Three Rivers District Council – District Wide Carbon Emissions and Net Zero Trajectory

Report produced in November 2022

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THREE RIVERS DISTRICT COUNCIL

Net Zero Trajectory for the Three Rivers District

Contents

Executive Summary

This report is split into two sections. Part A details the carbon footprint of the Council and Part B determines the carbon footprint of the Three Rivers district and advises on what can be done to reduce emissions and to align with a net zero carbon target of 2030.

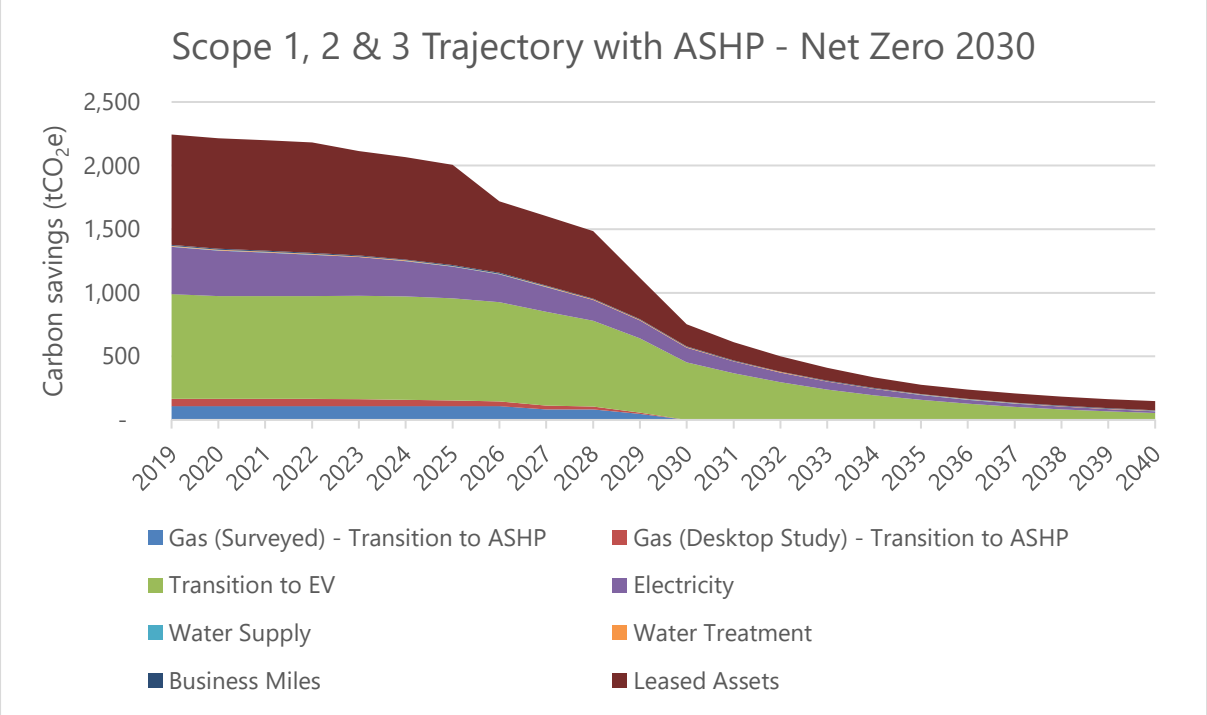
The table below shows the carbon emissions for Three Rivers District Council in 2020/21 as being 2,153 tonnes CO_2e for the known Scope 1, 2 & 3 emissions. There are emissions sources missing with the most noteworthy being purchased goods and services.

Carbon emissions by source for 2020/21

2020/2021			
Emissions Source	**Scope**	**% Split**	**TonnesCO2e**
Gas	1	5%	109
Vehicle - Council Owned	1	40%	863
Electricity	2	9%	184
Gas - WTT	3	1%	14
Vehicle - Council Owned - WTT	3	10%	207
Electricity - T&D	3	1%	16
Electricity - WTT	3	1%	28
Water Supply	3	0.1%	2.9
Water Treatment	3	0.3%	5.7
Vehicle - Employee	3	0.3%	5.6
Leased Assets	3	33.4%	718
Total		**100%**	**2,153**

The chart below shows the net zero trajectory for the Council's own Scope 1, 2 & 3 emissions:

Projection of the Scope 1, 2 and Scope 3 carbon emissions



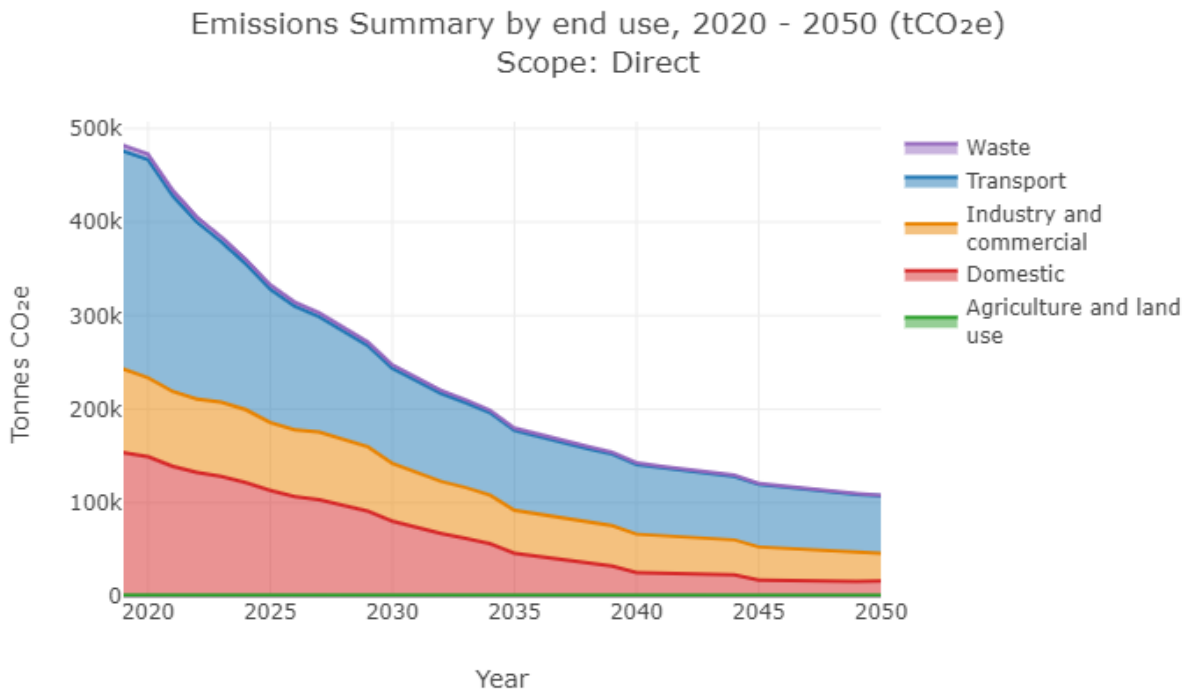
The conversion factors for future CO_2 emissions have been taken from the Treasury Green Book supplementary appraisal guidance on valuing energy use and greenhouse gas (GHG) emissions published by BEIS. These emissions factors include transmission and distribution losses, including significant losses due to power station inefficiency meaning that the emissions factors differ slightly to those calculated in the baseline emissions. Therefore, there is a difference between the carbon emissions in 2020/21 when comparing the trajectory to the carbon footprint.

This trajectory represents an overall saving of 1,493tCO_2e (67%) when comparing 2020 to 2030.

It is estimated that there will be 751tCO_2e from hard to reduce sources that will be unavoidable by 2030 that will need to be offset, and it is assumed that this can be offset through a land – based PV and tree planting scheme which will cost £736,360 combined.

The chart below shows the net zero trajectory for the whole district for Scope 1, 2 & 3 emissions:

Chart showing projection of carbon emissions through the Three Rivers District



Delivering carbon reduction projects with a high level of ambition could see emissions reduce from 472,787 tCO_2e in 2020 to 108,167 tCO_2e in 2050, which is a reduction of 77%. The emissions in 2030 will be 247,498 tCO_2e, which is a reduction of 48%.

Part A – Three Rivers District Council Carbon Emissions

There are separate reports titled 'Consultancy support – Scope 1, 2 and 3 Carbon Emissions – 2020/21' and 'Net Zero Carbon Emissions Trajectory for Three Rivers District Council' with a more detailed analysis of calculating the carbon footprint and net zero trajectory for the Council's own emissions.

1 Introduction

This section provides a calculation of the carbon footprint for Three Rivers District Council which can be used to monitor the performance for emitting carbon in the Council's own operations. The carbon footprint has been undertaken in accordance with best practise guidance by the Greenhouse Gas Protocol and calculated using conversion factors for the carbon dioxide equivalent (CO_2e) published by the Department for Business, Energy & Industrial Strategy (BEIS).

The reporting compares the financial years of 2018/19, 2019/20 and 2020/21.

The carbon footprint is categorised into scopes, which cover:

Scope 1 (direct) emissions are from activities owned or controlled by the Council. Examples of Scope 1 emissions include emissions from combustion in council owned or controlled boilers, furnaces and vehicles.

Scope 2 (indirect) emissions are associated with purchased electricity, heat, steam and cooling. These indirect emissions are a consequence of the Council's energy use, but occur at sources that the Council do not own or control. Examples include grid supplied electricity and heat provided through a heat network.

Scope 3 (other indirect) emissions are a consequence of the Council's actions that occur at sources the Council do not own or control and are not classed as Scope 2 emissions. Examples of Scope 3 emissions include business travel by means not owned or controlled by the Council (grey fleet), disposing of the Council's own waste and purchased goods in the supply chain etc.

2 Carbon Footprint

2.1 Carbon Reporting Boundaries

The organisational boundaries determine what emissions are the responsibility of the Council or others. This can be based on who owns, operates, or exerts control over certain assets. The buildings categorised under Scope 1 & 2 within this reporting are those where energy is purchased or acquired and consumed by the Council. The vehicles categorised under Scope 1 are vehicles that the Council own, lease and operate purely for the Council's own operations.

Scope 3 emissions are classified under 15 different categories as detailed under Appendix D. As Scope 3 emissions are under the influence of the Council, but not under its direct control, it can be difficult to obtain the necessary data to calculate the associated carbon emissions from some Scope 3 sources. One of the larger contributors to carbon emissions is purchased goods and services.

Emissions from assets a company owns and leases to another entity, but does not operate, can either be included in Scope 3 or excluded from the inventory.

Table 3 below shows all of the sources that make up the reporting boundary for the Council, within this report.

The emissions from these sources represents a good data set for a Council, as it is not uncommon for Councils to only have data available for electricity and gas only.

There are sources that are missing from the reporting and the largest contributor is likely to be from purchased goods and services, which is generally very difficult to gather data and calculate emissions about. This category includes all upstream (i.e. cradle-to-gate) emissions from the production of products purchased or acquired by the Council in the reporting year. Products include both goods (tangible products) and services (intangible products).

Cradle-to-gate emissions include all emissions that occur in the life cycle of purchased products, up to the point of receipt by the Council. Relevant purchases to the Council may include capital goods, such as office supplies, office furniture, computers, telephones, travel services, IT support, outsourced administrative functions, consulting services, janitorial, landscaping services, maintenance, repairs and operations.

The Council should set up procedures to record all emission sources related to its operations for future reporting, and it is likely that the overall emissions will increase as the data quality improves.

2.2 Carbon Emissions

2.2.1 Emissions for 2020/21

The set of data below shows a summary of the most recent year available of 2020/21.

