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Torbay's greenhouse gas reporting and sector emissions monitoring 2023

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Torbay

Management Summary

Torbay Council declared a Climate Emergency in 2019 and pledged to work towards reducing greenhouse gas (GHG) emissions. Subsequently the Council is proposing to align Torbay to meet a 78% reduction in GHG by 2035 (from 1990) the 2050 national Net Zero trajectory required under the Climate Change Act and reported on in the Government adopted Sixth Carbon Budget.

Centre for Energy and the Environment (CEE) at the University of Exeter has previously provided estimates of Torbay's territorial greenhouse gas (GHG) emission from 2016 to 2020 and projections of emissions to 2050 using data provide by the Climate Change Committee (CCC). This work updates the inventory to 2021, examines each GHG emitting sector and, using the Sixth Carbon Budget's Balance Pathway, identifies more meaningful, specific and timely metrics for monitoring progress.

Greenhouse gas emissions in Torbay are on a downward trajectory. Emissions of 687 kt CO_2e in 2010 declined by 32% to 466 kt CO_2e in 2021. Changes to date are due largely to the reduction in the carbon intensity of the national electricity grid, which over the period reduced the power sector's GHG emission by 69%. As a result, the sector has been responsible for 78% of the emission reduction in Torbay from 2010. In other key sectors improving efficiency of vehicles and, more recently, the impact of Covid 19 led to a fall in transport emissions (21% between 2010 and 2021) but it is buildings emissions, which are responsible for the largest portion of Torbay's emission (39%), where progress is most important that has been limited to an 8% reduction.

Comparisons with the national historic emissions show that while overall reductions between 2010 and 2021 seem on track with those nationally, change between 2016 and 2021 shows that Torbay is behind the nationally change by 5%.

Future emissions projections for Torbay following the CCC's Sixth Carbon Budget Balanced Pathway to Net Zero illustrate the scale of emissions reduction required over the coming years for Torbay to set a trajectory to a 78% reduction in GHG emissions in 2035 and Net Zero in 2050. The trajectory suggests a reduction in Torbay's total GHG emissions of 12 ktCO_2e in 2023 (2.5% of 2021) increasing to 33 ktCO_2e in 2025 (7% of 2021) with an average of 23 ktCO_2e (5% of 2021) for each of the following ten years to 2035. These emissions reductions are a serious challenge that should not continue to rely on the decarbonisation of the national electricity grid. The projections exclude offsets from land and GHG removals which are likely to take place nationally and consequently show Torbay to have residual emissions of 20.1 kt CO_2e in 2050.

The metric monitoring trajectories show the scale of the changes needed to meet some of the 2035 and 2050 projections set out in the Sixth Carbon Budget. These include:

- Over 555 PV installations each year every year to 2035 and 2050, a rate similar to the peak in 2011 and more than double the 263 installations in 2022.
- Installing loft insulation in over 22,000 homes by 2035 and 30,000 homes by 2050 with 1,300 in 2023 increasing to 4,000 in 2027.
- Insulating the walls of 13,000 homes by 2035 and 22,000 homes by 2050 with 900 in 2023 increasing to 2,600 in 2027.
- Putting heat pumps in 16,000 homes by 2035 and 42,000 homes by 2050, with installation rates at 1,500 each year or more for 20 years from 2028. There are currently 286 heat pumps in Torbay's homes.
- Connecting an extra 4,200 homes to heat networks by 2035 and 9,000 homes to heat networks by 2050; 326 each year.
- Improving the energy efficiency of 336 non-domestic buildings every year to 2035 and 2050 and switching 112 every year to low carbon heating.
- Limiting growth in driving in Torbay to a maximum of 4% for all motor vehicles and 2.3% for cars and taxis to 2035 (from a 2019 base).

- Continuing the exponential growth in electric vehicle ownership (aiming for 479 more fully electric cars in 2024) and installing an additional 69 charging points each year to 2035.
- Increasing cycling rates by 2 million kilometres annually (1.5 times the current total level) with matching increases in walking.
- Achieving a 4.5% annual increase in recycling rates each year, every year to 2030 and a 1.2 kt annual reduction in household waste generation each year, every year to 2037.

All these trajectories are challenging with the majority needing to overcome significant behavioural, funding and other barriers.

Some specific trajectories have yet to be determined (e.g. commercial and HGV decarbonisation) and it has not been possible to identify data sources or specific proxy measures for the industry and f-gas sectors due to a lack of data sources. The monitoring process needs to identify local actions that can address these shortcomings.

Contents

1 Introduction

Torbay Council declared a Climate Emergency in 2019 and pledged to work towards reducing greenhouse gas (GHG) emissions. Subsequently the Council is proposing to align Torbay to meet a 78% reduction in GHG by 2035 (from 1990) the 2050 national Net Zero trajectory required under the Climate Change Act and reported on in the Government adopted Sixth Carbon Budget[1].

In 2020 the Centre for Energy and the Environment (CEE) at the University of Exeter undertook the Net Zero Torbay study[2]. The study provided estimates of Torbay's territorial greenhouse gas (GHG) emission for 2016 and projections of emissions to 2050 using data provide by the Climate Change Committee (CCC). Torbay Council used the study to help inform how Torbay should prioritise actions to work towards becoming carbon neutral, and in 2021 an Initial Carbon Neutral Torbay Action Plan was developed. In addition, in 2021 a Torbay Climate Partnership was formed to accelerate climate action locally and the first Climate Conference was held. This led, in 2022, to a number of Climate Conversation events that explored the priorities in the Net Zero Torbay study ahead of the preparation of the draft Torbay Climate Emergency Action Plan 2023-2025.

A previous study updated Torbay's territorial GHG emission inventory with the 2020 data (published 2 years in arrears) and quantified the GHG reductions required to achieve net zero[3]. This work updates the inventory to 2021, examines each GHG emitting sector and, using the Sixth Carbon Budget's Balance Pathway, identifies more meaningful, specific and timely metrics for monitoring progress towards a 78% reduction by 2035 and Net Zero in 2050. The change required between the current status and the 2050 trajectory for each metric is used to calculate a measurable trajectory for the next year (2023) that can be reported on in 2024 and annually thereafter.

2 Greenhouse gas inventory

This greenhouse gas (GHG) inventory is for territorial emissions. Territorial emissions are those arising from within the boundaries of Torbay and are more within the control of people living, working and visiting the area[i]. The publication of territorial GHG emissions for local authority areas is 2 years in arrears, so the most recent data available is for 2021[4].

2.1 Methodology

This inventory reports emissions under the following categories:

- **power**: emissions resulting from electricity consumption;
- **buildings**: emissions resulting from fuel combustion in the domestic, commercial and public administration sectors;
- **industry**: emissions categorised as from industry (other than from electricity consumption and space heating and hot water provision in buildings), including large industrial installations, in the government local authority CO_2 dataset;
- **transport**: emissions from road and rail vehicles (emissions from electric vehicles are reported under power; emissions from aviation and shipping have not been included);
- **agriculture**: emissions from fuel use, livestock and arable farming (including urea, lime and fertilizer application) in the sector, as reported in the government local authority CO_2 dataset;
- **land use and land use change**: as reported in the government local authority CO_2 dataset;
- **waste:** emissions from the disposal of solid waste and wastewater, and
- **f-gases**: emissions from the consumption of fluorinated gases (in the absence of data for Torbay, national emissions have been apportioned on the basis of non-domestic electricity consumption since the majority of such gases are used in refrigeration systems, air conditioning and heat pumps).

Separate reports [5, 6, 7] describe the inventory methodology in more detail.

2.2 Results

Estimated total GHG emissions in Torbay in 2021 are 466,494 tonnes of carbon dioxide equivalent (t CO_2e; also expressed as 466 kt CO_2e). Figure 1 and Table 1 give the breakdown of emissions (for more detail see Appendix A).

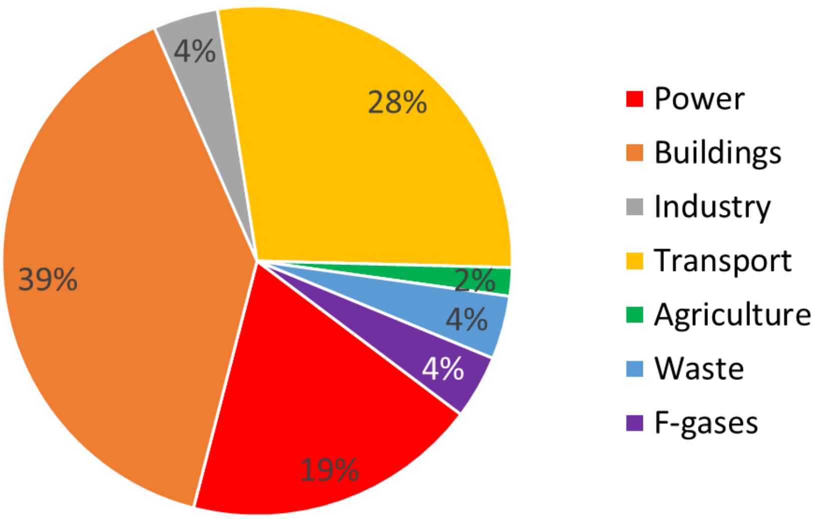


Figure 1. Sources of Torbay's greenhouse gas emission in 2021 (excludes the land use sector, which is responsible for a net reduction in GHG emissions of 180 t CO_2e due to sequestration)

[i] The territorial emissions method is consistent with the approach taken in UK national reporting. A complementary method, consumption-based carbon footprinting, considers upstream and downstream emissions arising outside an area.

Table 1. Torbay's greenhouse gas emission by sector in 2021

Sector	GHG emissions t CO_2e
Power	87,411
Buildings	183,832
Industry	19,185
Transport	130,185
Waste	18,789
F-gases	18,861
Agriculture	8,410
Land use	-180
Total	**466,494**

Figure 2 shows the breakdown of emissions for each year since 2005 (historic values have changed from those in the previous report[3] due to revisions in the source data, and the series has been extended back from 2008 to 2005[ii]). GHG emissions in Torbay have generally been on a downward trajectory with estimated GHG emissions of 787 kt CO_2e in 2005 declining by 41% by 2021; and 687 kt CO_2e in 2010 declining by 32% by 2021.

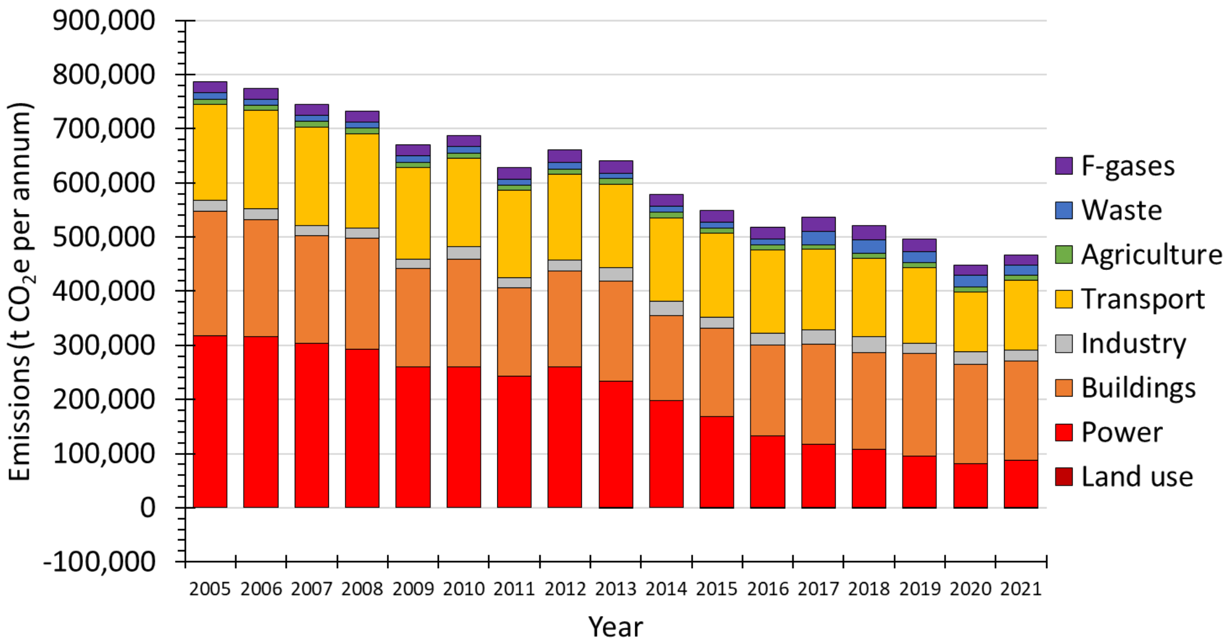


Figure 2. Sources of greenhouse gas emission in Torbay from 2005 to 2021

2.2.1 Progress in reducing emissions

The historic trajectory of GHG emissions in Torbay is compared to the national picture in Figure 3. National emissions as reported in the Climate Change Committee (CCC) 2023 Report to Parliament[8] have been scaled by the ratio of Torbay emissions to national emissions in 2005, the earliest year for which territorial emissions data are available for local and unitary authorities. If reported emissions for Torbay exceed this line, it indicates that emissions reductions have been less in Torbay than nationally. The plot shows that progress in Torbay outperformed national emissions to 2016, but by 2017 this advantage was lost and in subsequent years the pace of emissions reduction has mirrored the national trajectory.

[ii] In the absence of data, emissions from landfill prior to 2008 have been assigned the 2008 value. Methane emissions from landfill in 2008 to 2010 have been assigned the 2011 value in place of the implausibly low reported values used in the previous analysis.

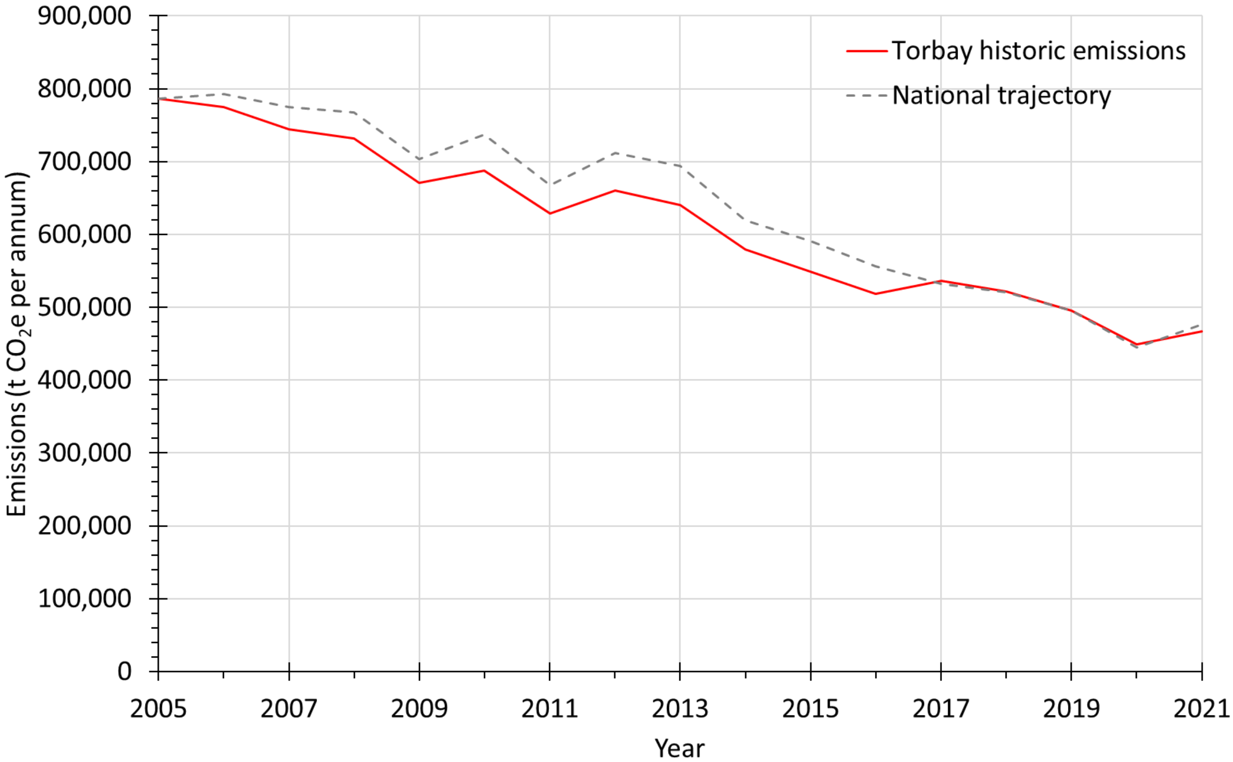
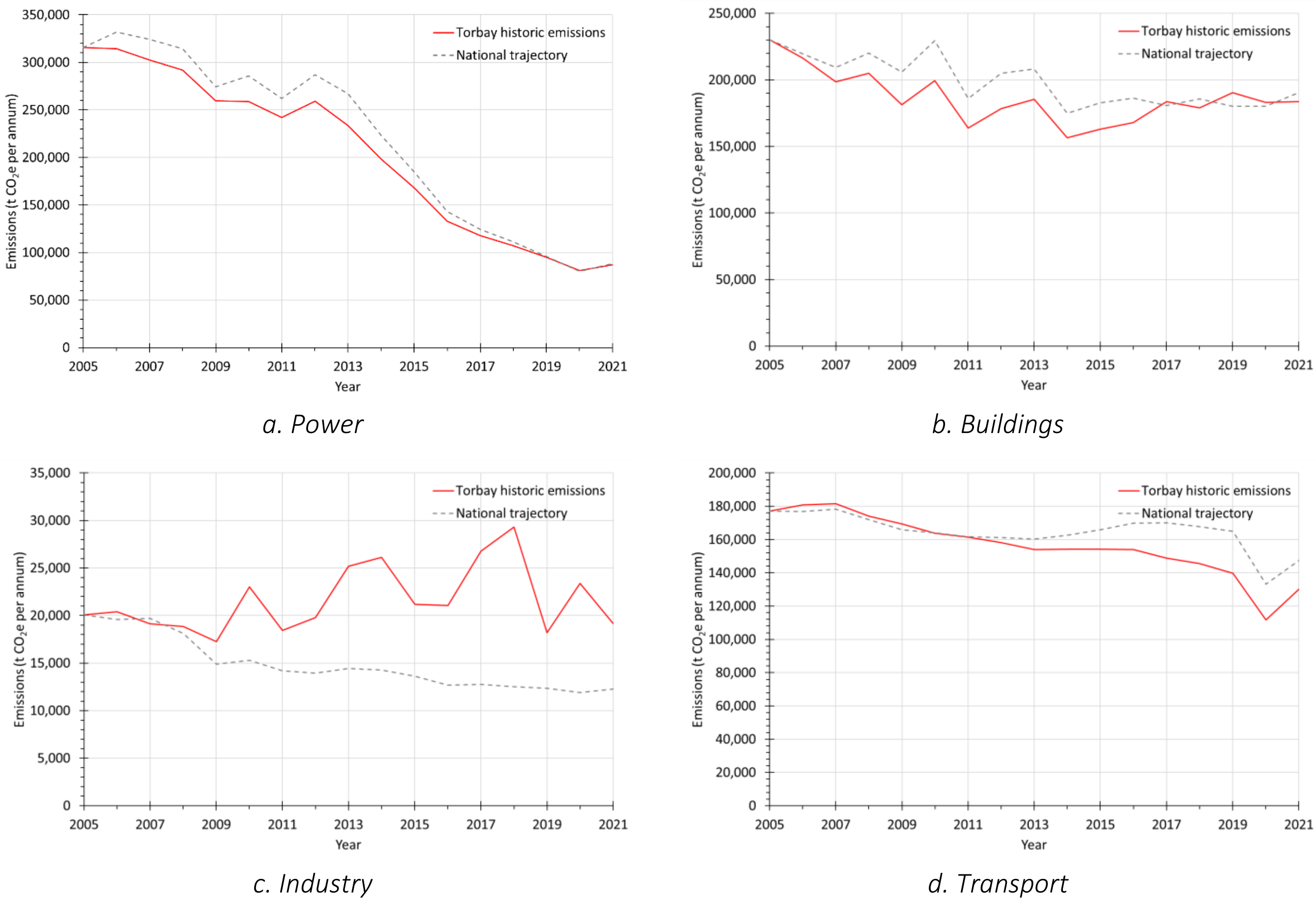


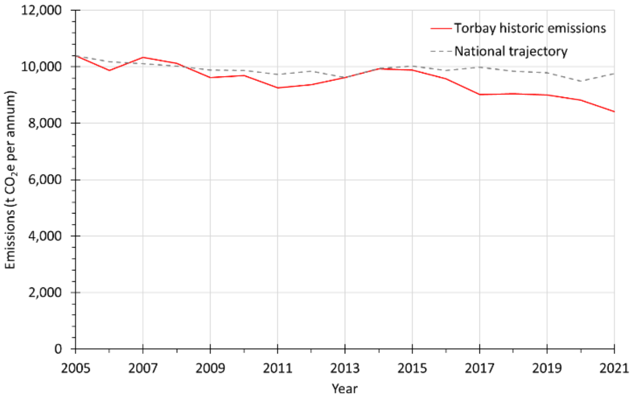
Figure 3. Historic total GHG emissions in Torbay compared to the national trajectory

Progress in individual sectors is depicted in Figure 4 a to h. Overall progress over the period from 2005 to 2021 has been better in Torbay than nationally in the transport, agriculture, land use, and f-gases sectors, whereas the reverse is true for industry and waste. Overall progress in the power and buildings sectors is similar in Torbay and nationally.

