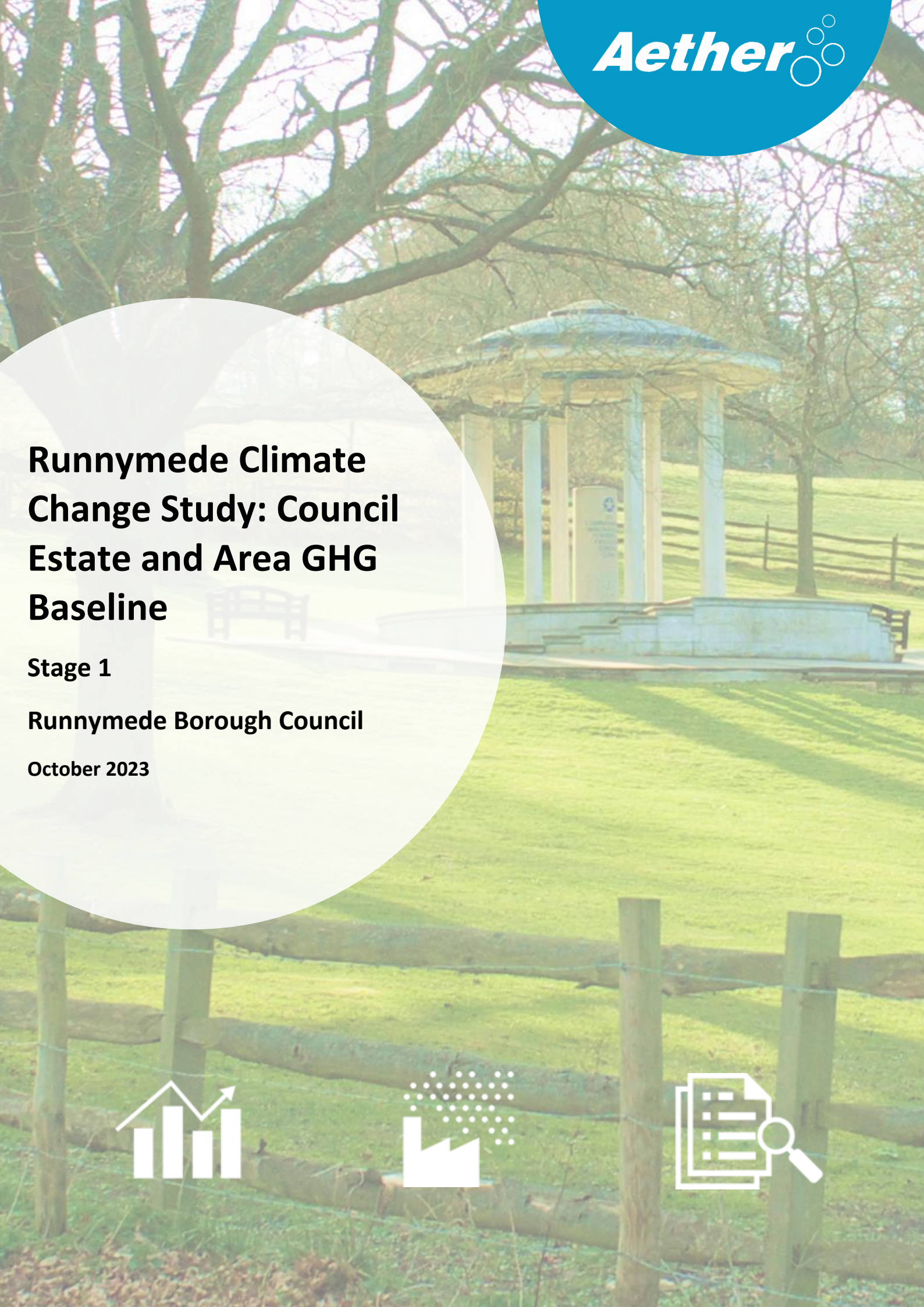

Runnymede Climate Change Study: Council Estate and Area GHG Baseline

Stage 1

Runnymede Borough Council

October 2023

Title	Runnymede Climate Change Study: Council Estate and Area GHG Baseline
Customer	Runnymede Borough Council
Recipient	Sarah Hides
Report Reference	3037
Report Status	Final
Revisions	V1
File	Y:\Projects\3037-Runnymede Climate Change Study\2_DeliverablesY:\Projects\3037-Runnymede Climate Change Study\1_Working\Reporting\Stage 1\Aether_RunnymedeStage1BaselineReport_Final_v1.docx

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Date	02/08/2023

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1 Introduction

In response to rising global temperatures due to greenhouse gases (GHG) emissions the Intergovernmental Panel on Climate Change (IPCC) released the *Special Report on Global Warming of 1.5°C*[1]. In this, it is made clear that ensuring global temperatures stay well-below 2°C pre-industrial levels is crucial to reduce large risks to human and natural systems, and efforts should be made to pursue warming of only 1.5°C to prevent the largest risks. Following this, global accords such as the Paris Agreement were signed, and national goals such as those outlined by the Climate Change Committee were made. The UK, as outlined by the Committee on Climate Change (2019), has set an ambition to "vigorously pursue an ambitious target to reduce greenhouse gas emissions (GHGs) to 'net-zero' by 2050" across the whole economy.

It is widely recognised that achieving the UK target will require cross-government cooperation. Local authorities are well placed to influence emissions in buildings, transport, and waste whilst holding the best knowledge of the needs and opportunities of their area. Local authorities can also drive emissions reductions in their areas through their role as community leaders and major employers, as well as their regulatory and planning capacities. Through their planning role, local authorities can leverage change by enabling sustainable development and placemaking, establishing building energy efficiency standards, implementing sustainable travel programmes and infrastructure, approving renewable energy projects, pursuing district heating programmes and implementing sustainable waste management programmes. Therefore, local action to reduce carbon emissions is vital for the UK to meet its international commitments to reduce our impact on global warming.

In January 2022, Runnymede Borough Council committed to tackling climate change and adopted a target to achieve operational 'Net Zero Carbon' emissions from its services and operations by 2030.

Runnymede's 2030 climate vision

The council intends that all its operations will be Carbon Net Zero by 2030.

- To work with our communities and businesses to create a sustainable living environment where people can meet the needs of the present without compromising the ability of future generations to meet their own needs (United Nations Brundtland Commission, 1987).
- To support the international climate change response to limit global warming to a 1.5 degrees centigrade temperature increase while simultaneously delivering a prosperous, caring, healthier borough where people are valued and cared for and where strong communities pull together.
- To support and encourage the private sector and green technology innovation within the Borough and incorporate it into our strategy wherever possible.

[1] https://www.ipcc.ch/2018/10/08/summary-for-policymakers-of-ipcc-special-report-on-global-warming-of-1-5c-approved-by-governments/

In making these commitments, Runnymede Borough Council acknowledged that reaching net zero will involve fundamental changes across the UK economy and that against this backdrop Runnymede Borough's influence individually, will be limited. However jointly, with other councils and organisations across the public and private sectors, notable impacts will be achievable.

Runnymede Borough Council published the Climate Change Strategy[2] in 2022 which presents the council's roadmap to reducing its carbon emissions in line with the Government's Net Zero targets. The strategy contains examples of actions already taken by the council in response to climate change and committed actions moving forwards which includes supporting communities, establishing a citizens panel and supporting schemes which promote localised services. A comprehensive list of the actions proposed by the council to meet its Net Zero commitments will be contained in the Council's Climate Change Action Plan which was under production at the time of writing this report. The Climate Change Strategy highlighted the need to establish a greenhouse gas (GHG) baseline on which progress towards the target can be monitored. Importantly, RBC outlined that the Runnymede Standard Carbon Baseline (RSCB) developed should be future proofed against emerging guidance on compiling baseline emissions at a local authority level by adhering to the principles of consistency and transparency. In practice this means that the baseline can be adapted against emerging guidance to ensure consistency in the method that RBC uses to monitor progress in implanting the climate change strategy.

Aether, Land Use Consultants (LUC) and Centre for Sustainable Energy (CSE) were commissioned by Runnymede Borough Council to complete a body of work to establish an evidence base, to be completed in two stages. This report presents a summary of the outcome of the first stage of work led by Aether, which focused on developing a baseline emission estimate for the council estate and the borough (**Section 44** and **Section 55**, respectively). This report also presents recommendations on how the baseline can support monitoring against the climate change strategy and establishing governance structure for effective monitoring **(Section 66**).

[2] https://www.runnymede.gov.uk/downloads/file/1533/climate-change-strategy

2 Scope of the emissions baseline

An important first step in the establishment of any emissions baseline is defining the scope of emission sources to cover. In the case of the area wide baseline, this is well defined, however for the council estate, careful consideration is required to ensure that emission accounting aligns with the council's ability to influence emissions.

Scopes are defined by the Greenhouse Gas Protocol for GHG accounting, as outlined in the table on the next page. Dividing emission sources into scopes is a useful way of breaking down the decision-making process as to what should be included within an organisational or city scale emissions inventory. Generally, all carbon accounts include scope 1 and 2 emissions, whereas scope 3 sources might be excluded or only partially included, depending on both the availability of data and the usefulness of its collection. It should be noted that one organisation's scope 3 emissions are another organisation's scope 1 or 2.

The emissions accounted for in the 'borough wide' baseline and the 'council estate' baseline are not discrete. For example, emissions included for 'commuting' in the council estate baseline will be partially included in transport emissions at the borough level.

2.1 Borough wide scope considerations

The baseline compiled for Runnymede area wide is a 'territorial-based emission inventory'. This type of emissions accounting is conventionally used for national carbon accounting, such as the UK's national inventory. It is geographically bounded, so limited to emission sources within specific boundaries. This inventory follows a sector-based approach, splitting emissions by the activity that caused them e.g. emissions from agriculture, transport, electricity generation etc.

2.1.1 Geographical boundaries and time range

The geographical, operational and time-related scopes of the targets are outlined below:

- The geographical boundary is the areas covered by the administrative areas of Runnymede Borough Council
- The baseline for data is the 2019 calendar year. Calendar year is used as this matches the timeframe of the activity data used as input to the emission calculation.
- The unit of measurement is CO_2e

2.1.2 Operational Boundary

An operational boundary defines the emission sources that are included in the reporting. Emission sources are divided into three scopes (see **Table 1** on the next page). Setting a clear operational boundary defines which emission sources are included in the reporting and which ones are excluded.

The most widely used set of standards for carbon accounting are those produced under the Greenhouse Gas Protocol. Of particular relevance to this project is the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories, otherwise known as the GHG Protocol for Cities. This standard describes the emission sources by "scopes" which should be considered as part of a city-wide carbon accounting process; the

definitions of the three scopes are shown in Table 1 below. The diagram (**Figure 1)** shows the activities that are included in the Runnymede borough baseline.

