



BOSTON BOROUGH COUNCIL

Carbon Reduction Plan

November 2021

Final

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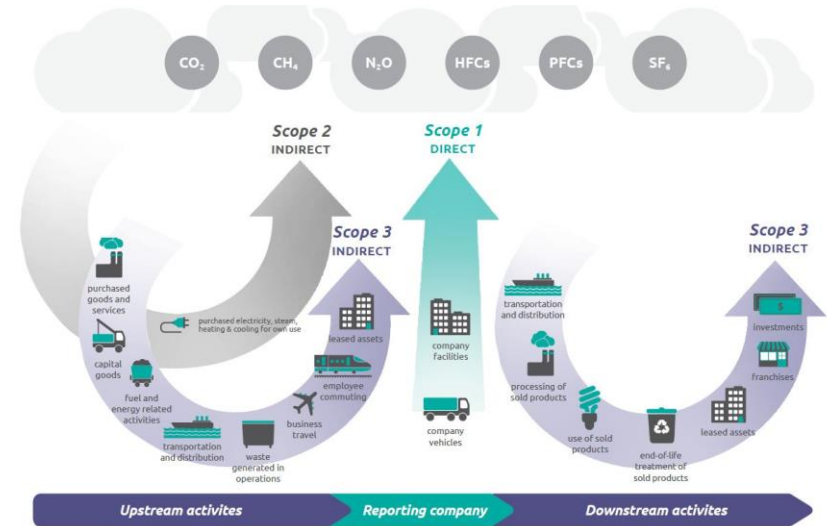
Boston Borough Council Carbon Reduction
Plan

Executive summary

Executive summary

- This Carbon Reduction Plan is a key step in Boston Borough Council’s (BBC) response to the climate crisis and sets out a number of strategic actions that BBC should work to implement to achieve their carbon reduction target.
- This carbon reduction plan suggests a number of projects that, alongside the decarbonisation of the UK electricity grid, will contribute to the Council reducing their carbon emissions.
- Emissions included within the carbon footprint and targeted projects:

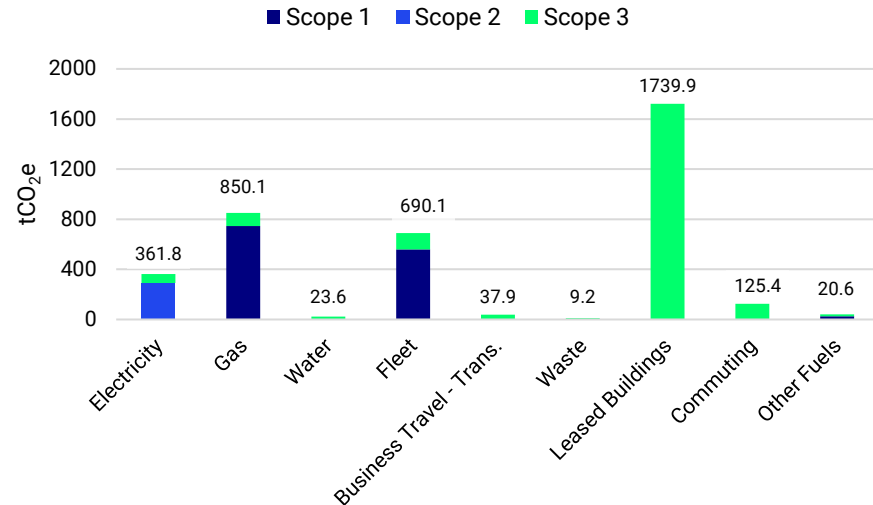
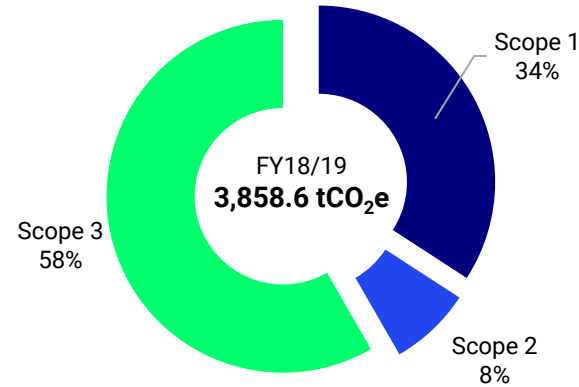
Scope 1	<ul style="list-style-type: none"> • Fleet fuel consumption • Gas consumption in the crematorium
Scope 2	<ul style="list-style-type: none"> • Electricity consumption in Municipal Buildings • Electricity consumption in council operated buildings
Scope 3	<ul style="list-style-type: none"> • Employee commuting and business travel



Executive summary







Carbon footprint summary

- BBC's carbon footprint for the financial year 2018/19 was calculated to be **3,858.6 tCO₂e**. The footprint consists of 9 emissions categories.
- Leased buildings make up the largest single emissions source, representing **45% (1,739.9 tCO₂e) of the total footprint**.
- Operation of buildings and facilities by the council is an emissions hotspot. Emissions from electricity, gas and other fuel consumption make up **27% of the total footprint (1,050.1 tCO₂e)**.
- Operation of the council's fleet is also a major contributor to the footprint, accounting for **15% (558.4 tCO₂e) of the total footprint**.
- Emissions from supply of water, treatment of wastewater, employee commuting and business travel are only a small part of the footprint – approximately **5% (187.0 tCO₂e)**.



Carbon reduction opportunities overview

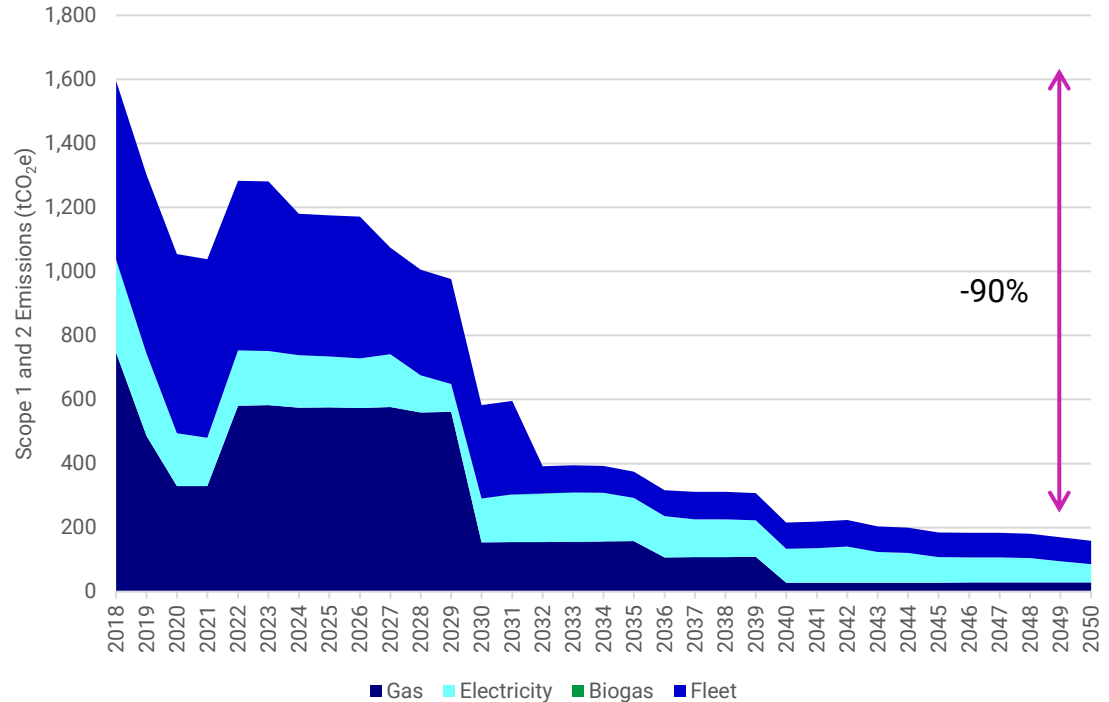
- The following carbon reduction opportunities have been identified across Boston Borough Council’s operations, with relevant project opportunities identified for each of the emissions areas detailed below. These projects will assist BBC on the pathway towards achieving its carbon reduction targets.

<p>Municipal Buildings</p>  <p>Upgrade fabric and heating systems. Install renewable energy measures.</p>	<p>Public Toilets</p>  <p>Install energy efficiency measures to reduce electricity consumption.</p>	<p>Geoff Moulder Leisure Complex</p>  <p>Relocate to new energy efficient site.</p>
<p>Crematorium</p>  <p>Install energy efficiency and renewable energy measures.</p>	<p>Fleet</p>  <p>Electrify vans in fleet. Trial and roll out electric RCVs.</p>	<p>Business Travel and Commuting</p>  <p>Encourage low carbon transport modes and mileage management.</p>

- The projects identified in this plan have the potential to reduce Boston Borough Council’s total emissions from 3,859tCO₂e tCO₂e/yr to just 2,423tCO₂e/year by 2050.
- The total estimated cost to implement the above projects is approximately £7.1mn not including any costs associated with large scale construction or property rationalisation. The project proposals in this plan have been based on high level and remotely accessed information and benchmarks. All projects will require full feasibility assessments to be undertaken to establish a detailed cost-benefit analysis.

Overview of Carbon Reduction Pathway

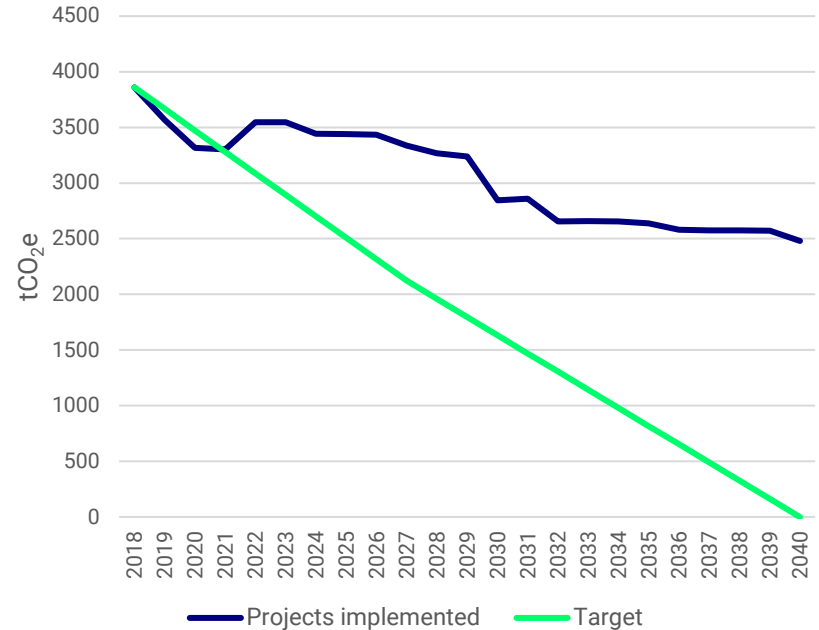
- 22 carbon reduction projects were modelled. The graph on the right shows the change in emissions with time. This **only shows the scope 1 and scope 2 emission sources** which have been the focus of the carbon reduction opportunity analysis.
- Projects considered cover fabric, lighting, and heating and HVAC upgrades, as well as electrification of fleet vehicles and the installation of solar PV.
- If all projects outlined are implemented then it can be expected that scope 1 and 2 emissions could decrease by 74% by 2030 and 90% by 2050 from a FY 2018/19 baseline. This is equal to 1,013 and 1,436 tCO₂e respectively.
- It is expected that the total capital cost of all projects will equal approximately £7.1million.



