion of waste sent for recycling represents the second step in the process for mitigating emissions from waste disposal. Relative to the other sectors covered in this chapter, waste emissions account for a very small proportion.

It is worth noting that the knock-on effects of improved waste management and processing can yield emissions savings in other areas – for instance, reduced demand for waste collections can lead to transport emissions savings due to lower quantities of waste produced overall.

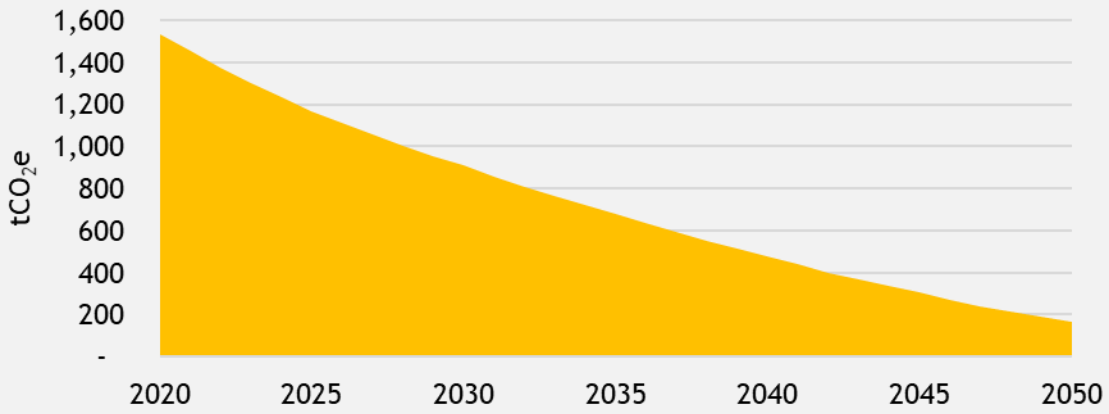


Figure 5.30: Waste emissions pathway under SCATTER High Ambition.

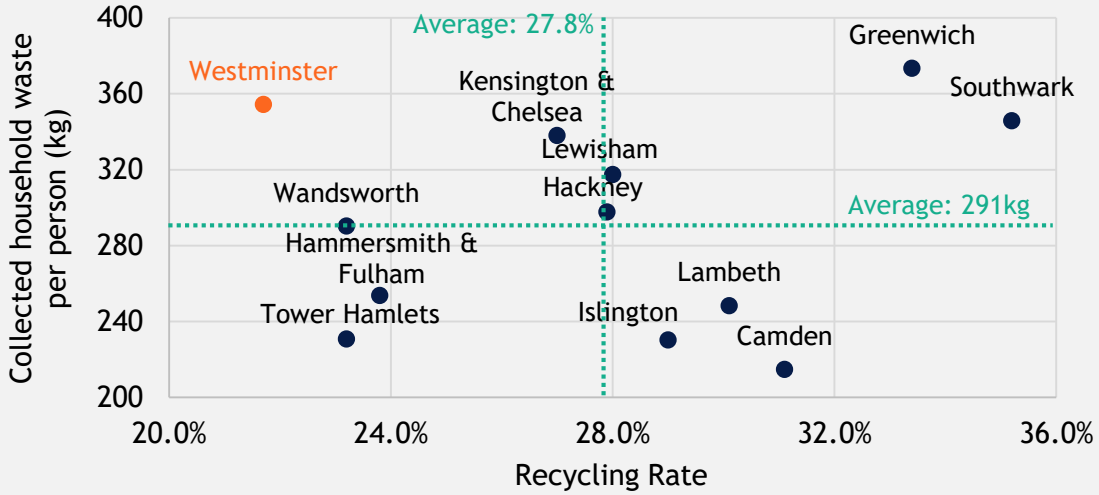


Figure 5.31: Comparing recycling rate against overall household waste per person for inner London boroughs. Westminster has the lowest recycling rate (c.22%) of any of this group as well as producing an above average amount of waste per person (354kg per year). Only Kensington & Chelsea demonstrates similar below-average performance in both metrics.

Waste interventions summary

- **Reducing the quantity of waste**: see page 86
- **Increased recycling rates**: see page 87

5.5 – WASTE
WASTE DISPOSAL: REDUCTION & RECYCLING
SCATTER INTERVENTION

The first measure considers the reduction in the overall volume of waste. This includes waste streams from households, industrial and commercial usage, construction and demolition.

Both of these measures account for the increasing population and number of households in Westminster.

The second measure considers an increase in recycling rate. After reducing the volume of waste outright, the second SCATTER intervention on waste considers changes to the proportion of waste retained within open-loop waste streams.

Further statistics which add further context are:

- The proportion of household vs non-household waste collected in Westminster was roughly a 40:60 split in FY2018/19.
- The proportion of this waste sent to landfill has fallen from just over 13% in FY2010/11 to zero in the most recent year.
- Since FY2015/16, the residual waste per household has fallen approximately 10%.

Key Milestones

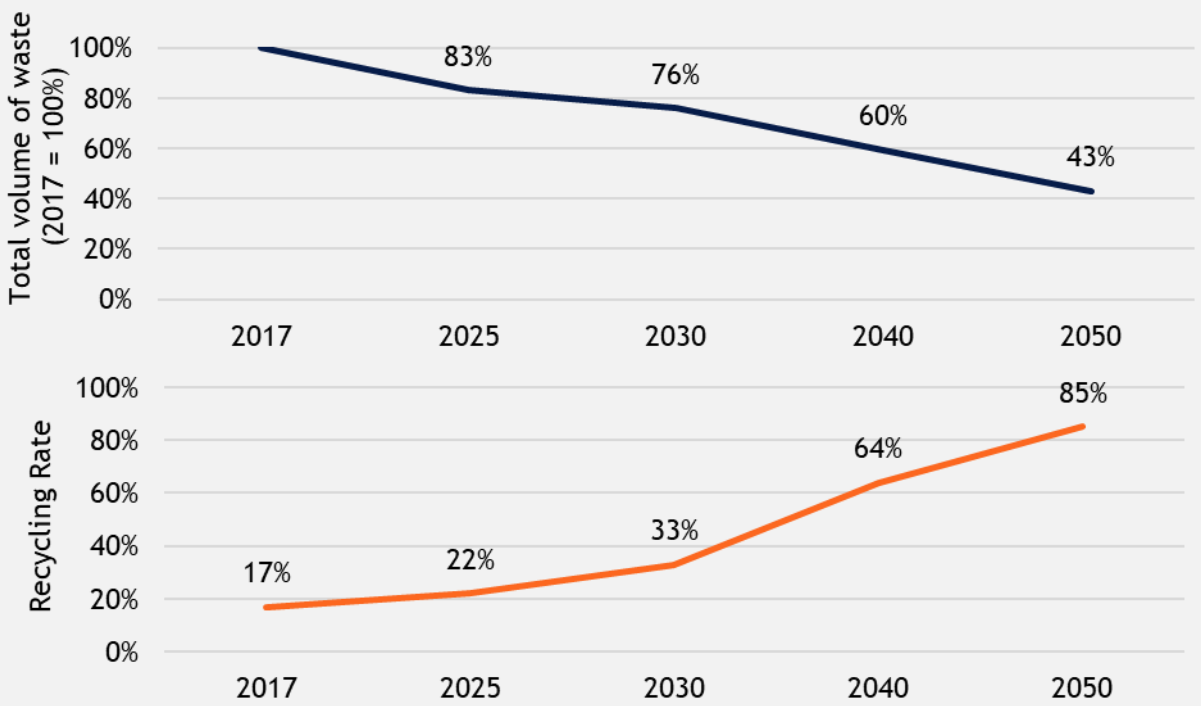


Figure 5.32: Modelled changes to overall waste (top) & recycling rate (bottom).

2025	17% reduction in total volume of waste; recycling rate increases to 22%
2030	24% reduction in total volume of waste; recycling rate increases to 33%
2040	40% reduction in total volume of waste; recycling rate increases to 64%
2050	57% reduction in total volume of waste; recycling rate increases to 85%

5.5 – WASTE
KEY STAKEHOLDER PERSPECTIVES

On the 3rd December, stakeholders in the planning, management, and utilisation of waste in Westminster shared their views on action in the sector across three action areas:

Helping businesses improve waste management & recycling rates

A better mechanism for best practice sharing is needed

Key issue: Coordinating and sharing good practice in an accessible way is challenging, with topics varying between sectors. Suggested opportunities:

- Develop a knowledge sharing mechanism to provide transferable insight
- Align the waste issues of businesses to consolidate and improve efficiencies
- Unite business interests in Business Improvement Districts
- Educate staff to drive bottom-up change

Maximising incentives to business

Key issue: Energy from Waste is currently the main end destination of waste for many businesses. Suggested opportunity:

- Engage with policy makers to explore policy incentives

Food waste poses a particular challenge

Key issue: The management of food waste, particularly in the hospitality sector, where businesses don't have adequate space to sort and store waste. Suggested opportunities:

- Update planning requirements to ensure adequate space for waste storage
- Encourage pledges on food waste, possibly expanding existing schemes
- Offer extra guidance for restaurants on best practice management

Tenant influence is difficult

Key issue: The lack of direct control of building managers over independent tenants to co-ordinate waste efforts. Suggested opportunities:

- Encourage building managers to impose "Green Lease" terms with commitments to waste management practices upon tenants

Helping citizens and communities

More resident engagement is needed

Key issue: Lack of clarity to residents regarding where to find out the best opportunities for waste management. Suggested opportunities:

- Coordinate clear & consistent education campaigns to drive understanding
- Help citizens understand circular disposal opportunities
- Develop repair shops or share knowledge by community engagement

Engaging domestic tenants

Key issue: Lack of control tenants have in their waste management. Suggested opportunity:

- Taking a similar approach to that for business through "Green Lease" terms

Crosscutting or systemic issues

A lack of data is hindering progress

Key issue: Challenges in accruing and understanding waste data, hindering reflections on performance and action. Suggested opportunities:

