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Colchester Borough Council

Climate emergency action planning: Pathway modelling and scope 3 footprinting

August 2020



Context

Colchester Borough Council (CBC) declared a Climate Emergency in July 2019 and committed to become a carbon neutral organisation by 2030. The Carbon Trust was initially commissioned to perform a carbon footprinting and scoping exercise to inform CBC's action plan. This recent report builds upon the preliminary work and has two main objectives:





a. Modelling of the Council's carbon neutral target out to 2030.

We have performed macro-level pathway modelling to map the Council's emissions out to 2030, accounting for national trends & potential projects that the Council could implement. The analysis allows for the Council to prioritise action between now and 2030 by understanding the type and scale of projects that should be implemented, as well as the emission sources that will still be present in 2030 under the scenario presented.

b. Expanding the footprint.

The footprint calculated in Phase 1 is made up of emission sources included in the Council's carbon neutral target, which were selected based on their data availability and ability to be influenced by the Council. This report broadens the footprint to include emission sources further outside of the Council's direct operational control, so called Scope 3 emissions. Practical advice around target setting for these emission sources is also provided.

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Executive Summary

Interviews with four officers responsible for emission hotspots were used to identify projects to include in macro-level scenario modelling of the Council's footprint. Nine potential projects were identified, and their emissions impact and implementation year(s) was estimated to map CBC's emissions out to 2030. The effect of the national grid decarbonising was included in the analysis.

Our analysis shows that the projects would reduce the Council's emissions by **3,401 tCO₂e by 2030**, approximately 55% of baseline emissions.

Several large 'step-change' projects were identified that will have a significant impact of the Council's emission trajectory: fleet electrification, replacement of the gas-fired CHP at Leisure World, and refurbishment of the Council's sheltered housing stock.

For the Council to achieve their carbon neutral target, further actions will have to be taken to reduce the residual emissions shown in this analysis (2,788 tCO₂e)

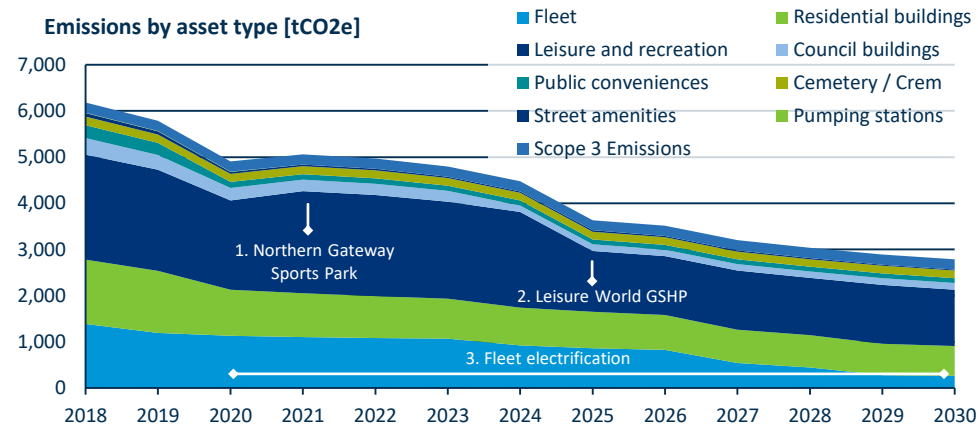


Figure ii. Pathway analysis of CBC's carbon neutral target to 2030. 'Step-change' projects include:

- | | |
|------------------------------|----------------------------|
| 1. Fleet electrification | - 1,090 tCO ₂ e |
| 2. Leisure World GSHP | - 787 tCO ₂ e |
| 3. North Gateway Sports Park | + 337 tCO ₂ e |

A formalised Action Plan should consolidate the recommendations made in this report, and include action to:

- Undertake detailed feasibility studies and develop business cases for the large step-change projects. These will require significant investment and their operation and phasing should be optimised before implementation.
- Consider ways to further reduce the gap-to-target, this should incorporate: the implementation of best practice across the estate (e.g. minimum energy standards for end-of-life replacements, building controls, behavioural shifts); the aggressive phasing out of fossil fuels across the Council's estate; and the consideration for offsetting any residual emissions.
- Introduce a monitoring and reporting cycle to regularly review progress against proposed activities, assigning an owner and timeframe for each action.



Executive Summary

To build on the understanding of the Council's own operations, a comprehensive Scope 3 footprint was calculated to allow the Council to understand the wider environmental impact of their value chain. For FY 18/19, CBC's Scope 3 footprint was **31,842 tCO₂e**, or ~84% of CBC's overall footprint. The majority of emissions are concentrated in two emission categories: **equity investments (47.7%)**, including Colchester Borough Homes (46.6%) and Colchester Amphora (1.08%), and **procured goods & services (40.4%)**.

The breadth of activity that the Council, CBH and Amphora has across the community make reductions in Scope 3 emissions a prime opportunity to drive sustainable change in the Borough. Likewise, a commitment to reduce the remaining emission sources (e.g. employee commuting, business travel) has the potential to secure buy-in across Council officers & members through tangible initiatives.

Over 90% of CBC's Scope 3 footprint has been calculated based on either economic proxies or benchmarks that are not sensitive to local context. For target setting, it is important to ensure the availability of quality data going forward to allow for accurate and regular reporting against the target. The Council should consider incorporating emission sources with good data quality & availability into the carbon neutral target, and prioritise data improvement for emission sources with lower quality data.

% of Scope 3 emissions

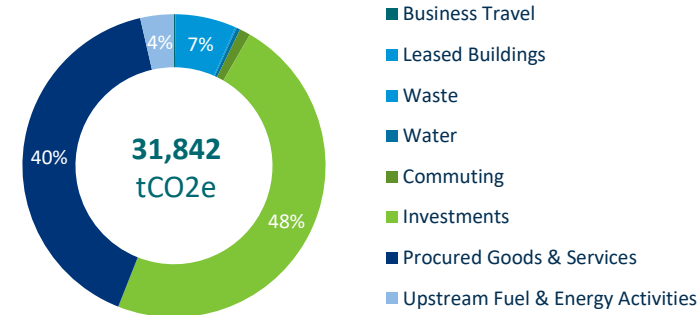


Figure ii. Breakdown of CBC's Scope 3 footprint for FY 18/19

It is recommend that the Council:

- Communicate and embed sustainability as a core value when engaging with the value chain to reduce CBC's overall environment impact & drive change in the Borough.
- Include Employee Commuting in the overall carbon neutral target and annual reporting of the Council's footprint – in addition to the other Scope 3 elements already included: business travel, water, and waste.
- Improve the collection of primary data for procured goods & services, leased buildings, and equity investments.
- Consider alternative target setting mechanisms for the housing stock managed by Colchester Borough Homes (e.g. EPC target)

Section 1. Pathway modelling: carbon neutral target

Colchester Borough Council has set a target of becoming a carbon neutral organisation by 2030. The target incorporates emission sources that have good data availability, to allow for consistent and accurate monitoring and reporting, and are within the Council's sphere of influence, allowing the Council to achieve reductions through actionable changes. This includes¹:

- Fuel consumption in the Council's fleet;
- Energy consumption in Council-operated buildings;
- Disposal and treatment of waste generated by the Council (including water);
- Emissions arising from business travel.

