Department for Energy Security & Net Zero

Energy consumption in the UK (ECUK)

1970 to 2023

About this release

Information on energy consumption in the UK by sector and end use.

In this release

Data tables

Additional data are available online as part of the ECUK 2024 publication:

Consumption

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Primary energy consumption

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Electrical products

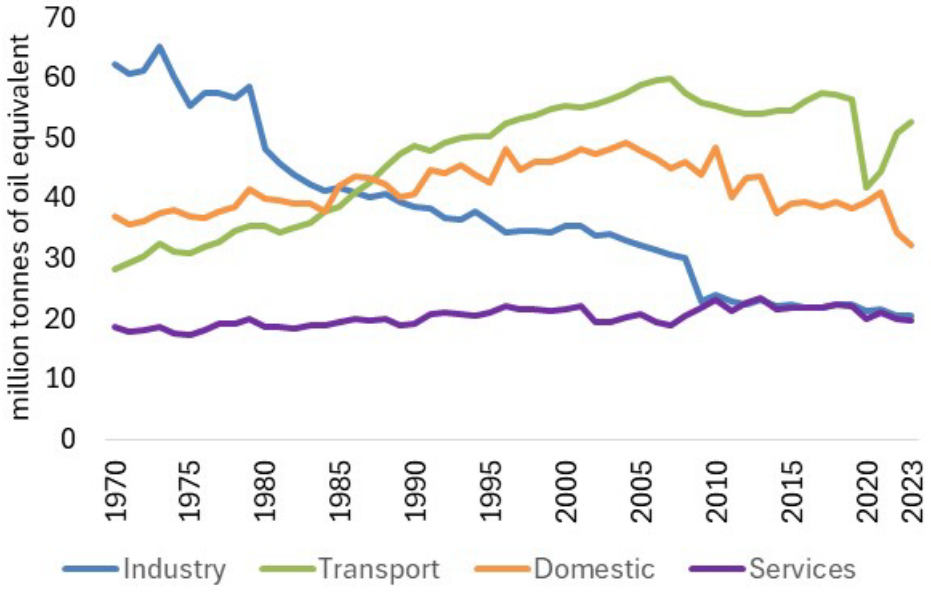
Following two decades of steady increases in consumption throughout the 1980s and 1990s final energy consumption in the UK has been on a decreasing trend since the turn of the century. Since 1970 final energy consumption in the industrial sector has been decreasing, while consumption in the transport sector has been increasing. In the domestic sector consumption peaked in the early 2000s and has been decreasing since. Between 2022 and 2023 final energy consumption in the UK showed a small **decrease of 0.6 per cent to 125 million tonnes of oil equivalent** (mtoe).

Energy consumption in the **domestic sector reached a record low**, decreasing 6.0 per cent to 32.2 mtoe, continuing a long-term downward trend, which in recent years has been contributed to by behaviour changes due to warmer temperatures and the impact of increased energy and other prices. The industry sector also saw a record low final energy consumption in 2023.

In contrast, **energy consumption in the transport sector increased** between 2022 and 2023 as the aviation sector in particular continued to recover from the impacts of the Covid-19 pandemic.

Energy intensity within the domestic sector continued the long-term decreasing (improving) trend. This is a result of energy saving measures such as improved insulation, more efficient boilers and greater end use efficiency of consumer appliances. Energy intensity in the transport sector also showed improvements as the air and rail sectors saw recovery of passenger loadings following the lifting of travel restrictions in place during the Covid-19 pandemic.

Energy consumption by sector, 1970 to 2023 (Table C1)



Chapter 1: Energy consumption

Final energy consumption

Final energy consumption is the energy used by people and businesses in their day-to-day activities. Core final consumption data are sourced directly from that section of the energy balances as published in The Digest of UK Energy Statistics.

Final energy consumption differs from primary energy consumption, which relates to total fuel used (for example electricity consumption is allocated to the fuel input, such as coal or gas, used to generate the unit of electricity). Primary energy consumption data is presented in Chapter 3. Further details on the definitions and terminology used in this release can be found in Chapter 5: Technical information and the DUKES glossary.

Key headlines

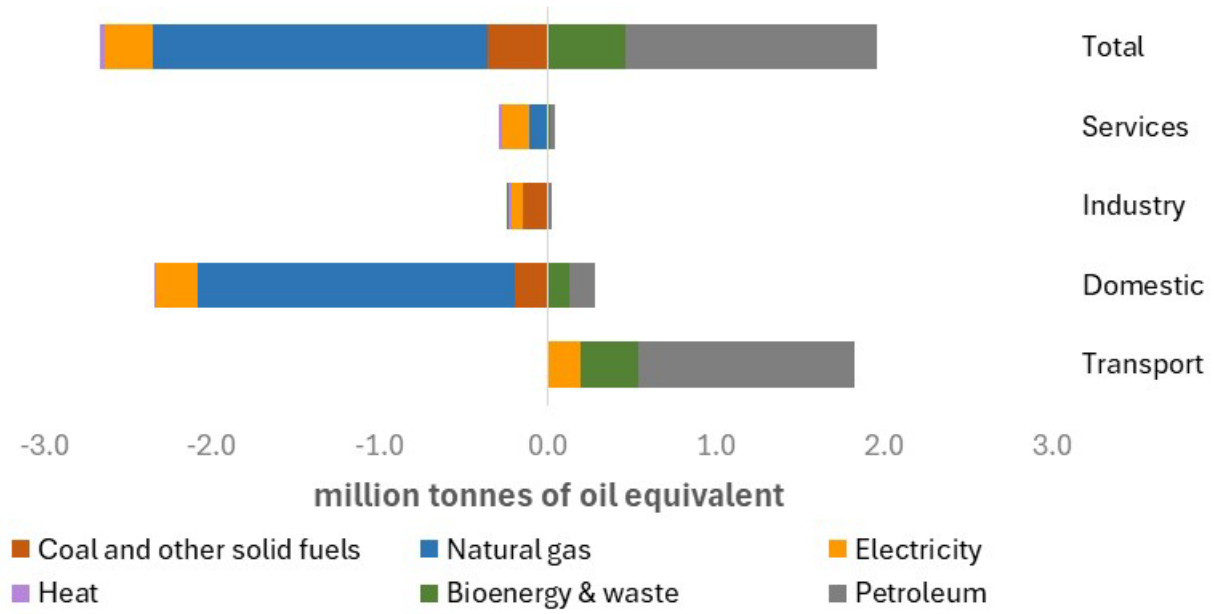
Final energy consumption in the UK decreased to a near record low of 125.0 mtoe in 2023, a 0.6 per cent fall on energy consumption in 2022. 2023 was the second lowest annual final energy consumption in the UK since 1970, behind only 2020 which was heavily impacted by the Covid-19 pandemic.

