

Lewisham Climate Emergency 'The Route to Neutral'

Trajectory Study Report

January 2020



Title	Lewisham Climate Emergency 'The Route to Neutral': Trajectory Study Report
Customer	Lewisham Council
Recipient	Emma Bushell
Report Reference	2203
Report Status	Final
Revisions	V5.2
File	Lewisham_RoutestoNeutral_Report_Final_v5.2.docx

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Date	11 January 2020

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Executive Summary

Lewisham Council declared a Climate Emergency in February 2019 and is committed to publishing a new Action Plan on Climate Change by the end of the municipal year 2019-20. Lewisham's Mayor and Cabinet have pledged 'to do everything within their power to make Lewisham carbon neutral by 2030'. Through a process of modelling emissions trajectories, this report provides an initial assessment of the range of actions needed to meet this target.

Achieving net zero carbon emissions in Lewisham equates to removing emission sources as far as possible and making use of some form of carbon offsetting to net off any remaining emissions. Many of the activities required for Lewisham to become carbon neutral are not within the direct control of the council and will require many stakeholders in the Borough, including residents and private companies, to take their own actions. The modelling underpinning this research shows that reaching carbon neutrality by 2030 is only possible with significant and sustained action at national, regional and local levels including a rapid roll out of new technologies. Lewisham Council's plans will need to recognise this, but there is an important role for the council in terms of demonstrating leadership and engaging others to encourage and enable the action needed to respond to the Climate Emergency.

The modelling described in this report has been undertaken using the Carbon Scenario Model (CSM), an excel based tool comprised of a carbon footprint for the borough's current emissions and emission reduction trajectories up to 2030 based on a series of carbon reduction projects represented in the model. The modelling is high level to provide a sense of scale of actions required and uses a range of source to quantify costs and carbon savings but there is significant uncertainty in some of the data and estimates used. This approach provides transparency of methods and also flexibility so that Lewisham Council can make changes to the model in future as plans become more confirmed and new data or information become available. The modelling has been constrained to a scope for which data are readily available but it is important to note that action will also be required to reduce emissions from other sources which cannot so easily be quantified at a borough level, in particular those related to food production, manufacturing of products and transport sources outside Lewisham.

The baseline projection from the 2017/18 carbon footprint shows that even without local carbon reduction projects considered, emissions will decrease by 24 % by 2030/31. This is largely driven by the decarbonisation of the electricity grid. Three scenarios have been developed for this study all of which are cumulative, i.e. the higher ambition scenarios assume that the previous scenarios will also be implemented in full.

The scenarios and the actions within the scenarios are presented as a way of showing how achievement of a target for carbon neutrality could be delivered. They do not represent agreed existing plans for delivery by Lewisham Council or other parties except where explicitly stated. Lewisham Council intends to set out its proposed actions in an Action Plan to be published later in the year. While this research is intended to inform that work it is recognised there are significant financial, legal, equalities and other implications of the actions and scenarios that have been developed, and that these need to be considered as part of the Council's existing decision-making.

The scenarios that have been developed for the study are:

- **Core Actions** This scenario includes those actions which are deemed within the current scope of Lewisham Council and other stakeholders over a 10 year horizon. This is in the context of a local authority already committed to action on reducing emissions and it is noted that delivery of 'Core Actions' cannot be taken for granted and requires resource and prioritisation to deliver.
- **Radical Stretch** This scenario contains actions which either extend significantly the actions under the Core Action scenario or assume wholesale new actions on individual sectors.
- **Systemic change** This scenario is based on projects for which emission reductions have been assigned but the means of achieving them are often not well defined, or where new technology or significant infrastructure are required.

Under the Systemic Change scenario, it is estimated that emissions in the borough would be reduced to 122kt CO₂e, a reduction of 80% from the baseline. While this still is some way short of net zero, it would represent a significant achievement and a very great acceleration in the process of decarbonising the UK economy supported through significant investment in infrastructure, legislation and fiscal incentives at a national level. A reduction of this magnitude will require changes across the UK economy and by individuals in their daily lives. It would require extensive local capital investment but also brings significant co-benefits, including revenue cost reduction.

An attempt has been made to quantify the investment costs required for the actions in the scenarios. However, in many cases, there is insufficient data to allow the actions to be fully costed with any certainty therefore the costs should be considered as indicative only. Despite these limitations, a capital cost of more than £1,600 Million has been estimated for the implementation of actions up to and including the Systemic Change scenario. This is likely to be a significant underestimate.

Lewisham Council's government funding has been cut by over 58% since 2013/14, while at the same time, the Council has faced increased costs through population growth, changes to government policy and other pressures. The overall effect of these changes has meant the Council has had to make over £174m cuts to its budget since 2010/11. Even without the context of financial pressures on the public sector, delivery of the range of activity needed for carbon reduction targets cannot be achieved by the Council alone and should not be seen as a Council service. The Council will need to find creative ways to bring additional resources into the borough to support this effort. However the main focus must be on the UK Government's commitment to delivery of a low carbon economy and clean growth. This is demonstrated by the carbon savings associated with individual actions identified within the scenarios.

Of the total costs that have been estimated, £63 Million are estimated to fall directly to the Council, £177 Million to schools, £233 Million to Lewisham Homes and an additional £160 Million to other social housing. More work is needed to provide a robust cost estimate for each of the actions described.

Set against these investment costs, there will be a benefit in terms of lower energy costs for the people and businesses in Lewisham. Under the Systemic Change scenario, this amounts to an estimated saving of £196 Million per year by 2030/31. Of these savings, 9% will fall to the Council or the residents of Lewisham Homes. Actions to reduce greenhouse gas (GHG) emissions can also have significant other benefits, in addition to addressing climate change. These are often called co-benefits and, while they are often

difficult to quantify, they can also be substantial, including improvements to health and wellbeing, improved equality and social cohesion, economic benefits through job creation and reduced fuel poverty and improved resilience to the impacts of climate change. These in turn may have a number of cumulative positive effects on public resourcing compounded by the avoided costs from the negative impacts of climate change.

Offsetting the remaining emissions in the Systemic Change scenario in 2030/31 has been calculated based on the purchase of carbon offset credits at roughly £9 million in 2030/31. This annual cost would apply every year in which emissions are above zero beyond the target year, although the amount will reduce in line with further emission reductions beyond 2030/31.

This study has made a series of recommendations to Lewisham Council which fall into three areas: internal processes, action by Lewisham Council, and lobbying and engagement work. Given the breadth of potential activity and the need for an evidenced-based approach, the Council would benefit from having additional internal processes to capture more data on emission sources, actions and benefits, providing the necessary evidence base for continued good prioritisation and evaluation of actions. Lewisham Council should target ambitious emissions reductions across its own estate and using the full range of powers at its disposal to help drive change and demonstrate leadership in GHG emission reduction. Lewisham should engage in lobbying GLA and central Government, as a Council in its own right and in conjunction with partner organisations, to ensure that key investments in technology and infrastructure and wider legislative change and fiscal incentives are available to enable actions to be possible within Lewisham within the required timeframe.

Contents

Executive Summary	II
1 Introduction	1
1.1 Project Background	1
1.2 Report Outline	2
2 Modelling approach and scope	3
2.1 Modelling approach	3
2.2 Definitions and scope	4
3 The emissions baseline and projection	13
3.1 Constructing the baseline	13
3.2 Estimating the baseline projection.....	15
3.3 Baseline projection and analysis	16
4 Identifying actions to reduce emissions	18
4.1 Identifying Actions	18
4.2 Quantifying Actions.....	19
5 Scenario definitions and estimated savings	21
5.1 Defining the scenarios	21
5.2 Actions included in each scenario and their estimated costs and impacts.....	22
5.3 Total savings estimated	29
6 Co-benefits of actions to reduce carbon emissions.....	31
7 Other emissions sources not currently quantified	34
7.1 Size and importance of non-quantified sectors.....	34
7.2 Key non-quantified sectors and actions that can be considered to reduce them.....	35
8 Local authority good practice	38
9 Summary and recommendations.....	41
9.1 Lewisham’s baseline and scenarios	41
9.2 Recommendations for further action	43
Appendix A: Baseline Activity data and data sources	45
Appendix B: Key data sources for potential actions	47

1 Introduction

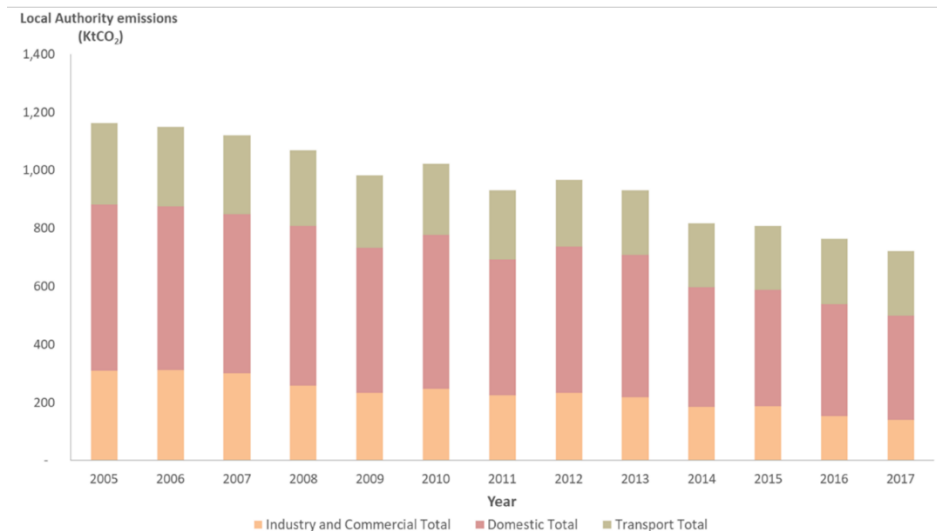
1.1 Project Background

Lewisham Council declared a Climate Emergency in February 2019 and is committed to publishing a new Action Plan on Climate Change by the end of the municipal year 2019-20. Lewisham’s Mayor and Cabinet have pledged ‘to do everything within their power to make Lewisham carbon neutral by 2030’.

The council’s starting point for this project is that this target should encompass borough-wide emissions and include direct and indirect emissions from borough-derived consumption and production. The modelling which supports this project has included direct emissions in the Borough plus emissions associated with electricity consumption but other indirect emissions, such as those related to the production of goods and services used in the borough, have not been included. It is still important to consider these consumption related emissions and how to reduce them because they are significant contributors to greenhouse gas emissions in the UK and elsewhere.

Borough wide emissions, based on BEIS official statistics for energy consumption, show a decreasing trend in emissions (of CO₂) over the period 2005-2017 (**Figure 1**). While emissions from homes and business and industry have decreased, mainly driven by the decarbonisation of electricity generation, transport emissions have remained relatively constant through the period. Lewisham Council has been active on carbon reduction and energy efficiency programmes over that time. The reduction in emissions in the borough over the period 2005-2017 (38%) is very similar to that for London as a whole (37%). Overall the BEIS data supports the view that urban life supports a lower carbon lifestyle. Per capita, Lewisham has the second lowest carbon emissions in England.

Figure 1 Carbon emissions in Lewisham, 2005-2017 (BEIS)¹



Even if the current rate of emissions reduction remains constant over the next 13 years, there will still be a significant shortfall in required emissions reductions to achieve the

¹ Note: this graph is based on BEIS Local Authority CO₂ emissions data. For this project, the BEIS fuel consumption data have been used in the model as they provides more detail and allows a more disaggregated projection into the future

net zero target for 2030. The extent of this emissions reduction gap and the actions which could be taken in order to close that gap to zero are analysed in this report.

It is clear that Lewisham's stated objectives mean they are in the cohort of UK local authorities adopting the most ambitious response to the climate crisis. Challenging targets have been adopted, both in terms of quantification and modelling potential scenarios, as well as identifying and delivering implementation plans.

In practical terms, many of the activities required for Lewisham to become carbon neutral are not within the direct control of the council and will require many stakeholders in the Borough, including residents and private companies, to take their own actions. The modelling underpinning this research shows that reaching carbon neutrality by 2030 is only possible with significant and sustained action at national, regional and local levels including a rapid roll out of new technologies. Lewisham Council's plans will need to recognise this, but there is a fundamental role for the council in terms of demonstrating leadership and in lobbying and engaging others to enable the action that is needed.

Achieving net zero carbon emissions in Lewisham equates to removing emission sources as far as possible and making use of some form of carbon offsetting to net off any remaining emissions.

Actions to reduce greenhouse gas (GHG) emissions can have significant other benefits, in addition to addressing climate change. These are often called co-benefits and, while they are often difficult to quantify, they can also be substantial. The Committee on Climate Change estimated that the monetised co-benefits from the actions set out in their report *Net Zero: The UK's contribution to stopping global warming* would, on a national basis, "partially or possibly even fully offset the [estimated] resource costs". The co benefits resulting from the actions set out in this report are discussed in **Section 6**.

1.2 Report Outline

Section 2 of this report describes the modelling approach used and defines the boundary of the model, both geographically and operationally. The boundary is based on the three-scope methodology used in the GHG Protocol reporting standards, which is also described. Key challenges in setting a net zero carbon target for the whole borough are also discussed. **Section 3** describes the construction and composition of the baseline, i.e. the borough's emission profile to 2030/31 if no action were taken by the Council or others acting in the borough. **Section 4** describes the process for defining actions and **Section 5** presents modelled scenarios which were developed together with estimated savings and data collected on costs. **Section 6** discusses the potential co benefits arising from the actions. **Section 7** provides a discussion of the key emission sources not modelled and **section 8** provides examples of approaches taken by other local authorities in the UK. **Section 9** summarises the results of the study and provides a series of recommendations for Lewisham Council.

2 Modelling approach and scope

2.1 Modelling approach

This GHG emission trajectory study for the Borough of Lewisham has been undertaken using the Carbon Scenario Model (CSM). Originally developed for use by local authorities (funded by Resource Efficient Scotland and Sustainable Scotland Network), this excel based tool has been adapted by the project team to provide a bespoke modelling solution for Lewisham. The CSM has been used to compile a carbon footprint for the borough's current emissions and emission reduction trajectories up to 2030 based on a series of carbon reduction projects represented in the model. This approach provides transparency of methods and also flexibility so that Lewisham Council can make changes to the model in future as plans become more confirmed and new data or information become available.

Within the model, emissions are disaggregated by sector (e.g. transport, domestic, industrial/commercial, public sector) and by "fuel" type (e.g. electricity, gas, road fuels) as well as taking into account the local generation of electricity. This allows for the identification of key emission sources, and for the impact of projects on sectors to be displayed in model outputs.

The initial set up of the model required input of the initial carbon footprint for Lewisham Borough and Lewisham Council in 2017/18 together with an estimate of a future emission projection assuming no further action is taken. This is the emission baseline projection upon which the scenarios are built. It demonstrates the remaining gap to carbon neutral in the financial year 2030/31 and defining the key emitting sectors where additional action is needed

Carbon reduction projects identified are entered into the model and potential savings calculated. These then form reduction trajectories to 2030 in accordance to which scenario projects are assigned to. Three scenarios have been developed for this study all of which are cumulative, i.e. the higher ambition scenarios assume that the previous scenarios will also be implemented in full. These are explained in more detail in **section 5**.

