



Llywodraeth Cymru
Welsh Government

Wales' Consumption Emissions Footprint

Update to the Final Statement
for the First Carbon Budget and
2020 Interim Target
including 2020 Consumption
Emissions Data

Welsh Government 2023

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Update to the Final Statement for the First Carbon Budget and 2020 Interim Target including 2020 Consumption Emissions Data

The new data including the year 2020 has been published in an Excel format alongside this report: [Carbon Budget 1 \(CB1\): Final Statement of Progress: supporting dataset – Consumption Emissions | GOV.WALES](#)

Background

In December 2022, Welsh Government published the Final Statement of Progress (2016-2020), which detailed our progress towards emissions reductions in the journey to net zero over Carbon Budget (CB) 1. It also included Welsh Governments first legislative assessment of consumption emissions in Wales. This report was intended to include consumption emissions estimates for the entirety of the CB period. However, due to the data available at that time this was not possible and only the years 2016 – 2019 were presented. The data for 2020 has now become available; therefore, this update is being published to present an estimate of consumption emissions from 2016 through to 2020, in line with the CB1 years.

What are consumption emissions?

Consumption emissions describe the emissions directly produced by Welsh households (including heating and driving, for example), emissions that occur within the UK to produce goods and services consumed in Wales, and 'imported' emissions that occur in other countries to produce goods and services consumed in Wales. Consumption emissions measurements differ from territorial emissions. Territorial emissions are defined as emissions that take place within national territories and offshore areas over which a country has jurisdiction, and it is these emissions that are recorded in the national inventory.

Consumption emissions are important to understand because Wales has a global responsibility to not only consider the emissions it produces but also the emissions from the goods and services it consumes. For a full explanation of the background, comparability and methodology of these statistics, as well as differences between emissions accounting, please see the Final Statement for the First Carbon Budget and 2020 Interim Target report published in 2022¹. There were methodological changes made when producing the statistics for this 2023 release, which means the numbers calculated in the Statement have been revised and are not the same as the 2022 publication. Please see the [Revisions](#) section for further details.

¹ [Final Statement for the First Carbon Budget and 2020 Interim Target \(gov.wales\)](#)

The effect of the coronavirus (COVID-19) pandemic

The coronavirus (COVID-19) pandemic and the resulting national restrictions had significant impacts across the United Kingdom (UK). Impacts on the economy and society occurred, which affected greenhouse gas emissions on both a territorial and consumption basis. Estimated territorial greenhouse gas emissions dropped 13% at a UK level and 12% at a Welsh level between 2019 and 2020^{2,3}. This drop is largely attributed to the reduction in road transport because of the COVID-19 travel restrictions. Emissions from energy supply also dropped due to decreased demand throughout the pandemic period. It is therefore expected that the pandemic would have had an effect on estimates of consumption emissions.

Key Points

The consumption emissions estimate indicated that:

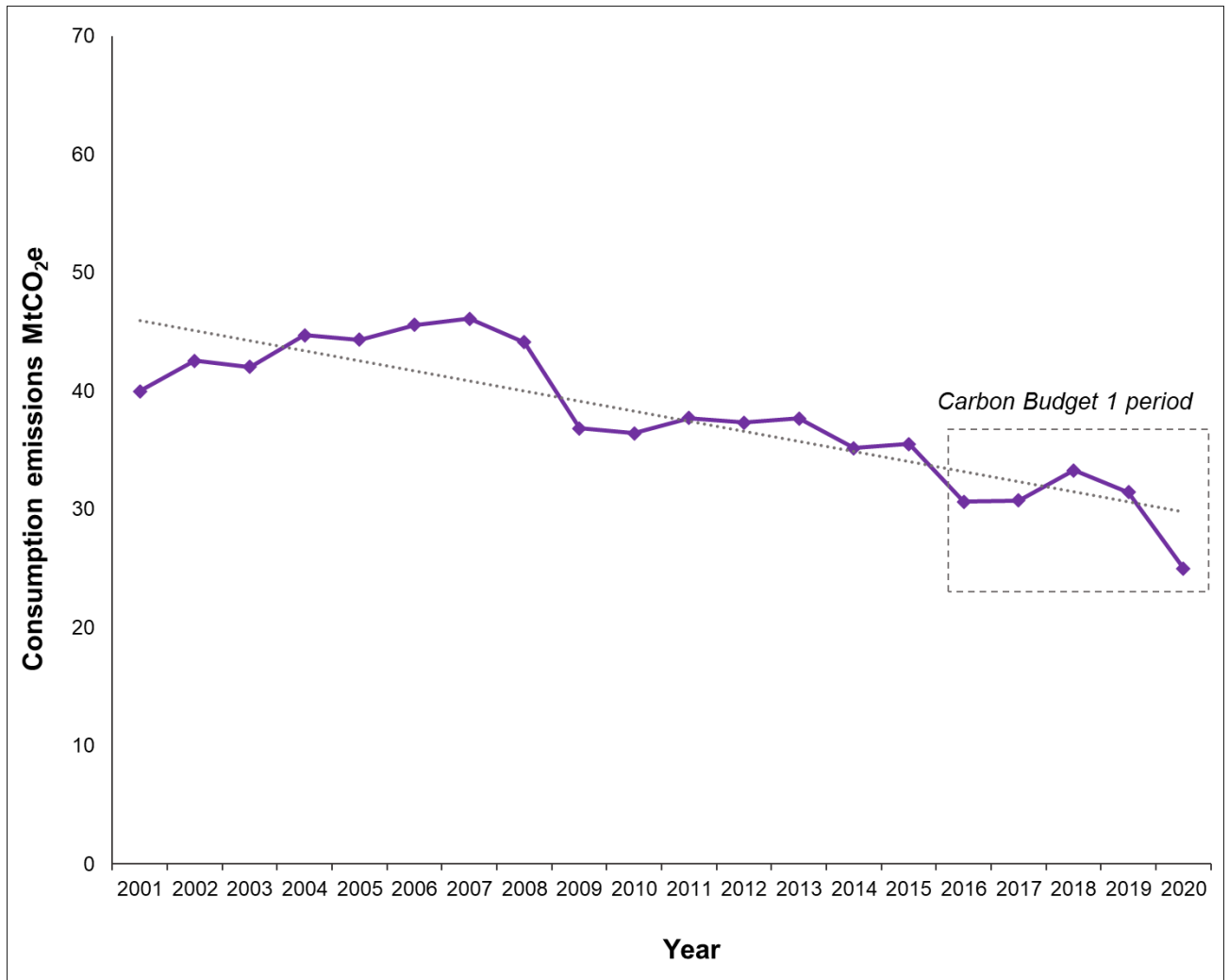
- An overall decreasing trend is seen between 2001 and 2020, with Wales' estimated consumption emissions footprint decreasing by 37% from 40 Mt CO_{2e} to 25 Mt CO_{2e}.
- During Carbon Budget (CB) 1, estimated emissions increased by 3% between 2016 and 2019 followed by a sharp decrease in 2020. This is expected to be linked to effects of the COVID-19 pandemic.
- Emissions embedded within imported goods and services (consumed in Wales but produced overseas) were the largest source of Wales' consumption emissions from 2002 to 2020.
- Between 2001 and 2020 the two largest sources of household end use emissions were housing (including furnishing) and transport. The emissions related to transport fell in 2020, coinciding with the COVID-19 pandemic.
- Wales' territorial and consumption emissions have both decreased since 2001, with territorial emissions being higher for the entire time period. As mentioned in the previous report, this could be associated with Wales having a higher traded share (for example: heavy industry) than other UK nations.
- General trends in estimated consumption emissions within this release are similar to those in the previous release (December 2022), although the entire time series has been revised. Please see the revisions section for further information on revisions.

²To assess trends on a comparable basis to Wales, emissions from international aviation and shipping are included for the UK.

³ [Report: Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2020 - NAEI, UK \(beis.gov.uk\) under AR5 Global Warming Potential values.](#)

