Winchester District: the DESNZ data on greenhouse gas emissions from 2005 to 2023 (published 4 July 2025)

Purpose of this report

On 4 July 2025 the government Department for Energy Security and Net Zero (DESNZ) issued the government update on greenhouse gas (GHG) emissions at local authority level for the period from 2005 to 2023 (the latest year for which data is available).. The data and how it was gathered can be found at

UK local authority and regional greenhouse gas emissions statistics, 2005 to 2023 - GOV.UK (www.gov.uk)

This paper illustrates what the DESNZ update tells us about the history and current state of greenhouse gas emissions in Winchester District, about their patterns and shape, and about the scale of the required reduction in these emissions. The paper touches on the broad implications of this. We hope it will be a reference point for further work on how Winchester District can tackle its greenhouse gas emissions.

Detail on the solutions is beyond the scope of this paper. You can email contactus@winacc.org.uk for more suggestions about specific solutions.

Some of the charts below contain considerable information in a small space, to fit into A4 size for printing. Readers on computer wishing to see clearly all the labels should zoom in on the charts (*control / mouse wheel, or view – zoom*).

Key points

For details, see the main body, below these points.

1. In 2020 total emissions reduced to 86% of the 2019 level because of lockdown during the Covid pandemic. 2023 data shows that emissions have now reduced to below their 2020 level at 97%. This confirms that emissions have resumed the slowly falling trajectory from 2005 to 2019: an average reduction of under three per cent per year.
2. Unfortunately it is nowhere near enough to hit the 2030 net zero target. Figure 13 shows examples of trajectories to reach net zero by 2030, but they

require reductions greater than the reductions that occurred during the Covid pandemic.

3. Two types of emission seem relatively untouched by attempts to reduce greenhouse gases.
    - Transport emissions remain by far the largest category of emissions in the district with 50.48%, compared with 31.82% national average. After a short post-covid rise have stabilised at their current level. It will be catastrophic if there is no sign of significant reduction soon (Figure 10).
    - Emissions from livestock show only a very gradual rate of reduction, and initiatives to accelerate their reduction would seem urgent.
4. Domestic and commercial emissions both show a steady reduction.
5. The DESNZ data shows that 'negative emissions' (carbon removal from land use) have flat-lined (see Figure 10 Land Use line). We need to accelerate negative emissions to support local active emission mitigation measures.
6. To convert methane to CO2e, the United Nations Intergovernmental Panel on Climate Change (IPCC) uses two time-frames to show how methane behaves: 20 years and 100 years. Methane's impact is three times greater in the first 20 years after it's been produced. This means that averaging it over 100 years understates its impact in the next two decades. That is why we have included an additional 20-year time frame for some charts.
7. If we use a time-frame of twenty years for converting methane to CO_2e, methane from livestock is responsible for 15% of all greenhouse gas emissions in Winchester District, making livestock the second largest DESNZ sub-category source of greenhouse gas emissions, after only motorways (see Figure 9).
8. Most energy consumed in Winchester District comes from burning fossil fuels. In 2022 energy use in Winchester District showed very little use of zero-carbon energy (about 13%) (Figure 16).
9. DESNZ gives data on territorial emissions only. The total carbon footprint in Winchester District results from both territorial emissions, and consumption emissions caused by providing goods and services from outside the UK. In 2022 consumption emissions were estimated to add 120% to territorial emissions (Figure 2 Greenhouse gas emissions associated with UK consumption 1996 to 2022).

What's new in this 2025 DESNZ data release?

In their 2025 report DESNZ made minor retrospective adjustments going back in some cases to 2005. Data used from earlier DESNZ (formerly BEIS) reports need to be revised using the DESNZ figures published in 2025.

Trends

Impact of Covid is fading

The DESNZ 100-year horizon data showed a rapid reduction in total emissions in 2020, to 86% of the 2019 level. This was because of Covid-19 lockdown, which reduced transport CO_2 emissions particularly. In 2021 there was a partial return to the 2019 level of emissions. However, in 2022 and 2023 emissions reduced, returning to the trajectory they had had up to 2019.

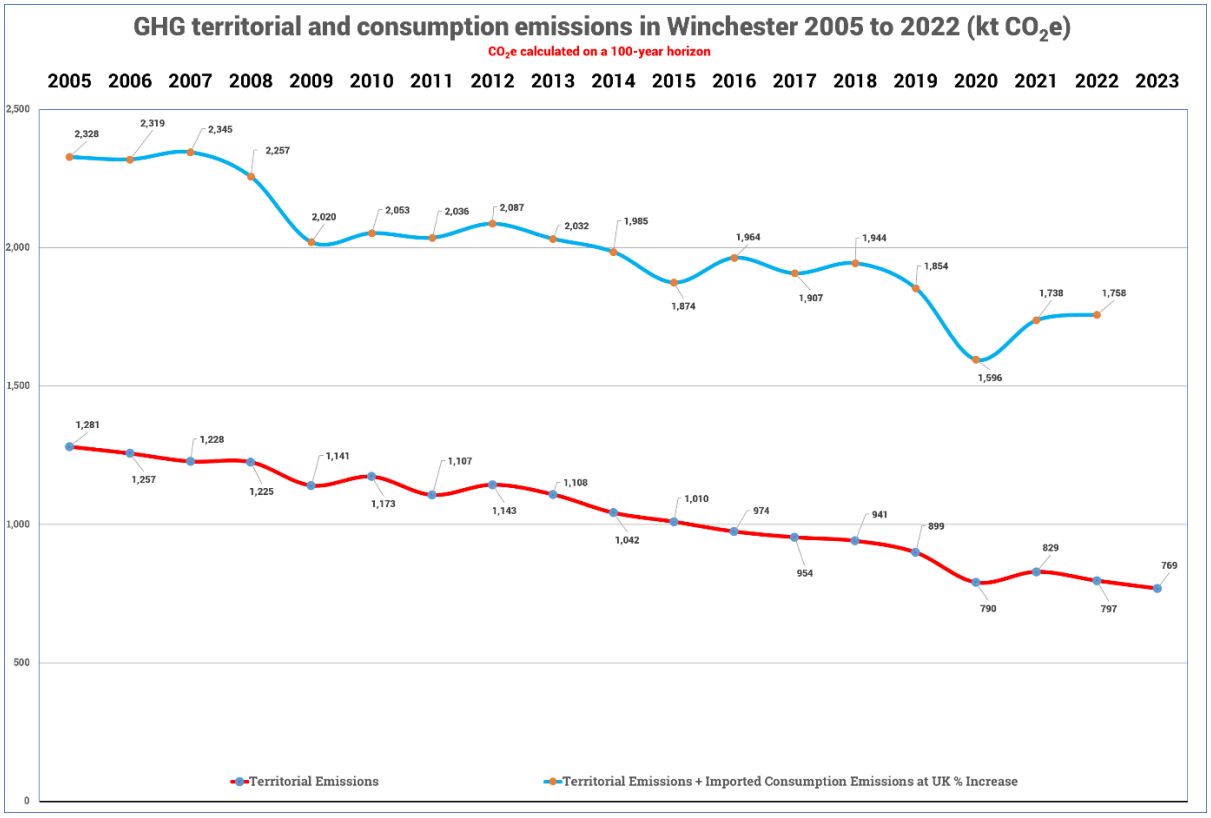


Figure 1

Trends in territorial and consumption emissions

DESNZ provides local authority data only about 'territorial' emissions; in other words emissions that occur within an authority's geographic boundaries. This is shown by the red line in Figure 1.