Target

Net Zero 2040, with a minimum emissions reduction of 45% by 2027

- Boston Borough Council has agreed to set a Net Zero 2040 target. This is an ambitious target which is in keeping with the latest climate science.
- BBC has committed to reduce its emissions to **Net Zero by 2040**, with a minimum emissions reduction of **45% by 2027** against a FY 2018/19 baseline.
- This would require year-on-year reduction of 4.55% each year. Annual reduction targets will be 5% to 2027 and 4.23% from 2027 – 2040.
- The graph shows the pathway if all projects suggested in this report are implemented and the target line. If all projects are implemented in the order suggested here, BBC will have a gap-to-target across all emission scopes of 1,215tCO₂e in 2027 and 2,478 tCO₂e in 2040.
- When considering scope 1 and 2 emissions only, the gap to target in 2027 and 2040 are 197tCO₂e and 215tCO₂e respectively once projects have been implemented.



Next steps

- Building on the analysis and project suggestions in this carbon reduction plan, BBC should now conduct further, more detailed feasibility assessments of individual project opportunities. This will ensure the Council is able to quantify costs and savings fully and be more confident in taking forward provisional project opportunities identified here.
- Considering the current emissions hotspots – operational buildings and facilities, and fleet – BBC should prioritise and coordinate efforts to reduce emissions in the first instance, using the contents of this Carbon Reduction Plan in the process.
- BBC should use the initial quantifications provided (energy, carbon and cost-saving potential) as a building block for the development of further detailed business cases going forward. The information shown in this plan, along with an explanation of the limitations, should be clearly communicated to stakeholders and shared with key decision makers across the organisation.
- Establishing an immediate action plan to build on the findings of this Carbon Reduction Plan will help to ensure carbon reduction remains a key part of the Council's agenda going forward, allowing the necessary budgets and organisational/governance structures to be developed accordingly to support decarbonisation.





Boston Borough Council Carbon Reduction
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Context and introduction

Context

- Growing acknowledgement of the latest science and recommendations from the Committee on Climate Change have resulted in unprecedented recognition of the global climate emergency and the need to act urgently. According to the IPCC's Fifth Assessment Report, unless there are immediate, rapid and large-scale reductions in emissions, limiting warming to close to 1.5 °C or even 2 °C will be beyond reach.
- The UK is already experiencing some of the effects of warming, such as sea level rise, increased flooding, warmer and wetter winters, increased extreme weather events and storms. Continued warming is projected to magnify these impacts, and risks relating to soil health, supply chains, public health and habitats will be exacerbated.
- The UK has recognised the scale of the problem and in 2019 declared a climate emergency, aiming to achieve Net Zero emissions by 2050. Local authorities have also recognised the issue, with 230 declaring a climate emergency. Local authorities have a crucial role to play in developing effective pathways towards reducing their emissions, which, if successfully achieved, will help to reduce climate impacts at both the local and national scale as well as delivering public health co-benefits resulting from cleaner air and leading more active lifestyles.
- Boston Borough Council declared a climate emergency in 2020 and environmental awareness and accountability are identified as a priority in the Corporate Strategy. BBC is committed to addressing the impact of its operations and as part of this commitment has agreed to produce a new Carbon Reduction Plan. The Carbon Reduction Plan will serve to engage and inform key stakeholders on the level of ambition required to pursue decarbonisation across Boston Borough Council's operations and support future decision-making.

Introduction

Project overview

- In the first stage of the project, the Carbon Trust calculated a carbon footprint for BBC. The footprint included scope 1, scope 2 and selected scope 3 emissions. The footprint was calculated for three consecutive years: FY 18/19, FY 19/20 and FY 20/21. A footprint report was produced which provided an overview of the carbon footprint, methodology and GHG Protocol, as well as highlighting key emissions hotspots within the organisation.
- Following this, a workshop was held with key stakeholders from the Council to present key findings from the carbon footprint calculation. A Business as Usual (BAU) emissions pathway was presented which captured overarching effects on emissions, such as grid decarbonisation. Options for carbon reduction targets were presented and compared to other local authorities in the area. In this workshop, initial opportunities for carbon reduction projects within the Council's operations were discussed and identified.
- Key personnel identified from the workshop were interviewed to gather more information and understand the potential for emissions reduction projects across the Council. The information provided supported analysis of carbon reduction pathways for BBC.
- This report forms a Carbon Reduction Plan. It includes a summary of the baseline carbon footprint calculation, information surrounding target setting and analysis of projects which should be implemented to drive carbon reduction across BBC. These projects have been quantified and present a gap-to-target. BBC should take the findings of this report forwards to inform a more detailed decarbonisation action plan.



Boston Borough Council Carbon Reduction
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Carbon footprint

Carbon footprint overview

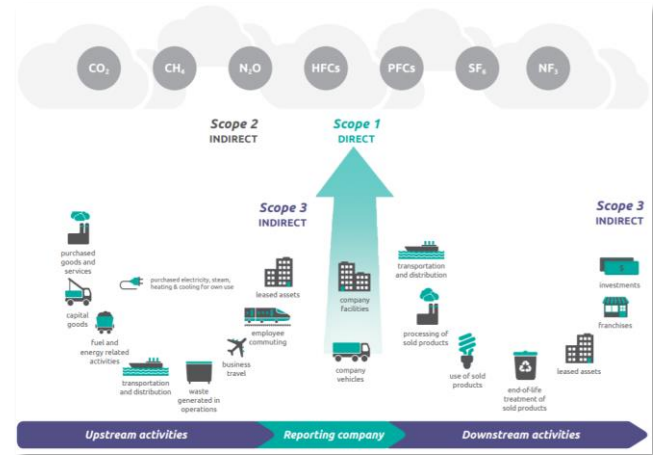
This section provides an inventory of BBC’s greenhouse gas emissions in the financial year 2018/19 – the ‘baseline’ against which future progress will be evaluated

The Carbon Trust has calculated BBC’s carbon footprint in accordance with the **Greenhouse Gas (GHG) Protocol** – the most widely used and accepted methodology for GHG accounting.

The organisational boundary also helps to determine how to categorise each emissions source within the boundary.

Under the GHG Protocol, emissions are categorised into 3 scopes:

- **Scope 1:** Emissions directly emitted by the organization (i.e. gas burnt in a gas boiler, tail pipe emissions from a vehicle).
- **Scope 2:** Emissions indirectly emitted from the consumption of purchased electricity, heat or steam.
- **Scope 3:** All other indirect emissions, such as the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned or controlled by the reporting entity, water consumption, waste disposal, etc.

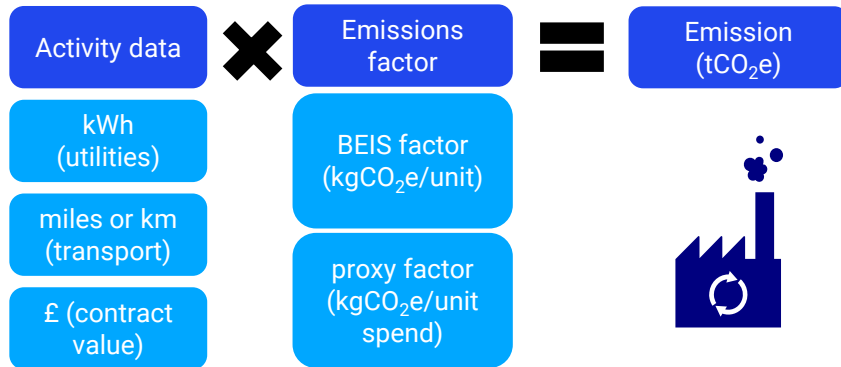


Above: Emission scopes, as defined by the GHG Protocol.


Carbon footprint methodology

Carbon emissions are calculated by taking activity data (e.g. kWh electricity consumed, litres of fuel) and applying an emissions factor.

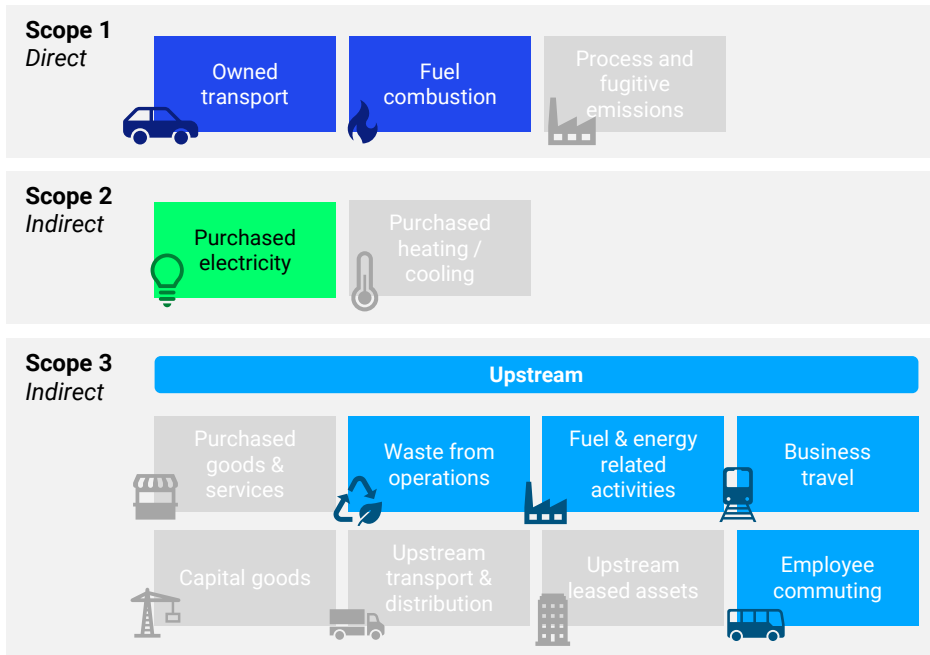
- Where possible, primary activity data should be collected throughout the reporting period for the carbon footprint calculation.
- Emission factors are updated annually and published by the UK Government’s department for Business, Energy and Industrial Strategy (BEIS).
- Where primary activity data is not available, appropriate benchmarks or proxies can be used to estimate emissions from that source. For example, typical electricity consumption per m² of a building.



What is a carbon dioxide equivalent (CO₂e)?
 CO₂ is one of 7 GHGs covered by the Kyoto Protocol. Each gas has a global warming potential (GWP). By comparing each gas’s GWP to that of carbon dioxide we can derive a CO₂ e value - the commonly used unit to report GHG emissions.
 Although CO₂ has the lowest GWP, it is also by far the most abundant GHG emission. Hence the focus on CO₂ when discussing emissions reduction and climate change.