Table 1: Carbon emissions by source for 2020/21

2020/2021			
Emissions Source	**Scope**	**% Split**	**TonnesCO2e**
Gas	1	5%	109
Vehicle - Council Owned	1	40%	863
Electricity	2	9%	184
Gas - WTT	3	1%	14
Vehicle - Council Owned - WTT	3	10%	207
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Vehicle - Employee	3	0.3%	5.6
Leased Assets	3	33.4%	718
Total		**100%**	**2,153**

Figure 1: Carbon emissions by source for 2020/21

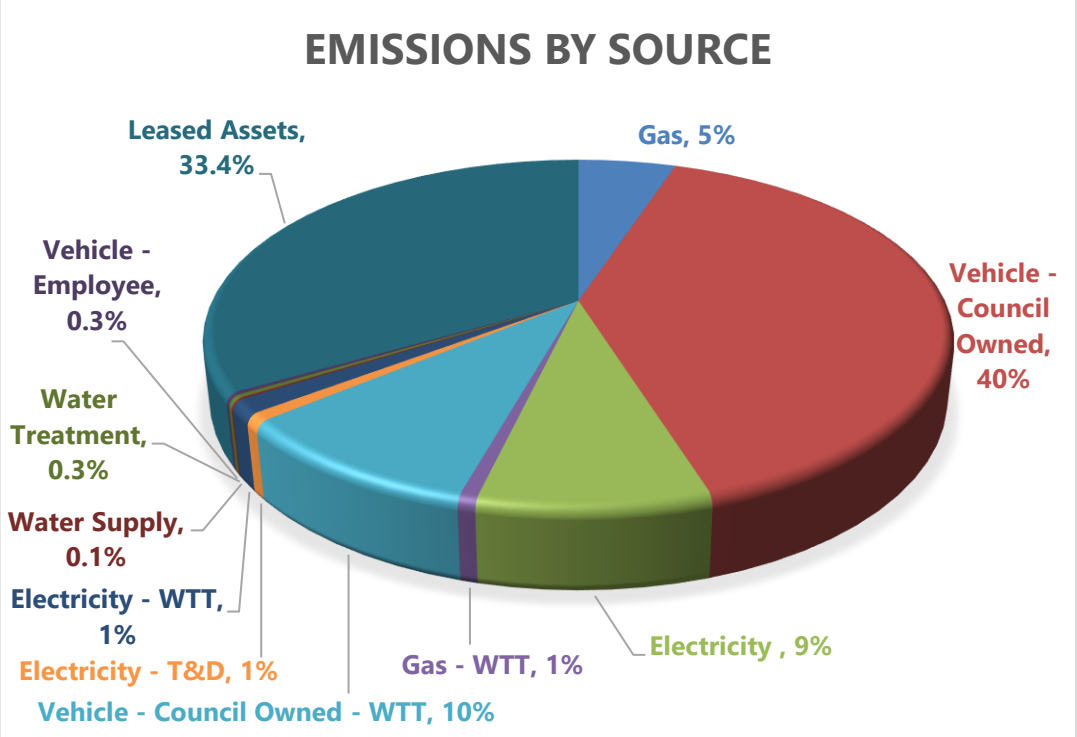
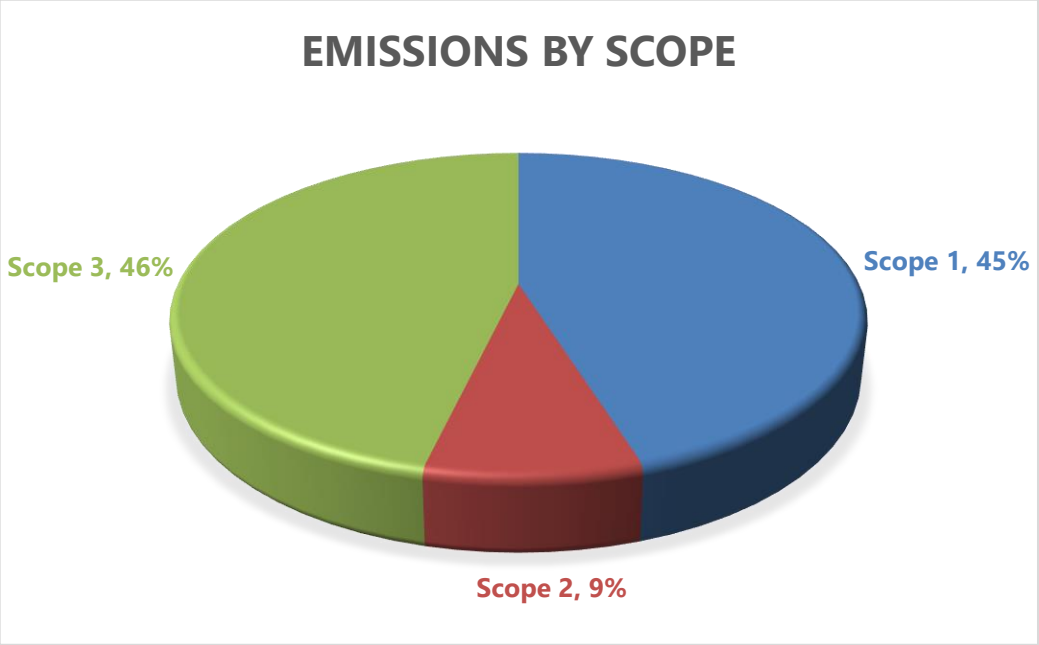


Table 2: Carbon emissions by scope for 2020/21

Emissions Source	% Split	TonnesCO2e
Scope 1	45%	972
Scope 2	9%	184
Scope 3	46%	997
Total	**100%**	**2,153**

Figure 2: Carbon emissions by scope for 2020/21



2.2.3 Comparison of Emissions for 2018/19, 2019/20 and 2020/21

Table 3: Difference in carbon emissions by year

	Tonnes of CO_2e		
	Apr 2018 – Mar 2019	**Apr 2019 – Mar 2020**	**Apr 2020 – Mar 2021**
Scope 1 - Direct Emissions	**994**	**989**	**972**
Natural Gas	136	131	109
Council Owned Vehicles	858	858	863
Scope 2 – Electricity Emissions	**340**	**273**	**184**
Total Scope 1 & 2 Emissions	**1,333**	**1,263**	**1,156**
Scope 3 – Indirect Emissions	**894**	**1,128**	**997**
Gas – Well to tank emissions	19	17	14
Council Owned Vehicles - Well to tank emission	202	204	207
Electricity – Distribution and transmission emissions	29	23	16
Electricity – Well to tank emissions	55	41	28
Water Supply	N/A	2	3
Water Treatment	N/A	5	6
Employee Vehicle emissions	21	7	6
Leased Assets	569	827	718
Total Gross Emissions	**2,227**	**2,390**	**2,153**
Carbon offset	0	0	0
Solar PV Exported	0	0	0
Total Net Emissions	**2,227**	**2,390**	**2,153**
Further Information			
Solar PV Generated	15,098	16,981	23,362
Degree Days at 15.5 ^{O}C	1,757	1,856	1,875
(an indicator of heat demand)			
Total electricity kWh	1,199,498	1,069,206	790,348
Total gas kWh	737,763	714,341	593,671

Figure 3: Scope 1 carbon emissions by year

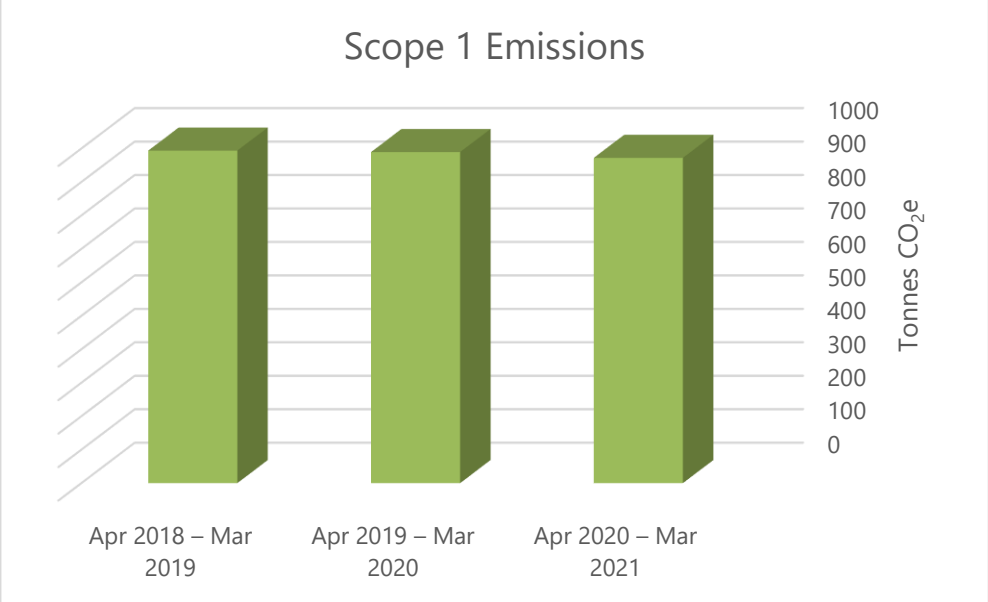


Figure 4: Scope 2 carbon emissions by year

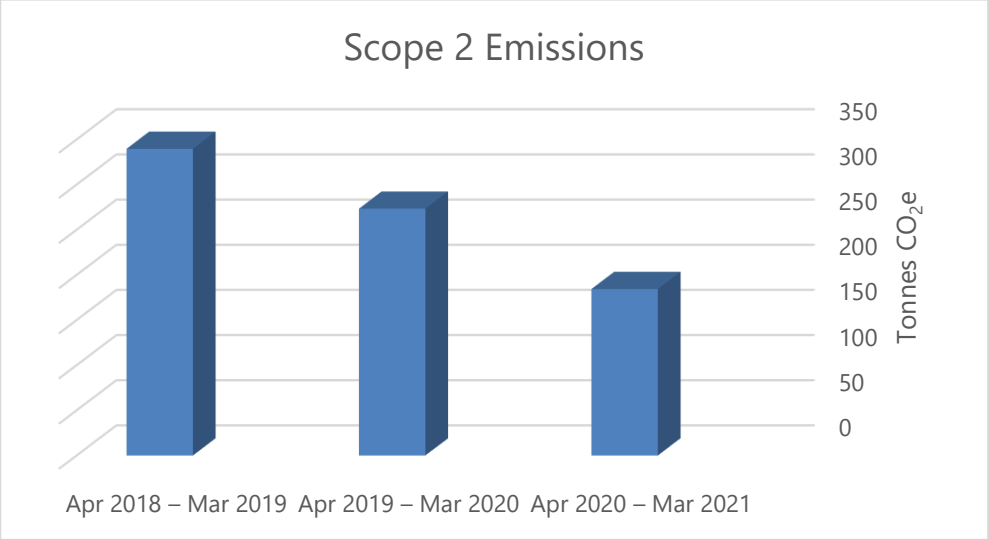


Figure 5: Scope 3 carbon emissions by year

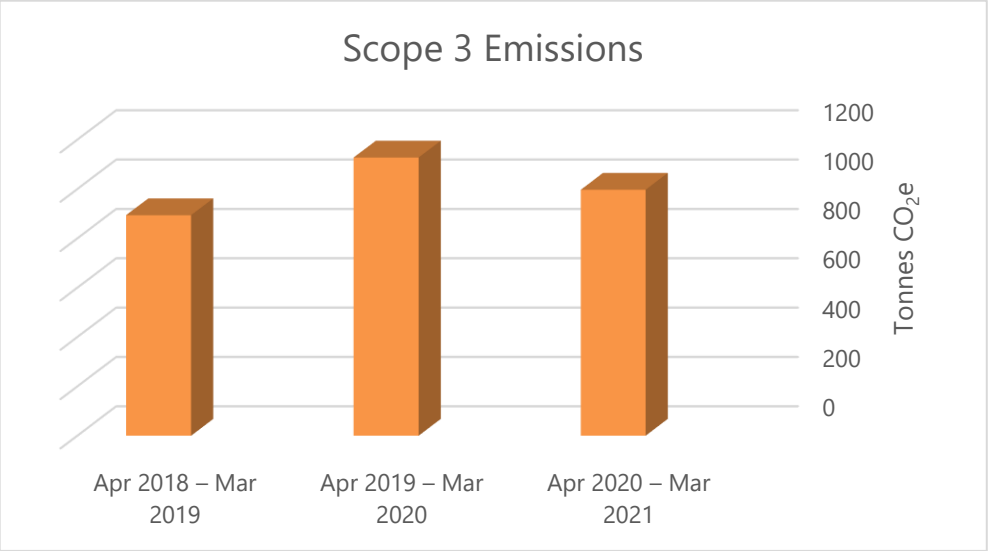
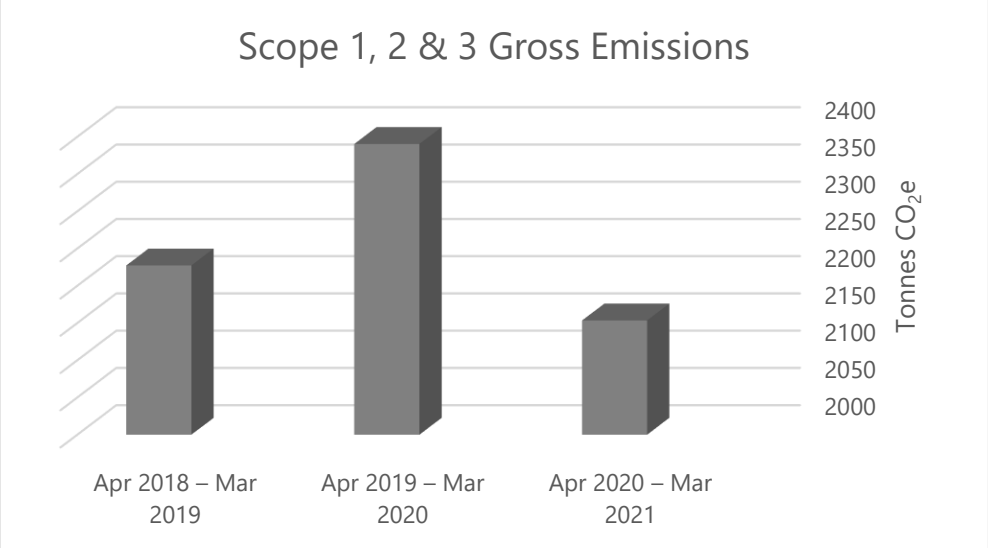