DESNZ does not supply data on "consumption" emissions. DEFRA makes this data available at a national level, but not at a district, or any sub-national level. DEFRA's national 'consumption emissions' are emissions that occur in the UK and abroad to supply the needs and desires of people within the UK. This includes many emissions caused outside the UK by growing and producing food, manufacturing goods, providing services, or generating wealth from

investment. We show the possible additional impact of this on Winchester District with the turquoise line in Figure 1.

Calculated by Leeds University, the DEFRA data show that in 2022, **emissions from greenhouse gases embedded in imported goods and services to the UK added a further 120% to domestic emissions**. Data for the chart below are taken from Carbon footprint for the UK and England to 2022 - GOV.UK Figure 1.

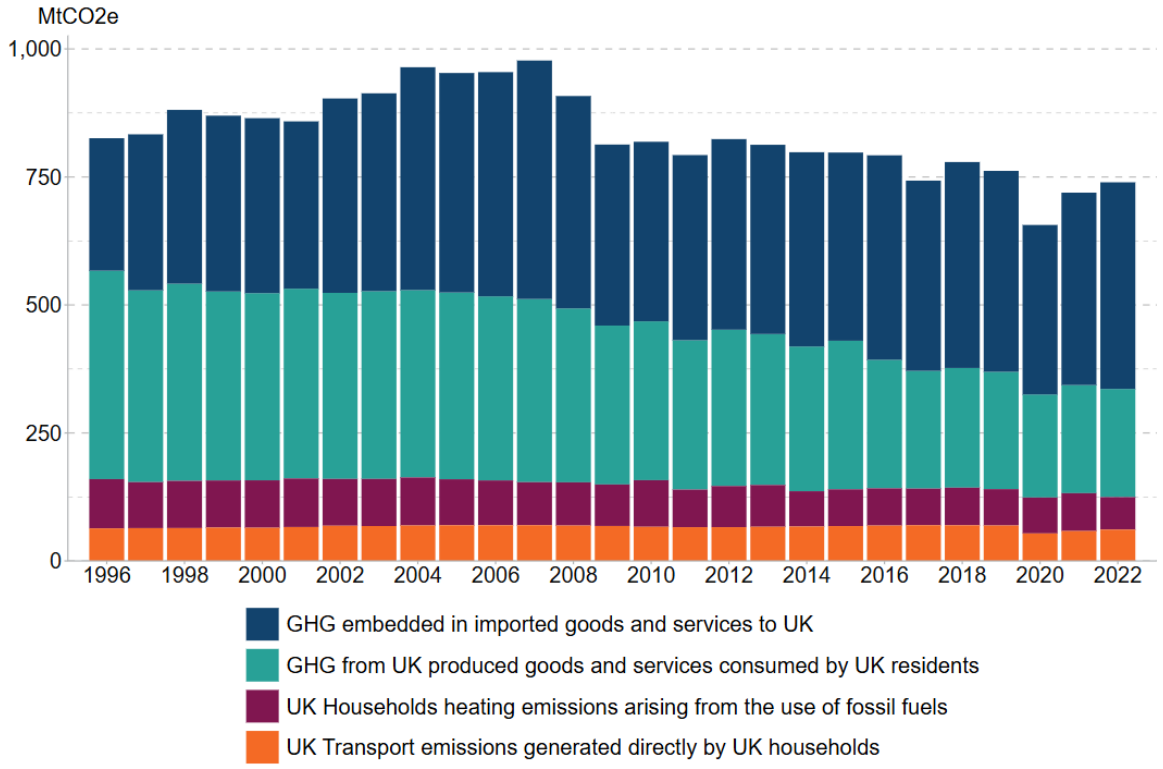


Figure 2 Greenhouse gas emissions associated with UK consumption 1996 to 2022

Between 1996 and 2022 there has been a total reduction of only 11% in consumption emissions, both within the UK and abroad. In public debate on emissions it is usually the 'territorial' reductions within the UK that are usually referred to. **The equivalent reduction for territorial emissions** over the period covered by data in figure 2 **is 49%**. By ignoring emissions caused by producing goods we import and services provided abroad we overstate by more than four times our success in reducing emissions. This will be as true for Winchester District as it is nationally. Because 'consumption emissions' data are not available below national level, our analysis concentrates on territorial emissions.

International transport (air and sea)

DESNZ territorial data for local authority areas does not yet include relevant emissions from air transport or shipping for commerce or leisure purposes,

although they are included in the data in figure 2. Hopefully, once included in territorial data, they will be assigned to local government areas in future data releases, and we will then be able to add them to the Winchester District emissions in future briefings.

Converting greenhouse gases to carbon dioxide equivalents

Weights of methane and nitrous oxide emissions are converted by DESNZ into the weight of CO_2 that would have an equivalent impact on global heating. This is referred to as CO_2e (e = equivalent) and is described as the **global warming potential (GWP) of each greenhouse gas**.

In 2023, DESNZ adopted the recommendations of the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment report (AR5) issued in 2013.

The formulae to calculate GWP vary depending on the period of time being considered because the different greenhouse gases decay naturally in the atmosphere at different rates across their lifetime.

Greenhouse gas	NAEI Name	Lifetime (years)	100-years GWP (AR5)	20-years GWP (AR5)
Carbon dioxide	CO2	50-200	1	1
Methane	CH4	12	28	84
Nitrous oxide	N2O	114	265	264

Figure 3

The next twenty years are crucial in our attempts to prevent global heating. We need an accurate estimate of emissions in that period. DESNZ have adopted **a time horizon of 100 years** for converting the emissions of methane and nitrous oxide to CO_2e. Methane emissions have **three times more impact** on global heating over a 20-years time horizon (it makes little difference for nitrous oxide). This is a strong argument for using **a time horizon of 20 years**. GWPs for a **20-year horizon** are given in Figure 3 in the blue-headed column (also based on the Fifth Assessment Report).

Our report uses mostly 100-year time horizons to maintain compatibility with DESNZ data but gives examples of the difference that conversions using a 20-year time horizon can make.

The most significant difference is that, with calculations using the 20-year horizon, **agriculture overtakes 'domestic' as the second largest group** of

emissions. Compare Figure 6 and Figure 7 to see how much difference the method of calculation makes.

How much global heating in Winchester District is caused by each main greenhouse gas?

DESNZ's July 2025 data release updated estimates for Winchester District's main territorial greenhouse gas emissions to 2023: from carbon dioxide, methane and nitrous oxide emissions. Figures 4 and 5 below are based on DESNZ data for 2023, converting methane and nitrous oxide to CO_2e first, like DESNZ, using a 100-year horizon and then recalculating the data using a 20-year horizon. Figure 5 reveals that methane is significantly more important than it appears in Figure 4 using a 100-year horizon.