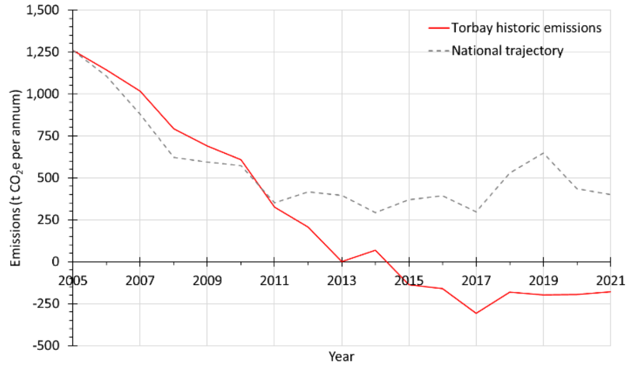


a. Power *b. Buildings*

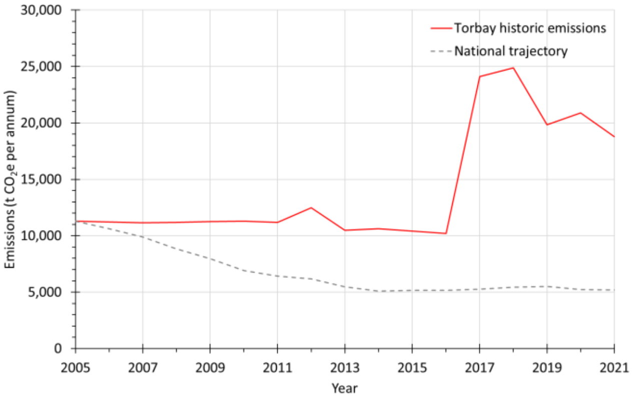
c. Industry *d. Transport*



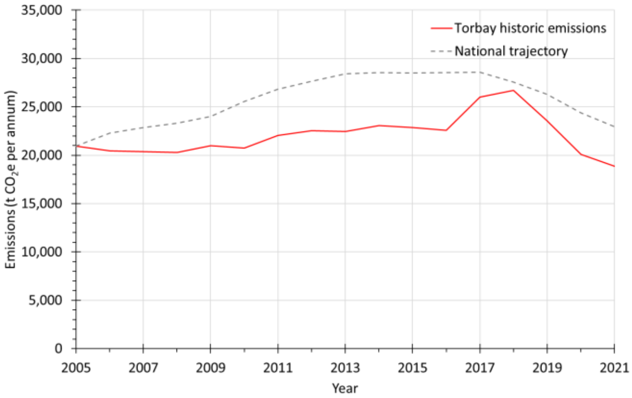
e. Agriculture



f. Land use



g. Waste



h. F-gases

Figure 4. Historic GHG emissions by sector in Torbay compared to the national trajectory

The changes achieved between 2010 and 2021 are summarised in Table 19. Appendix B shows the changes between 2005, 2008 and 2016 to 2021 and highlights that, while overall changes between 2010 and 2021 may seem on track with those nationally, change between 2016 and 2021 shows that Torbay is behind the national change by 5%. Figure 4, Table 2 and Appendix B highlight the following points:

- Electricity generation, and therefore changes in grid carbon intensity, will largely take place outside of Torbay, and nationally progress has stagnated in recent years.
- Lack of progress in the buildings locally and nationally is particularly concerning.
- The variability in industrial sector emission and its divergence from the national trajectory is likely to reflect data quality and the sector's relatively small size in Torbay.
- Torbay's historic transport emission compare favourably with those nationally.
- From 2018 onwards emissions data for the agriculture sector are available in the local authority emissions dataset published by the UK government [4] [iii]. Prior to this, data are taken from DEFRA farm surveys [9]. This introduces a significant discontinuity in the data series.
- The scope for further emissions reduction from land use change is limited by the size of Torbay and its predominantly urban nature; emissions reductions from land use change have slowed significantly since 2013, possibly due to increased urbanisation.
- Poor data quality in the waste sector makes it difficult to comment on the emissions trend with any degree of confidence; however, the sector is only responsible for 4% of total emissions

[iii] Whilst waste sector emissions are also now available in the Government dataset, they are calculated on the basis of waste arisings, not territorially, and so have not been used.

Table 2: Changes in Torbay's GHG emissions achieved from 2010 to 2021 in kt CO_2e and percentage terms with a comparison with the percentage change achieved nationally as documented in the CCC's 2023 report to parliament[8] Values in green meet or exceed the national reductions; those in red and in bold do not

Sector	Change achieved 2010 to 2021		
	t CO_2e	% Torbay	% CCC UK
Power	-171,330	**-66.2%**	-69.0%
Buildings	-15,614	**-7.8%**	-17.1%
Industry	-3,817	**-16.6%**	-19.7%
Transport	-33,560	-20.5%	-10.2%
Waste	7,491	**66.3%**	-24.6%
F-gases	-1,890	**-9.1%**	-10.3%
Agriculture	-1,277	-13.2%	-1.1%
Land use	-789	-129.6%[iv]	-29.9%
Total	-220,785	-32.1%	-31.6%

2.2.2 Future emissions trajectories

Future emissions trajectories for Torbay following the CCC Sixth Carbon Budget Balanced Pathway to Net Zero have been estimated. Emissions offset from land and GHG removals have not been included since they are impracticable on a large scale in Torbay, which is predominantly urban (reducing opportunities for sequestration through planting etc.).

The trajectories have been calculated from future national emissions set out in the CCC 2023 Report to Parliament[8] by scaling them to match emissions reported in Torbay in 2021. Given that total emissions in Torbay from 2005 to 2021 matched the total that would have resulted had emissions followed the national trajectory (within 5%), no adjustment has been made to account for historic over or under-performance of emission reduction in Torbay. The greatest contributor to this small discrepancy is the waste sector, where data quality is poor but the impact on total emissions is small.

Figure 5 shows the future trajectory of total emissions in Torbay following the Balanced Pathway but excluding offsets from land and GHG removals. Consequently, residual emissions of 20.1 kt CO_2e are projected in 2050.

[iv] Emissions from the sector have changed from positive to negative (i.e. increased carbon uptake) over the period.

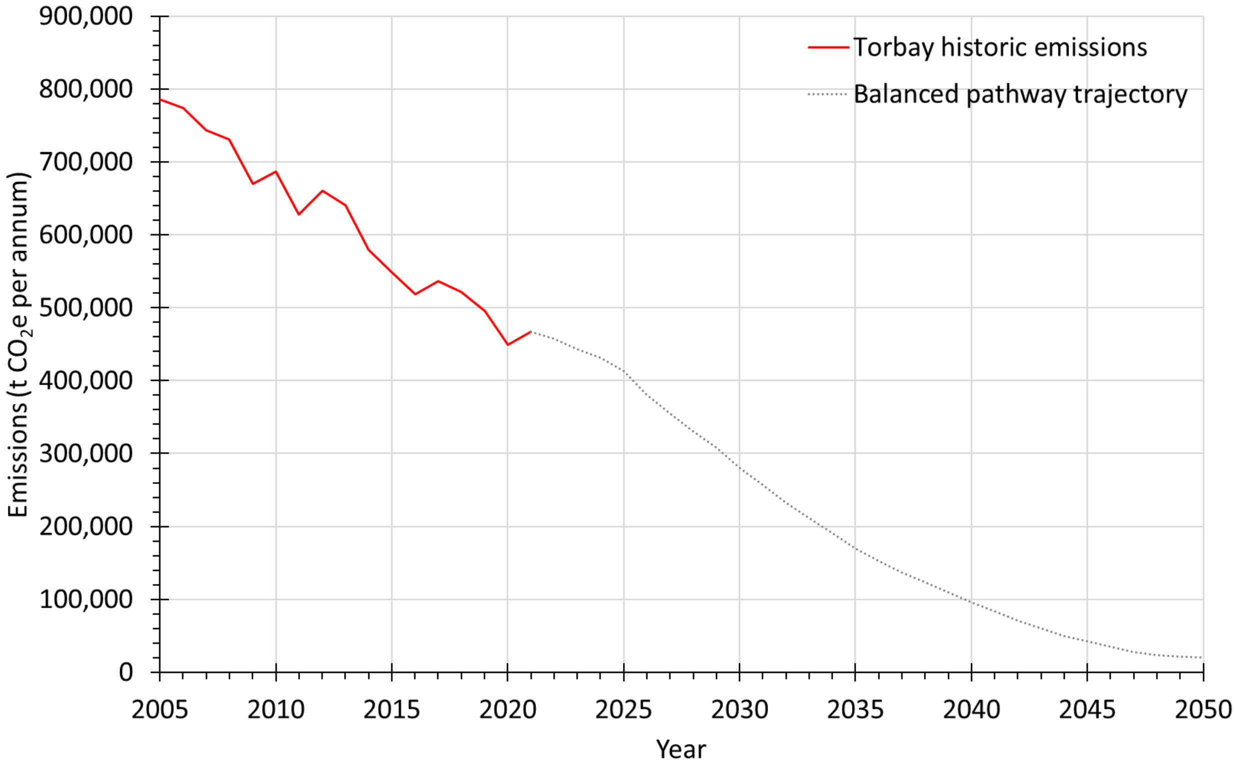
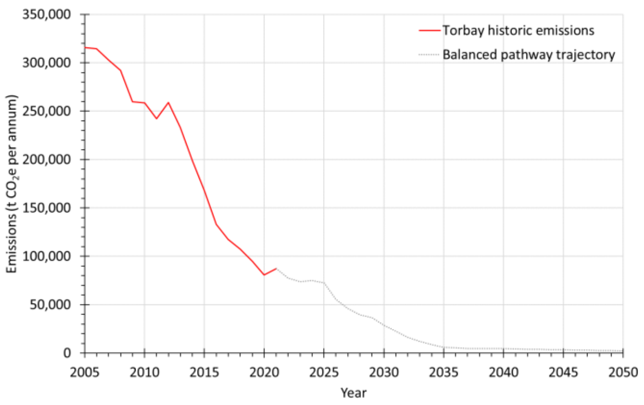
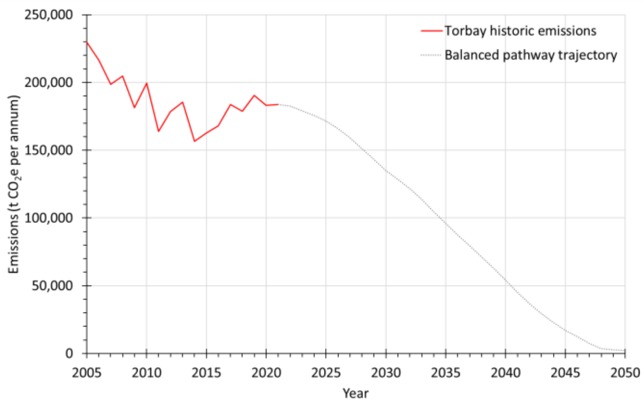


Figure 5. Future GHG emissions in Torbay compared to the national balanced net zero pathway

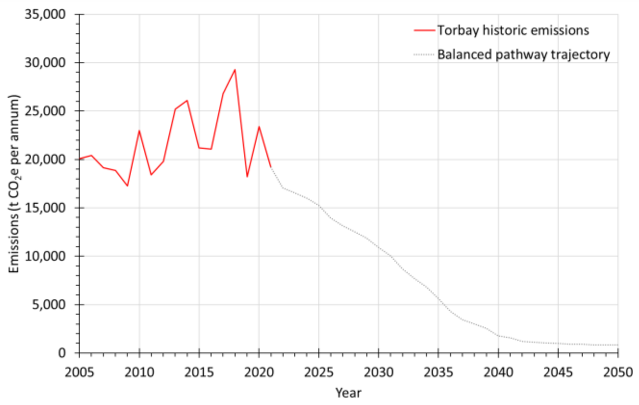
Figure 6 a to h depict the future trajectory of total emissions in Torbay following the balanced net zero pathway for each sector (the trajectory for land use is shown for information but has not been included in the overall totals depicted in Figure 5).



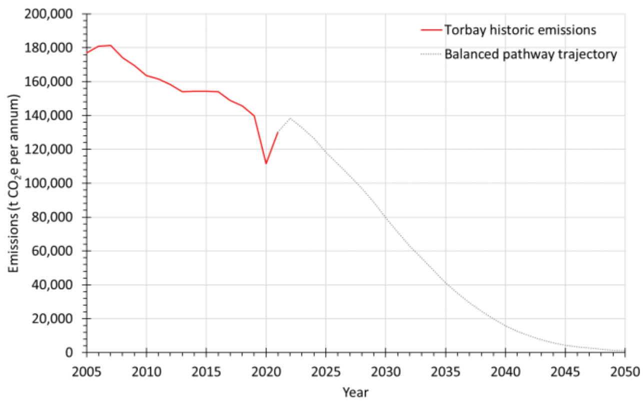
a. Power



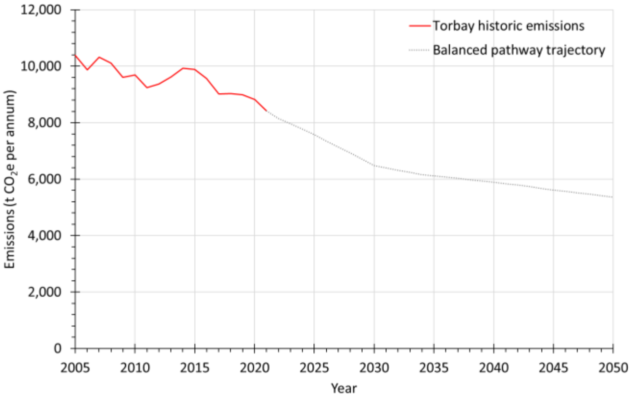
b. Buildings



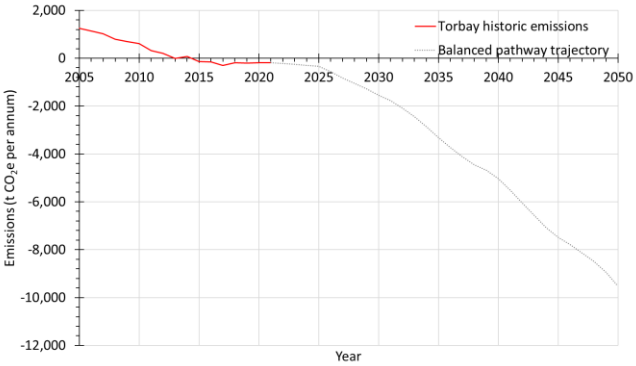
c. Industry



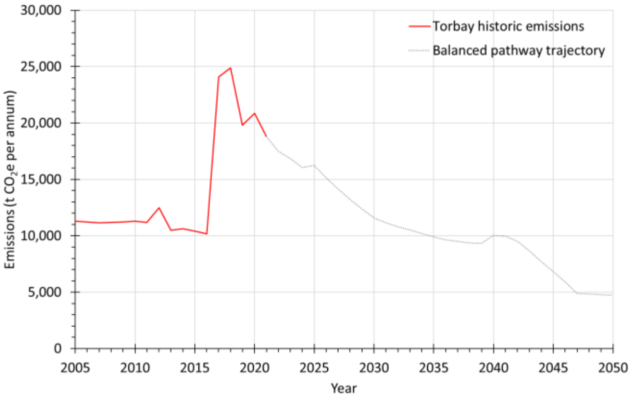
d. Transport



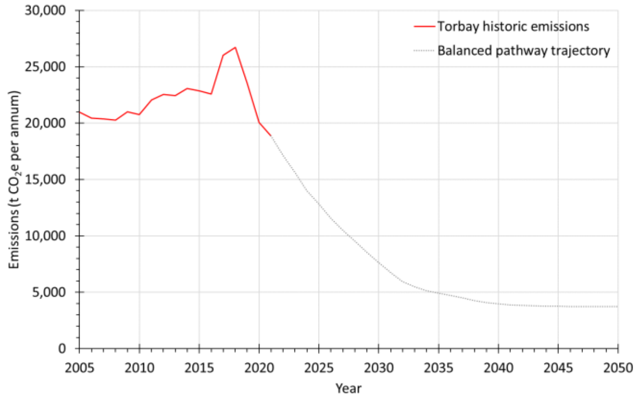
e. Agriculture



f. Land use



g. Waste



h. F-gases

Figure 6. Future GHG emissions in Torbay by sector compared to the national balanced net zero pathway

3 Sector emissions monitoring

While there may be a broad public understanding of what Net Zero means (i.e. minimal fossil fuel use), the two year lag in the publication of GHG emissions statistics presents challenges for setting and achieving easily understood interim CO_2 trajectories. This is compounded by the difficulty of relating reductions in quantities of CO_2 to everyday actions.

Torbay is reviewing its aspiration of becoming carbon neutral by 2030 and is now proposing to revert to the 2050 national net zero trajectory required under the Climate Change Act and reported on in the Sixth Carbon Budget, which the Government adopted in full in April 2021. Torbay also proposes to meet the Government's interim aim of a 78% reduction in GHG emissions by 2035 compared to 1990 levels[10].

The approach taken in the sub sections below[v] is to use the 2050 Balanced Pathway[vi] data from the Sixth Carbon Budget to establish the 2035 and 2050 net zero trajectory values for measures in Torbay. The change required between the current level and the 2035 and 2050 trajectory is then used to calculate a measurable pathway for the for the following year that can be reported on in 2024 and annually thereafter.

The default assumption, unless there is evidence to the contrary, is that progress will occur in a similar manner to the CCC's Balanced Pathway. The exceptions are the power and waste sectors where relevant CCC trajectories are not available. In these sectors a linear projection is used, i.e. with the same increment in each of the years between the most recent data and the relevant trajectory year.

3.1 Power

Power, distributed through the national and regional electricity networks is the sector of the UK economy that has decarbonised most rapidly. The resulting national grid emission factor has fallen by 60%, from 477 g CO_2/kWh in 2010 to 193 g CO_2/kWh in 2019[vii]. The use of a national emissions factor for local electricity CO_2 emissions calculations precludes considering carbon emissions from local power generation (from, for example, renewable electricity generation in Torbay) as Torbay's CO_2 reduction. All renewable energy generation in the UK contributes to national emissions reduction, so while Torbay should do everything possible to deliver local renewable electricity generation, the emission reduction benefits contribute to national grid decarbonisation.

The Sixth Carbon Budget estimates that demand for electricity will more than double by 2050. At the same time the CCC projects that grid carbon intensity will have reduced by 76% in 2030, 96% in 2040 and 99% in 2050. Zero carbon electricity generation is therefore essential for the national net zero trajectory to be met. Projections for the Balanced Pathway show that variable renewables such as solar photovoltaic (PV) and wind generation make up 58% of generation in 2030 and 66% in 2040 and 2050. Given these projections, it is clearly important to maximise Torbay's contribution to zero carbon electricity generation and, to be consistent with a 2050 net zero trajectory, Torbay could therefore look for full deployment of its renewable electricity potential by 2050.

The urban nature of Torbay limits the potential for renewable electricity generation. A review of energy opportunities in Torbay[11] identified solar photovoltaic (PV) panels as the most attractive form of renewable electricity generation technology in Torbay. There is some limited potential for larger ground mounted PV arrays and two schemes have recently received planning permission. Roof mounted PV arrays, although individually small, have the potential to make a material contribution if widely adopted across the rooftops of Torbay's homes and businesses.

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[v] The agriculture and land use sectors are not included as the net emission from these sectors are only 2% of Torbay's total emissions.

[vi] The CCC's Sixth Carbon Budget considers a number of potential pathways to net zero emission in the UK including the preferred Balanced Pathway. The Balance Pathway is its recommended pathway to meet the Sixth Carbon Budget and achieve a 78% reduction in GHG emissions in 2035 and Net Zero in 2050. Refer to Sixth Carbon Budget, Section 4c p 49, CCC, 2020

[vii] Sixth Carbon Budget, Figure 3.4.b, CCC, 2020.