Table 1 City carbon accounting scope definitions from the GHG Protocol for Cities

Scope	Definition	Sources to consider
1	GHG emissions from sources located within the borough	• Fuel combustion (for energy and transportation) within the borough boundary • Fugitive emissions from fossil fuels extraction and processing • Solid waste disposal (in boundary) • Biological treatment of waste (in boundary) • Incineration and open burning of waste (in boundary) • Wastewater treatment (in boundary) • Industrial processes occurring within the boundary • Product use occurring within the borough boundary • Livestock emission sources • Land use emission sources • Aggregate sources and non-CO_2 emission sources on land (e.g., fertilizer application and rice cultivation)
2	GHG emissions occurring as a consequence of the use of grid-supplied electricity, heat, steam and/or cooling within the borough boundary	• Consumption of grid-supplied energy consumed within the borough boundary (energy and transportation)
3	Other GHG emissions that occur outside the borough boundary as a result of activities taking place within the borough boundary	• Transmission and distribution losses from grid-supplied electricity • Well-to-tank emissions for stationary fuels, transportation fuels and electricity generation • Emissions from transboundary transportation • Solid waste disposal of waste transported out of boundary • Biological treatment of waste transported out of boundary • Incineration and open burning of waste transported out of boundary • Wastewater transported out of boundary to be treated

There are various reasons why some emissions are excluded from the scope of the area-wide baseline:

Limited data availability at borough scale:

- **Off-road machinery**: Data on fuel consumption is not available. Given the transient nature of e.g. construction equipment, the impact of actions taken at a borough level are unlikely to be completely captured. Nevertheless, this should not discount consideration of construction in the borough's climate action plans.
- **Household and commercial/industrial wastewater treatment**: Data held by Thames Water are not currently accessible and, in any case, identifying data specific to Runnymede may not be possible. Emissions could be estimated – albeit with a high degree of uncertainty. This could be considered under the

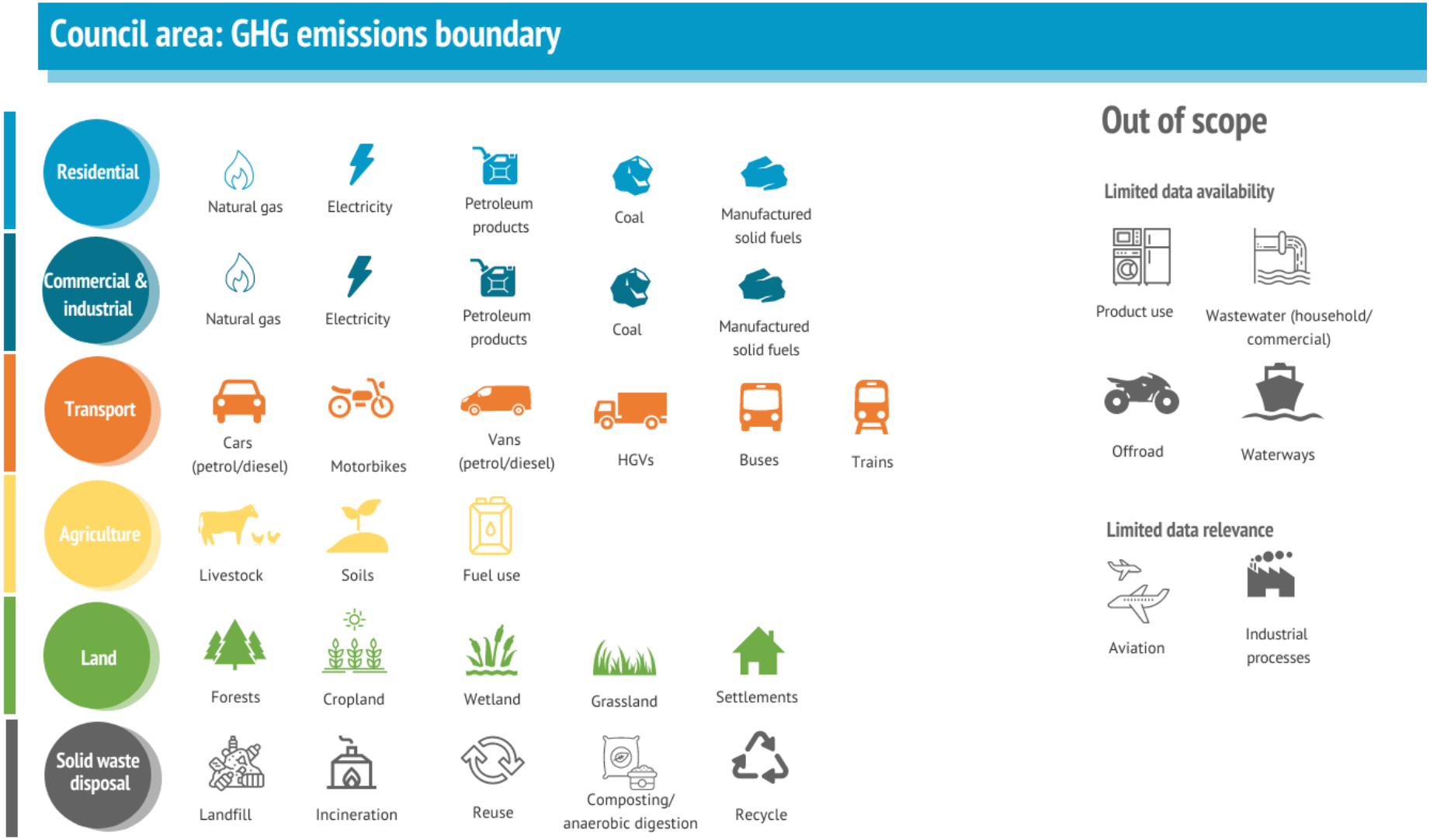
climate action plans and included within the modelling at a later date. Emissions from wastewater treatment are relatively small.

- **Waterways:** While there are emissions from river traffic within the borough boundary, apportioning them to Runnymede is highly uncertain and would not account for changes at a borough level.
- **Product Use**: data are scarce and uncertain. Emissions of concern in this sector are fluorocarbons used in electronics production and lubricants/paraffin waxes for non-energy products, neither of which are considered a significant source in Runnymede.

Limited relevance to borough emissions:

- **Aviation:** this is not a relevant source for inclusion in the baseline emissions as there is no airport within the council boundary. However, Runnymede Borough Council is committed to working jointly with partners such as the Heathrow Strategic Planning Group to address emissions associated with travel to London Heathrow Airport.
- **Industrial processes**: Energy consumption at industrial sites is contained within the BEIS energy data although other process emissions are not. It is likely that obtaining additional data would require significant time and effort for minimal return as there is not a significant industrial manufacturing sector within Runnymede. Additionally, Runnymede Borough Council has limited ability to alter these emissions.

Figure 1: Scope diagram for the borough wide emissions baseline



2.2 Council Estate scope considerations

2.2.1 Time range

The time-related scopes of the targets are outlined below:

- The baseline for data is the 2019/20 financial year. Financial years are used for reporting for the estate baseline as this matches the format of most input activity data.
- Emissions have also been compiled for subsequent years: 2020/21 and 2021/22.

2.2.2 Operational Boundary

An operational boundary defines the emission sources that are included in the reporting. Emission sources are divided into three scopes, see **Table 2** below. **Figure 2** later in this section presents more detail on the activities been identified within these three scopes that are included in the council baseline. Setting a clear operational boundary defines which emission sources are included in the reporting and which ones are excluded.

Runnymede is committed to considering the full scope of emissions occurring within the operational boundary within the limits of the organisational boundary, as outlined in the next section.

Table 2 Scope definitions for the Council estate baseline

Scope	Definition
Scope 1	GHG emissions from sources owned or controlled by the council.
Scope 2	GHG emissions from the consumption of purchased electricity, steam or other sources of grid-generated energy. Includes electricity supply to the council's operational buildings.
Scope 3	GHG emissions that occur indirectly from council activities, outside the control of the council (e.g. the council's procured services and investments).

2.2.3 Organisational Boundary

An organisational boundary defines which parts of an organisation are included for the purpose of GHG reporting. The following definitions are given in the GHG Protocol corporate reporting guidance.

Financial control boundary
Your organisation reports on all sources of environmental impact over which it has financial control. Your organisation has financial control over an operation if your organisation has the ability to direct the financial and operating policies of the operation with a view to gaining economic benefits from its activities.

Operational control boundary
Your organisation reports on all sources of environmental impact over which it has operational control. Your organisation has operational control over an operation if your organisation or one of its subsidiaries has the full authority to introduce and implement its operating policies at the operation.

Equity share boundary
Your organisation accounts for GHG emissions from operations according to its share of equity in the operation

Considering the implications of each organisational boundary, Runnymede Borough Council opted to develop the emissions baseline for the council estate using an **operational control boundary** for the following reasons:

- It presented the most pragmatic approach to defining the council estate emissions baseline as it allows the council to focus on what is in our direct control and what we are most able to influence and change.
- This approach most closely fits the aim of the climate change target adopted by the council in January 2022 'to achieve operational 'Net Zero Carbon' emissions from its services and operations by 2030'.
- An operational control boundary accounting approach is used by Surrey County Council to whom we regularly report our CO_2e emissions.
- The emissions estimates previously reported to BEIS sit within this approach.

It is important to note that the organisational boundary agreed is for reporting purposes only and does not preclude the council from working to reduce emissions in areas of its influence not included or reported on within the chosen boundary. This also applies to areas where data to show progress is hard to come by.

It is also noteworthy that if the approach to defining the organisational boundary should need to change in the future for any reason not yet foreseen, this would be possible due to the transparent accounting process used to create the baseline. As such information per source of emission could be disaggregated and moved between scopes to align with a different approach to defining the council's organisational boundary, if this became necessary.

Consideration to how the organisational approach impacts emission allocations within specific emission sources is presented below:

Leased Assets

Leased assets may be included in a local authority's Scope 1 or Scope 2 inventory depending on the type of lease and the consolidation approach the local authority uses

to define its organisational boundaries (the financial/operational control approach or the equity share approach). Emissions from leased assets that the council maintain operational control over are allocated to Scope 1 and 2 of the council estate. However, in line with reporting at Surrey County level, an operational approach has been chosen which means that when the council lease a building to another user on a full repairing and insuring (FRI) lease, the emissions associated with the operation of that building are allocated to Scope 3. This is because the level of influence such a lease allows means that the council is limited in the work that can be done until the break clauses in contracts.

Homeworking

Whilst emissions from homeworking would not be significant in the baseline year (2019/20), the rise in hybrid working due to the COVID-19 pandemic means that it is necessary to consider these emissions and are therefore included in scope. Emissions from homeworking have not been estimated for the year 2019/20 but are included in subsequent emission inventory years.

Council housing

Sheltered housing and care provision: Emissions from all council owned and operated sheltered housing, including care and retirement homes are included under Scope 1 and 2.

Communal areas: Runnymede is responsible for communal areas of council housing such as external lighting, entryways, corridors, stairways, etc and therefore has control over the emissions from these sources. The local authority could influence the emissions by, for example installing more energy efficient lighting or replacing heating systems. Reporting for these areas is included under Scopes 1 and 2.

Landlord services: Runnymede owns housing that is privately tenanted and therefore the council is not responsible for the payment of bills and does not have operational control of the use of energy.

It is understood that Runnymede owns the heating systems installed in council Housing and funds housing through a Housing Revenue Account. Therefore, in line with the considerations given to leased assets, the energy emissions from privately tenanted housing are included under Scope 3 in line with an operational based accounting approach.

Incorporated council companies

The operational emissions of the RBC Companies (RBC Heat, RBC Investments and RBC Services) are included in Scope 3 when using the operational control boundary approach.