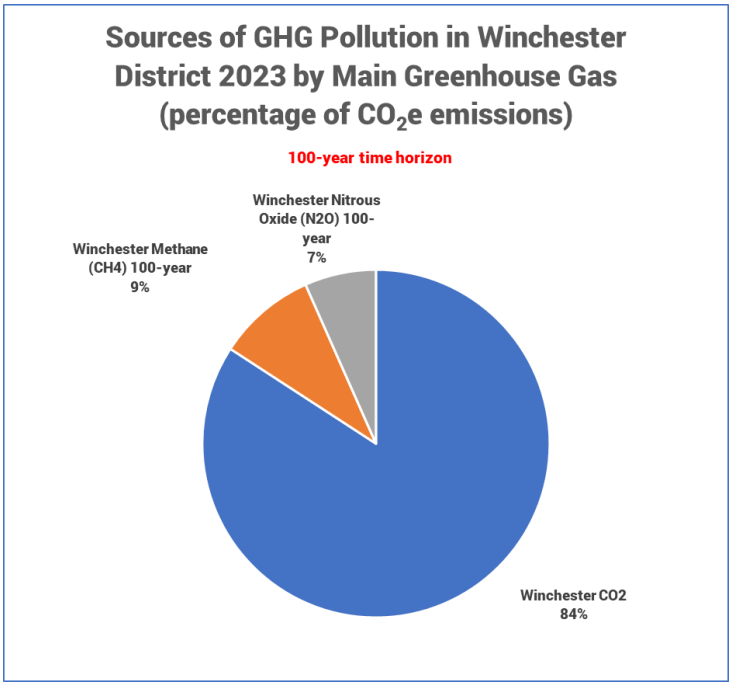


Figure 4

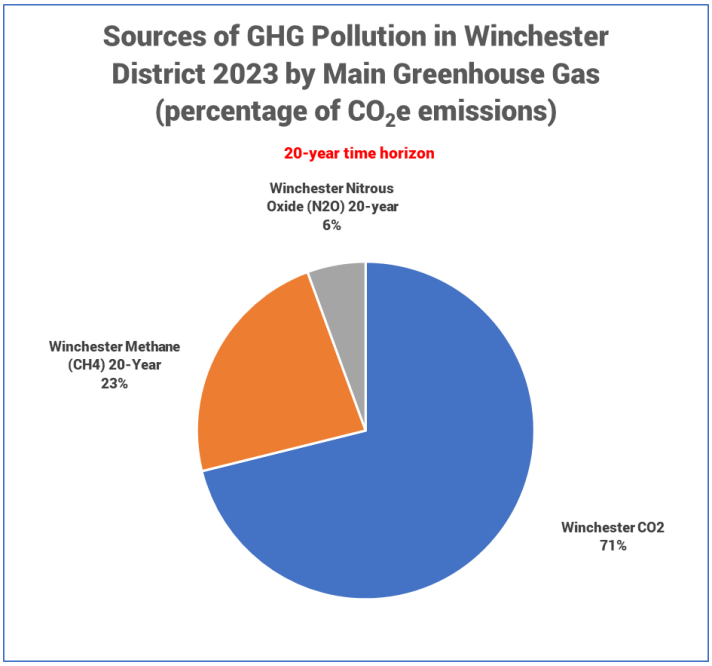


Figure 5

Over the next 20 years Winchester District 2023 methane emissions will have a much greater impact on global heating than they will have over the following eighty years. Their global heating potential will reduce after their first twenty years. Unfortunately, what happens in the next twenty years is crucial.

Even so, the scale of the damage caused by carbon dioxide emissions will still be greater than damage caused by methane emissions.

Which activities cause global heating in Winchester District?

DESNZ divide emissions into eight major activity categories. This helps us decide priorities for making changes that will reduce emissions in Winchester District. In 2023 activities in these categories caused the following emissions:

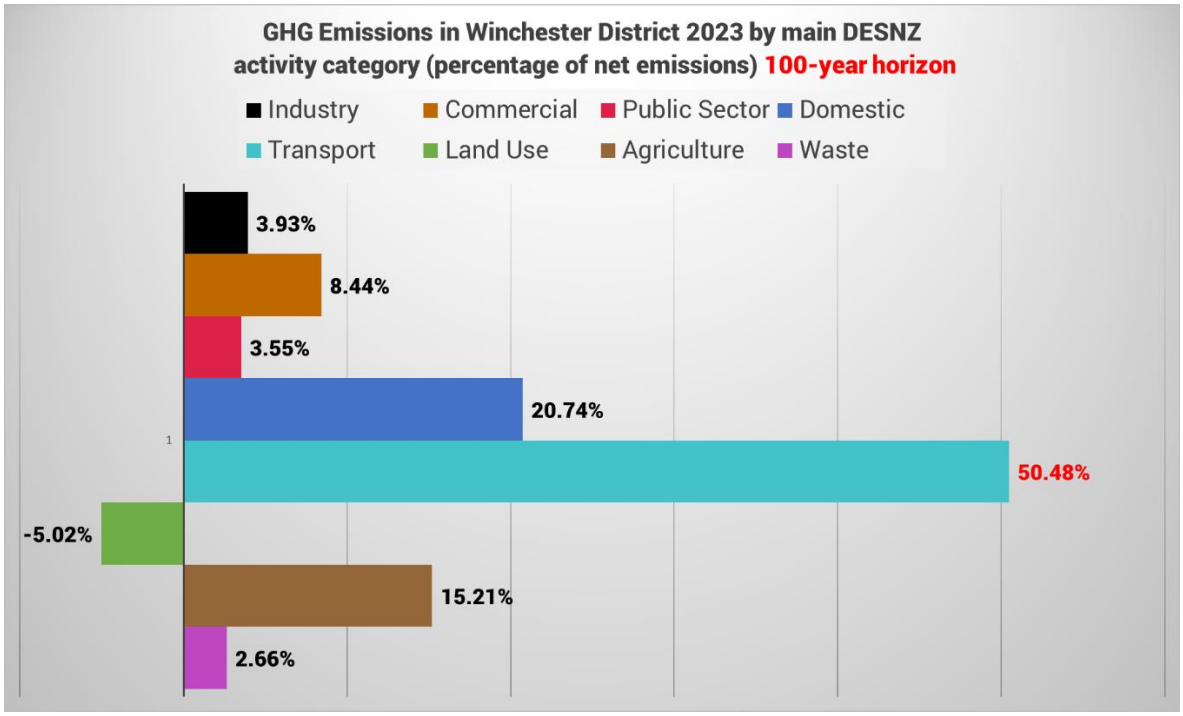


Figure 6

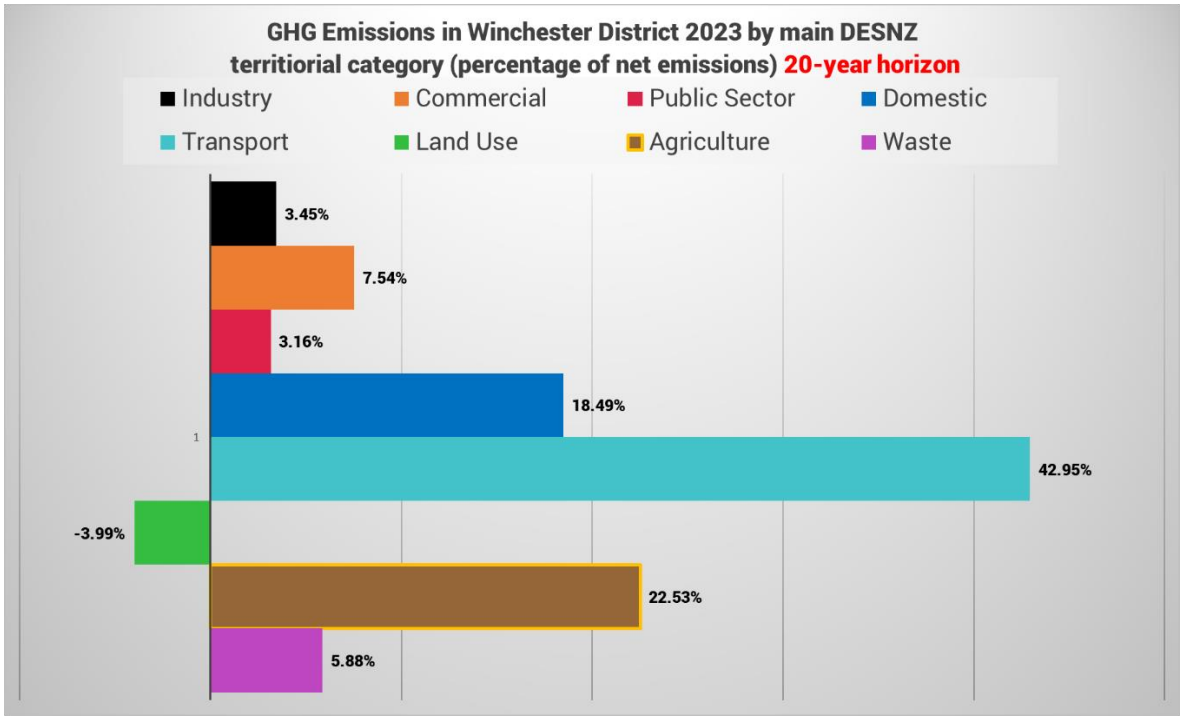


Figure 7

'Transport' is by far the largest category, responsible for over half the district's emissions (using the 100-year time horizon calculation), followed by 'Domestic' and then 'Agriculture.'

These main categories break down into the following sub-categories:

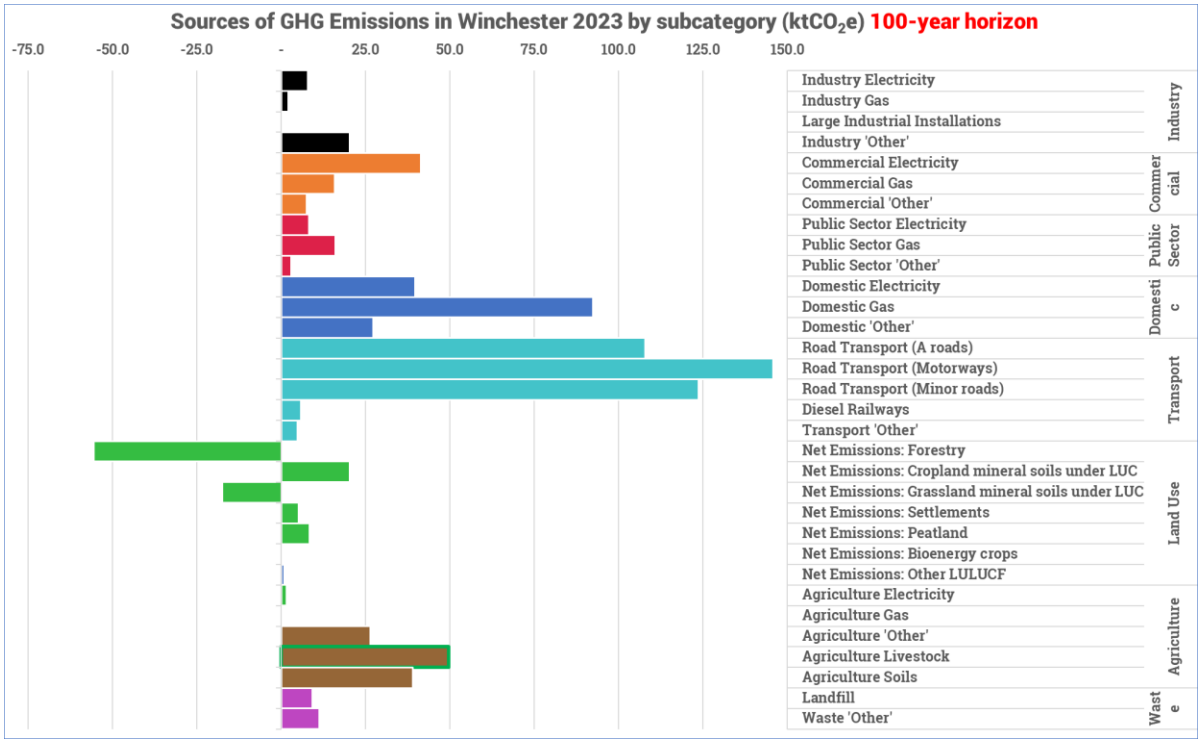


Figure 8

If this table is recalculated on a 20-year emissions horizon, agriculture (livestock) becomes the second most significant sub-category, because of the significant methane emissions produced:

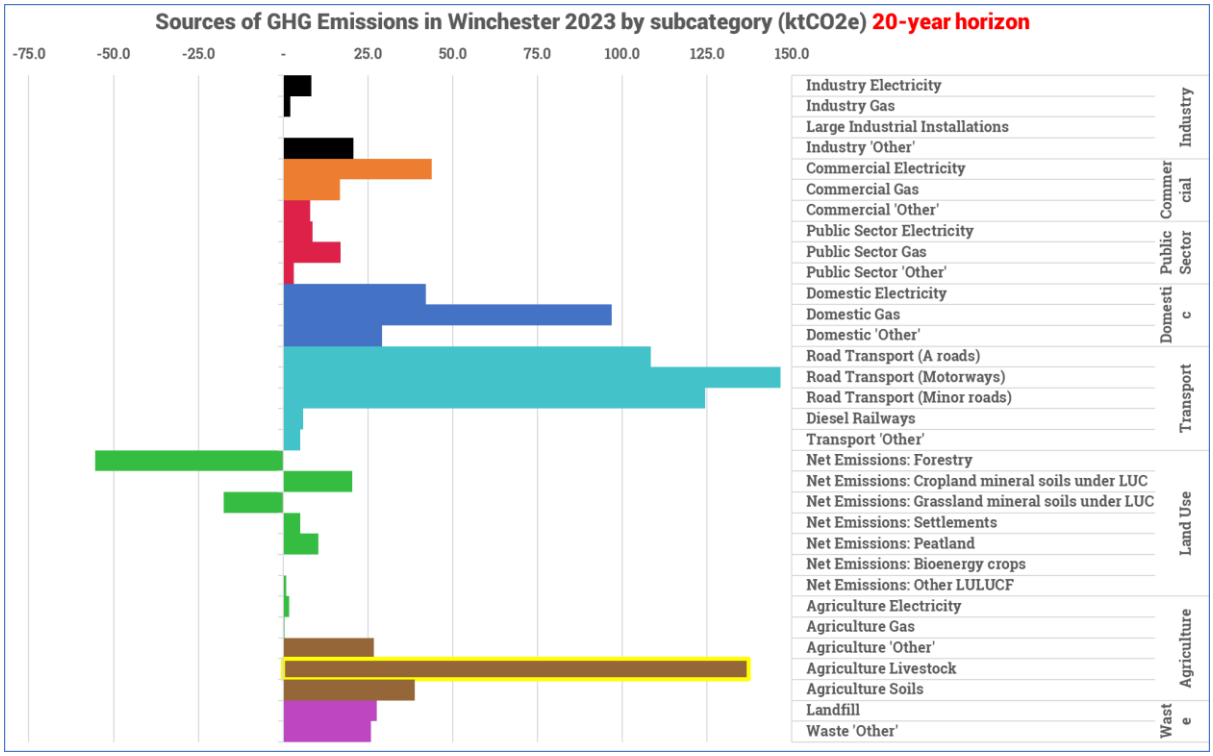


Figure 9

If we calculate emissions in this way, livestock is responsible for nearly 15% of all greenhouse gas emissions in the district. Now that DESNZ provides data on methane emissions and this problem is clearly understood, it would be appropriate to give more priority to addressing this.