- **Core Actions** This scenario includes those actions which are deemed within the current scope of Lewisham Council and other stakeholders over a 10 year horizon. This is in the context of a local authority already committed to action on reducing emissions and it is noted that delivery of 'Core Actions' cannot be taken for granted and requires resource and prioritisation to deliver.
- **Radical Stretch** This scenario contains actions which either extend significantly the actions under the Core Action scenario or assume wholesale new actions on individual sectors.
- **Systemic change** This scenario is based on projects for which emission reductions have been assigned but the means of achieving them is often not well defined, or where new technology or significant infrastructure are required.

The modelling approach was guided by the following principles.

- Provide **full transparency** of methods and data input. This involves full documentation of assumptions in the tool which has been handed over to Lewisham.
- Incorporate **flexibilities** in the modelling, allowing carbon reduction projects to be ‘switched on and off’ for scenarios as commitments evolve.
- Consider **uncertainty and risk** which are inherent in any projection scenario. The model allows for documentation of uncertainty.

However, the modelling approach used is a relatively simple one, and has required assumptions and estimation to be made of both current and future carbon emissions and activities related to them. This includes best estimates based on expert judgement to fill gaps where no reliable data were available. Therefore, the model outputs need to be treated as indicative and the cost data are incomplete because of a lack of easily available data for some actions.

2.2 Definitions and scope

2.2.1 Carbon neutrality

There are three commonly used terms within this field:

- **Zero Carbon:** this means the reduction of CO₂ (and possibly CO_{2e}) emissions to zero, without considering removals or offsetting;
- **Net Zero Carbon:** the balancing of carbon emissions against carbon removals and/or carbon offsetting with the net result being zero (see below); and
- **Carbon neutral:** this is effectively the same as net zero carbon.

In line with Lewisham Council’s resolution, the term “carbon neutral” is used in this report. Carbon neutrality balances carbon emissions with carbon removals. As defined by the Committee on Climate Change (CCC), a net-zero (i.e. carbon neutral) target requires “deep reductions in emissions, with any remaining sources offset by removals of CO₂ from the atmosphere (e.g. by afforestation)”. This removal requires either the purchase of carbon offsets² or direct carbon removal through additional carbon removal and storage (“sequestration”) activity on an organisation’s estate.

Although the phrase refers to carbon, this is usually taken to include all greenhouse gases covered under the UN Framework Convention on Climate Change’s Kyoto protocol³, measured in terms of their carbon dioxide equivalence. Carbon dioxide equivalent is a measure used to compare the emissions from various greenhouse gases based upon their global warming potential⁴. Therefore, CO_{2e} works as a single ‘currency’ for greenhouse gases, of which CO₂ is the usually by far the most abundant. It is possible to set a target based purely on CO₂ and for most organisations, this will cover the large majority of their emissions but for most common organisational emission sources, the additional GHGs occur together in similar types of products and services and therefore, reducing consumption will reduce all GHG emissions.

² Where a project for reduction in greenhouse gas emissions is funded in order to compensate for emissions made elsewhere

³ Carbon dioxide (CO₂), Methane (CH₄), Nitrous oxide (N₂O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), and Sulphur hexafluoride (SF₆)

⁴ https://www.ghgprotocol.org/sites/default/files/ghgp/Global-Warming-Potential-Values%20%28Feb%2016%202016%29_1.pdf

2.2.2 Geographical and temporal boundary

Setting the geographical and temporal boundaries is relatively straightforward at a high level and was agreed with Lewisham Council at the start of the project:

- The geographical boundary will be the area covered by the Lewisham Borough Council administrative area. Emissions from Lewisham Council’s own estate and activities will be included and calculated as a subset of those emissions.
- The baseline for data will be 2017/18 financial year, although the 2017 calendar year will be used where FY data are not available
- The target year is financial year 2030/31
- The target will be assessed and calculated on the basis of CO2e.

Figure 2: Lewisham Borough Council administrative area



2.2.3 Emission sources (operational scope)

The most widely used set of standards for carbon accounting are those produced under the Greenhouse Gas Protocol. Of particular relevance to this project is the *Global Protocol for Community-Scale Greenhouse Gas Emission Inventories*⁵, otherwise known as the GHG Protocol for Cities. This standard describes the emission sources and “scopes” which should be considered as part of a city-wide carbon accounting process; the definition of the three scopes is shown in **Table 1**, below. Therefore, a key consideration in defining what a carbon neutral Lewisham looks like is the extent to which the definition includes all scopes and how the boundary is set.

Table 1 Scope definitions

Scope	Definition
Scope 1	GHG emissions from sources located within the borough boundary
Scope 2	GHG emissions occurring as a consequence of the use of grid-supplied electricity, heat, steam and/or cooling within the borough boundary
Scope 3	All other GHG emissions that occur outside the borough boundary as a result of activities taking place within the borough boundary

⁵ <https://ghgprotocol.org/greenhouse-gas-protocol-accounting-reporting-standard-cities>

Upstream and downstream emissions (scope 3) are likely to far outweigh scope 1 and 2 emissions and will also be the most challenging to both quantify and address. However, it needs to be understood that one organisation's scope 3 emissions are another organisation's scope 1 or 2. For example, the carbon emissions associated with purchased goods (scope 3) are also the process and electricity emissions (scope 1 and 2) for the manufacturer. Therefore, where scope 3 emissions relate to scope 1 and 2 activities within the Lewisham area, they will be captured by the model.

The standard also sets out a series of principles, which are consistent with other standards under the GHG Protocol series, and which are intended to guide GHG accounting towards a fair and accurate account of GHG emissions. These are:

- **Relevance:** The reported GHG emissions shall appropriately reflect emissions occurring as a result of activities and consumption patterns of the city. The inventory will also serve the decision-making needs of the city, taking into consideration relevant local, subnational, and national regulations. The principle of relevance applies when selecting data sources and determining and prioritising data collection improvements;
- **Completeness:** cities shall account for all required emissions sources within the inventory boundary. Any exclusion of emission sources shall be justified and clearly explained.
- **Consistency:** emissions calculations shall be consistent in approach, boundary, and methodology. Using consistent methodologies for calculating GHG emissions enables meaningful documentation of emission changes over time, trend analysis, and comparisons between cities.
- **Transparency:** activity data, emission sources, emission factors, and accounting methodologies require adequate documentation and disclosure to enable verification. The information should be sufficient to allow individuals outside of the inventory process to use the same source data and derive the same results. All exclusions shall be clearly identified, disclosed and justified.
- **Accuracy:** The calculation of GHG emissions shall not systematically overstate or understate actual GHG emissions. Accuracy should be sufficient enough to give decision makers and the public reasonable assurance of the integrity of the reported information. Uncertainties in the quantification process shall be reduced to the extent that it is possible and practical.

Complying with these principles will provide a very high standard of GHG accounting. It also sets a very high bar in terms of the level of resource required simply to collect and verify data, resource which could be diverted towards planning and implementation carbon reduction actions. The GHG Protocol for Cities acknowledges this, stating that *“a city will need to make important decisions in terms of setting the inventory boundary, choosing calculation methods, deciding whether to include additional scope 3 sources, etc. Trade-offs between the five principles above may be required based on the objectives or needs of the city.”* Nor do the principles fully take into account the complexities of accounting for a region, in the case a borough, within a larger city. Some further guidance towards the application of the GHG Protocol scopes within this project, are shown in **Table 2**, below.

Table 2 Further principles for data inclusion and exclusion

Reasons for including data within the GHG boundary	Reasons for excluding data from the GHG boundary
The emission source occurs within the administrative boundary of Lewisham Council	The emission source has no available dataset and estimation methods will not benefit the decision-making
The quantity of activity data for the emission source is controlled by an organisation/individual within the administrative boundary of Lewisham Council	The emission source clearly belongs to a different geographical region and they are better placed to account for it
An organisation/individual with the geographical region has a significant level of control over the emission source even though it occurs outside the administrative boundary of Lewisham Council	Emission source makes up a very small proportion of overall emissions AND is very time consuming or difficult to collect activity data

This will in effect create three types of sources and their associated data:

- Sources which are clearly “in scope”, are important, and for which a reasonable level of data are available. This will include total electricity consumption and fossil fuel use within the Lewisham area;
- Sources which are clearly out of scope, either because they are sources which are not of significance in Lewisham, such as agriculture or industrial process emissions, or are minor and are best considered as sources outside the borough, such as river traffic emissions (where the whole of the tidal Thames comes under the jurisdiction of the Port of London Authority);
- Sources which are important but for which data are either unavailable or so uncertain that it becomes virtually impossible to show progress, and thus are not useful for making decisions or the development of actions. Such sources need to be acknowledged and discussed, and actions to address them are within the scope of the Lewisham climate action plan as a whole. However, they may not be included in numerical modelling in the first instance, although could be included at a later date as and when improved data become available. This could include issues such as the goods purchased by residents and businesses within the Borough, or the transport generated by activities outside the Borough (e.g. travel choices for airports).

2.2.4 Key challenges for delivery

The level of ambition set by Lewisham Council is very welcome in the fight to tackle climate change and demonstrates the Council’s desire to take a leadership role in addressing it. There are significant challenges in terms of achieving the target. These issues are not raised with a view to discouraging Lewisham’s ambition, but rather to highlight some of the significant additional challenges inherent in delivering against that ambition, and with a view towards helping direct the Council’s efforts towards the areas where action has the potential to be most effective:

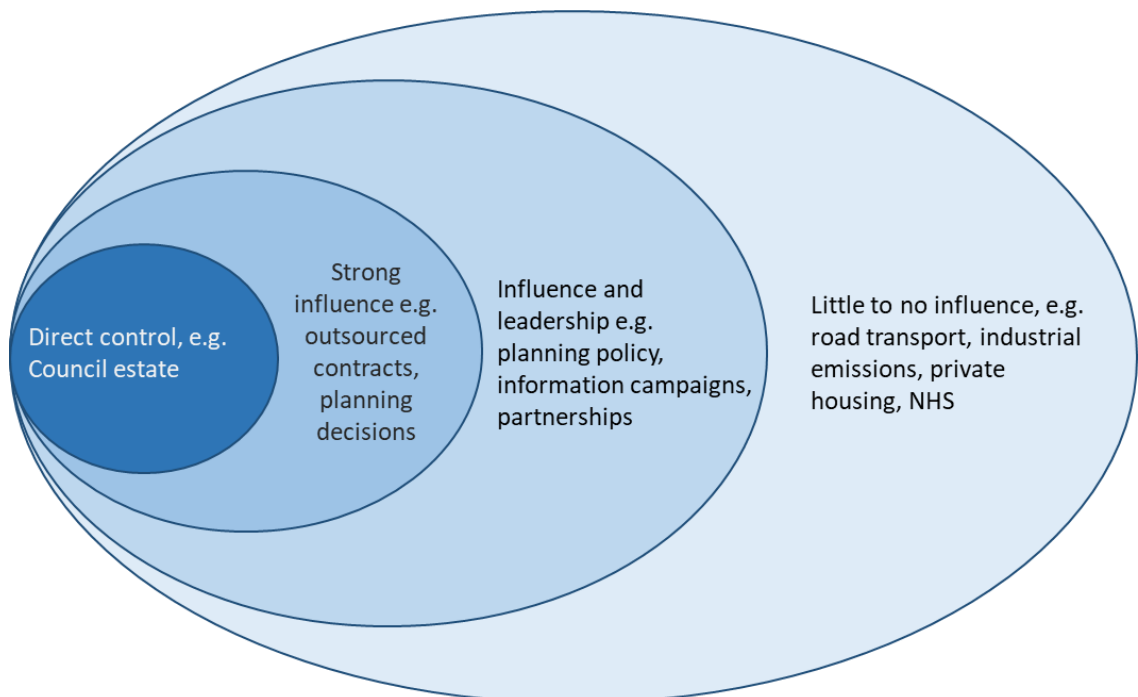
- **Matching emission sources with the most appropriate tier of governance:** the generation of electricity, fuels for road transport and fossil fuel (natural gas) for heating remain the key sources of CO₂ emissions in the UK. Managing demand for energy within the borough does come within the Council’s sphere of influence but decarbonising the national electricity and gas grids are beyond

the scope of what can be done in Lewisham. Likewise, for road fuels: while Lewisham Council could work to increase the uptake of zero emission vehicles, it cannot change the national road fleet nor the quality of fuel sold, both of which rest with national (and international) policy.

- **Mismatch between the Council’s ambition and national timescales:** the UK Government has committed to achieving carbon neutrality at a national level by 2050. In its report on the potential pathways to achieving this, the Committee on Climate Change made clear that even on this timescale, radical action is needed to reduce carbon emissions. Thus, it is unlikely that nationally controlled policies, such as grid decarbonisation, will achieve full carbon neutrality by 2030.
- **The limits of Council control:** the Council is clearly a major actor in Lewisham and has a strong role in both influencing activities within the borough and providing leadership on climate change issues. There are clearly limits to this level of control and influence and there is a spectrum of control ranging from direct control, e.g. over the Council’s own estate, through to no control, e.g. over decarbonisation of the national electricity grid. This is illustrated in **Figure 3**.
- **Data availability and the quantification of borough level emissions:** it will not be possible to quantify all of the emission sources in the borough, either because the data do not exist or they are not available at the borough scale (and there are no appropriate approximation methods). This does not mean that such emission sources are not addressed by Lewisham’s climate action plan, but it does mean that their impact, and the effectiveness of actions to address them, cannot be modelled to an acceptable level of certainty.

These factors in combination mean that achieving carbon neutrality within the borough by 2030/31 will require extensive and positive action from a wide range of stakeholders, from the national Government through to private companies and homeowners. Even then, there may be a need to invest in offset credits to support decarbonisation elsewhere.

Figure 3 Levels of control available to Lewisham Council



2.2.5 Exclusions from scope for this project

As noted above previously, there are some sources which cannot be modelled to an acceptable level of certainty, either because data do not exist or because the data are not available at a borough level. Such sources can, and some cases should, be addressed in Lewisham's climate action plans but will not be included in the modelled baseline or future emissions reduction scenarios. There are also a number of sources which are not significant within Lewisham. Based on this and on the guiding principles above, the following datasets have been excluded from the project boundary for modelling purposes and for the following reasons:

- **Aviation:** this is not a significant source for Lewisham, although travel to airports may be. This latter source could be considered under Lewisham's climate action plan but reliable data do not exist to enable it to be fully modelled (the part that occurs within Lewisham is already included).
- **Waterways:** While there are emissions from Thames river traffic within the Borough boundary, apportioning them to the Borough is highly uncertain and would not take into account changes at a borough level. The Port of London Authority is developing strategies to address emissions from river traffic for the whole of the tidal Thames.
- **Off-road:** Data are limited and uncertain. Given the transient nature of e.g. construction equipment, the impact of actions taken at a borough level are unlikely to be representable in forecasts (i.e. to 2030). Nevertheless, construction is a high profile activity within London and should be considered as part of Lewisham's climate action plan.
- **Non-CO₂ emission sources on land and livestock:** These are minor sources in Lewisham.
- **Industrial processes:** Energy consumption for industrial processes is contained within the BEIS energy data although other process emissions are not. It is likely that obtaining additional data would require significant time and effort for minimal return as there is not a significant industrial manufacturing sector within the Borough.
- **Product Use:** data are scarce and uncertain. Emissions of concern in this sector are fluoro-carbons used in electronics production and lubricants/paraffin waxes for non-energy products, neither of which are a significant source in Lewisham.
- **Household and Commercial/industrial wastewater treatment:** Data held by Thames Water are not currently accessible and, in any case, identifying data specific to Lewisham may not be possible. However, emissions could be estimated albeit with a high degree of uncertainty. This could be considered under Lewisham's climate action plan and included within the modelling at a later date.
- **Well to tank emissions for stationary fuels, transport fuels and electricity:** in the vast majority of cases, well to tank emissions will fall outside the borough boundary.