2.2.4 Exclusions from scope

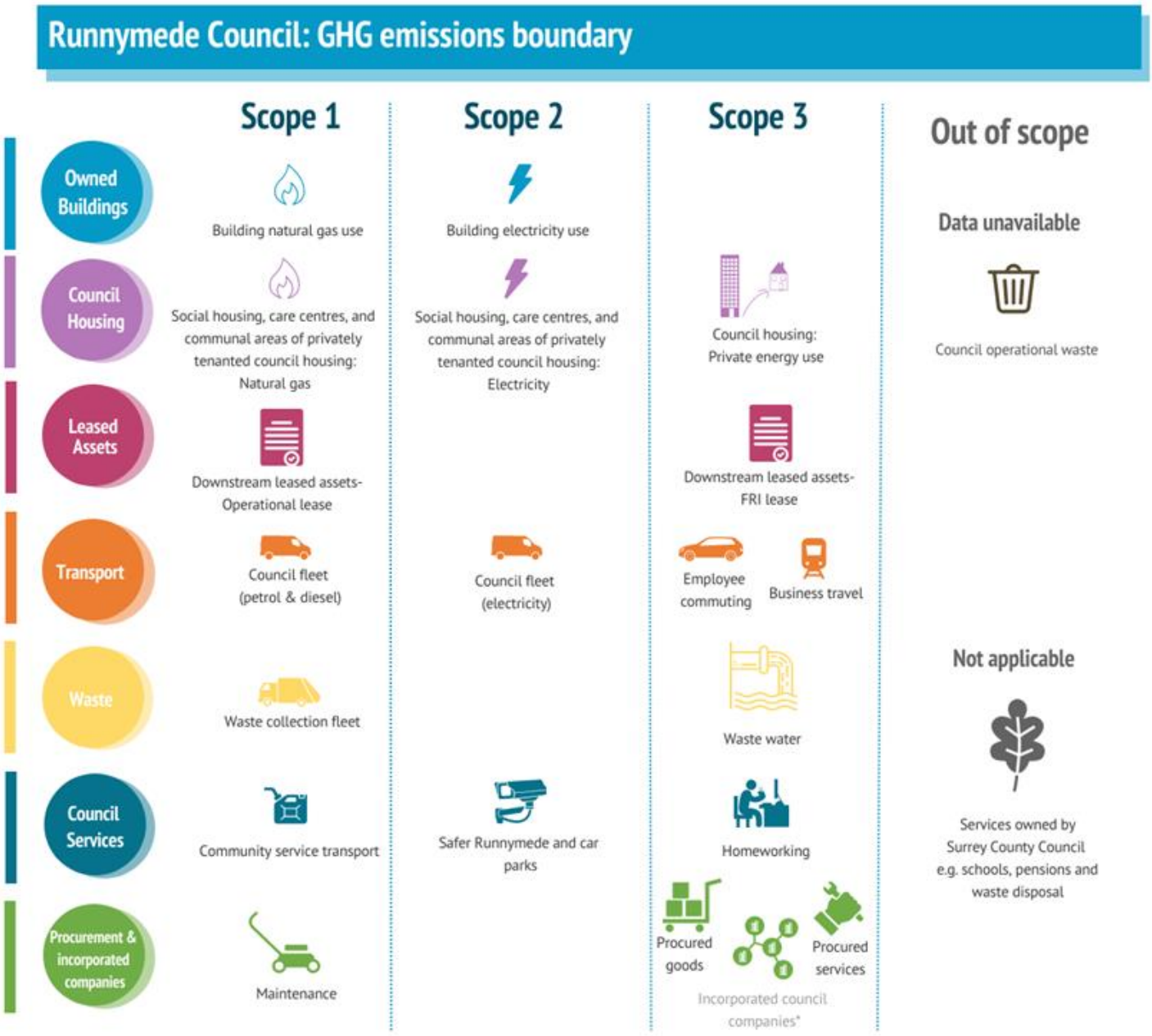
Surrey County Council Services i.e., waste processing, streetlighting, schools and pension fund are excluded from the RBC emissions baseline. Runnymede is not a waste authority

and therefore in accordance with the LGA reporting guidance for local authorities[3] will not report emissions arising from waste in the council estate scope. The emissions from the waste collection fleet however are included under Scope 1. The same principle has been applied to other services that Surrey has operational control over such as schools and streetlighting.

A summary of the source covered by Scopes 1 2 and 3 is provided in **Figure 2**.

[3] https://www.local.gov.uk/climate-change-reporting-guidance-local-authorities#scope-3-emissions-reporting-categories-

Figure 2: Summary of the scope of emissions baseline for the council estate



3 Methodology

This section presents the methodology used to compile the GHG emissions estimates for Runnymede Borough Council estate and wider borough area. It introduces the key concepts of emissions accounting and presents the input data used in the calculations.

3.1 Approach

The most widely used set of standards for local carbon accounting are those produced under the Greenhouse Gas Protocol; of relevance to this project is the Global Protocol for Companies and Organizations and Cities[4].

A **GHG inventory** is a dataset which presents estimates of emissions of various greenhouse gases from a wide range of activities in an organisation, country or other geographical area. A **GHG baseline**, is the GHG inventory for a specific year chosen by the reporting organisation from which progress in decarbonisation is monitored.

The standard approach to estimate GHG emissions is by multiplying activity data by an emission factor associated with the activity being measured (**Equation 1**).

Equation 1: Emission factor approach for calculating GHG emissions.

GHG emissions = Activity Data * Emission Factor

Emission Factor - This is the emissions per unit of activity, which usually comes from scientific literature. Emission factors may be quantified in a number of ways; for processes that strictly follow clear chemical or mass balance reactions they can be developed using an understanding of stoichiometry, or they can be developed empirically through statistical sample measurements. For example, EFs for stationary energy emissions are generally estimated based on sample measurements of the average carbon content of the fuel.

Activity data - This is a measure or estimate of the activity which is taking place, such as tonnes of fuel or miles driven. This data typically comes from national statistical datasets or from the organisation in question, in this case Runnymede Borough Council.

Example Calculation

- *Activity Data*

Natural gas consumption in an organisation's operated building: 98,500 kWh

- *Emission Factor*

Gross natural gas EF (direct): EF: 0.18385kg CO2e/kWh

- *Calculation*

Multiply kWh activity by the fuel specific EF to get total emissions from natural gas consumption

Total emissions: 98,500 x 0.18385= 18,109 kg CO2e

[4] https://ghgprotocol.org/companies-and-organizations

3.1.1 Carbon Dioxide Equivalent

The impact of different gases on the atmosphere is complex and depends on their duration and behaviour in the atmosphere. For example, methane produces 28 times more warming effect than an equivalent amount of carbon dioxide over an equivalent time period, known as the Global Warming Potential (GWP). In order to simplify this complicated situation, data for all GHGs are translated into a single comparable unit, carbon dioxide equivalence, or CO_2e, usually measured in kilogrammes or tonnes. Therefore, one tonne of CO_2e has the global warming impact of one tonne of CO_2 but it can be a mix of any of the seven Kyoto gases:

- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrous oxide (N_2O)
- Hydrofluorocarbons (HFCs)
- Perfluorocarbons (PFCs)
- Sulphur hexafluoride (SF6)
- Nitrogen trifluoride (NF_3)

Emissions are reported as a mass of CO_2 equivalent, CO_2e. Whilst less abundant than CO_2, other GHGs such as methane (CH_4) and nitrous oxides (N_2O) have a greater warming effect than CO_2. A Global Warming Potential (GWP) factor is applied to these GHGs to convert to CO_2e.

The council agreed that their net zero targets should cover all relevant gases and therefore emissions are to be reported in CO_2 equivalent.

3.1.2 Quality Principles

The GHG Protocol Accounting and Reporting standard also sets out a series of principles which are intended to guide GHG accounting towards a fair and accurate account of GHG emissions. These are:

- **Relevance**: Ensure the GHG inventory appropriately reflects the GHG emissions of the company and serves the decision-making needs of users, both internal and external to the company
- **Completeness:** Account for and report on all GHG emission sources and activities within the chosen inventory boundary. Disclose and justify any specific exclusions.
- **Consistency:** Use consistent methodologies to allow for meaningful comparisons of emissions over time. Transparently document any changes to the data, inventory boundary, methods, or any other relevant factors in the time series
- **Transparency:** Address all relevant issues in a factual and coherent manner, based on a clear audit trail. Disclose any relevant assumptions and make appropriate references to the accounting and calculation methodologies and data sources used.
- **Accuracy:** Ensure that the quantification of GHG emissions is systematically neither over nor under actual emissions, as far as can be judged, and that uncertainties are reduced as far as practicable. Achieve sufficient accuracy to

enable users to make decisions with reasonable assurance as to the integrity of the reported information.

Complying with these principles will provide a very high standard of GHG accounting.

3.2 Input Data

Activity data was collected from regularly published datasets of sub-national statistics for the area wide baseline and directly from Runnymede Borough Council for the council estate. Further details are provided on the council estate and borough wide inventories in **Appendix 1** and **Appendix 2**.

Emission factors for both the council and the borough GHG inventory are taken from "UK Government GHG Conversion Factors for Company Reporting"[5] for the applicable sources and years. For data sources in the council inventory which relate to the 2019/20 financial year, the 2019 emission factors are applied. Emission factors for the council Estate and area wide GHG inventory are further documented in Appendix 1 and 2, respectively.

3.2.1 Energy

The energy consumption data covers a range of council-owned buildings which have been categorised into the several groups. The groups used and a summary of the buildings covered within each group are presented in **Table 3**, together with the Scope within which they are accounted**.**

3.2.2 Water

Water supply and treatment covers emissions from the supply of water to council buildings and the treatment of wastewater. Water supply data was provided on a spend basis. It was assumed that emissions from water treatment were 95% of those from water supply.

3.2.3 Fleet and green spaces

Runnymede Borough Council provided fuel consumption for the council's fleet. Petrol and diesel consumption were multiplied by an emission factor to calculate emissions.

Green spaces and machinery cover emissions related to the fuel used to power tools such as leaf blowers, hedge cutters, and vehicles used by the council's green spaces team.

3.2.4 Waste

Waste emissions relate to the collection of waste through the contracted service provided by the council and fuel used to power street cleaners. These are estimated through applying BEIS carbon factors based on the fuel used by refuse trucks and street cleaners, respectively.

[5] https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting

Table 3: Buildings covered in Runnymede Borough Council's emissions inventory

Category	Buildings included	Scope	Data/ emissions apportionment
Operational buildings	Runnymede Civic Centre	1 & 2	Emissions apportioned based on floor area within ownership of RBC (80%)
	Chertsey Depot	1 & 2	Whole site
Community buildings	W Davies Pavilion	1 & 2	Whole site
	Chertsey Hall	1 & 2	Whole site
	Charter Place and Library	1 & 2	Whole site
	Eileen Tozer Day Centre	1 & 2	Whole site
	The Literary Institute Cultural Community Hub	3	Emissions apportioned based on ownership, RBC accounts for 20%
	Runnymede Pleasure Grounds	1 & 2	Whole site
	The Orchard	1 & 2	Whole site
	Ottershaw Memorial Fields	1 & 2	Whole site
	Chertsey Recreation Ground	1 & 2	Whole site
	Chertsey Museum	1 & 2	Whole site
	Gogmore Farm Park	1 & 2	Whole site
	MANORCROFTS & MANOR FARM	1 & 2	Whole site
	Woodham and New Haw Day Centre	1 & 2	Whole site
	Hythe Centre	1 & 2	Whole site
	Chertsey Cemetery	1 & 2	Whole site
	Victory Park	1 & 2	Whole site
	Sports Pavilion	1 & 2	Whole site
	The Lodge	1 & 2	Whole site
	Toilets	1 & 2	Whole site
Housing – Sheltered and communal use	Addlestone (Surrey Towers)	1 & 2	Communal areas
	Sandhills Lane	1 & 2	Communal areas
	Darley Dene Landlords Supply	1 & 2	Communal areas
	Stoneylands	1 & 2	Communal areas

Category	Buildings included	Scope	Data/ emissions apportionment
	Floral House	1 & 2	Communal areas
	Beomonds	1 & 2	Communal areas
	Heatherfields	1 & 2	Communal areas
	Beomonds Sheltered Housing	1 & 2	Communal areas
Housing – tenant use	Council housing	3	Whole site based on SAP ratings
Runnymede Heat Company Ltd.	Addlestone District Heat Network (DHN)	3	Whole site for 2021/22

3.2.5 Commuting

The *Runnymede Borough Council – Homeworking and Commuting Survey*[6] was developed to collect information to calculate emissions from heating as part of homeworking calculations and to understand commuting patterns. The total distance travelled was grouped by mode of travel based on categories listed in GHG Conversion Factors for Company Reporting. The survey was completed by 165 staff members (approximately 36% of council staff) and provided distances travelled one-way on a particular day. They were therefore scaled to reflect three return journeys a week (in line with the assumption of three days in the office per week). To estimate distance for all staff members, results were scaled against the 2021/22 FTE number of 445.3. Uncertainty is high for this emission source due to the need to extrapolate survey results to represent all staff and because of the likely variations in the way that individuals choose to travel.