Transport was the only sector to see a year-on-year increase in final energy consumption, up by 1.8 mtoe (3.6 per cent) to 52.6 mtoe. However, this was still lower than the energy consumption in transport in 2019 (56.3 mtoe), the last full year before the Covid-19 pandemic.

All other sectors saw a decrease in energy consumption, with domestic showing the largest decrease (6.0 per cent) to 32.2 mtoe. This is likely due to the continuation of high temperatures and high energy and other prices in 2023. The industry sector decreased by 1.1 per cent to 20.4 mote and the services sector decreased by 1.3 per cent to 19.8 mtoe.

Chart 1.1 shows the changes in consumption by sector highlighting which fuels are driving the changes. This shows the biggest contributors to the changes in consumption between 2022 and 2023 were increased petroleum consumption in the transport sector and decreased natural gas consumption in the domestic sector.

Chart 1.1 Change in consumption by sector and fuel, 2022 to 2023 (Table C1)

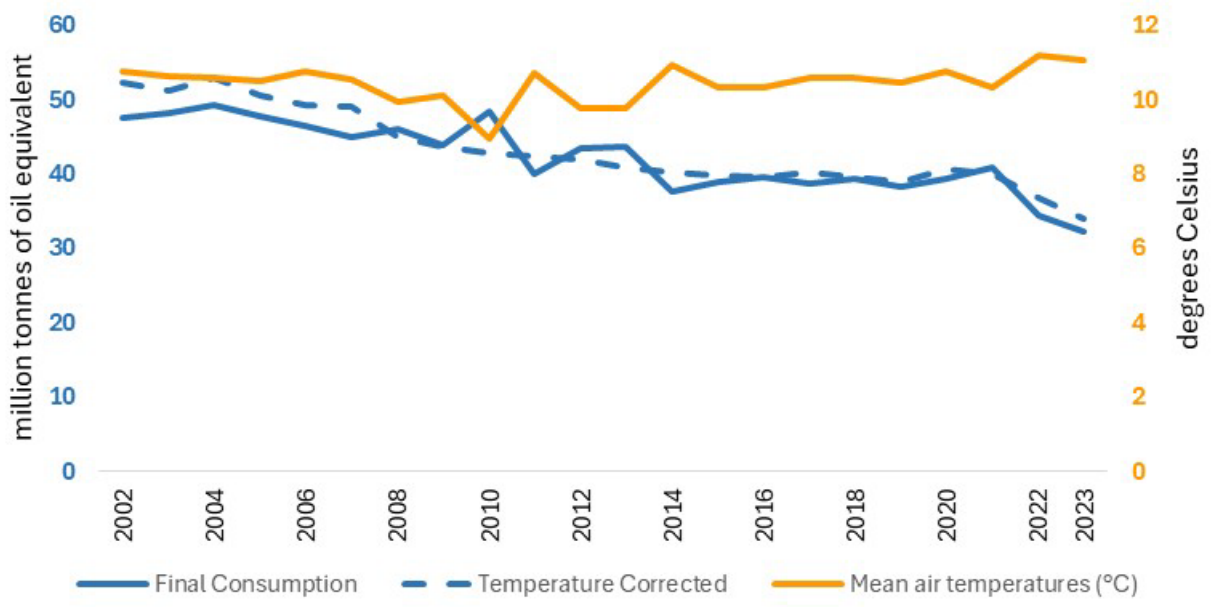


Domestic

Energy consumption in the domestic sector has been on a long-term decreasing trend since the early 2000s, partly due to improvements in energy efficiency and more recently the impact of warmer temperatures and higher energy and other prices. The last two years have seen some of the largest year-on-year falls outside of years that were impacted by cold winters. Between 2022 and 2023 domestic consumption fell by 6.0 per cent to 32.2 mtoe. This followed a 16 per cent reduction between 2021 and 2022. The main fuel contributing to the year-on-year decrease between 2022 and 2023 was natural gas, which fell by 8.5 per cent (1.9 mtoe).

On a temperature corrected basis, domestic consumption was higher at 34.0 mtoe. This was 7.4 per cent lower than the temperature corrected consumption for 2022, a larger fall than the unadjusted figures. This suggests there were factors other than temperature contributing to the fall in consumption between 2022 and 2023, such as behavioural changes due to higher energy and other prices.

Chart 1.2 Domestic consumption, temperature-corrected domestic consumption and average annual temperatures, 2002 to 2023 (Table C5)



Additional Statistics on Consumption in the domestic sector from the Department of Energy Security and Net Zero

National Energy Efficiency Data Framework (NEED)
Published 25 July 2024;

Mean and median electricity and gas consumption of domestic properties in 2021 by property characteristics and household attributes.

Estimates of the impact of installing energy efficiency measures on energy consumption

Household Energy Efficiency Statistics
Last updated 19 September 2024;

Statistics relating to the Energy Company Obligation (ECO) and Green Deal.

The detailed report is published monthly, with more detailed quarterly and annual updates.