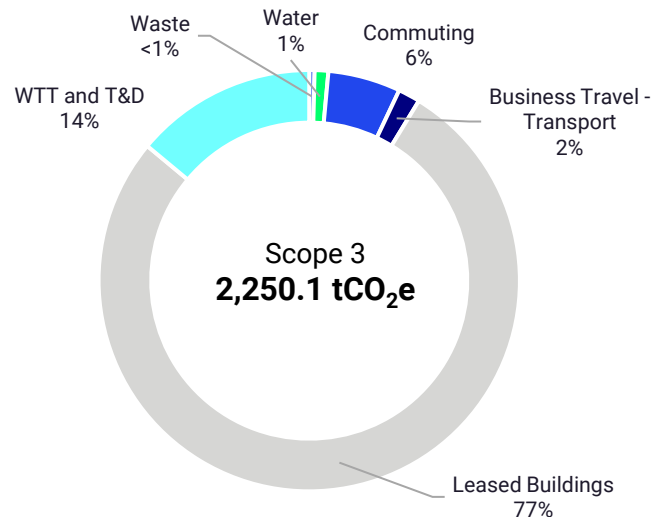
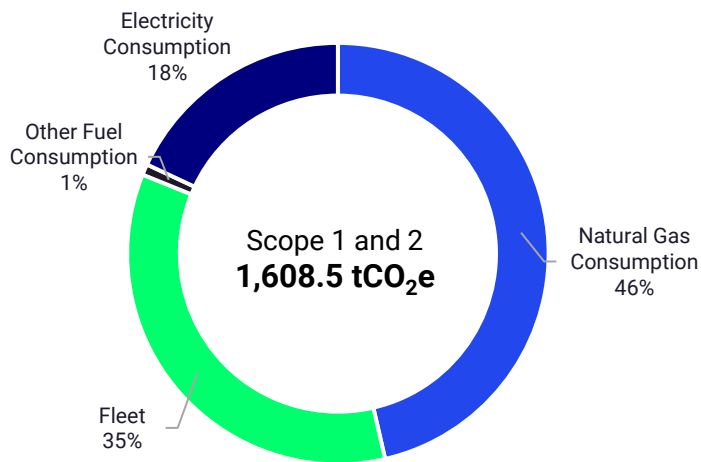
Emissions sources included



Emissions sources to be calculated within the chosen boundary of this assessment were agreed with BBC, and include relevant **Scope 1 and 2 emissions and selected Scope 3 emissions**. Relevance of each emissions source was determined using a qualitative assessment of a) perceived magnitude, b) data availability, and c) sphere of influence, alongside ability to achieve reductions through direct action.

Boston Borough Council Footprint FY18/19

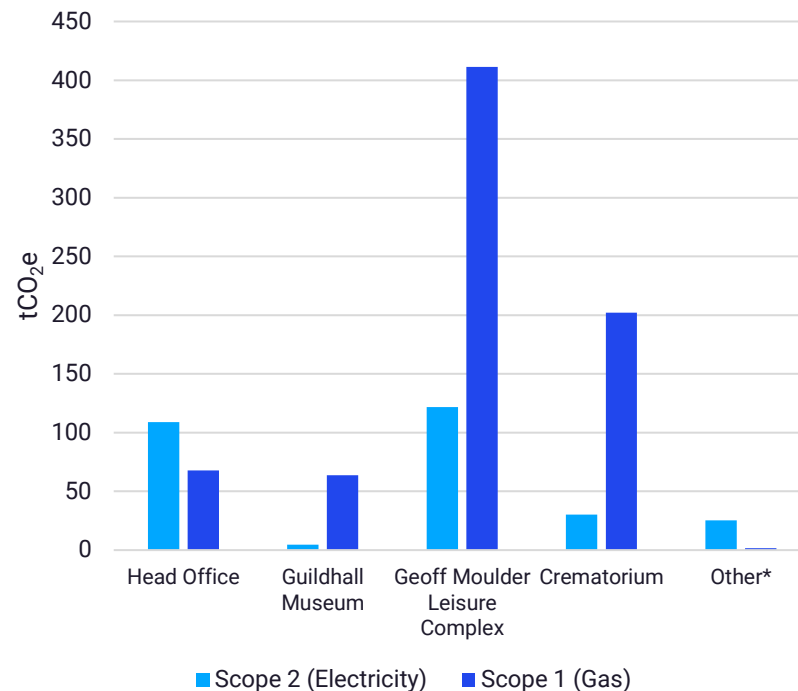
- The total footprint for BBC in FY 18/19 was **3,858.6 tCO₂e**.
- **Over one third of emissions, 34% (1,318.2 tCO₂e)** were scope 1. These are operational emissions as a direct result of the combustion of fossil fuels within council buildings and fleet.
- Only **8% (290.3 tCO₂e)** were scope 2. These are emissions that arise from operational electricity consumption.
- Over half of emissions, **58% (2,250.1 tCO₂e) arise from scope 3**. The majority of these are attributed to emissions from energy consumption in leased buildings and WTT and T&D associated with scope 1 and scope 2 emissions.



Hotspot – Operational buildings and facilities

Emissions from consumption of gas and electricity at BBC operated buildings and facilities

- The chart (right) provides site level view of operational emissions (Gas and Electricity) for FY 18/19.
- Operational emissions from all sites make up **27% (1050.1 tCO₂e) of the total footprint.**¹
- Emissions are dominated by the Geoff Moulder Leisure Complex and the Crematorium. These two sites account for 73% of all operational emissions.
- The majority of emissions arise from the use of natural gas, used for space and water heating functions. These emissions will not decrease with time in line with UK grid decarbonisation. Reducing these emissions will require energy efficiency measures and switching heating modes, e.g. air source heat pumps.
- As a result of these measures, electricity consumption, and costs associated with Scope 2 emissions, will increase over time. Due to the rate of grid decarbonisation, it is unlikely that scope 2 emissions themselves will increase. Hence measures should also be taken to reduce electricity consumption across all operational sites.



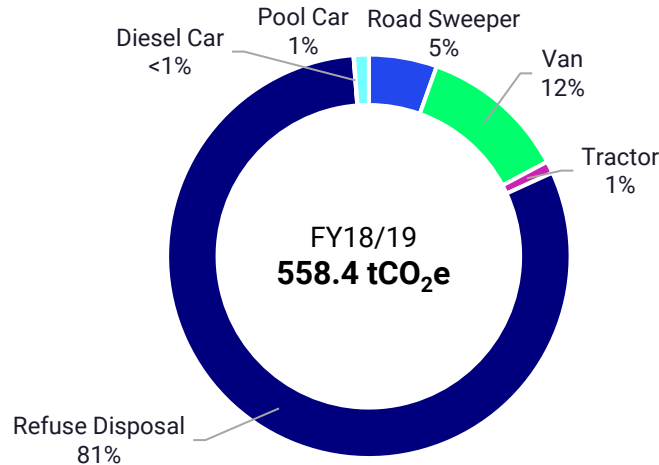
¹ WTT and T&D is excluded from these numbers. It was found to be 182.4 tCO₂e for operational emissions.

*Other contains temporary accommodation sites, leisure sites, power supply, depot and public toilets.

Hotspot – Fleet

Emissions from fuel consumed in vehicles owned and operated by the council

- The BBC fleet contained 41 vehicles in FY 18/19. 35 of these were diesel fuelled maintenance vehicles, 1 diesel car and 5 pool cars, assigned petrol fuel type. Maintenance vehicles include road sweepers, vans, refuse disposal vehicles and tractors.
- Emissions from fleet contributed **558.4 tCO₂e***, equivalent to **15% to the total carbon footprint**.
- Fuel consumption figures were provided by BBC. The total estimated fuel consumption for **FY18/19** was **213,045 litres**.

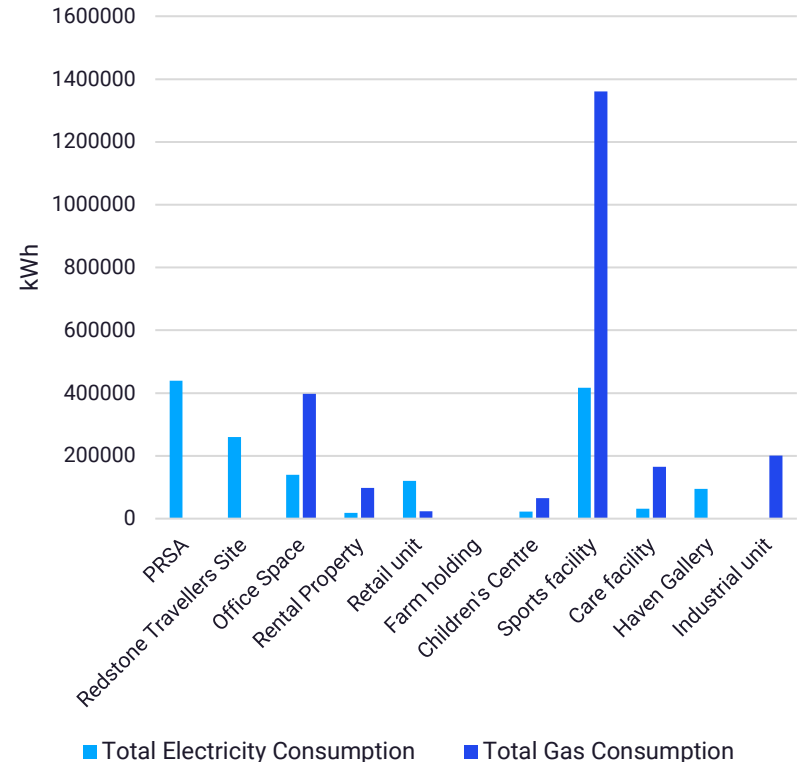


*Figures excluding well-to-tank, WTT. An additional 131.7 tCO₂e was associated with Scope 3 WTT emissions from fleet fuel consumption

Hotspot – Leased buildings

Emissions from consumption of gas and electricity at BBC leased buildings

- Emissions from leased buildings were found to be **1,739.9 tCO₂e**, **45% of the carbon footprint**.
- 19.4 tCO₂e** is from consumption of biomass at the Princess Royal Sports Arena and the Enterprise Centre.
- Where actual consumption data was not available, emissions were estimated from the floor area and building type.
- The chart (right) provides a building category view of estimated electricity and gas consumption FY 18/19.
- The majority of emissions arise from the use of natural gas, for space and water heating functions. These emissions will not decrease with time in line with UK grid decarbonisation. Reducing these emissions will require energy efficiency measures and switching heating modes, e.g. air source heat pumps.
- As a result of these measures, electricity consumption and costs associated with Scope 2 emissions will increase over time. Due to the rate of grid decarbonisation it is unlikely that scope 2 emissions themselves will increase therefore measures should also be taken to reduce electricity consumption across all operational sites.
- Leased building emissions are scope 3 and therefore BBC does not have direct control over them. It is important that BBC influence and engage with building occupants to adopt energy efficiency and fuel switching measures.



Other emissions sources

- Other emissions sources (Waste output and processing, Water consumption, Employee commuting, Business travel (transport), and WTT and T&D) made up around 14% of the footprint in FY 18/19.
- Although these emissions categories contribute less to the carbon footprint, reduction efforts should still be made via initiatives such as increased recycling, installation of water saving measures, and encouragement of active and public transport use.

Scope	Emissions Source	Total emissions (tCO ₂ e)	Percentage of total (%)
1	Natural Gas Consumption	746.4	19%
	Fleet	558.4	14%
	Other Fuel Consumption	13.4	0.3%
2	Electricity Consumption	290.3	8%
3	Waste	9.2	0.2%
	Water	23.6	0.6%
	Commuting	125.4	3%
	Business Travel - Transport	37.9	1%
	Leased Buildings	1,739.9	45%
	WTT and T&D	314.1	8%
Total		3,858.6	100.0%



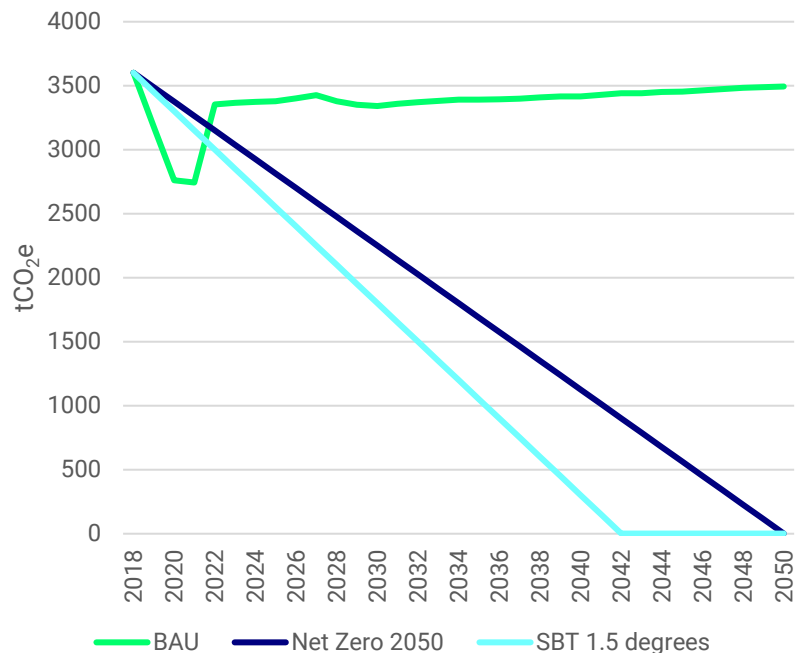
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Target setting

Target setting

Setting ambitious emissions reduction targets drives momentum for change, can spark innovation and investment, and ensures reductions meet national commitments.