3.1.1 Current renewable electricity generation

Data on renewable electricity (RE) installations is available from the Department of Energy Security and Net Zero (DESNZ) regional renewable energy statistics[12] and also from OFGEM's feed-in tariff installation report[13,viii]. The DESNZ data shows total RE generation in Torbay of 8.2 GWh in 2022, 2% of Torbay's electricity consumption in 2021 (414 GWh)[14]. PV generated 99.5% (8.2 GWh) and wind 0.5% (0.04 GWh) of total renewable energy in Torbay.

3.1.2 PV on homes

In 2022 there were a total of about 2,380 PV installations (amounting to 5% of Torbay's homes), with a total capacity of 8 MW generating 6.6 GWh. 2011 saw the largest annual installation rate (563 new installations). Recent installation rates have been significantly less, averaging 117 annually over the five years since 2018[ix], although the 250 installations estimated for 2022 are higher than the years immediately previous. Figure 7 shows the trends in domestic PV generation and installations as a percentage of Torbay's domestic roofs.

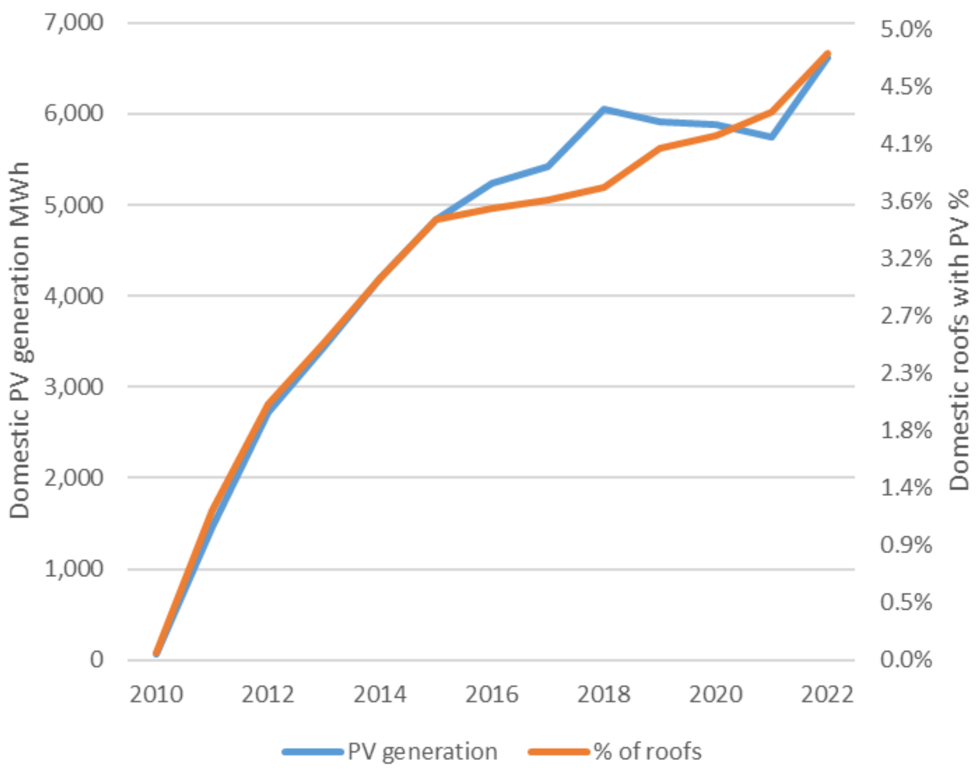


Figure 7: Historic domestic PV in Torbay from 2010 to 2020

The trajectory for PV assumes that by 2050 25% of Torbay's existing domestic roofs[x] have PV installed and that 50% of new homes built between 2020 and 2050[xi] have PV with each installation assumed to have the historic average peak capacity (3.4 kW). This pathway would mean that in 2050 16,846 domestic roofs (29%) in Torbay would have PV. Projections for the 28 years from 2022 to 2050 assume a linear pathway for the number of installations, capacity and generation. Figure 8 shows the resulting increase in domestic solar PV, which would generate 48 GWh in 2050.

[viii] The discontinuation of the feed–in tariff for PV means that OFGEM data is not representative after 2018.

[ix] The extent to which reduced installation numbers are due to changes reporting rather than actual reduction in PV installations is unknown.

[x] Based on 2021 census housing numbers and housing mix which is used to calculate the percentage of homes that have roofs (79% assuming 3 purpose-built flats or 2 conversions share one roof and ignoring flats in commercial buildings or mobile/temporary homes).

[xi] Based on annual the housing requirement of 720 per year to 2027 and population growth thereafter giving 8,802 new roofs with PV in 2050.

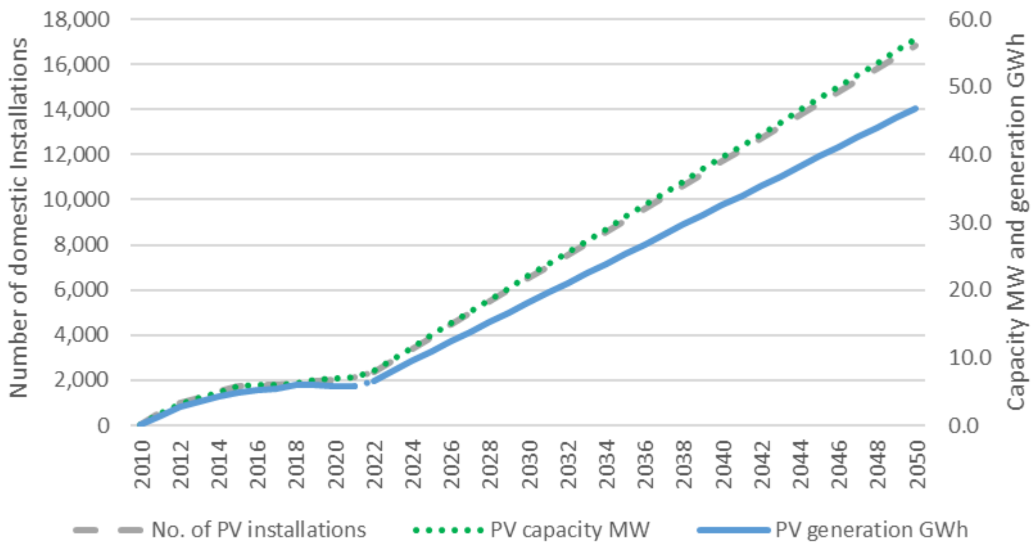


Figure 8: Historic and projected domestic PV in Torbay

The projected domestic installation rate is 517 per year, 2.6 times the historic average and 92% of the peak rate achieved in 2011.

3.1.3 Non-domestic PV

Non-domestic PV installations in Torbay generated 1.5 GWh in 2022 from 89 sites with a total capacity of 1.9 MW. New non-domestic PV will be a combination of a larger number of roof mounted PV arrays together with a small number of ground mounted sites. Torbay has 4694 non-domestic buildings[15]. A quarter of these are assumed to be suitable sites (mostly roofs) and it is assumed that these each accommodate the average historic installation capacity of 23 kW per site. On this basis, projected 2050 generation is 22 GWh. Projections for the 28 years from 2022 to 2050 assume a linear pathway for the number of installations, capacity and generation. Figure 9 shows historic and projected non-domestic PV installations, capacity and generation.

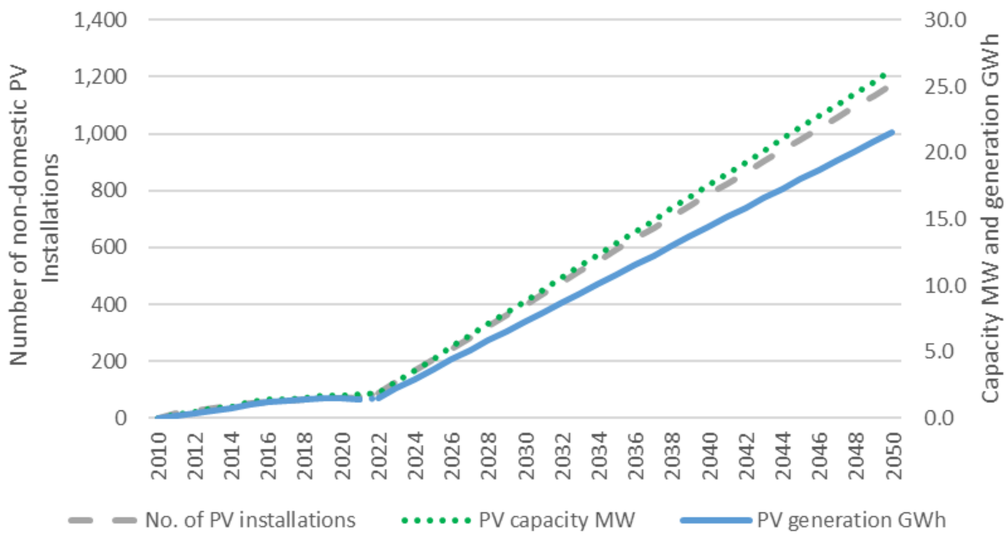


Figure 9: Historic and projected non-domestic PV in Torbay

The projected non-domestic installation rate is 39 per year, 5 times the historic average and 3 times the 14 per annum peak rate achieved in 2011.

3.1.4 All PV

Table 3 and Figure 10 show historic and projected domestic and non-domestic PV installations in Torbay.

Table 3. Historic and projected domestic and non-domestic PV installations in Torbay

Year	No. of PV installations	PV capacity MW	PV generation GWh
2010	32	0.1	0.1
2011	609	1.9	1.7
2012	1,033	3.6	3.1
2013	1,283	4.7	4.0
2014	1,543	5.8	4.9
2015	1,781	7.0	5.9
2016	1,826	7.3	6.4
2017	1,859	7.5	6.7
2018	1,907	7.7	7.5
2019	2,064	8.5	7.4
2020	2,115	8.6	7.3
2021	2,207	9.0	7.2
2022	2,470	9.9	8.2
2023	3,025	12.5	10.3
2024	3,581	15.2	12.5
2025	4,136	17.8	14.6
2026	4,691	20.4	16.8
2027	5,247	23.0	18.9
2028	5,802	25.6	21.1
2029	6,357	28.3	23.2
2030	6,913	30.9	25.4
2031	7,468	33.5	27.5
2032	8,023	36.1	29.7
2033	8,579	38.7	31.8
2034	9,134	41.4	34.0
2035	9,689	44.0	36.2
2036	10,245	46.6	38.3
2037	10,800	49.2	40.5
2038	11,355	51.8	42.6
2039	11,911	54.5	44.8
2040	12,466	57.1	46.9
2041	13,021	59.7	49.1
2042	13,577	62.3	51.2
2043	14,132	64.9	53.4
2044	14,687	67.6	55.5
2045	15,243	70.2	57.7
2046	15,798	72.8	59.8
2047	16,353	75.4	62.0
2048	16,909	78.0	64.1
2049	17,464	80.6	66.3
2050	18,019	83.3	68.5

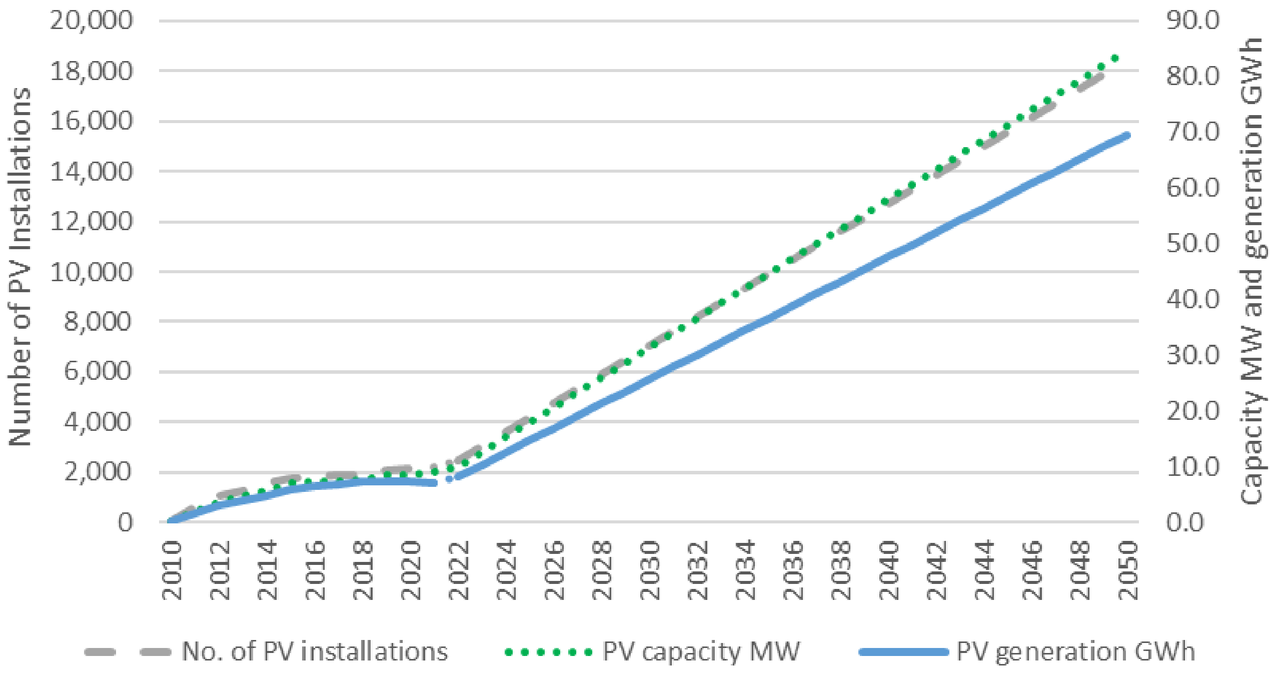


Figure 10: Historic and projected total (domestic and non-domestic) PV in Torbay

The projected overall installation rate from 2022 to 2050 is 555 per year, 2.7 times the historic average and similar to the 577 total installs achieved in 2011. The 2050 PV generation of 69 GWh represents 16.5% of Torbay's current electricity consumption. However, by 2050 the CCC Balanced Pathway projects that due to the increased use of electricity for heating buildings and powering electric vehicles, national electricity demand will double. If this increase in electricity use is replicated in Torbay, the contribution of 70 GWh of PV in Torbay would be less (8.3%). In 2035 projections show 9,689 PV installations with 44 MW capacity generating 36.3 MWh.

The resulting monitoring trajectory for PV in 2023 is set out below.

SECTOR:	POWER
CURRENT LEVEL:	2,470 PV INSTALLATIONS, 10 MW CAPACITY & 8 GWh GENERATION (2022)
MONITORING TRAJECTORY:	9, 689 PV INSTALLATIONS, 44 MW CAPACITY & 36 GWh GENERATION IN 2035
	18,019 PV INSTALLATIONS, 83 MW CAPACITY & 69 GWh GENERATION IN 2050
NEXT YEAR INCREMENT:	555 PV INSTALLATIONS, 2.6 MW CAPACITY & 2.2 GWh GENERATION (2022 TO 2023)
DATA SOURCE:	RENEWABLE ENERGY BY LOCAL AUTHORITY STATISTICS, DESNZ[12]
DATA AVAILABLE:	ANNUALLY

3.2 Buildings

Emissions from Torbay's buildings have reduced by 8% since 2010 significantly less than the 17% nationally. Buildings remain the dominant source of GHG emissions in Torbay, responsible for 183.8 kt CO_2e in 2020 or 39% of the total. The majority of emissions associated with the buildings sector are due to the requirements for space heating and hot water. Emissions from the consumption of electricity are included under the power sector. Reducing emissions arising from space heating and hot water relies on both reducing demand through efficiency measures, and supplying any heat required using low-carbon technologies. Figure 11 shows historic emission from buildings in Torbay compared to the national trajectory (the national trajectory line shows national emissions scaled to match Torbay's emissions in 2005) together with projected emissions were these to follow the CCC's UK balanced pathway trajectory to Net Zero in 2050.

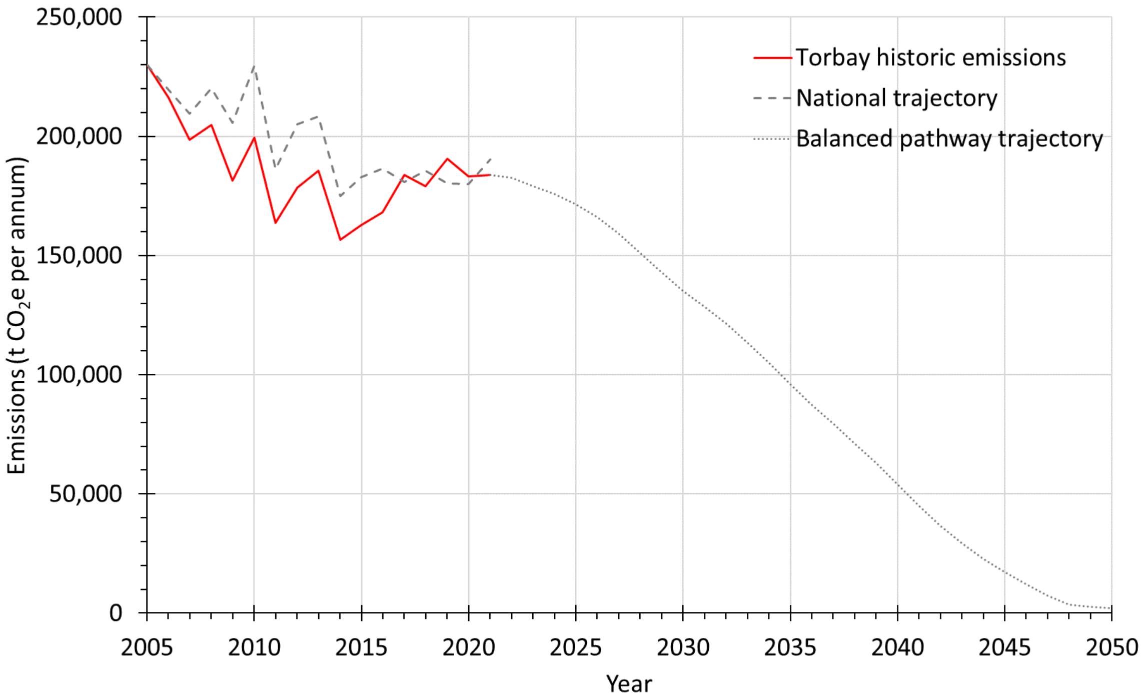


Figure 11: Historic buildings emissions for Torbay compared to the national picture, with a projected decline following the CCC balanced pathway trajectory to net zero overall emissions by 2050

3.2.1 Energy efficiency in homes

The Sixth Carbon Budget's Balanced Pathway calls for insulation of all lofts and cavities and solid wall insulation on 50% of solid wall homes by 2033.

Data from Energy Performance Certificates[16] (EPC) provides information on some 46,932 homes or three quarters of the 63,307[xii] homes in Torbay (duplicate EPCs on the same home excluded). The dates of the EPCs go back to 2008, which means that an EPC may be out of date as changes could have been made to properties since the most recent EPC was compiled. This caveat should be borne in mind when using EPC data; EPCs are a lagging indicator.

Publication of EPC data occurs quarterly. The assessment uses data published on 30th September 2022. Table 4 summarises the EPC coverage in Torbay at that date.

Table 4: Domestic EPC coverage in Torbay at 30th September 2022

Building type	2022
Number of EPCs	46,932
Number of homes	63,307
% EPC coverage	74%

[xii] Estimated number of homes in Torbay in 2022 based on 2021 census (62,995) plus 312 new dwellings in 2022.

Table 5 shows the roof insulation data in Torbay EPCs with the percentage for each type applied to the total number of homes.

Table 5: Loft insulation recorded in Torbay's EPCs at 30th September 2022

Roof / insulation type	EPCs	% of roofs	Torbay
Dwelling/premises above (no roof)	10,079	21.48%	13,596
U values given (new homes)	3,080	6.56%	4,155
Pitched uninsulated	3,397	7.24%	4,582
Pitched 100mm or less	9,316	19.85%	12,566
Pitched 101mm to 200mm	9,530	20.31%	12,855
Pitched 201mm to 300mm	6,571	14.00%	8,864
Pitched 300mm plus	1,076	2.29%	1,451
Pitched unknown	5	0.01%	7
Flat roofs	2,537	5.41%	3,422
Roof rooms & thatched	1,304	2.78%	1,759
Unknown	37	0.08%	50
Total	46,932		63,307

The recommended depth for loft insulation in pitched roofs is between 220mm and 270mm depending on the insulation material used[17]. Table 6 summarises roof insulation data from EPCs as at 30th September and 2022.