Figure 6: Scope 1, 2 & 3 carbon emissions by source by year

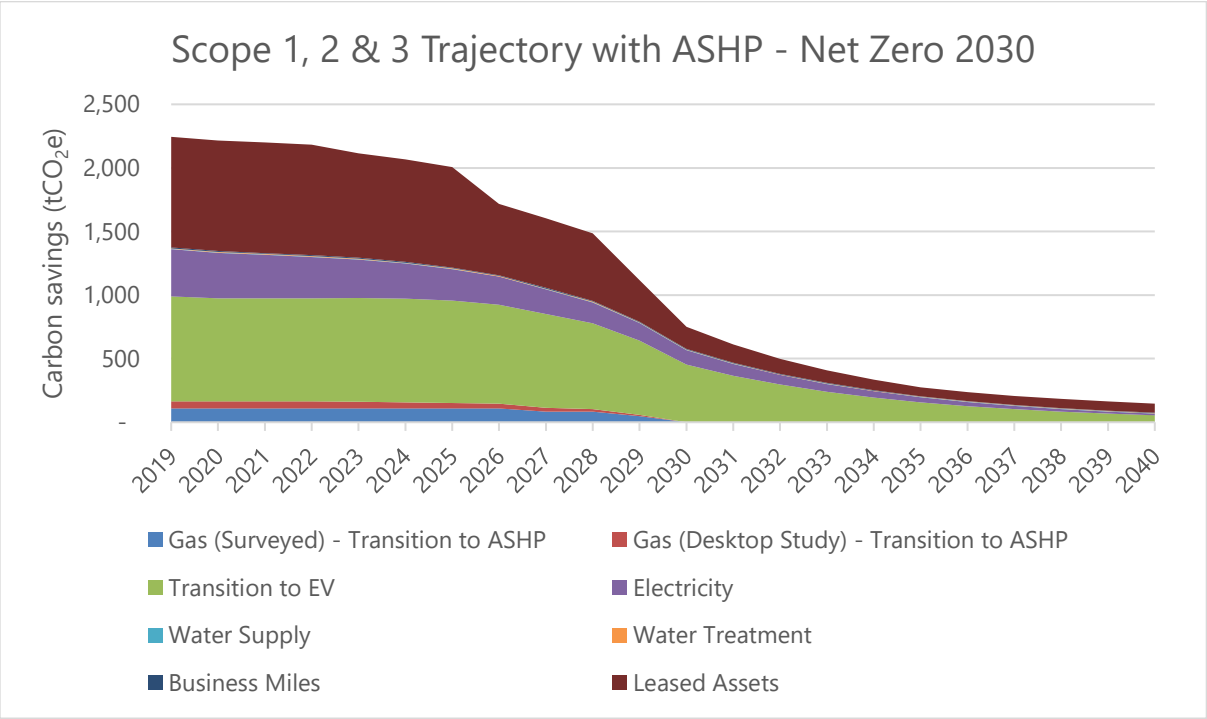


3 Three Rivers District Council Net Zero Trajectory

This section shows calculations for the carbon emissions baseline of the Council and an estimated projection of emissions after interventions are made with a net zero carbon target of 2030.

The trajectory below shows a projection of the Scope 1, 2 and known Scope 3 carbon emissions for the net zero targets of 2030. The total emissions from all Scope 3 sources are not known to date.

Figure 7: Projection of the Scope 1, 2 and known Scope 3 carbon emissions



The conversion factors for future CO_2 emissions have been taken from the Treasury Green Book supplementary appraisal guidance on valuing energy use and greenhouse gas (GHG) emissions published by BEIS[1]. These emissions factors include transmission and distribution losses, including significant losses due to power station inefficiency meaning that the emissions factors differ slightly to those calculated in Section 2. Therefore there is a difference between the carbon emissions in 2020/21 when comparing the trajectory to the carbon footprint.

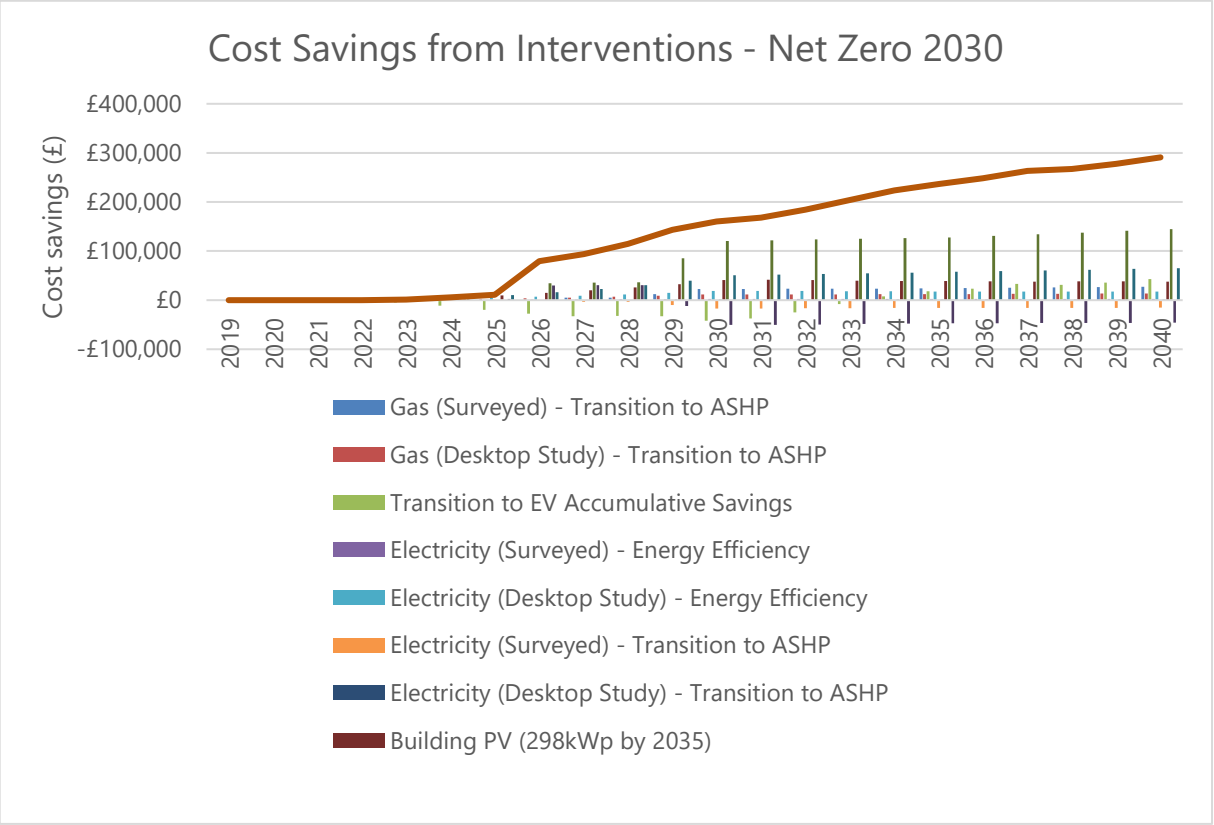
[1] https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal

This trajectory represents an overall saving of 1,493tCO_2e (67%) when comparing 2020 to 2030.

It is estimated that there will be 751tCO_2e from hard to reduce sources that will be unavoidable by 2030 that will need to be offset, and it is assumed that this can be offset through a land – based PV and tree planting scheme which will cost £736,360 combined.

Carrying out the recommended initiatives will result in financial savings over the term as shown in the chart below:

Figure 8: Financial savings to the council over the term



It is estimated that a financial budget of £19million is required to reach net zero carbon by 2030 for corporate assets by being more energy efficient in buildings, installing air source heat pumps, generating power, and developing a tree planting scheme. It is estimated that these initiatives will financially benefit the Council by £160,626 per year in 2030.

The above budgets do not take into account funds which would be spent on these assets as a matter of course over the term identified in the graph.

Part B – District Wide Net Zero Carbon Emissions

4 Introduction

This section involves identifying the carbon emissions for the whole Three Rivers local authority area. It involves research to identify and analyse different data sources to provide a recommendation on how to determine the baseline and carbon reduction programme across the district.

5 District Wide Carbon Emissions

The three main models that were considered were:

- Emissions of carbon dioxide for Local Authority areas published by BEIS[2]
- SCATTER[3]
- The Tyndall Centre carbon budget[4]

The methodology behind gathering the data of all three models is very similar but there are slight differences. The methodology is based on the Accounting and Reporting Standard developed by the Greenhouse Gas Protocol[5], the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories and the data sources from the same bases such as the Digest of UK Energy Statistics (DUKES) which contains data of actual energy usage for each sector.

This was deemed the most suitable method for reporting on district wide carbon emissions as the data gathering process is robust and established and this enables a comparison with other local authorities.

The data from BEIS can be used to track performance annually however, the related year's carbon emissions will not be published by BEIS until two years later due to the

[2] https://www.gov.uk/government/collections/uk-local-authority-and-regional-greenhouse-gas-emissions-national-statistics
[3] https://scattercities.com/
[4] https://carbonbudget.manchester.ac.uk/
[5] https://ghgprotocol.org/guidance-0

data lag (e.g. short term actions in 2020/21 will not be in the released reported emissions until 2022).

5.1 Emissions of carbon dioxide for Local Authority areas published by BEIS

The carbon emissions for the district have been calculated based on data provided by BEIS. The data table used was published in June 2022 and the most recent year available is 2020.

The data combines information from the UK's Greenhouse Gas Inventory with data from a number of other sources, including local energy consumption statistics, to produce a nationally consistent set of CO_2 emissions estimates at local authority level from 2005 to 2020 to allow a comparison between subsequent years.

Statistics in the individual datasets are based on the aggregation of data from different sources of information. Electricity and gas data is based on real consumption recorded from meters which is then aggregated upwards to local authority and regional level. Road transport fuel and residual fuel data are modelled using fuel consumption and emissions estimates gathered on a national level and then disaggregated throughout the United Kingdom using spatial data and region-specific statistics.

All emissions included in the national inventory are covered, except aviation, shipping and military transport, for which there is no obvious basis for allocation to local areas.

5.1.1 Electricity and Gas Data

Annualised electricity and gas consumption data was compiled by agents of the suppliers for each electricity and gas meter within Three Rivers district post codes and split between commercial and domestic users.

A correction factor is applied to the gas data so that it is adjusted to average weather conditions. This is to allow a fair comparison between data years as most of the gas usage is for space heating and domestic hot water. For example, the raw gas usage in the district may appear less in 2025 compared to 2017 as there may have been a particularly mild winter. Adjusting the data for weather considers the temperatures of this year and adjusts it to average temperatures meaning that the years are more comparable when monitoring savings due to carbon reduction methods.

5.1.2 Transport

Fuel consumption factors and traffic data was compiled for 6 major classes of vehicles to estimate regional fuel consumption and emissions estimates from passenger cars, light goods vehicles (LGVs), rigid and articulated heavy goods vehicles (HGVs), buses/coaches and mopeds/motorcycles. The vehicle classifications are further sub-divided by fuel type (petrol or diesel).

The methodology combines traffic activity data taken from the Department for Transport (DfT) national traffic census. The vehicle fleet composition data are based on licensing statistics and evidence from Automatic Number Plate Recognition (ANPR) data from DfT. These provide an indication of the vehicle mix by engine size, vehicle size, age, engine and exhaust treatment technology, Euro emission standards, and fuel type as observed on different road types.

5.1.3 Land Use, Land Use Change and Forestry (LULUCF)

LULUCF activities are both a source and sink for atmospheric CO_2. At the local authority level, the highest emissions tend to correspond to loss in soil carbon associated with grassland conversion to cropland and settlement as well as the drainage of organic soil under cropland, peat extraction or wildfire. The largest removals of CO_2 correspond to forest growth and changes in soil carbon associated with cropland conversion to grassland. At the UK scale, LULUCF activities are currently a net sink of CO_2.

The negative values in the table represent a removal of CO_2 from the atmosphere.

5.2 Accuracy of Data

Several sources of data were considered for the district wide carbon reporting method including raw data for electricity, gas and transport. Data from the UK Local Authority and Regional Carbon Dioxide Emissions National Statistic[6] was used as the methodology for data gathering is robust and collected annually to allow for consistent benchmarking in subsequent years.

[6] https://www.gov.uk/government/collections/uk-local-authority-and-regional-greenhouse-gas-emissions-national-statistics

5.3 District Wide Carbon Emissions

The emissions published by BEIS have changed in 2022 to include greenhouse gases which include carbon dioxide, methane and nitrous oxide. This is the first time that this data has included estimates of methane and nitrous oxide emissions, previously they have only included carbon dioxide emission estimates. In accordance with international reporting and carbon trading protocols, each of these gases is weighted by its global warming potential (GWP), so that total greenhouse gas emissions can be reported on a consistent basis (in carbon dioxide equivalent units). The GWP for each gas is defined as its warming influence relative to that of carbon dioxide and the combined terminology for reporting on all greenhouse gases is carbon dioxide equivalent or CO_2e (CO_2 means carbon dioxide only).

As CO_2e is a new methodology for reporting, it means that full historical CO_2e data is not available. The tables below are therefore split to show CO_2e between 2017 to 2020 and CO_2 between 2005 and 2020.