- **Science-based target (SBT):** Aligned to the 2015 Paris Agreement, targets are considered “science-based” if they reach the level of decarbonisation required to keep global temperature increase below 1.5°C. This target requires a 4.2% year on year reduction in emissions from the baseline.
- **Net Zero target:** A Net Zero organisation will set and pursue an ambitious 1.5°C aligned science-based target for its full value-chain emissions. Any remaining hard-to-decarbonise emissions can be compensated using certified greenhouse gas removal.
- Examples of both targets are illustrated in the graph to the right.
- In their [Net Zero Strategy \(2021\)](#), the UK government has committed to half direct emissions from the public sector by 2032 (compared to 2017 levels) and aims to further reduce emissions from public sector buildings by 75% by 2037. They have also set a Net Zero 2050 target for the UK.

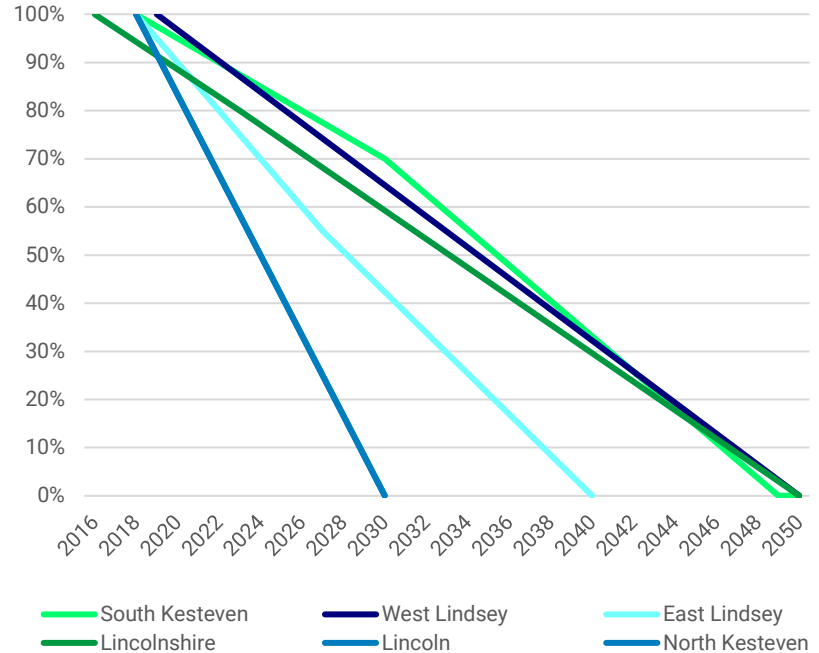


Target setting

Neighbouring targets and ambitions

Ambition

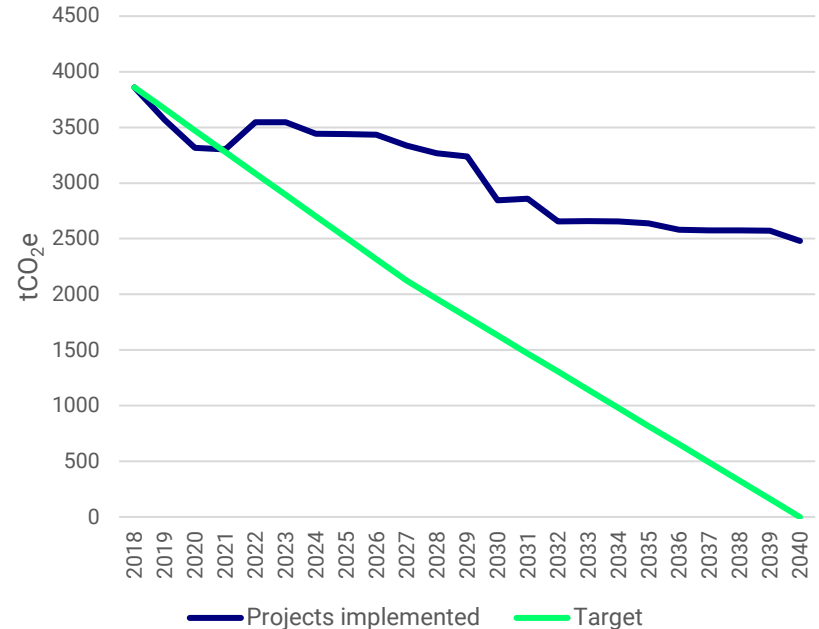
- **North Kesteven** – Net zero by 2030; measured against a 2018/19 baseline.
- **Lincoln City** – Net zero by 2030; measured against a 2018/19 baseline.
- **East Lindsey** – 45% reduction in emissions by 2027 and **net zero by 2040**; against a 2018/19 baseline.
- **Lincolnshire County** – 20% reduction by 2023 and then **carbon neutral by 2050**; measured against a 2016/17 baseline.
- **South Kesteven** – 30% reduction by 2030 and **net zero before 2050**; measured against a 2018/19 baseline.
- **West Lindsey** – Net zero by 2050; against a 2019/20 baseline.



Target setting

Net Zero 2040, with a minimum emissions reduction of 45% by 2027

- Boston Borough Council has agreed to set a Net Zero 2040 target. This is an ambitious target which is in keeping with the latest climate science.
- BBC has committed to reduce its emissions to **Net Zero by 2040**, with a minimum emissions reduction of **45% by 2027** against a FY 2018/19 baseline.
- This would require year-on-year reduction of 4.55% each year. Annual reduction targets will be 5% to 2027 and 4.23% from 2027 – 2040.
- Committee support is agreed provided the recommendations can be actioned without any reduction in the quality of services provided, the recommendations do not impact on the revenue budgets, nor do they impact on services.
- The graph shows the pathway if all projects suggested in this report are implemented and the target line. If all projects are implemented in the order suggested here, BBC will have a gap-to-target across all emission scopes of 1,215tCO₂e in 2027 and 2,478 tCO₂e in 2040.
- When considering scope 1 and 2 emissions only, the gap to target in 2027 and 2040 are 197tCO₂e and 215tCO₂e respectively once projects have been implemented.





Boston Borough Council Carbon Reduction
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Carbon reduction commitments

Carbon reduction commitments

- In order to support Boston Borough Council's carbon reduction target it is important to state how the Council aims to achieve these.
- The subsequent section outlines direct actions that could be implemented in order to reduce carbon emissions. Alongside the actions, the Council should also outline the steps required within the wider strategy that are needed in order to decarbonise.
- This section of the report therefore outlines a series of commitments that the Council should aim to align with going forward that will focus decarbonisation activities and also provide a layer of accountability.
- The commitments have been developed based on UK Government ambitions, suggestions outlined within the committee on climate change's update reports, and Carbon Trust's own extensive knowledge of developing decarbonisation strategies and providing assistance to UK public sector bodies.
- It is suggested that the Council review these commitments and ensure they align with both their ambition and expectations. Going forward the commitments should be seen as steps to follow and a benchmark to report progress against.
- The commitments have been organised in four yearly intervals, to ensure regular action is taken, and enough time is given to move from commitment, to plan, to action.

Carbon reduction commitments

By 2024

- Carbon reduction to be a high priority in business case decisions
- Carbon footprint to be calculated every year
 - This should be expanded from the current baseline footprint to include all emission sources
- Any new builds or major developments will be designed and accredited to a net zero framework
- Energy audits of all council owned buildings will have been undertaken
 - This will highlight carbon hotspots and detailed pipeline of costed projects to be implemented
- Waste heat strategy for the crematorium will be in place
- All lighting across council owned buildings will be LED
- Understanding of total renewable energy potential from solar PV will be known
 - Feasibility studies of all council owned buildings, roof space, car parks and land assets should be carried out and summarised within a renewable strategy
- Engage with key suppliers to communicate importance of emissions reduction in procurement decisions
- Install water saving accessories across all operational facilities
- Waste tonnage and type data will be collected

Carbon reduction commitments

By 2028

- Boston Borough Council will have reduced carbon emissions in line with target
- Low carbon heat plans will be in place
 - An understanding of future heating options for all council owned buildings should be in place, including heat pumps, hydrogen, or other low carbon fuels
- All cars and LGVs will be battery electric where practically possible
- Charging infrastructure at main council buildings will have been installed
- Trial of CNG HGV will have been undertaken
- All buildings will have up-to-date, standardised, and effective building management systems (BMS)
- Boston Borough Council will have 50% of renewable energy potential installed
 - Developed in line with the renewables strategy
- Supplier commitment to reducing emissions will be mandated within procurement contracts for major suppliers

Carbon reduction commitments

By 2032

- Boston Borough Council will have reduced carbon emissions in line with target
- Every building will have undergone a full energy efficient upgrade
 - Including installation of low carbon heating options identified within the heating strategy
- Boston Borough Council will have 100% of renewable energy potential installed
 - In line with the renewables strategy

By 2036

- All HGVs, including waste refuse vehicles will be zero emission vehicles

By 2040

- The crematorium will no longer use gas-fired furnaces in its operations



Boston Borough Council Carbon Reduction
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Carbon reduction opportunities

Carbon reduction opportunities

- This section of the project has developed and quantified a list of carbon reduction opportunities that could be implemented by Boston Borough Council.
- The opportunities identified have been guided by the analysis of the carbon footprint hotspots, in order to make sure that projects with the greatest carbon saving potential are suggested.
- Furthermore, individual discussions with particular areas of the council have been carried out to ensure the projects suggested are ambitious, relevant, and realistic.
- The projects identified are relevant **only to scope 1 and 2 emissions**. This has been done to ensure there is a focus on emission sources that the council have a direct influence over and therefore are easiest to impact on.
 - The largest scope 3 emission source is from leased buildings, it is therefore suggested that a strategy for decarbonising leased buildings is developed.
- The following pages outline the main focus areas for the carbon reduction opportunities as well as the quantified data of energy and carbon savings, potential capital cost, simple payback period and suggested year to implement.
- All opportunities identified should undergo a feasibility and technical assessment before implementation.