Fuel Poverty Statistics

The main report was published 14 February 2024 covering the year 2023

Sub-national electricity and gas consumption data
Published 25 January 2024;

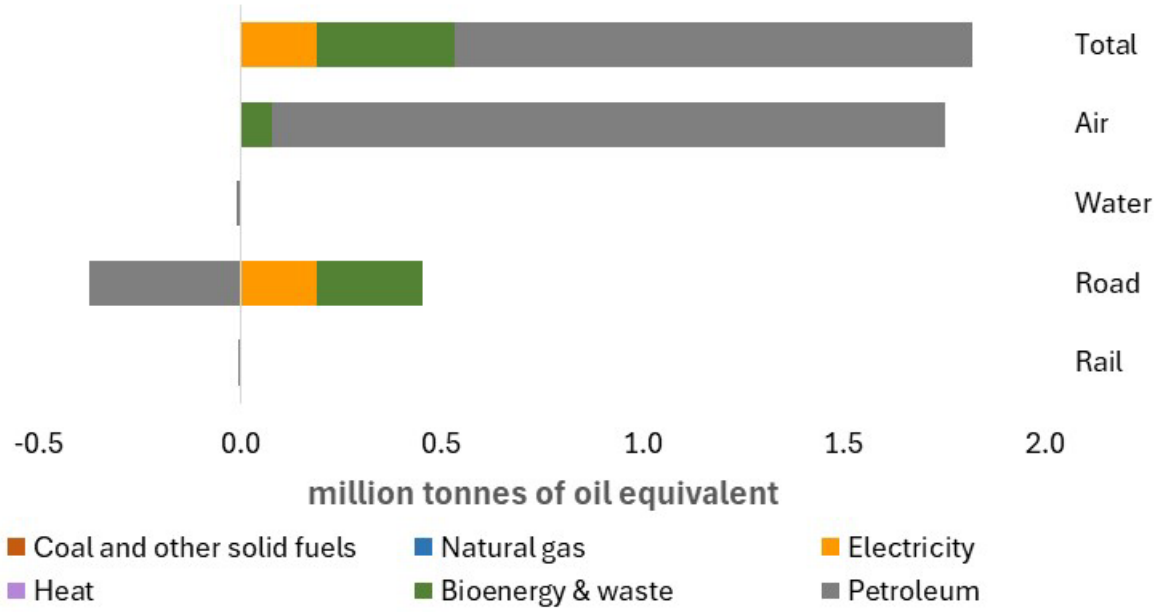
Estimates of consumption at the subnational level. Number of electricity and gas meters, total, mean and median consumption by fuel.

Transport

Between 1970 and 2008 energy consumption in the transport sector was on a steadily increasing trend as road and air traffic volume increased.[1] Consumption was negatively impacted in 2008 as a result of the financial crisis, and then again in 2020 during the Covid-19 pandemic. The transport sector has been the biggest component of final energy consumption in the UK each year since 1998. In 2023 the sector accounted for 52.6 mtoe, 42 per cent of the total energy consumption. The vast majority of consumption in the transport sector is from petroleum fuel (93 per cent). When considering transport modes, road transport is the biggest contributor to transport energy consumption at 73 per cent, followed by air at 24 per cent. Rail and water transport contribute approximately 2 per cent and 1 per cent respectively.

Between 2022 and 2023 transport energy consumption increased by 3.6 per cent to 52.6 mtoe. However this is still 6.5 per cent below the 56.3 mtoe consumed in 2019 before the impact of travel restrictions associated with the Covid-19 pandemic. Chart 1.3 shows the change in consumption by travel mode from 2022 to 2023. This shows the increase in consumption in transport in 2023 is primarily driven by air travel, which has continued to recover since the pandemic. The 2023 energy consumption for air travel was less than 1.0 mtoe lower than energy consumption for air travel in 2019.

Chart 1.3 Change in consumption in transport by travel mode, 2022 to 2023 (Table C1)

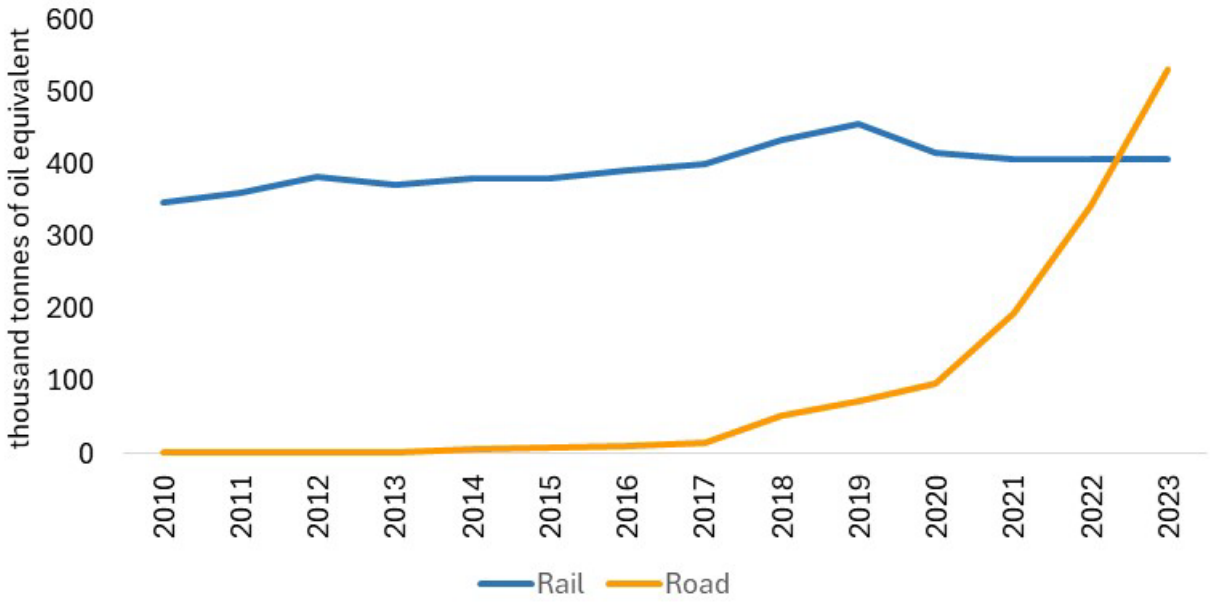


Electricity consumption remains a small component of overall road transport energy consumption at 0.5 mtoe out of 38.4 mtoe. However, electricity consumption in the road sector is rising each year, increasing by 55 per cent from 2022 to 2023. According to data from the Department for Transport, 455,240 plug-in electric cars were registered for the first time in 2023 compared to 367,737 in 2022 (a 24 per cent increase)[2]. In 2023, the estimate of electricity consumption in road electric vehicles (531 ktoe) exceeded that of electricity used in the rail sector (408 ktoe) for the first time.