5.3.1 Under the Influence of a Local Authority

The Local Authority carbon emissions estimates published by BEIS are split into two categories:

Full Dataset

This includes an estimate for all emissions within the territory of the Local Authority and includes:

- Industry (including electricity-related emissions);
- Commercial (including electricity-related emissions);
- Public sector (including electricity-related emissions);
- Domestic (including electricity-related emissions);
- Transport;
- Land use, land use change and forestry (LULUCF) (including removals of carbon dioxide from the atmosphere, so that net emissions from this sector can sometimes be negative);
- Agriculture (including electricity-related emissions);
- Waste management (distributed based on the waste arising in each local authority).

Subset Dataset

This is prepared on a different basis that excludes sources that are beyond the influence of the Council. As an example, this subset excludes emissions from very large industrial sites, diesel railways, motorways and land use. Very large industrial sites, such as a power station can make a large difference to the emissions of an LA and can unfairly bias the emissions totals. Similarly, a council has little influence over diesel railways and motorways as these are part of the national infrastructure.

The net effect of all land use changes is complex and is only partly under the influence of a council in terms of new buildings. It also depends on farming practices, and the actions of landowners and local agricultural and horticultural businesses.

The subset emissions are marginally lower than the full dataset in the Three Rivers district. For example, in 2020 the grand total emissions for the full dataset for carbon dioxide only were 474.3ktCO_2 and the subset emissions (excludes large industrial sites, railways, motorways and land-use which are beyond the influence of an LA) was 308.4ktCO_2. So, this is a difference of 165.9ktCO_2 or 35%. Most of the difference between the two figures is attributed towards road transport from motorways (the M25).

The tables show a summary of the emissions so they can fit on one page. A more detailed breakdown of emissions is available on the website of footnote 6.

Using the subset dataset may be fairer when comparing emissions against other councils, particularly as Three Rivers has the M25 running through it.

It is recommended to use 2005 as the baseline year as full and consistent datasets have been available.

5.3.2 Carbon Dioxide Only (CO_2)

Table 4: Local authority carbon emissions within the scope of influence of local authorities for 2005-2020 (kt CO_2) – Full Dataset – *Showing Carbon dioxide only*

Year	Industry & Commercial Electricity	Industry & Commercial Gas	Large Industrial Installations	Industry & Commercial 'Other'	Agriculture	**Industry & Commercial Total**	Public Sector Electricity	Public Sector Gas	Public Sector 'Other'	**Public Sector Total**	Domestic Electricity	Domestic Gas	Domestic 'Other'	**Domestic Total**	Road Transport (A roads)	Road Transport (Motorways)	Road Transport (Minor roads)	Diesel Railways	Transport 'Other'	**Transport Total**	LULUCF Net Emissions	**Grand Total**	Population ('000s, mid-year estimate)	Per Capita Emissions (t)
2005	73.9	19.1	0.0	18.3	3.9	**115.2**	25.4	15.8	0.4	**41.6**	93.8	130.5	7.2	**231.5**	65.9	191.5	81.0	5.4	1.7	**345.6**	-3.2	**730.8**	84.3	8.7
2006	77.9	20.1	0.0	16.3	3.9	**118.3**	26.8	16.7	0.3	**43.7**	99.3	127.1	6.8	**233.2**	63.4	192.0	86.5	5.3	1.8	**348.9**	-3.2	**740.9**	84.5	8.8
2007	71.3	16.4	0.0	16.3	3.6	**107.6**	24.5	13.6	0.2	**38.3**	100.1	121.8	6.9	**228.8**	60.6	186.4	89.0	5.7	1.7	**343.3**	-3.4	**714.6**	85.3	8.4
2008	67.8	16.0	0.0	13.9	3.5	**101.2**	23.3	13.2	0.2	**36.7**	94.7	127.0	7.5	**229.3**	56.9	177.4	81.0	5.6	1.7	**322.6**	-3.7	**686.2**	86.2	8.0
2009	60.8	13.8	0.0	13.0	3.3	**90.9**	20.9	11.4	0.1	**32.4**	85.4	117.3	6.8	**209.5**	54.6	173.1	78.3	5.6	1.6	**313.2**	-3.7	**642.3**	87.1	7.4
2010	61.8	16.4	0.0	13.9	3.4	**95.5**	21.2	13.5	0.1	**34.9**	89.4	130.8	7.2	**227.3**	53.2	161.2	76.8	5.6	1.5	**298.3**	-3.7	**652.3**	87.6	7.4
2011	52.3	14.3	0.0	12.0	3.1	**81.7**	18.0	11.8	0.2	**29.9**	85.3	107.7	6.8	**199.8**	52.6	175.2	75.5	5.4	1.6	**310.2**	-3.9	**617.8**	87.9	7.0
2012	66.7	13.8	0.0	10.9	3.5	**94.9**	22.9	11.4	0.1	**34.4**	90.4	118.1	6.5	**215.1**	51.7	187.9	74.0	5.5	1.6	**320.8**	-3.8	**661.4**	88.8	7.4
2013	63.4	15.4	0.0	9.8	3.4	**92.0**	21.8	12.7	0.0	**34.6**	83.1	123.2	6.8	**213.1**	49.9	190.8	73.3	5.5	1.7	**321.2**	-4.1	**656.8**	89.6	7.3
2014	52.4	12.6	0.0	11.1	3.1	**79.2**	18.0	10.4	0.1	**28.4**	70.1	103.6	6.3	**180.1**	48.9	198.9	74.8	5.6	1.6	**329.8**	-4.0	**613.5**	90.5	6.8
2015	43.5	13.0	0.0	12.1	2.9	**71.6**	14.9	10.7	0.1	**25.7**	59.8	109.5	6.4	**175.7**	49.1	199.9	75.1	5.4	1.6	**331.1**	-4.3	**599.8**	91.8	6.5
2016	36.1	13.3	0.0	11.9	2.9	**64.2**	12.1	11.4	0.1	**23.6**	48.6	114.6	6.3	**169.5**	49.2	206.5	77.2	5.3	1.6	**339.7**	-4.0	**593.1**	92.7	6.4
2017	30.2	13.9	0.0	12.9	2.8	**59.7**	11.3	10.1	0.0	**21.5**	41.8	108.8	6.3	**157.0**	45.8	206.6	81.6	5.2	1.5	**340.8**	-4.2	**574.9**	92.6	6.2
2018	28.9	18.6	0.0	13.2	2.6	**63.3**	10.4	10.3	0.0	**20.7**	38.2	109.4	6.4	**153.9**	42.4	204.0	78.3	5.0	1.6	**331.2**	-4.1	**565.1**	93.0	6.1
2019	25.5	15.1	0.0	12.0	2.6	**55.1**	9.1	10.4	0.0	**19.5**	34.5	107.7	5.9	**148.1**	40.9	198.8	75.1	5.2	1.6	**321.5**	-4.2	**540.1**	93.3	5.8
2020	19.7	14.2	0.0	13.9	2.5	**50.4**	7.7	10.2	0.0	**17.9**	32.3	107.8	5.9	**146.0**	32.2	165.7	60.7	4.1	1.4	**264.1**	-4.1	**474.3**	94.0	5.0

The table shows that the overall carbon emissions in the district have dropped by 256.5ktCO_2 between the base year of 2005 and 2020. This is a reduction in emissions of 35.1% however, it should be noted that the carbon conversion factor for grid supplied electricity only was 0.47537kgCO_2 and 0.23104kgCO_2 in 2005 and 2020 respectively which represents a reduction of 51.4% over the period as the grid has decarbonised by introducing more renewable sources and reducing fossil fuels such as coal.

The population of the district has risen by 11.5% over the period but the emissions have reduced by 43% per person.

5.3.3 Carbon Dioxide Equivalent (CO_2e)

Table 5: Local authority carbon emissions within the scope of influence of local authorities for 2005-2020 (kt CO_2e) – Full Dataset
Showing carbon dioxide equivalent

Year	Industry & Commercial Electricity	Industry & Commercial Gas	Large Industrial Installations	Industry & Commercial 'Other'	Agriculture	**Industry & Commercial Total**	Public Sector Electricity	Public Sector Gas	Public Sector 'Other'	**Public Sector Total**	Domestic Electricity	Domestic Gas	Domestic 'Other'	**Domestic Total**	Road Transport (A roads)	Road Transport (Motorways)	Road Transport (Minor roads)	Diesel Railways	Transport 'Other'	**Transport Total**	LULUCF Net Emissions	**Waste Management Total**	Grand Total	Population ('000s, mid-year estimate)	Per Capita Emissions (t)
2018	29.8	19.1	0.0	13.4	7.2	**69.5**	10.7	10.5	0.0	**21.3**	39.4	112.2	7.3	**158.9**	43.1	206.6	79.8	5.0	1.6	**336.2**	-3.8	**9.5**	**591.6**	93.0	6.4
2019	26.3	15.5	0.0	12.1	7.2	**61.1**	9.4	10.6	0.0	**20.1**	35.6	110.5	6.8	**152.9**	41.6	201.3	76.5	5.2	1.6	**326.3**	-3.9	**10.7**	**567.3**	93.3	6.1
2020	20.4	14.5	0.0	14.1	7.0	**56.0**	8.0	10.5	0.0	**18.4**	33.4	110.5	6.8	**150.7**	32.8	168.0	61.9	4.1	1.4	**268.1**	-3.8	**10.1**	**499.6**	94.0	5.3

The table shows that the overall carbon dioxide equivalent (CO_2e) emissions in the district have dropped by 92ktCO_2 between the 2018 and 2020. This is a reduction in emissions of 15.6%. The comparison of carbon equivalent emissions only goes as far as 2018 as this is the only data available.

5.3.4 Comparison with Neighbouring Authorities

Table 6 – Comparison of local authority emissions for 2020 (kt CO_2) – Full Dataset

Local Authority	Year	Industry & Commercial Electricity	Industry & Commercial Gas	Large Industrial Installations	Industry & Commercial 'Other'	Agriculture Total	**Industry & Commercial Total**	Public Sector Electricity	Public Sector Gas	Public Sector 'Other'	**Public Sector Total**	Domestic Electricity	Domestic Gas	Domestic 'Other'	**Domestic Total**	Road Transport (A roads)	Road Transport (Motorways)	Road Transport (Minor roads)	Diesel Railways	Transport 'Other'	**Transport Total**	**LULUCF Net Emissions**	**Waste Management Total**	**Grand Total**	Population ('000s, mid-year estimate)	Per Capita Emissions (t)
Three Rivers	2020	19.7	14.2	0.0	13.9	2.5	**50.4**	7.7	10.2	0.0	**17.9**	32.3	107.8	5.9	**146.0**	32.2	165.7	60.7	4.1	1.4	**264.1**	**-4.1**	**0.0**	**474.3**	94.0	5.0
Dacorum	2020	61.6	35.8	0.5	12.3	5.8	**116.0**	11.3	13.7	0.1	**25.1**	50.8	156.6	10.1	**217.5**	85.6	50.1	98.6	5.1	1.3	**240.7**	**-13.3**	**0.0**	**586.0**	155.5	3.8
Hertsmere	2020	37.6	31.0	0.0	29.4	2.1	**100.2**	5.3	13.4	0.0	**18.8**	36.4	119.2	5.5	**161.1**	50.4	200.1	60.8	4.8	1.7	**317.8**	**-5.4**	**0.0**	**592.4**	105.5	5.6
St Albans	2020	29.9	37.3	0.4	12.3	5.2	**85.1**	6.0	11.0	0.1	**17.1**	49.8	169.0	7.5	**226.2**	79.2	302.7	97.4	9.0	2.6	**490.8**	**-6.9**	**0.0**	**812.3**	149.3	5.4
Watford	2020	45.5	14.4	0.2	11.0	0.2	**71.3**	4.2	12.9	0.0	**17.1**	28.7	90.2	1.5	**120.4**	39.0	8.5	36.5	1.8	0.5	**86.3**	**-1.1**	**0.0**	**294.0**	96.6	3.0
Harrow	2020	25.4	24.1	0.0	11.1	0.5	**61.2**	7.5	19.8	0.0	**27.3**	67.1	263.6	2.2	**332.9**	52.0	5.4	120.0	4.3	1.0	**182.6**	**-2.5**	**0.0**	**601.5**	252.3	2.4

Table 7 – Comparison of local authority emissions for 2020 (kt CO_2e) – Full Dataset

Local Authority	Year	Industry & Commercial Electricity	Industry & Commercial Gas	Large Industrial Installations	Industry & Commercial 'Other'	Agriculture Total	**Industry & Commercial Total**	Public Sector Electricity	Public Sector Gas	Public Sector 'Other'	**Public Sector Total**	Domestic Electricity	Domestic Gas	Domestic 'Other'	**Domestic Total**	Road Transport (A roads)	Road Transport (Motorways)	Road Transport (Minor roads)	Diesel Railways	Transport 'Other'	**Transport Total**	**LULUCF Net Emissions**	**Waste Management Total**	**Grand Total**	Population ('000s, mid-year estimate)	Per Capita Emissions (t)
Three Rivers	2020	20.4	14.5	0.0	14.1	7.0	**56.0**	8.0	10.5	0.0	**18.4**	33.4	110.5	6.8	**150.7**	32.8	168.0	61.9	4.1	1.4	**268.1**	**-3.8**	**10.1**	**499.6**	94.0	5.3
Dacorum	2020	63.7	36.7	0.5	12.9	24.7	**138.5**	11.7	14.1	0.1	**25.8**	52.6	160.5	11.3	**224.4**	86.8	50.8	100.4	5.2	1.3	**244.5**	**-12.6**	**49.4**	**670.1**	155.5	4.3
Hertsmere	2020	38.9	31.8	0.0	30.0	6.6	**107.3**	5.5	13.7	0.0	**19.3**	37.6	122.2	6.4	**166.2**	51.1	202.9	61.9	4.8	1.7	**322.4**	**-5.1**	**41.1**	**651.3**	105.5	6.2
St Albans	2020	30.9	38.2	0.4	12.9	14.1	**96.5**	6.2	11.2	0.1	**17.6**	51.5	173.3	8.6	**233.4**	80.2	307.1	99.2	9.0	2.6	**498.2**	**-6.4**	**38.0**	**877.2**	149.3	5.9
Watford	2020	47.0	14.8	0.2	13.0	0.5	**75.4**	4.4	13.2	0.0	**17.5**	29.7	92.5	1.9	**124.0**	39.8	8.6	37.2	1.8	0.5	**87.9**	**-1.0**	**51.6**	**355.4**	96.6	3.7
Harrow	2020	26.3	24.7	0.0	12.5	1.1	**64.6**	7.8	20.3	0.0	**28.0**	69.4	270.3	2.8	**342.4**	53.0	5.4	122.5	4.3	1.0	**186.2**	**-2.3**	**12.5**	**631.4**	252.3	2.5

The table shows that Three Rivers has the lowest population in the region but the second lowest emissions, meaning that the emissions per person is the third highest just behind St Albans.