Much public discourse is rightly about emissions caused by waste (6% of the 2023 total). It would be consistent with this if there were to be three times more public discussion about livestock emissions in the district.

Is there any good news?

Negative emissions (when emissions are taken out of the atmosphere) help reduce the total emissions in Winchester District. Forestry, and to a lesser extent, grassland absorb greenhouse gases, but even together are not enough to counterbalance livestock emissions (calculated on a 20-year horizon).

How quickly are emissions reducing?

Figure 10 shows the different rates at which the emissions for each of the main categories are reducing over the years. The major factor appears to be the decarbonisation of the electricity supply. There is now the need to decarbonise all power supplies, in line with the government's priorities.

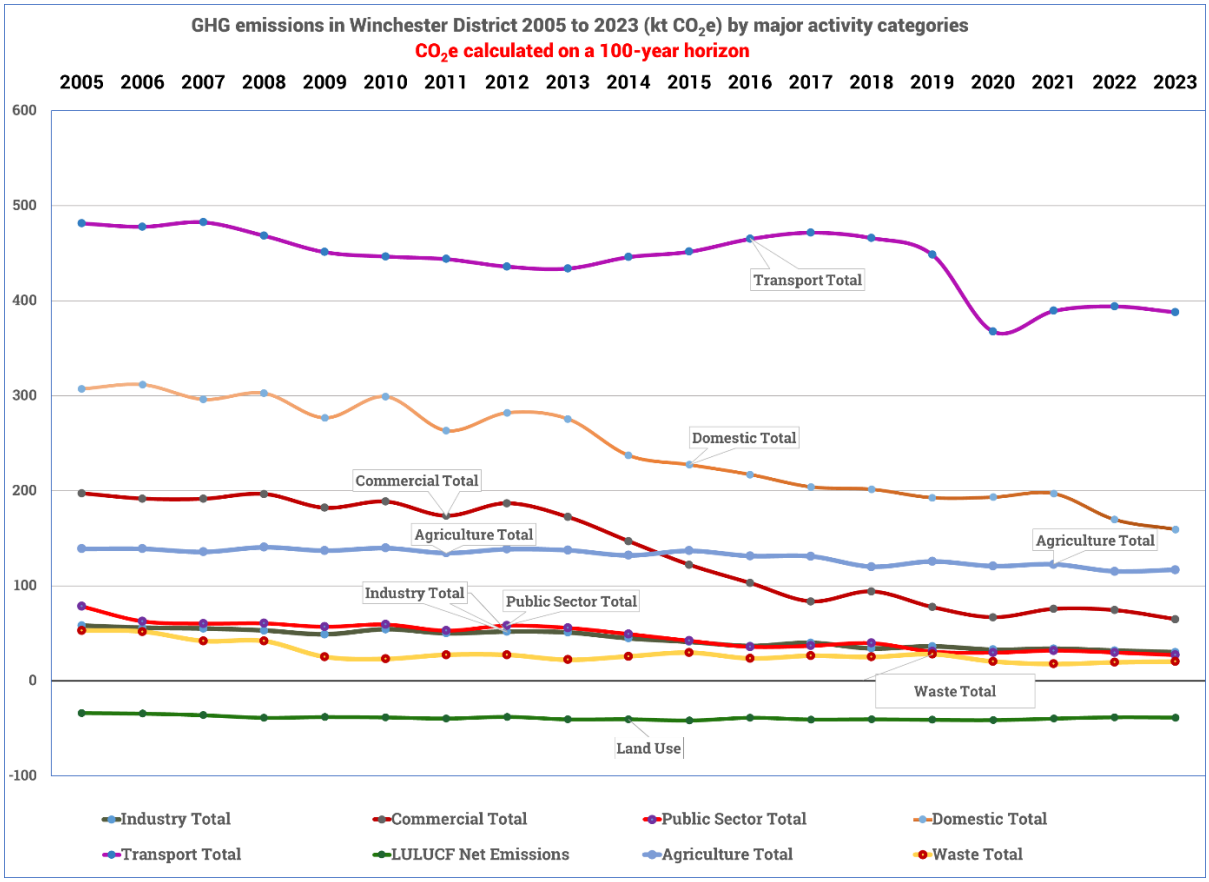


Figure 10

How do Winchester District's emissions compare with the national average?

Throughout the period between 2005 and 2023 emissions per person in Winchester District have been higher than average emissions per person across the country, with the exception of methane.