The Carbon Trust measured the Council's footprint from these emission sources, and for the financial year 2018/19 CBC's footprint was **6,180 tCO₂e** (see figure 1 for a more detailed breakdown). It is the Council's intention to reduce as much as feasibly possible by 2030, and offset any residual emissions with good quality offsets.

To gain an understanding of the pathway to decarbonisation and to prioritise focus areas for mitigating actions, macro-level scenario modelling was performed to map the Council's emissions out to 2030. The modelling accounts for potential projects that will have a material impact on the Council's baseline and the impact of the national grid decarbonising.

Further information about the Council's baseline footprint can be found in Appendix A.

¹ Emission sources are often categorised by scopes, as defined by the World Resources Institute (WRI). The Council's target is entirely inclusive of scope 1 and scope 2, and includes some elements of scope 3 (business travel, disposal and treatment of waste).

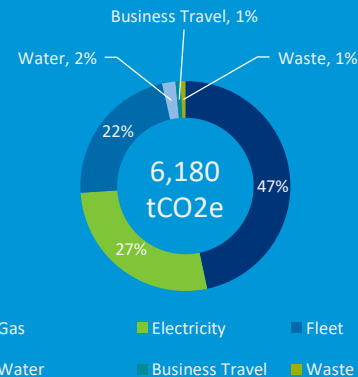


Figure 1. CBC's measured footprint for FY 18/19, and baseline for the carbon neutral target



Priority project identification

‘Hotspot’ areas were identified in the footprint as areas that offered the most potential for emissions reduction – these were energy consumption in buildings (particularly within leisure and recreation) and the fuel consumption in Council’s fleet. Interviews with 4 key CBC officers were conducted to develop a list of priority projects that could feasibly be implemented in these areas before 2030. Some of the key takeaways from the interviews included:

- 1. Ambition to become a fully electric fleet by 2030.** It is the Council’s intention to replace all end-of-life vehicles with electric vehicles (EVs), or hybrid vehicles where full electrification is not possible in the short term. The procurement cycle for the Council’s fleet is ~8 years, feasibly allowing for all vehicles to be electrified by 2030, including the Council’s large waste vehicles that are due for renewal in the 2028.
- 2. Decarbonisation of heat is being considered.** The majority of the Council’s stock is currently heated by gas boilers, but CBC is looking to prioritise low-carbon heating options where possible and the implementation of heat pumps has been considered for several sites. This should be considered in parallel with improving the energy performance of the building through fabric retrofits.
- 3. Renewable electricity** (Solar PV) is being generated on a number Council-operated buildings, and the transition to energy efficient practices has begun in several areas (e.g. LED lighting, occupancy controls).



Interviewees and areas of responsibility:

Lee Spalding	General buildings maintenance and performance
Rob Doran	Fleet manager
Richard Walker	Car parks
Tim Swallow	Leisure and recreation

Project identification

Nine projects that would have a material impact on the Council's carbon emissions were identified. The emission reduction associated with each intervention was quantified & layered on the baseline to map the Council's emissions out to 2030. At this stage the analysis focused on impact on emissions reduction and does not take into account cost of feasibility, which would need to be looked at in the next stage.

The pathway modelling focuses on larger projects in the Council's hotspot areas and should not be taken as a definite list of all that is possible. The Council should look to continue to seek out project opportunities that achieve emissions reductions alongside their primary benefits. Importantly, the Council should assess all projects for their emission reduction potential, to ensure that at least they won't have an adverse impact on the Council emissions.

Table 1. Nine potential projects identified during officer interviews. Further details of the project's can be found in Appendices B, with technical assumptions in Appendix C.

I.D.	Impact Area	Project Description	Year
1	Fleet	Full electrification of the fleet by 2030	2020 – 2030
2	Leisure & recreation	Replacement of gas fuelled CHP at Leisure World with an electric ground source heat pump (GSHP)	2025
3	Leisure & recreation	Solar PV installed at Leisure World car park	2028
4	Leisure & recreation	Addition of the Northern Gateway Sports Park to the Council's baseline	2021
5	Council buildings	Adoption of recommendations made in the CBH report 'Rowan House Refurbishment Project Feasibility'	2024
6	Council buildings	Town Hall: installation of a new gas boiler	2019
7	Residential buildings	Refurbishment of sheltered housing stock (Inc. fabric retrofit & LED roll-out)	2020 - 2030
8	Public conveniences	LED lighting installed at St John's and St Mary's car park	2020
9	Public conveniences	Middleborough car park removed from the Council's stock	2020

Project implementation

Our analysis shows that the nine identified projects would reduce the Council's emissions by **3,401 tCO₂e by 2030**.

This figure includes the expected decarbonisation of the national grid. (The carbon intensity of grid electricity is decreasing as the proportion of electricity generated from renewables increases and conventional fossil-fuel power generation is phased out.) From an emissions perspective this increases the attractiveness of electricity as a fuel source and is a significant contributor to the Council's expected emissions reduction. The two highest impact projects – fleet electrification and installation of a GSHP at Leisure World – both involve the displacement of fossil fuel with electricity. **Electrification will be critical for the Council to achieve their decarbonisation target.**

However, the electrification of the conventional technologies (e.g. vehicles, gas boilers) often requires supplementary measures and infrastructure, and should not be viewed as a like-for-like replacement. The Council should be aware of the requirements associated with electrification and plan a strategy for its' successful implementation across transport & heat.

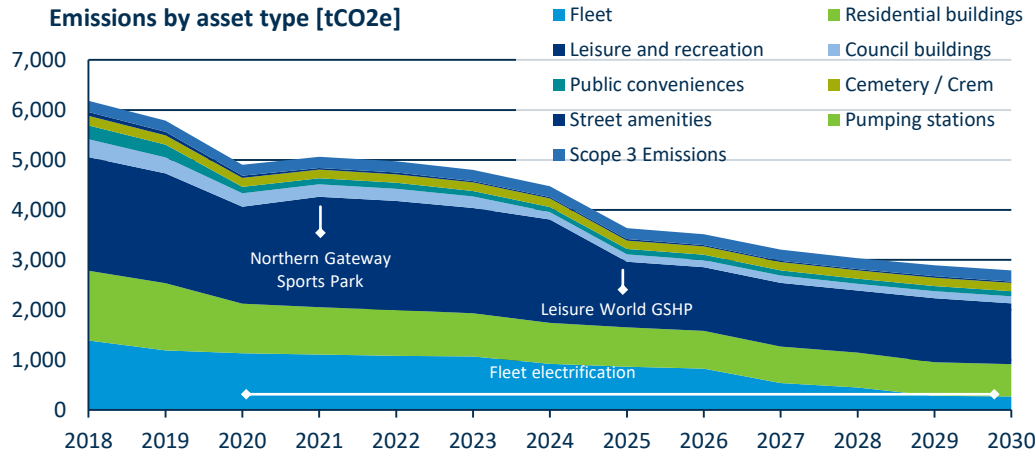


Figure 2. Pathway analysis of CBC's carbon neutral target to 2030 by asset type

'Step-change' projects:

1. Fleet electrification - 1,090 tCO₂e
2. Leisure World GSHP - 787 tCO₂e
3. Sheltered housing refurb. - 400 tCO₂e
4. Northern Gateway Sports Park + 337 tCO₂e

Project implementation

Under the scenario analysed, the electrification of heat and transport increases electricity consumption increases by 62%. Despite the increased kWh consumption, electricity-related emissions decrease by 50% due to national-level grid decarbonisation. The emissions associated with the Council's electricity will continue to decrease beyond 2030 as the grid decarbonises further; between 2030 - 2050, a 70% reduction in the UK's grid carbon intensity is forecast.