Subsequent reporting should monitor performance against peer councils.

6 SCATTER

SCATTER[7] (Setting City Area Targets and Trajectories for Emissions Reduction) is a tool dedicated to calculating the GHG emissions of LA's and follows the Global Protocol for City-wide Greenhouse Gas emissions. In addition, it provides details of initiatives that could be adopted to reduce emissions within the district.

The data sources that SCATTER and BEIS use are the same, but the methodology for calculating emissions by SCATTER differs from the emissions published by BEIS in a few key ways. SCATTER includes other non-CO_2 gases such as methane and nitrous oxide, uses different starting data, and includes categories not covered by the BEIS dataset. The emissions data will therefore differ slightly to the BEIS emissions data above. The methodology used by SCATTER is also the same dataset used by the Tyndall Centre for their budgets (see Section 7).

Although SCATTER is a recognised route to managing district wide emissions and there is a sound methodology, the tool is still work in progress and it is likely that it will become more accurate in the future as it is developed. At the time of writing there were some inaccuracies due to a technical issue on the website which was subsequently resolved. As such, checks should be made on the data and some manual adjustments may be required to analyse the data.

6.1 Emissions

The full SCATTER inventory for Three Rivers can be found in Appendix B which is a separate Excel document. The definition of emission Scopes are slightly different to those mentioned previously:

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

[7] https://scattercities.com/

Table 8 – Summary of greenhouse gas emissions in Three Rivers based on SCATTER for 2019 (tonnes CO_2e)

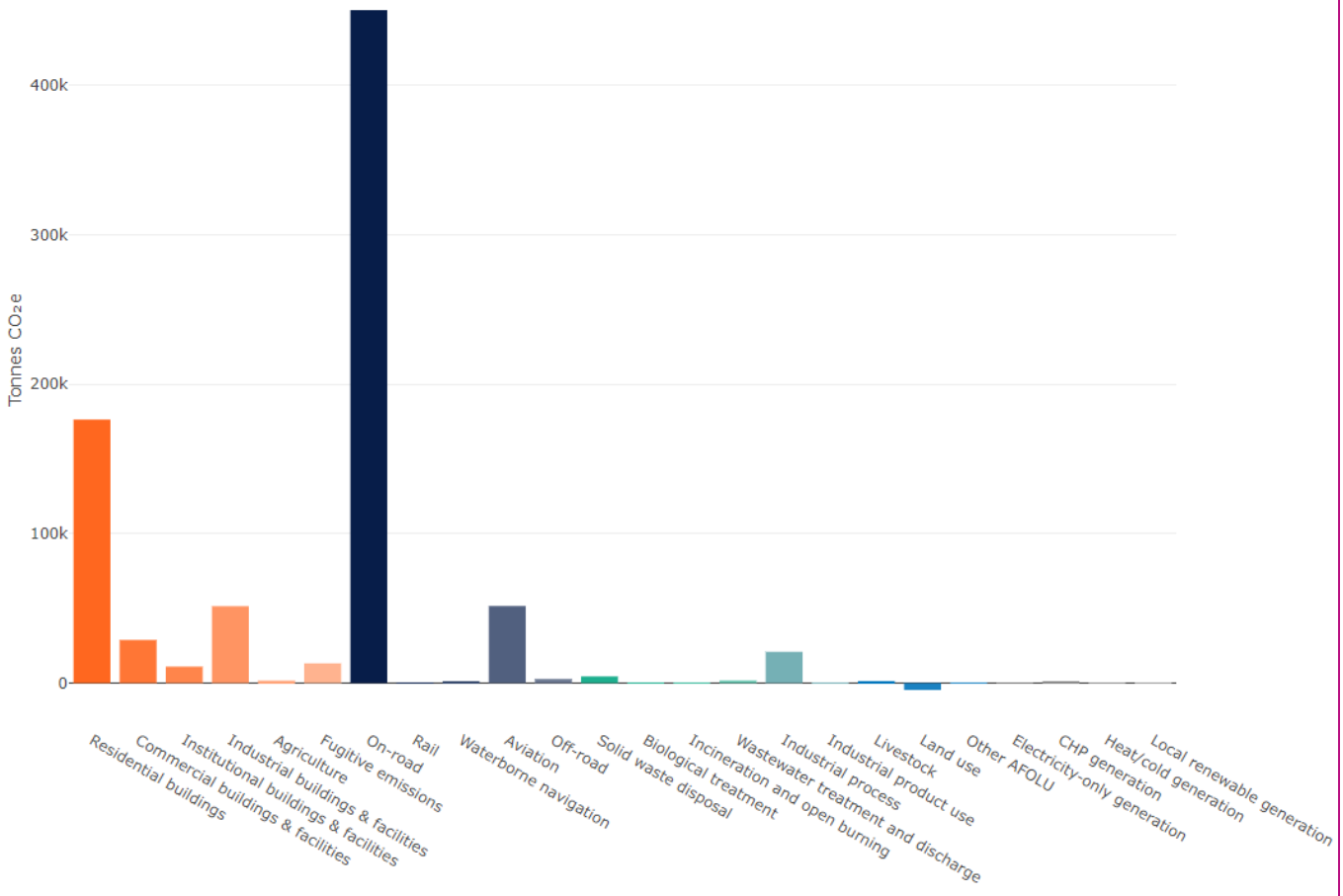
	Scope 1	Scope 2	Scope 3		
Sector	Sub-sector	Total tCO2e	Total tCO2e	Total tCO2e	Total tCO2e
		DIRECT	INDIRECT	OTHER	TOTAL
Stationary energy	Residential buildings	112,687.10	42,057.03	21,654.36	176,398.49
	Commercial buildings & facilities	7,464.93	17,676.62	3,701.28	28,842.83
	Institutional buildings & facilities	5,858.27	3,838.07	1,350.75	11,047.09
	Industrial buildings & facilities	22,504.24	21,533.38	7,462.03	51,499.66
	Agriculture	1,298.03	0.12	308.95	1,607.09
	Fugitive emissions	13,208.69	-	NE	13,208.69
Transportation	On-road	273,179.90	IE	177,348.23	450,528.13
	Rail	162.97	IE	38.79	201.75
	Waterborne navigation	736.13	IE	IE	736.13
	Aviation	NO	IE	51,627.21	51,627.21
	Off-road	2,726.98	IE	NE	2,726.98
Waste	Solid waste disposal	4,455.58	-	IE	4,455.58
	Biological treatment	NO	-	IE	-
	Incineration and open burning	276.10	-	IE	276.10
	Wastewater	1,697.06	-	NO	1,697.06
IPPU	Industrial process	20,944.17	-	NE	20,944.17
	Industrial product use	0.00	-	NE	0.00
AFOLU	Livestock	1,320.71	-	NE	1,320.71
	Land use	-4,611.54	-	NE	-4,611.54

	Other AFOLU	NE	-	NE	-
Generation of grid-supplied energy	Electricity-only generation	NO	-	NO	-
	CHP generation	445.61	-	70.88	516.49
	Heat/cold generation	NO	-	NO	-
	Local renewable generation	2.35	NO	NO	2.35

The table above was generated through SCATTER using the Global Covenant of Mayors' Common Reporting Framework (CRF) which is a globally recognised GHG reporting standard for cities. The categories coincide with the guidance within the GHG Protocol for Cities which recommends key emissions that each local authority should monitor. The table is colour coded based on the key below:

	Notation keys:
NO	Not Occurring
IE	Integrated Elsewhere
NE	Not Estimated
	N/A
	Required
	Optional

Figure 9: SCATTER subsector inventory summary for Three Rivers district



7. Tyndall Carbon Targeter

The Tyndall Carbon Targeter[8] analyses the carbon emissions of local authorities and presents an estimate of how emissions need to be reduced between 2020 to 2100 in order to sit within the commitments of the Paris Agreement to keep global temperature increases well below 2°C and pursuing 1.5°C. The term 'carbon budget' is used to indicate the maximum amount of carbon the Council can produce in a particular period of time to stay within the Paris Agreement. A carbon budget should not be confused with a monetary budget to reduce carbon emissions.

The methodology and data sources are based on the same principles of SCATTER and the BEIS LA emissions data, but the carbon emission data differs to the above methods as it only accounts for CO_2 and not CO_2e and excludes LULUCF. The carbon budget is calculated on a global and national level and then allocated to each LA area proportionally based on their regional emissions.

Based on the Tyndall calculations, for Three Rivers to make its 'fair' contribution towards the Paris Climate Change Agreement, the following recommendations should be adopted:

[8] https://tyndall.ac.uk/

1. Stay within a maximum cumulative carbon dioxide emissions budget of 3.4 million tonnes (MtCO2) for the period of 2020 to 2100. At 2017 carbon emission levels, Three Rivers would use this entire budget within 6 years from 2020 if no changes are made resulting in reduced emissions.

2. Initiate an immediate programme of carbon mitigation to deliver cuts in emissions averaging a minimum of -14.1% per year to deliver a Paris Agreement aligned carbon budget. These annual reductions in emissions require national and local action, and could be part of a wider collaboration with other local authorities. It should be noted that the average reduction in carbon emissions in Three Rivers to date since 2005 has been 2.2%, which is largely attributed to grid decarbonisation.

3. Reach zero or near zero carbon no later than 2041. The charts below provide an indicative carbon reduction pathway that stays within the recommended maximum carbon budget of 3.4 $MtCO_2$. At 2040 5% of the budget remains. This represents very low levels of residual carbon emissions by this time, or the Council may opt to forgo these residual emissions and cut emissions to zero at this point. Earlier years for reaching zero carbon emissions are also within the recommended budget, provided that interim budgets with lower cumulative carbon emissions are also adopted.

The Tyndall Centre recommends that the energy related carbon reduction target for the Three Rivers area for the period of 2020 to 2100 is 3.4 $MtCO_2$. To translate this into near to long term commitments a carbon reduction pathway within the 3.4 $MtCO_2$ is proposed here. This requires a consistent emissions reduction rate of -14.1% out to the end of the century. In 2040 95% of the recommended carbon budget is emitted and low level CO_2 emissions continue at a diminishing level to 2100.