3.2.6 Working from home emissions

Emissions related to working from home (WfH) were calculated following the methodology provided by Ecoact in their 2020 Homeworking emissions whitepaper[7]. WfH emissions were calculated for 2021, assuming that across a five-day work week, staff work from home for two of those days. As part of the combined commuting and homeworking survey, staff were asked about their homeworking setup. WfH emissions were calculated where staff were working in homes that would otherwise have been unoccupied, based on rates reported in the survey. Emissions were then calculated by aggregating up the survey results to a full-time equivalent (FTE) basis.

Homeworking emissions were calculated for electricity usage to power desk equipment and lighting, and emissions from heating. Benchmark values provided in the whitepaper were used to calculate emissions from electricity use for office equipment and lighting, using the assumption that 140W of power for desk equipment (e.g. monitors, chargers) and 10W for lighting is used across the year.

To calculate emissions from heating, staff were asked how their homes were heated. Natural gas was the most common heating type, followed by electricity and oil. It was assumed that heating was turned on for two homeworking days a week for 6 months between October and March. Average energy consumption rates per heating day were used for a household, based on the Ecoact method.

3.2.7 Emissions from third party suppliers

Standard industrial classification codes (SIC) are used to categories different activity types by industrial sector. In 2019, Defra published 'Indirect emissions from the supply chain'[8] which contains a list of carbon emission factors for each SIC code. This table can

[6] https://forms.office.com/Pages/DesignPageV2.aspx?subpage=design&token=6ff3eb99811c460f81debcc9560ba0b1&id=35BPxq8KfkKEAaHd3MAqhSpJeavA6gpEoKQmh5UwutxUOEpWMDBDU1RSNTYzSzQ4VFNFVVhMVzZZMS4u&analysis=true

[7] https://info.eco-act.com/en/homeworking-emissions-whitepaper-2020

[8] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/404542/Table_13_Indirect_emissions_from_supply_chain_2007-2011.xls

be used to produce initial high-level estimates of the Greenhouse Gas emissions relating to the production of goods, works and services purchased by a company or organisation.

Emission estimates from third party suppliers used by the council (appointed in accordance with the council's procurement processes) were calculated for 2019/20 – 2021/22 using expense reports provided by Runnymede Borough Council, which were allocated to SIC groups using expense codes information and the relevant carbon factor was then applied. Only the top 90% of spend was considered in each year, to focus on key sources and reduce the time needed for data processing. As Runnymede Borough Council provided an expense report, activity related to the transfer of finances was excluded from estimates. Expenses related to activities already included within the baseline were also excluded to avoid double counting. This covers activities such as electricity, gas and water payments.

The methodology used to estimate emissions from the supply chain should be considered as a tool to support a first estimate of supply chain emissions and identify hotspots of emissions in the supply chain and not as a tool with which to monitor and report emissions from specific procurement actions and contracts. The reasons for that are:

1. The categories are broad and allow for little discrimination between different product options and services within a category e.g. they cannot be used to choose a lower carbon option for delivering social care services because the one category covers all the options available to deliver care.
2. Relationships between spend and carbon emissions are complex; for materials and simple products, the relationships are likely to be reasonably accurate because energy and transport make up a larger proportion of the cost; however, for complex products and services, it is likely that each category represents a much larger range of actual emissions.
3. The emissions factors by SIC code will change over time depending on the industry efficiency and carbon intensity of energy use, but the published dataset may not be updated regularly.
4. An organisation cannot monitor change in Scope 3 supply chain emissions based on spend because the estimate will only change by reducing spend or by switching spend to a different lower carbon category. More detailed methods are required for monitoring change.
5. These factors are designed to look at the upstream Scope 3 emissions of goods and services but some purchasing decisions will also have potential impacts on the Scope 1 and 2 emissions of the organisation e.g. energy use by IT equipment or significant downstream scope 3 emissions e.g. non-reusable products going to landfill. These carbon/unit of spend factors do not enable easy understanding of these additional emissions.

Therefore, to support monitoring and reporting, a more dynamic approach is required. The initial analysis enables procurers to identify probable hotspots of carbon emissions within the supply chain (which might be related to the spend, or high carbon categories, or volume of materials) to inform a more collaborate approach with suppliers to identify both key sources of emissions within the specific product or service, and opportunities for reducing these and reporting savings. Recommendations on how RBC may look to improve estimation of emissions from this sector are included in **Section 7**.

4 Runnymede Borough Council GHG inventory

4.1 Runnymede Borough Council baseline inventory for 2019/20 - 2021/22

4.1.1 Total emissions (Scope 1-3)

Runnymede Borough Council's total GHG emissions, considering emissions from scope 1-3, in 2019/20 were estimated to be **19,836 tCO_2e**. A 11% increase in total emissions was estimated between 2019/20 and 2021/22 with emissions estimated to be **21,922 tCO_2e** in 2021/22.

Emissions from scope 3 sources, meaning GHG emissions that occur indirectly from council activities, outside of the direct control of the council (e.g. the council's procured services and investments) account for 94% of the total GHG emissions. Emissions from scope 1 and 2 are included in the inventory, meaning emissions arising from sources owned or controlled by the council directly or resulting from the consumption of purchased electricity, steam or other sources of grid-generated energy, account for the remaining 6% of the total GHG emissions. Emissions from scope 1 and 2 are explored further in **section 4.1.2** and scope 3 sources in **section 4.1.3**.

Emission estimates by sector are presented for the years 2019/20 to 2021/22 in **Figure 3** and

Table 4**.**

Figure 3: Emissions for Runnymede Borough Council (t CO_2e) , 2019/20 – 2021/22

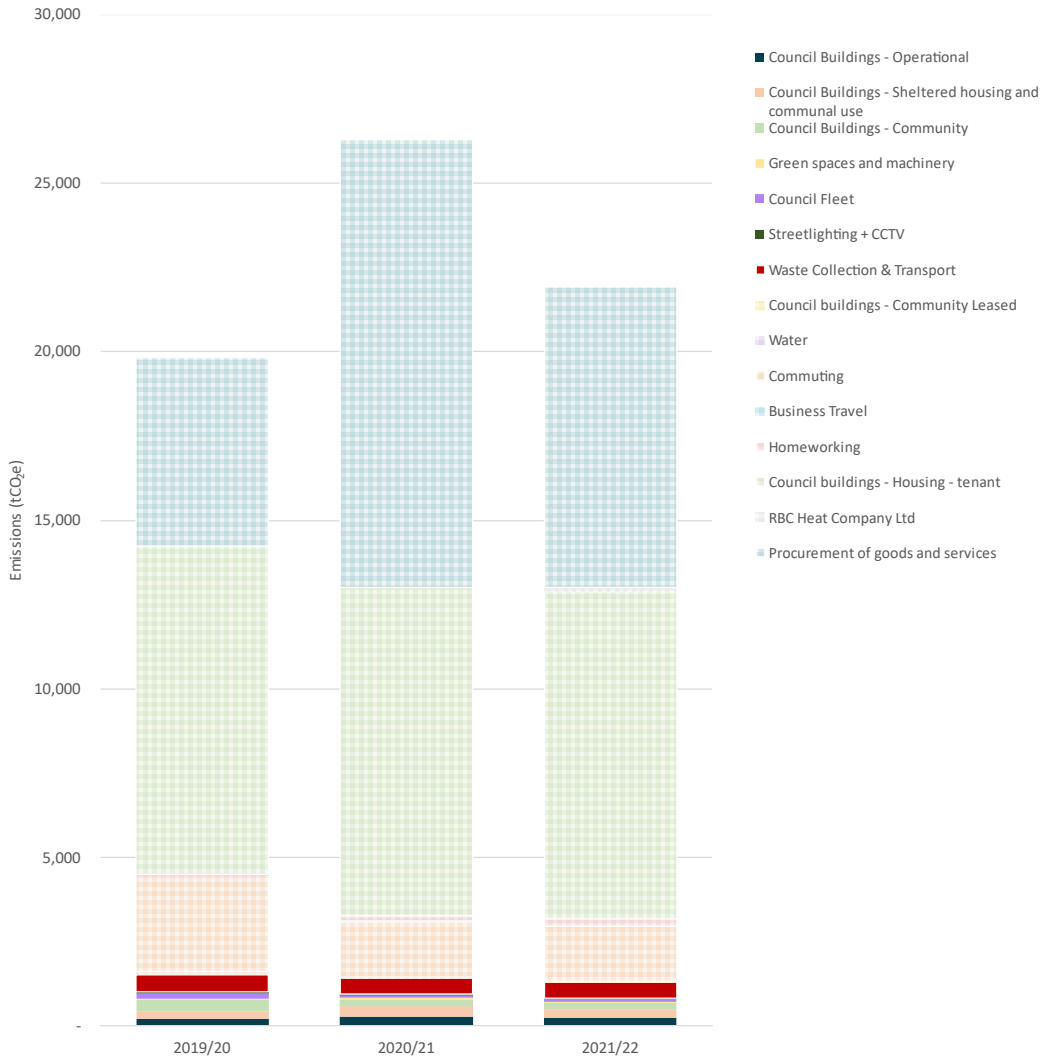


Table 4: Emissions (in tCO_2e) and percentage change in emissions from each sector, 2019/20-2021/22

Sector	Scope	Emissions (tCO_2e)			Change between 2019 baseline and 2021 (%)
		2019/20	2020/21	2021/22	
Council Buildings – Operational	*1+2*	212	274	234	10%
Council Buildings – Sheltered housing and communal use	*1+2*	200	298	251	26%
Council Buildings – Community	*1+2*	342	210	193	-44%
Council buildings - Total	***1+2***	**754**	**781**	**678**	**-10%**
Green spaces and machinery	1+2	47	44	19	-60%
Council fleet	1	147	81	102	-31%
Streetlighting + CCTV	2	60	55	14	-76%
Waste collection & transport	1	513	470	470	-8%
Scope 1 and 2 emissions total		1,521	1,395	1,283	-16%

Council buildings – community leased assets	3	33	10	6	-82%
Water	3	38	45	36	-6%
Commuting	3	2,865	1,635	1,618	-44%
Business travel	3	34	15	15	-57%
Homeworking	3	-	180	213	-
Housing – tenant consumption	3	9,733	9,734	9,697	0%
RBC Heat Company Ltd CHP	3	-	-	146	-
Procurement of goods and services	3	5,612	13,291	8,908	59%
Scope 3 emissions total		18,316	24,909	20,639	13%
Council total		**19,836**	**26,304**	**21,922**	11%