Table 6. Torbay roof insulation summary at 30th September 2022

	2022		
Roof / insulation type	EPCs	% of roofs	Torbay
Pitched roofs No insulation	3,397	7%	4,582
Pitched roofs < 200mm insulation	18,851	40%	25,428
Total pitched roofs requiring insulation	22,248	47%	30,011
Pitched roofs > 200mm insulation	10,727	23%	14,470
Total pitched roofs	32,975	70%	44,480
Other roofs	13,957	30%	18,827
Total roofs	46,932		63,307

About 30% of Torbay's homes either do not need roof insulation (e.g. non-top floor flats) or are difficult to insulate. Of the remaining 44,480 homes 14,470 (23%) are insulated (new build—where U values are given, or pitched roofs with more than 200mm of insulation). However, 4,582 pitched roof homes in Torbay have no loft insulation and 25,428 homes require top up insulation giving a total 30,011 homes, or 47% of the housing stock, in need of some loft insulation.

The Sixth Carbon Budget provides trajectories for the uptake of energy efficiency measures. Figure 12 shows the CCC's loft insulation trajectory applied to Torbay's uninsulated roofs.

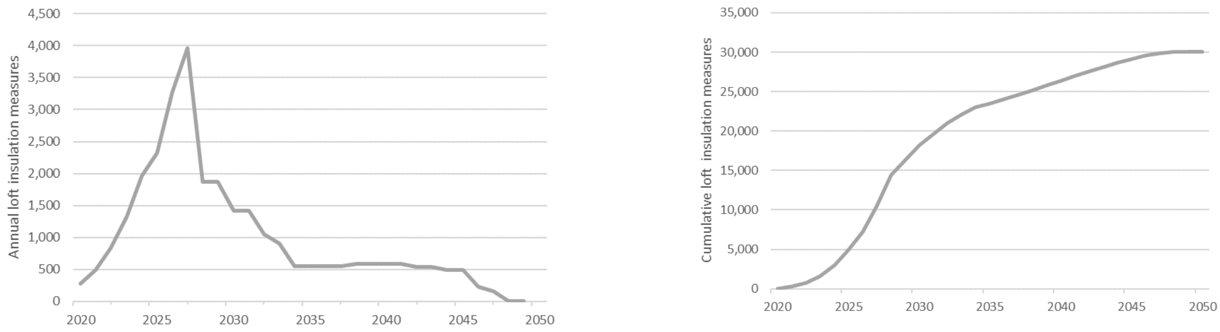


Figure 12: Annual and cumulative loft insulation trajectories for Torbay

Table 7 shows projected loft insulation numbers over the 5 years from 2020 to 2024.

Table 7: Projected loft insulation installs in Torbay's homes from 2020 to 2024

Year	Loft insulation
2020	273
2021	491
2022	842
2023	1,323
2024	1,960

The resulting monitoring trajectory for 2023 is set out below.

SECTOR: BUILDINGS

CURRENT LEVEL: 30,011 PITCHED ROOFS HAVE < 200MM INSULATION

MONITORING TRAJECTORY: 7,542 PITCHED ROOFS HAVE < 200MM INSULATION IN 2035

0 PITCHED ROOFS HAVE < 200MM INSULATION IN 2050

NEXT YEAR INCREMENT: 1,323 FEWER PITCHED ROOFS HAVE < 200mm INSULATION

DATA SOURCE: EPCs[13]

DATA AVAILABLE: QUARTERLY (BUT INCLUDES HISTORICAL DATA)

Table 8 shows a summary of the EPC data for wall insulation in Torbay.

Table 8: Wall insulation recorded in Torbay's EPCs at 30th September 2022

Wall type	EPCs	% of walls	Torbay
Insulated cavity walls	19,812	42.21%	26,725
Insulated other walls	1,136	2.42%	1,532
Insulated solid walls	6,888	14.68%	9,291
Partly insulated cavity walls	1,678	3.58%	2,263
Partly insulated other walls	450	0.96%	607
Partly insulated solid walls	49	0.10%	66
Uninsulated cavity	9,684	20.63%	13,063
Uninsulated other walls	504	1.07%	680
Uninsulated solid walls	6,693	14.26%	9,028
Unknown	38	0.08%	51
Total	46,932	100.00%	63,307

The data suggests that 36% of the homes in Torbay (22,771) do not have wall insulation of which 57% (13,063) are cavity walls and 40% (9,028) are solid walls.

The Sixth Carbon Budget provides trajectories for the uptake of wall insulation measures which aim to insulate all cavity walls and 50% of solid walls by 2050. The resulting annual and cumulative installation profiles applied to Torbay's homes are shown in Figure 13.

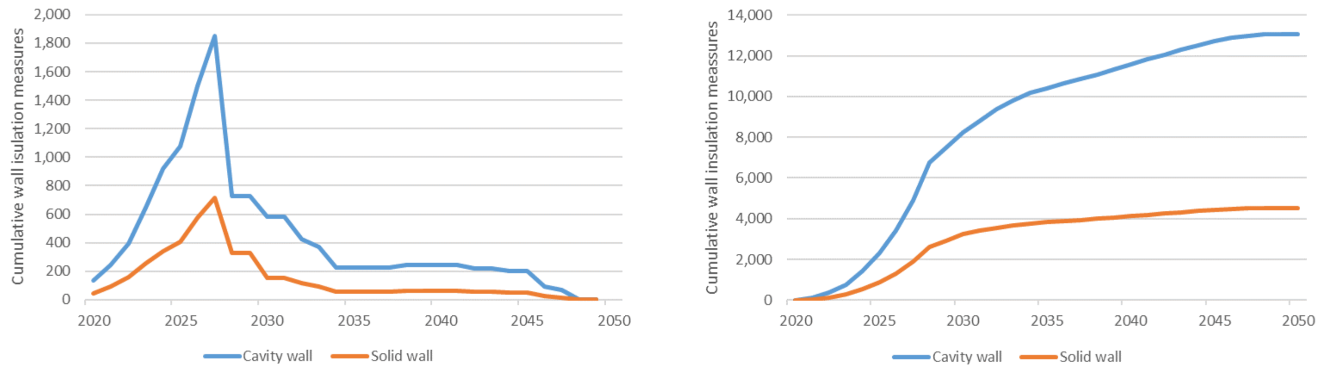


Figure 13: Annual and cumulative wall insulation trajectories for Torbay

Table 9 shows projected wall insulation numbers over the 5 years from 2020 to 2024.

Table 9: Projected wall insulation installs in Torbay's homes from 2020 to 2024

Year	Cavity wall	Solid wall
2020	137	47
2021	241	95
2022	392	162
2023	649	256
2024	918	339

The resulting monitoring trajectories for cavity and solid wall insulation measures in 2023 are set out below.

SECTOR: BUILDINGS

CURRENT LEVEL: 13,063 UNINSULATED CAVITY WALLS

MONITORING TRAJECTORY: 3,195 UNINSULATED CAVITY WALLS BY 2035

0 UNINSULATED CAVITY WALLS BY 2050

NEXT YEAR INCREMENT : 649 FEWER UNINSULATED CAVITY WALLS

DATA SOURCE: EPCs[13]

DATA AVAILABLE: QUARTERLY (BUT INCLUDES HISTORICAL DATA)

SECTOR:	BUILDINGS
CURRENT LEVEL:	9,028 UNINSULATED SOLID WALLS
MONITORING TRAJECTORY:	5,448 UNINSULATED SOLID WALLS BY 2050
	4,514 UNINSULATED SOLID WALLS BY 2050 (50%)
NEXT YEAR INCREMENT:	256 FEWER UNINSULATED SOLID WALLS
DATA SOURCE:	EPCs[13]
DATA AVAILABLE:	QUARTERLY (BUT INCLUDES HISTORICAL DATA)

3.2.2 Low carbon heat in homes

The Sixth Carbon Budget foresees the decarbonisation of home heating in urban areas via heat pumps and heat networks. By 2050 the uptake of heat pumps in UK homes with gas is forecast to reach 17.8 million representing 76% of the 23.6 million UK homes on the gas grid[18]. Around 20% of heat to homes and 42% to public and commercial customers will be through heat networks by 2050. Table 10 shows EPC data on heating in Torbay's homes.

Table 10: Heating types recorded in Torbay's EPCs at 30th September 2022

Heating type	EPC no.	% of heat type	Torbay
Mains gas central heating	35,400	75.43%	47,751
Electric storage heaters	5,364	11.43%	7,236
Electric room heaters	2,981	6.35%	4,021
Community schemes	1,768	3.77%	2,385
Electric central heating	558	1.19%	753
Room heaters mains gas	390	0.83%	526
Heat pumps	212	0.45%	286
LPG central heating	70	0.15%	94
Oil central heating	69	0.15%	93
Unknown	46	0.10%	62
Room heaters coal	34	0.07%	46
Solid fuel central heating	17	0.04%	23
Room heaters biomass	11	0.02%	15
Room heaters oil	5	0.01%	7
Room heaters bottled gas	4	0.01%	5
Biomass central heating	3	0.01%	4
Total	46,932	100.00%	63,307

The pro rata EPC data gives 268 homes in Torbay with heat pumps, 2,385 homes connected to community heating schemes[xiii] (heat networks) and 12,009 electrically heated homes, a total of 14,860 homes with low carbon heating. The remaining 48,627 homes existing in Torbay will require low or zero carbon-heating retrofit by 2050. If it is assumed that new build homes built after the introduction of the Future Homes Standard in 2025 have low carbon heating an additional 2,160 homes built between 2022 and 2025 will also require retrofitting bringing the total to 50,787 homes requiring retrofit low carbon heating. Heat pumps and heat networks are assumed to be the preferred retrofit options. The Sixth Carbon Budget assumes that 18% of homes are assigned to heat networks (9,142 of non-low carbon heated

[xiii] Defined as "a system in which a heat generator provides heat and/or hot water to more than one premises."

homes in Torbay) and provides a trajectory for the uptake of on gas grid heat pumps in the UK to 2050 which are applied to the remaining 41,645 non-heat network, non-low carbon homes in Torbay in Figure 14.

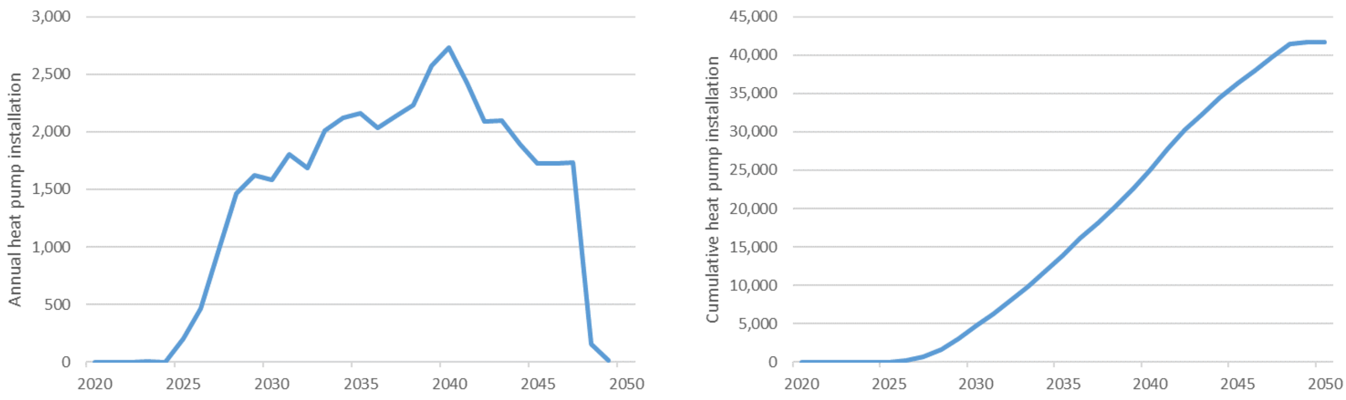


Figure 14: Annual and cumulative wall insulation trajectories for Torbay

Table 11 shows projected heat pump installation numbers over the 5 years from 2020 to 2024.

Table 11: Projected wall insulation installs in Torbay's homes from 2020 to 2024

Year	Heat pumps
2020	0
2021	0
2022	1
2023	7
2024	0

The resulting monitoring trajectories for heat pumps in 2023 are set out below.

SECTOR:	BUILDINGS
CURRENT LEVEL:	286 HEAT PUMPS IN HOMES
MONITORING TRAJECTORY:	16,376 HEAT PUMPS INSTALLED IN HOMES BY 2035
	41,645 HEAT PUMPS INSTALLED IN HOMES BY 2050
NEXT YEAR INCREMENT:	7 HEAT PUMP INSTALLS
DATA SOURCE:	EPCs[13]
DATA AVAILABLE:	QUARTERLY (BUT INCLUDES HISTORICAL DATA)

The CCC does not provide profile for the uptake of heat networks. Heat network uptake is therefore projected to occur evenly over the 28 years to 2050.

SECTOR: BUILDINGS

CURRENT LEVEL: 2,385 HEAT CUSTOMERS CONNECTED TO HEAT NETWORKS

MONITORING TRAJECTORY: 6,629 HEAT CUSTOMERS CONNECTED TO LOW CARBON HEAT NETWORKS IN 2035

11,526 HEAT CUSTOMERS CONNECTED TO LOW CARBON HEAT NETWORKS IN 2050

NEXT YEAR INCREMENT: 326 HEAT CUSTOMERS CONNECTED TO LOW CARBON HEAT NETWORKS

DATA SOURCE: EPCs[13]

DATA AVAILABLE: QUARTERLY (BUT INCLUDES HISTORICAL DATA)

Table 12 summarises the current and projected 2050 net zero heating mix in Torbay's homes.

Table 12: Current (at 30th September 2022) and projected 2050 net zero heating mix in Torbay's homes

Heating type	Current	2050	Change
Gas	47,751	0	-47,751
Electric heating	12,009	12,009	0
Heat pump	286	41,931	41,645
Heat network	2,385	11,526	9,142
Other	875	0	-875
Total	63,307	65467	2,160

Currently most heat networks are fuelled by natural gas. Fossil fuel based heat networks will need to decarbonise to achieve Net Zero.

SECTOR: BUILDINGS

CURRENT LEVEL: NO ZERO CARBON HEAT NETWORKS (ASSUMED)

MONITORING TRAJECTORY: SOME HEAT NETWORKS DECARBONISED BY 2035

ALL HEAT NETWORKS DECARBONISED BY 2050

NEXT YEAR INCREMENT: DECARBONISATION PLAN FOR ALL HEAT NETWORKS IN TORBAY

DATA SOURCE: UNKNOWN

DATA AVAILABLE: UNKNOWN

3.2.3 Energy efficiency and low carbon heat in non-domestic buildings

The Sixth Carbon Budget assumes that non-domestic buildings achieve a 27% reduction in energy consumption compared to the CCC's 2018 baseline. However, in its Balanced Pathway, the CCC assumes that commercial energy efficiency measures are fully deployed by 2030 and public sector measures are fully deployed by 2032. Nationally the CCC projects that by 2030 37% of public and commercial heat demand is met by low-carbon sources. Of this low-carbon heat demand, 65% is supplied via heat pumps, 32% via district heating and 3% by biomass. By 2050 all heat demand is met by low-carbon sources of which 52% is heat pumps, 42% is district heat, 5% is hydrogen boilers and around 1% is new direct electric heating.

In practical terms, this requires organisations (or in many cases, their landlords), to invest in efficiency measures such as insulation and low and zero carbon building services.

Display Energy Certificate (DEC) and non-domestic Energy Performance Certificate (EPC) data[16] provide an insight into Torbay's non-domestic buildings. DECs are required annually on buildings accessed by the public which are over 1000 m^2, and less frequently (every 10 years) on smaller buildings (over 250 m^2). There are some 212 premises with DECs in Torbay[xiv]. Non-domestic EPCs have been required since 2008 on the sale, rental or construction of non-domestic premises. As EPCs are not required regularly some will be out of date with the potential for changes having been made since the EPC was performed. There are 2,840 non-domestic EPCs in Torbay[xv]. DECs and EPCs provide an operational/asset rating from A (good) to G (poor) for each building based on the building's estimated CO_2 emissions.

The CO_2 estimates in DECs and EPCs are calculated using electricity CO_2 emissions factors that are not consistent with those resulting from Torbay's 2021 GHG emission estimate. Building electricity consumption figures in the DECs have therefore been used to estimate CO_2 emissions using the 2021 grid electricity emission factors for each rating band resulting in total CO_2 emissions from buildings with DECs of 19 kt CO_2 (a 46% reduction compared to 40 ktCO_2 reported in the DECs). Figure 15 shows the distribution of buildings, floor areas and CO_2 emissions for each DEC band. The graph suggests that poor performing buildings in band E account for a disproportionate share of the building stock's CO_2 emissions.

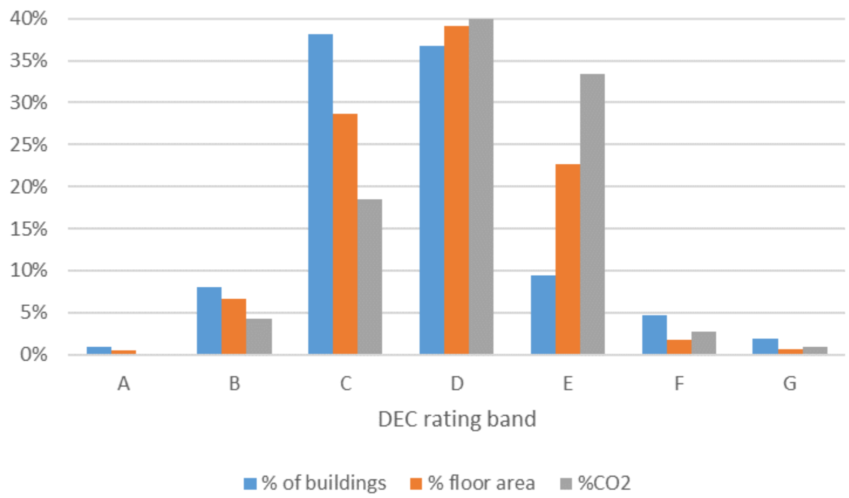


Figure 15: Percentage of non-domestic buildings, floor area and CO_2 emissions for each DEC band in Torbay at 30th September 2022

Average CO_2/m^2 figures for each rating band have been used to estimate how improvements in building performance to a better performing band is likely to impact CO_2 emissions[xvi]. Improving buildings with DEC ratings of D, E, F and G (112 buildings) to a C rating achieves a 35% reduction in CO_2 emissions, while improving only E, F and G rated buildings (34 buildings) to a D rating achieves an 12% reduction.

EPCs do not provide energy consumption data so the methodology applied to DECs cannot be repeated. Total CO_2 emissions recorded in the 2,840 EPCs are 107 kt CO_2. As with DECs, this figure will be inconsistent with Torbay's 2021 GHG inventory. If the 46% reduction applied to the DECs is applied, total emission fall to 49 kt CO_2 (much of which will duplicate savings from buildings that also have DECs). Figure 16 shows the distribution of buildings, floor areas and CO_2 emissions for each EPC band which suggest a more proportionate profile of CO_2 emissions compared with the number of buildings and floor space that is found from DECs.

[xiv] DECs with missing energy data excluded.
[xv] EPCs with missing energy data excluded.
[xvi] Note that no specific allowance is made for electricity grid decarbonisation.

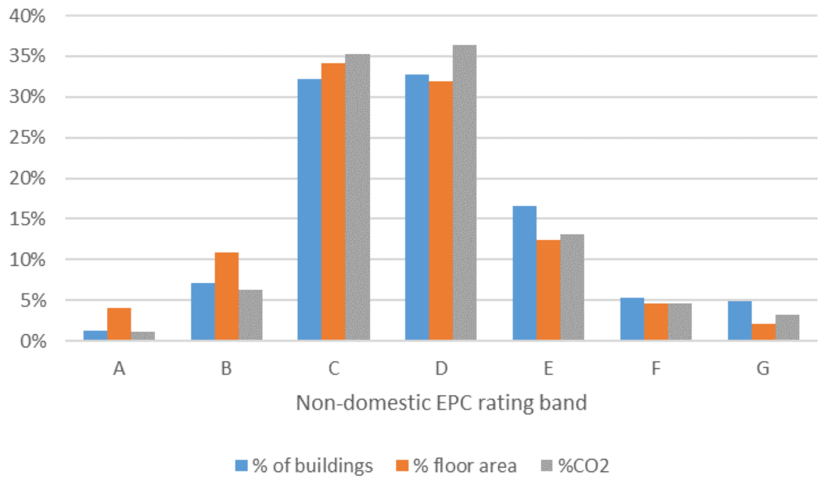


Figure 16: Percentage of non-domestic buildings, floor area and CO_2 emissions for each EPC band in Torbay at 30th September 2022

The 49 kt CO_2 adjusted total emissions from EPCs compares with the non-domestic GHG assessment of 83 kt CO_2 (59%). This indicates that EPCs have not been undertaken on all non-domestic properties, as is confirmed by comparing the number of EPCs (2,840) with the 4,694 non-domestic buildings recorded in the non-domestic national energy efficiency data-framework (61%).