Whilst beneficial from an emissions perspective the **changing of fuel types has a social and economic impact**, and the improper installation and/or operation of electrified technologies (e.g. heat pumps) can result in increased costs and reduced user comfort. The Council should therefore develop feasibility studies with accompanying business cases to ascertain the wider impacts of any change; consideration of government incentives, smart tariffs and ancillary services (e.g. demand side response) should be considered in the business case for electrification. The Council should also look to engage with end-users to ensure best-practice operation is followed to facilitate the user's transition to new technologies, and ultimate acceptance/comfort in doing so.

By 2030, gas is expected to remain the largest contributor to CBC's overall footprint despite a 40% reduction in its consumption. Under the scenario, gas use in 2030 is concentrated in Leisure facilities - predominately Leisure World - and sheltered housing managed by the Council (*see Appendix B*).

Fuel consumption relative to baseline %

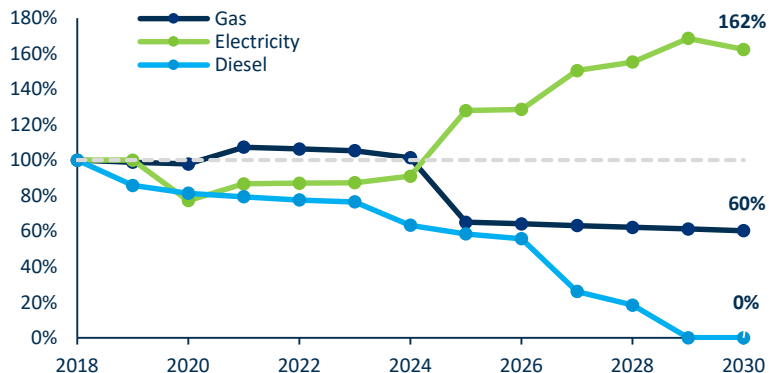


Figure 3. Fuel changes in the scenario relative to baseline consumption

Emissions by fuel [tCO₂e]

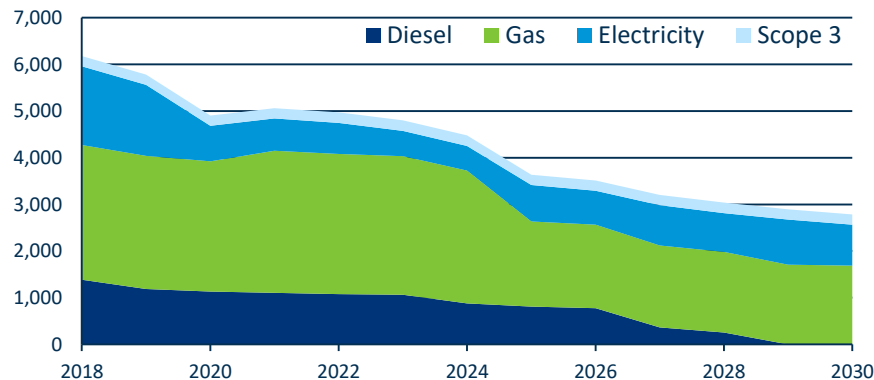


Figure 4. Pathway analysis of CBC's carbon neutral target 2030 by fuel type

Gap to target

The scenario shows that CBC will have approximately **2,788 tCO₂e of residual emissions** in 2030. This is a significant reduction on the baseline but still represents a gap to the Council's target. To close the gap further, it is recommended that:

a. Implement best practice across the estate.

The scenario presented does not account for incremental progress in energy efficiency, building controls, and behavioural shifts. *Best-practice in all of these aspects will have to be followed for CBC to achieve carbon neutrality by 2030.* A review of building management systems (BMS), end-of-life procurement guidelines, and employee engagement should be conducted to optimise the use of assets under the Council's control. CBC should ensure their climate emergency target is imbedded into broader Council policy and processes, so that no other activity is inadvertently having a detrimental effect on reaching the target.

b. Aggressively pursue hotspot areas consuming fossil fuels.

Unlike electricity, emissions from direct fossil fuel use (e.g. gas) are less sensitive to macro-level trends and will require Council intervention to substantially reduce. The phasing out of fossil fuels can feasibly extend beyond this scenario e.g. the electrification of heat in Sheltered Housing, and CBC should consider electrification as a primary option where it is feasible. Where gas consumption is required in some capacity due to technical, financial or social constraints, optimisation studies should be performed to reduce its use as far as possible.

c. Additions to the estate

Additions and/or changes to the estate should be captured in the Council's reporting. If the Council is involved in any new build projects, the energy performance of the building should be a core component throughout the design, procurement, and construction phases of the project. See page 16 for further detail.

c. Offsetting

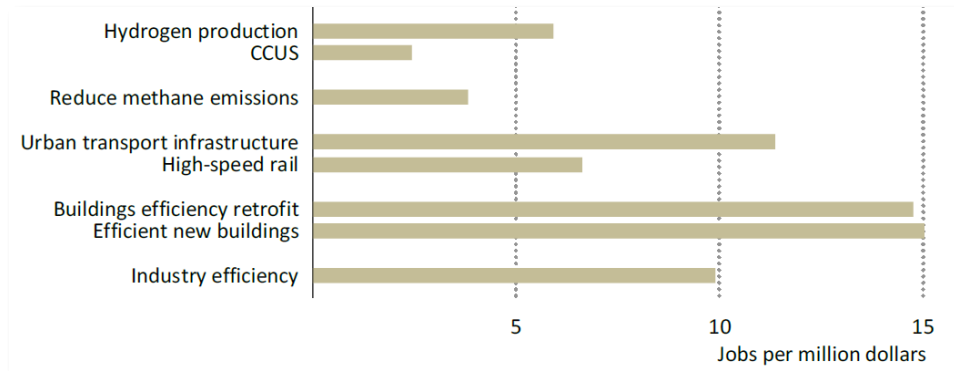
Even under an extreme decarbonisation pathway, it is likely that CBC will still have some residual emissions in 2030. It is therefore recommended that the Council consider the formation of a robust offsetting strategy with high quality credits, to match these residual emissions – see page 12 for further detail.



Sustainable recovery after Covid-19

The projects proposed in this scenario would create a step-change in the Council's environmental performance and will require significant resource commitment over the next 10 years to achieve. Green investment has been shown to create stimulus for social, health and economic gain in both the short and long-term, with the IEA identifying several projects proposed in this report (electrification of transport, retrofit of buildings, solar PV) as some of the most efficient mechanisms for creating construction and manufacturing jobs¹. CBC should consider how the Council's target and broader sustainability can be maximised through the Covid-19 response, and look to localise the potential benefits as much as possible.