A further category of emissions which is likely to be most problematic is the **procurement of goods and services**. A full accounting of all goods and services purchased within Lewisham is likely to result in carbon emissions which far outweigh all

other sources (potentially by an order of magnitude)⁶. However, estimation of such sources is highly complex and uncertain and tends to be possible only on a product type basis, i.e. a “green” product will have the same estimated embedded emissions as the standard product. Thus, future changes in consumption patterns, e.g. towards “greener” products, will tend not to be reflected in that type of emissions calculations.

This category should certainly be considered as part of Lewisham’s climate action plan and attempts should be made to identify the key product sectors, with the potential for inclusion in the modelling at a later date. In particular, for Lewisham Council’s own emissions, outsourced services should be modelled. This will help prevent “carbon leakage” where further services are outsourced (or brought back in-house) in the future. However, it will require the collection of data from contractors who may not be contractually obliged to provide such data and may regard it as commercially sensitive.

2.2.6 Offsetting

As highlighted above, achieving carbon neutrality is likely to involve both a combination of deep carbon emissions reductions and the offsetting of any remaining carbon emissions. At the start of this project, it was agreed that Lewisham Council assumes that offsetting will form part of the carbon neutral target because net-zero carbon by 2030 is not possible otherwise. However, it was also agreed that offsetting could not be a council liability alone and that other parties would need to contribute in some way.

Carbon offsetting enables individuals and organisations to compensate for any emissions they cannot avoid or reduce, by paying for a carbon credit i.e. to pay for an equivalent amount of emissions to be reduced or removed elsewhere. These emissions savings are generated through the implementation of a wide variety of projects across a wide range of locations and might range from planting trees, to installing solar panels, to cancelling industrial carbon credit allowances. The Committee on Climate Change warns that offsetting is not a panacea and that to reach net zero, “most sectors will need to reduce emissions close to zero without offsetting; the target cannot be met by simply adding mass removal of CO₂ onto existing plans for the 80% target.”⁷

The Committee on Climate Change suggests the UK will need to develop a substantial ‘negative sector’ by 2050, i.e. that technology will need to be further developed that is capable of directly removing greenhouse gases from the air. In its advice, the remaining emissions are removed largely using bio-energy with carbon capture and storage (BECCS), where additional amounts of energy crops (e.g. short rotation coppice willow or *miscanthus*) are grown, burned to produce power and the resulting CO₂ is stored underground⁸. There may be limited potential for such solutions within Lewisham itself, but other more viable opportunities for the Borough might include building with biomass⁹ and, potentially, afforestation (tree planting), although the latter would require a high land take and would need to remain undisturbed for the long term. For

⁶ The C40 Cities report on urban consumption shows the extend of indirect emissions resulting from cities, which it describes as “consumption-based” but which are analogous to scope 3: https://c40-production-images.s3.amazonaws.com/other_uploads/images/2270_C40_CBE_MainReport_250719.original.pdf?1564075036

⁷ Committee on Climate Change (2019), Net Zero – The UK’s contribution to stopping global warming, 2 May 2019

⁸ Although note this may result in other environmental impacts, for example in relation to air quality or sustainable land use

⁹ Whereby plant-based materials are used in construction, storing carbon and preserving it for as long as the building remains standing

example, 1 hectare of trees is estimated to contain around 430 tonnes of carbon¹⁰. By comparison, using BEIS figures (which only cover scopes 1 and 2), Lewisham was responsible for the emission of 765,000 tonnes of CO₂e in 2017.

There might also be the possibility of funding and/or purchasing REGO-backed¹¹ electricity supply, which guarantees that the power is backed by renewable generation and can be reported as zero carbon, or biomethane from certified sources for gas for heating.

Key considerations in weighing up offsetting options include:

- **Carbon Price:** Current offsetting costs are relatively low, sometimes under £10 per tonne. However, it is expected that offsetting costs will increase, partly due to rising demand but also because of increasing costs of abatement through time. In the UK the shadow price of carbon is set by the Government. It provides policy guidance and is applied in the appraisal of all government projects with carbon implications. In the current BEIS central price trajectory the shadow price of carbon for modelling purposes grows from £14 (central estimate) per tonne of CO₂ in 2020 to £43 per tonne in 2030. However a recent report has suggested a shadow price consistent with a net-zero target would start at £50 per tonne of CO₂ (with a range of £40–100) in 2020 and complete decarbonisation will require the use of negative emissions technology, which, at the scale required, could cost in the order of £160 (£125–300) per tonne of CO₂ in 2050.¹²
- **Location.** The geographic origin of carbon offsets is important to consider. Most carbon offsets available for purchase are generated by activities taking place in countries other than the UK. Carbon offsets from international activities can offer particular benefits: they tend to be lower cost than abatement options in the UK, maximising the value of each pound spent on climate change mitigation, and can also support wider sustainable development goals. However, domestic schemes can provide homegrown environmental and economic benefits (literally, in the case of tree planting) and may be a preferable option.
- **Timing:** Lewisham will need to consider when any push to begin offsetting the borough's emissions should begin. One approach could be to wait until 2030 before offsetting residual emissions. This may focus minds on emissions reductions until that point. But other options could include setting up offsetting schemes and policies sooner, to help normalise the process and costs of offsetting, to increase the 'price' of carbon-intensive activities (and therefore de-incentivise them) and to help fund emissions reductions within the borough (e.g. through an evolved version of the Lewisham carbon offset fund).
- **Budget and ownership:** Lewisham will need to think carefully about the potential costs of offsetting borough-wide emissions, particularly if the aim is to offset all scopes. The costs of doing this could be prohibitive. And who should be responsible for offsetting? One option could be for Lewisham Council to choose to commit to offsetting all emissions from its own

¹⁰ Broadleaf trees in a temperate climate at 20 years old. Estimated using IPCC methodology (Vol 4, Ch. 4): <https://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html>

¹¹ Renewable Energy Guarantees of Origin

¹² http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2019/05/GRI_POLICY-REPORT_How-to-price-carbon-to-reach-net-zero-emissions-in-the-UK.pdf

operations, and then encourage individuals and organisations to offset their own emissions (direct and indirect).

- **Scopes:** Should emissions from all scopes be offset? As highlighted above, costs of offsetting all indirect emissions could be prohibitive. And given they are difficult to quantify; it may not be possible to robustly measure how much carbon needs to be offset. Limiting the scope of what should be offset (e.g. Scopes 1 and 2) may be a pragmatic option and might also help avoid double-counting.
- **Verification:** Whichever option or scheme(s) Lewisham opt for, it will be important to select an offset strategy that involves the purchase of robust, verifiable carbon offsets to ensure that any carbon offset is additional, avoids leakage, is not double-counted and meets other recognised quality criteria for carbon offsetting.

3 The emissions baseline and projection

The emissions baseline describes Lewisham’s current GHG emission profile, or carbon footprint. It contains all of the electricity and natural gas use in the borough, the vehicle emissions, industrial and waste management activities. These are broken down by different sectors, shown below, using data from UK Government, GLA or Lewisham Council. This footprint is then projected forward in time, assuming no further action is taken in the borough. The changes in the baseline emission profile are therefore as a response to pressures and actions from outside the borough, such as the national process of decarbonising electricity generation, changes in population, growth forecasts for traffic, changes in technology (such as the uptake of electric vehicles), etc. This provides a basis on which to calculate the effect on GHG emissions of actions from within the borough.

3.1 Constructing the baseline

In order to begin constructing emission trajectories for Lewisham to achieve carbon neutrality by 2030, it was first necessary to consider the emissions in the ‘starting year’. A carbon footprint was compiled by a selected baseline year of 2017/18. This year was chosen as it is the latest year for which data is most widely available.

Data were collected from both national data sets (BEIS data on baseline energy consumption) and directly from Lewisham Borough Council. Full details of activity data used for the compilation of the baseline carbon footprint are documented in **Appendix A**. In order to translate activity data into GHG emission estimates, activity data were multiplied by emission factors.

3.1.1 Borough wide emission estimates

In Lewisham, total emissions were estimated to be 804,961 tonnes of CO₂e in 2017/18. Emissions by sector are presented in **Figure 4** and **Table 3**. The most significant emissions source is Domestic Natural Gas, comprising 31.6 % of total emissions.

Figure 4 Estimated CO₂e emissions for Lewisham Borough in 2017/18

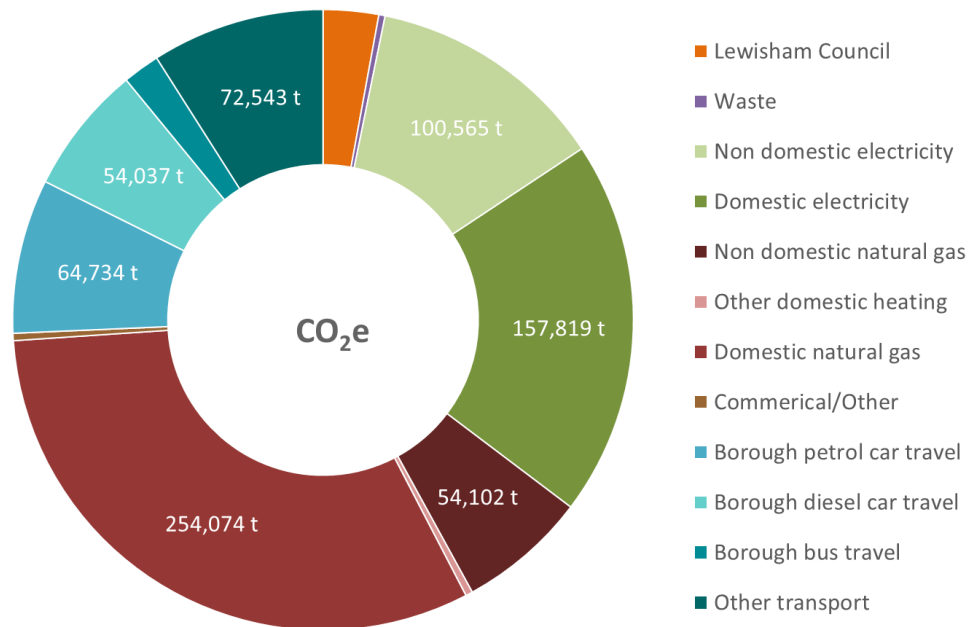


Table 3 Estimated CO₂e emissions for Lewisham Borough in 2017/18

Sector	2017/18 (t CO ₂ e)	% of total emissions
Lewisham Council	23,203	2.9
Waste	2,635	0.3
Non-domestic electricity	100,565	12.5
Domestic electricity	157,819	19.6
Non-domestic natural gas	54,102	6.7
Domestic natural gas	254,074	31.6
Other domestic heating	2,959	0.4
Commercial/Other	3,049	0.4
Borough petrol car travel	64,734	8.0
Borough diesel car travel	54,037	6.7
Borough bus travel	15,508	1.9
Other transport	72,275	9.0
Total	804,961	

Notes: **Commercial/ other** comprises consumption of fuels other than gas and electricity, as estimated by BEIS. **Other transport** comprises HGVs, LGVs, motorcycles and rail travel. **Waste** emissions account for emissions from the incineration of waste at SELCHP

The sources of emissions in Lewisham are numerous and dominated by the use of natural gas for heating and electricity for heating and lighting homes, businesses and other buildings such as hospitals and schools. There are no significant industrial emission sources in Lewisham except for the SELCHP energy from waste plant.

It is not possible to identify other individual large users of energy because there is no publicly available information, but variations of energy intensity could be considered by analysing the MSOA level data published by BEIS¹³ to give an indication of areas with higher than average energy use.

3.1.2 Lewisham Borough Council emission estimates

Total emissions for the council own estate were estimated to be 23,203 tonnes of CO₂e in 2017/18, with the breakdown shown below in **Figure 5** and **Table 4**. The largest source of emissions, comprising of 45.8 % of total Lewisham Council emissions, was from natural gas in council owned and operated buildings. The small sources without labels in the figure below relate to council business travel fuel consumption. Public transport emissions are not included in this dataset, but bus and coach emissions are included in the borough wide dataset above (Borough bus travel).

¹³ <https://www.gov.uk/government/collections/sub-national-gas-consumption-data#lsoa/msoa-data>

Figure 5 Estimated emissions from the Council own estate (CO₂e)

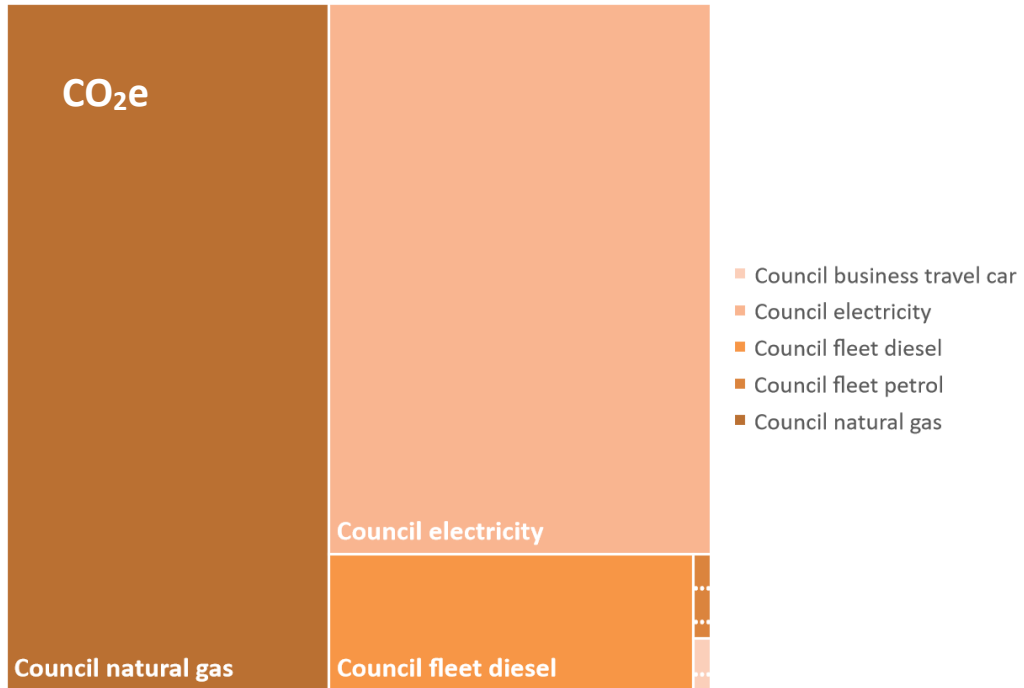


Table 4 Estimated emissions from the Council own estate (CO₂e)

Sector	2017/18 (t CO ₂ e)	% of total emissions
Council natural gas	10,628	45.8
Council electricity	10,072	43.4
Council fleet diesel	2,385	10.3
Council fleet petrol	73	0.3
Council business travel	45	0.2
Total	23,203	

3.2 Estimating the baseline projection

The starting point for modelling future emissions trajectories is the Baseline emission projection. Even without carbon reduction initiatives planned within Lewisham, emissions will still change over time due to underlying drivers such as changes in population and a national process of decarbonising the electricity grid through the increased use of renewable energy and improving energy efficiency of vehicles and other products.