Consumption Emissions Footprint Results

Figure 1. Wales' Consumption Footprint (2001-2020) Mt CO₂e

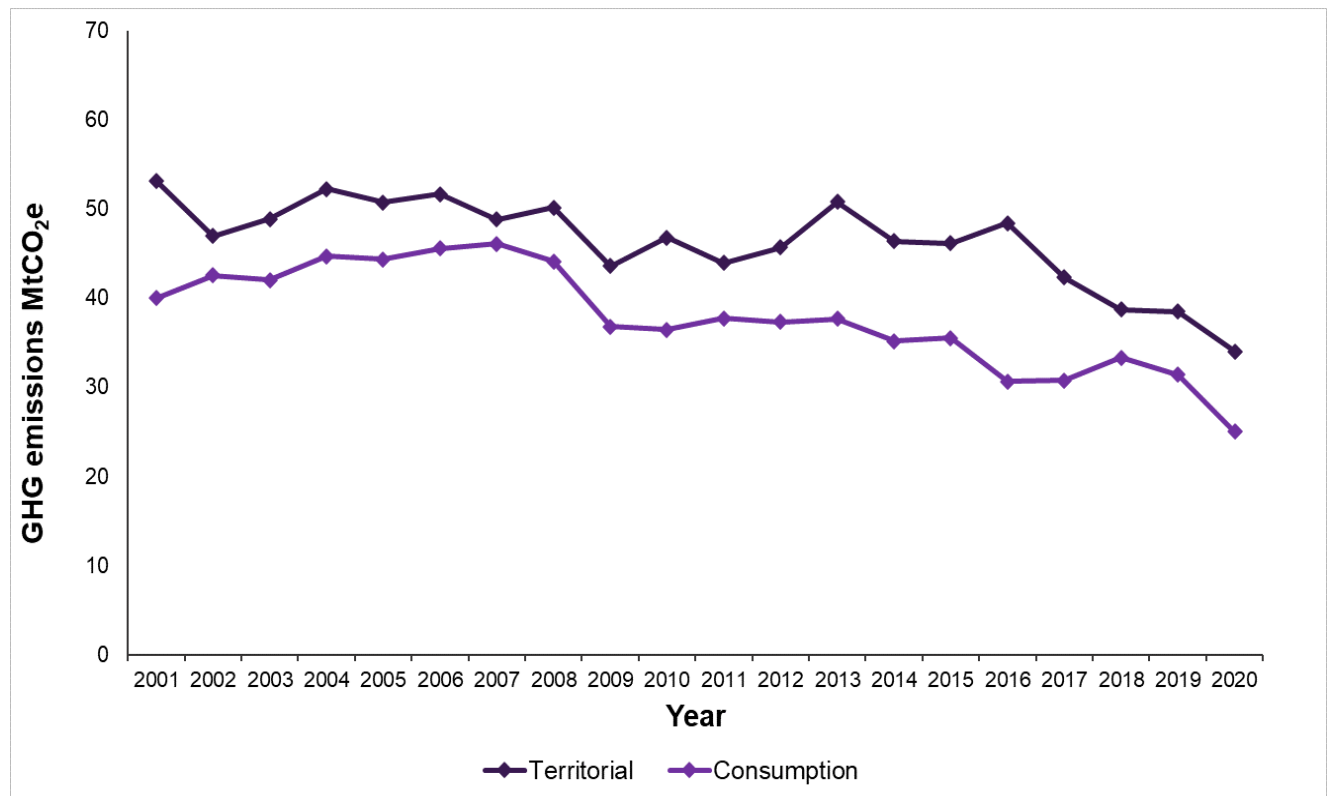


Summary

- Between 2001 and 2020, Wales' estimated consumption emissions footprint has decreased by 37%, from 40 Mt CO₂e to 25 Mt CO₂e (Figure 1). When comparing 2001 and 2019 to remove effects of the COVID-19 pandemic, the decrease is approximately 21%.
- Overall, estimated emissions show a general downwards trend since 2001.
- Over Carbon Budget 1 (CB1) years 2016 – 2020, emissions increased initially, followed by a steep decline in 2020. Overall emissions between 2016 and 2020 decreased by approximately 18%.
- The estimated drop between 2019 and 2020 was 20%, and below the general trendline. This drop coincides with the COVID-19 pandemic and national restrictions that occurred in 2020.
- Excluding the covid impacted year of 2020, there was a small increase of 3% in Wales' consumption emissions between 2016 and 2019.

Comparison of Consumption and Territorial Emissions

Figure 2. Wales territorial and consumption emissions 2001-2020.