Novel ways of accessing financing are starting to emerge that could support the investment required. For example, in April 2020, Abundance Investment issued the UK's first Community Municipal Investment for West Berkshire Council that will support specific projects within their carbon neutral Action Plan². The Council should explore similar opportunities to access the finance required. Short term Covid-19 stimulus packages, such as the Green Homes Grant, could help facilitate multiple Council objectives, including the carbon neutral target, and help improve the viability of projects with more marginal business cases.



¹ IEA (2020), *Sustainable Recovery*, IEA, Paris <https://www.iea.org/reports/sustainable-recovery>

² <https://medium.abundanceinvestment.com/west-berkshire-council-gives-the-green-light-to-the-uks-first-community-municipal-investment-54c59d28989>

A low-angle photograph looking up at the tall, slender trunks of a forest, reaching towards a bright, sun-dappled sky. The perspective creates a strong sense of height and verticality.

Carbon offsetting

Carbon offsetting is a mechanism for cancelling out residual GHG emissions through the reduction of emissions outside of an organisation's emission boundary. CBC will still have some residual emissions in 2030, meaning offsetting will be required for the Council to achieve carbon neutrality. Carbon offsetting can typically be categorised into three broad groups:

- a. **Avoided depletion of natural carbon sinks.** E.g. protecting forested areas, wetlands and peatlands.
- b. **Avoided emissions.** E.g. renewable energy projects, energy efficiency projects.
- c. **Greenhouse gas removal,** either natural (e.g. forestation, ocean fertilisation) or engineering (e.g. direct air capture)

CBC has previously explored tree planting as a mechanism to achieve carbon offsets. Although tree planting creates a natural carbon sink, accounting for the level of carbon reduction is complex & is dependent on several local factors (tree maturity, land-use changes, tree health etc.). Tree planting should be encouraged & offers several social and environmental co-benefits (creation of green space, enhanced biodiversity), but should not be viewed by the Council as a silver bullet to offset all residual emissions. It is likely that the Council will require a divested offsetting strategy incorporating the three groups above.

The exact level of offsetting required by CBC is still not clear and guidance is expected to progress between now and 2030. (The World Resource Institute and the Carbon Trust are developing a new accounting standard for GHG removal, which is due for public comment in 2021). It is recommended that the Council agree on several principles around which a specific offsetting strategy can be built as the sector develops. Any strategy should include the principles of:

- a. **Reductions before offsetting.** Offsetting should only be explored after efforts to achieve reductions within an organisation's emission boundary have been explored.
- b. **Additionality.** The reductions achieved should be additional to what would have happened in the absence of the project.

CBC can also derive some additional conditions for an offset strategy, for example dictating that an investment should be localised and look to achieve carbon reductions in the local community.

Recommendations

The Council will have to develop and implement an ambitious Action Plan to achieve their 2030 carbon neutral target. The following phased recommendations are made from this report, which should be consolidated in a formalised Action Plan:

In the short-medium term (2020 – 2025) the Council should:

- Pursue easy-wins throughout the estate. Implement technologies that have a high technology readiness level (TRL) and established business cases (e.g. LED lighting, occupancy controls, EC plug fans). Incorporating these proven technologies can be done with fewer feasibility studies, business plan development etc. and should as a very minimum be included in procurement guidelines for end-of-life replacements.
- Introduce the electrification of transport and heat where practical and cost effective. Favourable use-cases should be initially prioritised for electrification (e.g. smaller vehicles where the EV market is mature, or high energy performing buildings that can adopt a heat pump with minimal retrofit). The Council should use the opportunities to upskill the local workforce where possible.
- Perform detailed feasibility studies of ‘step-change’ projects (e.g. Leisure World GSHP, deep electrification of the fleet). These projects will require substantial planning and optimisation, but our analysis indicates they will be essential for the Council to achieve the carbon neutral target. It is recommended that feasibility studies are considered for a) the replacement of the gas CHP at Leisure World, b) deep electrification of the Council’s fleet, and c) retrofit programme of Sheltered Housing.
- Consider the core values underpinning an offsetting strategy, and closely monitor the sector as more guidance is published.
- Introduce a monitoring and reporting cycle to regularly review progress against proposed activities, assigning an owner and timeframe for each action.

Medium-long term (2025 – 2030). The Council should:

- Implementation of the larger ‘step-change’ projects, the design and operation of which should be optimised in the earlier feasibility study.
- Heightened roll-out of electric vehicles and building retrofits, facilitated by a mature local supply chain, lower technology costs and improved TRLs. More marginal use-cases where the business case is not as strong may have to be considered for action.
- Consolidate and publish a transparent offsetting strategy for achieving carbon neutrality.



Section 2. Scope 3 footprint

A comprehensive Scope 3 footprint has been calculated to allow CBC to understand their wider environmental impact. The Council also wanted to explore the possibility of setting a target for the Council's Scope 3 emissions to help drive reductions in their value chain, and target setting recommendations have been made.

Scope 3 emissions originate from assets outside of the Council's direct operational control and are measured to understand the indirect emissions associated with an organisation's activities. For many organisations the majority of their greenhouse gas (GHG) emissions lie outside their own operations in their Scope 3. Measuring Scope 3 emissions can allow organisations to:

- Assess where the emission hotspots are in their supply chain;
- Engage suppliers and assist them to implement sustainability initiatives;
- Improve the energy efficiency of the products they use;
- Positively engage with employees to reduce emissions from business travel and commuting.

The indirect nature of Scope 3 emissions make primary data (e.g. energy consumption data) harder to obtain. Where *actual* data is not available, benchmarks and/or proxies are often used to approximate emissions. Additionally, as emission reductions are ultimately reliant on a third party there are fewer direct actions that a reporting organisation can take to reduce their Scope 3 footprint, relative to Scope 1 & 2.

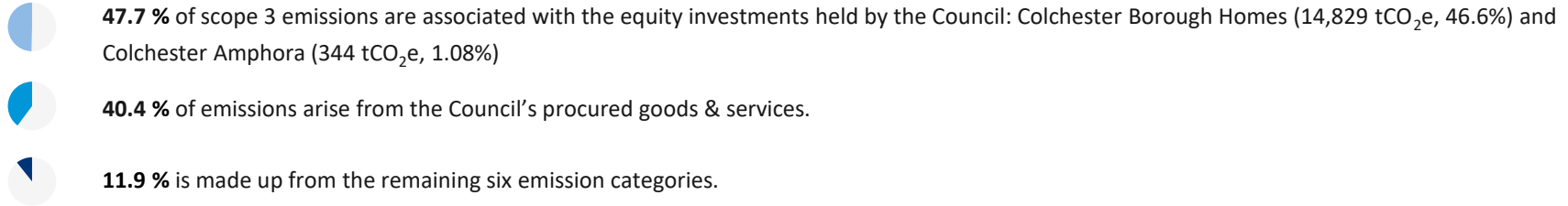
Emission sources in the Scope 3 footprint:

- Council **procured goods** (e.g. paper) and **services** (e.g. construction contracts)
- The energy consumption in **leased buildings** owned by the Council but operated by a third party
- Companies that the Council holds an **equity investment** in
- **Employee commuting** to work
- The **extraction, production, and transportation of fuel and energy** consumed by the Council
- Disposal and treatment of **waste generated by the Council** (including water)
- Emissions associated from **business travel**



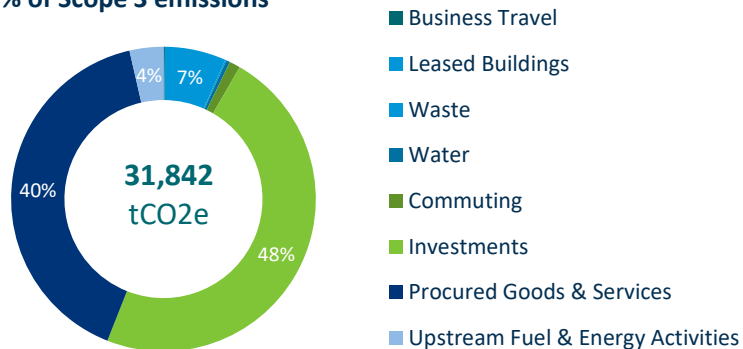
Scope 3 footprinting

CBC's scope 3 footprint for the FY 2018/19 was calculated to be 31,842 tCO₂e. This is primarily made up of two emission categories:



The Council's Scope 3 footprint makes up 84% of CBC's overall footprint, which is typical of UK Local Authorities. Currently, only the emissions associated with business travel and waste (inc. water) are included in the Council's carbon neutral target. The Council are exploring potential target setting options for the remaining emission sources.

(a) % of Scope 3 emissions



(b) % of total footprint

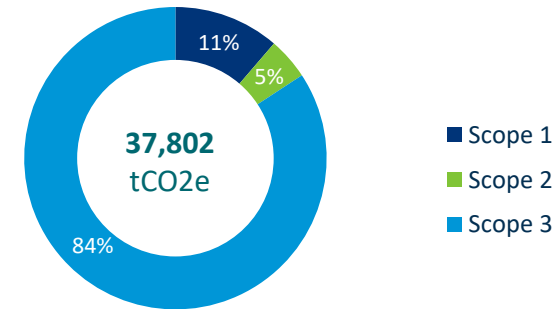


Figure 5. (a) Breakdown of CBC's Scope 3 emissions for FY 18/19 by emission source, (b) Breakdown of CBC's total footprint for FY 18/19 by Scope.

Hotspot 1: Council Investments

The majority of emissions associated with Council investments are related with Colchester Borough Homes (CBH) and the housing stock managed by them. The housing stock consists of 5,281 properties, the bulk of which have good energy performance; properties managed by CBH have an average SAP rating of 72 (relates to EPC C) and ~80% of the stock currently meet the 2035 UK Gov't target for all domestic buildings to reach EPC C. CBH also manage the sheltered housing stock that, whilst strictly outside of their boundaries of control, was included in the Council's carbon neutral target due to their ambition to drive improvements in the stock and heightened influence over their energy performance (see Section 1). The sheltered housing stock is therefore excluded from this analysis.

CBH is a wholly-owned company of Colchester Borough Council, and the Council should use their influence & planning authority to drive reductions associated with the company. This should be done for both the existing building stock and any additions to the building stock – *see below*.

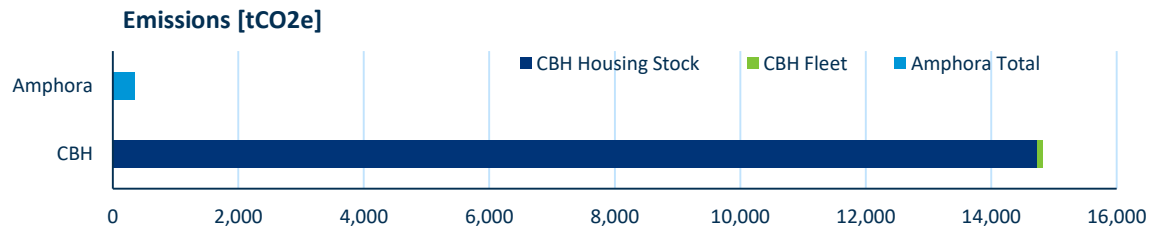


Figure 6. Breakdown of the Scope 3 emission source 'Investments'.

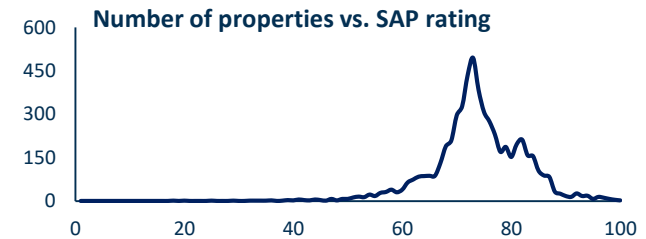


Figure 7. SAP rating of properties managed by CBH

- Existing building stock.** The Council should encourage CBH to adopt sustainability as a core theme in their landlord practices. End-of-life replacements should meet best-in-class energy performance where possible, and tenant engagement should promote sustainable living. Approximately 100 heat pumps have already been installed by CBH; the lessons learnt from this roll-out should be considered and disseminated to facilitate deeper penetration of the technology.
- Additions to the building stock.** The Council should look to embed sustainability in additions to the building stock, and make it a core theme in the design, procurement and construction phases. The Council should look beyond minimum building regulations and use the planning stage to demand high-performing buildings. Low-carbon building standards (e.g. PassivHaus) are becoming increasingly mainstream, and offer the opportunity to upskill low-carbon practitioners in the local area - see the Goldsmith Estate built by Norwich City Council for an example of a PassivHaus social housing design. Low-carbon standards should be considered for every development and implemented where feasible.



Hotspot 2: Procured goods and services

Procured goods and services (PG&S) refers to the upstream emissions (extraction, production, transportation) of products purchased by the Council in the financial year, including both tangible products (goods) and intangible products (services). This ranges from the paper bought for use in Council offices to the manufacturing of concrete used by a construction contractor. Due to its range, PG&S is often one of the largest contributors to a Local Authorities Scope 3 footprint. It is also one of the hardest to obtain primary activity data for and requires significant engagement with the supply chain to accurately monitor & achieve reductions. In the absence of activity data, environmentally extended input-output (EEIO) analysis has been performed to estimate emissions on the basis of contract type of value¹. Whilst EEIO's reduce data requirements and allow for hotspots to be identified, they are a function of industry national-level trends and are not sensitive to local factors (e.g. green procurement). To improve the accuracy of the footprint and make it sensitive to Council actions, CBC should engage with suppliers as much as possible to obtain activity data.