The baseline projection encompasses the basic drivers of emissions, which can be both positive and negative, as well as estimating impacts of firm policies adopted at national scale. The BEIS 2018 energy projections¹⁴ have been used as the basis of the baseline projection, using the published Exiting Policies Scenario. This includes the predicted impacts of energy efficiency and other policies on national emissions. The impact of these changes has been calculated as a pattern of percentage change for future years for each main source in the Lewisham model. Nevertheless, the key drivers include:

¹⁴ <https://www.gov.uk/government/publications/updated-energy-and-emissions-projections-2018>

National electricity grid factor: this is, in effect, the progressive decarbonisation of grid electricity in the UK, as renewable energy sources overtake carbon-based generation. This is being driven by a range of Government policies. The future grid electricity factors used in the model were published the Treasury Green Book supplementary appraisal guidance on valuing energy use and greenhouse gas (GHG) emissions.¹⁵

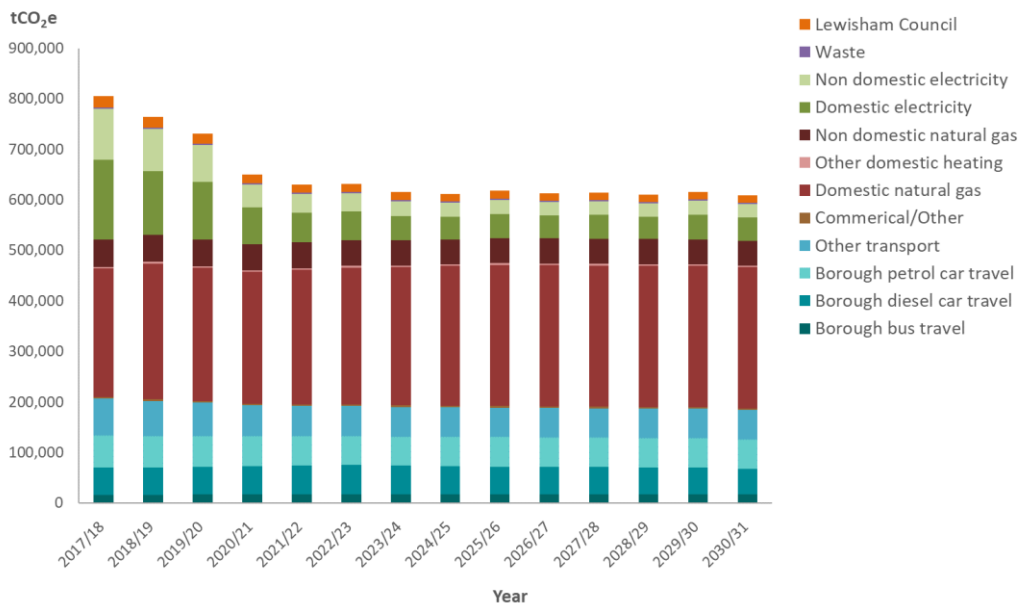
Energy efficiency and new technologies: The BEIS projections take account of policies related to the uptake of new technologies and the replacement of products with new ones that are more efficient. This includes the changes to road vehicle fleet, including electrification. The effect of the London ULEZ is not specifically considered in this baseline because it is based on national data.

Population and housing forecasts: an increasing population will increase energy demand directly, as well as driving increases in service provision and thus the emissions of Lewisham Council and other public sector organisations. The BEIS energy projections include the impact of population change and this has not been adjusted in the model for Lewisham. Because of increases expected here, even more effort is needed to reduce emissions.

3.3 Baseline projection and analysis

The baseline projection from the 2017/18 carbon footprint is shown in **Figure 6**. Results suggest that given the factors outlined above and even without local carbon reduction projects considered, emissions will decrease by 24 % by 2030/31. This is largely driven by the decarbonisation of the grid, which reduces emissions from non-domestic and domestic electricity up to 74%. Emission decreases are also seen from car travel, other transport and waste. Increases in emissions are estimated for some sectors; borough bus travel, domestic natural gas and other domestic heating, reflecting changes in travel behaviours and population changes.

Figure 6 Baseline emission projection for Lewisham Borough 2017/18 – 2030/31



¹⁵https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/794737/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal-2018.pdf

Table 5 Baseline emission projection estimates in 2017/18 and 2030/31, with % change

Sector	2017/18 (t CO ₂ e)	2030/31 (t CO ₂ e)	% change
Lewisham Council	23,203	14,728	- 36.5
Waste	2,635	2,588	- 1.8
Non-domestic electricity	100,565	26,348	- 73.8
Domestic electricity	157,819	47,063	- 70.2
Non-domestic natural gas	54,102	48,831	- 9.7
Domestic natural gas	254,074	279,609	+ 10.1
Other domestic heating	2,959	3,027	+ 2.3
Commercial/Other	3,049	3,095	+ 1.5
Borough bus travel	15,508	17,509	+ 12.9
Borough diesel car travel	54,037	50,187	- 7.1
Borough petrol car travel	64,734	58,716	- 9.3
Other transport	72,275	57,223	- 20.8
Total	804,961	608,924	- 24.4

4 Identifying actions to reduce emissions

A two-stage approach was adopted to identify and then quantify the potential actions that could be undertaken to contribute to carbon emissions reductions in Lewisham.

4.1 Identifying Actions

The first stage involved generating ideas for actions and gathering relevant data on each of them. Actions were sought in the following categories shown in **Table 6**.

Table 6 Categories used for scoping potential actions

Category	Scope
Housing	Actions to reduce emissions from social and private (owner occupied and private rental) housing
Road transport	Actions to reduce emissions from all road transport, including the council fleet
Lewisham Council's own estate	Actions to reduce emissions from council buildings (inc. LA schools) and operations, excluding council fleet
Other public buildings	Actions to reduce emissions from other public buildings inc. non-LA schools and hospitals
Commercial	Actions to reduce emissions from buildings and processes in commerce and industry
Energy generation	Low carbon / renewable energy development opportunities
Waste	Actions to reduce emissions from waste
Green space and other land use	Opportunities to develop green and blue infrastructure
Other	Any other actions to reduce emissions

The evidence sources used in this first stage included:

A review of existing and potential future council/local activity. This comprised unpublished information provided by the council, as well as information available online. Along with policy documents and strategies covering topics such as transport, housing energy, domestic retrofit, rail and waste, the council provided data on planned or potential activity in relation to the council transport fleet, Lewisham Homes' housing stock, existing and planned heat networks and the council's estate. This enabled us to identify a large number of actions which had already been planned or considered in the borough. They were also used to source data to enable quantification (e.g. of the potential for each action in Lewisham, costs, activity and/or carbon savings) of other potential actions.

A review of national and regional programmes and policies likely to contribute to carbon reduction in Lewisham. The Mayor of London has developed a suite of relevant policy documents and strategies, many underpinned by a significant evidence base. These were a further source of planned and potential actions (by external actors) that could impact on Lewisham borough emissions and of data to enable quantification of other actions.

A review of local authority good practice on climate change. As noted in **section 8**, a large number of local authorities have now declared a climate emergency including 27 of the 33 London Boroughs. A smaller number have made subsequent commitments to

respond to that climate emergency and a smaller number again have begun to set out how these commitments will be met. For example, Bristol City Council has published a Climate Emergency Action Plan, Glasgow City Council has published the report and recommendations of Glasgow City Council's climate emergency working group and Camden Council has high-level carbon scenarios for 2025 and 2030. These, and other council activity on climate mitigation, were reviewed in order to inform the actions.

Other existing sources/databases. A range of other data sources were utilised to inform the actions matrix and a number of guidance documents provided ideas for actions to support the reduction of local authority area carbon emissions. The Crohm (Carbon Reduction Options for Housing Managers) dataset produced by Parity Projects was particularly important, as it was used as the basis for identifying and quantifying packages of actions to improve the energy efficiency of the housing stock. Guidance documents were also reviewed that included specific guidance aimed at local authorities on responding to their climate emergency declarations, produced by Ashden and Friends of the Earth.

References for the key sources of evidence are included in **Appendix B**. For each potential action, we gathered, as far as available, relevant data on:

- Relevant national, regional and local policies
- Existing action/delivery in Lewisham
- Examples of similar actions/commitments elsewhere
- Modelling of activity or GHG emissions reductions, i.e. data that could be utilised to model activity and/or emissions reductions
- The scale of opportunity for delivering the action in Lewisham
- The costs of implementing the action
- Other possible impacts/co-benefits

4.2 Quantifying Actions

The second stage involved completion of a detailed actions matrix. From the ideas generated in stage 1, actions were identified for each of the different emissions sectors in the model and with different levels of ambition to align with the different scenarios. In some cases, action variations were developed simply through adjusting the scale and/or likely commissioning year.

In practice, the identification of actions for inclusion in the model was an iterative process, with the actions repeatedly adjusted and refined, e.g. following suggestions/comments from team members or when new data was sourced. For each action in the matrix, we drew on the data identified during stage 1, supplemented by further interrogation of web-based sources and databases, to identify as far as possible:

- The potential 'owner' of the action, along with other relevant stakeholders;
- The type of influence that Lewisham Council could have on the action:
 - Direct influence through Council actions
 - Indirect influence or enabling of partners
 - Lobbying other organisations
 - Raising public awareness
- The status of the action:
 - Funding agreed to go ahead
 - Feasibility study completed

- Planned but not agreed
- Idea – already implemented elsewhere
- Idea – yet to be implemented elsewhere
- Any available data on the co-benefits of the action
- Data on the costs and potential savings associated with the action (or data that could be used to generate estimates)
- The timescales for delivering the action
- The activity which the action would deliver, e.g. kWh of electricity or litres of fuel saved (or data that could be used to generate estimates)
- Where activity data was not available or could not be calculated, the carbon reduction potential associated with the action (or data that could be used to generate estimates)
- Estimated confidence of activity or carbon reduction potential

In many cases, we used high-level ‘best estimates’ for costs and activity/carbon reduction potential based on the best data available, e.g. scaling up or down from existing or proposed initiatives in Lewisham or elsewhere. It is worth noting here that the CCC Net Zero report states “the costs and benefits of deep decarbonisation are unknowable with any precision”.¹⁶

¹⁶ Committee on Climate Change (2019) Net Zero: The UK’s contribution to stopping global warming, p217. <https://www.theccc.org.uk/wp-content/uploads/2019/05/Net-Zero-The-UKs-contribution-to-stopping-global-warming.pdf>

5 Scenario definitions and estimated savings

5.1 Defining the scenarios

Each action in the model was assigned to one of the scenarios defined below. These scenarios are effectively phases of implementation. They are not alternative options for reaching carbon neutral. Assigning actions to the different scenarios was a judgement in each case, based on an assessment of:

- The extent to which the action was agreed or committed to, e.g. backed by a specific policy commitment and/or with a committed timescale for delivery.
- The extent to which the action was funded.
- The extent to which the action was within the influence of Lewisham Council.
- The cost of the action.
- The level of ambition of the action.
- The extent to which the action was novel or speculative in terms of technology or scale of implementation, i.e. whether it had already been implemented elsewhere.

The interdependencies between actions have been recognised as far as possible, and efforts made wherever relevant to eliminate double counting. For this reason, emission reductions as a result of behaviour change, communication and engagement campaigns have not been modelled as individual actions. However, it is acknowledged that these are key drivers behind the implementation of many of the actions included in the modelling study, most significantly for transport and domestic measures where individual choices have a large bearing on the effectiveness of a measure. It has also been well established that behaviour change has the capability to deliver large reductions in emissions.

Core Actions - This scenario includes those actions which are deemed within the current scope of Lewisham Council and other stakeholders within a 10 year horizon. This is in the context of a local authority already committed to action on reducing emissions and it is noted that delivery of 'Core Actions' cannot be taken for granted and requires resource and prioritisation to deliver. The actions include some that are currently planned as well as those that have not received full clearance or budget allocation. The name Core Action is used here to reflect the analysis of the Committee on Climate Change regarding action needed to reach net zero emissions. Actions are required locally, enabled by decisions and investments made regional and nationally to respond to the need for action on climate change. This is not to suggest that such actions are easy and implementing the full scenario will present significant challenges.

Radical Stretch - This scenario contains actions which either extend significantly the actions under the Core Actions scenario or assume wholesale action on individual sectors, such as the full electrification of the taxi fleet. This scenario includes the impact of carbon reduction projects which are currently not well formed and would be considered high ambition due to costs, technology readiness or barriers to public uptake. They are all feasible, in terms of technology being available, but they assume high levels of uptake or long payback periods. They all require significant investment but the rewards, in terms of lower energy costs and additional co-benefits, will also be higher. This scenario also covers the actions needed by a wide range of other agencies locally including the rest of the public sector, local business and residents. The Council's

role to inform, encourage and inspire action will be an important part of the action needed to support this work.

Systemic Change - This scenario includes actions that are currently much more ambitious in terms of technology change and developing new infrastructure and/or scaling up of technology as well as legislative changes and fiscal policies. It will therefore require significant investments elsewhere before the actions can be realised e.g. CCS, hydrogen roll out, etc. These actions are assumed to be delivered late in the timeframe and very much dependent on other factors. The largest challenges remaining, assuming the Radical Stretch actions are delivered, are residual emissions arising from domestic gas and road transport. Tackling this requires more fundamental change in relation to infrastructure and social-economic factors that require significant action at a national level. The Council's role working with other organisations to push for this action remains an important part of the approach needed but it is recognised that actions in this scenario are highly uncertain.

5.2 Actions included in each scenario and their estimated costs and impacts

Table 7 on the following pages provides a list of the actions that have been quantified and included in the carbon modelling. The Systemic Change scenario estimates that the result of the combination of all quantified actions would result in a reduction of 80% in CO₂e emissions compared to the baseline in 2030/31, and a reduction of 85% from the baseline in 2017/18.

The data tables and graphs in the following pages provide details of the modelled estimates of savings. It should be noted that, while the pattern of emission reductions described provides a useful indication of the results of the actions overall, there have been assumptions made for each action. These include the potential activity change resulting from the action, how this translates into carbon emission reductions and the level of uptake/penetration of the action.

Wherever possible, the project team has drawn on robust and publicly available data sources to support the quantification of the actions. There were some gaps in data available for emissions reductions by actions (in which case the actions have not been included in the model) and also in the estimates of cost of implementing actions. Therefore, expert judgement by the project team and Lewisham council officers has been used for actions where published sources of data were not found, with the exception of some actions in the Systemic scenario for which no cost estimates could be made. Overall the estimates of capital costs, cost savings and carbon impacts should be considered as indicative. **Section 7** of this report further considers emissions sources that have not been included in the modelling.

Table 8 at this end of this section provides estimates of the emissions remaining for each scenario and the related carbon offsetting costs for each. **Table 9** provides a summary of costs and potential revenue savings for each scenario, split between Lewisham Council (for actions that are owned by the Council) and other parties, which would include public sector organisations, private householders and commercial organisations in the Borough. This is followed in **Section 6** by a qualitative assessment of the co benefits resulting from the actions.