[1] Department for Transport – Road traffic estimates, Department for Transport / Civil Aviation Authority – Aviation statistics

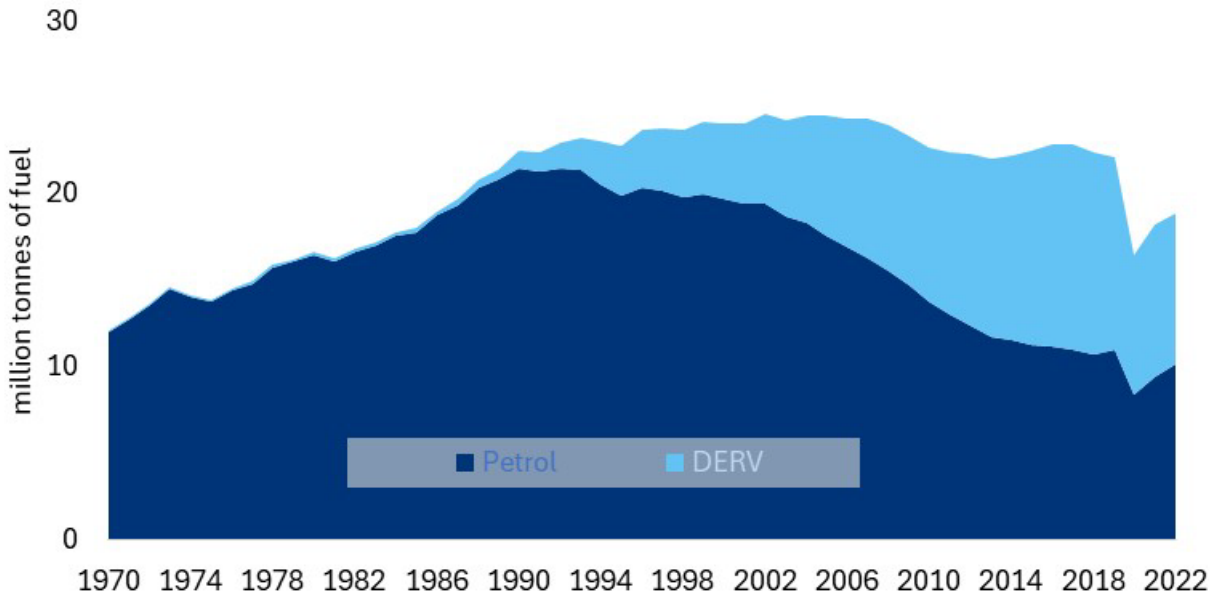
[2] See Department for Transport - Vehicle licensing statistics data tables – Table VEH1153b

Chart 1.4 Electricity consumption in road and rail sectors, 2010 to 2023 (Table C1)



Consumption data with detailed breakdown by vehicle type is only available up to 2022 (Table C8).[3] Cars were the largest consumer of road transport fuel, with 18.9 million tonnes of fuel (petrol and diesel combined) consumed in 2022 (56 per cent of the total). Overall fuel use in cars increased by 3.7 per cent from 2021 to 2022, however this was made up of a 7.9 per cent increase in petrol use in cars and a small decrease in diesel use of 0.8 per cent.[4] Biofuels contributed 6.7 per cent of the overall road fuel use in 2022, up approximately 1.5 percentage points from 2021.[5]

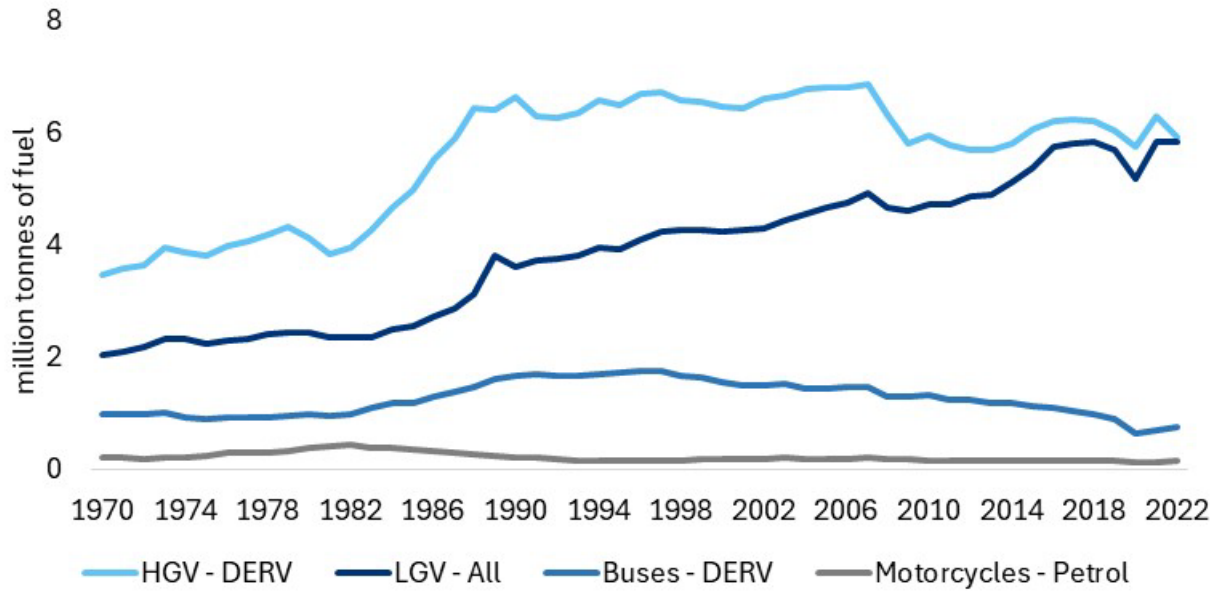
Chart 1.5 Petrol and diesel (DERV) consumption for cars, 1970 to 2022 (Table C8)