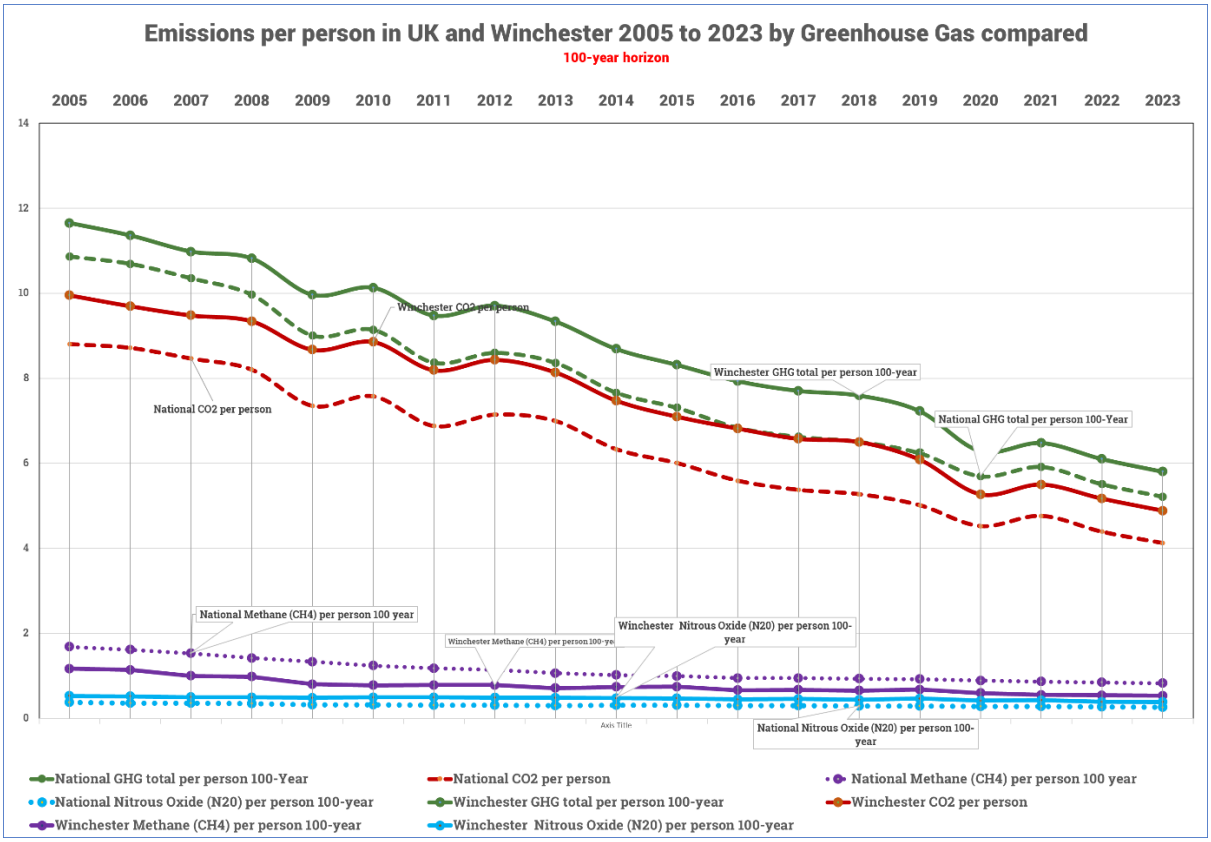


Figure 11

The slight narrowing of the gap in 2020 was possibly a reflection of the reduction in transport activity (relatively high in Winchester) during the Covid-19 emergency. The narrower gap, however, has remained for 2021 and 2022. Figure 12 shows that from 2019, a noticeable reduction of the gap by a third took place and has largely remained. This could reflect the impact of the Carbon Neutrality Action Plan.

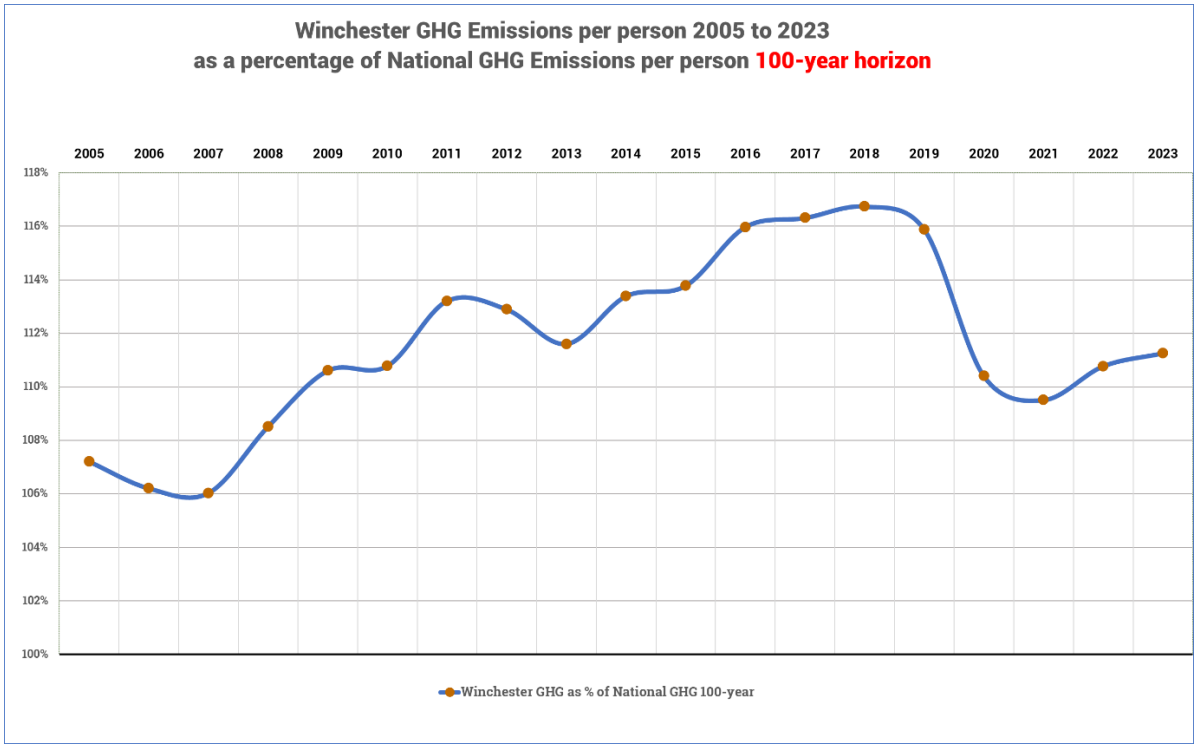


Figure 12

Figure 13:

- looks at the rate of total greenhouse gas emissions reduction between 2005 and 2023
- assumes that for 2024 emissions in Winchester District will reflect the 2024 percentage reduction in UK emissions in the Provisional UK greenhouse gas emissions statistics 2024 - GOV.UK (in relation to Winchester District's 2023 total emissions)
- assumes that emissions for 2025 will be a return to 'business as usual', basing an arithmetical projection on the historic trajectory 2005 to 2022, and then
- charts pathways that will be necessary to reduce emissions in the district to zero by 2030, in line with the City Council's Declaration of Climate Emergency.