Table 7 Actions included in the modelling and associated carbon savings and estimated costs (where available)

Sector	Action Description	Action code	First year savings	Owner of action	Carbon savings (ktCO2e)	Annual Cost Savings (£M)	Capital Cost (£M)
Core action scenario							
Lewisham homes	Insulation package - social homes	H4	2025/26	Lewisham Homes	17	4.7	50
Commercial	Enhance energy efficiency in the commercial & industrial sector Phase 1	C1	2023/24	private sector companies	13	8.8	13
Transport	Cleaning the bus fleet	T6	2021/22	TFL	12	23	35
Other social housing	Insulation package - social homes	H4	2025/26	Social housing providers	12	3.3	34
Lewisham homes	Heating systems upgrade package - social homes	H2.1	2025/26	Lewisham Homes	6.2	2.0	22
Transport	Improve walking and cycling infrastructure	T4	2022/23	TFL / LBL	4.8	4.9	1.5
Transport	Expansion of the ULEZ	T9	2025/26	TFL	4.6	2.7	No data
Other social housing	Heating systems upgrade package - social homes	H2.1	2025/26	Social housing providers	4.2	1.4	15
Transport	Package of workplace travel measures	T1	2025/26	LBL/TFL and companies	4.1	-2.4	4.0
Energy Generation	Convoys Wharf and Neptune Wharf Heat network	EG2	2028/29	LBL / private sector companies	3.2	5.8	7.1
Other Public sector	Enhance energy efficiency of non-council public buildings Phase 1	PS1	2023/24	various public sector orgs	2.6	1.2	2.6
Lewisham homes	Lower cost measures package - social homes	H1.1	2023/24	Lewisham Homes	2.2	0.8	5.2
Other social housing	Lower cost measures package - social homes	H1.1	2023/24	Social housing providers	1.5	0.5	3.6
Transport	All electric council fleet (not including waste fleet)	T13	2026/27	LBL	1.1	0.4	1.2
Schools	Retrofit building management systems (Schools)	CE3s	2025/26	Schools/ LBL	0.7	0.3	2.0
Schools	School travel plans	T11	2022/23	Schools/ LBL	0.7	0.4	0.1
Schools	Insulation and heating upgrades in council schools	CE5s	2027/28	Schools/ LBL	0.6	0.1	25
Lewisham Council	Retrofit building management systems (Corporate estate)	CE3c	2025/26	LBL	0.5	0.2	1.3
Lewisham Council	Insulation and heating upgrades in council buildings (not schools)	CE5c	2027/28	LBL	0.4	0.1	0.6
Transport	Rationalise suppliers of goods & services to the council	T12	2025/26	LBL	0.2	0.1	0.1
Transport	Low carbon council fleet	T2	2021/22	LBL	0.1	0.1	0
Schools	Replace old building lights with LEDs	CE2	2023/24	Schools/ LBL	0.1	0.1	0.6
Energy Generation	Lewisham Gateway Gas CHP Heat Network	EG4	2024/25	LBL / private sector companies	0.1	0.02	0.1

Sector	Action Description	Action code	First year savings	Owner of action	Carbon savings (ktCO2e)	Annual Cost Savings (£M)	Capital Cost (£M)
Lewisham Council	Replace old building lights with LEDs	CE2	2023/24	LBL	0.05	0.1	0.4
Schools	Energy saving awareness raising among council staff	CE8	2023/24	Schools/ LBL	0.02	0.04	0.04
Lewisham Council	Energy saving awareness raising among council staff	CE8	2023/24	LBL	0.02	0.02	0.02
Schools	Installation of renewable heat generation on council buildings	CE7	2026/27	Schools/ LBL	0.01	0.002	0.1
Lewisham Council	Installation of renewable heat generation on council buildings	CE7	2026/27	LBL	0.01	0.002	0.04
Schools	Installation of renewable electricity generation on council buildings	CE6	2026/27	Schools/ LBL	0.002	0.004	0.03
Lewisham Council	Installation of renewable electricity generation on council buildings	CE6	2026/27	LBL	0.002	0.002	0.02
Radical Stretch Scenario							
Private housing	Insulation package - private homes	H4	2026/27	private owners/landlords	40	10.8	113
Transport	Maximise cycling potential	T14	2028/29	TFL	35	20.5	14
Private housing	Heating systems upgrade package -private homes	H2.1	2026/27	private owners/landlords	14	4.6	51
Commercial	Enhance energy efficiency in the commercial & industrial sector Phase 2	C2	2028/29	private sector companies	13	8.8	13
Transport	Improve electric vehicle infrastructure	T3	2021/22	TFL / LBL	10	4.7	0.1
Private housing	Lower cost measures package - private homes	H1.1	2024/25	private owners/landlords	9.9	3.6	24
Private housing	Lower cost measures package (additional) - private homes	H1.1 +	2029/30	private owners/landlords	9.9	3.6	24
Energy Generation	Catford/Lewisham Hospital district heating schemes	EG3.2	2030/31	LBL / private sector companies	7.0	0.7	8.4
Private housing	Heating systems upgrade 'stretch' package - private homes	H3.1	2029/30	private owners/landlords	6.6	1.8	82
Transport	100% electric taxis through taxi licensing	T10	2029/30	TFL	6.5	2.7	32
Lewisham homes	Heating systems upgrade 'stretch' package - social homes	H3.1	2029/30	Lewisham Homes	5.9	1.7	55
Private housing	Insulation 'stretch' package - private homes	H5	2030/31	private owners/landlords	5.6	1.5	64
Other social housing	Heating systems upgrade 'stretch' package - social homes	H3.1	2029/30	Social housing providers	4.1	1.2	38
Private housing	Solar hot water - private	H6.2	2029/30	private owners/landlords	3.2	0.9	40
Other Public sector	Enhance energy efficiency of non-council public buildings Phase 2	PS2	2029/30	various public sector orgs	2.6	1.2	2.6

Sector	Action Description	Action code	First year savings	Owner of action	Carbon savings (ktCO2e)	Annual Cost Savings (£M)	Capital Cost (£M)
Private housing	Solar PV - private	H6.1	2029/30	private owners/landlords	1.5	3.1	87
Energy Generation	Lewisham Homes blocks district heating	EG5	2023/24	LBL	1.2	0.2	1.5
Lewisham homes	Solar hot water - social housing	H6.2	2029/30	Lewisham Homes	1.1	0.3	14
Transport	Electric waste fleet	T13.1	2026/27	LBL	1.0	0.4	1.1
Energy Generation	Deptford / New Cross district heating	EG6	2026/27	LBL / private sector companies	0.9	0.1	1.1
Other social housing	Solar hot water - social housing	H6.2	2029/30	Social housing providers	0.8	0.2	9.7
Schools	Further installation of renewable heat generation on council buildings	CE10	2029/30	Schools/ LBL	0.6	0.1	3.5
Lewisham homes	Solar PV - social housing	H6.1	2029/30	Lewisham Homes	0.5	1.1	30
Schools	Schools REFIT funded further insulation and heating upgrades	CE11	2029/30	Schools/ LBL	0.5	0.1	27
Lewisham Council	Further installation of renewable heat generation on council buildings	CE10	2029/30	Schools/ LBL	0.4	0.1	2.3
Other social housing	Solar PV - social housing	H6.1	2029/30	Social housing providers	0.4	0.7	21
Lewisham Council	Coporate estate further Insulation and heating upgrades	CE13	2029/30	LBL	0.3	0.1	0.5
Energy Generation	Hither Green district heating scheme	EG3.1	2030/31	LBL / private sector companies	0.3	0.05	0.3
Lewisham homes	Insulation 'stretch' package - social homes	H5	2029/30	Lewisham Homes	0.3	0.1	19
Other social housing	Insulation 'stretch' package - social homes	H5	2029/30	Social housing providers	0.2	0.05	13
Lewisham Council	Replace old street lights with LEDs	CE1	2021/22	LBL	0.2	0.3	6.1
Schools	Further installation of renewable electricity generation on council buildings	CE9	2029/30	Schools/ LBL	0.2	0.2	1.8
Lewisham Council	Further installation of renewable electricity generation on council buildings	CE9	2029/30	LBL	0.1	0.2	1.2
Energy Generation	Bond House / Goodwood Road district heating	EG7	2030/31	LBL / private sector companies	0.1	0.2	0.2
Energy Generation	Community energy developments	EG1	2025/26	LBL / private sector companies	0.1	0.1	1.0

Sector	Action Description	Action code	First year savings	Owner of action	Carbon savings (ktCO2e)	Annual Cost Savings (£M)	Capital Cost (£M)
Systemic Change Scenario							
Private housing	Other methods to reduce domestic gas use e.g. biogas, hydrogen, replacement with heat pumps	H7	2030/31	private owners/landlords	55	15.0	No data
Transport	Other methods to reduce road transport emissions, including further electrification of private vehicles and significant investment in public transport infrastructure.	T15	2030/31	LBL / private individuals & companies	45	13.7	No data
Private housing	Insulation additional 'stretch' package - private homes	H5 +	2029/30	private owners/landlords	35	9.6	138
Private housing	Heating systems upgrade additional 'stretch' package - private homes	H3.1 +	2029/30	private owners/landlords	34	10.7	221
Commercial	Other methods to reduce non-domestic gas use e.g. biogas, hydrogen, replacement with heat pumps	C3	2030/31	private sector companies	19	4.0	No data
Schools	Full school retrofit across the entire schools' estate	CE12	2030/31	Schools/ LBL	4.6	1.0	117
Lewisham homes	Insulation additional 'stretch' package - social homes	H5 +	2029/30	Lewisham Homes	4.4	1.2	17
Lewisham Council	Catford regeneration resulting in Carbon neutral council office space	CE14	2030/31	LBL	3.0	0.6	50
Other social housing	Insulation additional 'stretch' package - social homes	H5 +	2029/30	Social housing providers	3.0	0.8	12
Lewisham homes	Heating systems upgrade additional 'stretch' package - social homes	H3.1 +	2029/30	Lewisham Homes	3.0	0.9	19
Other social housing	Heating systems upgrade additional 'stretch' package - social homes	H3.1 +	2029/30	Social housing providers	2.1	0.6	13
Energy Generation	Arklow Rd, Marine/Cannon/Deptford Wharves & Yeoman Str district heating	EG9	2030/31	LBL / private sector companies	1.3	2.5	3.0
Energy Generation	Grinling Gibbons and Deptford Green schools district heating	EG8	2030/31	LBL / private sector companies	0.1	0.01	0.2

Figure 7 Summary of the emission reduction scenarios

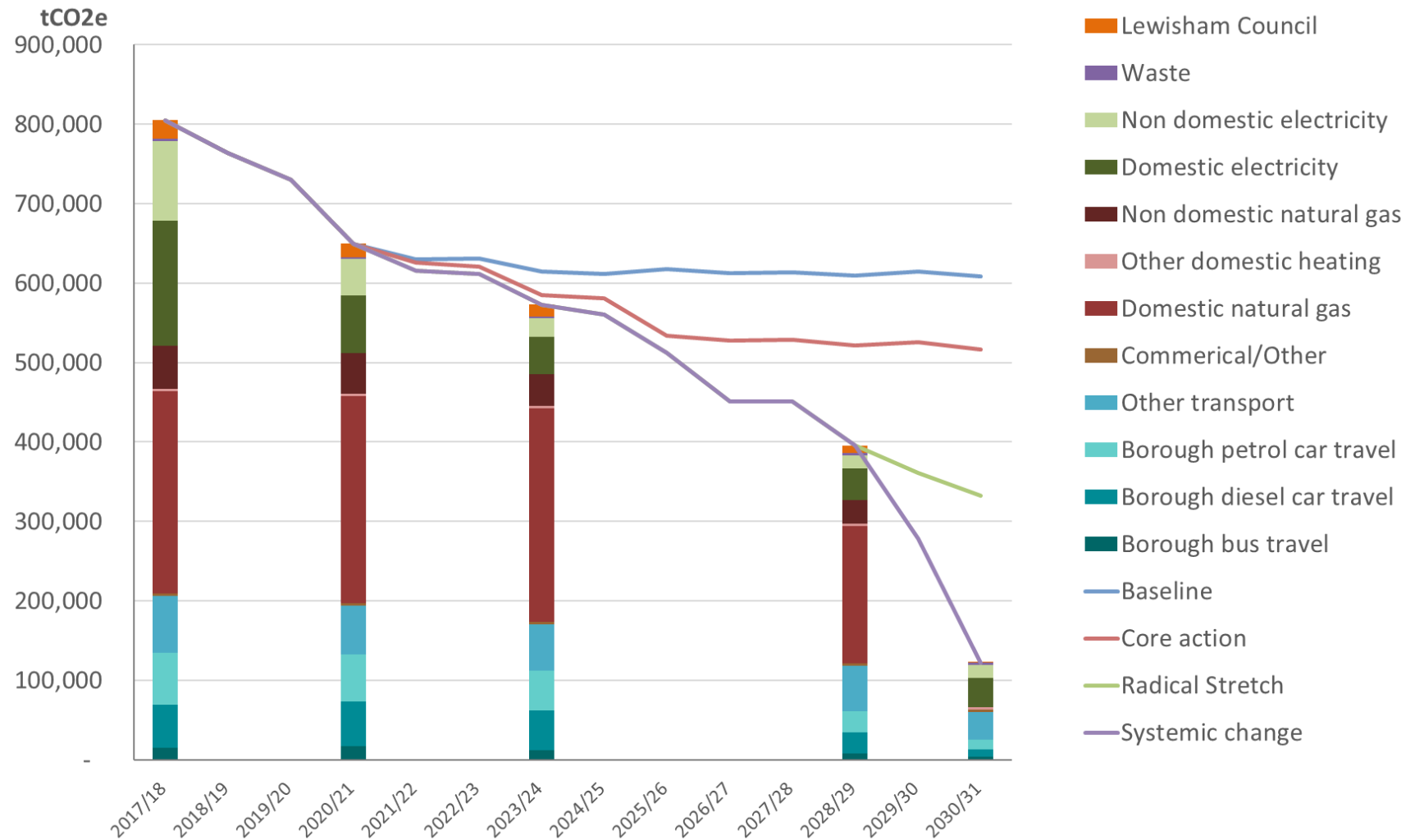


Figure 8 Relative contributions of emissions from different sectors 2017/18 and 2030/31