For FY 18/19 the two largest contracts were attributed to construction and procurement contracts. These types of contract are non-recurrent and likely to create a large degree of volatility in the Council's Scope 3 emissions year-on-year. The Council should be aware of this inherent volatility and report transparently around annual variations in PG&S. Although fluctuations in the PG&S (and therefore the wider Scope 3 footprint) will create annual discrepancies, the Council should install sustainability as a core theme in their procurement strategy to produce reductions in like-for-like PG&S. This could include, for example, the use of a Social Value Portal in the procurement of contracts.

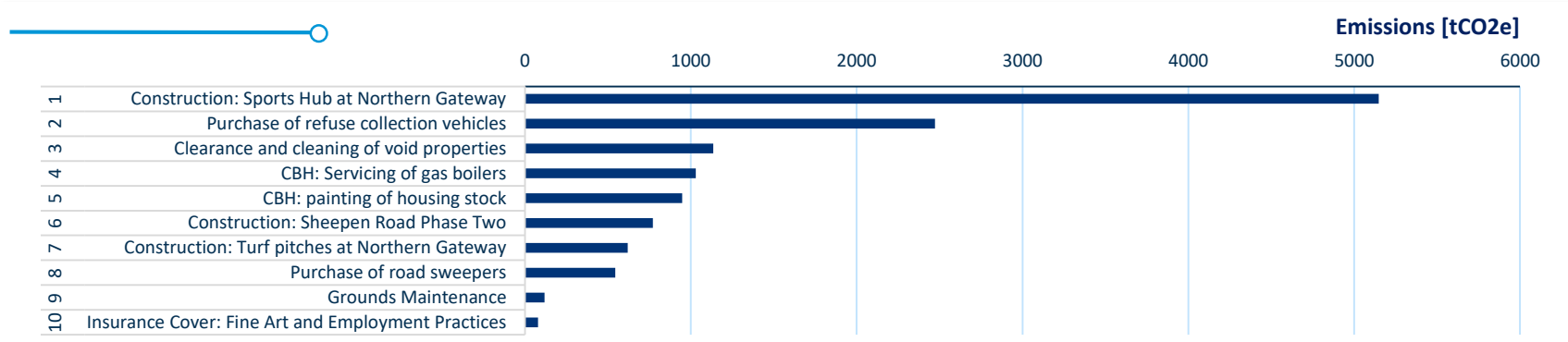


Figure 8. Breakdown of the Scope 3 emission source 'Procured goods and services'.

¹ Activity data was provided for CBC's ground maintenance contract (I.D. 9), the remaining emissions were estimated using EEIO analysis. Refer to Appendix D for further information on the EEIO's used.

Remaining emission sources:

Although far smaller in magnitude than Council investments and PG&S, the remaining Scope 3 emission sources should not be overlooked. Emission sources such as business travelling, employee commuting and waste generation directly stem from employee behaviour, and a commitment to reduce them will result in tangible differences noticed by officers and members in the Council, for example, the provision of EV charging points in the car park, or the promotion of a cycle-to-work day. These actions can powerful drivers for instilling a sustainability culture within the Council and enable buy-in from officers and members for the overall target. The changes should be embraced throughout the Council's hierarchy and across officers and members to create a united approach.

Below are some example actions that could reduce CBC's Scope 3 footprint whilst having a direct impact on Council employees:

Enable remote working



Enable video conferencing



Car sharing incentives



Encourage recycling and reducing waste generation



Encourage use of public transport



Employee engagement



Install showers and storage to promote cycling to work



Carbon literacy training



Target Setting

The Council want to explore the possibility of target setting for their Scope 3 emissions. Before any target is set it is important to ensure the availability of quality data going forward to allow for accurate and regular reporting against the target. It is also important to consider the sphere of influence the Council has over that emission source, such that reductions can be reasonably expected as a result of Council action.

For the FY 18/19, **over 90% of CBC's Scope 3 footprint has been calculated based on either economic proxies or benchmarks** that are not sensitive to local context. It will therefore be difficult to accurately monitor and report against a target until data improvements have been made in these large hotspot areas. A summary of current data quality & the expected availability of ideal data sources is provided below. The Council should consider incorporating emission sources with good data quality & availability into the carbon neutral target. Data improvement should be targeted for sources with low quality data where there is an expectation that the data can be improved; and alternative considerations should be given to sources where model data is unlikely to become available.

Table 2. Evaluation of data for CBC's Scope 3 footprint assessment

Emission Source	tCO2e	Data used	Data quality	Ideal Data	Data availability	Recommendation
Water	127 (0.40%)	Water consumption data		Water consumption data		Include in target
Waste	43.4 (0.14%)	Waste generation & treatment data		Waste generation & treatment data		Include in target
Business Travel	49.8 (0.16%)	Transport type & mileage		Transport type & mileage		Include in target
Procured G&S	12,870 (40.4%)	Contract values Grounds maintenance fleet data		Contractor energy consumption data		Data improvement
Leased buildings	2,070 (6.5%)	Floor area & building type		Energy usage of lessor		Data improvement
Investments	15,173 (47.7%)	Annual revenue (Amphora) Fleet, building floor area & EPC data (CBH)		Apportioned energy consumption data		Data improvement Consideration of other target
Commuting	369 (1.2%)	Transport type & mileage (staff survey)		Transport type & mileage		Include in target
Upstream energy	1,140 (3.59%)	Energy consumption data		Energy consumption data		Remain conscious of wider environmental impact



Recommendations

The Council should continue to monitor their wider environmental impact through regular Scope 3 emission assessments and develop data collection processes to improve the footprint's quality. Specific recommendations are made to the Council:

- a. Include **Employee Commuting** in the overall carbon neutral target and annual reporting of the Council's footprint – in addition to the other Scope 3 elements already included: business travel, water, and waste. Proactive engagement with Council employees should be conducted to assess how these emissions can be reduced, and low-carbon travel options should be promoted where possible.

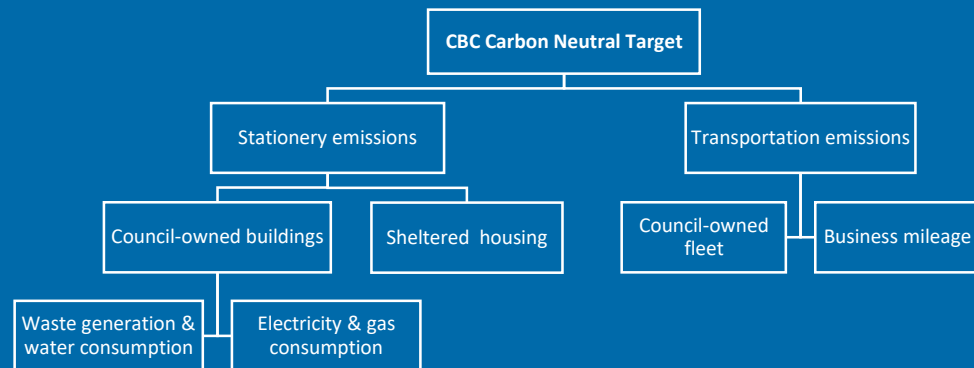
It is currently not a firm recommendation to include 'Upstream Energy' in the carbon neutral target; whilst data quality & availability is good, actions to achieve specific reductions (e.g. on a kgCO₂e/unit delivered) are significantly removed from the Council's core sphere of influence.