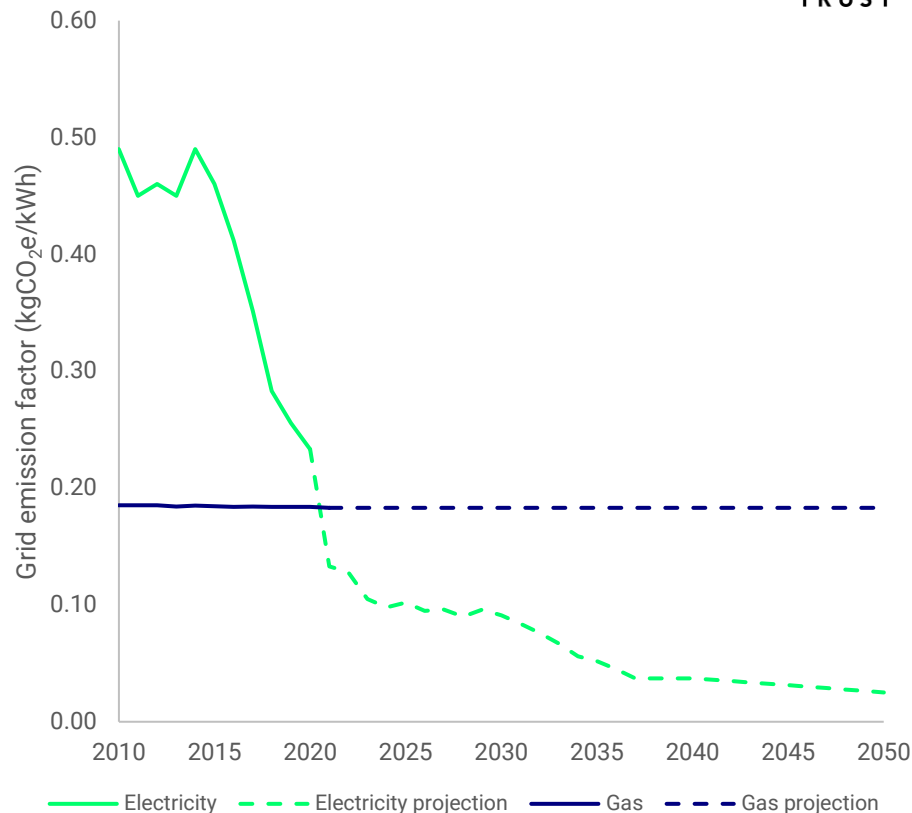
Summary of carbon reduction opportunities

- A total of **22 projects** have been outlined across the Municipal Buildings, crematorium, Geoff Moulder Leisure Complex (GMLC), public toilets, Guildhall and fleet.
- These projects show a potential to **reduce scope 1 and 2 emissions** by 74% by 2030 and **90% by 2050** from a FY 2018/19 baseline.
- It is expected that the total capital cost of all projects will equal approximately **£7.1million**.

<p>Short term (2021 – 2025)</p>	<p>Upgrade fabric, lighting, HVAC and heating system in the Municipal Buildings, install LED lighting and lighting controls in public toilets, upgrade building fabric in crematorium and chapel, electrify fleet vans and trial CNG RCVs.</p>	<p>Medium and longer term recommendations are inherently subject to greater degrees of uncertainty. These actions are made based on the current state-of-play and should be reviewed and updated as part of annual reporting and governance. It is anticipated that technology advancements, cost reductions and policy support will create a more favourable environment for action in the medium/longer term and BBC should remain agile and actively engaged with the market to take advantage of favourable developments.</p>
<p>Mid term (2025 – 2030)</p>	<p>Municipal Buildings: BMS is upgraded, solar carport is constructed in parking area to supplement electricity consumption.</p> <p>GMLC redevelopment is completed.</p> <p>Crematorium and chapel: Solar PV is installed on the roof of the chapel and a biogas blend is used to fuel the furnace in the crematorium.</p> <p>CNG RCVs are rolled-out across the fleet.</p>	
<p>Long term (2030 – onwards)</p>	<p>BBC move to new, energy efficient municipal building, novel cremation technologies are in use at the crematorium, electric RCVs are trialled and rolled-out.</p>	

UK electricity grid decarbonisation

- As the UK switches more of its energy production to renewable sources, less carbon dioxide will be produced by the generation of electricity. This means over time the **grid electricity** that is used by consumers will become **less carbon intensive**.
- Between 2010 and 2020 the carbon intensity of grid electricity has decreased by over 50%. This has largely been driven by coal fired power plants being taken off-line and the large-scale rollout of offshore wind farms.
- The projections of the grid intensity in the future are produced by BEIS¹. It is expected that the carbon intensity of grid electricity will be just 4% of 2010's values.
- Other projections produced by national grid even have the carbon intensity becoming negative under certain scenarios – namely through the roll out of bioenergy carbon capture and storage.
- The emissions intensity of electricity is set to hit parity with the emissions intensity of natural gas in the immediate future and will thereon continue to reduce. This “greening of the grid” makes electrification of transport and heating an attractive option from a carbon reduction perspective and **electrification should be a priority**.
- The carbon savings potential of projects outlined in this report are reported in terms of savings today and savings in recommended implementation year. For projects which reduce electricity consumption, i.e energy efficiency projects, carbon savings potential will be lower if implemented in the future when the grid intensity is lower.



Emission savings from electricity over time

- As a result of the decarbonisation of the UK electricity grid, the consumption of electricity will be less carbon intensive in the future compared to the baseline year.
- This means that the total reduction in emissions between the baseline year and the target year will be greater than the sum of all emission savings from just looking at the projects implemented; as there will be carbon reductions from projects plus the natural reduction from grid decarbonisation.
- When quantifying the carbon reduction potential of projects linked to the consumption of electricity, the year in which the project is implemented is very important:
 - An energy efficiency project, ie. one that results in reduced consumption (such as installing LED lighting), will result in the same energy saving regardless of the year of installation. However, the carbon savings will be greater in the near term while the grid is still relatively carbon intensive.
 - A fuel switching project, one that result sin moving from a fossil fuel to electricity (such as fleet electrification), will result in greater carbon savings in the future compared to the present day – this is because the difference in emission factors between a fossil fuel and electricity will only increase as the grid decarbonises, meaning the carbon savings will be greater.
- The projects outlined in the following pages quote both the carbon savings that would be achieved in the baseline year and in the year of implementation. The baseline year carbon saving allows a like for like comparison of the carbon reduction potential of a project, whereas the savings quoted for the year of implementation are the likely estimated savings that will be achieved.

Municipal Buildings carbon reduction opportunities

- BBC operates its head office in the Municipal Buildings. A proportion of the building is rented to tenants who are charged service fees for consumption of electricity and natural gas. The Municipal Buildings are split into three distinct sites, which vary in age and fabric standard. The original building is a 1908, solid brick construction, with little to no existing insulation or glazing. A second building is also solid brick, with no insulation, but does have some glazing measures in place. Finally, the new structure has some insulation and glazing installed and is built to a higher specification.
- The Municipal Buildings make up 17% of all operational emissions. 62% of emissions from the Municipal Buildings arise from electricity consumption and 38% from fuel used in building energy.
- It is expected the Council will remain in the Municipal Buildings in the mid-term (5 – 10 years), however, are open to the possibility of moving premises due to the challenges associated with upgrading the fabric and heating systems at the site. Projects with a payback period within this lifetime should be prioritised. This will increase the value of the building if the decision is made to move.
- The projects recommended which directly impact the building are related to fabric, lighting, HVAC, BMS and heating system upgrades. Construction of a solar carport in the car parking area has also been recommended as a way to generate renewable energy on-site, given the incompatible roof style for rooftop solar PV. Finally, in the long term, BBC should consider moving office to a more energy efficient building. This would dramatically reduce emissions from the office site and improve the comfort and experience of building occupants.



Above: Boston Borough Council Municipal Buildings

Municipal Buildings carbon reduction opportunities

The following actions have been recommended to reduce carbon emissions at the Municipal Buildings:

ID	Opportunity	Description	Energy saving (kWh)*	Baseline GHG saving (tCO ₂ e)	Implementation year	Implementation year GHG saving (tCO ₂ e)	CapEx	Payback period (yr)
1	Loft insulation	Installation of loft insulation in the Municipal Buildings	Gas: 6,346 Electricity: 2,965	1.9	2023	1.7	~£9,000	17.5
2	LED lighting in 'new' building	Installation of LED lighting in the newest section of the Municipal Buildings	Electricity: 32,729	7.6	2023	5.5	~£21,000	5.9
3	Boiler upgrade for 'old' building	Upgrading the boiler to a more efficient gas boiler in the old section of the Municipal Buildings	Gas: 58,118	10.7	2024	10.7	~£20,000	11.5
4	HVAC service in the 'new' building	Carry out a full service of the HVAC system and replace any failing or faulty parts	Electricity: 20,880	4.9	2024	3.5	Contractor quote required	-
5	Upgrade BMS	Upgrade the building management system across the Municipal Buildings	Gas: 36,808 Electricity: 38,433	13.4	2026	11.1	~£162,000	32.8
6	Solar carport	Construct a solar carport in the parking area of the Municipal Buildings. This will provide on-site electricity generation and additional coverage for vehicles	Electricity: 45,214	10.5	2026	7.8	~£61,000	12.2
7	New office site	Relocate office from the Municipal Buildings to a more energy efficient building	Gas: 368,079 Electricity: 86,830	88.0	2036	47.7	N/A	-

* Energy savings quoted here assume they are installed in isolation, ie. do not consider the impact of demand reduction made possible from other opportunities

** All capital costs quoted here are estimates, these should not be taken as actual costs and consultation with a supplier/installer should be undertaken to better understand expected costs

Crematorium carbon reduction opportunities

- The crematorium is responsible for 22% of operational emissions. The majority of these emissions (87%) come from combustion of natural gas in the heating systems and cremator furnace. 13% of emissions for the crematorium are attributed to electricity consumption for lighting and technical equipment in the cremator furnace.
- The crematorium and chapel buildings are currently fairly poor energy efficiency buildings. Recommendations centre around building fabric upgrades, such as installation of cavity wall and loft insulation in the chapel and glazing upgrades in the crematorium building. Opportunities to install rooftop Solar PV on the chapel roof should also be explored to supplement electricity consumption on-site.
- Finally, running the furnace is the most energy intensive process at this site. There are few alternatives currently commercially available and BBC should continue to monitor the market as alternative cremation technologies become established. A biogas blend to fuel the furnace should be considered in the medium term, with more ambitious action to implement novel cremation alternatives, such as Resomation, considered in the longer term.



Above: Boston Cemetery Drive

Crematorium carbon reduction opportunities

The following actions have been recommended to reduce carbon emissions at the Crematorium:

ID	Opportunity	Description	Energy saving (kWh)*	Baseline GHG saving (tCO ₂ e)	Implementation Year	Implementation year GHG saving (tCO ₂ e)	CapEx**	Payback period (yr)
11	Glazing upgrade of crematorium building	Upgrade the glazing on all crematorium windows and glass corridor	Gas: 8394	1.5	2025	1.5	~£9,000	36.7
12	Crematorium louvres	Louvres/brise soleils to be installed to the exterior of the glass corridor to reduce solar gain in the summer. No energy saving here but improved comfort levels.	N/A	N/A	2025	N/A	N/A	N/A
13	Upgrade cavity wall insulation	Upgrade cavity wall insulation in the chapel as far as possible	Gas: 3,592	0.7	2025	0.7	~£4,000	37.8
14	Loft insulation	Install loft insulation in the chapel	Gas: 1,734	0.3	2025	0.3	~£1,300	25.8
15	Solar PV	Install Solar PV on the chapel roof	Electricity: 27,538	6.4	2027	5.2	~£32,000	10.6
16	Use biogas blend in furnace	Switch fuel combusted in crematorium furnace from natural gas to a biogas blend	Gas: 110,644 Biogas: - 110,644	20.3	2028	20.3	N/A	-
17	Introduce use of a new cremation method	Implement the usage of Resomation or alternative cremation processes	Gas: 442,580 Biogas: - 110,644 Electricity: - 110,644	55.6	2040	75.5	N/A	-

* Energy savings quoted here assume they are installed in isolation, ie. do not consider the impact of demand reduction made possible from other opportunities

** All capital costs quoted here are estimates, these should not be taken as actual costs and consultation with a supplier/installer should be undertaken to better understand expected costs

Geoff Moulder Leisure Complex carbon reduction opportunities

- The GMLC is responsible for 51% of operational emissions. The majority of these emissions, 77%, come from combustion of natural gas in the heating systems and pool heating. 23% of emissions for the leisure complex are attributed to electricity consumption.
- The Geoff Moulder Leisure Complex is expected to move to a new site with state of the art facilities, as a result of funding received through the Towns Fund.