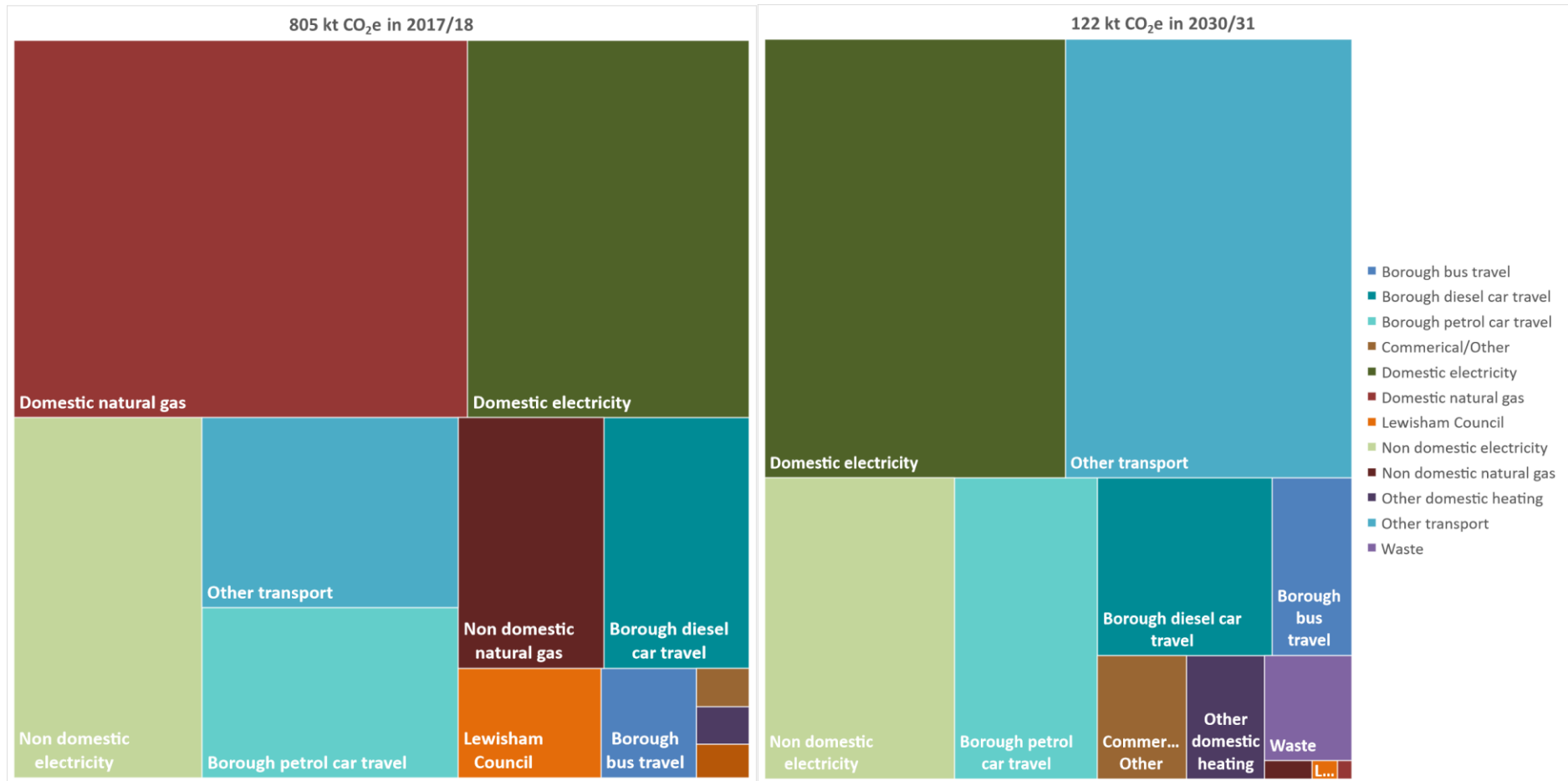
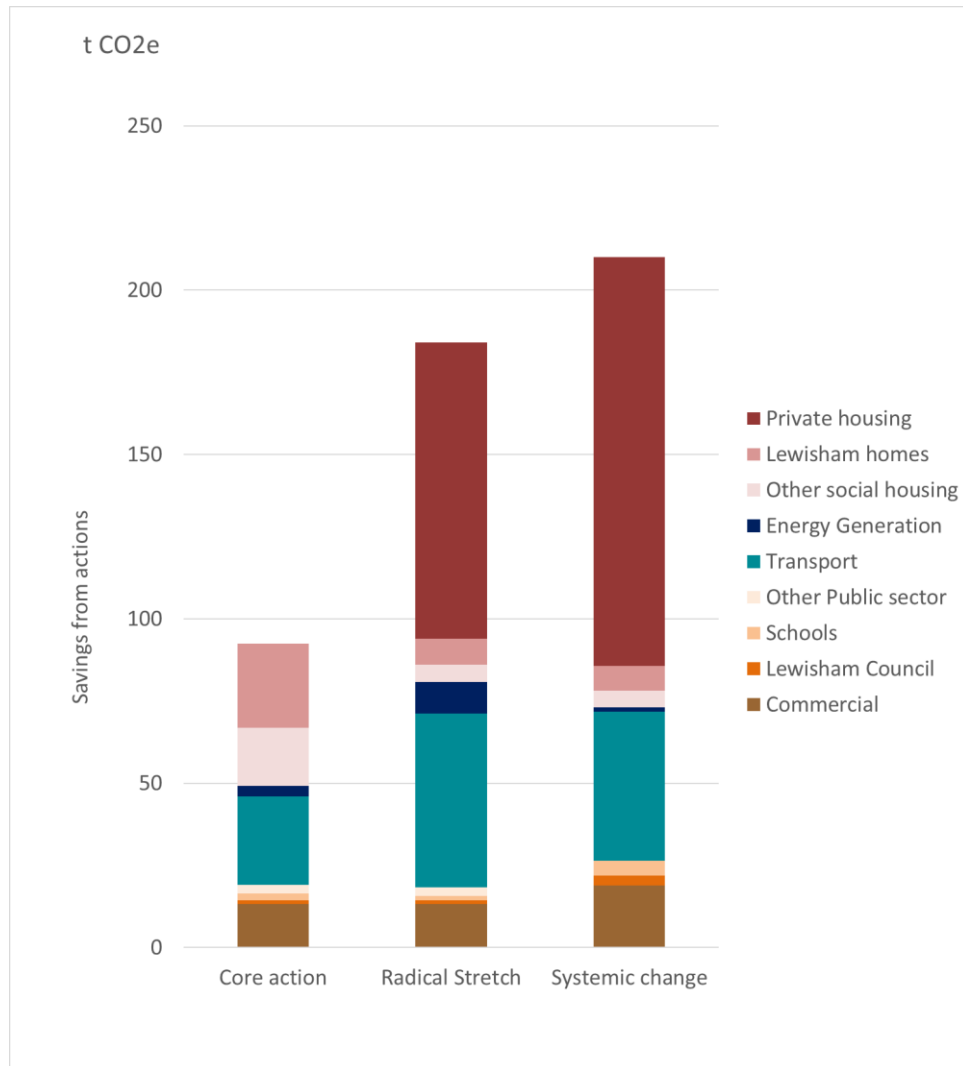


Figure 9 provides a summary of the estimated predicted savings resulting from the actions in the main sectors, showing their relative contributions to the emissions reductions predicted for 2030/31 compared to the baseline.

Figure 9 Estimates emissions reductions from of actions by sector and scenario in 2030/31



5.3 Total savings estimated

Table 8 below presents the overall predicted impacts of the four scenarios and also the estimated cost for offsetting carbon in each case to reach carbon neutral, assuming £40 per tonne in 2019/20¹⁷ and assumed to increase by 5% per year across the timeseries. **Table 9** provides a summary of costs and revenue savings for Lewisham Council and other stakeholders.

¹⁷ http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2019/05/GRI_POLICY-REPORT_How-to-price-carbon-to-reach-net-zero-emissions-in-the-UK.pdf

Table 8: Estimates of remaining emissions in 2030/31, including estimated offsetting cost

Scenario	Emission reduction from Baseline 2030/31		Borough wide		Lewisham Council	
	tCO2	% reduction	Remaining emissions (tCO2)	Cost of carbon offset (£M)	Remaining emissions (tCO2)	Cost of carbon offset (£M)
Core Actions	92,505	15%	505,365	34.6	11,054	0.76
Radical stretch	276,663	45%	324,578	22.2	7,683	0.53
Systemic change	486,665	80%	122,129	8.4	129	0.01

Table 9: Estimates of the costs of actions and their related revenue savings

Scenario / Sector	Capital Cost (£M)	Revenue Savings (£M) 2030/31
Core action	226	59
Lewisham Council	2.4	0.4
Lewisham homes	77	7.6
Other social housing	53	5.2
Schools	28	1.0
Other Public sector	2.6	1.2
Transport	42	29
Commercial	13	8.8
Energy Generation	7.2	5.8
Radical Stretch	803	76
Lewisham Council	10	0.6
Lewisham homes	119	3.2
Other social housing	82	2.2
Schools	32	0.5
Other Public sector	2.6	1.2
Private housing	484	30
Transport	47	28
Commercial	13	8.8
Energy Generation	12	1.4
Systemic change	591	61
Lewisham Council	50	0.6
Lewisham homes	37	2.1
Other social housing	25	1.5
Schools	117	1.0
Private housing	359	35
Transport	NO DATA	14
Commercial	NO DATA	4.0
Energy Generation	3.2	2.5
Grand Total	1619	196

6 Co-benefits of actions to reduce carbon emissions

Actions aimed at reducing GHG emissions can have both positive and negative impacts on other policy areas. In general, the principal negative impact of GHG emission reduction actions occurs where fuels are switched rather than removed, i.e. the movement away from petrol vehicles to diesel power or switching heating to biomass. Such actions can negatively impact air quality. However, as none of the measures described in this study involve fuel switching of this type, potential negative impacts are minimised.

The positive impacts of GHG reduction measures, also known as co-benefits, can be significant. It is important to identify these co-benefits because often using reasons for implementation other than to reduce carbon, such as more direct economic or health benefits, can help towards decisions to take positive action on reducing GHG emissions. While all co-benefits have not been assessed in detail for this study, there is a mature and expanding literature which can be drawn on to provide a qualitative assessment of the co-benefits of the actions in the scenarios described in this report¹⁸.

Important co-benefits include:

Improvements to health and wellbeing as a result of improved air quality (through reduced use of combustion engine vehicles and gas heating) and safer streets, increased activity from people walking or cycling more, reduced fuel poverty from more energy efficient homes and healthier (less carbon intensive) diets. For example:

- It is estimated that for every £1 spent on fuel poverty prevention (for example through energy efficiency retrofit programmes) there is a 42p saving in NHS health costs
- If the average dietary intake in the UK complied with the recommendations of the World Health Organisation, a reduction in greenhouse gas emissions of 17% could be achieved whilst increasing average life expectancy by over 8 months.

Improved equity and social cohesion through focusing on the most vulnerable in society, such as action to alleviate fuel poverty or create access to green spaces.

- 10.9% of Lewisham households are in fuel poverty and there were 140 excess winters deaths in the borough during the winter of 2017-18. Energy efficiency retrofit programmes will reduce these figures.
- In general, people living in the most deprived urban areas are more exposed to poor air quality than those in less deprived areas. Action to reduce air pollution will improve air quality for these groups.

Economic benefits through reduced expenditure on energy (for both households and businesses) as well as the creation of a wealth of economic opportunities and jobs in the low carbon economy. For example:

¹⁸ For example, this Aether led study for Scottish Government:

<https://www.gov.scot/publications/evidence-review-potential-wider-impacts-climate-change-mitigation-options-built/>

- Analysis for the Committee on Climate Change estimated that the low carbon economy has the potential to grow 11% per year between 2015 and 2030 – four times faster than the rest of the economy.
- It has been estimated that over 7,000 jobs could be created in the energy efficiency retrofit sector in London as a result of a pilot programme that is currently underway¹⁹.

Increased resilience of cities and their communities to future changes in energy prices and energy systems, as well as a potential increase in the resilience of communities and infrastructure to the impacts of climate change. For example:

- The costs to councils of climate impacts (such as flooding) are likely to grow. Increasing green infrastructure will help reduce flood risk.
- Average domestic fuel bills have more than doubled in the last ten years in real terms, pushing large numbers of households into fuel poverty. Energy efficiency retrofit programmes will help make households resilient to future price rises.

Table 10, below, shows a qualitative assessment of some of the measures included in this study. It shows that the co-benefits are substantial and wide ranging and demonstrates that action to reduce GHG emissions can progress, in a significant way, other environmental, social and economic improvements.

¹⁹ Ashden (2019) 31 climate actions that councils can take and their co-benefits, <https://www.ashden.org/programmes/co-benefits>

Table 10 Qualitative assessment of co-benefits from actions in this study

Measures	Health	Economy	Equity/Social Cohesion	Resilience
Housing – H1-H6 Retrofit energy efficiency and renewable energy measures	Reduced fuel poverty (particularly in social housing)	Savings on fuel bills; plus lots of employment from the retrofitting work	Ensures social housing tenants have access to efficient homes	Protection from future fossil fuel price increases
Road transport – T1 Workplace travel measures	Improved air quality	Reduced congestion; potential cost savings for employees	Could raise funds to invest in public transport; helps those without access to a car; increased social contact through lift sharing	Protection from future fossil fuel price increases
Road transport – T4 Improve walking and cycling infrastructure & T14 Maximise cycling potential	Improved air quality; safer streets; increase in active travel	Reduced congestion and improved air quality create a more attractive place to do business	Helps those who can't afford a car; safer roads for all	Protection from future fossil fuel price increases
Road transport – T9 ULEZ across whole borough	Improved air quality	Reduced congestion and improved air quality create a more attractive place to do business	Reduced congestion/improved air quality for all	
Road transport – T11 School travel plans	Improved air quality; increase in active travel by school children; safer streets		Improved air quality for all; safer roads for school children	Educating the next generation about low carbon, low cost options for travel
Green space – G1 Development and delivery of Green and Blue Infrastructure Strategy	Improved air quality; increased wellbeing	More attractive place to do business	Brings greenery to all parts of the city	Reduces flooding
Other – O1 Healthier school meals	Encourages healthier eating and reduced obesity		Brings healthier eating options to all	

7 Other emissions sources not currently quantified

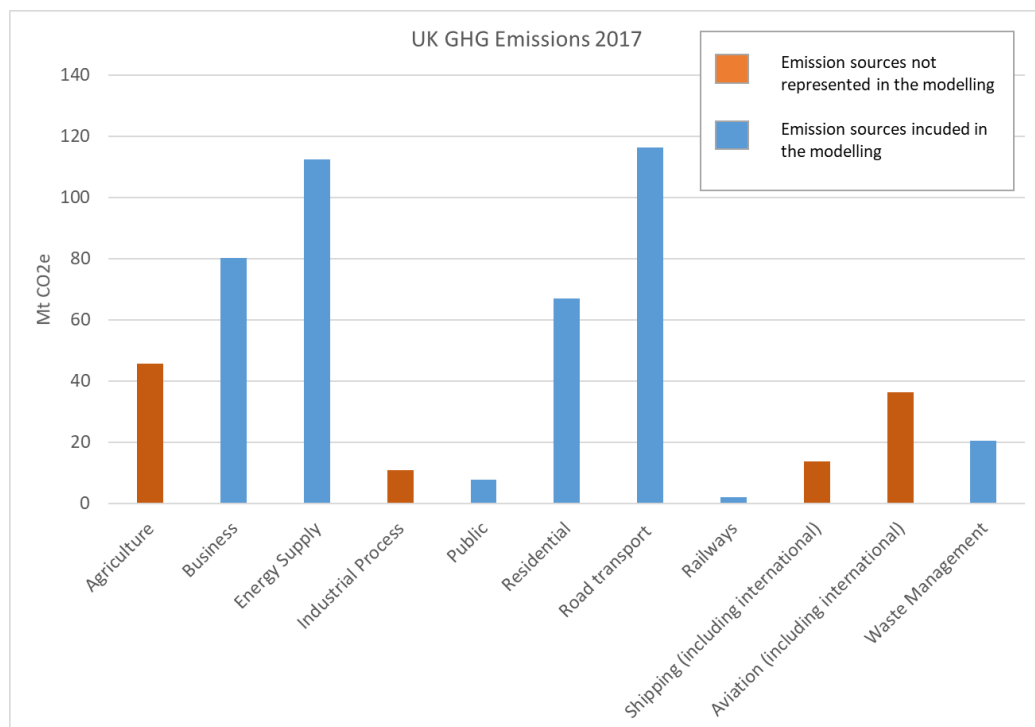
7.1 Size and importance of non-quantified sectors

One of the difficulties in using numerical modelling to support policy development is that there are some emissions sources or types of action which do not lend themselves to quantification. Modelling is limited by the availability of useful data, but the production of final output results can mask the fact that not all sources or actions can be considered. This is very much the case in carbon accounting, especially when accounting for complex systems, such as in a city borough.

The modelling described in this report has been limited to activities which generate emissions directly within the Borough of Lewisham plus emissions associated with the generation of electricity used within Lewisham. This therefore excludes emissions produced during the production and transport of goods (food and other products) and services purchased and used in Lewisham. It also excludes travelling outside Lewisham such as flights).