[3] This data is sourced from an external contractor
[4] These estimates do not account for electricity consumption in road transport
[5] Biofuels data is not allocated to vehicle type in this data

Over the last 30 years consumption in light goods vehicles (LGVs) has been increasing and is now almost equal to the consumption in heavy goods vehicles (HGVs). Fuel consumption in HGVs decreased by 5.5 per cent between 2021 and 2022, while consumption in LGVs remained broadly static. Buses and motorcycles both saw increases in fuel consumption between 2021 and 2022, 7.8 per cent and 11 per cent respectively. Overall, LGVs and motorcycles are the only vehicle types for which fuel consumption was higher in 2022 than it was in 2019 pre-pandemic. Consumption for other road vehicles (excluding cars) is shown in Chart 1.6.

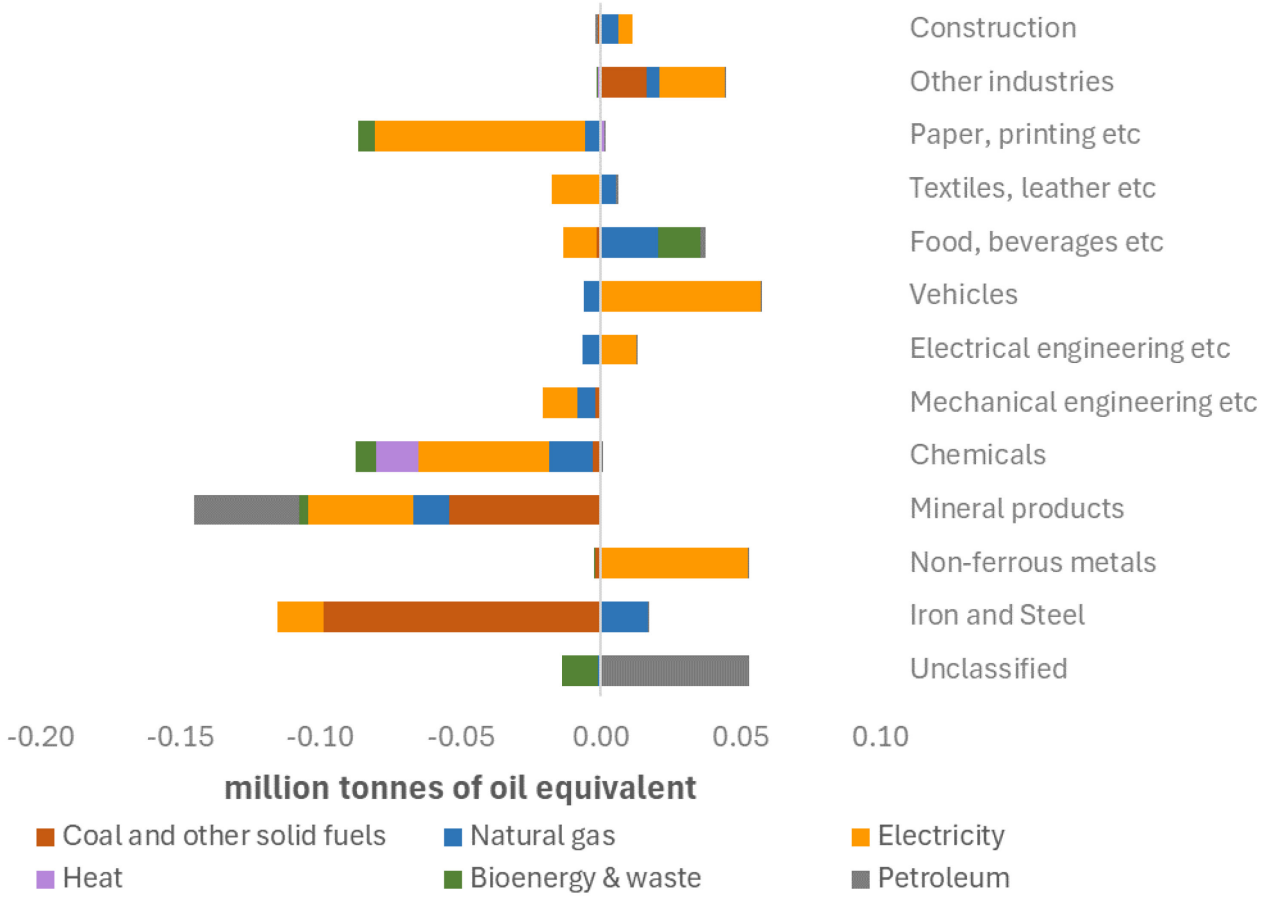
Chart 1.6 Consumption by other types of vehicles (excluding electricity), 1970 to 2022 (Table C8)



Industry

Energy consumption in the industry sector decreased steadily from 1970 to 2008. Between 2008 and 2009 there was a sharp fall in energy consumption associated with the financial crisis, after which the decreasing trend has continued but at a slower rate. Energy consumption was largely static between 2022 and 2023, with only a small decrease of 0.2 mtoe (1.1 per cent) seen. However, this is the lowest annual energy consumption in the industry sector since the start of the time series in 1970. There was more of a mixed picture across different industrial sectors. Mineral products and iron and steel saw the biggest decreases between 2022 and 2023, which for iron and steel was mostly due to a reduction in the energy consumption from coal and other solid fuels. Non-ferrous metals and vehicles had the largest increase year-on-year, mainly driven by increases in electricity consumption.