4.1.2 Scope 1 & 2 Emissions

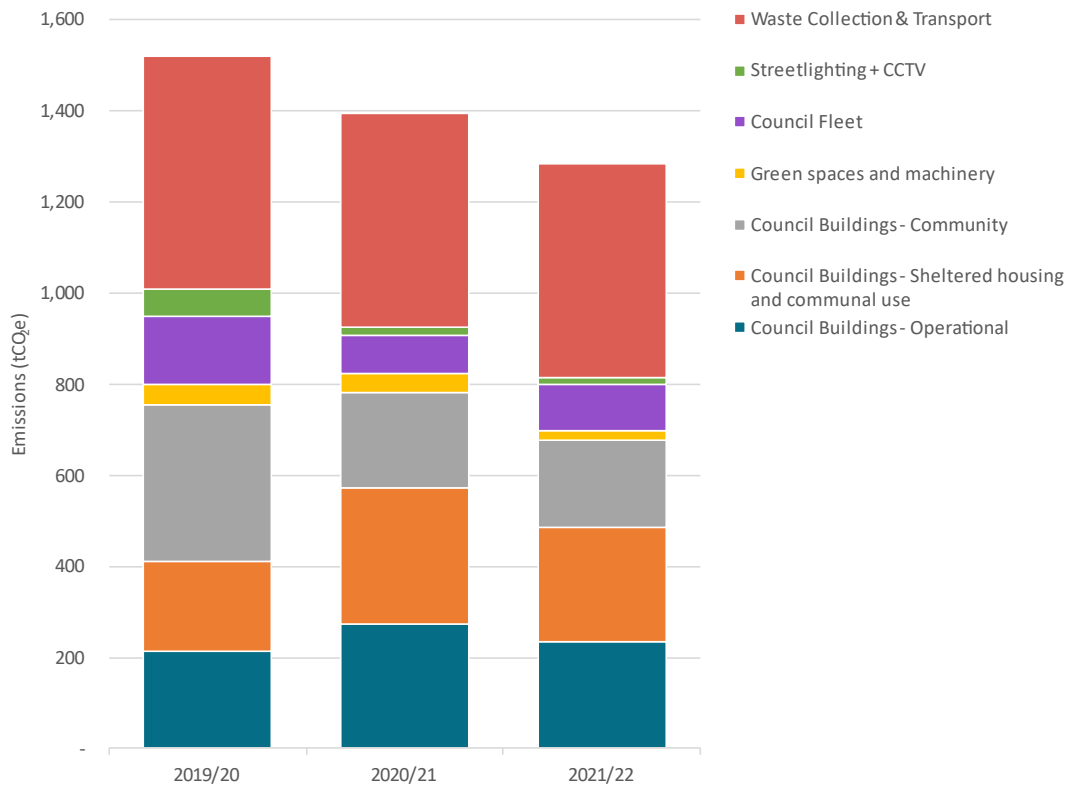
Considering emissions arising from Scope 1 and 2 only, emissions from the council estate **decrease** between 2019/20 and 2021/22 by 16%, from **1,521 tCO_2e** to **1,283 tCO_2e**, respectively (Figure 4). Emission reductions are observed across all categories under scope 1 and 2 except for 'Council Buildings – Operational and Sheltered housing and communal use'.

Considering emissions from scope 1 and 2 only, the most significant emissions within arise from energy consumption within council buildings (53% of the total). Waste collection and transport is the next most significant source comprising of 37% of total emissions. Emissions from fuel consumed within the council owned fleet is responsible for 8% of the total, with emissions from green spaces and machinery, street lighting and CCTV attributable to approximately 1% each.

The greatest reduction in emissions between 2019/20 and 2021/22 was a 76% reduction in emissions arising from the operation of streetlighting and CCTV. Whilst the decarbonisation of the electricity grid drives reductions in emissions associated with electricity consumption, significant reductions in the total kWh consumed by streetlighting and CCTV networks were also observed.

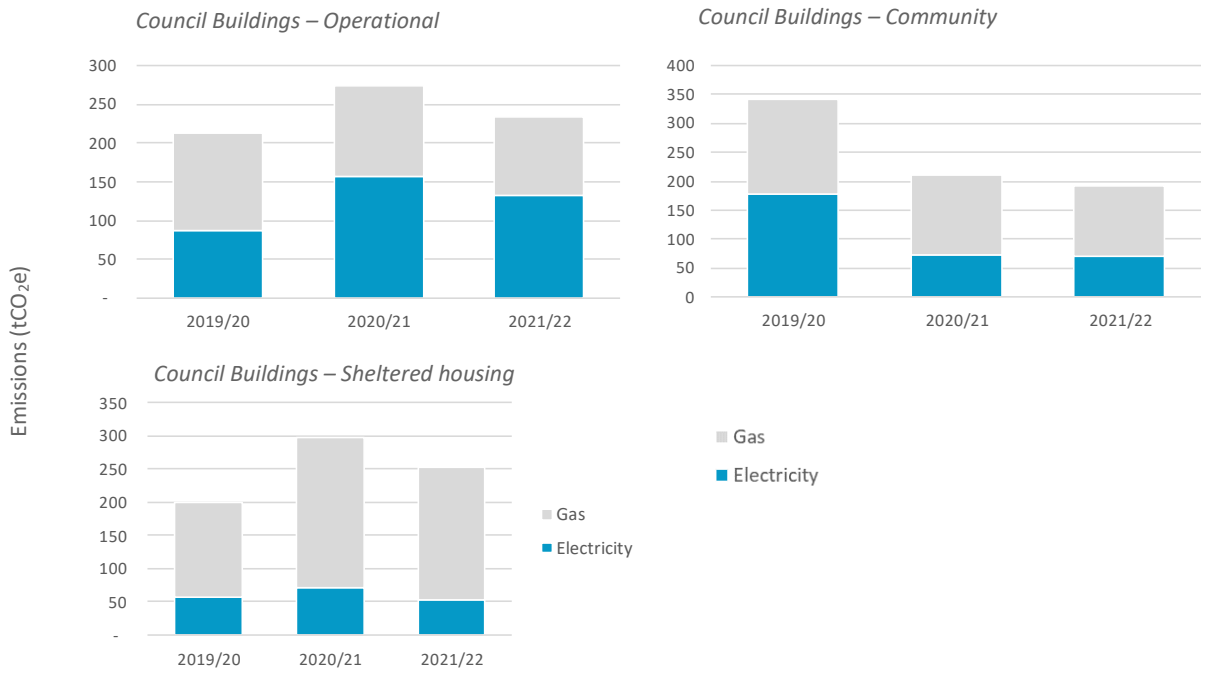
Significant reductions are also observed in fuel consumed in vehicles and machinery used for the management of green spaces (60% decrease) and in gas emissions from community council buildings (44% decrease). The impact of COVID-19 is observed through reductions in 2020/21 compared to 2019/20 for the council fleet, which to some extent 'rebounded' in 2021/22 and 'Council Buildings – Community'. There is no observed reduction in operational council buildings in 2020/21 suggesting that lower occupancy rates and building closures did not lower recorded energy use. Emissions from 'Council Buildings – Sheltered housing and communal use' increased in 2020/21 which may indicate higher energy consumption due to the 'stay at home' order as a result of COVID-19.

Figure 4: Emissions for scope 1 and 2 sources for Runnymede Borough Council, 2019/20 – 2021/22 (tCO_2e)



Emissions from council buildings (as presented in Table 4) arise due to consumption of both electricity and gas. Figure 5 presents the split of emissions between those arising from gas and electricity use by each building category.

Figure 5: Building emissions split by electricity and gas, by type, 2019/20 – 2021/22 (tCO_2e)



4.1.3 Scope 3 Emissions

Emissions arising from scope 3 are significant, comprising of 94% of the total emissions from the council estate in 2021/22. Emissions in scope 3 are dominated by a handful of sectors with large associated emissions; procured of goods, works and services, council housing and commuting. **Figure 6** presents the split of emissions across scope 3 in 2021/22, with the trends presented in **Figure 7** and

Figure 8.

Emissions related to the third-party provision of goods, works and services increase by 59% between 2019/20 and 2021/22. This is explored in more detail in section 4.1.4.

Estimated emissions from commuting and homeworking have varied significantly over the time series due to changes in working patterns at RBC driven by COVID-19. The results indicate that the reduction in emissions associated with commuting outweighs the increase in emissions due to energy consumed whilst employees work from home.

Figure 6: Emissions for scope 3 sources for Runnymede Borough Council, 2021/22 (tCO_2e)

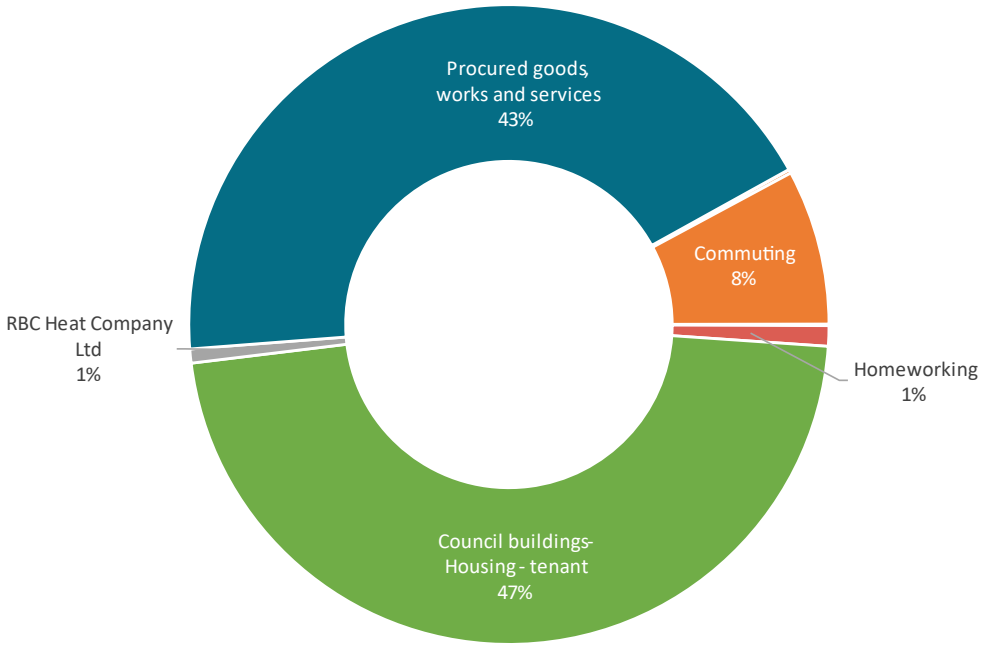


Figure 7: Emissions for largest scope 3 sources for Runnymede Borough Council, 2019/20-2021/22 (tCO_2e)

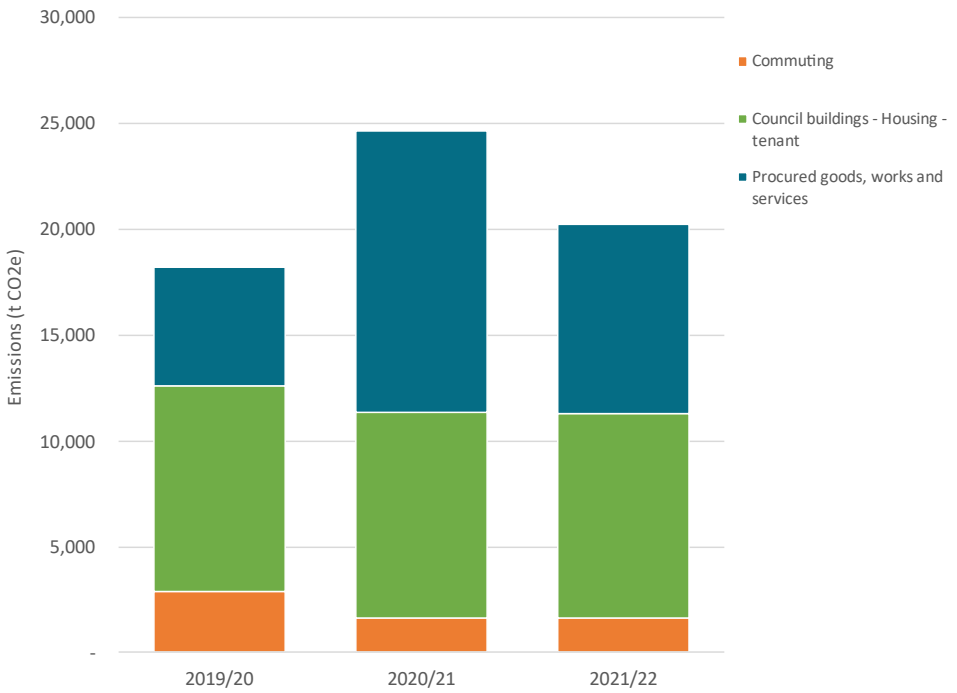
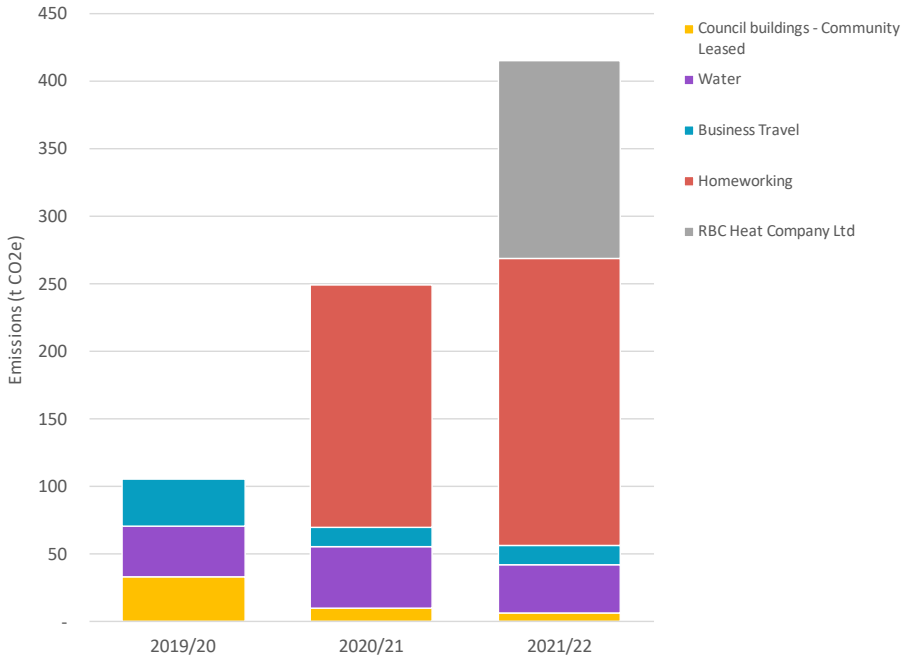