- Roll out a standardised waste reporting framework to support businesses
- Develop more stringent waste reporting requirements for businesses

Waste operators

Key issue: The high number of waste operators in the city, meaning more vehicles on the roads and hindering consolidation. Suggested opportunities:

- Improve data on waste collection rates to streamline collections
- Explore consolidation models for waste collection & best practice case studies

Considering and preparing updates in policy

Key issue: Fragmented commercial waste context and lack of readiness in businesses for new policies. Suggested opportunity:

- Share knowledge to help businesses move to more circular, sustainable models

5.5 – WASTE
ACTION PLANNING

Priority	Goal	Action	Stakeholder Responsible
Priority 1: Reduce the Quantity of Waste (Lower Carbon Impact Potential)	1) a) Behaviour change drives reductions in the amount of waste produced by businesses	Set baselines and targets for waste reduction in line with a circular economy approach to the waste hierarchy. Support this by expanding waste and recycling reporting through a standardised waste reporting framework for businesses.	Collective Action
		Develop a knowledge sharing mechanism which incorporates technology to enable businesses to collaboratively share best practice and incentivise behaviour change around waste reduction and the circular economy. Restaurants need particular support and encouragement in managing food waste. E.g. Food waste pledge or Olio app. Consolidate efficiencies between businesses to drive improvement. (WCC)	Westminster City Council
	1) b) All businesses are better supported in managing and recycling their waste	Provide better incentives to commercial sites such as restaurants, and other workplaces, to adopt improved waste management measures and encourage positive behaviour change. (WCC)	Westminster City Council
	1) c) Less frequent waste collection and increased recycling	Consider reducing the number of general waste collections made, to incentivise waste reduction. Increase reliance on recycling facilities, with a focus on commercial producers first.	Collective Action

Case Study

The Food Waste Pledge, created by The Crown Estate, commits restaurants across its Regent Street and St James's holdings to achieve a 25% reduction in food waste.

5.5 – WASTE
ACTION PLANNING

Priority	Goal	Action	Stakeholder Responsible
Priority 1: Improve Recycling Rates and Waste Management (Lower Carbon Impact Potential)	2) a) Residents are supported to improve rates of the re-use and recycling of materials	Develop education campaigns for residents on what can be recycled, highlighting opportunities for circular disposal and its associated impacts.	Collective Action
	2) b) Biogas plant capacity and generation is explored and maximised	Explore options to improve biogas plant capacity in the area. Owing to the limited options for development in Westminster, stakeholders could also explore ways to ensure capacity to generate biogas is maximised, including through capture within supply chains (green gas can be difficult to source on the open market).	Collective Action
	2) c) Local waste disposal companies are supported to better manage waste data and consolidate operations	Facilitate communication among local waste disposal companies to create better data disclosure and explore options for consolidation.	Collective Action

Case Study

The Goodlife Centre Repair Café, Southwark occasionally hosts an afternoon of fixing and skill-sharing, offering expert advice from experts and skilled enthusiasts so attendees can try to repair, reuse and recycle their items.

5.5 – WASTE
BENEFITS OF ACTION

Carbon savings estimates

The chart in Figure 5.33 describes the estimated carbon savings related to the actions described in this chapter. In summary:

- Emissions savings from waste reduction remain modest when compared against the other sectors discussed in this report.
- Successful implementation of the waste measures will likely carry some influence over on-road emissions savings locally, though these are very difficult to quantify.

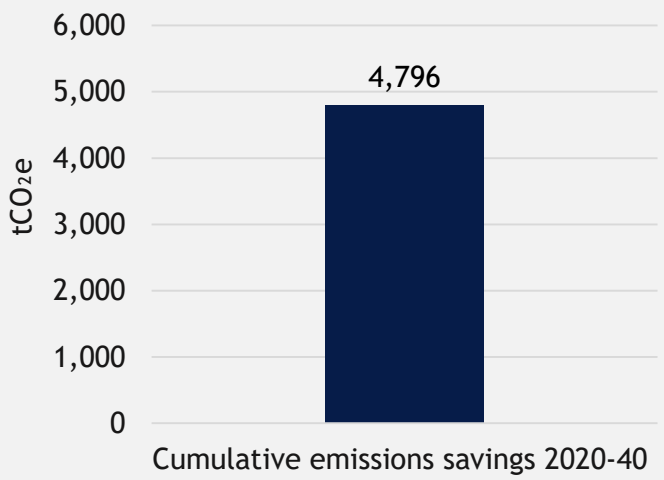


Figure 5.33: Cumulative emissions savings along the High Ambition Pathway following successful implementation of the measures described in this section.

Associated co-benefits

Health benefits

Multiple health benefits through reducing air pollution:

- Poor air quality has been linked to around 40,000 deaths a year in the UK.[1]

Financial benefits

- Lower costs associated waste collection and disposal and potential to generate income e.g. composting.[2]
- Job creation: If a target of 70% recycling rate is reached it could create 50,000 new UK jobs.[3]
- A zero-waste strategy builds a circular economy, where one person's "waste" is a resource for something new. This creates good, green jobs as resources are endlessly recirculated through our economy instead of being used once and then disposed or destroyed.[4]
- Waste reductions promotes social equity and builds community. A zero-waste approach can build community capacity, support marginalized communities and protect community health.[4]

Environmental benefits

Recycling reduces pollution. When manufacturers use recycled paper, air pollution is reduced by 73 percent and water pollution by 35 percent. Recycled steel reduces 97 percent of the mining waste produced through manufacture of virgin resources, which reduces air pollution with 86 percent and water pollution with 76 percent. Using recycled glass decreases mining wastes by 80 percent and air pollution by 20 percent.[1]

1. Health Matters: Air Pollution (Public Health England, 2018)
2. University of Central Oklahoma
3. 7 benefits of recycling (Friends of the Earth, 2018)
4. Benefits of Zero Waste (Toronto Environmental Alliance)

5.5 – WASTE
RECOMMENDED PRIORITIES FOR ACTION

Westminster City Council:

Direct Control:

- Enable businesses to reduce the amount of waste by developing a knowledge sharing mechanism. Restaurants and food waste should be focus areas.
- Reduce the number of waste collections- partner with collection businesses as part of this discussion

Influence:

- Support businesses and local residents in managing and recycling waste through incentives
- Support local waste disposal companies to manage waste data and consolidate their operations

Businesses:

- Reduce the waste produced on premises
- Educate customers on waste impacts to help inform their purchasing decisions and reduce use of items not typically accepted through mainstream recycling collections
- Expand waste and recycling reporting
- Consolidate operations with other waste disposal companies and work with WCC to manage waste data
- Collaboratively share best practice and participate in the knowledge sharing mechanism developed by WCC

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 reduction and recycling
- National Infrastructure Commission -

Greater London Authority:

- The GLA encourages collaboration between councils within London to reduce waste- this should continue
- Provide more funding to help waste disposal plants to minimise their carbon output, focusing on carbon capture. New build plants should have an achievable path to becoming net zero by 2040.

Local Residents:

- Participate in education campaigns to build understanding of what can be recycled
- Get involved with local food redistribution groups and repair, re-use and item-swap groups

Other Partners:

- **Schools-** educate children around issues of waste management and recycling
- **Local charities -** explore partnerships to minimise littering and highlight impact on nature and communities
- **Sustainable Restaurant Association -** continue to support businesses in achieving compliance

5.6 Green Space & Offsetting

Anthesis

5.6 – GREEN SPACE BACKGROUND

Scope of section

SCATTER makes estimates for emissions associated with agriculture, forestry and land use. Whilst these are extremely limited within Westminster in terms of their emissions, the potential for using green space and land development for offsetting hard-to-remove emissions and maximizing co-benefits is explored within this section.

A more detailed analysis of Westminster's land use, soil carbon stocks and tree coverage is also explored.

Current contexts

Westminster is home to some of the UK's most famous and well-known parks and green spaces. These spaces are owned and managed by The Royal Parks with limited direct control from WCC. The latest audit carried out as part of the Greener City Action Plan identified over 200 open spaces within the city.

WCC does own approximately 20,000 trees across the city's streets, open spaces and on housing estates and individual properties. This number is currently growing at a rate of c.150-200 trees per year after accounting for replacement of felled trees.

The GLA's Environment Strategy is currently targeting a 10% increase in canopy coverage by 2050, an estimated increase of 3,300 ha of additional canopy.

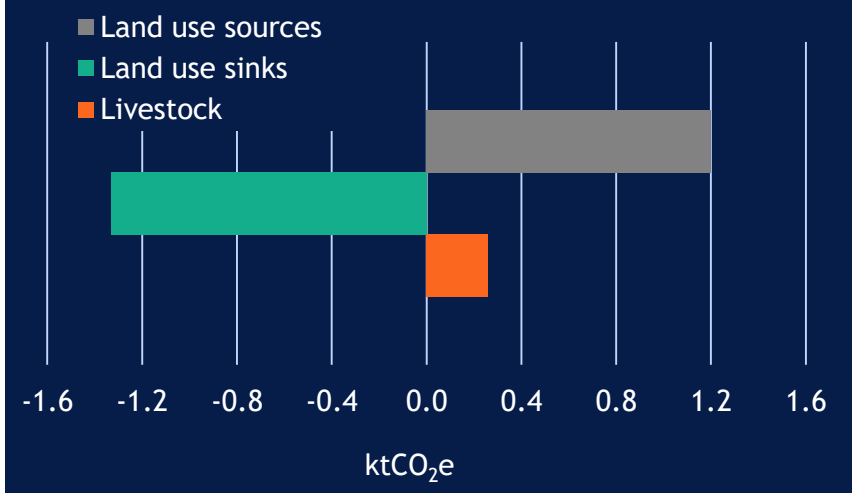


Figure X: SCATTER inventory figures for land use and livestock. Livestock emissions are scaled from livestock figures allocated at GLA level, whilst land use emissions are estimated from BEIS datasets.