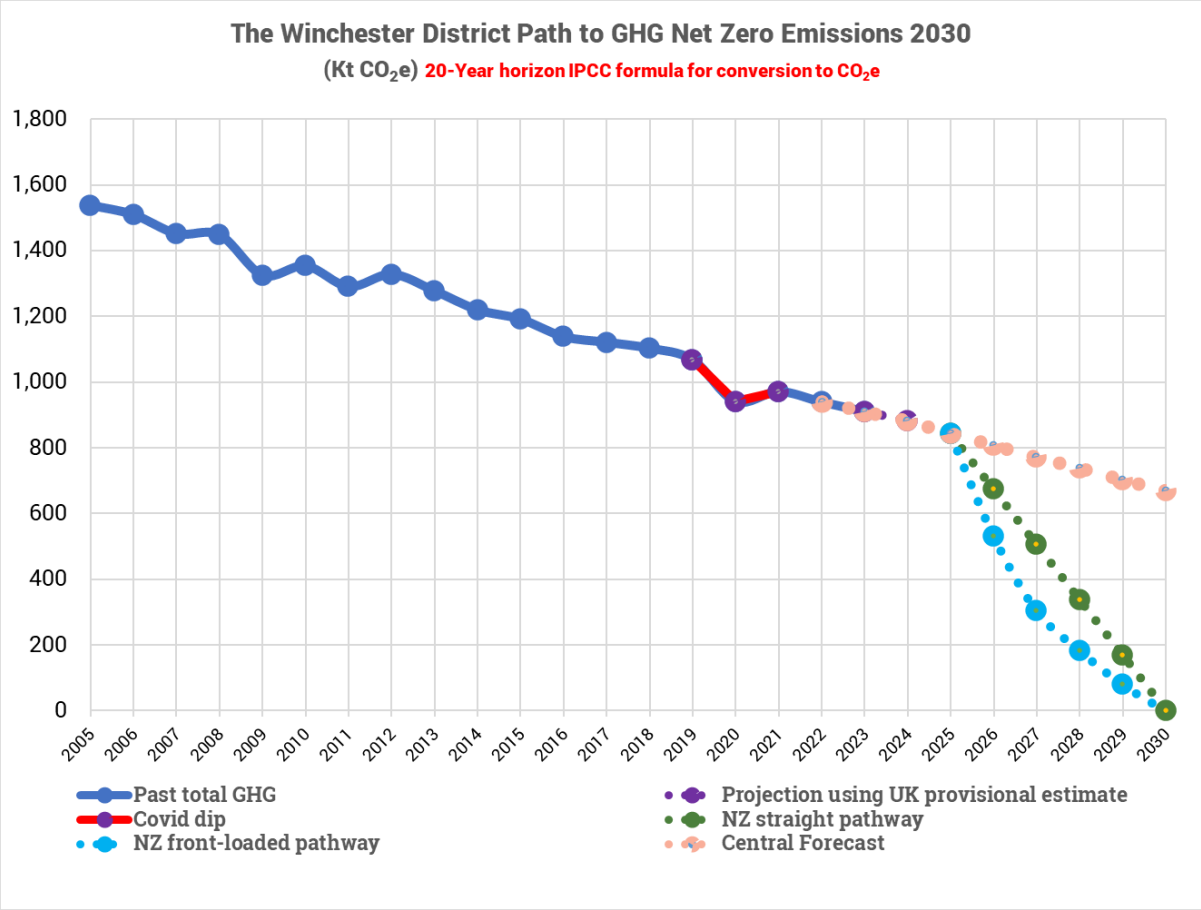


Figure 13

As this shows, significant acceleration of emissions reduction will be necessary. Two pathways are offered:

- **The straight-line pathway** is a useful indication of the overall rate of reduction necessary. Every year for five years the reduction will need to be 138 $ktCO_2e$ about four times the average reduction (36.63 $ktCO_2e$) that happened between 2012 and 2019, and **33% more annually than the reduction in emissions that took place in 2020 during the Covid pandemic**.
- It would however be even wiser to adopt **a front-loaded pathway** to leave time later for resolving problems and for concentrating on tackling the most difficult reductions, and reduction fatigue. Initially, this pathway will require a far greater rate of reduction than the straight-line reduction. In 2025 the pathway suggested in figure 21 would require about 8 times the average reduction between 2012 and 2019 or 2½ times the Covid reduction.

A simple projection of trends will give us some idea of what will happen if we do not reduce carbon emissions more quickly, ideally four times more quickly, than we have done so far.

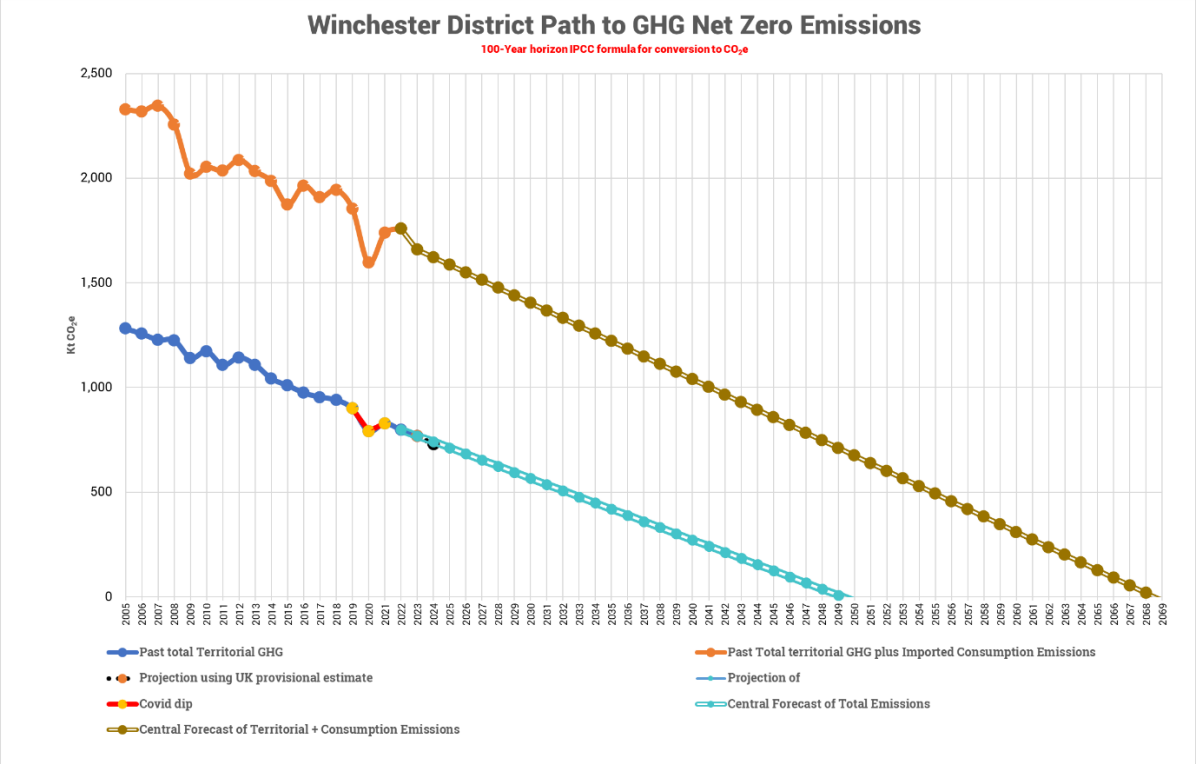


Figure 14

It may be slightly reassuring that that the projection of territorial emissions will reach net zero by 2049. However, once consumption emissions from abroad are added in, net zero will not be reached until 2069.

Worse, this would be to overlook the fact that some emissions ('persistent emissions') are reducing at a very slow rate. These emissions need greater focus.