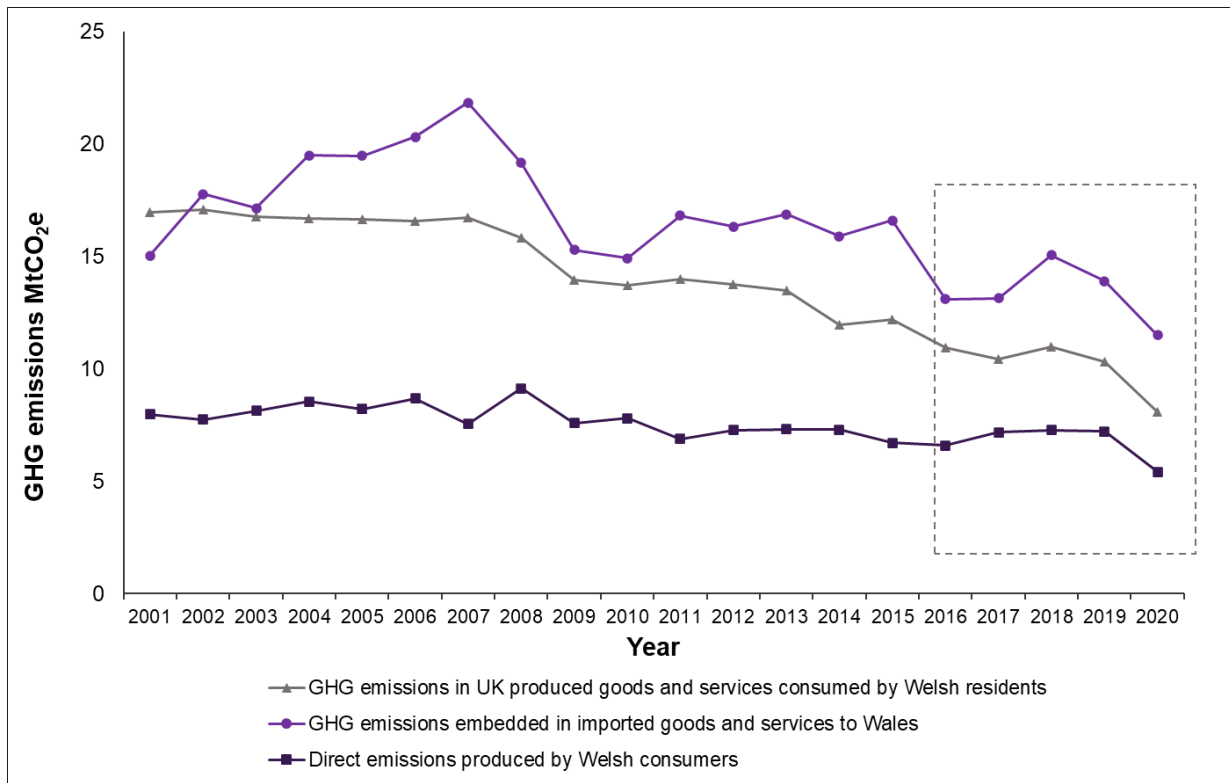
- Territorial and consumption emissions have broadly followed similar trends since 2001, with an overall decreasing trend (Figure 2).
- Between 2001 and 2020, estimated territorial emissions dropped by 36% and estimated consumption emissions by 37%, showing similar decreases. Although, the effect of the COVID-19 pandemic must be considered in this long-term decrease. When comparing 2001 and 2019, territorial emissions dropped by 28% and consumption emissions by 21%.
- Between 2019 and 2020, territorial emissions dropped 12% in Wales and consumption emissions 20%, showing a greater decrease in consumption emissions during the pandemic.
- The long-term trend since 2001 shows that both territorial and consumption emissions are decreasing, suggesting that direct Welsh emissions are being reduced and not increasingly offshored; though this is not definitive and does not guarantee future trends will be the same. Indeed, over the CB1 period 2016 - 2019 (excluding the 2020 covid impacted year), the data suggests territorial emissions declined but this was alongside a slight increase in consumption emissions. Wales must continue to work to reduce emissions across all metrics.

- Consumption emissions being lower than territorial is unusual in comparison to the rest of the UK where consumption emissions are typically higher.^{4,5} This could potentially be due to Wales having a higher share of the traded sector (e.g., heavy industry) than the UK average.

Analysis of Wales' consumption footprint

Emissions sources

Figure 3. Main sources of consumption emissions in Wales 2001 – 2020.