5.6 – GREEN SPACE
KEY PLANS AND POLICY

National

- The 25 Year Environment Plan – focused on protection and development of new and existing woodland. The associated draft Environment Bill 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 makes a series of recommendations to local authorities
- Agriculture Bill – part of legislation to address the UK's departure from the EU and replace the Common Agricultural Policy (CAP), designed to align with the UK's climate change target.

GLA

- London Environment Strategy - London's first integrated environment strategy. Sets out a target of increasing London's tree cover by 10% by 2050.
- Mayor of London's Greener City Fund - £12m fund to support community initiatives, strategic green infrastructure, woodland development, and community engagement.
- TFL's Healthy Streets Programme includes provision for improvement's to the city's Green Infrastructure

Westminster

- Westminster City Council's Environment Policy – Released in 2015, the policy defines Westminster City Council's commitment to leadership in sustainability, including the protection and improvement of open spaces.
- Westminster Greener City Action Plan - sets out how the city intends to lead the way in sustainability. This includes addressing use of open spaces and improving biodiversity.

5.6 – GREEN SPACE
SCATTER PATHWAYS MEASURES

High Ambition Pathway

The use of green spaces and the natural environment has a significant role in acting as a carbon "sink" – meaning that it removes carbon emissions from the atmosphere in the form of trees and other natural features. Management of natural infrastructure also forms an important part of achieving significant co-benefits to the city, in terms of net biodiversity gain, improved air quality and improving quality of place.

A more detailed analysis of green spaces and land use emissions will follow the SCATTER analysis in this chapter, with a more specific focus and different methodology to SCATTER.

The contribution to emissions from agriculture, forestry & land use within SCATTER is a very small proportion of the overall emissions within Westminster. Wooded areas and grasslands act as net carbon sinks, whilst cropland and non-agricultural land act as carbon sources.

Under the High Ambition pathway, increases to the wooded areas within Westminster correspond to notable increases in the sequestration potential of the city's green spaces.

Green space interventions summary

- **Increased tree coverage & planting, improved land management:** see page 96

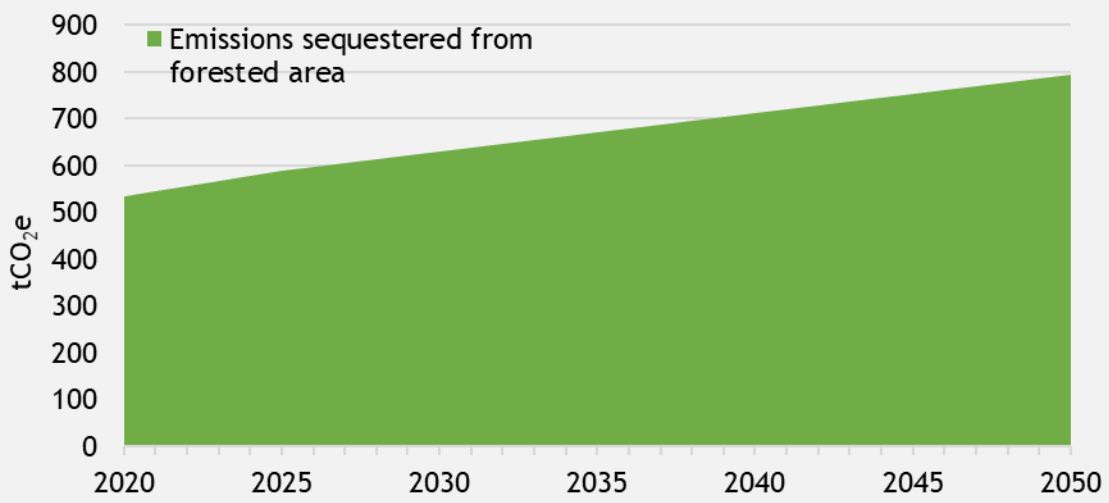


Figure 5.34: High Ambition Pathway projection for emissions sequestered by forested areas of Westminster.

5.6 – GREEN SPACE
TREE COVERAGE & LAND MANAGEMENT
SCATTER INTERVENTIONS

SCATTER considers increases to the coverage of trees as well as changes to land use and numbers of livestock. In terms of baseline data for Westminster, DEFRA datasets have been applied for land usage and livestock number. For tree planting measures, the baseline case comes from National Forestry Inventory data with consideration made for Westminster's urban context.

Projected increases in wooded land area have been taken from the original DECC 2050 calculator. Changes in land usage model a transition from open grassland to land which can be used to sequester greater levels of carbon. Tree planting measures model the increase in non-woodland tree planting; this incorporates changes to tree coverage from lone trees, hedgerows, green rooves and so on. Whilst this analysis is applied to Westminster's context in terms of size, there are limitations related to land use change that are not captured by the tool.

London borough livestock numbers are scaled from figures for Inner & Outer London, which are very low. It is acknowledged that this apportioning of livestock may not accurately reflect the numbers of in-boundary livestock, but also that this represents an extremely limited contribution to the emissions profile (<0.02%).

Key Milestones

Tree coverage	24% increase in forest/ woodland canopy coverage by 2030.
Land management	7% decrease in grassland coverage; 1% land use change to non-agricultural land due to new building developments
Tree planting outside woodland	Increase coverage of trees outside woodland to c. 6.7% of total land area, an average of 25 trees per ha.

Research into the sequestration potential of carbon dioxide per hectare of wooded area stipulates that for a tree whose canopy coverage extends to 25m^2, the lifetime uptake of carbon is around 750kgCO_2.

5.6 – GREEN SPACE
TACKLING RESIDUAL EMISSIONS

The need for offsets

As explored in Chapters 3 and 4, it is necessary to investigate carbon removal or 'offsetting' because:

- Some emissions are very hard to remove. Even with all 30 interventions in SCATTER set at the maximum levels of ambition, there remain sources of emissions in the energy system.
- Technology and policy may not move quick enough – Technology developments and/or policy developments may help to close the gap to target in the future. However, there is uncertainty over our ability to deploy both the known and more nascent technologies at scale which means reliance cannot be placed on them to deliver reductions.

Exploring Carbon Offsets

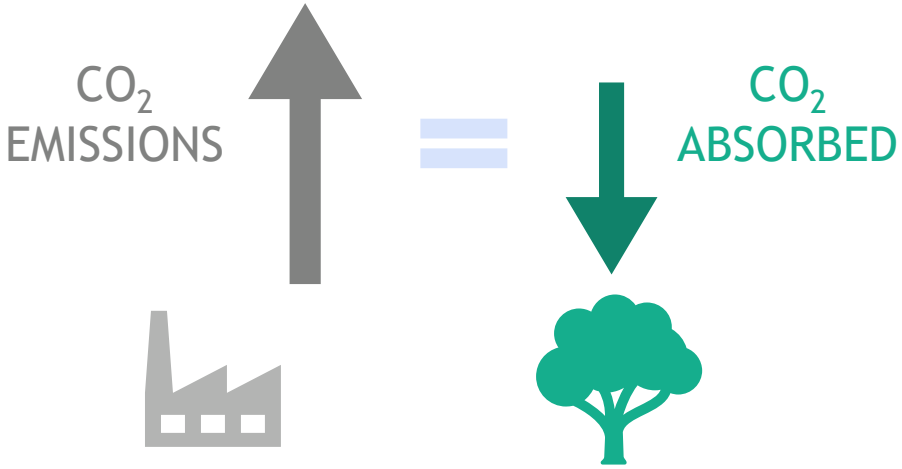
Generally speaking, 'carbon neutral' or 'net zero' typically mean the same thing: That some carbon/GHG emissions remain but are then 'netted off' or 'offset' through carbon dioxide removal. Such removal may occur due to Negative Emissions Technologies (NETs), such as geo-sequestration or biomass energy with carbon capture and storage, or natural sequestration via means such as afforestation.

Information on the key principles of offsetting, and upholding integrity and can be found in this carbon neutrality guidance from C40. It is important to note that leading scientific and best-practice forums such as C40, SBTi and CDP are in the process of establishing clearer guidance in consideration of the validity of offsetting in achieving carbon neutrality goals.

In exploring offsetting opportunities, stakeholders should, as much as possible, prioritise those within the boundaries of Westminster (as opposed to out-of-boundary investments which could be more expensive and may be harder to justify in terms of public spending). Taking such action also offers several co-benefits, including clean water; biodiversity; recreation; water flow regulation and flood mitigation.

Emissions reductions should be prioritised

Offsetting offers great potential for contributing to your net carbon reductions. Nevertheless, for reasons of impact, speed and cost, actions which prioritise reduced energy consumption and decarbonisation of energy supply should be prioritised.



5.6 – GREEN SPACE
TACKLING RESIDUAL EMISSIONS

Why current offsets may not be suitable for a council to procure:

- **Preference local benefit retention**: Taxpayers' money may be less favorably invested 'out of boundary' or overseas. Most have a preference, for co-benefits or 'social' returns beyond climate change mitigation to be retained in boundary that councils serve. For example, job creation & health benefits.

- **Diverse range of project types:** Given the diversity of schemes available, taxpayers may wish to have a say of which co-benefits are a preference. Unlike a corporate that choses a scheme that may be aligned with it's international supply base or consumer preferences, a taxpayer does not have the choice as to whether they 'buy the product' or 'opt in' for one type offsetting scheme over another. If that offset offers no tangible value to the taxpayer, the council may be subject to criticism.

- **Limited range of local options:** There are limited certified scheme options within the UK or local authority boundary. The two that currently exist are nature sequestration solutions in the form of Peatland Code & Woodland Carbon Code. Such offset scheme projects may not align geographically with the city or financially with budgets available (excess demand is increasing the cost of these schemes).

- **Typically, no ROI available from existing schemes:** Neither international offsetting schemes or UK Natural sequestration methods offer a return on Investment (ROI). No established 'Returnable Investment' models yet exist in the UK for nature-based solutions. These are being developed but are not yet readily available.