Above: Geoff Moulder Leisure Pool Building

ID	Opportunity	Description	Energy saving (kWh)*	Baseline GHG saving (tCO ₂ e)	Implementation Year	Implementation year GHG savings (tCO ₂ e)	CapEx**	Payback period (yr)
10	Leisure centre redevelopment	Demolition of existing centre and replacement with electrically fuelled only state of the art centre that adheres to CIBSE good standard as a minimum	Gas: 2,235,782 Electricity: -848,319	213.5	2030	344.3	N/A	-

* Energy savings quoted here assume they are installed in isolation, ie. do not consider the impact of demand reduction made possible from other opportunities

*** All capital costs quoted here are estimates, these should not be taken as actual costs and consultation with a supplier/installer should be undertaken to better understand expected costs

Guildhall building

- The Guildhall building and museum is the fourth largest emitting site, with the majority of emissions from the consumption of natural gas for heating.
- Given the listed nature of the building, and discussions with the estates and facilities team it has been deemed that this site has limited potential for carbon reduction opportunities.
- Despite not being able to undergo any serious upgrades or retrofit, there are still some energy saving measures that can be put in place:
 - Ensuring all electrical equipment is as efficient as possible
 - Making sure that heating profiles are optimised
- Furthermore, it is recommended that a detailed energy audit is undertaken by a specialist consultant in listed buildings.



Above: Guildhall

Public toilets carbon reduction opportunities

- The public toilets operated by BBC are responsible for 1% of operational emissions. All these emissions are from consumption of electricity. Although these sites contribute very little to the total carbon footprint, there are simple energy efficiency measures that can be installed here at low cost to demonstrate BBCs intention to decarbonise.
- The following actions are recommended:

ID	Opportunity	Description	Energy saving (kWh)*	Baseline GHG saving (tCO ₂ e)	Implementation year	Implementation year GHG saving (tCO ₂ e)	CapEx**	Payback period (yr)
8	Installation of LEDs	Installation of LED lighting in all public toilet facilities	Electricity: 3,240	0.8	2025	0.5	~£2,000	5.9
9	Installation of energy efficient hand dryers	Replacement of old hand dryers with energy efficient models in all public toilets	Electricity: 3,240	0.8	2025	0.5	~£3,500	9.8

* Energy savings quoted here assume they are installed in isolation, ie. do not consider the impact of demand reduction made possible from other opportunities

** All capital costs quoted here are estimates, these should not be taken as actual costs and consultation with a supplier/installer should be undertaken to better understand expected costs

Fleet carbon reduction opportunities

Vans

- BBC's current fleet consists of 41 vehicles, the majority of which are diesel fuelled maintenance vehicles. Maintenance vehicles include road sweepers, vans, refuse disposal vehicles and tractors. The fleet also contains one diesel car and 5 pool cars, assumed to be petrol fuelled. Emissions from the fleet contributed 15% to the total carbon footprint. Vans contributed 12% of total fleet emissions.
- In order to reduce emissions, the fleet must transition from fossil fuels to electric vehicles. Electrification of the fleet is the most effective way to decarbonise this emissions category. Cost parity in the near future, and the resulting business case for electric vehicles (EV), suggest that BBC should take up electric vans as soon as possible.¹ As well as reducing emissions, co-benefits of EVs such as reduced running costs, improved driver experience, and reduced air and noise pollution, make the use of EVs an attractive option.²
- Since the emissions intensity of electricity in the UK is significantly lower than the emissions intensity of diesel, an emissions reduction of over 50% for vans would be seen. As the UK grid continues to decarbonise, emissions would continue to decrease significantly.

ID	Opportunity	Description	Energy saving*	GHG savings (tCO ₂ e)**	Implementation year	Implementation year GHG savings (tCO ₂ e)	CapEx**	Payback period (yr)
18	Electrification of vans	Replace diesel fleet vans with electric vans	Diesel: 25,034 Lt Electricity: - 110,644 kWh	51.3	2024	52.1	£414,000	14.0

* Energy savings quoted here assume they are installed in isolation, ie. do not consider the impact of demand reduction made possible from other opportunities

** All capital costs quoted here are estimates, these should not be taken as actual costs and consultation with a supplier/installer should be undertaken to better understand expected costs. It is assumed the vehicle is purchased outright and not leased, electric vehicle purchasing incentives have not been taken in to account.

¹ [Break-up with combustion engines, BNEF \(2021\)](#)

² [Benefits of electric vehicles, EDF Energy](#)

Fleet carbon reduction opportunities

Refuse collection vehicles (RCV)

- 11 of the fleet's 41 vehicles are diesel fuelled RCVs, responsible for 81% of fleet emissions.
- In order to reduce emissions, RCVs must transition from fossil fuels to electric vehicles. However, the price of electric RCVs could be a barrier to procurement in the short to mid term. It is expected the price of electric RCVs will continue to fall as uptake increases and supply chains become more established. As an interim strategy, BBC could immediately trial then rollout compressed natural gas (CNG) RCVs. During this period, electric RCVs could be trialled with the aim of eventually converting the fleet from fossil fuelled to electric.
- It should be noted that many councils are currently trialling electric RCVs with success. Westminster City Council has partnered with Veolia to roll out a fully electric fleet, from street sweepers to RCVs and Manchester City Council is set to replace half its current fleet of RCVs with electric alternatives.^{1,2}

ID	Opportunity	Description	Energy saving*	GHG savings (tCO ₂ e)	Implementation year	Implementation year GHG savings (tCO ₂ e)	CapEx**	Payback period (yr)
19	CNG RCV trial	Trial use of compressed natural gas RCVs for a number of vehicles	Diesel: 14,728 Lt Biogas: -5,841 kg	38.6	2024	38.6	~£360,000	24.0
20	CNG RCV rollout	Transition whole RCV fleet to compressed natural gas	Diesel: 44,184 Lt Biogas: -17,523 kg	115.8	2027	115.8	~£1,080,000	24.0
21	Electric RCV trial	Trial use of electric RCVs for a number of vehicles	Diesel: 14,728 Lt Electricity: -23,403 kWh	33.1	2030	35.0	~£450,000	33.6
22	Electric RCV rollout	Transition whole RCV fleet to electric vehicles including previously CNG	Diesel: 88,368 Lt Electricity: -234,030 kWh Biogas: 23,364 kg	183.7	2032	201.9	~£4,500,000	60.8

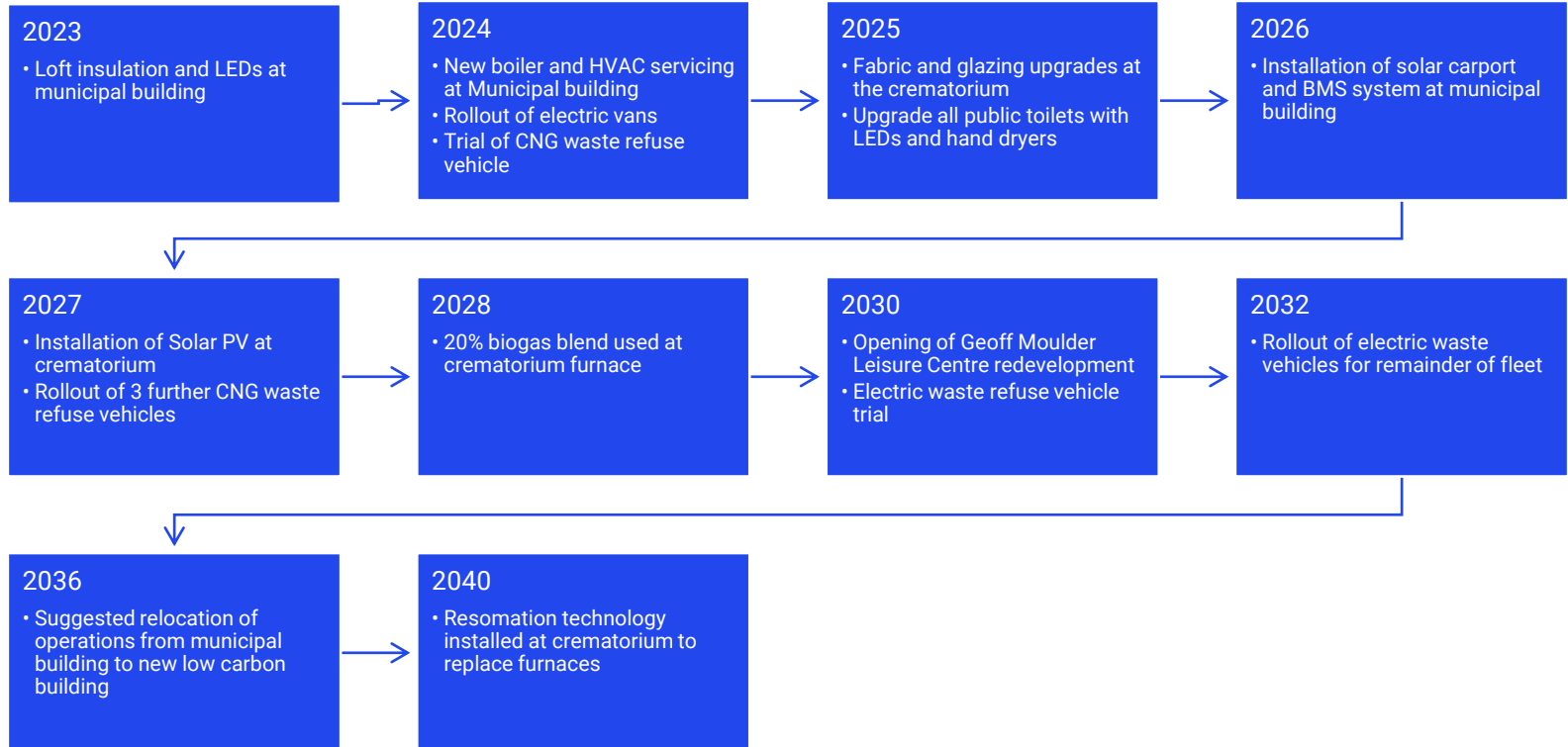
* Energy savings quoted here assume they are installed in isolation, ie. do not consider the impact of demand reduction made possible from other opportunities

** All capital costs quoted here are estimates, these should not be taken as actual costs and consultation with a supplier/installer should be undertaken to better understand expected costs. It is assumed the vehicle is purchased outright and not leased, electric vehicle purchasing incentives have not been taken in to account.