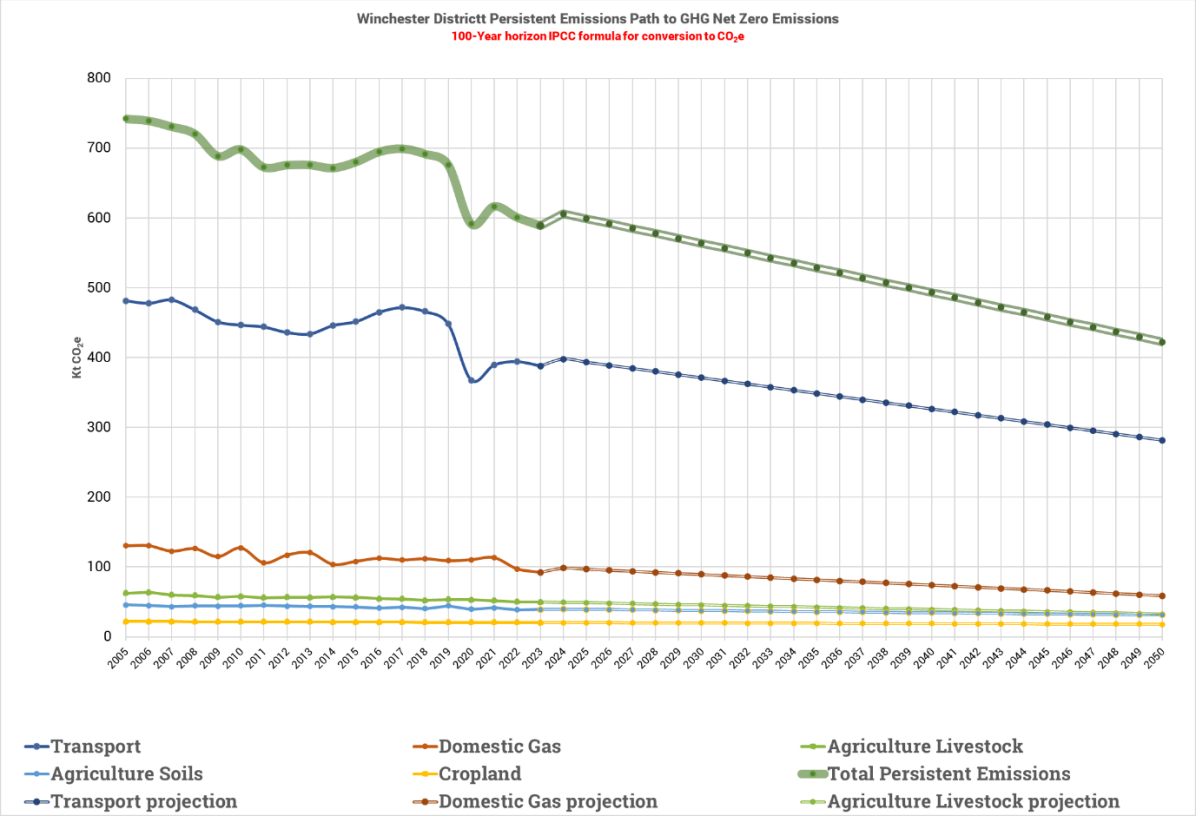


Figure 15

It is widely assumed that electrification of road transport will reduce emissions. This will be only partially true unless zero carbon electricity can be made in sufficient quantity to meet transport's enormous appetite for energy, or unless more energy-efficient modes of transport are successfully promoted. Similarly there needs to be a concerted effort to reduce livestock emissions, and efforts to electrify domestic heating may need to be accelerated. The other persistent sources of emission are rarely referred to, but they should be in any list of priorities.

At the current rate of emissions reduction **net zero will be reached by**:

- **Transport in 2113**
- **Domestic gas in 2089**
- **Livestock in 2101**
- **Soils in 2147**
- **Cropland by 2250**

The first three will emit significant amounts of greenhouse gas.

Energy sources

Most energy consumed in Winchester District comes from fossil fuels. Emissions will reduce if we switch to using zero-carbon sources of energy. The

balance is changing only slowly towards renewables. In 2022 energy use in Winchester District still showed very little use of zero-carbon energy (about 13%):

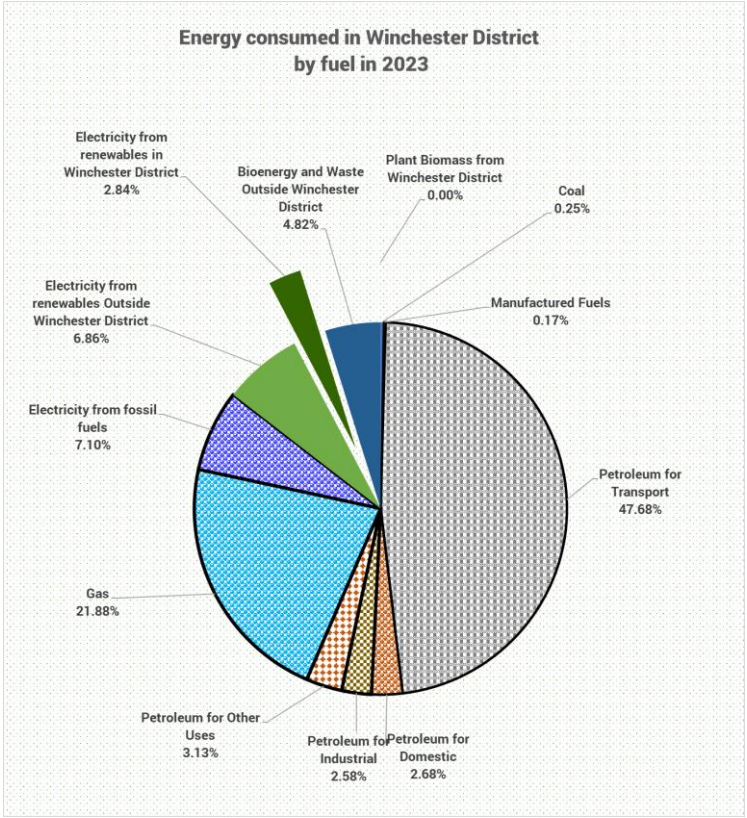


Figure 16

Data from DESNZ [Total final energy consumption at regional and local authority level: 2005 to 2022 - GOV.UK (www.gov.uk)] 26 September 2024

Appliances powered by electricity use energy more efficiently than appliances using other sources of energy, so it is difficult to be precise about how much green energy we would need to replace fossil fuels in the district.

Initial estimates suggest we would need at least **four times more green electricity to replace fossil fuels** as a source of energy. To provide all our energy needs from electricity produced within Winchester District boundaries, we would probably need to produce at least fifteen-times more than is currently produced.

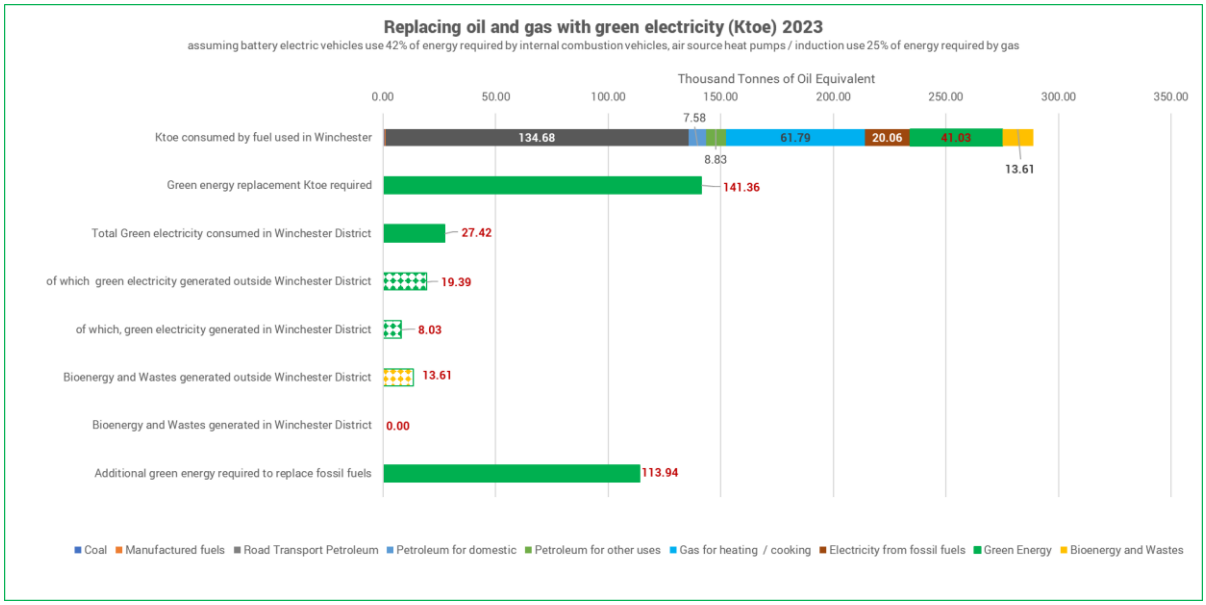


Figure 17

Phil Gagg 31 August 2025