- **Carbon removal and storage is difficult to scale:** Natural sequestration methods in the UK are still challenging to offset the quantity of residual carbon at the scale required i.e. they can only get you so far. Note that ABI may be a mixture of carbon reduction and removal; depending on the project.

- **Traditional' offsetting risks still apply:** If lower quality offsets were procured, then risks around permeance, additionality of saving and verification may still exist and pose reputational risks to the purchaser (as they have done for many corporate buyers over the years). Traditional offsetting is still recommended to be considered as a last resort.

Case Study: Consensus among UK authorities for a new mechanism?

A new mechanism known as Authority Based Insetting (ABI) is being explored by over 20 UK Local Authorities at present.

These included the West Midlands Combined Authority, The City of Newcastle and Brighton & Hove. It also included non-council partners such as Trafford Housing Trust (a subsidiary of L&Q Group) , a Wildlife Trust and representatives from the Greater Manchester Environment Fund. Further details are enclosed overleaf.

5.6 – GREEN SPACE
TACKLING RESIDUAL EMISSIONS

Authority Based Insetting - an alternative to traditional offsets

Historically, the term *insetting* refers to businesses making investments into their own supply chains, with the aim of delivering carbon savings and added value to their stakeholders and supply chains.

Authority Based Insetting (ABI) is currently still in concept development stage, but takes these principles and applies them to a local authority context. It encourages investment into project initiatives within the local boundary and contributing towards carbon reduction goals. Traditionally, carbon offsetting projects are not based locally to the investor, which poses challenges for local authorities looking to make impacts within Westminster itself. It can also add significant levels of cost for 3rd party verification and certification.

ABI may provide a more appealing offsetting alternative given that:

- Investment is retained within local communities and schemes
- Low-carbon co-benefits are retained locally (e.g. health, jobs and quality of place).

ABI would seek to achieve two key things:

1. **Report carbon impacts transparently**: providing a clear and consistent framework for reporting local initiatives that may occur outside of a organisation's boundary, but within the city-wide boundaries. Principles such as additionality, permanence and verification would still be of paramount importance.
2. **Increase the transactional efficiency:** Identifying projects and matching suitable finance is an area local governments and investors have struggled with for years. With the support of the council and access local networks, ABI could gives much greater visibility of local, investable projects; allowing for aggregation of similar opportunities (where relevant). It could also significantly reduce verification costs by ensuring investment remains traceable to specific, tangible projects and no trading of ownership occurs (unlike with offsetting schemes).

Given that ABI projects can be embedded within an organisation's existing operations or supply chain, and provide potential payback or ROI, they provide a great canvas for public/private partnerships (e.g. matched funding), and commercial alliances. Through the commercial stakeholder engagement element of this work, Westminster will be positioned to explore such opportunities.

5.6 – GREEN SPACE
LAND USE ANALYSIS - INTRODUCTION

Comparison to SCATTER

As outlined on the previous pages, SCATTER does include some Agriculture and Land-Use interventions that lead to a reduction in emissions and some removal/sequestration of carbon. These natural capital interventions aim to reflect the increase in agricultural potential in line with national tree cover goals rather than offsetting potential.

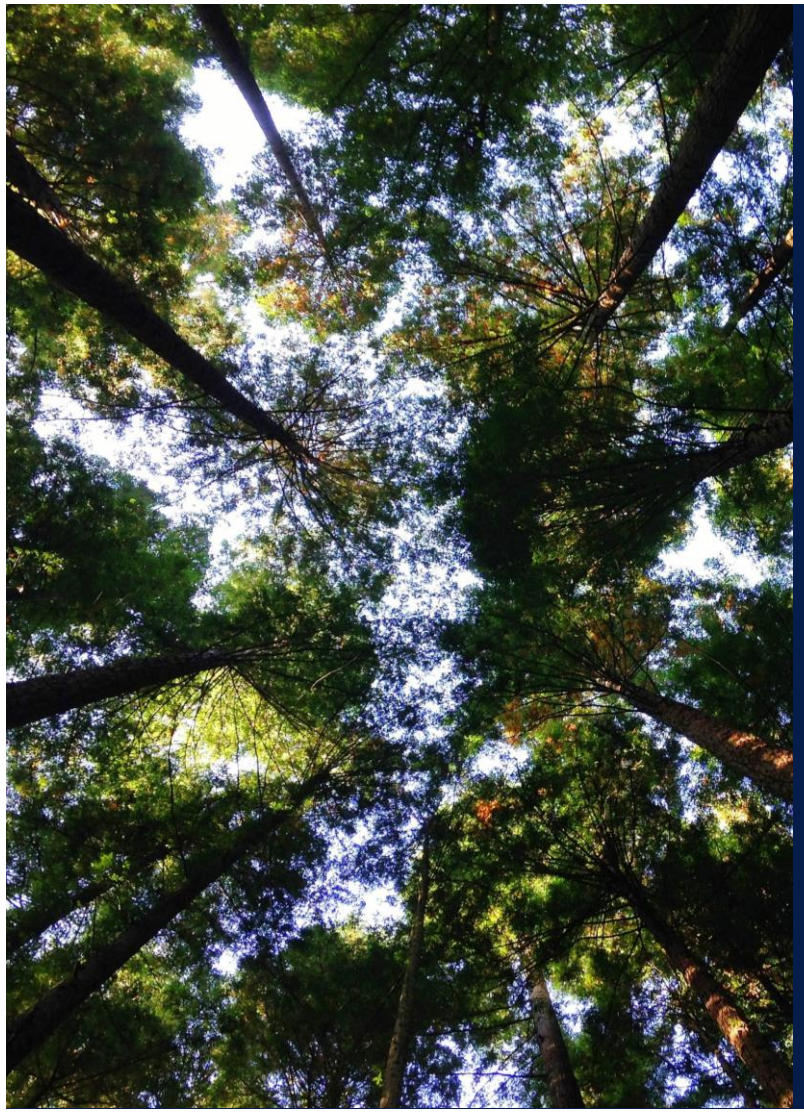
In seeking to tackle residual emissions it is important to go further than the SCATTER measures, and understand the offsetting potential in Westminster.

Therefore, this section of the report provides additional analysis of land use and agriculture to identify further opportunities in this sector. A different methodology and datasets to SCATTER have been used. The aim is to provide a high-level initial assessment of where the opportunities for nature based solutions and offsetting could be and how this could help to address the residual emissions or gap to target.

Additional Analysis in this section:

Analysis of these following areas has been conducted to support more informed decisions in this sector.

- Land Type – Assessment of land types across the city using Crop Maps which are usually based on satellite images- page 102
- Soil Carbon – Assessment of soil carbon maps based on countryside surveys in 1978 and 2007- page 104
- Tree planting – Analysis of potential impact of tree planting in the City based on data from the London Tree Canopy Cover map, and with consideration of conversations with the arboriculture team at WCC – page 105



Key Figures

Woodland in the Westminster City area provide a net carbon storage of about 1,045tC per year

London has more than 40% of the UK's green walls and roofs

Existing tree canopy cover for Westminster was 16.17% as of 2018

To achieve 30% tree canopy cover, 15,528 more trees need to be planted, sequestering an additional cumulative total of 194 tCO_2 up to 2030

5.6 – GREEN SPACE
LAND USE ANALYSIS
LAND TYPES

The first step in this analysis is to look at the land use types across the city to assess the areas which could be enhanced.

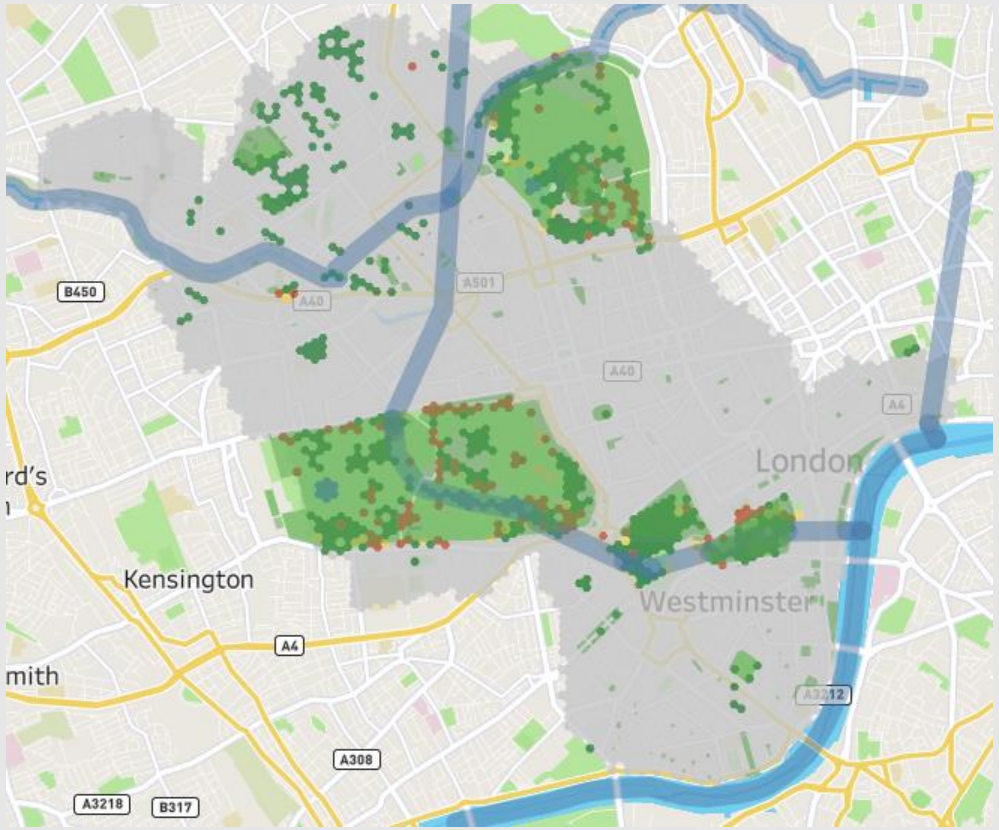
Results

The single largest land use is non-agricultural land, which forms about 1,720 ha (80%) of the total. The next major land-type is woodland/ trees (including trees in hedgerows and fields) of 190 ha (9%) then permanent grassland of 170 ha (8%).