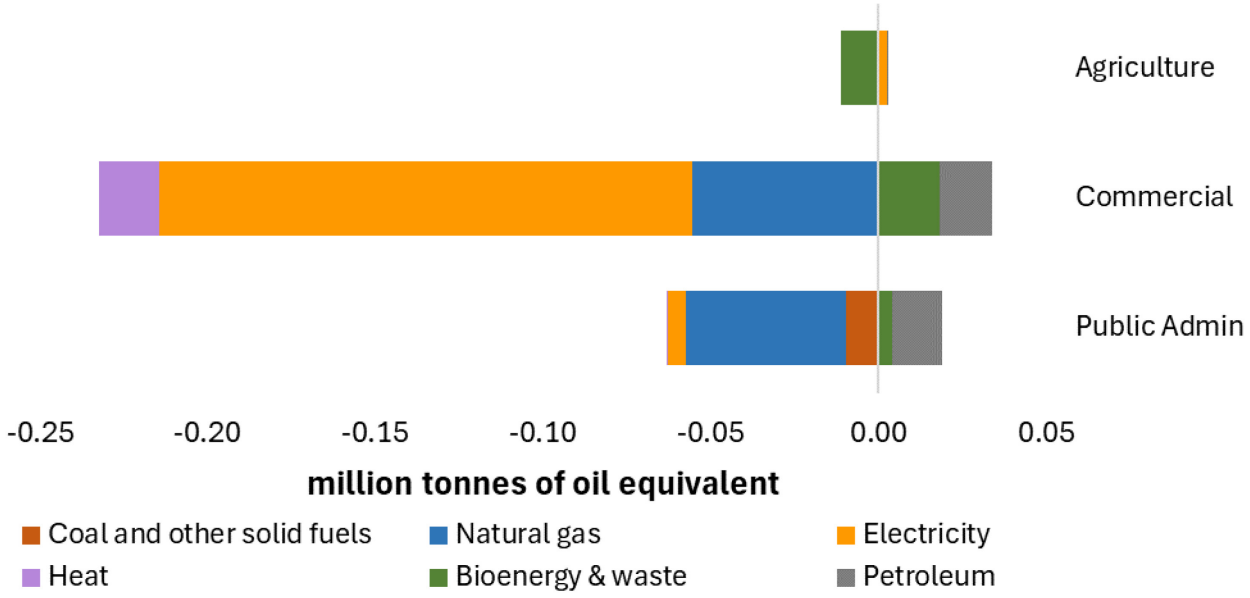
Chart 1.7 Change in industrial consumption sub-sectors, 2022 to 2023 (Table C2)



Services

Consumption in the services sector decreased by 0.3 mtoe between 2022 and 2023. There was a relatively large reduction in energy consumption from electricity in the commercial sub-sector. The commercial and public administration sub-sectors both also saw reductions in energy consumption from natural gas (Chart 1.8), which is likely a continuation of the impact of high energy and other prices reducing the demand for space heating.

Chart 1.8 Changes in services consumption, 2022 to 2023 (Table C4)



Chapter 2: Energy intensity

What is energy intensity?

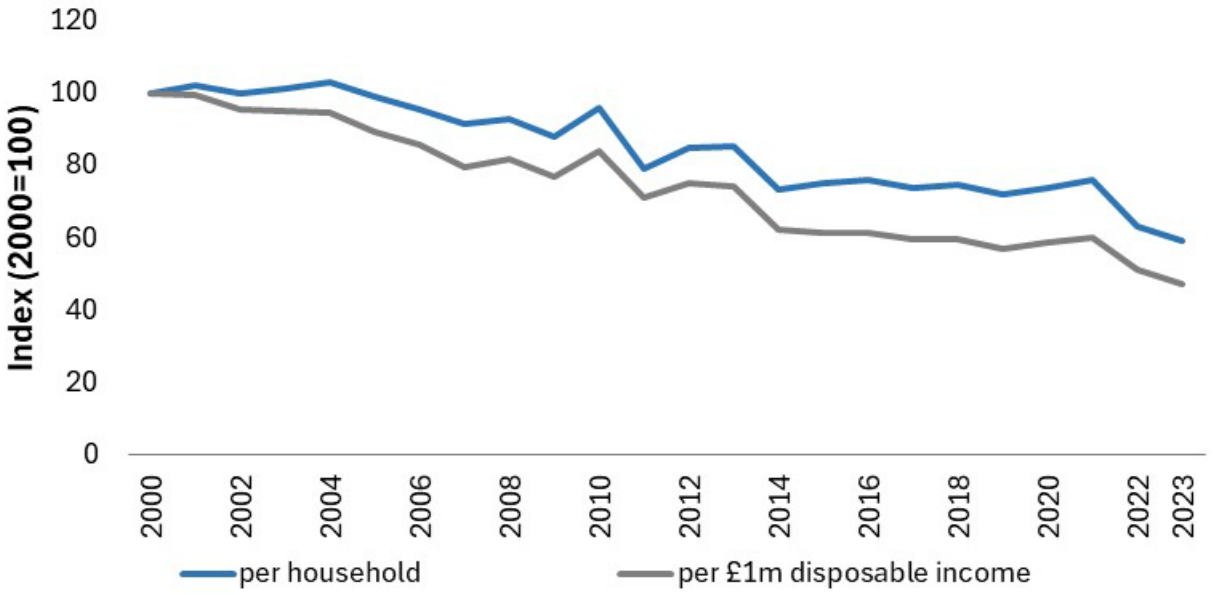
Energy Intensity is the amount of energy per unit of output. It includes (but is not limited to) energy efficiency changes. Units of output vary depending on the sector and sub-sector and relate to economic activity such as number of passengers and distance travelled for the transport sector, whilst changes in the Office for National Statistics Index of Production data are used to estimate trends in the output for the industrial sector. For the domestic sector intensity is calculated using population and household data, and will be impacted by the efficiencies of boilers, appliances and lighting.