- Estimated emissions embedded in imported goods and services were the largest source of estimated consumption emissions in 2020 (Figure 3). They have decreased by 24% since 2001, with a peak in 2007 of 22 Mt CO_{2e}.
- Emissions embedded in UK-produced goods and services were the next largest source in 2020 and have decreased by approximately 52% since 2001, with a peak in 2002 of 17 Mt CO_{2e}.
- Direct emissions produced by Welsh households had the smallest contribution to the 2020 emissions totals, and generally has not changed substantially year on year. Overall, direct emissions decreased by 32% between 2001 and 2020.
- Across the CB 1 period, emissions embedded in imported goods and services were the largest estimated emission source, with a peak in 2018 of 15 Mt CO_{2e}.

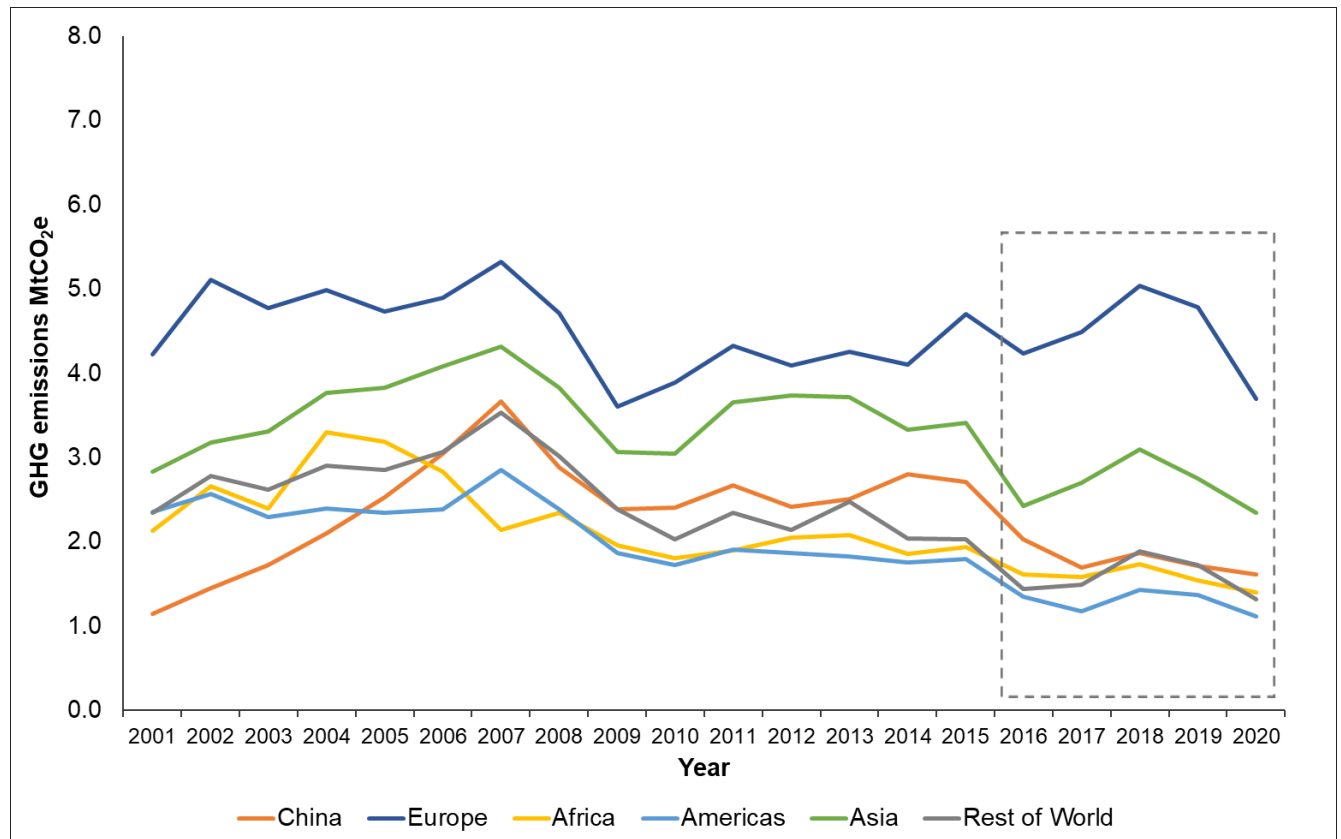
⁴ Carbon footprint for the UK and England to 2020 - GOV.UK (www.gov.uk)

⁵ Scotland's Carbon Footprint 1998 – 2019 - gov.scot (www.gov.scot)

- A similar trend was seen between 2019 and 2020 across all three categories with a substantial drop in emissions estimates, with emissions embedded in UK-produced goods and services decreasing 22%, direct emissions decreasing 25% and emissions embedded in imported goods and services decreasing 17%.