Figure 8: Emissions for other scope 3 sources for Runnymede Borough Council, 2019/20-2021/22 (tCO_2e))



4.1.4 Emissions related to the third-party provision of goods, works and services

There are emissions associated with the third party provision of goods, works and services which result from the procurement activities carried out by the council. Whilst the council has an influence over emissions from this source, it does not have direct control. These emissions are presented here as an initial estimate of the scale of third party emissions, and to start to identify the goods, works and services which represent the largest carbon sources within this category. Methodologies for estimating emissions from third party suppliers are not yet well established and have a high uncertainty and are therefore presented separately to the inventory.

The methodology used to estimate emissions from third parties following the procurement of goods, works and services is based on published factors of carbon intensity per amount spent[9]. This was applied to the council's financial accounts summary. Financial transactions not related to the purchase of goods, works and services were excluded from the carbon totals, as were activities that were included within the baseline, such as purchase of fuel, to avoid double counting.

Emissions from third party suppliers procured by the council were approximately 5,612 tCO_2e in 2019/20, 13,291 tCO_2e in 2020/21 and 8,908 tCO_2e in 2021/22. Phase 1 of the Egham Regeneration project was identified as the greatest source of emissions at 37% in 2019/20 (**Table 5**). However, to put this in context, this was a major £90 million mixed use town centre regeneration scheme which has provided 100 student bedspaces, 101 residential units, a cinema and a variety of retail units together with car parking,

[9] https://www.gov.uk/government/statistics/uks-carbon-footprint

highway improvements and public realm enhancements. The construction of this scheme will also have contributed to the carbon emissions under this category in 2020/21 and 2021/22.

Table 5: Identified emission hotspots within Runnymede Borough Council's supply chain

Year	Procurement type	Spend category	SIC Category	% of procurement emissions
2019/20	Works	Egham Regeneration – Phase 1	Buildings and building construction works	37%
		Chertsey Metrode Development	Buildings and building construction works	9%
		New Egham Leisure Centre Development	Buildings and building construction works	6%
2020/21	Works	Egham Regeneration - Phase 1	Buildings and building construction works	68%
		Chertsey Metrode Development	Buildings and building construction works	16%
2021/22	Works	Egham Regeneration - Phase 1	Buildings and building construction works	91%
	Services	Major Repairs - Major Specials (C)	Rest of repair; Installation	4%

5 Runnymede Borough GHG inventory

5.1 Borough inventory

Runnymede Borough's GHG emissions for 2019 have been estimated to be 634 $ktCO_2e$. Emissions by sector are presented in **Figure 9** and **Table 6.** The most significant emissions source is the transport sector, comprising 58% of total emissions.

Figure 9: Estimated $ktCO_2e$ emissions for Runnymede Borough in 2019

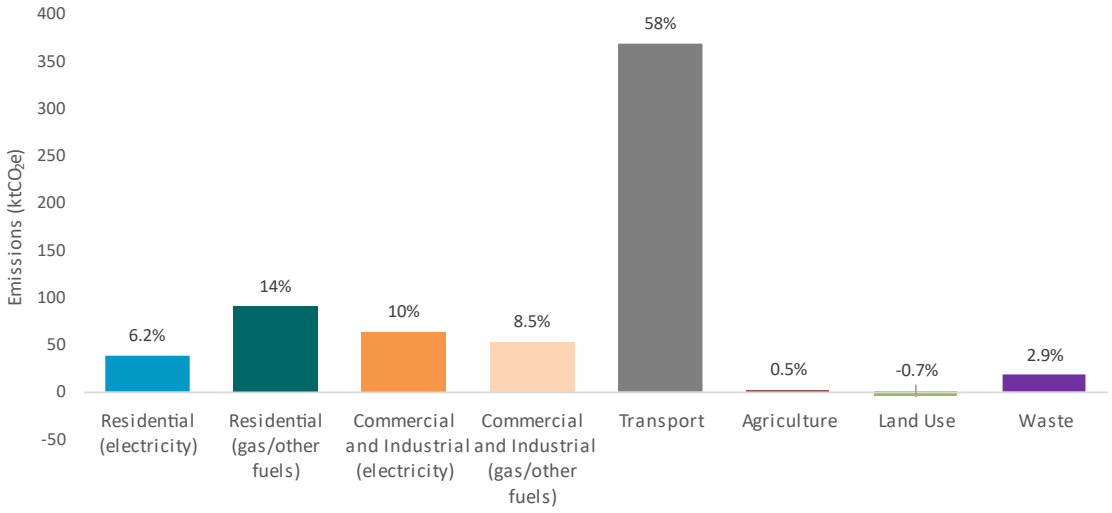


Table 6: Estimated $ktCO_2e$ emissions for Runnymede Borough in 2019

Sector	2019 emissions (kt CO_2e)[10]	% of total emissions[10]
Residential (electricity)	39.3	6.2%
Residential (gas/other fuels)	90.9	14.3%
Commercial and Industrial (electricity)	63.8	10.1%
Commercial and Industrial (gas/other fuels)	53.9	8.5%
Transport (buses and rail)	6.2	1.0%
Transport (cars/LGVs/motorbikes)	298	47.1%
Transport (HGVs)	64	10.1%
Agriculture	3.1	0.5%
Land use	-4.3	-0.68%
Waste	18.3	2.9%
Total	**634**	

The sources of emissions in Runnymede are dominated by transport use within the borough, particularly from private car use. The second largest source, at 21% of total emissions, is from heating of residential homes.

[10] Due to rounding of values, summing values shown in the table may not equal totals shown.

Emissions from land use and land use change in Runnymede are currently a small net sink of CO_2 at -4.3 $ktCO_2e$. This is due to carbon sequestration occurring in woodland and grassland areas of the borough.

Please note that a portion of emissions included in the council baseline are also included in the borough baseline. For example, council fleet, commuting, and business travel are included within the borough transport figures and working from home is included within the residential sector. Emissions from the collection of waste material by the council are included in the transport emissions from HGVs. This is due to the subnational datasets used to calculate the borough emissions not specifying the purpose of the fuel quantities provided. The data sources used to calculate the borough baseline are included in **Table A2.1.** The activity data and emission factors used are in **Table A2.** and **Table A2.**, respectively.

A per capita factor represents the emissions of an average person in a country or region – they are total emissions divided by population. The average per capita emission for England was 5.7 tCO_2e in 2019[11]. In comparison, per capita emissions in Runnymede are 7.1 tCO_2e in 2019. This comparatively higher emission per capita is largely driven by the high transport emissions within Runnymede; as an average, in England transport emissions comprise 33% of total emissions, whereas in Runnymede transport is 58% of the total emissions.

5.2 Change in emissions compared to the 2019 baseline

Emissions from private transport decreased between 2019 and 2020 by 23%. The change in fuel usage for each transport mode and types are presented in **Table 8.**

Emissions from land use and land use change remained consistent between years, at a sink of -4.30 ktCO2e in 2019 and -4.24 ktCO2e in 2020. Waste emissions decreased from 18.3 ktCO2e in 2019 to 17.6 ktCO2e in 2020.

In summary, emissions at the borough level reduced in a number of key sectors between 2019 and 2020, however, it is likely that there will be a 'rebound' effect in future years reflecting a return to 'business as usual' following the lockdown during the COVID-19 pandemic.

[11] UK local authority and regional greenhouse gas emissions national statistics: 2005-2021

Figure 10 and **Table 7** show the emissions for the borough for the years 2019 and 2020. Total emissions decreased from 634 $ktCO_2e$ in 2019 to 556 $ktCO_2e$ in 2020, equating to a 12% reduction.

At 21%, the greatest reduction in emissions across this period was from electricity use in the commercial and industrial sector followed by a 19% reduction in emissions from the transport sector. The reduction in emissions may be due to the impacts of the COVID-19 pandemic. Domestic electricity usage increased by 9 GWh between 2019 and 2020 while non-domestic usage decreased by 33 GWh over the same period, potentially reflecting stay at home orders, an increase in homeworking, and temporary closure of non-essential commercial activity. The decreased electricity demand, combined with the decrease in the carbon intensity of the UK electricity grid, resulted in a decrease in emissions between 2019 and 2020. Transport emissions equally decreased across this period due to stay at home orders, reducing travel for leisure and commuting.

Emissions from private transport decreased between 2019 and 2020 by 23%. The change in fuel usage for each transport mode and types are presented in **Table 8**.

Emissions from land use and land use change remained consistent between years, at a sink of -4.30 $ktCO_2e$ in 2019 and -4.24 $ktCO_2e$ in 2020. Waste emissions decreased from 18.3 $ktCO_2e$ in 2019 to 17.6 $ktCO_2e$ in 2020.

In summary, emissions at the borough level reduced in a number of key sectors between 2019 and 2020, however, it is likely that there will be a 'rebound' effect in future years reflecting a return to 'business as usual' following the lockdown during the COVID-19 pandemic.