The ECUK methodology document provides further information on the output factors used for each sub-sector. Further details on the definitions and terminology used in this release can be found in Chapter 5: Technical information and the DUKES glossary.

Domestic

The long-term trend since 2000 has been a reduction in the domestic energy intensity, which can be attributed to improved insulation and more efficient boilers, lighting and consumer appliances. A small increase in domestic energy intensity was seen in 2020 and 2021 as a result of lockdowns and increased home working during the Covid-19 pandemic. Between 2022 and 2023 consumption per household decreased by 6.4 per cent. This follows a large decrease of 17 per cent between 2021 and 2022, which reflected warmer weather and higher energy and other prices. Chart 2.1 shows the long-term trend in consumption per household, alongside a similar metric of consumption per £1m of disposable income. Both of which demonstrate the long-term reducing trend.

Chart 2.1 Indexed change in energy intensity per household and on disposable income basis, 2000 to 2023 (Table I3)



Transport

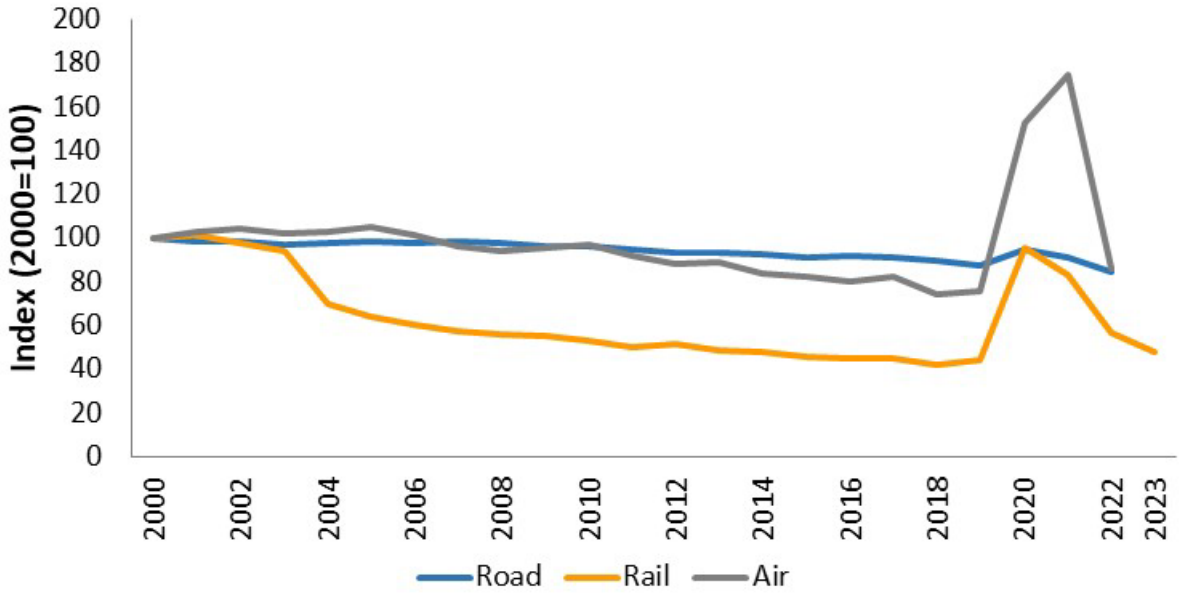
For road and air transport the latest traffic data is for the year 2022. In 2022 there were an estimated 672 billion road passenger kilometres travelled in Great Britain.[6] This was up from 595 billion in 2021 but still 9.3 per cent lower than the 741 billion road passenger kilometres travelled in 2019. Energy consumption per billion passenger kilometres decreased by 7.1 per cent from 2021 to 2022 to 35.4 mtoe. This is lower than the pre pandemic figure of 36.5 mtoe per billion passenger kilometres, possibly due to the phasing out of older less efficient vehicles. The energy intensity of road transport was less affected by the pandemic than rail or air transport (Chart 2.2).

Air passenger travel fell from 385 billion passenger kilometres in 2019 to 67 billion passenger km in 2021 due to Covid-19 related travel restrictions. Between 2021 and 2022 some of this fall was reversed, with 270 billion passenger kilometres travelled.[7] Consequently, energy intensity for air travel decreased (improved) by 51 per cent to 39.4 ktoe per billion passenger kilometres in 2022. However, this was still higher than the energy intensity seen in 2019 (34.7 ktoe per billion passenger kilometres),[8] which is likely due to planes still flying at a lower level of occupation than they did prior to the Covid-19 pandemic.

For rail travel data including 2023 is available. Post-pandemic increases in rail passenger travel continued in 2023, from 50.6 billion passenger kilometres in 2022 to 58.4 billion passenger kilometres in 2023.[9] Similarly to road and air, rail passenger travel is still below pre-pandemic levels. In 2023 the energy intensity for rail travel decreased (improved) to 17.2 ktoe per billion passenger kilometres. This is still slightly higher than the 2019 figure of 15.4 ktoe per billion passenger kilometres. Energy consumption in the rail sector was almost static in 2023 compared to 2022, which indicates that the improvement in energy intensity is a result of higher passenger loadings on trains.

Chart 2.2 shows the energy intensity for road, rail and air transport indexed to the year 2000. This demonstrates the large post-pandemic recovery of energy intensity in the rail and air sectors, while the energy intensity of road transport has been more static throughout the time series.