- a. Engage with their wholly-owned companies to promote the sustainability agenda, achieve emission reductions, and catalyse the development of low-carbon professionals in the Borough:
 - i. **Colchester Borough Homes.** Specific recommendations for the existing and new building stock are made on page 17 of the report. An alternative target-setting approach is recommended for the housing stock managed by CBH, where the collection of tenanted energy consumption is considered improbable. With current data, the Council could consider setting an EPC target either in relation to the whole or the average of the stock (e.g. all buildings EPC B / building stock an average of EPC B by 2035).
 - ii. **Colchester Amphora.** Whilst emissions related to Amphora's own activities were relatively small, they are responsible for the development and management of several large projects in the Borough. The Council should look beyond minimum building regulations where feasible, and promote ambitious sustainability standards for future developments, and incorporate best practice into the management of existing buildings. Target setting should be reviewed if data improvements can be secured.
- b. Data improvements should be targeted toward the Council's **PG&S and leased buildings**, working with contractors, suppliers and lessees to obtain primary data where possible.

Appendix A: Baseline footprint

TRANSPORTATION FOOTPRINT

Ranking	Site Type	Emissions (tCO ₂ e)
1	Fleet Vehicles	1,388
1.a	Waste vehicles	819
1.b	Other vehicles	569
2	Business Travel	50
TOTAL		1,438



STATIONARY FOOTPRINT

Ranking	Site Type	Electricity (tCO ₂ e)	Gas (tCO ₂ e)	Water (tCO ₂ e)	Waste (tCO ₂ e)	TOTAL
1	Leisure and recreation	762	1,511	82	33	2,388
1.a	Leisure World	656	1,445	58	25	2,184
2	Sheltered housing	467	928	25	0	1,419
3	Council buildings	148	209	10	9	376
4	Public conveniences ¹	207	72	7	0	286
5	Cemetery / Crem	23	165	2	1	191
6	Street amenities ²	78	0	1	0	79
7	Pumping stations	3	0	0	0	3
TOTAL		1,687	2,884	127	43	4,742

TOTAL BASELINE

Ranking	Emission source	Emissions (tCO ₂ e)
1	Stationary footprint	4,742
2	Transportation footprint	1,438
TOTAL		6,180

¹ Public conveniences are made up of various car park lighting, public toilets, refuse tips etc.

² Street amenities refers to lighting, CCTV etc.

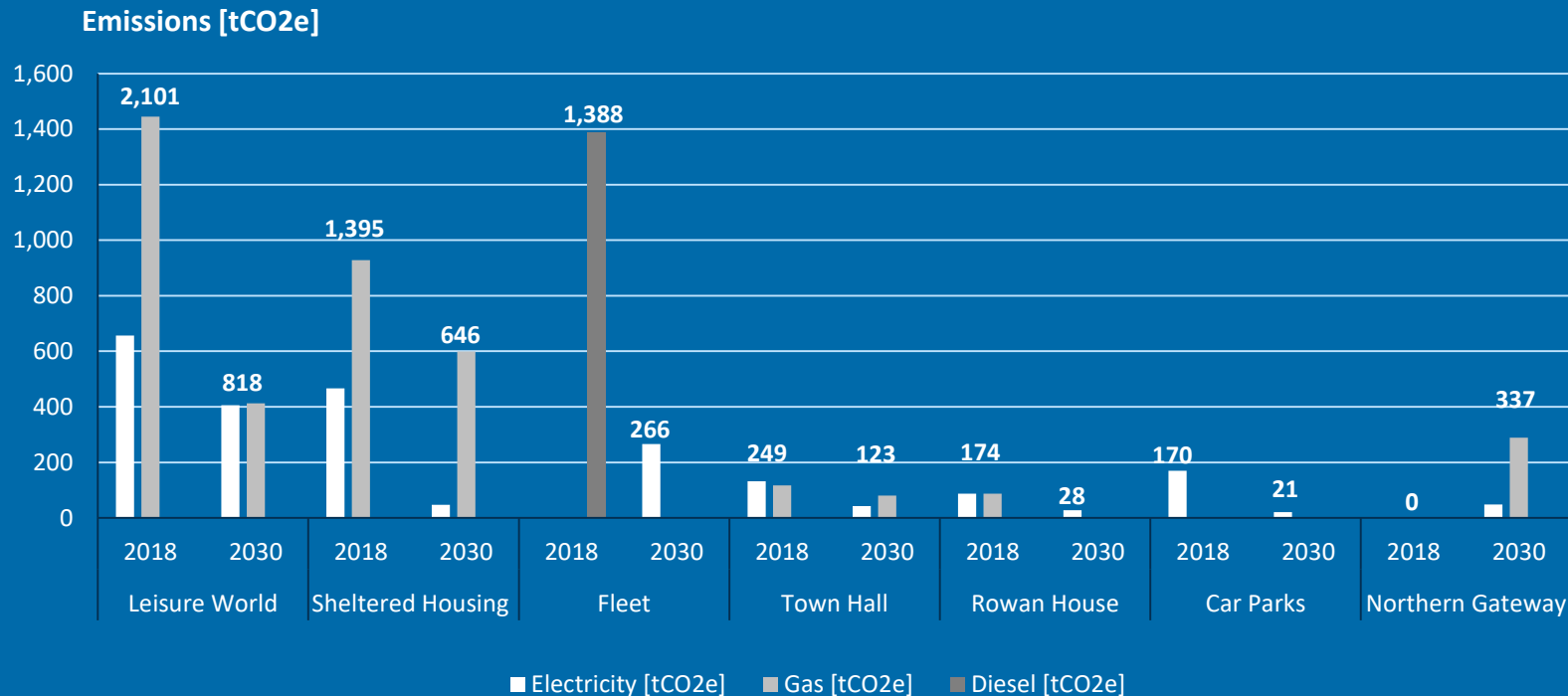
Appendix B: Further project details

The consumption impact of each project is shown in the table below. The figures represent the final increase/decrease once the measure is fully implemented. The consumption changes are assumed constant from the year of implementation until 2030. The associated emissions for each year the measure is active is calculated according to the emissions factor specific to that year; the tCO₂e figure shown below is based on 2030 emission factors.

I.D.	Project Description	Electricity +/- [kWh]	Gas +/- [kWh]	Diesel +/- [L]	Emissions +/- [tCO ₂ e]
1	Fleet electrification	2,921,371		- 516,443	- 1,090
2	Leisure World GSHP installation	2,134,961	-5,530,778		-787
3	Leisure World solar PV	-365,589			-33.3
4	Northern Gateway Sports Park	533,782	1,626,319		+ 337
5	Rowan House Refurbishment	-1,075	-473,495		-84.2
6	Town Hall: new gas boiler		-133,611		-23.7
7	Sheltered Housing refurbishment	-1,136,173	-1,668,398		-400
9	Car park LED	-182,121			-16.6
9	Middleborough car park	-187,098			-17.0

Appendix B: Further project details

The graph below shows hotspot areas in the Council's footprint and their associated emissions in 2018 and 2030 under the present scenario.