Figure 10: $ktCO_2e$ emissions for Runnymede Borough, 2019-2020

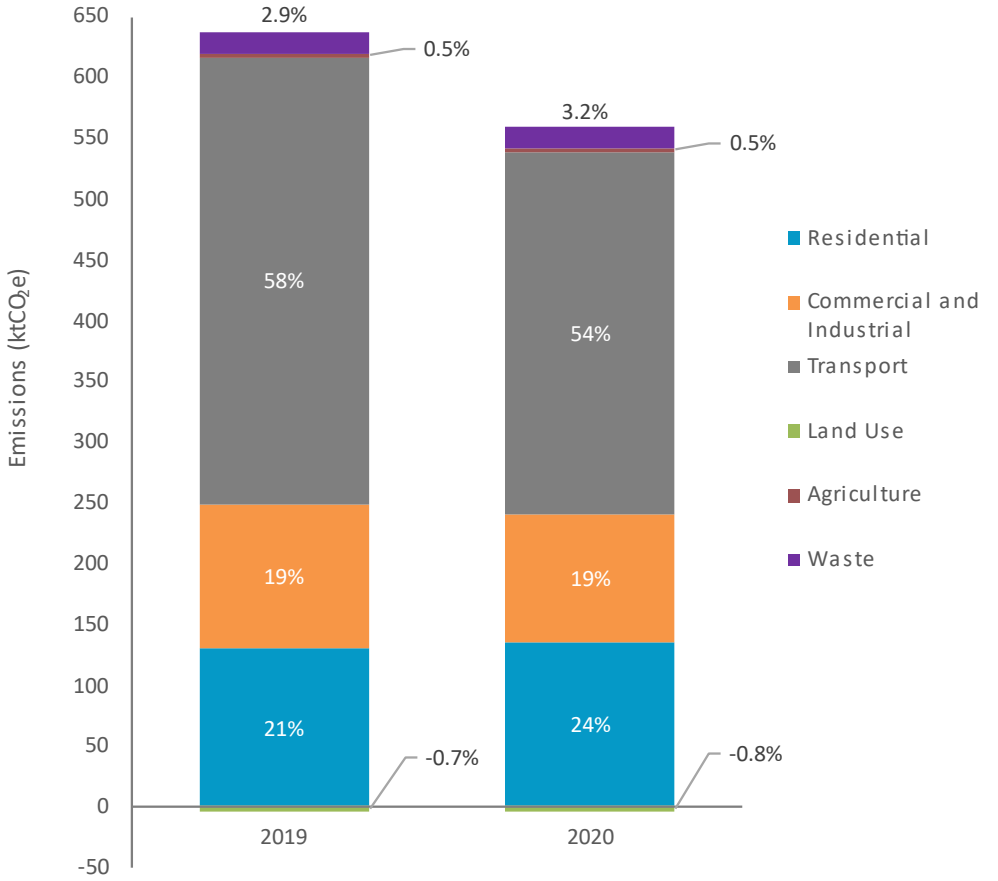


Table 7: Emissions (in $ktCO_2e$) and percentage change in emissions from each sector, 2019-2021

Sector	Scope	Emissions ($ktCO_2e$)		Change between 2019 baseline and 2020 (%)
		2019	2020	
Residential (electricity)	2&3	39.3	38.0	-3.3%
Residential (gas/other fuels)	1	90.9	97.7	7.5%
Residential buildings total		130	136	4.2%
Commercial and industrial (electricity)	2&3	63.8	50.4	-21%
Commercial and Industrial (gas/other fuels)	1	53.9	54.2	0.6%
Commercial and Industrial buildings total		118	105	-11%
Transport (buses and rail)	1	6.2	3.5	-43.9%
Transport (cars/LGVs/motorbikes)	1	298.4	231.1	-22.6%
Transport (HGVs)	1	64.2	64.4	0.2%
Transport total		369	299	-19%
Agriculture	1	3.1	3.0	-2.3%
Land use	1	-4.3	-4.2	-1.2%
Waste	3	18.3	17.6	-3.7%
Borough Total		634	556	**-12%**

Table 8: Borough private transport emissions and percentage change, 2019-2020

Emission source	Emissions ($ktCO_2e$)		Change from 2019-2020 ($ktCO_2e$)	% change 2019 – 2020
	2019	2020		
Cars (petrol)	118	89	-28	-24%
Cars (diesel)	121	85	-36	-30%
Motorcycles (petrol)	1.7	1.2	-0.54	-31%
LGVs (petrol)	1.8	1.7	-0.12	-7%
LGVs (diesel)	56	54	-1.84	-3%
Total	**298**	**231**	**-67**	**-23%**

6 Monitoring and governance

By updating the GHG inventory on a regular basis, Runnymede Borough Council will be able to track the level of GHG emissions for the council and the borough included in the scope of the inventories, albeit with some delay in data availability. The ability of the GHG inventory to show progress in decarbonisation and the effectiveness of mitigation actions depends on the GHG estimation methods possible for the inventory. Where data availability is a limiting factor, the inventory might not show a true reflection of decarbonisation efforts.

It will be necessary for the council to establish and formalise data supply chains so that emissions can be monitored and reported with confidence at regular intervals. This will particularly be the case for emissions from the council's own estate and operations. It is therefore recommended that data requirements are set out clearly for each service area. Data provision will need to be given a high priority, with commitment agreed at Head of Service level. Responsibility for data should sit with a specific role as opposed to with a named individual, to allow for staff turnover.

If one does not already exist, it would be beneficial to set up an asset register, listing individually the buildings and vehicles which are considered to be within scope. It is also recommended that the process for data provision should be made as clear and simple as possible, with template forms provided for each service area for the submission of (e.g.) meter readings.

Priority areas for formalising data supply processes should include:

- Gas and electricity consumption in council buildings (e.g. offices, depots)
- Gas and electricity consumption in community buildings (e.g. day centres)
- Gas and electricity consumption in council housing
- Fuel consumption by waste collection vehicles
- Fuel consumption by other council vehicles
- Fuel consumption associated with business travel

It is recommended that the frequency of monitoring and reporting is also agreed at the outset. If reporting is to be an annual activity, there may still be value in more regular monitoring to ensure that emissions reporting is based, for example, on actual rather than estimated meter readings. For certain areas, it may be possible to align financial reporting with data provision - for example, the council's energy bills will be based on gas or electric meter readings - and it would be worth exploring whether aligning the two might lead to some internal efficiencies.

With regard to procured works, goods and services, the council adopted its Sustainable Procurement Policy in 2023. This sets out how environmental considerations will be built into the procurement and delivery of goods, works and services through its specifications, tender questions, evaluation criteria, key performance indicators and clauses of contracts.

Specifically in relation to carbon reduction, the policy sets out supplier expectations, stating that where relevant and appropriate to the contract and decided on a case by case basis, the council expects prospective suppliers to:

- Provide requested information and details of environmental impacts (including for in-scope suppliers, carbon emissions under scopes 1 and 2 with estimations

on emissions from scope 3 activities), compliance with corporate commitments and plans for improvement during the procurement process;

- Meet requirements for environmental impact improvement, monitoring and reporting (for example relating to carbon emission reduction) which have been built into the specification of contracts, where appropriate, and measure and report on these requirements throughout the contract lifetime, taking corrective and remedial actions if necessary;

- Commit to mitigating impacts on climate change throughout operations through carbon reduction initiatives as well as through the encouragement and support of this practice throughout their own supply chains;

- Minimise the transport requirements associated with any contract through local sourcing and servicing, efficiency improvements or transport alternatives (such as using postal services, active transport or electric vehicles) to minimise air pollution and carbon impact of transport operations;

This policy is expected to ensure that a consistent approach to carbon is applied throughout the tender process, reducing the risk around contracts being let which fail to deliver emissions reductions. It should be noted that whilst the policy sets out council requirements, it does not constrain council officers in exceeding the requirements where appropriate.

In terms of governance, it is recommended that operational (non-political) governance for the councils' net-zero targets, both for the council's own emissions and those from the wider borough area, should sit at Senior Leadership Team level. This will ensure that the commitment to net-zero comes from the top of the council down. Establishing, for example, a Net-zero Monitoring Board would provide governance arrangements through which the council can ensure that operational decisions being made within each individual service area are consistent with the over-arching net-zero commitments.

It would also be worth considering Carbon Literacy training for the council, with the aim of achieving accreditation from the Carbon Literacy Project as a Carbon Literate organisation, possibly to Silver level. If the Senior Leadership Team undertook this training initially, that would help to embed a net-zero culture across the council, again from the top down.

7 Conclusions and Recommendations

Runnymede Borough Council has set an ambitious net zero target for its operations by 2030. To determine the extent of additional policies and actions required to meet this target, an evidence base of a comprehensive and accurate baseline is required, and is provided in this report.

This evidence base report has been compiled for Runnymede Borough Council to present the main components of their own footprint and wider geographical area. This can be used to work with internal council departments to identify key areas for projects or for wider stakeholder engagement with local businesses and other public bodies.

Throughout the report, a number of recommendations have been made - some recommendations relate to data improvements or suggestions to provide further data sources to the baseline and trajectories and some recommendations are suggested to Runnymede Borough Council as next steps. Both are summarised below.

Recommendation 1: Establish and maintain data flows

This study was informed by a number of key data sources obtained from different departments across Runnymede Borough Council. It is therefore recommended that as follow up to this work that data flows are established within the council which set out the data requirements from council officers across the different departments. This should communicate to all data providers the frequency at which data is required, the preferred format and the reporting period. It is important that this data requirement is established within departments as opposed to with individuals to ensure that institutional memory is retained should individuals move departments/ leave the council.

Recommendation 2: Data set improvements

The period between baseline compilation and data collection for the subsequent year should be utilised to follow up with data providers to discuss further clarification to data sets and to discuss alternative datasets which may allow for improvements in emission calculations. The following datasets have been identified as priorities following this baseline compilation and relate to areas where it is felt that data quality could be improved or data gaps filled.

A key principle of GHG inventory compilation is continuous improvement, and therefore RBC should view these data improvement suggestions as the start of an improvement plan to be implemented as a standard part of an annual cycle to improve the GHG estimates.

Energy consumption from operational and leased council buildings: Data is incomplete for some leased assets and so a priority of the improvement plan should be to gap fill missing data.

Council spend on third party suppliers: Current emission estimates from procurement are uncertain due to the use of per £ carbon factors. See Recommendation 3 for further guidance.

Water usage and treatment: It was not possible to estimate emissions from water usage and treatment from activity data (m^3) and therefore spend data was used to infer consumption. Whilst the use of spend data is an acceptable data source for calculating

baseline emissions at a high-level baseline due to the close relationship between spend and consumption, to improve accuracy moving forward, it is recommended that the council collect data on a volume basis. It is however noted that as water usage and treatment is a minor source of emissions that this may be lower priority compared to other improvement items

Recommendation 3: Engage with the council's largest suppliers and contractors to better understand scope 3 emissions from third party suppliers procured by the council

As is expected, the emissions from third party suppliers who are providing goods, works and services for the council are a large source of emissions from the council's activities. The methodology used in this baseline study gives an indication of the magnitude of the emissions using high level estimates of CO_2e per £ spent.

To gain a more accurate representation of emissions from the procurement of third party suppliers it is recommended that the council improve the accuracy of the emission calculations by engaging with their highest spend sectors to provide more detailed information on the carbon emissions associated with the goods, services or works they are providing. The implementation and embedding of the council's 2023 Sustainable Procurement Policy within the organisation and the council's supply chains should allow the council to gather improved data in this regard.

Recommendation 4: Future tracking and reporting of GHG emissions

It will be necessary to produce further GHG inventories of emissions within the scope of this baseline in order to assess realised emission reductions. This will be required at minimum in any target year to verify if the emissions target has been achieved, however it is recommended that inventories are calculated annually to track progress. It is further recommended that the council consider some external verification of any updated GHG estimates to ensure that the estimates align with the GHG protocol methodologies and quality principles.

Appendix 1 – Council Estate Inventory Calculation tool

The council estate baseline was developed within Aether's GHG inventory tool. The tool is designed to present the emission estimates in a transparent manner, with all data sources documented within the tool itself.

The 'How To Update' sheet in the workbook contains step-by-step instructions on how Runnymede Borough Council can update the inventory in the future. Figure 811 shows the cover page of the GHG inventory tool for Runnymede Borough Council. The sheets of the tool are as follows:

- **QA Sheet** – containing meta-data on version control, authors, quality assurance checks
- **How To Update** – containing steps on how to update the inventories and tracker in future iterations, as well as full references for data sources
- **Council-Calculations** - containing activity data, emission factors and emissions calculations for Runnymede Borough Council
- **Council Buildings –** containing emission calculations at the council building level using linked activity data from the laser energy data sheets.
- **Emission factors** – contains the emission factors applied to activity data to calculate greenhouse gas emissions
- **Outputs** – containing summary figures of the inventories
- **Laser data –** Sheets 'Calculations 2019-2021' include the raw energy consumption data from laser energy for the council building calculations.