Emissions source regions

Figure 4. Source region of Wales' import-related consumption emissions 2001 – 2020.



Note: Due to the way regions were combined within the model, the country categories displayed here may not include all countries within the named continent. For further information please see the Final Statement for the First Carbon Budget and 2020 Interim Target report.

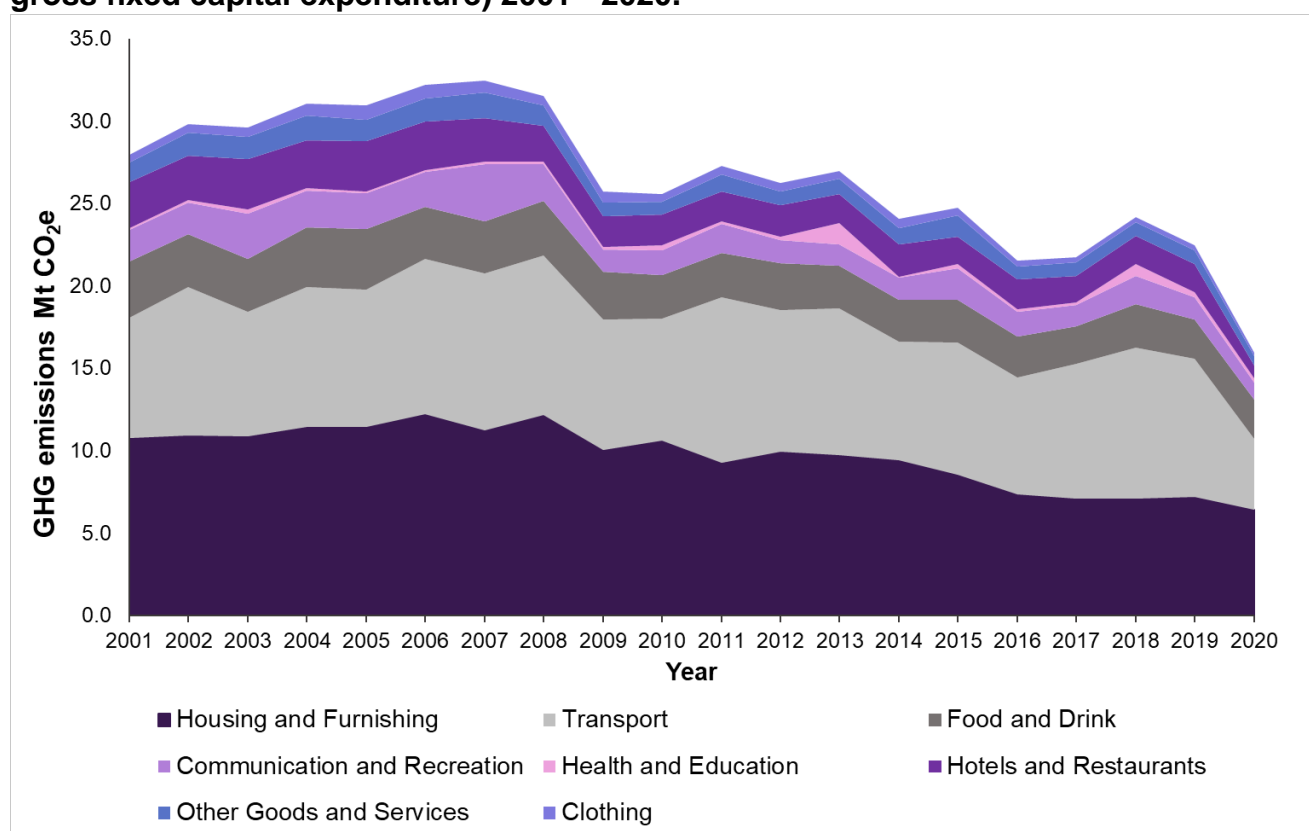
- Overall, estimated imported emissions from each source region have fluctuated since 2001, with Europe being the largest source of imported emissions (Figure 4).
- The emissions embedded in imports related to each source region have mostly decreased, aside from China which saw an estimated 41% increase (from just over 1Mt CO₂e to just below 2 Mt CO₂e) since 2001. Estimated imported emissions from Europe decreased 13%, Africa 34%, Americas 53%, Asia 17% and Rest of World 44%.
- During the CB 1 period, imported emissions from all source regions fluctuated with a peak in 2018. There was an overall decrease in estimated emissions