As with DECs, average CO_2/m^2 figures for each rating band in the EPCs have been used to estimate how improvements in building performance to a better performing band is likely to impact CO_2 emissions. Improving buildings with EPC ratings of D, E F and G rated buildings (1,689 or 59% of the buildings with EPCs) to a C rating achieves a 5% reduction: well short of the 27% required by the CCC. Improving C, D, E, F and G (2,605 or 92% of the buildings with EPCs) to a B rating achieves a 43% reduction in CO_2 emissions. This implies that achieving a 27% CO_2 emission reduction will require significant energy efficiency upgrades to some 2,685[xvii] non-domestic buildings in Torbay. Assuming that the same number are upgraded in each of the eight years to the CCC's trajectory for 2030 gives 336 buildings requiring upgrading per year.

SECTOR:	BUILDINGS
CURRENT LEVEL:	4,306 NON-DOMESTIC BUILDINGS WITH EPC BAND C, D, E, F, AND G RATINGS
MONITORING TRAJECTORY:	1,621 NON-DOMESTIC BUILDINGS BAND C, D, E, F & G IMPROVED TO BAND B BY 2035
	2,685 NON-DOMESTIC BUILDINGS BAND C, D, E, F & G IMPROVED TO BAND B BY 2050
NEXT YEAR INCREMENT:	336 NON-DOMESTIC BUILDINGS IMPROVED FROM BANDS C, D, E, F & G TO BAND B
DATA SOURCE:	EPCs/DECs[16]
DATA AVAILABLE:	QUARTERLY (BUT INCLUDES HISTORICAL DATA)

[xvii] 92% of the 4,694 non-domestic buildings in Torbay (4,306 pro-rated (27/43)).

Table 13 shows the numbers of low carbon heating (LCH) measures implied by the CCC's non-domestic heating projections.

Table 13: Projected low carbon heat sources for non-domestic buildings.

Area CCC timeframe	National 2030	National 2050	Torbay 2030	Torbay 2050
Total low carbon heat provision	37%	100%	37%	100%
from:				
Heat pumps	65%	52%	1,129	2,441
Heat networks	32%	42%	556	1,971
Biomass	3%		52	
Hydrogen		5%		235
Direct electric		1%		47
Total	**100%**	**100%**	1,737	4,694

Net Zero by 2050 requires Torbay to meet the CCC's 2050 trajectory for zero carbon heating. EPC data shows that 4 non-domestic buildings in Torbay are heated with biomass and one is supplied by a heat network. Grid electricity is the main heating fuel for 1,562 premises[xviii]. Assuming that the remaining 3,127 buildings require LCH upgrades and that the same number are upgraded in each of the 28 years to 2050 gives 112 buildings per year.

SECTOR: BUILDINGS

CURRENT LEVEL: UNKNOWN

MONITORING TRAJECTORY: 1,456 NON-DOMESTIC BUILDINGS WITH LOW CARBON HEATING (LCH) BY 2035

4,694 NON-DOMESTIC BUILDINGS WITH LOW CARBON HEATING (LCH) BY 2050

NEXT YEAR INCREMENT: 112 NON-DOMESTIC BUILDINGS INSTALL LCH MEASURES

DATA SOURCE: EPCs/DECs[13]

DATA AVAILABLE: QUARTERLY (BUT INCLUDES HISTORICAL DATA)

[xviii] Non-domestic EPCs do not specify how many non-domestic buildings have heat pumps.

3.3 Industry

The industrial sector covers emissions from manufacturing and construction businesses excluding those arising from the consumption of electricity (included under the power sector) and from space heating and hot water provision in buildings (covered above). Typically, the sector includes energy intensive industrial activities such as refineries, chemicals, iron and steel and cement, which together are responsible for nearly two thirds[19] of UK industrial sector emissions. These industries are not present in Torbay. Emissions in the area are more likely to occur from activities such as food and drink manufacture, printing, water treatment and waste management and a variety of other smaller manufacturing businesses.

Industrial emissions in Torbay are relatively small (19.2 kt CO_2e or 4% of total emissions in 2021). Figure 17 shows the historic trajectory of industrial emissions in Torbay compared to the national trend and applies the projected reductions envisaged in the CCC's UK Balanced Pathway. Historically, there is a general trend of rising emissions although the figures show considerable volatility. Achieving zero carbon by 2050 would require a reduction in emissions of 2.4 kt per annum from 2021 onwards.

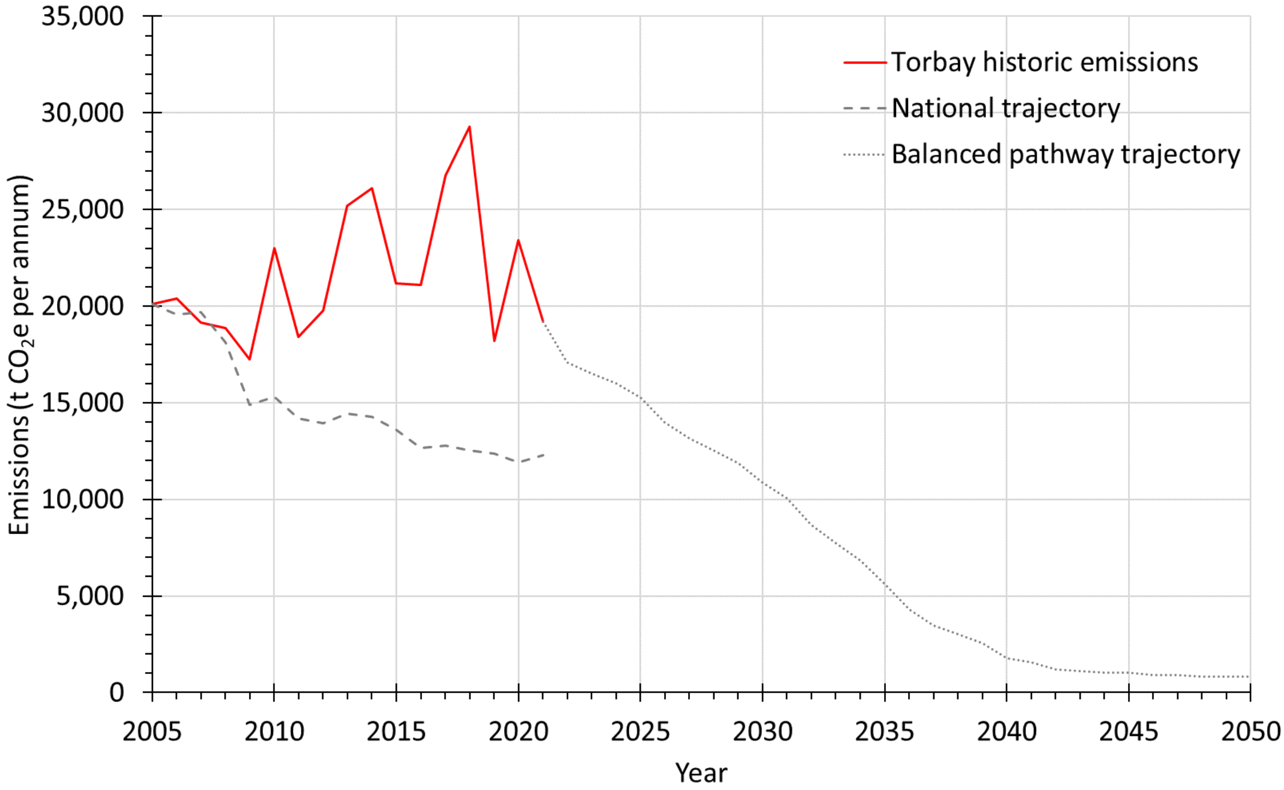


Figure 17: Historic industrial emissions for Torbay compared to the national picture, with a projected decline following the CCC balanced pathway trajectory to net zero overall emissions by 2050

Table 14 shows projected reduction in Torbay's industrial emissions implied by the CCC's Balanced Pathway over the 5 years from 2022 to 2026.

Table 14: Projected reduction in industrial emissions in Torbay from 2022 to 2026

Year	Industrial emissions $ktCO_2e$
2022	796
2023	593
2024	560
2025	773
2026	1,403

The CCC envisages fuel switching (to electricity and hydrogen), carbon capture and storage, and improved energy efficiency as key to decarbonisation of the sector. The absence of identified industrial point source emissions in Torbay makes it difficult to identify specific measures that target significant industrial emissions in the area. Improving industrial energy efficiency and switching away from fossil fuels to electricity are likely to be the most effective ways of reducing emissions. However, there is currently insufficient granularity in the data to measure or set trajectories. The monitoring trajectory is therefore based on the DESNZ Local Authority CO_2 emission dataset.

SECTOR:	INDUSTRY
CURRENT LEVEL:	19,185 THOUSAND TONNES CO_2 EMISSIONS (2021)
MONITORING TRAJECTORY:	5,631 THOUSAND TONNES CO_2 EMISSIONS BY 2035
	NEAR ZERO CO_2 EMISSIONS BY 2050
NEXT YEAR INCREMENT:	593 THOUSAND TONNES CO_2 EMISSIONS REDUCTION
DATA SOURCE:	DESNZ LOCAL AUTHORITY CO_2 STATISTICS[4]
DATA AVAILABLE:	ANNUALLY

The identification of more specific measures for the industrial sector is required.

3.4 Transport / Mobility

Emissions from transport, Torbay's second largest emissions sector after buildings, account for 28% of the total. A 25% reduction was achieved from 2008 to 2021 (26% from 2005 to 2021). A sharp decline in 2020 attributable to Covid-19 travel restrictions returned emissions 20% lower than 2019, but in 2021 emissions two-thirds of this reduction had been lost, with emissions only 7% lower than in 2019. The extent of further post Covid-19 bounce back remains to be seen.

Historic emissions are plotted on Figure 18. Between 2008 and 2019 a year-on-year decline in emissions averaging 3.1 kt CO_2e per annum was evident. The emissions reduction outperformed that observed nationally from 2010 onwards (the 'national trajectory' line shows national emissions scaled to match Torbay's emissions in 2005).

The plot also indicates the future emissions trajectory implied by the CCC balanced net zero pathway to achieve zero net total emissions (from all sectors combined) by 2050. Allowance is made for further Covid-19 bounce back, but from 2023 onwards a sharp decline in emissions is required to 2035 (averaging 7.6 kt CO_2e per annum), with a slowing rate of decline in the years thereafter.

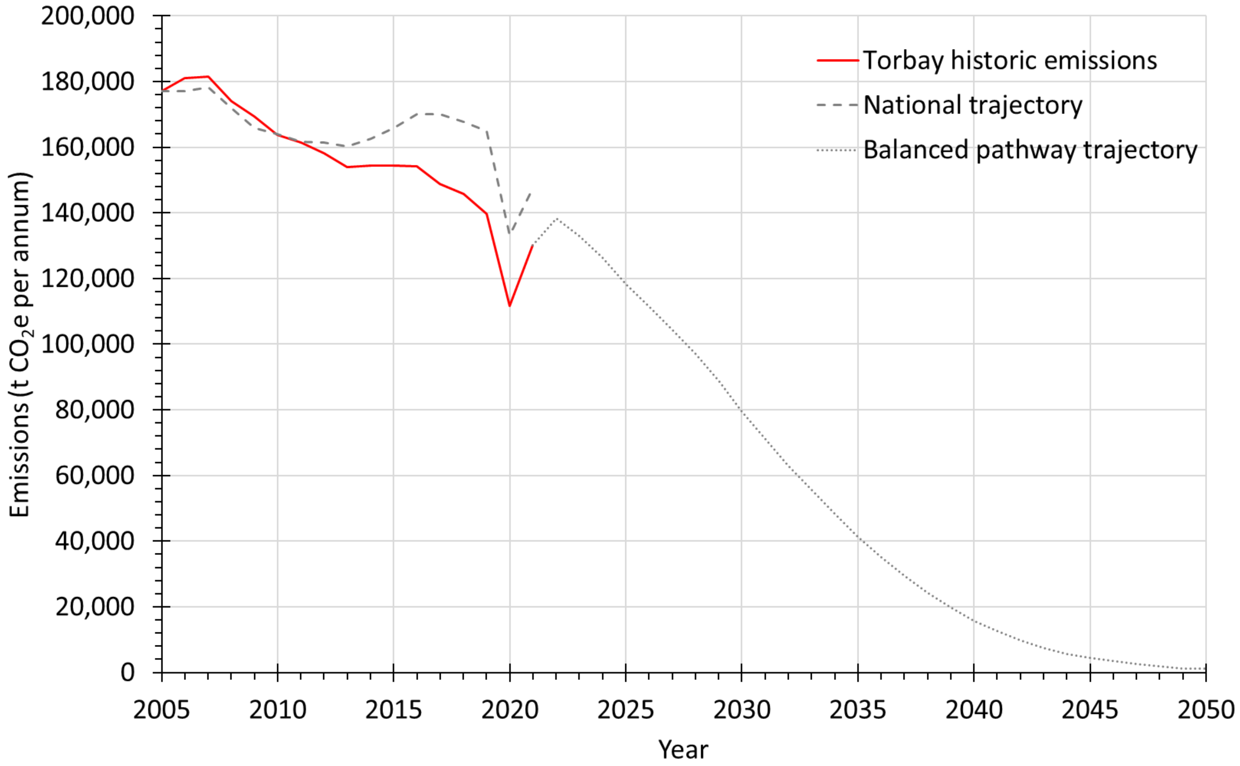


Figure 18: Historic transport emissions for Torbay compared to the national picture, with a projected following the CCC balanced pathway trajectory to net zero overall emissions by 2050

While lower emission vehicles will be key to the decarbonisation of the transport sector, curtailing growth in vehicle use is also an important factor. In Torbay, vehicle-kilometres increased at an average of 6.7 million per annum between 2013 and 2019. A 20% reduction year-on-year reduction was seen in 2020, attributable to Covid-19 travel restrictions. In 2021 just over one-half of this reduction was maintained; in 2022 only 18% of the reduction remained (Figure 19). The Balanced Pathway in the Sixth Carbon Budget assumes a 17% reduction in car miles in 2050 from a 2019 baseline. Lesser reductions of 3% for light goods vehicles and 10% for heavy goods vehicles are assumed for 2030 with no further reduction thereafter. A 5 to 8% modal shift from cars to public transport is assumed; we estimate this would lead to a 50% growth in buses and coaches. Overall motor vehicle mileage would reduce by 14%, based on fleet composition taken from traffic counts in Torbay [20]. These reductions, applied linearly, are shown by the dotted lines on Figure 19.

The CCC 2023 Report to Parliament[8] contains revised key surface transport indicators, in light of the Government's Carbon Budget Delivery Plan which reduces the quantified level of ambition for the surface transport sector. There are now no significant policies to reduce car usage. The revised CCC recommended path shows growth in car and van mileages of 10% and 40% respectively from 2019 to 2050. HGV usage is shown to reduce by 2.3% over the same period. Overall, road traffic growth from 2019 to 2035 is limited to 4%. Applying the revised national trajectory to Torbay traffic flows results in a maximum increase in car traffic of 2.3% from 2019 to 2035.

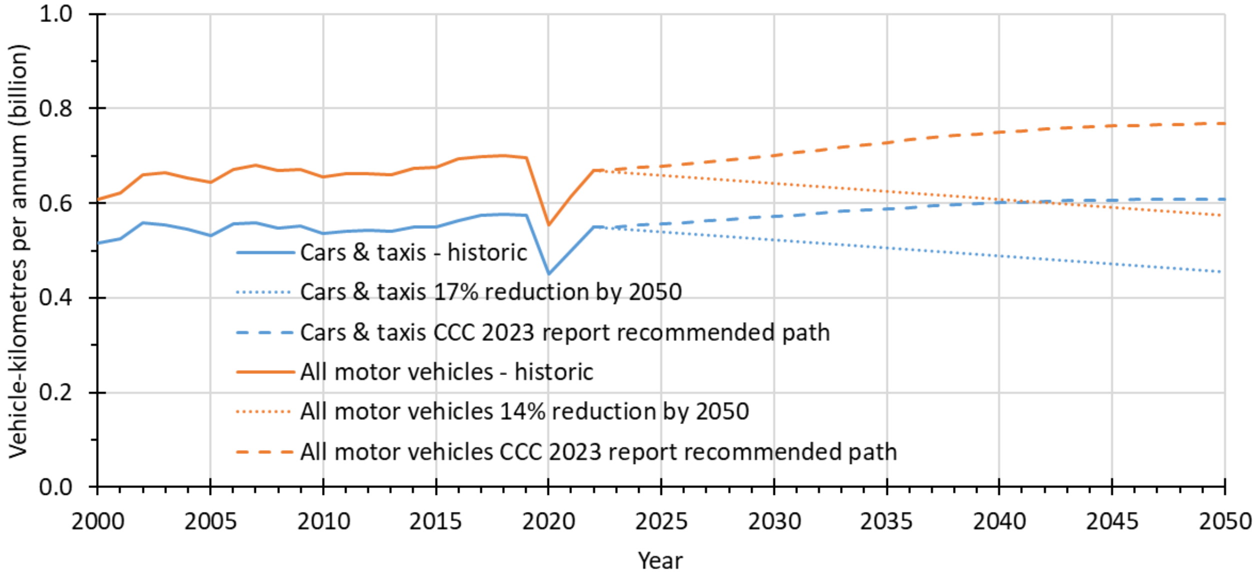


Figure 19: Vehicle kilometres on roads in Torbay [20]

SECTOR:	TRANSPORT/MOBILITY
CURRENT LEVEL:	669 MILLION VEHICLE KILOMETRES (2022) – ALL MOTOR VEHICLES
MONITORING TRAJECTORY:	MAXIMUM 4% INCREASE (FROM 2019) BY 2035 TO 728 MILLION VEHICLE KILOMETRES 11% INCREASE (FROM 2019) BY 2050 TO 769 MILLION VEHICLE KILOMETRES
NEXT YEAR INCREMENT:	MAXIMUM 671 MILLION VEHICLE KILOMETRES (2023)
CURRENT LEVEL:	549 MILLION VEHICLE KILOMETRES (2022) – CARS AND TAXIS
MONITORING TRAJECTORY:	MAXIMUM 2.3% INCREASE (FROM 2019) BY 2035 TO 588 MILLION VEHICLE KILOMETRES MAXIMUM 6% INCREASE (FROM 2019) BY 2050 TO 609 MILLION VEHICLE KILOMETRES
NEXT YEAR INCREMENT:	MAXIMUM 551 MILLION VEHICLE KILOMETRES (2023)
DATA SOURCE:	LOCAL AUTHORITY ROAD TRAFFIC STATISTICS, DfT[20]
DATA AVAILABLE:	ANNUALLY

3.4.1 Electric and zero carbon vehicles

Electric vehicles and charging points hold the key to the transformation of mobility. Net zero requires all cars and vans driving in Torbay to be electric and the provision of supporting charging infrastructure. The provision of infrastructure for larger commercial vehicles and HGVs is also required to enable emissions reduction from these vehicle classes.

The number of battery electric vehicles (BEVs) registered in the Torbay[xix] area has been accelerating with 605 battery electric cars registered in spring 2023 (0.9% of Torbay's 67,699 licensed cars)[21,22]. The technology is relatively established with many models of BEV now available, albeit at a price premium over internal combustion powered cars. Figure 20 shows the historic uptake of battery electric vehicles in Torbay, the south west region and Great Britain. It is evident that uptake of battery electric cars and light goods vehicles in Torbay has significantly lagged regional and national uptake. The CCC 2023 progress report to parliament[8] regards BEV car uptake nationally as being on track.