Figure 811: Structure of Runnymede Borough's GHG Inventory tool

Appendix 2– Borough wide Inventory Datasets

Table A2.1: Data sets used for the borough GHG inventory

Source number	Data Source	Sector	Description
1	Department for Business, Energy and Industrial Strategy (BEIS): 'Sub-national electricity sales and numbers of customers'	Grid electricity; domestic economy, domestic standard and non-domestic	This dataset provides energy consumption data for domestic and commercial electricity use in the borough of Runnymede.
2	Department for Business, Energy and Industrial Strategy (BEIS): 'Road transport energy consumption at regional and local authority level'	Borough bus travel, Borough diesel car travel, Borough petrol car travel, Borough motorbike travel, Borough HGV, Borough LGV diesel and Borough LGV petrol	This dataset provides fuel consumption data (diesel and petrol) for road vehicles in the borough of Runnymede.
3	Department for Business, Energy and Industrial Strategy (BEIS): 'Sub-national weather uncorrected gas sales and numbers of customers'	Natural gas; domestic and non-domestic	This dataset provides energy consumption data for domestic and commercial gas use in the borough of Runnymede.
4	Department for Business, Energy and Industrial Strategy (BEIS): 'Sub-national estimates of non-gas, non-electricity and non-road transport fuels'	Petroleum, coal and manufactured solid fuels consumption	This data set provides consumption data for other fuels, non-gas and non-electricity for domestic, commercial, industrial and non-road transport use in the borough of Runnymede.
5	Department for Business, Energy and Industrial Strategy (BEIS): 'UK local authority and regional carbon dioxide emissions national statistics'	Borough emissions from land use, agriculture and waste	This dataset provides net CO_2e emissions from land use, land use change and forestry (LULUCF), agriculture and waste for the borough of Runnymede.
6	Department for Business, Energy and Industrial Strategy (BEIS): 'Greenhouse gas reporting: conversion factors' 2019 - 2020	All sectors	This dataset provides emission factors for all sources covered in this inventory.

Calculation Input Data

Table A2.2: Activity data for the borough GHG inventory

Sector	Category	Fuel	Unit	Data Source	2019	2020
Commercial	Non-domestic	Gas	GWh	3	240	243
Commercial	Non-domestic	Electricity	GWh	1	250	216
Commercial	Public Administration	Petroleum	ktoe	4	0.171	0.331
Commercial	Commercial	Petroleum	ktoe	4	0.114	0.054
Industrial	Industry	Petroleum	ktoe	4	2.9	2.7
Industrial	Industry	Manufactured solid fuels	ktoe	4	0.05	0.06
Industrial	Industry	Coal	ktoe	4	-	-
Land Use	Forest	Net CO_2 emissions	kt CO_2e	5	-5.26	-5.25
Land Use	Cropland	Net CO_2 emissions	kt CO_2e	5	1.97	1.99
Land Use	Grassland	Net CO_2 emissions	kt CO_2e	5	-2.27	-2.28
Land Use	Wetlands	Net CO_2 emissions	kt CO_2e	5	-	-
Land Use	Settlements	Net CO_2 emissions	kt CO_2e	5	1.27	1.29
Residential	Domestic	Gas	GWh	3	472	509
Residential	Domestic	Electricity	GWh	1	154	163
Residential	Domestic	Petroleum	ktoe	4	0.55	0.57
Residential	Domestic	Coal	ktoe	4	0.29	0.28
Residential	Domestic	Manufactured solid fuels	ktoe	4	0.35	0.34
Transport	Buses	Diesel	ktoe	2	1.83	0.99
Transport	Cars	Petrol	ktoe	2	37.3	28.2
Transport	Cars	Diesel	ktoe	2	39	28
Transport	Motorcycles	Petrol	ktoe	2	0.55	0.38
Transport	HGV	Diesel	ktoe	2	20.8	21.3
Transport	LGV	Petrol	ktoe	2	0.6	0.5

Sector	Category	Fuel	Unit	Data Source	2019	2020
Transport	LGV	Diesel	ktoe	2	18.2	18.0
Transport	Rail	Petroleum	ktoe	4	0.186	0.158
Agriculture	Off-road/agriculture	Petroleum	ktoe	4	0.159	0.156
Agriculture	Livestock	-	kt CO_2e	5	2.10	2.10
Agriculture	Soils	-	kt CO_2e	5	0.53	0.47
Waste	Landfill	-	kt CO_2e	5	7.62	6.99
Waste	Waste Management 'Other'	-	kt CO_2e	5	10.63	10.59

Table A2.3: Emission factors for the borough GHG inventory

Sector	Category	Fuel	Unit	Data Source	2019	2020
Multiple	UK	Grid Electricity	$kgCO_2e/kWh$	UK Government GHG Conversion Factors for Company Reporting - UK Electricity - Electricity generated	0.2556	0.2331
Multiple	UK	Grid Electricity T&D	$kgCO_2e/kWh$	UK Government GHG Conversion Factors for Company Reporting - Transmission and distribution - T&D- UK electricity	0.1839	0.1839
Multiple	UK	Natural Gas	$kgCO_2e/kWh$	UK Government GHG Conversion Factors for Company Reporting - Fuels - Gaseous Fuels - Natural Gas - kWh (Gross CV)	0.3318	0.3204
Multiple	Industrial & Commercial	Coal	$kgCO_2e/kWh$	UK Government GHG Conversion Factors for Company Reporting - Fuels - Solid fuels - Coal (industrial) - kWh (Gross CV)	0.2568	0.2567
Multiple	UK	Gas oil	$kgCO_2e/kWh$	UK Government GHG Conversion Factors for Company Reporting - Fuels - Liquid fuels - Gas Oil - kWh (Gross CV)	0.3350	0.3350
Multiple	UK	Solid smokeless fuel	$ktCO_2e/TJ$	NAEI https://naei.beis.gov.uk/data/ef-all-results?q=149740	0.3447	0.3446
Residential	Domestic	Coal	$ktCO_2e/TJ$	NAEI https://naei.beis.gov.uk/data/ef-all-results?q=149742	0.2468	0.2467
Residential	Domestic	Kerosene (burning oil)	$kgCO_2e/kWh$	UK Government GHG Conversion Factors for Company Reporting - Fuels - Liquid fuels - Burning Oil - kWh (Gross CV)	0.1734	0.1684
Transport	Car (average size)	Diesel	$kg\ CO_2e/km$	UK Government GHG Conversion Factors for Company Reporting - Passenger vehicles - Cars (by size) - Average car - Diesel	0.1808	0.1743
Transport	Car (average size)	Petrol	$kg\ CO_2e/km$	UK Government GHG Conversion Factors for Company Reporting - Passenger vehicles - Cars (by size) - Average car - Petrol	0.1047	0.1031

Sector	Category	Fuel	Unit	Data Source	2019	2020
Transport	Buses	Petrol	kg CO_2e/passenger km	UK Government GHG Conversion Factors for Company Reporting - Business travel-land - Bus - Average Local Bus	0.8456	0.8302
Transport	HGV (all, 50% laden)	Diesel	kg CO_2e/km	UK Government GHG Conversion Factors for Company Reporting - Freighting goods - HGV(all diesel) - All HGVs – 50% laden	0.1155	0.1134
Transport	Motorcycle (average)	Petrol	kg CO_2e/km	UK Government GHG Conversion Factors for Company Reporting - Passenger vehicles - Motorbike - Average	0.2365	0.2196
Transport	Van (average)	Petrol	kg CO_2e/km	UK Government GHG Conversion Factors for Company Reporting - Freighting goods - Vans - Average (up to 3.5 tonnes) - Petrol	0.2521	0.2471
Transport	Van (average)	Diesel	kg CO_2e/km	UK Government GHG Conversion Factors for Company Reporting - Freighting goods - Vans - Average (up to 3.5 tonnes) - Diesel	0.2568	0.2567
Transport	Rail	Diesel	kgCO_2e/kWh	UK Government GHG Conversion Factors for Company Reporting - Fuels - Liquid fuels - Gas Oil - kWh (Gross CV)	0.2556	0.2331

Appendix 3 - Key Terms and Definitions

Activity: an action that leads to emissions of greenhouse gases. Examples include combustion of fossil fuels for heat, generation of electricity and transport, treatment of waste and wastewater, industrial processes. Activity data represent how much of this activity is taking place and has a variety of different units e.g. kWh, passenger kilometres, tonnes of waste etc.

Carbon dioxide equivalent (CO_2e): carbon dioxide equivalent is a measure used to compare the emissions from various greenhouse gases based upon their global warming potential. For example, the global warming potential for methane over 100 years is 28. Therefore 1 tonne of methane released is equivalent to 28 tonnes of CO_2 (measured on a 100-year time horizon). Therefore, CO_2e works as a single 'currency' for greenhouse gases.

Carbon emissions: often used as a shorthand to refer to greenhouse gas (GHG) emissions that are included in the Kyoto Treaty. Carbon dioxide is the most common GHG and other gases can be measured in relation to it (see CO_2e).

Carbon neutral: the balancing of carbon emissions against carbon removals and/or carbon offsetting with the net result being zero (see also net zero carbon).

Carbon reduction: an activity that reduces carbon emissions compared to a baseline scenario.

Climate change: the large-scale, long-term shift in the planet's weather patterns or average temperatures.

Climate change mitigation: action taken to reduce the release of greenhouse gas emissions or increase the removal of emissions by enhancing sinks (e.g. increasing the area of forests).

Decarbonisation: usually refers to the electricity sector and refers to reducing the carbon intensity of electricity generated (emissions per kWh) by increasing efficiency of supply or changing the generation fuel mix from fossil fuel to renewables and low carbon sources.

Emission factor: the average emissions of a given GHG for a particular activity. Emission factors are also expressed as the average combination of GHGs for a particular activity, in units of $kgCO_2e$.

Global warming: refers to the recent and ongoing rise in global average temperature near Earth's surface. It is caused mostly by increasing concentrations of greenhouse gases in the atmosphere. Global warming is causing climate patterns to change. However, global warming itself represents only one aspect of climate change.

Greenhouse Gas (GHG): a gas in our atmosphere that absorbs and emits radiation within the thermal infrared range. There are naturally occurring greenhouse gases in our atmosphere which maintain surface temperatures in a range conducive to life. However, since the industrial revolution, anthropogenic sources of GHGs have increased hugely, leading to 40% increase in atmospheric concentration of carbon dioxide. This is causing

increases in surface temperatures and is the main cause of climate change. There are seven GHGs covered by the Kyoto Treaty, but the main ones are carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O), and action needs to be taken to reduce emissions of these.

Greenhouse Gas Protocol: a joint initiative of the World Resource Institute (WRI) and the World Business Council for Sustainable Development (WBCSD), the GHG Protocol provides global standard frameworks for the measurement and management of greenhouse gas emissions.

Net zero carbon: the balancing of carbon emissions against carbon removals and/or carbon offsetting with the net result being zero (see also carbon neutral).

Project lifetime: anticipated lifetime of an energy efficiency technology or low carbon behaviour, used to calculate lifetime savings.

Removals: CO_2 removals refer to a set of techniques that aim to remove CO_2 directly from the atmosphere by either increasing natural sinks for carbon or using chemical engineering to remove the CO_2, with the intent of reducing the atmospheric CO_2 concentration.

Scope: a way of categorising emission sources in relation to the reporting organisation, used as a way of providing transparency in emissions accounting, making it clear the type of emission source and the level of control of the reporting organisation over the source. Three levels of scope have been defined and used on a global basis.

Sequestration: a natural or artificial process by which carbon dioxide is removed from the atmosphere and held in solid or liquid form. The uptake of atmospheric carbon by plants and the growth of wood or increase of peat volume are examples of biological sequestration. Also see removals.

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