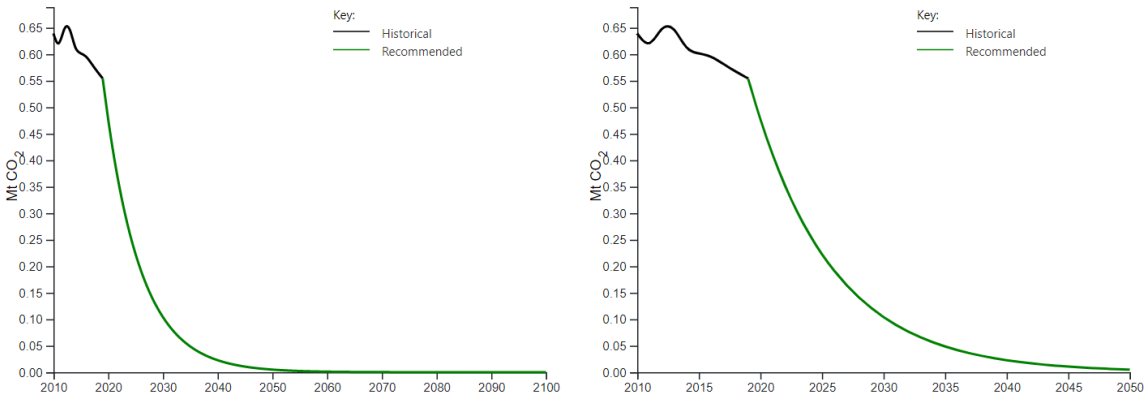


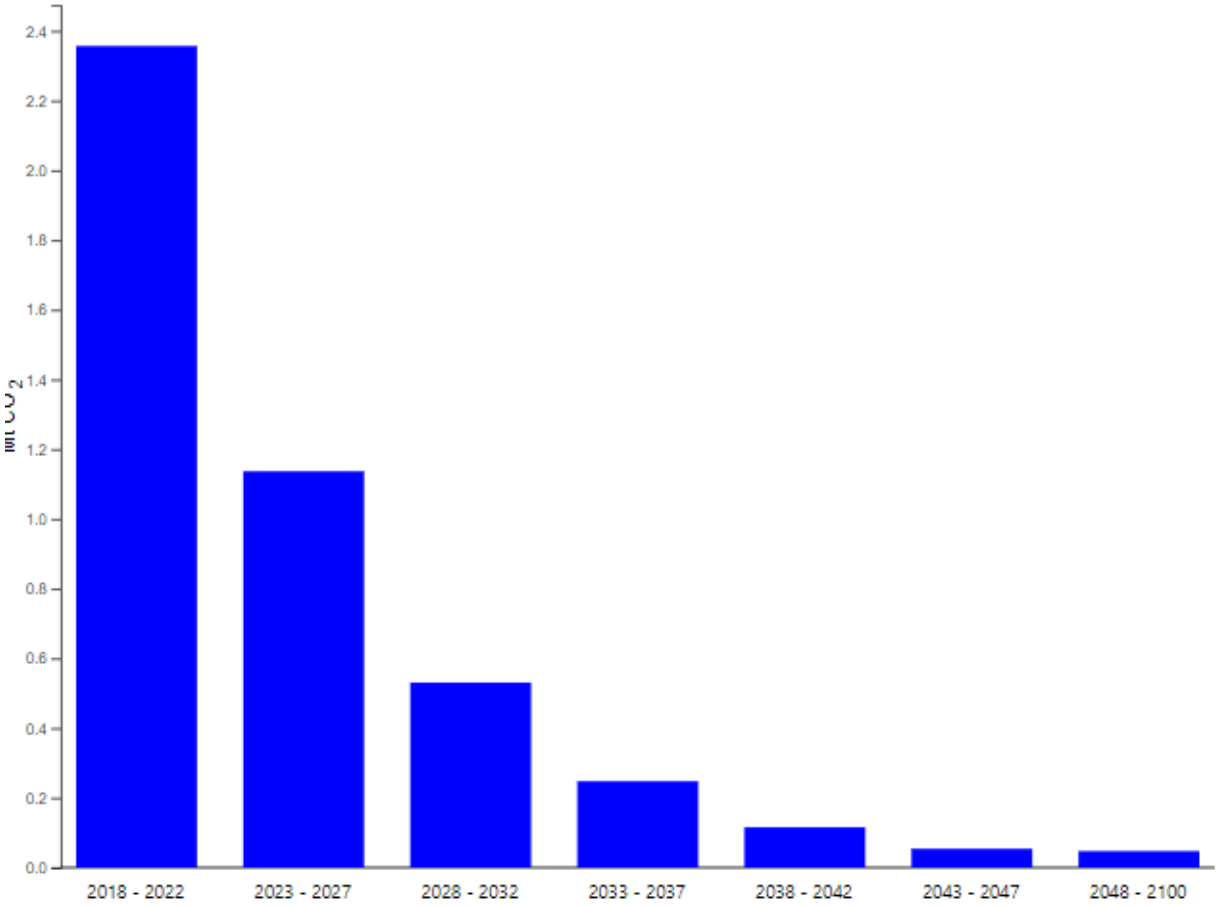
Figure 10a (left): *Energy related carbon only emissions pathways (2010-2100) for Three Rivers premised on the recommended carbon budget.* ***Figure 10b (right):*** *Energy carbon only emissions pathways (2010-2050) for Three Rivers premised on the recommended carbon budget.*

Table 9 presents the Three Rivers energy CO_2 only budget in the format of the 5-year carbon budget periods in the UK Climate Change Act. To align the 2020 to 2100 carbon budget with the budget periods in the Climate Change Act an estimation has been made of the CO_2 emissions for Three Rivers for 2018 and 2019, based on BEIS provisional national emissions data for 2018 and assuming the same year on year reduction rate applied to 2019. The combined carbon budget for 2018 to 2100 is therefore 4.5 $MtCO_2$.

Table 9: Periodic Carbon Budgets for 2018 for Three Rivers

Carbon Budget Period	Recommended Carbon Budget (Mt CO_2)
2018 - 2022	2.4
2023 - 2027	1.1
2028 - 2032	0.5
2033 - 2037	0.2
2038 - 2042	0.1
2043 - 2047	0.1
2048 - 2100	0.0

Figure 9: Periodic Carbon Budgets for Three Rivers



The results from the Tyndall Centre show that for Three Rivers to make its fair contribution to delivering the Paris Agreement's commitment to staying "well below 2°C and pursuing 1.5°C"

global temperature rise, then an immediate and rapid programme of decarbonisation is needed. Based on 2017 carbon emission levels, Three Rivers will exceed the recommended budget available by 2026. **To stay within the recommended carbon budget Three Rivers will, from 2020 onwards, need to achieve average mitigation rates of carbon from energy of around -14.1% per year**. This will require that Three Rivers rapidly transitions away from fossil fuel use.

Table 10: Percentage reduction of annual emissions for the recommended CO2-only pathway out to 2050 in relation to 2015

Year	Reduction in Annual Emissions (based on recommended pathway)
2020	20.9%
2025	63.1%
2030	82.8%
2035	92.0%
2040	96.2%
2045	98.2%
2050	99.2%

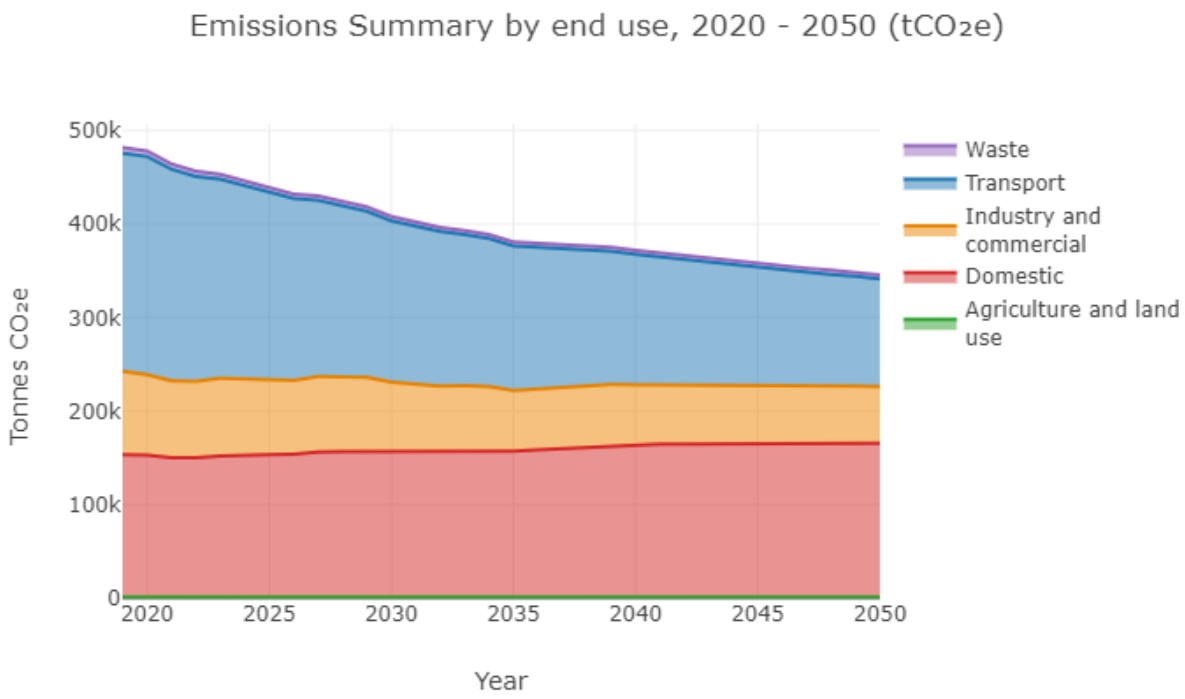
8 District Wide Action Plan

The district wide action plan is based on the Pathways methodology provided by SCATTER. The starting point for the data below is based on the data from Table 8 in Section 6.

Pathways is intended to provide an understanding of the speed and scale of emissions reductions that are feasible using only emissions reduction measures and natural sequestration. Whilst the chart demonstrates 2050 as the end point based on the UK's national net zero target, this can be used as a guide to indicate what initiatives can be done to achieve the net zero target by 2030.

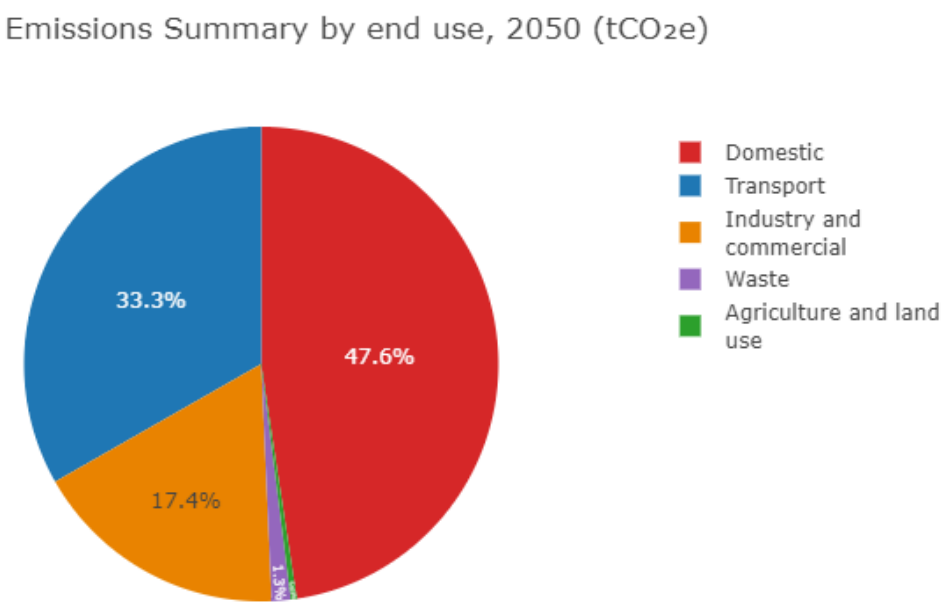
8.1 Business As Usual

Figure 10: Emissions Summary by end use with no interventions for Scope 1, 2 and 3, 2020 – 2050 (tCO_2e)



The table above shows the forecast emissions if there are no widespread interventions made to reduce emissions. The total emissions do decline over the term and this coincides with the national drive to decarbonise the grid, the transition to electric vehicles and organic upgrades.

Figure 11: Emissions Summary by end use with no interventions for Scope 1, 2 and 3, 2020 – 2050 (tCO_2e)



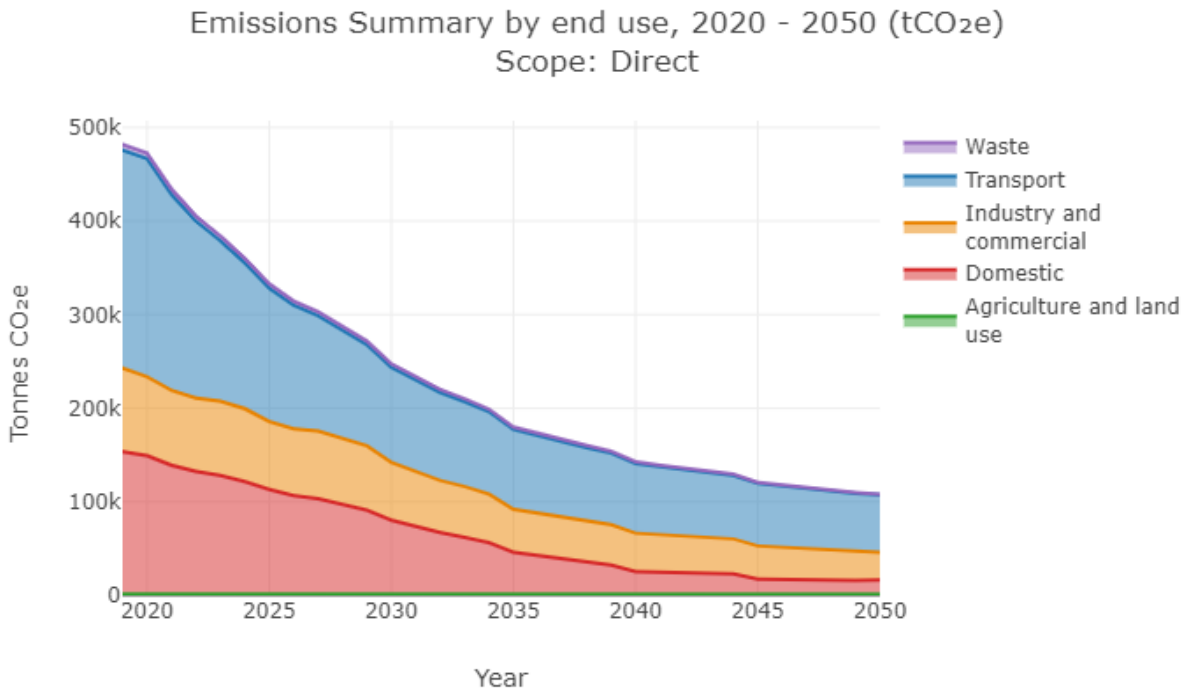
The chart shows that 98.3% of emissions come from the domestic, transport and industry and commercial sectors.