between 2016 and 2020 from China of 20%, Europe 13%, Africa 13%, Americas 17%, Asia 3% and Rest of World 8%.

- Imported emissions from all source regions dropped sharply between 2019 and 2020, following the trend of emissions reductions during the COVID-19 pandemic. Estimated emissions originating from Europe and Rest of World saw the biggest decrease of 23%. China had the smallest decrease of 6%, with Africa having a 9% decrease, Americas 18%, and Asia 15%.

End use emissions sources

Figure 5. Emissions by end use (related to households only and excluding emissions related to local/central government, non-profit organisations and gross fixed capital expenditure) 2001 - 2020.



- Estimated emissions from the majority of household end uses have decreased since 2001 (Figure 5). Emissions dropped sharply in 2008 and then again in 2020 coinciding with the 2008 recession and 2020 COVID-19 pandemic.
- Over the CB 1 period, emissions fluctuated but the proportion of emissions from different sources remained relatively stable between 2016 and 2019. This trend changed in 2020.
- Between 2019 and 2020, estimated emissions from the majority of end use sources decreased, except food and drink which remained stable. The end use with the greatest estimated decrease in 2020 was Hotels and Restaurants (down 55%), followed by transport (down 49%). The drop in transport emissions can also be seen in territorial emissions in 2020.

Methodology

For a full explanation of the methodology used alongside the full information quality assessment, please see the previously published report here:

- [Final Statement for the First Carbon Budget and 2020 Interim Target \(gov.wales\)](https://gov.wales/government/press-releases/2023/03/2023-carbon-budget-2020-interim-target)

Data Quality

The statistics presented in this report are an estimate only and should not be considered definitive. All modelling exercises have inherent uncertainty due to variability within model parameters. Additionally, greenhouse gas emissions originating from other countries are difficult to assess in comparison to territorial emissions that are present in the inventory. A key source of uncertainty in this footprint, is the scaling of UK data to Wales where the Living Costs and Food Survey is used. This survey has a limited sample size so may not fully capture Welsh consumption patterns and changes. It is also important to note that this methodology does not account for emissions related to land use change.

Revisions

Estimates for previous years are revised with each update, due to methodological improvements and revisions of the underlying input data.

There were two alterations to the methodology and data input made in the 2023 release compared to the 2022 release, both changes were to the UK level data and no changes were made to the way these data were scaled to Wales. These changes were:

- Improvements to the method for removing tax on imported goods.
- Move from Global Warming Potential (GWP) AR4 values to AR5.

Improvement to the method for removing tax on imported goods

In previous versions of the method used to construct the UK MRIO database, the University of Leeds utilised the Analytical tables to calculate the proportion of the Combined Use table that was from domestic use. They then used proportions to calculate the total imported use by industry as a row within the model. For the 2023 release this was altered to ensure that the imports were the result of the total industrial output minus domestic use minus value added. This ensured that the column sums add up to the value for total industrial output in basic prices. The previous method over-estimated the value of imports because they were not basing them on this basic price total.

The result of this change in the imports calculation is a reduction in imported emissions, which reduces the share of emissions from imported goods by around 3% for recent years. The actual difference in monetary terms between the imports row calculated in previous years and this year is relatively small, but the difference in emissions is exaggerated because the emissions intensity of imports is higher than the emissions intensity of domestic goods.

Move from GWP AR4 values to AR5

The 2023 release uses the Environmental Accounts released in Autumn 2022, which use AR5. The difference is minimal and the effect on the consumption accounts is also minimal since the imported emissions data already uses the AR5 version of GWP.

Acknowledgements

This report is published with thanks to University of Leeds for their expertise in calculating and providing these statistics, and also to DEFRA for coordinating their production and sharing the reports with Welsh Government.