The map adjacent is taken from the Crop Map of England (CROME), which mainly uses satellite data to identify land-uses and crop types; it is a snap-shot at a point in time (summer 2018) and should be considered indicative only. The table below summarises land use:

Land Use	Area (ha)	%
Non-agricultural land	1,720	80%
Woodland	190	9%
Permanent Grassland	170	8%
Arable	50	2%
Fallow land	10	<1%
Water	10	<1%
Legumes / nitrogen fixing	0	0%
Heathland	0	0%
Total	**2,150**	**100%**

Figure 5.35: Westminster land use map, compiled from CROME data.



Land use (group)
- Beet-type arable crop
- Bracken, heather and heathland
- Cereals
- Clover-type leguminous and nitrogen-fixing crop
- Field beans (spring)-type leguminous and nitrogen-fixing crop
- Field beans (winter)-type leguminous and nitrogen-fixing crop
- Land lying fallow
- Linseed (spring)- type arable crop
- Lucerne-type leguminous and nitrogen-fixing crop
- Non Agricultural Land
- Oilseed (winter)- type arable crop
- Pea (spring)- type leguminous and nitrogen-fixing crop
- Permanent crops other than nursery crops and short rotation coppice
- Permanent Grassland
- Potato-type arable crop
- Triticale (winter) - type arable crop
- Water
- Woodland

5.6 – GREEN SPACE
LAND USE ANALYSIS
UNDERSTANDING CARBON STOCKS

To evaluate the potential of carbon savings in land use it is important to understand key carbon sinks and stocks within Westminster.

Land use - forestry

Forestry in the UK as a whole is a net carbon sink, storing an average of 5.5 tonnes of carbon (tC) per hectare per year for existing woodland. Of this, about 1.3tC are stored in the soil, 2.9tC in trees, and 1.3tC in dead wood and leaf litter. Applying this average to the total area of woodland in the Westminster City area would give net storage of about 1,045 tC per year. This corresponds to a CO_2 sequestration value of around 3.8 $ktCO_2$. Additional data on woodland age and type would be needed to better estimate the actual contribution of current forestry to net emissions.

Carbon stocks by land use

Understanding existing carbon stocks can help prioritise areas for action – for conservation of existing stocks or for additions through land-use management or change. Carbon is stored in several "pools" – the key ones being soil and above-ground biomass (trees, crops and other plants). The balance of total carbon between these pools depends on the type of land – woodland stores relatively more carbon in above-ground biomass (trees) than cropland or grassland, for example.

Habitat	Tonnes carbon (tC) per ha			
	Soils (15cm)	Vegetation	Soils (100 cm)	Vegetation & Soils (100 cm)
Dwarf shrub heath	88	2	218	220
Coniferous woodland	90	70	185	255
Broadleaf, mixed woodland	73	70	150	220
Neutral grassland	69	1	130	170
Improved grasslands	67	1	116	117
Arable and horticulture	47	1	95	96

Figure 5.35: Carbon stocks by land-use type (not specific to Westminster), adapted from Natural England, 2012 and Open University 2018. Carbon in soils to 100cm is extrapolated from 15cm using ratios calculated from Natural England 2012.

Above-ground carbon

Using the hectares of land estimated here and applying them to the broad land-types within the Crop Map of England gives an estimated 13,520 tC stored in vegetation. The majority is within woodland and trees, using an area of 190 hectares.

5.6 – GREEN SPACE
LAND USE ANALYSIS
SOIL CARBON

Significant quantities of carbon is also stored in soils below ground. Protecting and managing existing sinks of carbon, such as soils, is an essential step in maximising carbon sequestration.

Findings

The maps opposite show estimated soil carbon to 15cm in the area in 1978 and 2007. Total soil carbon in the top 15cm for the area, based on the above data, is estimated to be 160,000tC, equivalent to 600 ktCO_2. Extrapolating this to a depth of 100 cm gives approximately 350,000 tC stored, equivalent to 1,300 ktCO_2.

How significant is Westminster's soil as a carbon sink?

To add some context to these figures, we can consider them in terms of emissions sources within Westminster:

- The carbon sequestered in the top 15cm of soil is roughly equivalent to the total direct emissions from Westminster's buildings.
- Carbon sequestered to a depth of 100cm is roughly equivalent to the emissions arising from Westminster's electricity consumption in buildings.

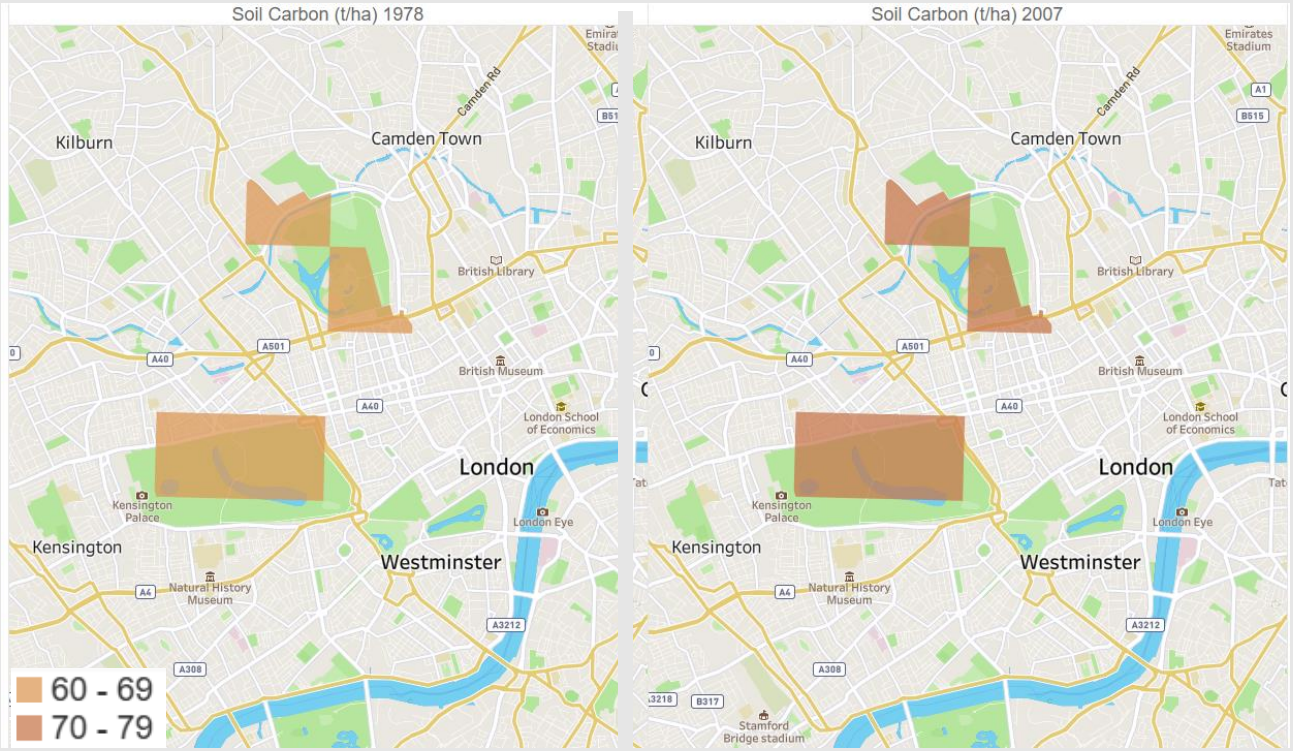


Figure 5.36: Estimated soil carbon stocks to 15cm based on land-cover type (land-use) and soil characteristics. Source: Countryside Surveys 2007 and 1978. The map is lower-resolution than the CROME and the underlying land-uses in this map don't always correspond to those in CROME.

5.6 – GREEN SPACE
LAND USE ANALYSIS
TREE PLANTING

Existing tree canopy cover (right) calculated for Westminster was 16.17% (18,155 trees) as of 2018. The London Urban Forest Partnership aims to increase canopy cover in the entirety of London by 10% by 2050, reaching 23% total. For Westminster specifically, we assessed the carbon impact of planting enough trees to increase canopy cover to a minimum of 25% and 30%. 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:

- To achieve 25% tree canopy cover, 9,914 more trees need to be planted, sequestering an additional cumulative total of 124 tCO_2 up to 2030, and 1,290 tCO_2 by 2050.
- To achieve 30% tree canopy cover, 15,528 more trees need to be planted, sequestering an additional cumulative total of 194 tCO_2 up to 2030, and 2022 tCO_2 by 2050.

This analysis does not account for the practical space implications of such a tree planting initiative in Westminster. Based on conversations the arboriculture team at WCC, current plans will deliver 1,500-2,000 additional in the public realm up to 2040. This does not account for land under other ownership.
Calculations are based on a cumulative planting regime of 10% of the target number of trees, per year, up to 2030. Assumes a planting age of 2 years, with an equal mix of Large (sycamore, oak), Medium (rowan, silver birch, hornbeam) and Small (cherry/plum, hawthorn, apple) species.

It is important to recognise that tree planting is not the only natural capital solution and other appropriate interventions should be identified and evaluated. Although activities inside the City should be prioritised, stakeholders may also wish to pursue planting opportunities outside of the City boundary where more space is available.