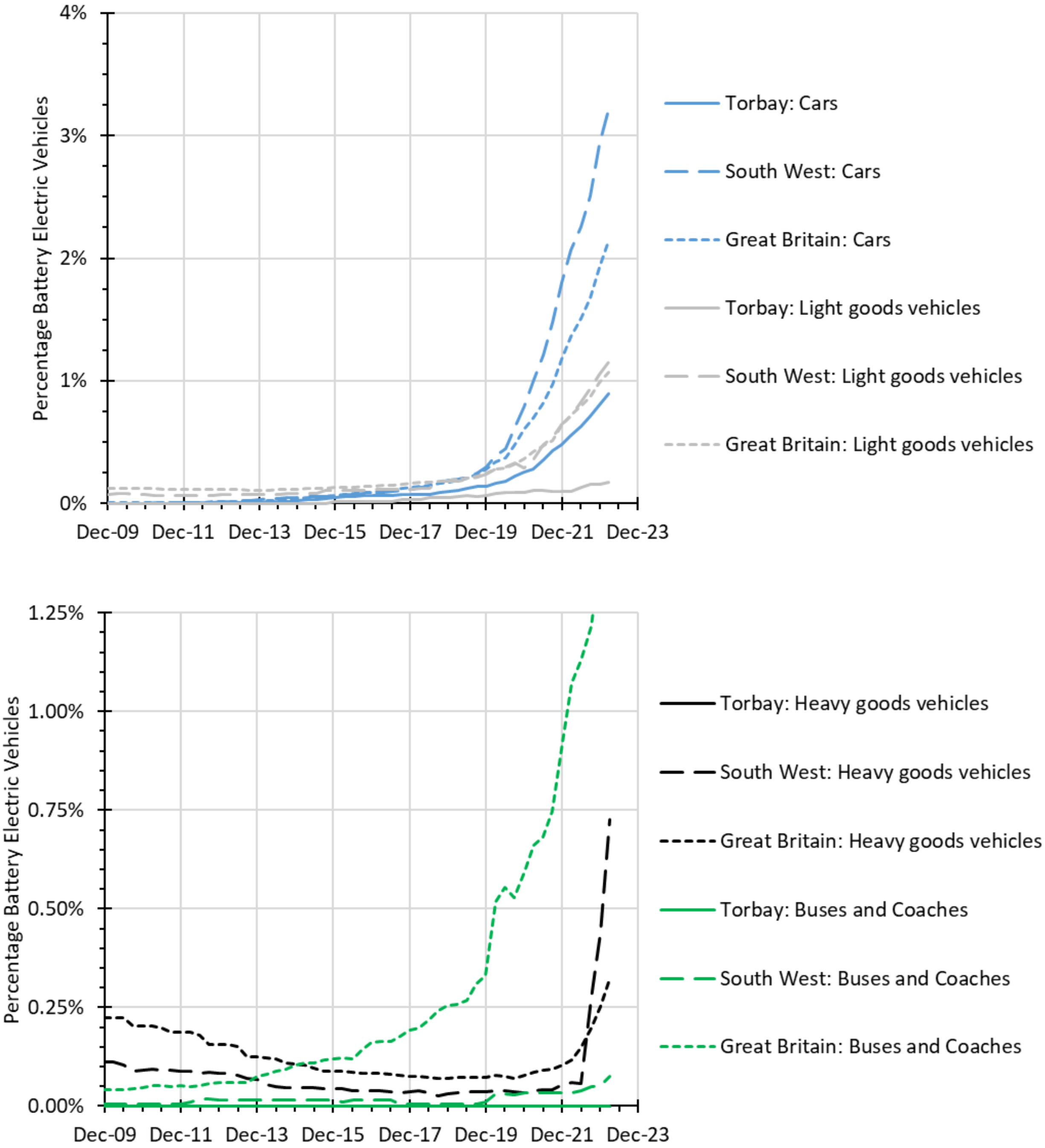


Figure 20: Battery electric vehicles in Torbay, the south west and Great Britain, 2010 to 2023 [21,22]

[xix] Considering vehicle registrations in Torbay is a consumption-based approach (as against territorial). Vehicles registered in Torbay drive outside the boundaries. The aim is for all vehicle mileage within Torbay to be undertaken in EVs, which requires all those driving in the area using vehicles registered elsewhere to also be BEVs. Measures to achieve this might include a strict clean air zone, for example. Nonetheless, BEV registrations in Torbay are a relevant indicator of progress towards eliminating fossil fuel mobility.

The rate of uptake of battery electric cars in Torbay has been approximately exponential, as shown in Figure 21.

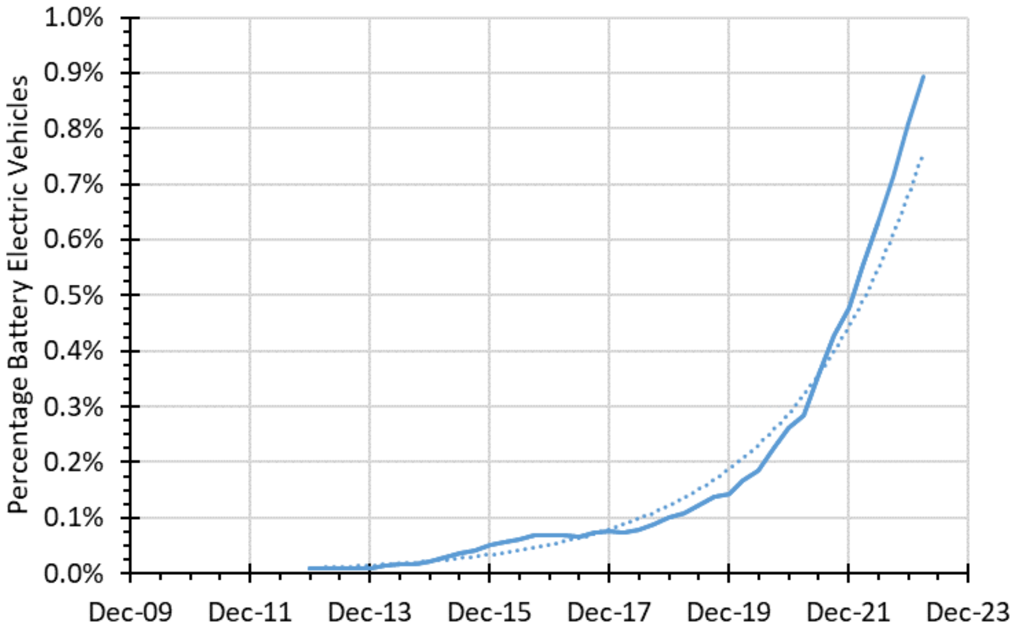


Figure 21: Exponential function fitted to battery electric car uptake in Torbay

Applying the exponential curve to future uptake of BEV cars, all cars would be battery electric by 2035 (Figure 22, Table 15).

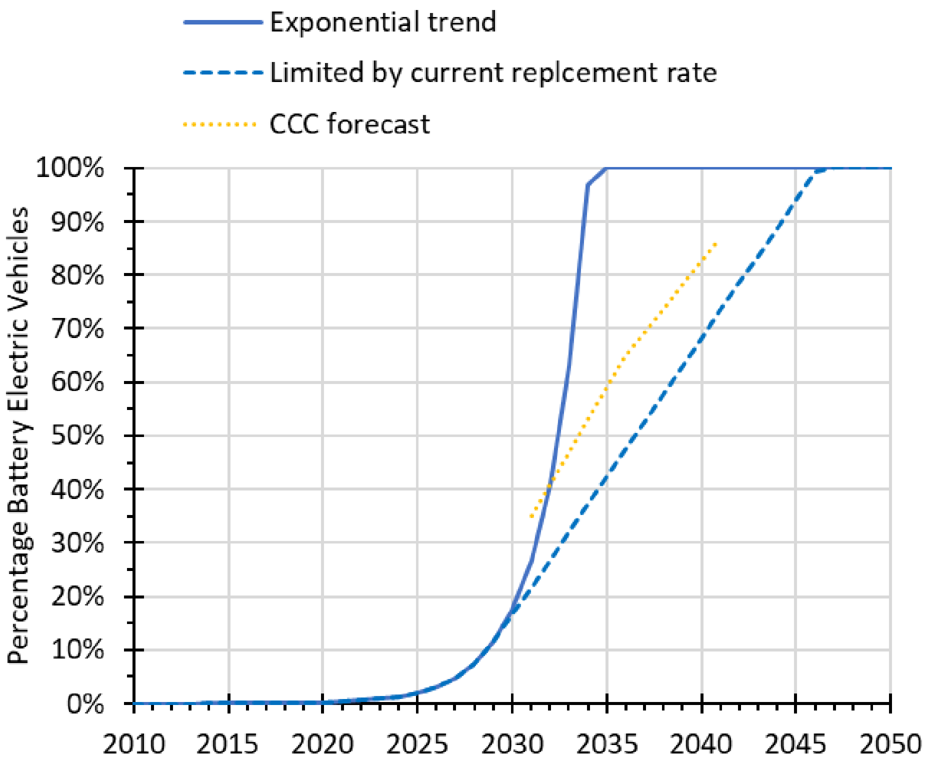


Figure 22: Projected battery electric cars in Torbay to 2050 following the historic exponential trend, the trend limited by the current fleet replacement rate, and CCC forecasts[xx]

[xx] The forecast is for the car and van fleet combined.

Table 15. Battery electric car uptake following historic exponential trajectory (shaded parts of the table are unlikely to be achievable through the normal vehicle replacement cycle - see below).

Year	BEV projection	
	Number	%
2022	428	0.6%
2023	605	0.9%
2024	894	1.3%
2025	1,373	2.0%
2026	2,109	3.1%
2027	3,240	4.8%
2028	4,983	7.4%
2029	7,654	11.3%
2030	11,758	17.4%
2031	18,061	26.7%
2032	27,777	41.0%
2033	42,668	63.0%
2034	65,543	96.8%
2035+	67,699	100.0%

In 2022, first-time registrations of cars represented 5.2% of the South West fleet[23] which, if applied to Torbay's vehicles, implies that about 3,500 new vehicles are registered annually. Cells that are shaded in Table 15 (2030 onwards) exceed this number of annual new registrations and occur if the uptake of BEVs continues to follow the historic exponential trend. The rate of fleet replacement has been higher in the past (reaching 8.8% in 2015,Figure 23). The current rate is more representative of the current uncertain economic conditions. Even the higher rate of the 6,000 new cars registered per year is exceeded from 2031 on.

The shading implies that from 2030 the number of new electric cars registered in Torbay will significantly exceed the current rate of fleet replacement. If replacement is limited to the current 5.2% per year (Figure 23), 100% uptake would not be achieved until 2047 (Figure 22). This shows the potential pitfalls of relying on accelerated uptake of measures in the latter part of the decade.

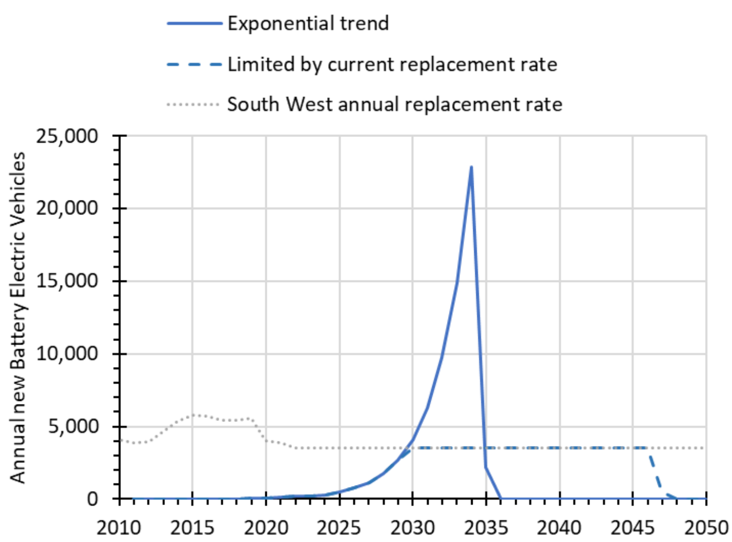


Figure 23: Projected annual additional BEV cars in Torbay to 2050 following the historic exponential trend and the trend limited by the fleet replacement rate. The fleet replacement rate has been held constant at 5.2% per annum from 2022 on.

The CCC's Sixth Carbon Budget report forecasts that BEVs will account for about 35%, 65% and 87% of cars in the years 2030, 2035 and 2040 respectively. This represents a greater uptake in 2030 than is predicted if the current trend is followed in Torbay (17% uptake), but lower levels of uptake in 2035 and 2040 (Figure 22). If uptake is limited to the current rate of fleet replacement the levels of fleet penetration forecast by the CCC will not be achieved in any of the three years. Incentives to increase the rate of fleet replacement or further accelerate the uptake of BEVs in earlier years will be required to achieve higher replacement rates. Measures could include the promotion of car clubs or additional regulation of petrol and diesel vehicles.

Recent policy announcement by central government delaying a ban on the sale of new petrol and diesel cars from 2030 to 2035 is concerning as it is likely that it will delay uptake of BEV cars.

SECTOR:	TRANSPORT/MOBILITY
CURRENT LEVEL:	605 BATTERY ELECTRIC CARS REGISTERED IN TORBAY (0.9%) (March 2023)
MONITORING TRAJECTORY:	23,700 BATTERY ELECTRIC CARS (35%) IN TORBAY IN 2030
	APPROACHING 68,000 BATTERY ELECTRIC CARS (100%) IN TORBAY IN 2050
NEXT YEAR INCREMENT:	479 EXTRA BATTERY ELECTRIC CARS REGISTERED IN 2024
DATA SOURCE:	ULEV AND VEHICLE REGISTRATION STATISTICS, DfT[21, 22, 23]
DATA AVAILABLE:	QUARTERLY

BEV light goods vehicles are available in most market segments for vehicles below 3.5 tonnes gross weight, although vehicle choice is limited. Uptake in Torbay has again lagged the regional and national average (Figure 20). Nationally, the CCC 2023 progress report to parliament[8] highlighted BEV light goods vehicle uptake as lagging behind the required level. As shown in Figure 24 the growth in BEV light goods vehicles in Torbay has been broadly linear. If this trend continues, only 0.8% of light goods vehicles will be BEVs in 2050 (Figure 25).

The annual replacement rate of light goods vehicles is higher than that of cars, reflecting more intensive average usage. The replacement rate was 6.6% in 2022, a 2% reduction from the previous year and down from a peak of 9.7% in 2016. If all new light goods vehicles are BEV from 2024 onwards, 100% of the fleet would be BEV from 2039. To match the CCC forecasts the rate of replacement can be reduced slightly from this limiting scenario, following the historic linear uptake to 2025, and replacing 5.2% of the fleet with BEVs annually thereafter. This is not implausible given that the BEV light goods vehicle model range is not as developed as the range of cars available, and the higher fleet replacement rate.

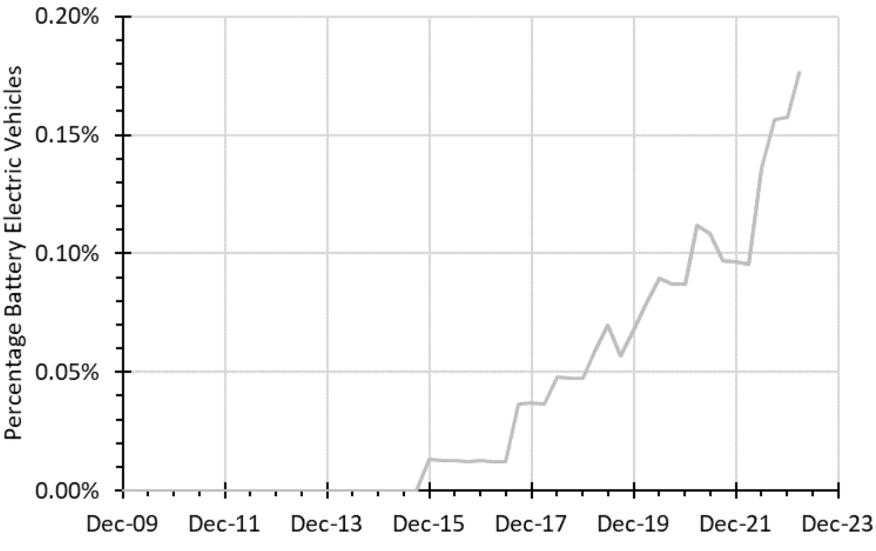


Figure 24: Battery electric light goods vehicle uptake in Torbay

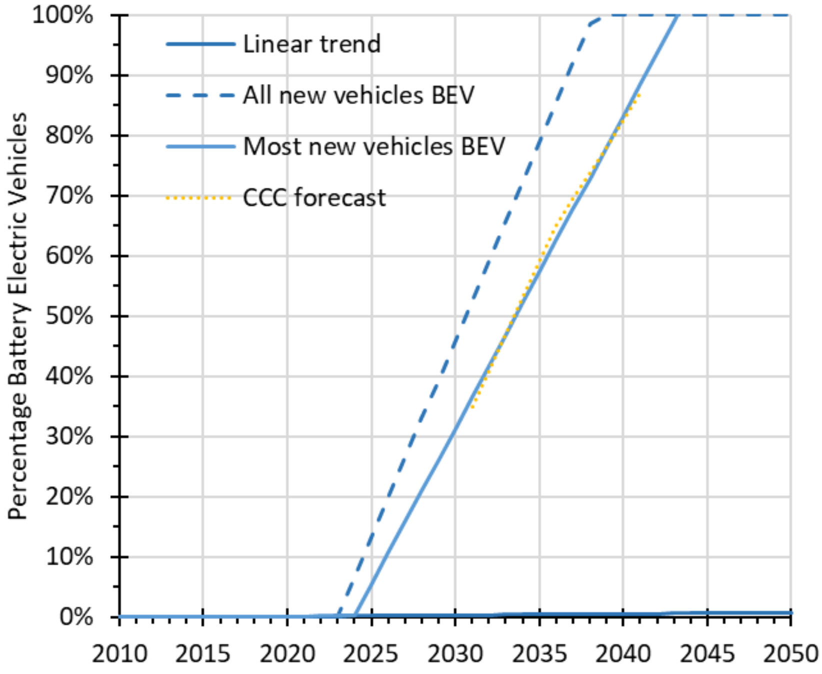


Figure 25: Projected battery electric light goods vehicles in Torbay to 2050 following the historic linear trend, limited by the current fleet replacement rate, or to match CCC forecasts [xx]

SECTOR:	TRANSPORT/MOBILITY
CURRENT LEVEL:	17 BATTERY ELECTRIC LIGHT GOODS VEHICLES REGISTERED IN TORBAY (0.2%) (March 2023)
MONITORING TRAJECTORY:	3,370 BATTERY ELECTRIC LIGHT GOODS VEHICLES (35%) IN TORBAY IN 2030
	APPROACHING 9, 640 BATTERY ELECTRIC LIGHT GOODS VEHICLES (100%) IN TORBAY IN 2050
NEXT YEAR INCREMENT:	4 EXTRA BATTERY ELECTRIC LIGHT GOODS VEHICLES REGISTERED IN 2024
DATA SOURCE:	ULEV AND VEHICLE REGISTRATION STATISTICS, DfT[21, 22, 23]
DATA AVAILABLE:	QUARTERLY

Larger commercial vehicles will need to be zero emissions along with cars and light goods vehicles. Whilst the analysis above considers the vehicle fleet as a whole, the strategy for the replacement of large vehicles (which are operated commercially) is likely to differ significantly from the replacement of cars (and to an extent light goods vehicles) which are largely privately owned. In March 2023 there were 442 HGVs and 220 buses and coaches registered in Torbay. Again, these only represent a fraction of the vehicles driving on Torbay's roads. Although relatively few in number, larger vehicles have greater emissions per vehicle, so transitioning them away from fossil fuels is important. Zero emission vehicle technology is less established for heavy vehicles and limited to demonstration trials.

Vehicle registration data indicates that no such vehicles are registered in Torbay, although large operators often register vehicles away from the areas in which they operate. A small number of vehicles are registered within the south west region (0.7% of total HGV registrations and 0.07% of all bus and coach registrations). It is not currently practical to formulate an evidence based trajectory for larger commercial vehicles.

SECTOR: TRANSPORT/MOBILITY

CURRENT LEVEL: NEAR ZERO NON-FOSSIL LARGER COMMERCIAL VEHICLES

MONITORING TRAJECTORY: SOME ZERO CARBON LARGER COMMERCIAL VEHICLES AND HGVS BY 2035

100% ZERO CARBON LARGER COMMERCIAL VEHICLES AND HGVS BY 2050

NEXT YEAR INCREMENT: TO BE DETERMINED

DATA SOURCE: ULEV AND VEHICLE REGISTRATION STATISTICS, DfT[21, 22, 23]

DATA AVAILABLE: QUARTERLY

3.4.2 Vehicle charging points

The Sixth Carbon Budget provides estimates of the public vehicle charging point infrastructure required nationally in 2035. These figures have been prorated by the registered number of vehicles to estimate the number of charge points required in Torbay (Table 16).

Table 16. The estimated number of public vehicle charging points required in Torbay in 2035.

Charger size	Quantity
3 to 7 kW	134
22 kW	279
50 kW	397
150+ kW	13
Total	**823**

In July 2023 Torbay had 30 charging points[xxi], an increase of four since July 2022.[24]. To achieve 823 charging points by 2035, assuming an even number of installations over 12 years, will require the addition of 69 new charging points per year. This is approximately 17 times the installation rate achieved over the past year.