¹ Westminster City Council and Veolia Electric Fleet, 2021

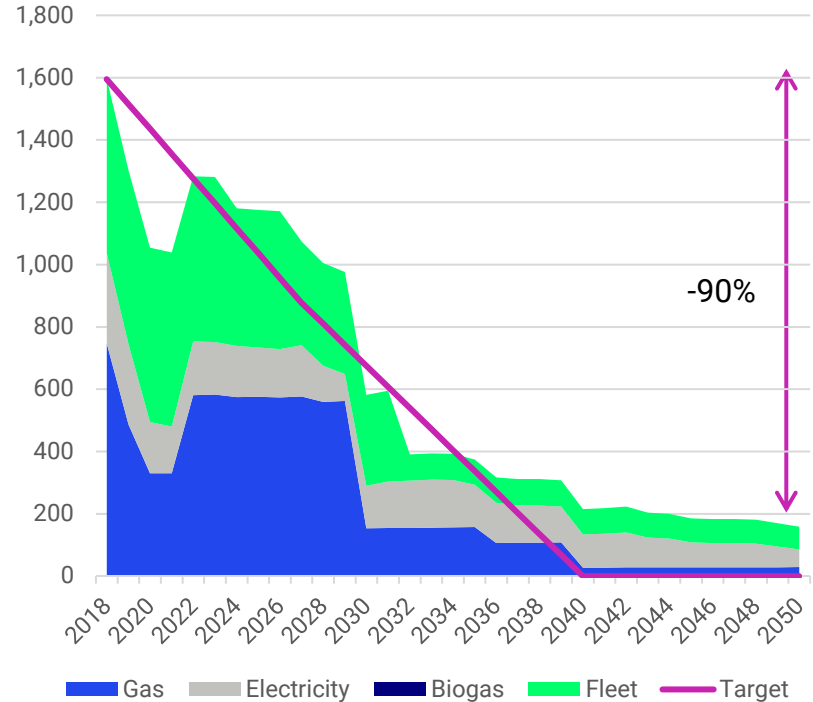
² Manchester City Council invests £9.8m in electric refuse collection vehicles, 2020

Timeline of opportunity implementation



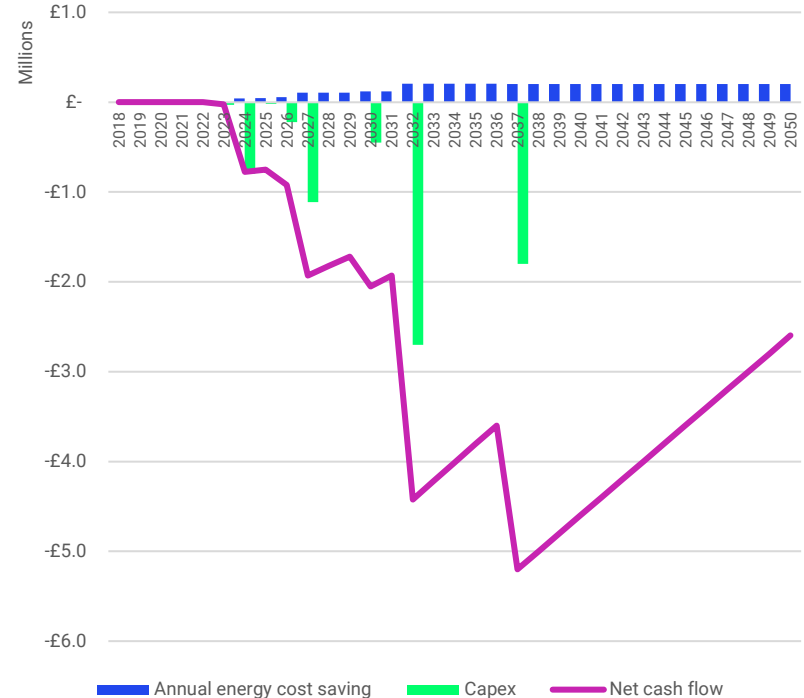
Carbon reduction potential

- If all projects outlined within the previous sections are implemented then it can be expected that **scope 1 and 2 emissions** could decrease by 74% by 2030 and 90% by 2050 from a FY 2018/19 baseline.
- The graph (right) demonstrates the change in emissions with time. This only shows the scope 1 and scope 2 emission sources which have been the focus of the carbon reduction opportunity analysis.
- It is expected there will still be 582 tCO₂e and 159 tCO₂e emitted annually in 2030 and 2050 respectively.
- These residual emissions are largely expected to arise from electricity consumption within the new municipal building and the Geoff Moulder Leisure Complex redevelopment; fleet emissions are expected to be the other significant source of emissions in the future.
- These residual emissions could be reduced by further actions in energy efficiency, use of renewables, or through greenhouse gas removals/offsets.



Project finance and cashflow

- The graph (right) shows the total spend on projects outlined within this section on a year by year basis, as well as the expected annual energy cost savings from said projects.
- It is worth noting here that only projects where capital costs have been quoted are displayed, for example cost of and energy savings of the relocation of the municipal building offices have not been displayed.
- It is expected that the total capital cost of all projects will equal approximately £7.1million; once all projects are implemented annual energy costs are expected to be just over £200k less than they currently are. Overall, this means that Boston Borough Council will not have positive cash flow until 2063.
- Energy saving costs take in to account projected changes in fuel costs.



Commuting and business travel carbon reduction opportunities

- The emissions associated with employee commuting and business travel made up 4% of the total carbon footprint. Although this is a small proportion of the footprint, it is an area where rapid, low cost measures can be effectively implemented. The following opportunities should be considered to reduce the total journeys and mileage carried out through commuting and business travel:
 - Use of video conferencing tools to reduce face-to-face meetings
 - Car sharing schemes reduce miles driven in cars at low capacity
 - Remote working policy to establish when employees need to travel to the office
 - Encourage use of active and public transport as low carbon alternatives to cars
 - Install electric vehicle charging points to encourage employees to own electric cars



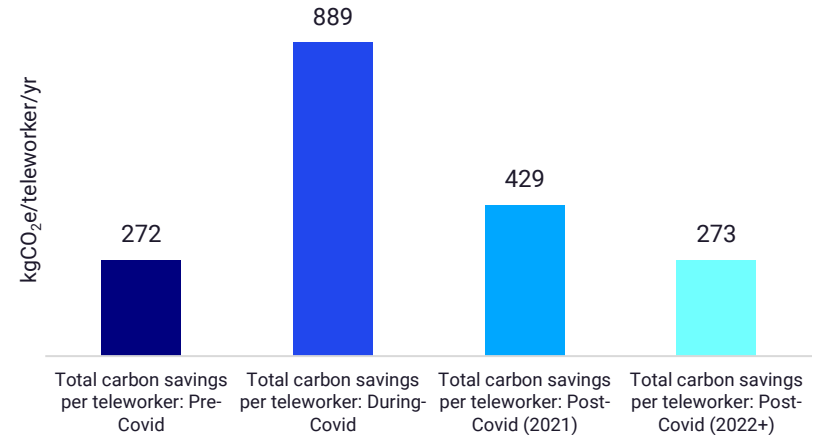
The impact of remote working on emissions

Remote working under a hybrid model may lead to modest carbon savings on an individual level, however the outlook is complicated and hybrid working could lead to a rise in carbon emissions

During the Covid-19 pandemic, people were required to work from home for periods of time. As a result, there was a dramatic reduction in emissions from transport, with road traffic falling between 50 – 75%. However, domestic energy consumption soared, with residential energy consumption jumping 15% at the start of lockdown in the UK.¹

A review of 39 teleworking studies suggested that teleworking reduces energy usage, however differences in methodology, scope and assumptions between studies make it difficult to estimate an ‘average’ energy saving. Despite the generally positive verdict on teleworking as an energy-saving practice, there are numerous uncertainties and ambiguities about its actual or potential benefits. These relate to the extent to which teleworking may lead to unpredictable increases in non-work travel and home energy use that may outweigh the gains from reduced work travel. The available evidence suggests that economy-wide energy savings are typically modest, and in many circumstances could be negative or non-existent.²

A report published by the Carbon Trust found that remote working could save 4.1 MtCO₂e per year in the UK.³ The report considered emissions from office energy, avoided commuting and residential energy consumption. Teleworking post-Covid (2022+) was found to have the potential to save 273 kgCO₂e/teleworker/year. The study found that saved office emissions were the largest contributor, followed by avoided commuting, particularly where office buildings are inefficient. The scenario is based on assumptions about future behaviour and ways of working and is inherently highly uncertain.



¹<https://www.iea.org/commentaries/working-from-home-can-save-energy-and-reduce-emissions-but-how-much>

² [A systematic review of the energy and climate impacts of teleworking, Sorrell et.al \(2020\)](#)

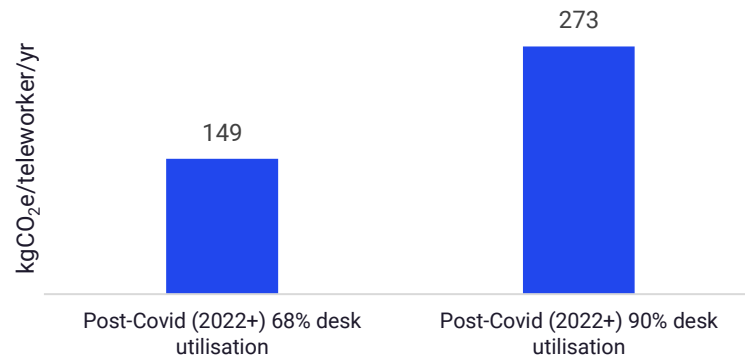
³ [Homeworking Report, Carbon Trust & Vodafone Institute for Society and Communication \(2021\)](#)

The impact of remote working on emissions

Remote working under a hybrid model may lead to modest carbon savings on an individual level, however the outlook is complicated and hybrid working could lead to a rise in carbon emissions

The study found that factors such as seasonality, proximity to office, and mode of transport also have an effect on an average teleworker's emissions. For example, a German teleworker commuting to the office in winter can reduce their carbon impact by working in the office; whereas in summer they will reduce their impact by working at home, whether they commute by train or car. Further, a typical German teleworker commuting from a rural setting in winter will save emissions by working from home, where an urban-based teleworker will increase their individual emissions.

Building stock energy efficiency is also important. In winter, as domestic energy consumption rises to respond to the heating demand in the UK, the carbon impact of teleworkers might end up being much higher, particularly where the building stock is predominantly inefficient. This could exacerbate the negative impact from inefficient homes that consume a lot of energy and office buildings only partly utilised that would heat half-empty offices. This effect could also be seen where there is a risk of households being split between teleworking and the office. In the worst-case scenario, this split could result in higher energy consumption and more emissions as both homes and offices are fully operating to enable both parties to work.



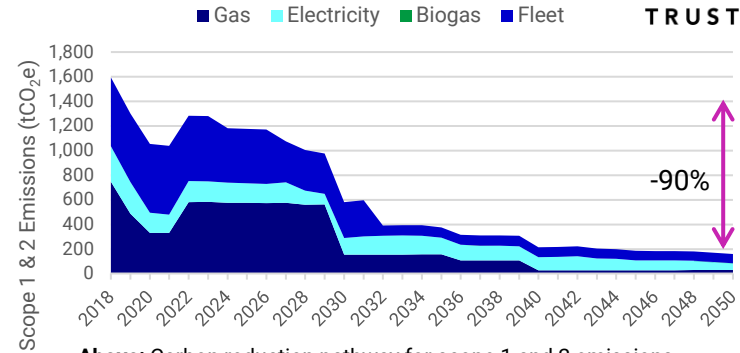
¹<https://www.iea.org/commentaries/working-from-home-can-save-energy-and-reduce-emissions-but-how-much>

² [A systematic review of the energy and climate impacts of teleworking, Sorrell et.al \(2020\)](#)

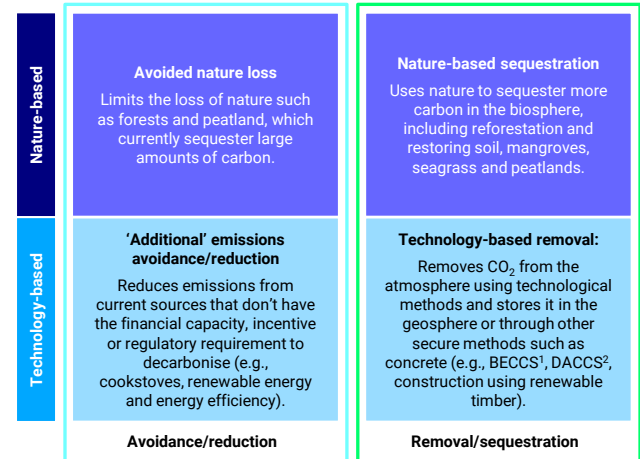
³ [Homeworking Report, Carbon Trust & Vodafone Institute for Society and Communication \(2021\)](#)