8.2 Reducing District Wide Emissions

This section looks at the potential initiatives that could be applied to reduce emissions in the Three Rivers area. The interventions selected have been taken from SCATTER and assumes a high level of ambition. The SCATTER tool is the best available source to analyse district wide emissions trajectories however, it is still being developed and a level of manual interventions are required to calculate emissions. The reductions pathway below does not include initiatives that could be developed to generate local power in Three Rivers and this has been calculated separately.

Appendix C – shows a year-on-year breakdown of the district wide carbon emissions when considering the best case scenario.

Figure 12: Emissions Summary by end use with high ambition of interventions for Scope 1, 2 and 3, 2020 – 2050 (tCO_2e)



Delivering carbon reduction projects with a high level of ambition could see emissions reduce from 472,787 tCO_2e in 2020 to 108,167 tCO_2e in 2050, which is a reduction of 77%. The emissions in 2030 will be 247,498 tCO_2e, which is a reduction of 48%.

Figure 13: Emissions summary by end use with high ambition of interventions for Scope 1, 2 and 3, 2020 – 2050 (tCO_2e)

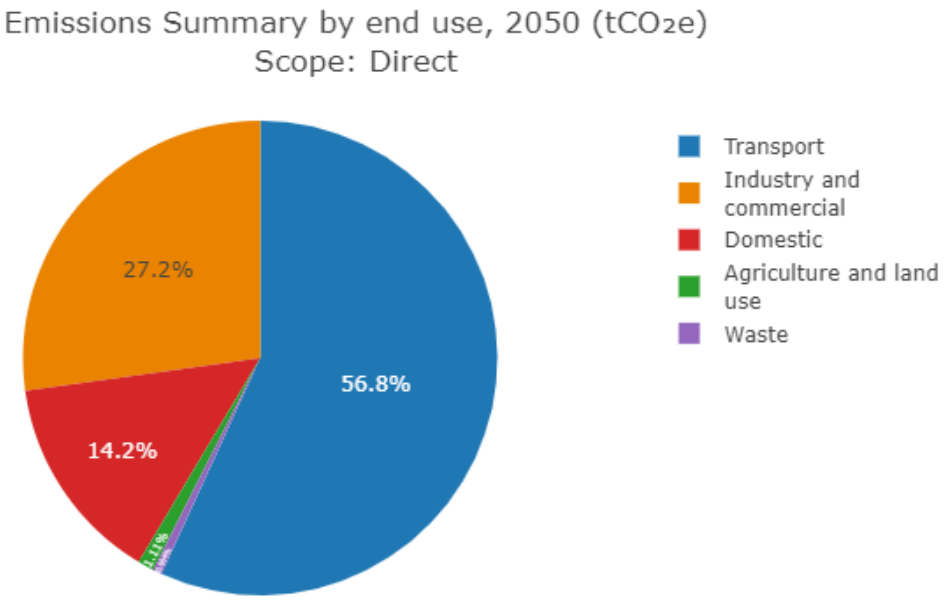
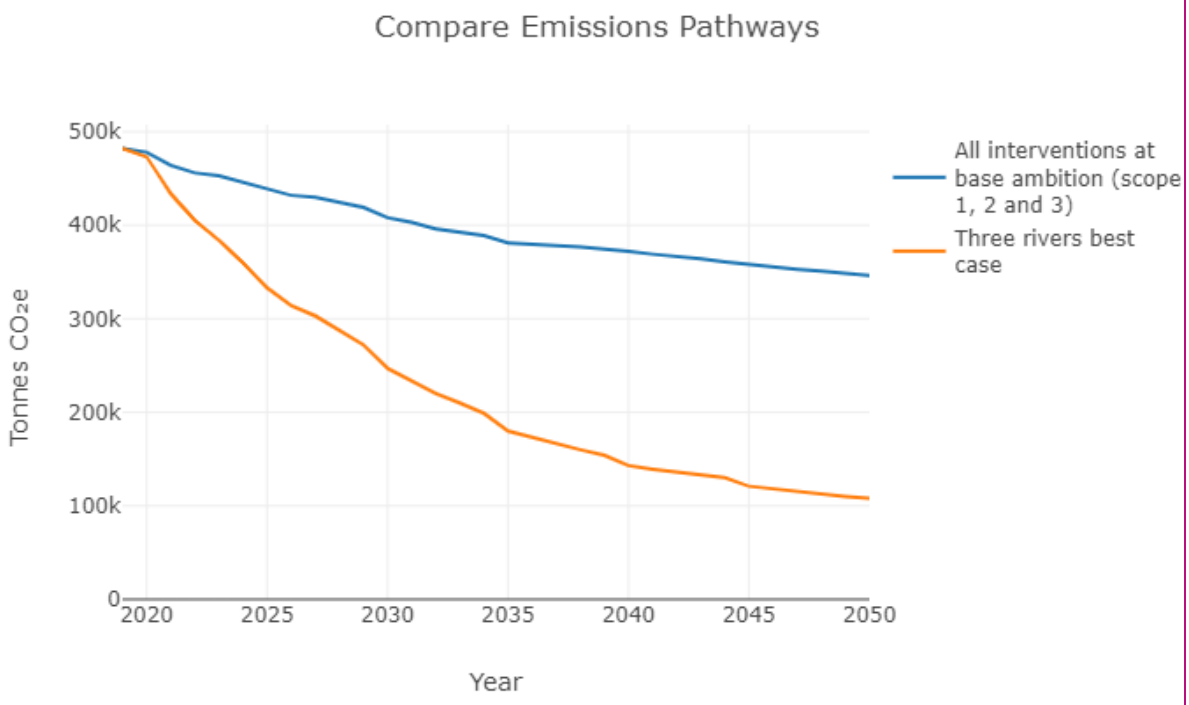


Figure 14: Comparison of emissions for business as usual against a high ambition of interventions for Scope 1, 2 and 3, 2020 – 2050 (tCO_2e)



8.3 Methodology for Reducing Emissions

The table below shows the assumptions that were made to reduce the emissions as shown above. This is deemed as a high level of ambition and the best case scenario in SCATTER.

Table 11: Assumptions made for district wide carbon trajectory

All interventions at base ambition (Scope 1, 2 and 3)	Best case
Agriculture and Land Use	
5% increase in forest cover by 2030.	24% increase in forest cover by 2030.
2% decrease in grassland. Cropland increases 5%; increase in the coverage of settled land.	7% decrease in grassland. Cropland decreases 1%; increase in the coverage of settled land.
0.2% annual growth in dairy cows & livestock	0.5% annual reduction in livestock numbers
Tree-planting to increase current coverage by 30% by 2030; no subsequent commitments.	Tree-planting to increase current coverage by 30% by 2030; from 2030-2050 further increase of 20%.
Domestic Buildings	
By 2050, domestic lighting and appliance total energy demand has dropped to 80% of current levels.	By 2050, domestic lighting and appliance total energy demand has dropped to 27% of current levels.
Small reductions in energy demand from cooking; no change in heat source.	Small reductions in efficiency of domestic cooking. Proportion of cooking which is electric increases to 100% in 2050.
Hot water demand per household grows 5% every 5 years	Hot water demand per household reduces by 8% every 5 years
All new houses are built to 2013 building regulations (no change).	100% new build is built to passivhaus standard.
All current households remain at weighted average heat loss.	By 2050, 10% of current stock is retrofitted to a medium level; 80% deep retrofit.
No change to current technology mix for home heating.	By 2050, 7% resistive heating; 60% air-source heat pumps and 30% ground-source heat pumps; 3% district heating
Industrial and Commercial	
In 2050, commercial heating, cooling and hot water demand is 103% of today's levels	In 2050, commercial heating, cooling and hot water demand is 60% of today's levels
No change to current technology mix for commercial heating.	By 2050, 7% resistive heating; 60% air-source heat pumps and 30% ground-source heat pumps; 3% district heating
Commercial lighting & appliance energy demand increases 28% by 2050	Commercial lighting & appliance energy demand decreases 25% by 2050.

Share of cooking which is electric is as today.	By 2050, 100% of commercial cooking is electrified.
Industry moves to higher natural gas consumption, with electricity consumption falling before 2035 then remaining constant.	Industrial electricity consumption is 50% of total energy consumption by 2035; 65% by 2050. Output falls by 2% every year for non-heavy industry.
Other industry process emissions are reduced at a rate of 2.6% per year.	Reductions in process emissions from all industry: general industry reduces process emissions at a rate of 4.5% per year. Chemicals emissions reduce 1% per year; metals 0.7% per year, and minerals 0.8% per year.
Transport	
By 2050, 47% increase in distance travelled by road freight; 40% increase in efficiency. In waterborne transportation, 15% decrease in use of waterborne transport.	By 2050, 22% decrease in distance travelled by road freight; 75% increase in efficiency. In waterborne transportation, 28% increase in use of waterborne transport.
No change to total travel demand per person	25% reduction in total distance travelled per individual per year by 2030.
No change to current national average modal split by total miles: 74% transportation by cars, vans and motorcycles.	Average modal share of cars, vans and motorbikes decreases from current national average 74% total miles to 38% in 2050.
Cars, buses and rail is 100% electric by 2050. Slight increase in average train occupancy.	Cars and buses are 100% electric by 2035, rail is 100% electric by 2030. Average occupancies increase to 18 people per bus km (from 12), 1.65 people per car-km (up from 1.56), and 0.42 people per rail-km (from 0.32).
No change to aviation.	No change to aviation.
By 2050, 48% increase in fuel use at UK ports.	By 2050, 48% increase in fuel use at UK ports.
Waste	
65% recycling, 10% landfill, 25% incineration by 2040; remaining constant to 2050	65% recycling, 10% landfill, 25% incineration achieved by 2035, recycling rates increasing to 85% by 2050
Total volume of waste is 124% of 2017 levels by 2040.	Total volume of waste is 61% of 2017 levels by 2040.

Even at a high level of ambition it can be seen that the trajectory curve for SCATTTER is not as steep as the Tyndall Centre curve, meaning that the best-case scenario shown in SCATTER will not meet the same targets laid out by the Tyndall Centre as demonstrated in the table below:

Table 10: Comparison between the recommended target of the Tyndall Centre and the high ambition scenario from SCATTER

Year	SCATTER	Tyndall Centre
2030	247ktCO_2	100ktCO_2
2050	108ktCO_2	10ktCO_2

SCATTER have acknowledged that there is a difference between their best-case projections and the Tyndall Centre targets and have stated that they are in the development phase to create a method for amending cumulative emissions for the SCATTER pathway to make it comparable with the Tyndall Centre's budget.

8.4 Power Generation

As part of the assessment for the Three Rivers area, the SCATTER tool shows potential interventions to generate power however, it does not show a reduction in carbon emissions when introducing new interventions for power generation.

The SCATTER tool calculator considers locally-generated electricity to be used locally, in preference to using the grid electricity. Locally-produced electricity that SCATTER has calculated from the source data is used first. When this is all used, remaining demand is met with imported electricity. This has a different expected emissions factor each year and reduces as the grid decarbonises. If too much local electricity is produced, this is considered exported.

This can mean that the calculation tool does not consider more renewables into the mix if it believes that the amount of local generation is already optimised to the extent that too much is being generated and it is exceeding local energy demand. This means that applying more renewables to the Pathway makes no difference to the future carbon emissions.

This may well be the case in Three Rivers however, based on experience of using the tool for other authorities this is a common assumption that is being made by SCATTER and we believe that it is unlikely that the local generation capacity in Three Rivers exceeds demand.

The figures provided in the table below have been calculated based on the potential energy generation per land area and household in the district. The figures have not been included in the net carbon emissions provided in SCATTER, so these figures are shown separately to illustrate how carbon emissions could be reduced further by installing renewables based on the scenarios below.

Scatter categorises the scale of interventions on a scale of 1 – 4 with 1 being no or minimal interventions and 4 being a high ambition of interventions. The modelling below is based on a category 4 - high ambition based on the detail below:

- Hydroelectric power stations – There is scope to install hydroelectric power generation in the district due to the water courses however, more detailed information is needed on its suitability.
- Large scale solar PV - Large scale solar generation grows to 100kWh per hectare by 2030
- Small scale solar PV - Local solar capacity grows to equivalent to 1,550kWh per household in 2030
- Small scale wind - grows 2.6MWh per hectare in 2030

The generation capacity has been calculated using the assumptions below, taken from government statistics:

- Total number of households[9] = 36,130 (2011)
- Land area[10] = 88.8km^2

Electricity carbon coefficient 2030[11] = 0.05156kgCO_2e/kWh

Intervention	2030 kWh	2030 tCO_2e
Hydroelectric power stations	Dependant on suitable locations	?
Large scale solar PV	888,000	46
Small scale solar PV	56,001,500	2,887
Small scale wind	23,088,000	1190
Total	**79,977,500**	**4,124**

The forecast emissions in 2030 are estimated to be 247,498 tCO_2e following a high ambition of interventions. The emissions avoidance by installing this generation capacity would save 4,124 tCO_2e, based on the 2030 electricity emissions factor, resulting in net emissions of 243,374 tCO_2e by 2030.