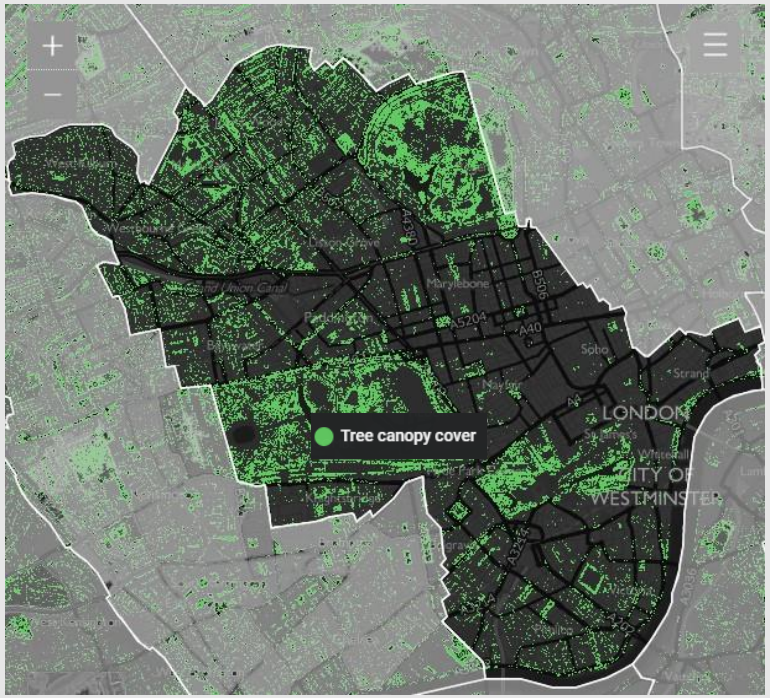


Figure 5.37: Westminster tree canopy cover.
Source: London Tree Canopy Cover Map

1 - We modelled the carbon sequestration of the city's current tree population of 18,155 trees based on sequestration rates estimated in an empirical study from a comparable urban tree population, and referring to the Woodland Carbon Code's carbon calculation tool, and i-Tree canopy. 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. Our calculations assume that the newly planted trees will 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, 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.

5.6 – GREEN SPACE OFFSETTING CASE STUDIES

Offsetting Strategies/Activities

Cheshire East Council - As part of their climate emergency declaration, Cheshire East committed to becoming carbon neutral in their own operations by 2025. Their Climate Change Action Plan included an assessment of what it means for a local council to be carbon neutral and the potential role of offsetting. This considered key factors such as:

- Likelihood of requiring offsets
- The scope and boundary of neutrality
- The scope and boundary of offsetting
- The cost of offsetting vs other low carbon investments
- The value that certified 'Carbon Neutral' status offers the public

Their work has also considered introducing principles such as Authority-based insetting and the potential for tree planting in borough.

Warrington Borough Council - First local authority to have 100% solar energy supply. The solar farm is located out of boundary and is connected locally to the grid; supply is thus offset rather than being locally sourced.

Warrington Borough Council's out of boundary solar farm.

Innovative land-use practices

Urban Oases and Pocket Parks

An urban oasis or a pocket park is a free-to-enter open space in between buildings in built-up areas, which can include plants, wildlife or water features to offer respite from its surroundings, shade and connection with nature.

London's Wild West End project involves large property owners establishing green corridors between existing green space to encourage birds, bees and bats back into London, allowing both people and wildlife to move between them. The number of green installations has increased by 29%.

London's Wild West End

Green walls and green roofs (also known as 'living' walls and roofs)

Green roofs are roofs of buildings covered with vegetation which can be left vacant or landscaped for recreational use. Green walls are installations of plants to vertical walls often in places with limited space, which can integrate with green roofs. They both offer air purification, thermal stabilisation (insulating in winter, cooling in summer), a biodiversity boost, noise reduction and dust suppression.

Colindale Gardens in Barnet, London is a new neighbourhood which is promoting green space in urban areas by featuring green roofs, podium gardens and new wildlife habitats.

London has more than 40% of the UK's green walls and roofs, in part due to the Living Roofs and Walls Policy

4.6 – GREEN SPACE
KEY STAKEHOLDER PERSPECTIVES

On the 10th December, stakeholders in the built environment, land use, and infrastructure in Westminster shared their views on opportunities and challenges around green space and offsetting in Greenwich, across three key themes:

Knowledge, awareness, and engagement

Understanding nature-based solutions is very challenging

A key issue identified is that stakeholders felt that the impact of potential measures are hard to measure. Suggested opportunities:

- Consolidate topics into easy-to-understand priorities, with help from WCC
- Support stakeholders' understanding through education and case studies

Resident engagement is currently low

A key issue identified is that there are no meaningful engagement campaigns currently in place to gain resident buy-in. Suggested opportunities:

- Build a volunteer base to co-ordinate action and connect stakeholders
- Improve communication with residents and raise awareness

Businesses do not fully understand the importance and benefits of action

A key issue identified is that businesses often perceive the problem to be too big, overshadowed by more immediate concerns. Suggested opportunities:

- Help businesses understand the benefits of action

Weak consideration of carbon impact within the planning process

A key issue identified is the level of knowledge of nature-based solutions within the planning process is low. Suggested opportunities:

- Label areas suitable for urban greening with development requirements
- Better train planning officers to assess opportunities and developer claims

Heritage planning restrictions present a barrier

A key issue identified is that heritage restrictions do not align with net zero initiatives encouraging nature-based solutions. Suggested opportunities:

- Challenge the status quo around planning policies and the feasibility of what can be achieved while preserving heritage buildings.

Physical space constraints

Space restraints have a big impact on what can be achieved

A key issue identified is the lack of space within Westminster and the competing need for both homes and green space. Suggested opportunities:

- Explore innovative greening solutions e.g. green walls, biosolar roofs
- Protect existing tree stock and rent roof space for solar PV programmes

Existing tree stock must be protected

A key issue identified is the challenges experienced protecting existing trees, such as costs or unwilling residents or businesses. Suggested opportunity:

- Engage businesses and residents around the benefits of trees
- Improve understanding of tree maintenance requirements

Sharing opportunities, collaborating, and financing

Business to business green space opportunity sharing

A key issue identified is the lack of opportunity for businesses to make partnerships to invest in projects across the city. Suggested opportunities:

- Explore the role WCC can play to better connect businesses to 'partner'
- Involve community groups to identify opportunities
- Help stakeholders decide which initiatives offer the best value for money
- Develop a shared resource or map of opportunities

Governance and prioritisation

A key issue identified is the challenge faced by stakeholders to judge offsetting opportunities alongside other competing priorities. Suggested opportunities:

- Develop a city-wide approach for offsetting across Westminster
- Share and understand the wide variety of opportunities available in the above city-wide approach

5.6 – GREEN SPACE & OFFSETTING
ACTION PLANNING

Priority	Goal	Action	Stakeholder Responsible
Priority 1: Improve Land Management (Lower Carbon Impact Potential)	1) a) Nature-based sequestration and improvement projects inside and outside the city boundary are identified and maximised	Develop an offsetting strategy to identify specific opportunities for natural capital projects both inside the city and outside the boundary. This would include a detailed land use analysis. Provide stakeholders with a view of specific land use change opportunities. Provide stakeholders with the means of better understanding which offsetting initiatives offer the best value for money, the impact benefits and the accounting principles associated with offsetting.	Collective Action
		Impose more ambitious green space requirements in policy and on land being considered for development, including the protection of existing natural features. Ensure that carbon benefit is factored into the decision-making process on land use. (WCC)	Westminster City Council
Priority 2: Increase Tree Planting (Lower Carbon Impact Potential)	2) a) Existing tree coverage is maintained and opportunities to increase tree coverage are explored	Protect current natural capital stock.	Collective Action
		Impose more ambitious green space requirements in policy and on land being considered for development, including the protection of existing natural features. Ensure that carbon benefit is factored into the decision-making process on land use.	Collective Action

Case Study

Dalston Eastern Curve Garden in London is a community-led urban oasis on Hackney's disused railway which is described as 'a safe haven for learning, growing, relaxation and natural play' and is designed to increase green space in the area.

Case Study

Utrecht, Netherlands has a Green Structure Plan which has utilised efficient and multifunctional use of space and used trees to create coherent green infrastructure, despite densification and increasing pressure on its public green space.

5.6 – GREEN SPACE
RECOMMENDED PRIORITIES FOR ACTION

Westminster City Council:

Direct Control:

- Maintain existing tree coverage within the city boundary
- Explore opportunities to increase tree coverage within the city boundary
- Identify and maximise nature-based sequestration and improvement projects inside the city boundary

Influence:

- Identify and maximise nature-based sequestration and improvement projects outside the city boundary
- Impose more ambitious green space requirements in policy
- Demonstrate the importance of greening spaces better to engage customers, businesses and tenants

Businesses:

- Support in identifying of opportunities for nature-based sequestration and improvement projects.
- Ensure existing tree stock on land owned by business is appropriately managed and protected.
- Explore opportunities for innovative green space solutions such as green walls and roof gardens.

National Government:

- Ensure national planning requirements include incentives for developments to protect existing green space, and maximise opportunities for further coverage.
- Building on the 25 year Environment Plan, develop national legislation which sets more ambitious goals for the protection and enhancement of green spaces nationally.

Greater London Authority:

- Explore ways of convening local authorities to develop coordinated approaches to green space development, maximising opportunities for development of "wildlife corridors" and other green space benefits whose benefits are maximised at scale.

Residents:

- Where appropriate, support in tree planning and other initiatives.
- Continue to use existing green spaces to demonstrate their value.
- Lobby for improved and expanded green spaces in Westminster.

Other Partners:

- **Wild West End:** Continue to promote green spaces and biodiversity in Westminster. Support in a review of opportunities to increase green spaces.
- **Community Groups:** Partner with WCC, businesses and other stakeholders to help identify opportunities for nature-based sequestration and to support with the maintenance of existing tree coverage

5.6 – GREEN SPACE BENEFITS OF ACTION

The scale of potential offsets

As discussed earlier in this report, even along the High Ambition pathway, Westminster falls short of its zero emissions target by 2040 across the city.

The graphic below indicates the scale of these emissions and how they compare in context against current sources of emissions.