Appendix C: Technical Appendix

Key assumptions for the scenario modelling:

Project 1. Fleet electrification

- The phasing of electrification was determined accounting for vehicle age and type. Older, smaller vehicles were prioritised for early electrification; newer, larger vehicles were phased later where possible. The phasing assumes that the electrification of refuse vehicles will be viable by the late 2020s. Vehicles were phased assuming a lifetime of ~ 8 years and using a like-for-like replacement (by vehicle type).
- No fleet expansion/rationalisation was accounted for, and the mileage of the current fleet was assumed to remain constant between now and 2030.
- The electricity consumption required for the vehicles was derived from standard kWh/mile figures, dependent on vehicle type
- Where the mileage of vehicles was not provided, the mileage was derived from the diesel consumption using standard miles per gallon assumption

Vehicle type	Miles per gallon	kWh/mile
Small diesel car, up to 1.7 litre or under	50	0.25
Diesel van Class I (up to 1.305 tonnes)	45	0.25
Medium diesel car, from 1.7 to 2.0 litre	45	0.25
Diesel van Average (up to 3.5 tonnes)	40	0.3
Diesel HGV Rigid (>3.5 - 7.5 tonnes)	13.5	3
Medium petrol car, from 1.4 - 2.0 litres	40	0.25
Gardening and Grounds Maintenance - diesel	45	0.25
Diesel HGV Rigid (>17 tonnes)	9.5	3.7
Refuse trucks or road sweepers (rigid size)	13.5	3
Diesel HGV Articulated (>33t)	8	4

Sources:

<https://www.gov.uk/government/statistical-data-sets/energy-and-environment-data-tables-env>

RCVS: 'Ditching Diesel, A cost-benefit analysis of electric refuse collection vehicles'

<https://www.buyacar.co.uk/cars/1524/electric-car-economy-explained>

Appendix C: Technical Appendix

Key assumptions for the scenario modelling:

Project 2. Replacement of gas fuelled CHP at Leisure World with an electric ground source heat pump (GSHP)

- Electricity generated from the gas CHP system obtained from the FY 18/19 footprint data: 1,617,459 kWh
- CHP efficiencies calculated using meter readings obtained from the CHP operator: power efficiency, 29%; heat efficiency 33%
- Gas consumption of CHP derived from the power efficiency & electricity produced: $\frac{1,617,459 \text{ [kWh]}}{0.29 [\%]} = 5,530,778 \text{ kWh}$
- Heat production derived from the CHP gas consumption and heat efficiency: $5,530,778 \text{ [kWh]} \times 0.33 [\%] = 1,858,714 \text{ kWh}$
- Operating hours of 5,712 assumed for a replacement ground source heat pump (16 hours a day, 7 days a week, 51 weeks a year)
- Required GSHP size derived from the heat production & operating hours: $\frac{1,858,714 \text{ [kWh]}}{5,712 \text{ [h]}} = 317.1 \text{ kW}_{th}$
- Annual electricity consumption of GSHP calculated assuming a SCOP of 3.5: $\frac{317.1 \text{ [kW}_{th}] \times [5,712 \text{ hr}]}{3.5} = 517,502 \text{ kWh}$
- Total grid electricity increase: $517,502 \text{ [kWh]} + 1,617,459 \text{ [kWh]} = 2,134,961 \text{ kWh}$

Project 3. Solar PV installed at Leisure World

- Number of car parking spaces available for a solar PV installation provided as 285
- Installation size (430 kW_p) calculated according to previous feasibility studies performed at St Mary's and St John's car parks, using 1.5 kW_p/space
- Annual generation (365,589 kWh) calculated according to previous feasibility studies, using solar irradiance 850 kWh/kW_p

Appendix C: Technical Appendix

Key assumptions for the scenario modelling:

Project 4. Addition of the Northern Gateway Sports Park to the Council's baseline

- The addition of two main buildings at the Northern Gateway Sports Park (Colchester Rugby Club and Colchester Sports Club) was considered. Electricity & gas consumption for the sites was estimated using the BRUKL output documents:

Site	Floor Area m ²	Specific elec. consumption kWh m ⁻²	Specific gas consumption kWh m ⁻²	Absolute elec. consumption kWh	Absolute gas consumption kWh
Colchester Rugby Club	3,166	63.91	219.34	202,339	694,430
Colchester Sports Club	5,256	63.06	177.3	331,443	931,889
TOTAL	8,422	-	-	533,782	1,626,319

Project 5. Adoption of recommendations made in the CBH report 'Rowan House Refurbishment Project Feasibility'

All electricity and gas savings were taken from the technical appendix of the CBH report, which were based on metered data after a site audit had been undertaken.

Project 6. Town Hall: installation of a new gas boiler

It was assumed that the Town Hall's old boiler operating an efficiency of 75% was replaced with a new boiler operating at 95% efficiency. The consumption of gas at the Town Hall was assumed constant (634,651 kWh)

Appendix C: Technical Appendix

Key assumptions for the scenario modelling:

Project 7. Refurbishment of sheltered housing stock (Inc. fabric retrofit & LED roll-out)

- Analysis of EPC certificates showed an average EPC rating of C across the sheltered housing stock
- Assumed that by 2030, all buildings are upgraded to EPC B (with the exception of Enoch House and Worsnop House, which have already been refurbished)
- Estimated saving of 40% applied to gas & electricity consumption (*source: Carbon Trust analysis*)

Project 8. LED lighting installed at St John's and St Mary's car park

- Figures obtained from the Council's feasibility studies, which were provided as part of this project

Project 9. Middleborough car park removed from the Council's stock

- Electricity consumption set to 0 kWh

Appendix D: EEIO Data

The EEIO input used for procured goods & services (PG&S) represents the expenditure for FY 18/19.

The EEIO input used for investments is the annual revenue for FY 18/19.

Emission source	Contract Name	EEIO Input GBP	EEIO Category	EEIO Emission Factor kgCO2/GBP
PG&S	Construction works for Sports Hub at Northern Gateway	12,327,287	Construction materials and products: Non-residential commercial and health care structures	0.288
PG&S	Sheepen Road Phase Two: construction of offices	2,351,226	Construction materials and products: Non-residential structures	0.226
PG&S	Construction of turf pitches on the Northern Gateway site	1,202,352	Construction materials and products: Non-residential structures (miscellaneous)	0.355
PG&S	Insurance cover – fine art & employment practices	700,000	Services: Insurance agencies, brokerages, and related activities	0.078
PG&S	Purchase of road sweepers	992,938	Manufactured products: Trucks (light) and utility vehicles	0.378
PG&S	Clearance and cleaning of void properties	1,156,893	Services: Buildings and dwellings services	0.677
PG&S	Servicing of gas boilers within CBH housing stock	1,050,000	Services: Buildings and dwellings services	0.677
PG&S	Painting of CBH housing stock	965,608	Services: Buildings and dwellings services	0.677
PG&S	Purchase of new refuse collection vehicles	3,726,439	Manufactured products: Trucks (heavy duty)	0.458
Investments	Colchester Amphora	3,691,568	Services: Funds, trusts, and other financial vehicles	0.064

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