Gap-to-target

- Complying with national targets for Net Zero 2050 will require BBC to dramatically reduce its carbon emissions. However, there may be some hard-to-abate emissions remaining after implementation of ambitious decarbonisation projects.
- If all projects outlined in this report are implemented then it can be expected that scope 1 and 2 emissions could decrease by 90% by 2050 from a FY 2018/19 baseline.
- It is expected there will still be **159 tCO₂e gap-to-target** for a target of Net Zero 2050 for scope 1 and 2 emissions.
- These residual emissions arise from electricity consumption in the new municipal building and Geoff Moulder Leisure Complex redevelopment; fleet emissions are expected to be the other significant source of emissions in the future.
- These residual emissions could be reduced by further actions in energy efficiency and use of renewables. Once every effort has been made to reduce these emissions, offsetting using nature/technology-based greenhouse gas removals (GGRs) can be considered. **It is crucial that offsetting should always be secondary to all efforts for reducing emissions within the BBC's own GHG inventory.**



Above: Carbon reduction pathway for scope 1 and 2 emissions

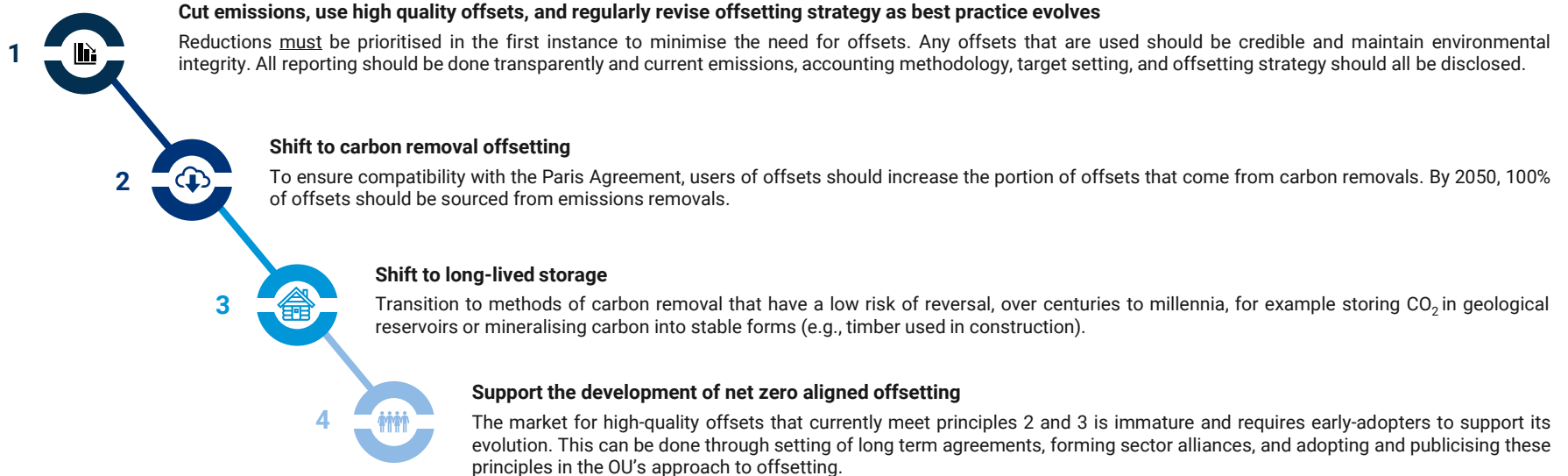


Above: the four categories of carbon offsetting.

Approach to offsetting

The voluntary offset market will undergo significant change between now and 2050

The exact level of GGRs required by BBC is not clear and the Council should outline an offsetting strategy to ensure integrity and validity of any GGRs purchased. Market demand for voluntary offsets is expected to soar as Net Zero commitments rise and global offsetting schemes (e.g. CORSIA¹) become effective. The current market is not fit-for-purpose and many of the historic credits that exist on the market draw criticism for not meeting robust standards. There are therefore calls from market participants (e.g. the Taskforce on Scaling Voluntary Carbon Markets) to reform these carbon markets and a substantial amount of guidance is expected between now and 2050 as the sector evolves. In the long term, the principles set out by the University Oxford for net zero aligned carbon offsetting are recommended as a guide for BBC:²



¹ CORSIA: Carbon Offsetting and Reduction Scheme for International Aviation

² <https://www.smithschool.ox.ac.uk/publications/reports/Oxford-Offsetting-Principles-2020.pdf>



Boston Borough Council Carbon Reduction
Plan

Governance and engagement



Governance

- To manage the implementation of a Carbon Reduction Plan it is important that organisational procedures and resources are put in place to maintain a focus on carbon reduction over time.
- In order to achieve carbon reductions that will support decarbonisation ambitions, BBC will have to consider robust, yet dynamic organisational structures, to ensure that they remain flexible in the approaches being taken to reduce emissions over time.
- The Climate Change and Environment team should work with all departments across the council to ensure progress is made.



Stakeholder engagement

- Robust engagement with stakeholders from across the Council will be crucial to enable successful climate action and project implementation. BBC should explore innovative ways for the whole organisation to contribute towards decarbonisation.
- An effective engagement strategy should be drawn up that actively involves all Council departments, employees and Councillors. Achieving the greatest possible input and buy-in will allow BBC to work closely with stakeholders to identify priority areas for emissions reductions. It will be important for the Council to remain transparent throughout all engagement activities, and to provide stakeholders with the opportunity to contribute towards the planned reduction activities that the Council intends to implement across its own estate.



Boston Borough Council Carbon Reduction
Plan

Monitoring and reporting



Monitoring and reporting

- Once a carbon footprint has been measured, a target set, and a Carbon Reduction Plan outlined, monitoring progress is an important part of implementation. Monitoring and reporting are essential activities that should be undertaken at least annually between the baseline year and target year, and beyond.
- Regular data collection and calculation of the carbon footprint should be undertaken to track progress against decarbonisation targets.
- Not only does the footprint need to be monitored at least annually, but progress with implementing carbon reduction opportunities should be actively monitored too. This should include implementation year, energy reduction and cost savings. By doing so, successful projects can be reported in a quantitative as well as a qualitative way. This can help to drive momentum and support the securing of budget for future measures. In addition to monitoring the footprint itself, the project team should continually monitor how local plans and policies will affect the Council's footprint and affect the ability of the Council to reach its carbon reduction target. This will help the team to identify other potential carbon reduction opportunities and ensure that any carbon reduction co-benefits of specific policies and actions can be delivered.



Boston Borough Council Carbon Reduction
Plan

Appendices

Appendix A

Stakeholders engaged

- Key personnel within the Council’s operations were engaged to better understand the opportunities for decarbonisation. The following people were contacted to be interviewed:

Person	Position
Andy Fisher	Assistant Director - General Fund Assets, Boston Borough Council
Nigel Hall	Property Services Officer, Boston Borough Council
Richard Tweddell	Property Manager, Boston Borough Council
Martin Potts	Principal Officer – Bereavement, Boston Borough Council
Victoria Burgess	Assistant Director – Neighbourhoods, Boston Borough Council
Dave Horry	Principal Leisure Services Officer, Boston Borough Council

Appendix B

General assumptions

- All emission factors are taken from and align with the BEIS GHG reporting emission factors
- The following fuel unit costs are assumed: Gas – 3p/kWh, Biogas – 3p/kWh, Electricity – 11p/kWh, Diesel – 108.43p/litre
- Air source heat pumps are assumed to have a CoP of 3.0, existing boilers to be 80% efficient, and new boilers to be 95% efficient
- The average annual temperature within Boston is 13.95°C, as taken from local weather stations
- Internal building temperatures are assumed to be 20.5°C

Appendix B

Project assumptions

Project ID	Assumptions
1	Existing U-value – 0.2W/m ² K; New U-value – 0.11W/m ² K; Roof area – 1,805m ²
2	Municipal building aligns with CIBSE Part F type 2 ‘typical’ office; LED saving results in 50% energy decrease as per CT guide CTV049
4	Municipal building aligns with CIBSE Part F type 2 ‘typical’ office; 25%:75% split between gas use for HWS:Heating; 10% energy saving possible through HVAC servicing as per carbon trust guide CTV046
5	10% total energy saving possible as per carbon trust guide CTG054
6	Potential solar PV area – 441m ² ; 80% of area available for panels; 1m ² = 0.15kW _p ; EST solar calculator – 1kW _p = 854.7kWh/yr
7	New build to have same floor area as existing site; new site to be electrically fuelled only; building to be built to RIBA 2030 standard of total energy intensity of 55kWh/m ²
10	Assume new leisure centre complex to have same floor area, and to meet CIBSE guide F ‘good’ benchmark energy intensity of 360kWh/m ²
11	Total glazed area – 30.8m ² ; existing U-value – 5W/m ² K, new U-value – 1.2W/m ² K
13	Existing U-value – 0.55W/m ² K; New U-value – 0.23W/m ² K; Roof area – 156.5m ²
14	Existing U-value – 0.2W/m ² K; New U-value – 0.11W/m ² K; Roof area – 268.5m ²

Appendix B

Project assumptions

Project ID	Assumptions
15	Potential solar PV area – 214.8m ² ; 80% of area available for panels; 1m ² = 0.15kW _p ; EST solar calculator – 1kW _p = 854.7kWh/yr
16	Gas blend to be 20% biogas, 80% natural gas
17	Resomation website literature – process consumes 1/5 of current cremation process
18	Current miles per litre for diesel – 7.2 miles/litre; Ford e-transit van achieves 2.93 miles/kWh _e
19	Assume CNG vehicles will use compressed biogas as opposed to natural gas; current diesel refuse vehicle – 0.68 miles/litre; CNG vehicle achieves 0.58 kg(CNG)/mile; assume only one vehicle trialled initially in 2024
20	Assume a further three vehicles converted to CNG in 2027
21	Current diesel refuse vehicle – 0.68 miles/litre; electric vehicle achieves 2.34kWh _e /mile; assume only one vehicle trialled initially in 2030
22	Assume remaining diesel refuse vehicles converted to electric in 2032, assume CNG refuse vehicles converted to electric in 2037

Appendix C

Abbreviations

• GHG	Greenhouse gas	• SO _x	Sulphurous oxides
• BBC	Boston Borough Council	• BAU	Business as usual
• DEC	Display energy certificate	• FTE	Full time employee
• PSDS	Public sector decarbonisation scheme	• BEIS	Department for business, energy and industrial strategy
• SBT	Science based target	• EV	Electric vehicle
• SBTi	Science Based Targets Initiative	• CIBSE	Chartered institute of building services engineers
• tCO ₂ e	Tonnes of carbon dioxide equivalent	• CCC	Committee on climate change
• PV	Photovoltaics	• GGR	Greenhouse gas removal
• CoP	Coefficient of performance	• CNG	Compressed natural gas
• aM&T	Automatic monitoring and targeting	• CT	Carbon Trust
• BMS	Building management system	• EST	Energy saving trust
• FES	Future energy scenarios	• DACCS	Direct air carbon capture and storage
• A/GSHP	Air/Ground source heat pump	• RCV	Refuse collection vehicle
• kWh	Kilowatt hour		
• LED	Light emitting diode		
• HVAC	Heating, ventilation and cooling		
• GWP	Global warming potential		
• NO _x	Nitrous oxides		



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