SECTOR: TRANSPORT/MOBILITY

CURRENT LEVEL (2023): 30 CHARGING POINTS

MONITORING TRAJECTORY: 823 PUBLIC ELECTRIC VEHICLE PUBLIC CHARGING POINTS IN 2035

NEXT YEAR INCREMENT: 69 ADDITIONAL PUBLIC CHARGING POINTS

DATA SOURCE: PUBLICLY AVAILABLE EV CHARGING DEVICES BY LA, DfT[24]

DATA AVAILABLE: QUARTERLY

3.4.3 Walking and cycling

Figure 26 shows cycling activity on Torbay's major roads. Some of these routes have on-road or off-road cycle paths. Count data are also available for a small number of minor roads, but distance data are not publicly available and the count locations generally change from year to year. Activity on major roads is therefore assumed as a proxy for cycling activity as a whole. Growth has been sporadic, with large year-on-year increases in some years, and to a lesser extent year-on-year decline in others. Calculating a three-year rolling average from historic data clarifies the general trend. This averaged data shows increases from 2005 to 2011 followed by a gradual decline to 2015. Since 2015 there was a year-on-year increase to 2020, with a subsequent year-on-year decline. The 2020 peak may be attributable to Covid-19

[xxi] The government data are sourced from Zap-map and include some charging points that are not publicly accessible (e.g. at hotels and leisure facilities). Work for other local authorities has indicated that a significant number of public charging points may not be counted.

travel restrictions. Cycling has now declined to below pre-pandemic levels, which is concerning. Increased homeworking post-pandemic may be responsible, in which case journeys would be avoided rather than switched away from active travel modes. The average increase in annual cycle kilometres for the years 2015 to 2019 is 110,620 km per annum, or 9% of the 2015 value.

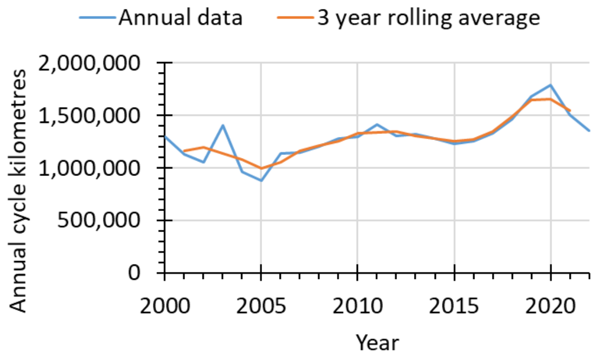
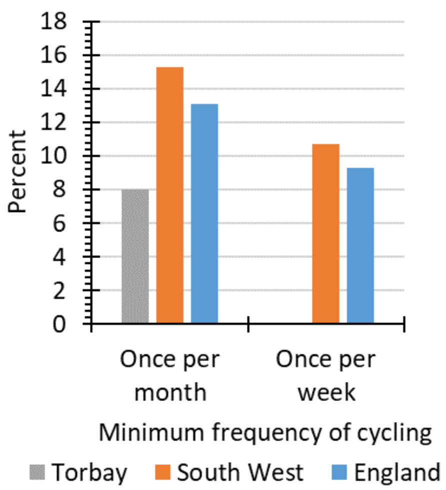
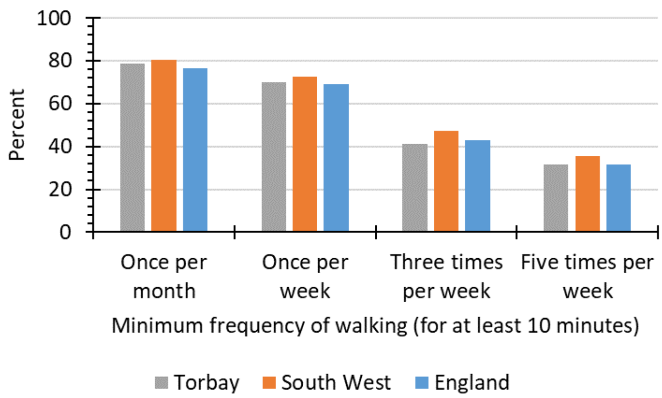


Figure 26: Cycling count in Torbay based on selected count locations on major roads and link lengths [20].

The DfT publishes statistics on walking and cycling based on the National Travel Survey and the Active Lives Survey[25]. These include the proportion of adults who do any walking or cycling, for any purpose, by frequency and local authority. Figure 27 shows the 2022 statistics for Torbay compared to the South West and England.



(a) Cycling



(b) Walking

Figure 27: The percentage of adults who did any walking or cycling, for any purpose in 2022 [25]

The figures suggest that people in Torbay cycle significantly less frequently than the regional or national average. This is surprising for an urban area; in Exeter, for example, cycling is more prevalent than the regional or national average. Torbay has relatively few off-road cycle lanes compared to Exeter which has very popular off-road leisure routes along the canal and estuary. Torbay's hilly geography may be part of the explanation for lower cycling rates; e-bikes may help overcome this. Year-on-year the percentage of people cycling at least once per month increased by 2.2 percentage points, a significant increase. Data on people cycling at least once per week is not available for 2022 for Torbay due to an insufficient sample size. Data on more frequent cycling (at least 3 or five times per week) are absent from the 2022 dataset for the same reason.

Patterns for walking in Torbay are similar to the regional and national average. Year-on-year the number of people walking once per week or less has remained similar, but the number of people walking at least three times per week has reduced significantly (by 8.3 percentage points for at least three times per week and by 4.6 percentage points for at least five times per week). This is likely attributable to the legacy impacts of the Covid-19 pandemic being greater in 2021.

In the Sixth Carbon Budget the CCC assumes that 5-7% of car journeys could be shifted to walking and cycling (including e-bikes) by 2030, rising to 9-14% by 2050. Urban areas such as Torbay should exceed this national figure. England's Cycling and Walking Investment Strategy[26] aims to double cycling from 2013 to 2025. The Government's recent transport decarbonisation plan[27] identifies that 43% of urban journeys are under 2 miles and aims for 50% of all journeys in towns and cities to be cycled or walked by 2050 (assumed here to be 22% of journeys split evenly between cycling and walking, a trajectory of 11% for each).

Figure 28 takes the historic cycling counts from Figure 26 and projects these to 2050.

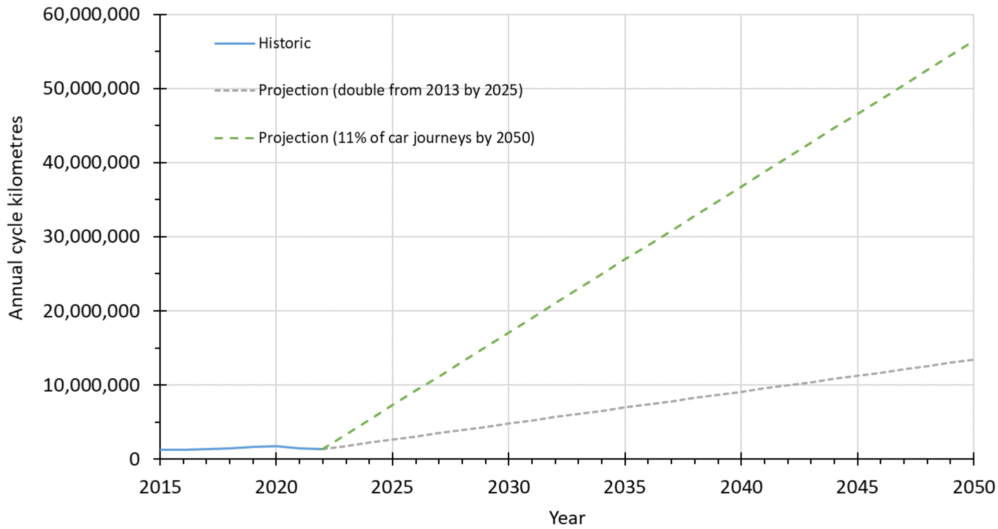


Figure 28: Cycling count projections for Torbay

Doubling by 2025 would (if linearly extrapolated) lead to 13.4 million kilometres cycled on major roads by 2050. This would therefore appear to fall short of the 57 million required for cycling 11% of all car and taxi journeys (although the cycling projection does exclude unquantified cycling activity on minor roads). To meet the 11% trajectory by 2050 (assuming linear growth) requires an annual increase of 2.0 million kilometres (146% of 2022 cycling recorded by traffic counters on major routes).

The CCC 2023 progress report to parliament[8] highlights significant cuts to active travel budgets, with the £470 million unallocated from the £700 million budget reduced to £100 million.

SECTOR: TRANSPORT/MOBILITY

CURRENT LEVEL: 1.35 MILLION km CYCLED (ON MAJOR ROADS) (2022)

MONITORING TRAJECTORY: 27 MILLION km CYCLED BY 2050

57 MILLION km CYCLED BY 2050

NEXT YEAR INCREMENT: 1.97 ADDITIONAL MILLION km CYCLED IN 2023

DATA SOURCE: DfT LOCAL AUTHORITY ROAD TRAFFIC STATS (MAJOR ROADS)[25]

DATA AVAILABLE: ANNUALLY

To meet the overall walking and cycling trajectory, the amount of walking activity would need to be similar to cycling. A source of data has not yet been identified to monitor this trajectory.

SECTOR: TRANSPORT/MOBILITY

CURRENT LEVEL: UNKNOWN

MONITORING TRAJECTORY: UNKNOWN

NEXT YEAR INCREMENT: 1.97 ADDITIONAL MILLION km WALKED IN 2023

DATA SOURCE: UNKNOWN

DATA AVAILABLE: UNKNOWN

3.5 Waste

The Sixth Carbon Budget suggests that 80% of the UK's CO_2 abatement in the waste sector to 2035 is from waste prevention, increased recycling and banning biodegradable waste from landfill. By 2050 30% of the abatement comes from fitting carbon capture and storage to energy from waste (EfW) plants. The additional 10% of emissions reductions comes from capturing more methane at landfills, reducing wastewater treatment emissions and improving composting. The CCC foresee a range of measures including reducing waste generation by 33% by 2037, increasing the UK wide recycling rate to 70% by 2030 and fitting carbon capture and storage (CCS) to all EfW plants by 2050.

It is important to recognise that locally Torbay Council only has information on, and collection and disposal responsibilities for, domestic waste. Local authorities have little knowledge of or influence over commercial waste in their locality. It is important for Torbay to obtain reliable and up to date information on volume and composition of non-domestic waste streams to enable assessment of emissions from non –domestic waste.

SECTOR:	WASTE
CURRENT LEVEL:	UNKNOWN NON-DOMESTIC WASTE ARISINGS AND COMPOSITION
MONITORING TRAJECTORY:	TO BE DETERMINED
NEXT YEAR INCREMENT:	OBTAIN DATA ON NON-DOMESTIC WASTE IN TORBAY
DATA SOURCE:	TO BE DETERMINED
DATA AVAILABLE:	TO BE DETERMINED

This remainder of this section therefore considers collection and disposal of domestic waste only.

Torbay's waste emissions (18.8 kt CO_2e) are about 4% of the total. Figure 29 shows historic emissions compared to the national trajectory and projections following the CCC's Balance Pathway (the national trajectory shows national emissions scaled to match Torbay's emissions in 2005). Poor data quality in the waste sector makes it difficult to comment on the historic emissions trend with any degree of confidence. Torbay's waste is exported for disposal at the Devonport EfW plant (ERF) and this means that Torbay's waste emissions are considerably lower that neighbouring authorities as there are no waste disposal sites in Torbay.

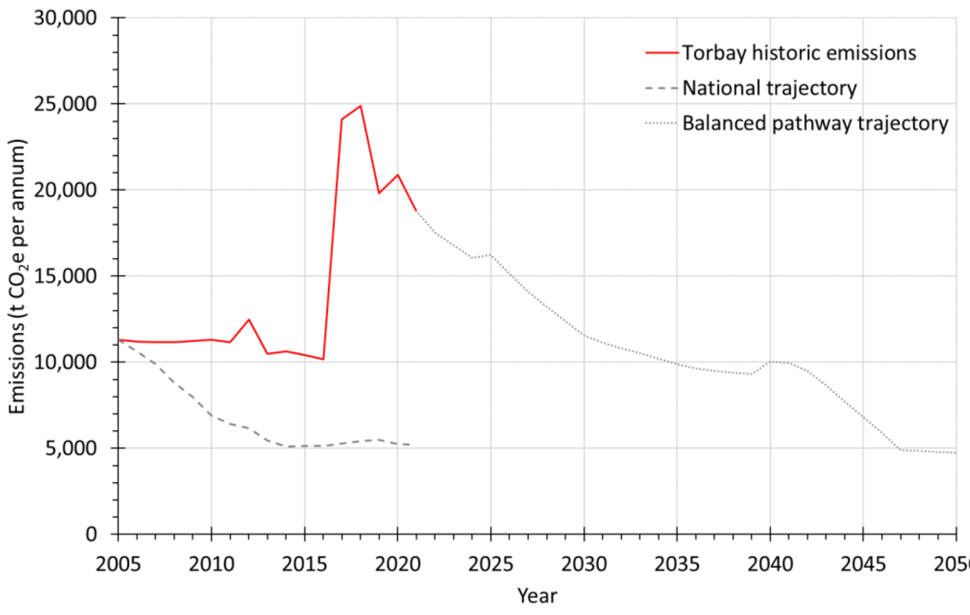


Figure 29: Historic waste emissions for Torbay compared to the national picture, with a projected decline following the CCC balanced pathway trajectory to net zero overall emissions by 2050

3.5.1 Waste collection and recycling

The Devon Authorities Strategic Waste Committee provides data on waste in Devon and Torbay[28]. The data shows that the amount of domestic waste generated by Torbay's residents is marginally lower than that in the rest of Devon (see Figure 30).

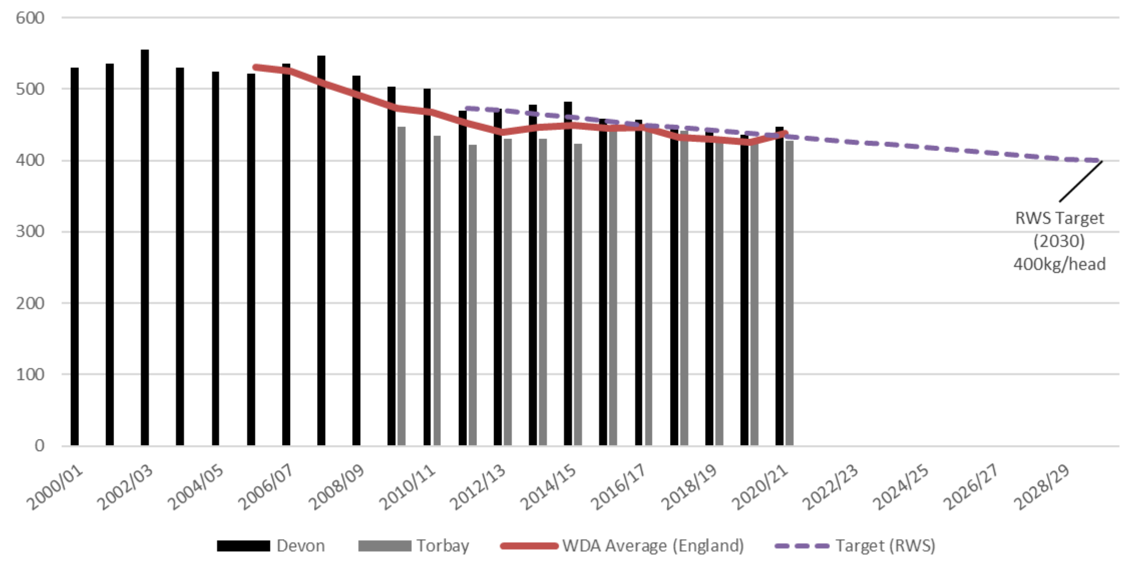


Figure 30: Domestic waste per head in Devon and Torbay (courtesy of DCC)

However, Figure 31 shows that recycling rates are significantly lower in Torbay than Devon as a whole. This is partly explained by the more urban nature of Torbay compared to Devon.

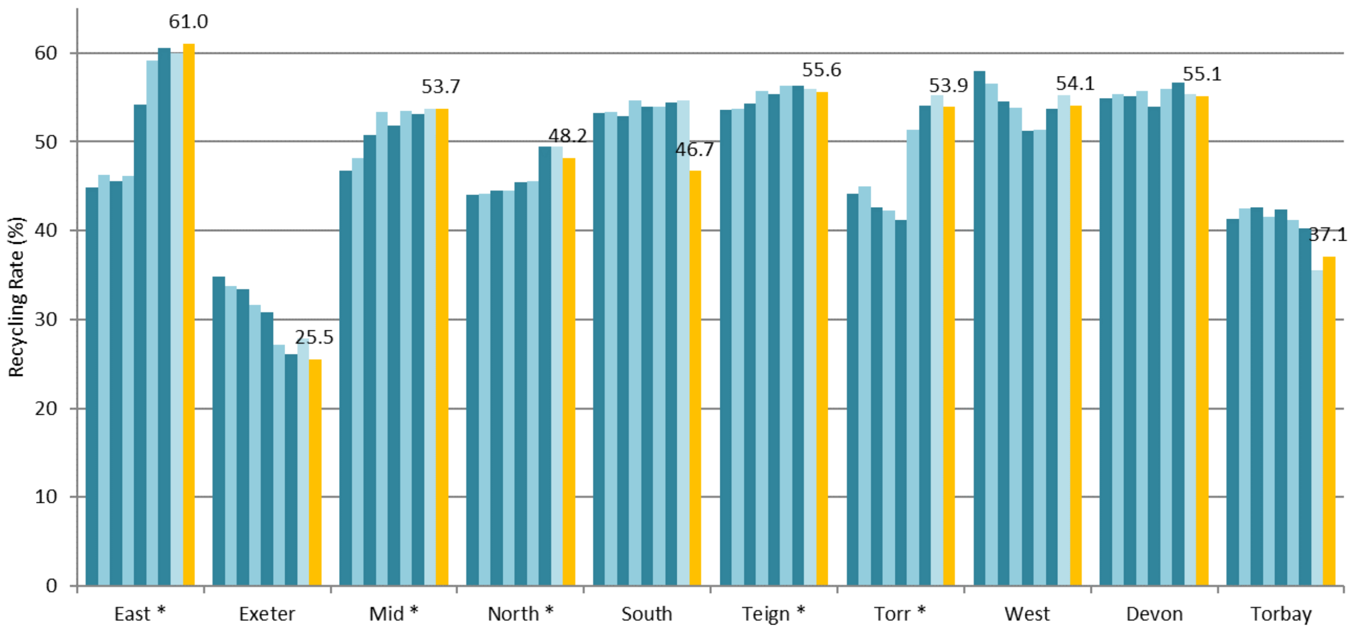


Figure 31: Domestic waste recycling rates in Devon and Torbay since 2013/14 (courtesy of DCC)

Figure 32 illustrates the 4.5% annual increase in recycling rate that Torbay needs to achieve the CCC's recommended 70% recycling rate by 2030.

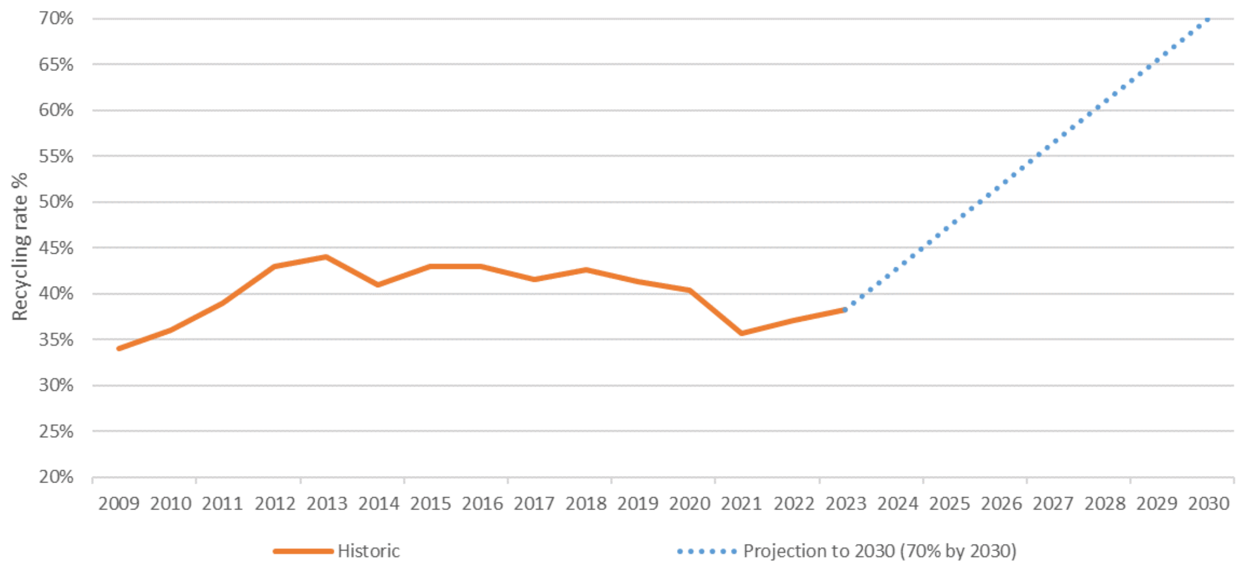


Figure 32: Domestic waste recycling projection for Torbay to meet 70% in 2030

Waste prevention is a vital component of emissions reduction from the sector. In its 2050 trajectory to net zero the CCC aims for a 33% reduction in waste arisings by 2037.