However, the emissions from to these excluded sources are important and still need to be considered in plans to reduce emissions in Lewisham. The relative importance of the emissions can be indicated by considering their sectoral contribution to UK total greenhouse gas inventory.²⁰ **Figure 10** below shows UK total emissions for sectors which have not been included in the modelling, in orange, alongside those sectors that are in some way included. The total of the emission sources not represented in the modelling is 21% of the UK emissions.

Figure 10: UK Total Greenhouse Gas Emissions (excluding land use change) showing sources that are represented and those not included in the Lewisham modelling



²⁰ https://naei.beis.gov.uk/resources/PivotTableViewer_2019_GHG_WebVersion.xlsx

7.2 Key non-quantified sectors and actions that can be considered to reduce them

7.2.1 Manufacture of goods

The most important sector not quantified in the modelling relates to the manufacture and use of food, other goods and services. This clearly covers a huge range of activities, from everything bought by residents, organisations and companies in Lewisham and all of the services procured by them from companies operating outside the borough, e.g. office cleaning and other “outsourced” services. This sector also includes some of the most difficult carbon emission sources to address, such as aviation and agriculture (through production and transport of food).

The Committee on Climate Change identified agriculture and aviation specifically as “hard-to-treat” sectors in its 2019 report *Net Zero: The UK’s contribution to stopping global warming*. GHG emissions from transport more generally and from agriculture have been relatively stable over recent years and have not matched the progress made in, for example, power generation, where decarbonisation have been far more apparent. Neither food production (agriculture) nor aviation are part of the direct emission profile for the Lewisham area. However, the purchasing choices made by individuals, companies and organisations in the borough – the type of diet or mode of travel chosen – all impact on the scope 3 emissions which can be attributed to it.

While, in theory, these emissions could be accounted for, in practice the data are either not available or the output is so uncertain and unresponsive to activity change that it becomes actively unhelpful. Nevertheless, there is a range of actions which organisations, companies and individuals can undertake in order to reduce the climate change impact of purchased goods and services:

- **Consider personal purchasing habits:** among other things, the Committee on Climate Change recommends that people should “minimise flying, especially long-haul, where possible”, and “eat a healthy diet, for example with less beef, lamb and dairy²¹”.
- **Choose “low carbon” or environmentally friendly products.** While this is not a guarantee that carbon emissions will be lower than for the standard product, at the very least it demonstrates demand for such products and provides a market signal that low carbon is an important consideration in purchasing decisions.
- **Reduce product use.** Emissions based on products purchase can clearly be reduced by purchasing fewer products. While this may appear obvious, some caution needs to be applied. For example, extending the use of a product, such as a boiler or piece of IT equipment could mean that its replacement with a more energy efficient version is delayed, thus increasing direct emissions or electricity purchased. Nevertheless, making better use of products will, in general, reduce emissions overall.
- **Gather data on purchased services.** One of the issues in accounting for purchased services is the lack of data, which contractors may regard as being commercially sensitive. However, individual contracting organisations and companies can, as part of their contract, require that carbon emission data is

²¹ A recent article in The Economist cited research which showed that “Going vegan for two-thirds of meals could cut food-related carbon emissions by 60%”: <https://www.economist.com/graphic-detail/2019/11/15/how-much-would-giving-up-meat-help-the-environment?>

provided as part of the contract deliverable, data which they can then incorporate into their own carbon foot-printing.

- **Change procurement practice.** A key point of decision for most larger organisations in terms of the environmental impact of their purchases is the way in which they describe the products or services they require, e.g. in a tender specification. The requirement for low carbon/low emission product and for service providers to have clear environmental policies and, preferably, to operate a zero-carbon accounting process could be written in as a standard part of the specification. Not only will this make data gathering easier, it will also provide a clear signal of demand for such products and services.

7.2.2 Distribution of goods

Upstream transport means the way in which products, components, etc are transported before they are received by the organisation or individual concerned. Downstream transport is the way in which products or manufactured goods are delivered to customers. As the modelling included in this study considers all transport in Lewisham, some of these emissions will already be captured. For Lewisham, it is likely that upstream transport emissions are larger than downstream (in general, cities tend to consume more than they produce). While it is possible for individual organisations or companies to account for their upstream emissions, doing so for the whole borough is a task far beyond the scope of this project, even if the data were available. However, there are actions which can be taken to reduce the climate impact of upstream and downstream transport:

- **Rationalise purchasing.** Small item purchasing has been made far easier through online purchasing. This will tend to increase the frequency of deliveries, and delivery journeys, as items are purchased as and when needed. The number of delivery journeys could be reduced through rationalised purchasing whereby the number of product providers is reduced and/or the frequency of ordering is reduced to group orders. This will reduce the convenience of purchasing but could also pay dividends in terms of reduced delivery costs.
- **Choose low carbon transport options.** Delivery and logistics providers now have a range of low carbon options available, from consolidated delivery to low emission vehicles. By specifying a preference for low carbon options, organisations and companies provide a clear market signal that there is a demand for such services and will help drive their expansion and availability.
- **Buy local.** Clearly, one way to reduce transport emissions is to reduce the length of the journeys required for delivery, etc. Once again though, this is not always a straightforward decision – full life cycle analysis may mean that purchasing low carbon products produced further way will result in lower overall emissions than higher carbon version produced locally. However, the length of journey should be factored into purchasing decisions.

7.2.3 Commuting from outside Lewisham

Employee commuting is both a significant part of an organisation’s footprint and of the overall traffic load in Lewisham. Home working is an increasing trend and should, ideally, form part of the organisation’s carbon accounts. For people who both live and work in Lewisham, commuting and home energy use will be accounted for under the general categories (transport, gas use, electricity use) in the model. Emissions that arise outside

the borough, as a result of commuting from other parts of the London and the wider country, and for home workers based outside the borough, companies can undertake their own accounting processes, making the data available as appropriate, and use tools such as green travel plans to help reduce the impact.

7.2.4 Off-road emissions

Emissions from construction and associated activities are a significant part of the total emissions for London, where construction activity is at a relatively high level in national terms. However, individual sites are short lived in the context of a trajectory to 2030 and beyond and so accurately accounting for the GHG impact of construction is problematic and projecting this forward into the future even more so. It may be that better data will become available to allow off-road emissions to be considered within the model but there are nevertheless actions which could be undertaken to reduce the GHG emissions from construction, including:

- Re-using materials on site to reduce transport emissions
- Specifying the use of late model/high emission standard construction machinery and vehicles
- Avoiding the use of diesel fired generators

7.2.5 Urban tree planting

Tree planting schemes can be used as a means of providing “negative emissions” to offset calculated GHG emissions. Such schemes are likely to form part of the UK’s national programme to achieve carbon neutrality by 2050 as they are for many other countries.

The land area required to make a significant impact on Lewisham’s emissions would be considerable: 1 hectare of trees is estimated to contain around 430 tonnes of carbon²². Moreover, the trees would need to remain for a considerable amount of time in order to be effective and, in an urban landscape, this will be extremely difficult to guarantee. Lewisham has 520 hectares of natural green space²³. If a quarter of this space were converted into new woodland, which is more than is likely to be feasible, that would result in a carbon capture of 56kt CO₂ over 20 years, representing only 2% of the remaining emissions in the Systemic Change scenario in 2030/31.

This shows that while trees are important in an urban context because they have a number of beneficial impacts beyond the sequestration of carbon, they cannot provide a significant solution as a means of carbon offsetting. However, their omission from the modelling used to support this study should not discourage the expansion of current tree planting in the borough.

²² Broadleaf trees in a temperate climate at 20 years old. Estimated using IPCC methodology (Vol 4, Ch. 4): <https://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html>

²³ <https://lewisham.gov.uk/-/media/files/imported/openspacestrategy2012.ashx>

8 Local authority good practice

In recent months, many local authorities across the UK have been galvanised to declare a climate emergency, including 27 other London local authorities²⁴ and the GLA. However, with local authorities at a relatively early stage of formulating their implementation plans, and with a range of different approaches being taken, there is no established approach and the overall picture is developing at a fast pace. The Climate Emergency campaign has resulted in over 100 declarations being made by local authorities in the UK. To the best of our knowledge, very few specific action plans have been published to date on achieving council commitments made through these declarations.²⁵

In order to enable Lewisham to benchmark itself against approaches being taken by other councils, we have undertaken a review of a sample of council Climate Emergency declarations to understand what approaches other councils might be likely to take and how they are approaching and defining carbon neutrality. A summary of findings is set out in **Table 11**. The table highlights that, based on councils' initial declarations, a variety of approaches to achieving carbon neutrality are being taken. For some (e.g. Cambridge, Hounslow, Lambeth and Oxfordshire), the focus appears to be on achieving carbon neutrality within council operations rather than the area as a whole. In Wales, the Welsh Government has set a net zero carbon target for the public sector as a whole, with the boundary set relatively wide in terms of operations and scope.

Like Lewisham, other councils have an explicit focus on area-wide carbon neutrality, including 13 Boroughs in London with a 2030 target for Borough emissions. Target dates for achieving carbon neutrality do differ widely across the UK. Authorities are reviewing carbon budgets, convening citizens panels and undertaking additional analysis to develop pathways to net zero emissions area-wide by 2030.

The London Borough of Haringey says explicitly that their target will include consumption and production emissions and others, including East Cambridgeshire, are reviewing the authority's own emissions on the basis of consumption and production. Lewisham has also said that they would like to include this. In practice, it is likely that councils will have different approaches in terms of what scopes they include.

In 2016 Manchester City Council committed to become a zero-carbon city. In 2018, the City Council adopted the "Playing Our Full Part" recommendations, with an identified set of carbon budgets and 13% per year carbon reductions, leading to zero carbon by 2038. The Manchester zero carbon framework 2020-2038 and actions from 2020-2022 will be adopted early in 2020. The Tyndall Centre and Friends of the Earth Manchester have been appointed to independently monitor progress. An emissions inventory covering scope 1 and scope 2 emissions has been produced to underpin the carbon reduction trajectories.

Also, in 2019, the Leeds Climate Commission developed a roadmap to 2050. While this demonstrated that a pathway to zero carbon by 2050 was possible, it also showed that a combination of all of the readily available emissions reductions technologies and approaches would not deliver the emissions reductions necessary. The roadmap

²⁴ https://www.campaigncc.org/councils_climate_emergency

²⁵ For example Bristol City Council published an initial action plan on 16 July but this is being developed further: <https://democracy.bristol.gov.uk/documents/s34127/Climate%20Emergency%20-%20The%20Mayors%20Response.pdf>

therefore looked at a series of “innovative actions”, including switching the heating network to decarbonised hydrogen, working with the largest energy consumers to deliver significant improvements, deep retrofit of domestic and public/commercial buildings and ensuring that all new buildings are carbon neutral, accelerated roll out of district heating and electric vehicles and behavioural measures including promoting ambitious levels of walking and cycling.

In summer 2019, the London Borough of Camden worked with a citizens’ assembly of 50 randomly selected residents to agree and prioritise a set of actions towards carbon neutrality that were presented to them over a multi-day Assembly. The prioritised list of 17 actions has been adopted by full council during October 2019. Other UK local authorities that have declared climate emergencies are also developing or undertaking similar co-creation exercises.

Within Europe, the French national government has declared a climate emergency and is preparing for a national level citizens assembly (an announcement on a similar exercise in the UK was made in early November). In Germany, many local authorities have declared a climate emergency, but to date, the focus has been on aligning internal governance and decision-making processes to allow all council decisions to be filtered through a set of climate related criteria.

What is clear is that a growing number of UK local authorities are declaring emergencies and building partnerships, amending governance arrangements and undertaking pathway analysis and carbon budget reviews. Within that context, Lewisham’s intended definition and approach is likely to be one of the more ambitious in the UK, with challenging targets adopted, both in terms of quantification and modelling potential scenarios, as well as identifying and delivering implementation plans.

Table 11 Examples of council Climate Emergency commitments

Authority	Commitments									
	Operations			Area-wide					National lobbying	
	Carbon neutral operations by 2030	Carbon neutral operations 'asap'	Reduce emissions from operations	Carbon neutral area 'asap'	Carbon neutral area by 2028	Carbon neutral area by 2030	Explicit commitment to reducing consumption & production	Area leadership & coordination activity	Call for more national action	Call to Westminster for more powers
Cambridge		✓	✓					✓	✓	✓
Haringey						✓	✓			✓
Hounslow		✓								✓
Islington						✓		✓	✓	✓
Lambeth	✓							✓		
Lewisham						✓		✓		✓
Nottingham					✓					
Norwich				✓						✓
Oxfordshire	✓							✓		
Plymouth						✓				✓
Leeds			✓			✓		✓	✓	✓
St Albans	✓					✓		✓	✓	✓
Richmond upon Thames			✓			✓				✓
Carlisle	✓					✓		✓		✓
East Cambridgeshire	✓					✓	✓	✓		

9 Summary and recommendations

9.1 Lewisham's baseline and scenarios

Lewisham Council's aim of achieving a carbon neutral borough by 2030 is ambitious and extremely challenging. The major sectors and sources responsible for GHG emissions in Lewisham are outside the Council's control and will require significant investment by private businesses and residents who will need strong incentives to achieve this. It will also require a greatly accelerated rate of decarbonisation in the generation of electricity at a national level and the road transport sector at a (mainly) regional level. This challenge is increased by the lack of "negative emission" opportunities in Lewisham, such as through land use change, something which is available at a national scale. Hence achieving net zero carbon emissions in Lewisham equates to removing emission sources as far as possible and making use of some form of carbon offsetting to net off any remaining emissions.

9.1.1 Future emission estimates

The baseline projection developed in this study shows that, without any action by the Council or stakeholders in the borough, carbon emissions for Lewisham are estimated to reduce from 805kt CO₂e in 2017/18 to 609kt CO₂e in 2030/31. In this scenario, the single largest sector in 2030/31 will be domestic natural gas, which is predicted to be responsible for 46% of total emissions. The next largest sector will be car travel, responsible for almost 20% of emissions (diesel and petrol combined). In 2017/18, Lewisham Council's own emissions will account for around 2% of the total emissions for the borough.

A comprehensive review of the actions currently proposed for Lewisham and similar areas in the UK has produced the Core actions, Radical Stretch and Systemic Change scenarios. To an extent, the Core actions reflect a continuation and acceleration of previous efforts to reduce emissions in the Borough in that, while they will require a great deal of effort, commitment and investment, they are not a radical departure from the way in which the borough currently operates. In contrast, the Systemic Change scenario indicates what could be achieved through a far more radical programme, virtually eradicating domestic natural gas use and rapid electrification of the current road vehicles in Lewisham.

The means of achieving these reductions is not fully specified. A significant number of assumptions have been made in the development of the scenarios and Lewisham Council will need to undertake further work to fully scope out the actions. The Systemic Change scenario would need to include wholesale replacement of gas space and water heating in almost all domestic properties in Lewisham, with conventional electric heating or air source heat pumps. This could also include still more radical measures such as the replacement of the natural gas network with one based on sustainable produced hydrogen. In terms of the road vehicles, full decarbonisation is envisaged nationally for 2050. Achieving 50% by 2030 would represent a very great acceleration, requiring the active replacement of privately owned conventionally fuelled vehicles with electric/hybrid options far in advance of the "natural" turnover rate.