However, the Scatter methodology which has been used to illustrate these issues is based on an academic and desk based analysis. From the experience of APSE Energy to date, it would be preferable to develop a realistic programme of potential works based on the actual

[9] https://www.threerivers.gov.uk/download?id=19211
[10] https://en.wikipedia.org/wiki/Three_Rivers_District
[11] https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal

capacity of the area to host different renewable energy technologies. This would not be difficult or expensive and would give a much more realistic view of what could be achieved, at what cost and over what timescale.

9.0 Offsetting

Emissions are forecast to be 247,498 tCO_2e by 2030 with a high ambition of interventions which excludes renewable generation.

The above interventions already include a 7% decrease in grassland, cropland decreases by 1%; increase in the coverage of settled land. As well as a 0.5% annual reduction in livestock numbers.

Further sequestration (the process of capturing and storing CO_2 through tree planting) methods can be achieved through localised planting schemes that would contribute to offsetting emissions. The scale and detail of this would need to be identified in a detailed feasibility study.

By reducing emissions through a high ambition level of interventions the CO_2 carbon emissions in 2030 are estimated to be 247,498tCO_2e. This can be reduced further by introducing a high level of renewables which can reduce emission by 4,115tCO_2e and leaving the net emissions as 243,374tCO_2e, which is the total amount of emissions that will need to be offset to be net zero carbon.

Based on the Woodland Trust statement that it costs £25 to offset 1 tonne of CO_2 in British woodlands, it would cost £6,084,350 to offset the remaining emissions in the year 2030.

There are other schemes that provide carbon offsetting through international planting schemes such as One Carbon World which contributes funding towards large scale forestry schemes for as much as £1.20/tCO_2e.

10 Conclusion

It is recommended to report annually on the progress of reducing carbon emissions. Emissions from the Council's own operations should be calculated using the methodology in the APSE Energy report 'Consultancy support – Scope 1, 2 and 3 Carbon Emissions – 2020/21'. Policies and procedures should be put in place to record emissions data as it is made available rather than trying to retrieve the data in bulk retrospectively.

Monitoring of the district wide emissions should be reported annually using published data from BEIS and SCATTER. The carbon budgets from the Tyndall Centre should be reviewed on a five yearly basis to reflect the most up to date science, any changes in global agreements on climate mitigation and progress on the successful deployment at scale of negative emissions technologies.

BEIS, SCATTER and the Tyndall Centre all obtain their data from the same sources but use slightly different methodologies to present the data, so the outputs are not exactly the same. A level of manual data analysis and adjustments will still be required to account for measures that are not captured in the standard reporting such as carbon offsetting.

The Council should initiate its carbon management strategy and action plan without delay to ensure that it has a chance of becoming net zero carbon by 2030.

10.1 Recommendations

Short Term Action – Up to 6 Months
Collect and save emissions data as it is made available for all core emissions, Scope 1, 2 & 3 emissions.
Set up processes and procedures to request and record emissions data from suppliers and staff.
Carry out detailed energy audits of buildings.
Engage with the local community, universities, NHS, businesses and key stakeholders to move forward with communication and jointly on actions.
Medium Term Action – Up to 18 Months
Develop detailed feasibility studies to identify viable energy efficiency projects, localised power generation projects and carbon offsetting schemes.
Carry out detailed engineering design for projects.
Develop a procurement strategy to deliver projects.
Develop a strategy to provide alternative options beyond private car travel.
Liaise with the Distribution Network Operator to understand the grid capacity and how this relates to future electricity demands.
Long Term Action – Within 7 Years
Make a transition away from fossil fuel vehicles.
Increase electric vehicle charging network and sustainable travel infrastructure.
Develop large scale renewable heat and power generation projects.
Roll out energy efficiency and power generation projects to all buildings.
Develop an on-going tree planting and biodiversity improvement schemes.

11. Glossary

Term	Definition
Carbon dioxide equivalent (CO_2e)	The carbon dioxide equivalent (CO_2e) allows the different greenhouse gases to be compared on a like-for-like basis relative to one unit of CO_2 and includes the six greenhouse gases with the greatest global warming potential (GWP).
Carbon footprint	A carbon footprint measures the total greenhouse gas emissions caused directly and indirectly by a person, organisation, event or product. A carbon footprint is measured in tonnes of carbon dioxide equivalent (tCO_2e).
Council Vehicles	Vehicles that are owned or controlled by the Council. This does not include employee-owned vehicles that are used for business purposes.
Electricity	Electricity used at sites owned/controlled by the Council. This is reported as a Scope 2, indirect emission. The conversion factors used are for the electricity supplied to the grid that the Council purchase - they do not include the emissions associated with the transmission and distribution of electricity.
Employee Vehicles	Travel for business purposes in assets not owned or directly operated by the Council. This includes mileage for business purposes in cars owned by employees, public transport, hire cars etc.
Gas	Primary fuel sources combusted at a site or in an asset owned or controlled by the Council.
Solar PV	Solar Photovoltaic panels to generate renewable electricity from the sun.
Transmission and Distribution	Transmission and distribution (T&D) factors are used to report the Scope 3 emissions associated with grid losses (the energy loss that occurs in getting the electricity from the power plant to the premises).
Wastewater	Water returned into the sewage system through mains drains.
Water Supply	Water delivered through the mains supply network.

Appendix A – Carbon Calculations

Appendix B – SCATTER Calculations

Appendix C – SCATTER Best Case Trajectory Data

The above appendices are provided separately as spreadsheets.

Appendix D – Data that should be gathered to report on Scope 3 emissions

Item	Category	Details Required
1	Purchased goods and services	This category includes all upstream (i.e. cradle-to-gate) emissions from the production of products purchased or acquired by the Council in the reporting year. Products include both goods (tangible products) and services (intangible products). This category includes emissions from all purchased goods and services not otherwise included in the other categories of upstream scope 3 emissions (i.e. category 2 through category 8 below). Cradle-to-gate emissions include all emissions that occur in the life cycle of purchased products, up to the point of receipt by the Council. Cradle-to-gate emissions may include: • Extraction of raw materials • Agricultural activities • Manufacturing, production, and processing • Generation of electricity consumed by upstream activities • Disposal/treatment of waste generated by upstream activities • Land use and land-use change • Transportation of materials and products between suppliers • Any other activities prior to acquisition by the reporting company Relevant purchases to the Council may include capital goods, such as office supplies, office furniture, computers, telephones, travel services, IT support, outsourced

		administrative functions, consulting services, janitorial, landscaping services, maintenance, repairs and operations. For accurate carbon reporting emissions, the Council should request cradle-to-gate emission factors for materials used by suppliers to produce purchased goods such as Environmental Product Declarations (EPDs). It is likely that many suppliers will not be able to provide all the emission data. If an EPD cannot be provided, supplementary information required includes the volume of product (kg) and the carbon emission factor (kg CO_2e). A policy should be developed so that suppliers in the supply chain are required to provide this data as part of the contract, where the volume of goods is noteworthy.
2	Capital goods	Capital goods are final products that have an extended life and are used by the Council to manufacture a product, provide a service, or sell, store, and deliver merchandise. Capital goods are treated as fixed assets or as plant, property, and equipment (PP&E). Examples of capital goods include equipment, machinery, buildings, facilities, and vehicles. The required information is the same as Category 1 above. A policy should be developed so that suppliers in the supply chain are required to provide this data as part of the contract.
3	Fuel- and energy related activities (not included in Scope 1 or Scope 2)	Transmission and distribution (T&D) losses have been included and calculated from the data provided in Scope 2.

4	Upstream transportation and distribution	Category 4 includes emissions from: • Transportation and distribution of products purchased in the reporting year, between suppliers and its own operations in vehicles not owned or operated by the Council. • • Third-party transportation and distribution services purchased by the Council in the reporting year (either directly or through an intermediary), including inbound logistics, outbound logistics (e.g. of sold products), and third-party transportation and distribution between the Council's own facilities. The Council requires data on: • Quantities of fuel (e.g., diesel, petrol, jet fuel, biofuels) consumed • Amount spent on fuels • Distance travelled • Vehicle type This may include managed assets - Vehicles that are used by the Council but are not owned by the organisation and generally do not appear on the organisation's balance sheet, for example, maintenance contractor vehicles, outsourced refuse and recycling trucks, road sweepers, grounds maintenance mowers etc. A policy should be developed so that suppliers using their own vehicles are required to provide this data as part of the contract.
5	Waste generated in operations	This includes emissions from third-party disposal and treatment of waste generated in the Councils owned or controlled operations in the reporting year. This category includes emissions from disposal of both solid waste and wastewater. The Council should request volume and emissions data from the waste treatment company applicable to **its own waste stream**. If this cannot be provided, the emissions

		can be calculated by requesting the volume of waste, type and disposal method: Example of data required: Total weight (kg) of waste type and disposal method e.g. • 5,000kg municipal waste to landfill • 500kg organic garden waste to composting • 1,000kg metal recycled • 1,000kg plastic recycled • 1,000kg paper recycled Data is required for the volume of supply and wastewater in cubic metres (m^3) from water bills. Local authorities have an important role in waste prevention and sustainable waste management through awareness-raising campaigns, providing separate collection for recycling and food waste, and implementing waste-to-energy schemes. It is therefore voluntary on whether the Council choose to include the emissions from waste associated with the whole borough, or just the Council's own operation.
6	Business travel	Travel for assets not owned or directly operated by the Council. This includes mileage for business purposes in cars owned by employees, public transport, hire cars etc. Require details for: <u>Vehicle</u> Fuel type, size of vehicle and distance for: • Car • Motorbike • Taxis • Bus • Rail <u>Flights</u>

		• Airport travelled to/from • Number of passengers • Class type • Distance <u>Ferry</u> • Foot or car passenger • Distance
7	Employee commuting	This category includes emissions from the transportation of employees between their homes and their worksites. Emissions from employee commuting may arise from: • Car • Bus • Rail • Other modes of transportation Staff would be required to provide method of transport and distance travelled. It may be difficult and time consuming to collect accurate data.
8	Upstream leased assets	This category is applicable from the operation of assets that are leased by the Council. If the Council procures the energy then this should be considered as Scope 1 and 2. If the landlord is responsible for the Scope 1 and 2 emissions, the Council should include the reporting under Scope 3. An example may include an office that the Council lease from a private landlord. All energy bills may be included as part of the lease and the energy contract is under the name of the landlord. The Council should therefore request the energy data from the landlord and include this under Scope 3.

		Data required include the Scope 1 and 2 data from the leased asset.
9	Downstream transportation and distribution	This category includes emissions that occur in the reporting year from transportation and distribution of sold products in vehicles and facilities not owned or controlled by the Council in the reporting year. It is assumed that this category is not applicable to the Council as it does not manufacture and sell products.
10	Processing of sold products	It is assumed that this category is not applicable to the Council as it does not manufacture and sell products.
11	Use of sold products	It is assumed that this category is not applicable to the Council as it does not manufacture and sell products.
12	End-of-life treatment of sold products	It is assumed that this category is not applicable to the Council as it does not manufacture and sell products.
13	Downstream leased assets	This category is applicable where the Council is the landlord to a lessee. If the Council procures the energy on behalf of a lessee then this should be considered as Scope 1 and 2. An example of this is where the Council may lease a premises to a lessee and include all energy costs as part of the lease. The energy contract is under the name of the Council and is therefore reported under Scope 1 and 2. If the lessee is responsible for the Scope 1 and 2 emissions, the council should include the reporting under Scope 3. An example of this is a shop that the Council own and the occupant pays for the energy bills and the contract is under their name. The Council should request the energy

		data from the shop occupier and report this under Scope 3. Data required include the Scope 1 and 2 data from the leased asset.
14	Franchises	It is assumed that this category is not applicable to the Council as it does not operate any franchises.
15	Investments	This category includes scope 3 emissions associated with the Council's investments in the reporting year, not already included in scope 1 or scope 2. This category is applicable to investors (i.e. organisations that make an investment with the objective of making a profit) and organisations that provide financial services. This category also applies to investors that are not profit driven (e.g. multilateral development banks). Investments are categorised as a downstream scope 3 category because providing capital or financing is a service provided by the organisation. Category 15 is designed primarily for private financial institutions (e.g., commercial banks), but is also relevant to public financial institutions (e.g., multilateral development banks, export credit agencies) and other entities with investments not included in scope 1 and scope 2. The Councils scope 3 emissions from investments are the scope 1 and scope 2 emissions of investees. For purposes of greenhouse gas accounting, this standard divides financial investments into four types: • Equity investments • Debt investments • Project finance • Managed investments and client services An example of the information required is the Scope 1 and 2 emissions from the bank where an investment is in place. This is based on the Council's proportional share of investment in the investee. If the Council has

		£1million invested in the bank and the banks total investments amount to £100million, the Council should report on 1% of the banks Scope 1 and 2 emissions. It is assumed that this information will be difficult to collate from third parties and that the total emissions will be proportionally small compared to other emission sources and these emissions could be excluded from the reporting.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