~300 $ktCO_2e$

…of emissions outstanding along the High Ambition pathway at 2040…

…roughly equivalent to

85%

of domestic emissions from 2017…

…or the lifetime sequestration potential of

400,000

trees.

Associated co-benefits

Health benefits

There are multiple health benefits of green spaces and trees:

- Certain trees and other vegetation can improve air quality by intercepting harmful pollutants.
- 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.
- Nature can improve cognitive development and concentration.
- There are also significant mental health benefits including helping to alleviate stress, anxiety and depression.
- 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.

Financial benefits

- Increases in house prices between 5%-18% when a property is associated with mature trees.
- Increased productivity resulting from the aforementioned factors.
- 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.
- 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.

06 Appendices

Anthesis

APPENDIX 1: GLOSSARY OF TERMS

AFOLU – Agriculture, forestry & land use.

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

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

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

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

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

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

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

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

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

IPCC – Intergovernmental Panel for Climate Change.

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

LULUCF – Land use, land use change & forestry.

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

APPENDIX 2: SCATTER FAQ

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 CDP / Global Covenant of Mayors reporting.

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

Note that the categories may not sum to 100% due to rounding.

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

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

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_20) and Methane (CH_4). These are reported as a CO_2 '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 for road transport, BEIS data splits total emissions across road type; SCATTER uses fuel consumption for on-road 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.

APPENDIX 3: DATA TABLES FOR SCATTER AND BEIS PROFILES

Sector	Scope 1 & 2 Emissions, $ktCO_2$
Industry and Commercial Electricity	798.4
Industry and Commercial Gas	482.1
Large Industrial Installations	0.1
Industrial and Commercial Other Fuels	45.5
Agriculture	0.1
Domestic Electricity	124.9
Domestic Gas	177.5
Domestic 'Other Fuels'	4.4
Road Transport (A roads)	229.5
Road Transport (Motorways)	-
Road Transport (Minor roads)	68.7
Diesel Railways	2.1
Transport Other	1.2
LULUCF Net Emissions	-0.2
Grand Total	**1,934.2**

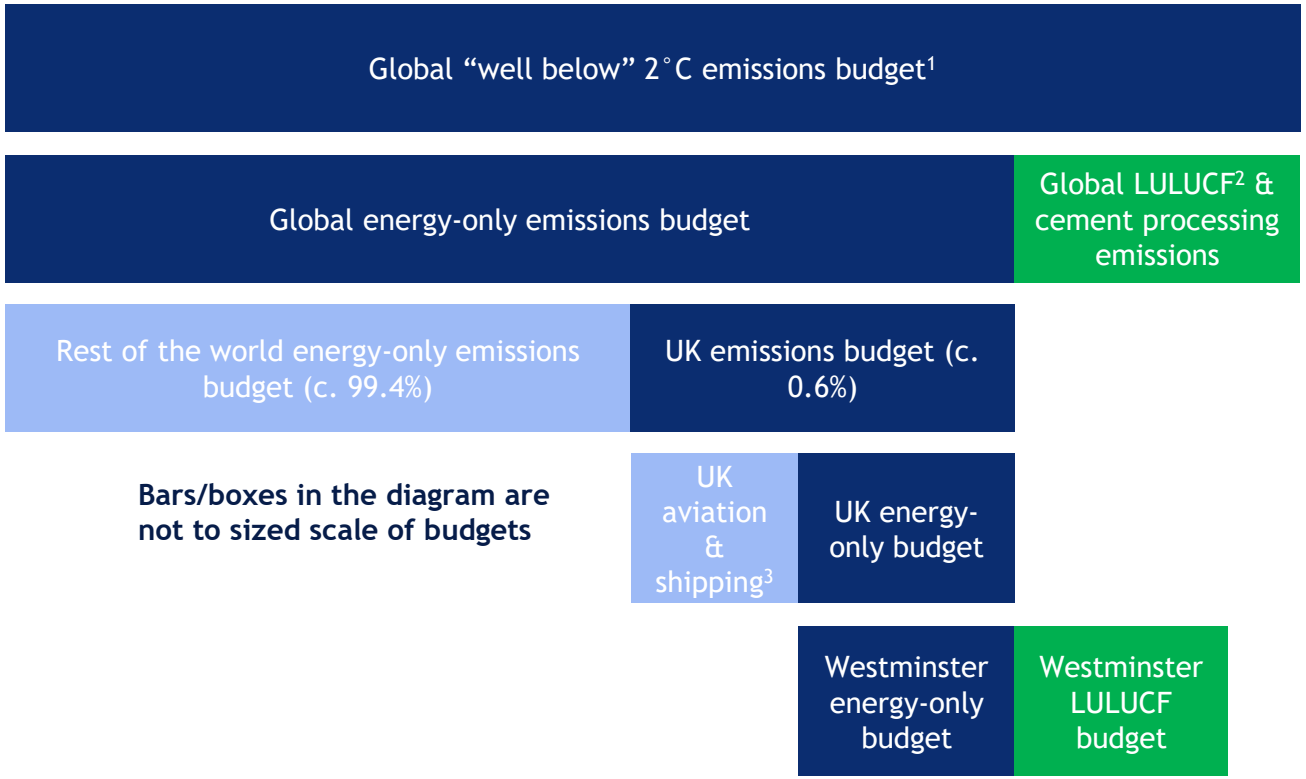
Sub Sector	Direct, $ktCO_2e$	Indirect, $ktCO_2e$
Residential buildings	179.4	171.7
Commercial buildings & facilities	133.7	123.5
Institutional buildings & facilities	205.5	623.9
Industrial buildings & facilities	163.8	361.7
Agriculture	0.1	<0.1
Fugitive emissions	0	0
On-road	248.1	IE
Rail	1.9	IE
Waterborne navigation	0.2	IE
Aviation	NO	NO
Off-road	2.5	IE
Solid waste disposal	1.5	0
Biological treatment	0	0
Incineration and open burning	0	0
Wastewater	15.3	0
Industrial process	34.3	0
Product use	0	0
Livestock	0.3	0
Land use	-0.13	0
Other AFOLU	0	0
Electricity-only generation	5.4	0
CHP generation	1.4	0
Heat/cold generation	0	0
Local renewable generation	0.1	0
Sub-total	**992.2**	**1,280.8**
Grand total	**2,273.0**	

Notes:

- BEIS data (far left) and SCATTER data (near left) are compiled using different methodologies.
- Within the SCATTER model, national figures for emissions within certain sectors are scaled down to a local authority level based upon a series of assumptions and factors.
- Figures for land use were omitted from the profile given in Chapter 1. The gross totals described in the emissions inventory have been adjusted to reflect this.

IE = Included Elsewhere
NE = Not Estimated
NO = Not Occurring

APPENDIX 4: DERIVING THE CARBON BUDGET



Westminster's carbon budget

The carbon budget sets out a finite emissions limit that should not be exceeded in order that Westminster remains in line with the Paris Agreement. The budget itself is derived from a 'scaling-down' approach – a full methodology is available to view in the full print version of the Tyndall Centre's research.

The Tyndall Centre for Climate Change Research have based this budget on a 2˚C global average temperature rise, on the basis that:

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

Negative Emissions Technologies (NETs)

NETs remain a highly speculative and uncertain development and are leaned upon heavily in IPCC models. Large-scale NETs are not likely to be viable within the Westminster boundary due to the profile of emissions.

If research, development and demonstration of NETs shows that they may work at scale, and then they are rolled out globally at unprecedented rates, 1.5˚C may theoretically be achievable. However this is only made possible if rapid, deep 2˚C mitigation begins now and additional feedbacks do not occur.

1 - Budget derived from IPCC AR5 synthesis report and represents a 66-100% probability of global warming not exceeding 2˚C ("well below"). Due to the inertia in our energy systems and the amount of carbon we have already emitted, the Paris 1.5˚C commitment is now only likely to be viable if negative emissions technologies (NETs) prove to be successful at a global scale. If the 11.3% emissions reduction rates for Westminster 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.

APPENDIX 5 – FULL SUMMARY OF SCATTER PATHWAYS MEASURES

Many of the measures opposite are based on the DECC 2050 Calculator, though SCATTER operates on updated assumptions, data and projections. SCATTER was also designed to have greater applicability to local authorities.

Measures described as part of the tool are not designed to prescribe certain technologies or policies. Similarly, they are not intended to discount alternative means of arriving at the same end goal, just because they do not feature in the model.

Interventions are often defined in terms of changes relative to a baseline year (typically 2017). Where this is not the case, every effort has been made to define the current contexts in the same parameters as the SCATTER interventions to enable direct comparison.