Figure 33 shows the combination of achieving a 70% recycling rate in 2030 and a 33% reduction in waste arisings in 2037.

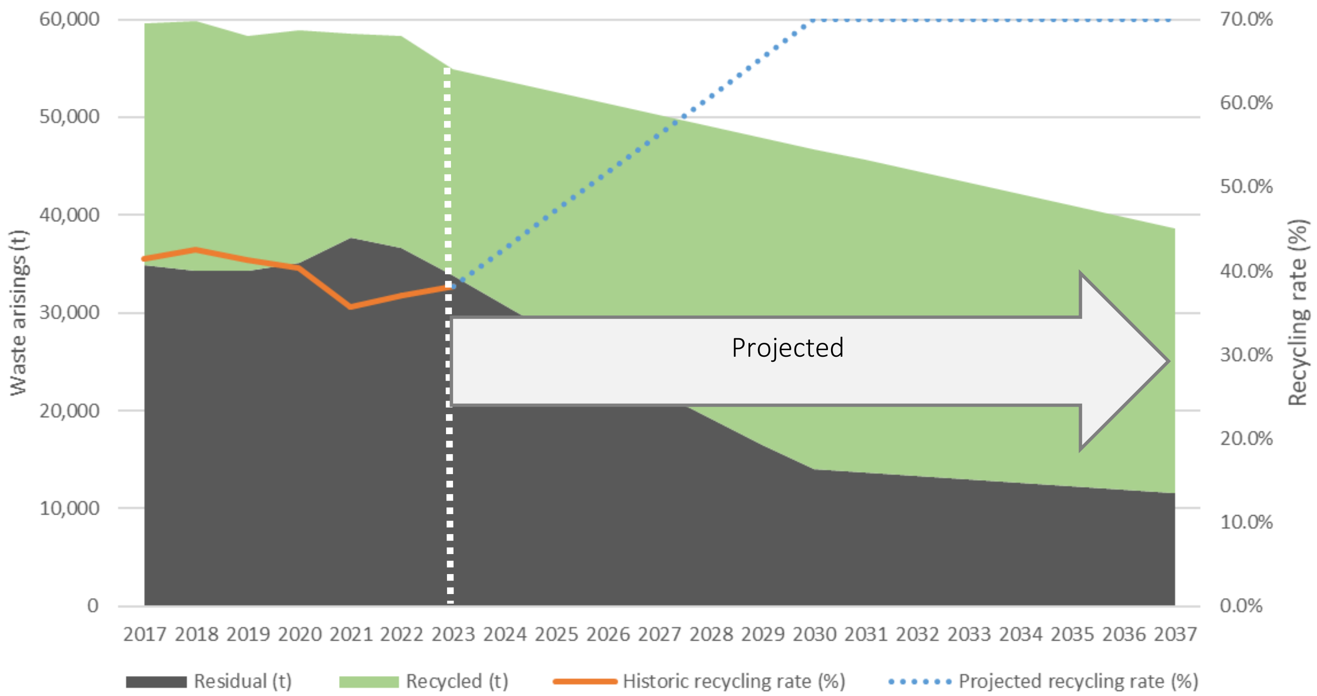


Figure 33: Historic and projected domestic waste arisings and recycling rates

This shows that while total waste arisings would fall 33% from 54,878 t in 2022/23 to 38,660 t in 2036/37, residual waste would fall from 33,888 t in 2022/23 to 11,598 t in 2036/37: a 66% reduction. These projections lead to the following waste collection and recycling monitoring trajectories.

SECTOR:	WASTE
CURRENT LEVEL:	54.9 kt TOTAL WASTE ARISINGS IN 2022/23
MONITORING TRAJECTORY:	41.0 kt TOTAL WASTE ARISINGS IN 2034/35
	38.7 kt TOTAL WASTE ARISINGS IN 2036/37
NEXT YEAR INCREMENT:	1.2 kt TOTAL WASTE ARISNG REDUCTION
DATA SOURCE:	DCC[28]
DATA AVAILABLE:	ANNUALLY

SECTOR:	WASTE
CURRENT LEVEL:	38.2% RECYCLING RATE IN 2022/23
MONITORING TRAJECTORY:	70% RECYCLING RATE IN 2029/30 AND THEREAFTER
NEXT YEAR INCREMENT:	4.5% RECYCLING RATE INCREASE
DATA SOURCE:	DCC[28]
DATA AVAILABLE:	ANNUALLY

3.5.2 Waste disposal

Torbay disposed of its residual waste in landfills up to 2016. The Council now sends its residual waste for disposal at the Devonport ERF. The plant uses waste to generate electricity for the national grid and provides a limited amount of heat to the adjacent dockyard. Although emissions from the plant occur in Plymouth, Torbay can play its part in reducing EfW emission by:

- Increasing plastic recycling rates in Torbay to reduce fossil inputs to the ERF. Reducing plastics is an important factor in cutting EfW plant emissions.

- Encouraging the EfW plant operator to increase the export of heat. Heat export increases the efficiency of energy recovery from the waste burnt and reduces CO_2 emissions: the more heat used, the lower the emissions.

- Encouraging the installation of carbon capture and storage. The Sixth Carbon Budget requires the installation of CCS on all UK energy from waste plants between 2040 and 2045.

3.6 F-gases

Fluorinated gasses (F-gases) account for a small percentage of UK GHG emissions (3% in 2018) and, although released in small volumes, they can have a global warming potential (GWP) up to 23,000 times greater than CO_2. The four F-gases included in the UK emissions inventory are hydrofluorocarbons (HFCs) (accounting for 94% of GHG emissions in 2017), sulphur hexafluoride (SF_6) (4% in 2017), perfluorocarbons (PFCs) (2% in 2017) and nitrogen trifluoride (NF_3) (less than 1% in 2017).

The largest source of emissions of HFCs (77%) is the refrigeration, air conditioning and heat pump sector (RACHP). Emission release is due to refrigerant leakage from appliances during use and at disposal. Current regulation outlaws refrigerants of various types, mandates inspection regimes and testing and sets a cap on the amount of HFCs that can go on the market. Cuts to the cap every 3 years give a 79% reduction from 2015 levels in 2030. Beyond this, the CCC identifies F gas replacement with lower GWP F gases as the main emission reduction measure. The Balanced Pathway reduces F gas emissions by 81% in 2050. Achieving this 81% reduction in a linear decrease by 2030 requires a reduction of 9% of current emissions each year, every year.

The National Atmospheric Emissions Inventory (NAEI)[29] provides estimates of HFC emissions. NAEI emissions are apportioned to Torbay based on non-domestic electricity consumption[30]. Given the range of uses (RACHP, fire-fighting, blowing agents/propellants, electrical switchgear, metal production, etc), local usage will vary and the apportioned value is therefore subject to significant uncertainty.

Figure 34 shows historic F-gas emission estimated for Torbay compared to the national trend. Although the estimated 18.9 kt CO_2e emissions from F-gases in Torbay are a minor part of Torbay's footprint (4%), under a net-zero scenario, the decarbonisation of other sectors means that, left unchanged, the F-gas contribution will play an increasing a role. In addition, the future deployment of tens of thousands of heat pumps across Torbay has the potential to increase F gas emissions. Ensuring that the release of F gases are as near to zero as practical will be important in ensuring that Torbay achieves the emissions reductions that the deployment of heat pumps should secure. The projected decline under the CCC's Balanced Pathway is shown in Figure 34.

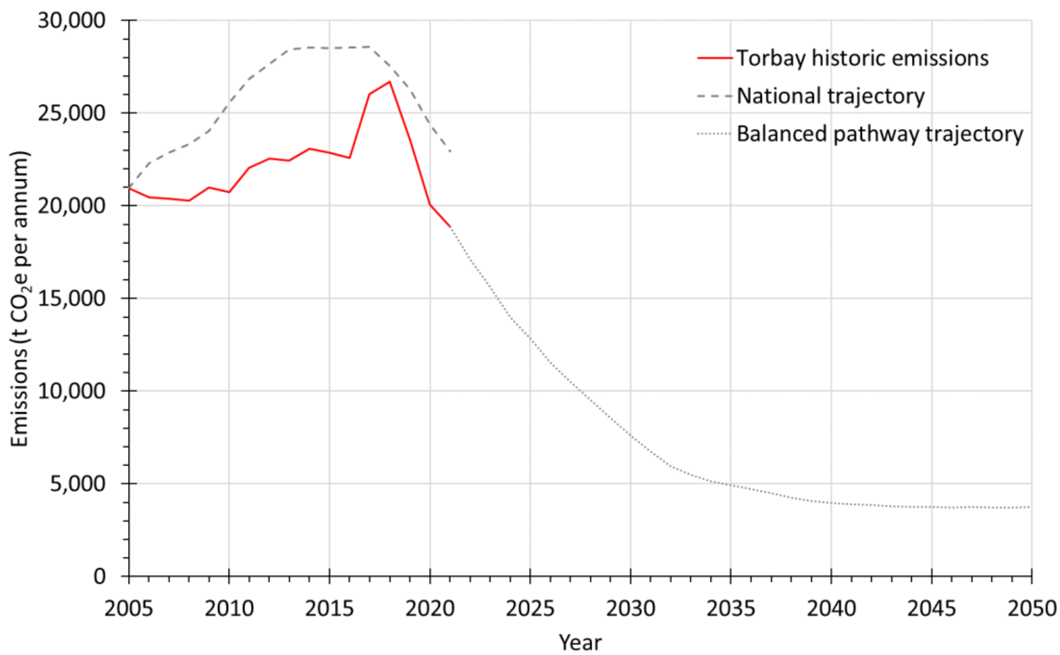


Figure 34: Historic F-gas emissions for Torbay compared to the national picture, with a projected decline following the CCC balanced pathway trajectory to net zero overall emissions by 2050

Table 17 shows the projected F-gas emission reduction in Torbay's implied by the CCC's Balanced Pathway over the 5 years from 2022 to 2026.

Table 17: Projected reduction in F-gas emissions in Torbay from 2022 to 2026

Year	F-gas emissions $ktCO_2e$
2022	1,757
2023	1,506
2024	1,603
2025	1,167
2026	1,274

Emissions reduction in the F-gas sector is driven by national and international legislation and there is therefore relatively limited scope for Torbay to accelerate emission reduction from F-gases. Local trading standards bodies enforce air conditioning inspections (which are required for any system with a rated output of over 12 kW). More proactive enforcement of these air conditioning inspections may be a route to lower emissions.

Display Energy Certificates (DEC) and Energy Performance Certificates (EPC)[xxii] record air conditioning equipment with capacity of over 12 kW and provide estimate of systems with lower capacities. DECs and EPCs suggest a total capacity estimate of 2,968 kW[xxiii]. Installations with capacity above 12 kW in DECs and EPCs are in 19 organisations/buildings as shown in Table 18 and total 2,047 kW or 70% of the estimated total.

More detailed information on each system can be found in individual building air conditioning inspection certificates and reports.

Table 18. Air conditioning capacity in Torbay listed in DECs and EPCs

Source	Organisation	Location	System rating kW	%
DED	Spires College	Westlands Lane	736	36%
EPC	Electronics & Photonics Innovation Centre	Waddeton Close	426	21%
DEC	Pembroke House Surgery	266-276 Torquay Road	253	12%
DEC	Cotswold House	Warren Road	181	9%
EPC	South Devon College	Long Road	97	5%
DEC	South Devon Magistrates Court	Union Street	39	2%
EPC	Aspen Way Depot	Aspen Way	39	2%
EPC		Unit 3, Nicholson Road	38	2%
EPC		288 Torquay Road	30	1%
EPC		8 Strand	28	1%
EPC		8 Victoria Street	28	1%
DEC	Homelands Primary School	Westhill Road	25	1%
EPC		24 Victoria Street	20	1%
EPC	Brixham Linc Centre	Brixham Enterprise Est, Rea Barn Rd	20	1%
EPC		8 Tor Hill House, Union Street	19	1%
DEC	Barton Surgery	Lymington House, Barton Hill Way	18	1%
EPC	Jodes	Marble Court, Lymington Rd	18	1%
EPC		60 Union Street	17	1%
EPC	Jackz Corner Club	Parkham Road	15	1%
		Total	**2,047**	**100.0%**

[xxii] For references see Buildings section
[xxiii] Likely to be an upper estimate as there will be some duplication between DECs and EPC below 12 kW

Identifying these organisations/buildings enables a targeted approach to a year on year reduction in HFC leakage rates by encouraging a reduction in the requirements for air conditioning through improved building performance, minimising refrigerant leakage from existing equipment through good maintenance and encouraging the use of very low GWP refrigerants when replacing refrigerant or installing new equipment. However, it should be remembered that DEC and EPC data suggests that there are currently some 500 air conditioning units across Torbay with capacity less than 12 kW.

With most F-gas emissions coming from RACHP equipment the number, size and refrigerant type of units probably represents the best proxy measure for local emissions. However, air conditioning certification is only required every five years, giving a long time lag. In addition, reducing these measures locally will not necessarily lead to a reduction in the apportioned NAEI emissions if non-domestic electricity consumption remains the basis for apportionment.

SECTOR:	F-GASES
CURRENT LEVEL:	18.9 THOUSAND TONNES CO_2 EMISSIONS (2020)
MONITORING TRAJECTORY:	4.9 THOUSAND TONNES CO_2 EMISSIONS BY 2035
	NEAR ZERO CO_2 EMISSIONS BY 2050
NEXT YEAR INCREMENT:	1.5 THOUSAND TONNES CO_2 EMISSIONS REDUCTION
DATA SOURCE:	DESNZ LOCAL AUTHORITY CO_2 STATISTICS[4]
DATA AVAILABLE:	ANNUALLY

The identification of more specific measures for the F-gas sector is required.

4 Conclusions

Greenhouse gas emissions in Torbay are on a downward trajectory. Emissions of 687 kt CO_2e in 2010 declined by 32% to 466 kt CO_2e in 2021. Changes to date are due largely to the reduction in the carbon intensity of the national electricity grid, which over the period reduced the power sector's GHG emission by 69%. As a result, the sector has been responsible for 78% of the emission reduction in Torbay from 2010. In other key sectors improving efficiency of vehicles and, more recently, the impact of Covid 19 led to a fall in transport emissions (21% between 2010 and 2021) but it is buildings emissions, which are responsible for the largest portion of Torbay's emission (39%), where progress is most important that has been limited to an 8% reduction.

Projections using the CCC's Balanced Pathway illustrate the scale of emission reduction required over the coming years for Torbay to set a trajectory to a 78% reduction in GHG emissions in 2035 and Net Zero in 2050. The trajectory suggests a reduction in Torbay's total GHG emissions of 12 $ktCO_2e$ in 2023 (2.5% of 2021) increasing to 33 $ktCO_2e$ in 2025 (7% of 2021) with an average of 23 $ktCO_2e$ (5% of 2021) for each of the following ten years to 2035. These emissions reductions are a serious challenge that should not continue to rely on the decarbonisation of the national electricity grid.

The monitoring trajectories show the scale of the changes needed to meet some of the 2035 and 2050 projections set out in the Sixth Carbon Budget. These include:

- Over 555 PV installations each year every year to 2035 and 2050, a rate similar to the peak in 2011 and more than double the 263 installations in 2022.
- Installing loft insulation in over 22,000 homes by 2035 and 30,000 homes by 2050 with 1,300 in 2023 increasing to 4,000 in 2027.
- Insulating the walls of 13,000 homes by 2035 and 22,000 homes by 2050 with 900 in 2023 increasing to 2,600 in 2027.
- Putting heat pumps in 16,000 homes by 2035 and 42,000 homes by 2050, with installation rates at 1,500 each year or more for 20 years from 2028. There are currently 286 heat pumps in Torbay's homes.
- Connecting an extra 4,200 homes to heat networks by 2035 and 9,000 homes to heat networks by 2050; 326 each year.
- Improving the energy efficiency of 336 non-domestic buildings every year to 2035 and 2050 and switching 112 every year to low carbon heating.
- Limiting growth in driving in Torbay to a maximum of 4% for all motor vehicles and 2.3% for cars and taxis to 2035 (from a 2019 base).
- Continuing the exponential growth in electric vehicle ownership (aiming for 479 more fully electric cars in 2024) and installing an additional 69 charging points each year to 2035.
- Increasing cycling rates by 2 million kilometres annually (1.5 times the current total level) with matching increases in walking.
- Achieving a 4.5% annual increase in recycling rates each year, every year to 2030 and a 1.2 kt annual reduction in household waste generation each year, every year to 2037.

All these trajectories are challenging with the majority needing to overcome significant behavioural, funding and other barriers.

Some specific trajectories have yet to be determined (e.g. commercial and HGV decarbonisation) and it has not been possible to identify data sources or specific proxy measures for the industry and f-gas sectors due to a lack of data sources. The monitoring process needs to identify local actions that can address these shortcomings.

Appendix A. Breakdown of Torbay's 2021 GHG emissions

Sub-sector	t CO_2e	Sector
Residential Electricity	47,242	Power
Residential Fuel	128,307	Buildings
Commercial Electricity	16,187	Power
Commercial Fuel	10,533	Buildings
Public Administration Electricity	10,797	Power
Public Administration Fuel	44,992	Buildings
Industry Electricity	11,882	Power
Industry Fuel	19,137	Industry
Large Industry	48	Industry
Industrial Processes	0	Industry
Industry Product Use	18,861	F-Gases
Agriculture Electricity	1,304	Power
Agriculture Fuel	1,923	Agriculture
Agriculture Livestock	5,521	Agriculture
Agriculture Arable	966	Agriculture
Land Use and Land Use Change	-180	Land use
Road Transport (exc. Electricity)	129,533	Transport
Rail Transport (exc. Electricity)	651	Transport
Solid Waste Disposal	17,545	Waste
Biological Waste Treatment	0	Waste
Waste Incineration and Burning	0	Waste
Wastewater Treatment	1,244	Waste
TOTAL	**466,494**	

Appendix B. Updated emissions compared to 2005, 2008 and 2016 baselines

Table 19. Changes achieved from 2005, 2008 and 2016 baselines in t CO_2e. Negative values indicate a reduction

Sector	Change achieved (t CO_2e)		
	2005 to 2021	2008 to 2021	2016 to 2021
Power	-228,400	-204,636	-45,573
Buildings	-46,138	-21,067	15,799
Industry	-905	335	-1,892
Transport	-46,835	-43,860	-23,903
Waste	7,488	7,613	8,600
F-gases	-2,099	-1,408	-3,733
Agriculture	-1,979	-1,706	-1,157
Land use	-1,439	-971	-19
Total	**-320,306**	**-265,701**	**-51,878**

Table 20. Changes achieved from 2005, 2008 and 2016 in percentage terms. Negative values indicate a reduction. The values in parentheses show the change achieved nationally as documented in the 2023 report to parliament[8]. Values in green meet or exceed the national reductions; those in red and in bold do not

Sector	Change achieved (%)		
	2005 to 2021	2008 to 2021	2016 to 2021
Power	-72.3% (-72.0%)	**-70.1% (-71.9%)**	**-34.3% (-38.2%)**
Buildings	-20.1% (-17.2%)	**-10.3% (-13.5%)**	**+9.4% (+2.1%)**
Industry	**-4.5% (-38.8%)**	**+1.8% (-32.1%)**	-9.0% (-3.0%)
Transport	-26.5% (-16.7%)	-25.2% (-14.3%)	-15.5% (-13.3%)
Waste	**+66.3% (-53.9%)**	**+68.1% (-41.0%)**	**+84.4% (1.2%)**
F-gases	-10.0% (+9.4%)	-6.9% (-1.7%)	**-16.5% (-19.7%)**
Agriculture	-19.0% (-6.1%)	-16.9% (-2.7%)	-12.1% (-1.1%)
Land use	-114.3% (-68.2%)	-122.8% (-35.6%)	+11.8% (+2.0%)
Total	**-40.7% (-39.6%)**	**-36.3% (-36.3%)**	**-10.0% (-15.2%)**

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