Under the Systemic Change scenario, it is estimated that emissions in the borough would be reduced to 122kt CO₂e, a reduction of 80% from the baseline. While this still is somewhat short of net zero, it would represent a considerable achievement and a very

great acceleration in the process of decarbonising the UK economy. Such a reduction will require changes to be made across the UK economy and by individuals in their daily lives. It would require extensive local capital investment but also bring with it significant co-benefits, including revenue cost reduction.

In the Systemic Change scenario, grid electricity and the remaining conventionally fuelled road fleet are significant contributors to the remaining 122kt CO₂e. Addressing these remaining emissions will require national action, eliminating any fossil fuel powered electricity generation (including modern combined cycle gas turbines) unless fitted with carbon capture and storage, and for the regional road fleet to also be converted to electrical power. While both of these are envisaged by the Committee on Climate Change for the UK, the current trajectory is to achieve them by 2050.

This overall assessment is in line with work available from other areas of the country. Other UK local authorities have also set out plans to reach carbon neutrality following on from declarations of climate emergency. Work for Leeds in particular has shown that acceleration of economically and technically viable emissions reduction technology options alone will not be sufficient to reach neutrality goals. A set of Innovative measures is proposed within their report. The Leeds Carbon Roadmap acknowledges that *“Adopting these innovative options could require policy support from national government as well as new capacities, significant investment and wide-spread buy-in across the city”*.

9.1.2 Costs and benefits

An attempt has been made to quantify the investment costs required for the actions in the scenarios. There were some gaps in data available therefore, expert judgement by the project team and Lewisham council officers has been used for actions where published sources of data were not found, with the exception of some actions in the Systemic scenario for which no estimates could be made. Overall the estimates of capital costs, cost savings and carbon impacts should be considered as indicative and more work is needed to provide a robust cost estimate for each of the actions described.

Despite these limitations, a capital cost of more than £1,600 Million has been estimated for the implementation of actions up to and including the Systemic Change scenario. This is likely to be a significant underestimate. Of the above costs estimated, £63 Million are estimated to fall directly to the Council, £177 Million to schools, £233 Million to Lewisham Homes and an additional £160 Million to other social housing. There also needs to be significant and sustained action by a range of other stakeholders, such as private homeowners and small businesses in the borough, particularly in the Systemic Change scenario, which is why the costs of this scenario fall predominantly outside the Council. Lobbying and partnership work by the Council is an important way in which Lewisham Council can take action.

Offsetting the remaining emissions in the Systemic action scenario in 2030/31 has been estimated to cost roughly £8.4 Million in 2030/31, based on the purchase of carbon offset credits.

Set against these investment costs, there will be a benefit in terms of lower energy costs for the people and businesses of Lewisham. Under the Speculative Action scenario, this amounts for a saving of £196 million per year by 2030/31. Of these savings, 9% will fall to the Council or the residents of Lewisham Homes.

There will also be considerable co-benefits accrued as a result of taking radical action to reduce GHG emissions in Lewisham. These include:

- **Improvements to health and wellbeing** as a result of improved air quality and safer streets, increased activity from people walking or cycling more, reduced fuel poverty from more energy efficient homes and healthier diets
- **Improved equity and social cohesion** through focusing on the most vulnerable in society, such as action to alleviate fuel poverty or create access to green spaces
- **Economic benefits** through reduced expenditure on energy as well as the creation of a wealth of economic opportunities and jobs
- **Increased resilience of cities and their communities** to future changes in energy prices and energy systems, as well as a potential increase in the resilience of communities and infrastructure to the impacts of climate change

These co-benefits have not been quantified or monetised. However, the Committee on Climate Change’s report *Net Zero: The UK’s contribution to stopping global warming* suggests that the fully monetised co-benefits associated with achieving net zero emissions on a national basis would “*partially or possibly even fully offset the [estimated] resource costs*”.

9.2 Recommendations for further action

As a result of this study, the following recommendations are offered. They are aimed at Lewisham Council and fall into three areas: internal processes, action by Lewisham Council, and lobbying and engagement work.

9.2.1 Internal processes and data collection

It is important, both in terms of planning additional action and tracking progress towards the carbon neutral target, that more and better quality data are gathered and stored in a coherent way. This needs to be proportionate, so that data gathering doesn’t become a burdensome task in itself, but is essential to making effective and properly directed decisions.

- Lewisham Council should establish a comprehensive and coherent system for data collection and management, preferably making this publicly available. This will enable the updating of the data used in this study, an extension to the list of actions proposed, tracking actions as they are implemented, and progress towards the final target. Better, more available data will greatly assist in stakeholder confidence and engagement.
- As part of the data collection and storage system, Lewisham Council should focus efforts on the collection of data to allow the estimation of costs, and on activity data around purchasing and procurement, and off-road emissions.
- An indication of areas with higher than average energy use, and therefore places for initial focus for reductions, can be found by considering variations of energy intensity by analysing the MSOA level data published by BEIS.²⁶
- It is also a priority to collect data on actions being undertaken, committed to and planned by other organisations and companies operating in the borough.
- Lewisham Council will need to undertake a significant amount of stakeholder engagement, to secure both the commitment of others in the borough to take

²⁶ <https://www.gov.uk/government/collections/sub-national-gas-consumption-data#lsoa/msoa-data>

action and to obtain data on what those actions are and what they are likely to achieve. It is suggested that a joint governance structure is set up to help facilitate this.

9.2.2 Lewisham Borough Council's direct actions

In terms of its own actions, Lewisham Council will need to be both ambitious and demonstrative, fully taking up its leadership role within the borough. This will include significant budget allocation to, and the identification of other funding sources for, decarbonisation schemes.

Action by the Council should prioritise its own estate (2% of the borough's locally measurable emissions), social housing and low carbon procurement, with a particular focus on reducing domestic gas use.

Further work should be undertaken to explore and, where possible, quantify the co-benefits arising from the measures undertaken and planned.

The Council should use the full range of powers at its disposal to both help drive change and demonstrate leadership in GHG emission reduction. These will include land use planning powers (for new build and renovation standards), building control, the promotion of low carbon development, the facilitation of opportunities for renewable energy and further new technologies, and enforcement in the private rented sector²⁷. For example, the council has significant influence over the implementation of identified climate actions within Lewisham Homes. Lewisham homes are 16 % of the total number of households in Lewisham and therefore are responsible for an estimated 8 % of the total borough wide emissions.

9.2.3 Lobbying and engagement actions

Lewisham should engage in lobbying GLA and central Government, both as a Council in its own right and in conjunction with partner organisations (within and outside the borough). Adopting ambitious targets and plans will strengthen the Council's position. Lobbying could relate to policies to provide:

- an increase in electric vehicle charging infrastructure (public and private);
- incentives for zero emission vehicles;
- support for domestic property retrofits;
- higher energy standards for new build homes;
- acceleration of the grid decarbonisation and incentives to reduce gas use;
- incentives for companies to achieve net zero carbon emissions;
- funding to facilitate ambitious decarbonisation programmes by local authorities.

²⁷ A more extensive discussion of these powers can be found here : <https://www.theade.co.uk/resources/publications/the-warm-arm-of-the-law-tackling-fuel-poverty-in-the-private-rented-sector>

Appendix A: Baseline Activity data and data sources

Data Source	Sector	Description
Stationary Energy		
Department for Business, Energy and Industrial Strategy (BEIS): 'Sub-national electricity sales and numbers of customers, 2017(1)'	Grid electricity; domestic economy 7, domestic standard and non-domestic	This dataset provides energy consumption data for the geographical area within Lewisham jurisdiction from which the emissions can be estimated
Lewisham Council: '2019.08.30_Utilities_Cost_&_Consumption_LBL_01.04.2017-31.03.2018'	Council electricity consumption	Data provided by Lewisham Council which provides electricity consumption for the council own estate – buildings and street lighting.
Department for Business, Energy and Industrial Strategy (BEIS): 'Sub-national weather uncorrected gas sales and numbers of customers, 2017'	Natural gas; domestic and non-domestic	This dataset provides energy consumption data for the geographical area within Lewisham jurisdiction from which the emissions can be estimated
Lewisham Council: '2019.08.30_Utilities_Cost_&_Consumption_LBL_01.04.2017-31.03.2018'	Council Natural Gas consumption	Data provided by Lewisham Council which provides natural gas consumption for the council own estate.
Department for Business, Energy and Industrial Strategy (BEIS): 'Sub-national estimates of non-gas, non-electricity and non-road transport fuels in 2016'	Petroleum, Coal, MSF and bioenergy and waste consumption.	This data set provides consumption data for other fuels, non-gas and non-electricity.
Transport		
Department for Business, Energy and Industrial Strategy (BEIS): 'Road transport energy consumption at regional and local authority level, 2017'	Borough bus travel, Borough diesel car travel, Borough petrol car travel, Borough motorbike travel, Borough HGV, Borough LGV diesel and Borough LGV petrol	This dataset provides fuel consumption data for Lewisham administrative areas from which emissions may be estimated.
Lewisham Council: '2019.09.20_Staff travel emissions 2017-18'	Council business travel car, council business travel motorbike	Staff business travel emissions in vehicle km for car and motorbike

Data Source	Sector	Description
Lewisham Council: 'Copy of FleetCO ₂ '	Council fleet diesel and petrol	Litres of fuel used in council own fleet vehicles
Department for Business, Energy and Industrial Strategy (BEIS): 'Sub-national estimates of non-gas, non-electricity and non-road transport fuels in 2016'	Borough freight rail	Dataset provides rail tonne km data for Lewisham borough.
Greater London Authority: 'London Energy and Greenhouse Gas Inventory (LEGGI), 2016, Transport energy consumption and CO ₂ / CO ₂ e emissions by borough, 2015'	Borough passenger rail	Data set provides rail kWh for passenger rail for the Lewisham borough.
Waste		
Lewisham Council: 'Waste Data Flow for Lewisham Council'	Borough recycling, Borough reuse, Borough composting, Borough incineration household, Borough incineration commercial and Borough incineration	Waste flow data provided by Lewisham Council providing tonnes of waste processed in different waste streams.

Appendix B: Key data sources for potential actions

Key local policies and other data sources

Lewisham Council (2011) Local Implementation Plan 2011-2031, <https://lewisham.gov.uk/-/media/files/imported/local-20implementation-20plan-202011-31.ashx>

Lewisham Council (2018) Draft Transport Strategy & Local Implementation Plan 2019-2041, https://consultation.lewisham.gov.uk/planning/lip/user_uploads/lip3--pdf.pdf

Lewisham Council (2017) Lewisham Cycle Strategy 2017, <http://councilmeetings.lewisham.gov.uk/documents/s53983/Lewisham%20Cycle%20Strategy%202017.pdf>

Lewisham Council (2018) Corporate Strategy 2018-2022, <https://lewisham.gov.uk/-/media/files/corporate-strategy-1.ashx>

Future Climate/LSX (2011) Lewisham & South East London domestic energy efficiency retrofit

Lewisham Council (2018) Lewisham Low Emission Vehicle Charging Strategy 2018-2022, https://consultation.lewisham.gov.uk/corporate-policy-and-governance/lewisham-low-emission-vehicle-strategy/user_uploads/draft-low-emission-vehicle-charging-strategy.pdf

Lewisham Council (2017) A Vision for Rail, https://consultation.lewisham.gov.uk/planning/lip/user_uploads/appendix-e---lewisham-vision-for-rail-1.pdf

Lewisham Council (2014) Lewisham Council Energy Policy 2014-2018, <http://councilmeetings.lewisham.gov.uk/documents/s30270/Energy%2520Policy%2520Appendix.pdf>

Lewisham Council (2017) Lewisham Waste Strategy Implementation Plan, <http://councilmeetings.lewisham.gov.uk/documents/s51463/06%20Waste%20strategy%20implementation%20200717.pdf>

WSP, Parson Brinckerhoff (2016) N Lewisham heat network feasibility study, <https://lewisham.gov.uk/inmyarea/regeneration/deptford/north-lewisham-heat-network-feasibility-study>

Ramboll (2010) London Heat Map Study for London Borough of Lewisham

Key London policies and other data sources

GLA (2018) London Environment Strategy, https://www.london.gov.uk/sites/default/files/london_environment_strategy_0.pdf

GLA (2018) London Environment Strategy - Implementation Plan, https://www.london.gov.uk/sites/default/files/implementation_plan.pdf

GLA (2018) London Housing Strategy - Implementation Plan, https://www.london.gov.uk/sites/default/files/2018_lhs_implementation_plan_rev1.pdf

GLA (2018) Mayor's Transport Strategy, <https://www.london.gov.uk/sites/default/files/mayors-transport-strategy-2018.pdf>

GLA (2019) Draft London Plan - Consolidated Changes Version, July 2019, <https://www.london.gov.uk/what-we-do/planning/london-plan/current-london-plan>

GLA (2018) The Mayor's Economic Development Strategy for London - Implementation Plan, <https://www.london.gov.uk/sites/default/files/economic-development-strategy-2018-implementation-plan.pdf>

GLA (2015) London Zero Carbon Pathways Tool, <https://data.london.gov.uk/dataset/london-s-zero-carbon-pathways-tool>

GLA (2018) Zero Carbon London: The 1.5C Compatible Plan, https://www.london.gov.uk/sites/default/files/1.5_action_plan_amended.pdf

C40 Cities & GLA (2018) CAP Technical Assistance for London Work Package 2 – Zero Carbon Building Policies Key Findings Report, https://www.london.gov.uk/sites/default/files/arup_building_energy_efficiency_report.pdf

C40 Cities & GLA (2018) London's Climate Action Plan: WP3 Zero Carbon Energy Systems, https://www.london.gov.uk/sites/default/files/element_zero_carbon_energy_systems_report.pdf

Key sources of information on local authority good practice

Carbon Descent (2019) Camden Carbon Scenarios for 2025 and 2030 – An update to the 2010 Study, <https://www.camden.gov.uk/documents/20142/0/Carbon+Scenarios+to+2030.pdf/215aa878-c657-10c7-4119-7a9f92dbb0f5>

Manchester City Council (2016) Climate change action plan 2015/2016 to 2019/2020: emissions monitoring report and planned actions to 2020, https://secure.manchester.gov.uk/downloads/download/6033/mcc_climate_change_action_plan_201415-201617

Glasgow City Council (2019) The report and recommendations of Glasgow City Council's climate emergency working group, <http://www.glasgow.gov.uk/councillorsandcommittees/viewDoc.asp?c=P62AFQDN0GZLZ3DNDX>

Bristol City Council (2019) Mayor's Climate Emergency Action Plan 2019, <https://www.bristol.gov.uk/documents/20182/33379/Mayor%27s+Climate+Emergency+Action+Plan+2019+FINAL.pdf/db6a1919-ad51-c50e-3ca2-3b4561195476>

Other key sources

Ashden (2019) 31 climate actions that councils can take and their co-benefits, <https://www.ashden.org/programmes/co-benefits>

Friends of the Earth (2019) Your Climate Action Plan: Developing a Climate and Nature Emergency Action Plan with your local authority, https://takeclimateaction.uk/sites/files/climate/documents/2019-08/A4_ClimateActionPlan.pdf

Committee on Climate Change (2012) How local authorities can reduce emissions and manage climate risks, <https://www.theccc.org.uk/publication/how-local-authorities-can-reduce-emissions-and-manage-climate-risks/>

Carbon Trust (2012), Local authorities: Saving energy in local authority buildings, <https://www.carbontrust.com/media/196392/ctv028-local-authorities.pdf>

Parity Projects Crohm (Carbon Reduction Options for Housing Managers) data, see <https://parityprojects.com/platform/>

Propensity to Cycle Tool for England & Wales, see <http://pct.bike/>



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