Transport

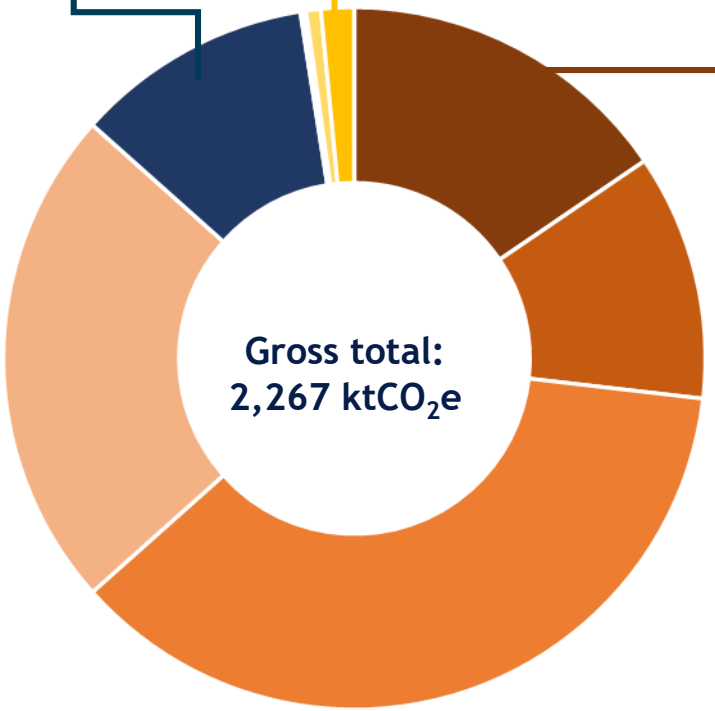
- Travelling shorter distances
- Driving less
- Switching to electric vehicles
- Improving freight emissions
- International aviation & shipping

Waste disposal and industrial processes

- More efficient processes
- Shifting off oil fuels
- Producing less waste
- Increased recycling rates

Nature-based solutions

- Increased tree coverage
- Land (& livestock) management
- Tree planting



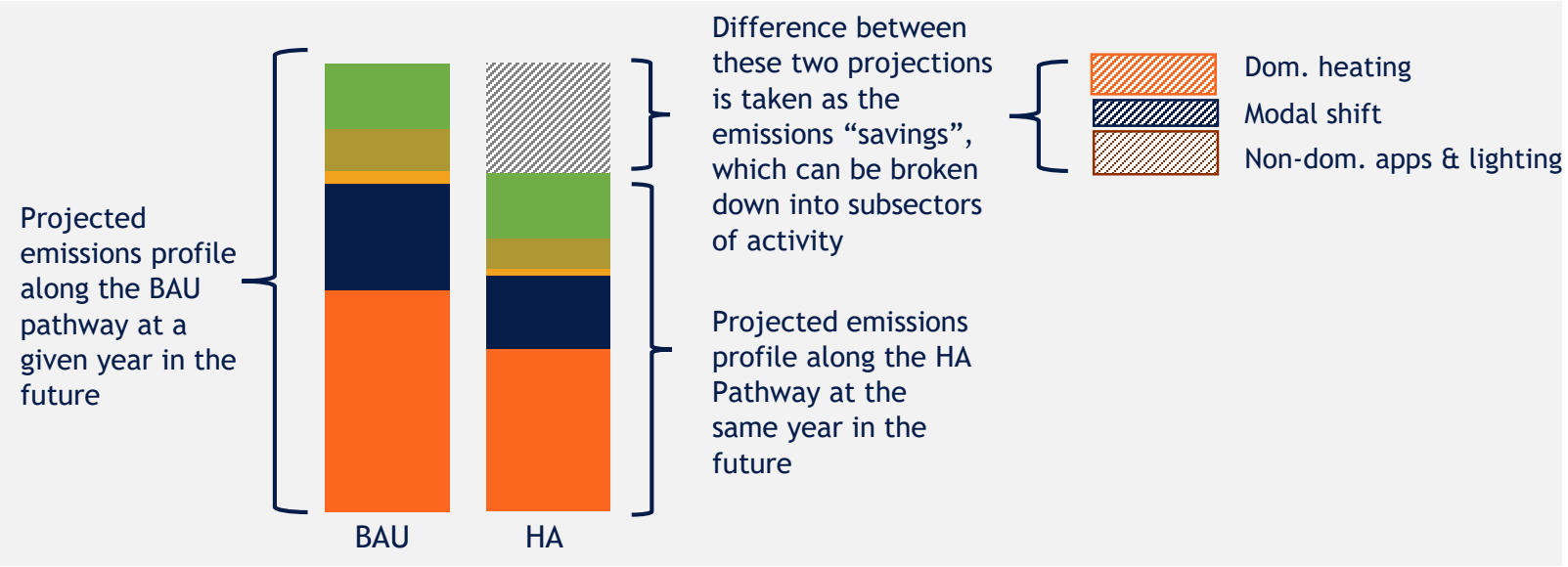
Buildings (domestic, commercial and other non-domestic)

- More energy efficient heating
- Energy efficiency measures in homes and new-builds
- Shifting off gas heaters
- Appliance and lighting efficiency
- Shifting off gas for cooking

Energy Supply

- Increased solar PV
- Increased wind
- Increased tidal, wave & hydro

APPENDIX 6: CARBON SAVINGS METHODOLOGY



Why are carbon savings important to estimate?

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

Estimating emissions savings

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

Which areas of activity have been estimated?

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

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

Energy supply

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

APPENDIX 7A: PRIORITISING YOUR ACTIONS- CONSIDERING CARBON

Overview of judgement of Potential, based on Estimated Carbon Savings from SCATTER.
Within the action plan, each recommended action is aligned with one of the SCATTER subcategories below. The judgement of Higher/Medium/Lower impact potential for that subcategory is based on a stratification process considering the carbon impact of all opportunities across Westminster. The potential carbon impact data originates in SCATTER, where we calculated the savings associated with actions in each of the "subcategories".

Emissions sector	SCATTER subcategory	Judgment of Potential	Scale of saving
Domestic	Improve building efficiency	Higher	>1,000,000 tCO_2e
Domestic	Improve lighting and appliance efficiency	Medium	>100,000 tCO_2e
Non- Domestic	Industrial building efficiency	Higher	>1,000,000 tCO_2e
Non- Domestic	Improved heating efficiency	Higher	>1,000,000 tCO_2e
Non- Domestic	Shift off gas heaters	Higher	>1,000,000 tCO_2e
Non- Domestic	Improve lighting and appliance efficiency	Higher	>1,000,000 tCO_2e
Waste	Reduce the quantity of waste	Lower	>1,000 tCO_2e
Waste	Increase recycling rates	Lower	>1,000 tCO_2e
Transport	Switch to electric vehicles	Higher	>1,000,000 tCO_2e (overall total for on-road)
Transport	Travel shorter distances	Medium	>100,000 tCO_2e (much smaller proportion than other measures)
Transport	Modal Shift	Higher	See above for on-road total
Transport	Improve freight emissions	Higher	See above for on-road total
Transport	Reduce Aviation & Shipping Impacts	Lower	>1 tCO_2e
Energy Supply	Increase Local Renewable technologies	Higher	>1,000,000 tCO_2e
Energy Supply	Support Large Scale Technologies outside the area	Higher	>1,000,000 tCO_2e
Green Space	Improve Land Management	Lower	>1,000 tCO_2e
Green Space	Tree Planting/ Increase Tree Coverage	Lower	>1,000 tCO_2e

Prioritising actions by carbon impact potential

The Action Planning points in the report provide key goals and actions for Westminster City Council to reduce their carbon emissions across 6 key sectors. Across each sector, the actions have been grouped in line with carbon reduction interventions outlined in SCATTER. These groups have then been presented in this report in sequence of **potential carbon impact**. These priority areas for action are presented in the table across, along with an indication of their potential carbon impact.

Understanding the potential carbon impact

The sequencing of the priority groups (Higher, Medium, or Lower carbon impact potential) as they appear in the action planning component of this report, was based on their estimated carbon savings potential, which were calculated using SCATTER (further detail above). This is intended to account for the differing impact potential across the sectors. Where necessary, some additional judgement was applied (for instance, the full impact of Energy Supply measures is not quantified within the Energy Supply sector, and these have been judged to offer high impact potential). It is important to note that this judgement of potential impact is limited to carbon savings, and does not account for other benefits of action or implementation considerations (e.g. cost).

Overleaf, we outline our approach to sequencing each of the recommended actions within a priority group.

APPENDIX 7B: PRIORITISING YOUR ACTIONS- SEQUENCING NEXT STEPS

Prioritising actions by recommended order of action

Within each priority group (see previous page) are a number of goals and actions, which are also individually organised in order of priority relative to each other. Relative priority order is based on Anthesis' judgement and is intended to support Westminster City Council to more efficiently formulate next steps upon receiving this action plan.

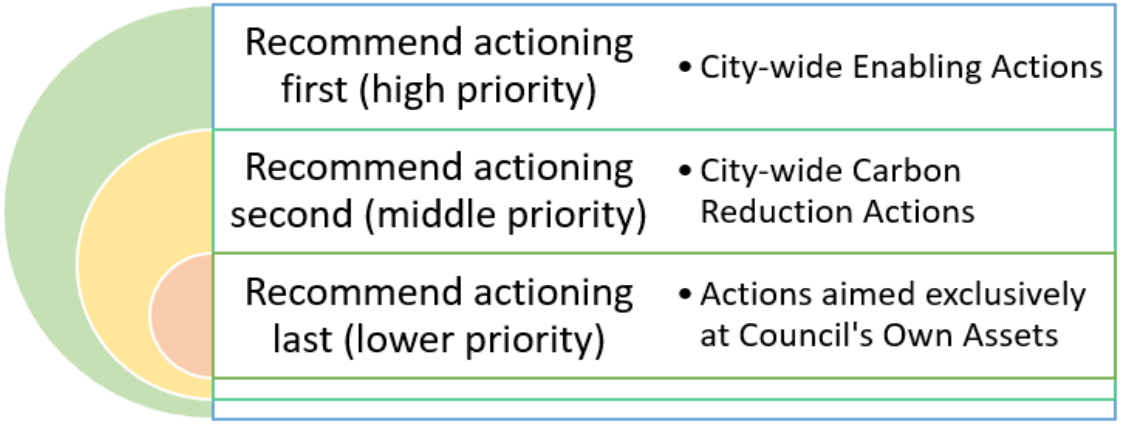
Anthesis' judgement of the recommended sequence of actions was based on whether the actions are classified as enabling or carbon reduction actions:

- **Enabling Actions** - Actions which are deemed crucial prerequisites in implementing carbon reduction actions (see below), but are less likely to bear a direct carbon saving themselves
- **Carbon Reduction Actions** - Actions which will result in a direct carbon saving.

As a rule, we advise stakeholders to focus on exploring Enabling Actions first.

An additional consideration was whether the action is intended to be implemented city wide, or is focused on council-owned assets. While it is important that the council is seen as a leader in this space, the footprint of the Councils Own Assets will be comparatively minor (>5%) relative to the City-wide emission sources. Given this, and the scope of this work, it is therefore our recommendation that actions aimed at city wide assets are prioritised.

Illustration of process undertaken for prioritisation of Goals and Actions within each Priority Group:



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