Chart 2.2 Change in energy intensity for passenger transport, 2000 to 2022 (2023 for rail) (Table I2)

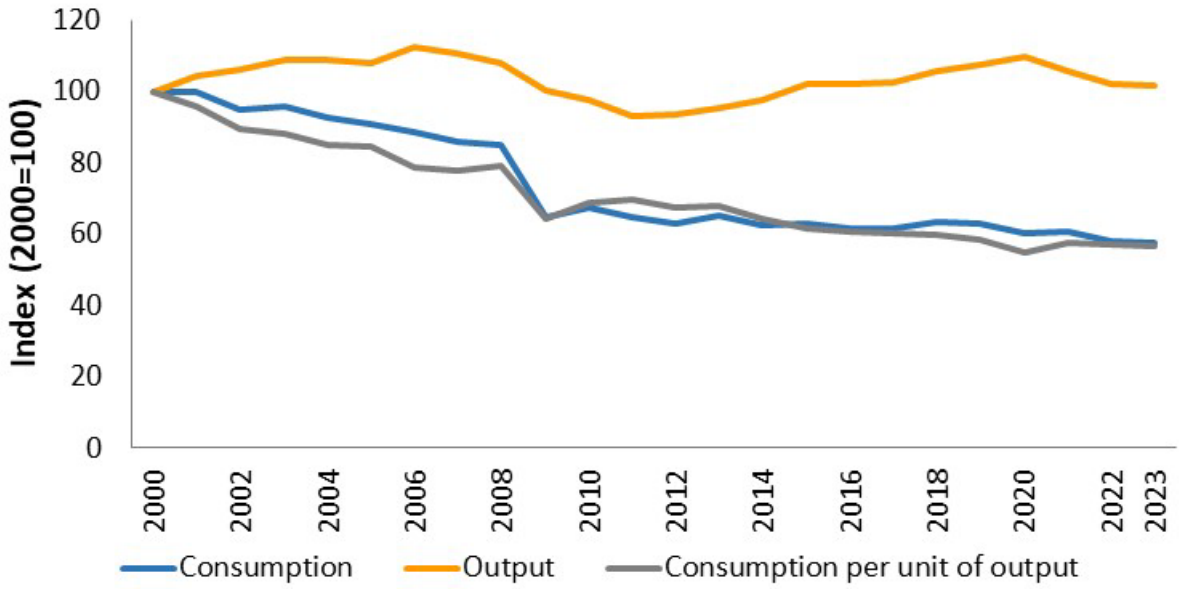


[6] Department for Transport TSGB0101
[7] Department for Transport AVI0201
[8] The passenger kilometre measure used for this intensity calculation is for UK airlines worldwide rather than for aircraft taking off from UK airports as is used for energy consumption (Main outputs for UK airlines by type of service: UK airlines)
[9] Office of Rail and Road Passenger Rail Usage

Industry

Energy consumption in the industry sector and estimates of output both decreased slightly between 2022 and 2023. Consequently, the energy intensity decreased by 0.6 per cent from 217 to 216 ktoe per unit of output, which is the lowest energy intensity since 1970.[10] The decrease in industrial energy intensity in 2023 is a continuation of a long-term falling trend which has seen energy intensity fall consistently since 1970. This is attributable to changes in the kinds of products being manufactured as well as increased process efficiency.

Chart 2.3 Indexed change in industrial consumption, output and intensity, 2000 to 2023 (Table I4)

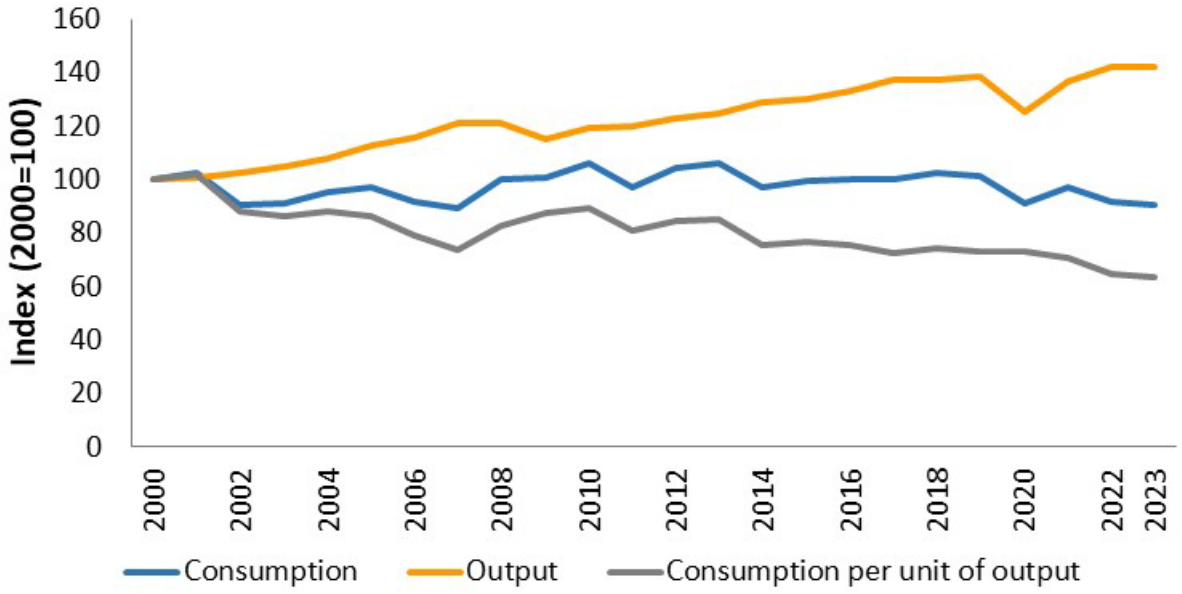


[10] Office for National Statistics economic output data

Services

For the second year running economic activity in the services sector (excl. agriculture) exceeded the pre-pandemic output of 2019. While output in the services sector has been increasing since the pandemic, overall energy consumption has been decreasing, which is reflected in a fall in the energy intensity of the services sector, with the 2023 value of 173 ktoe per unit of output being 2.2 per cent and 11 per cent below the 2022 and 2019 values respectively. The reduction in energy consumption in this sector is likely to be at last partly related to warmer temperatures and behavioural changes from high energy prices motivating tighter control of energy use.

Chart 2.4 Indexed change in services consumption (excluding agriculture), output and intensity, 2000 to 2023 (Table I4)



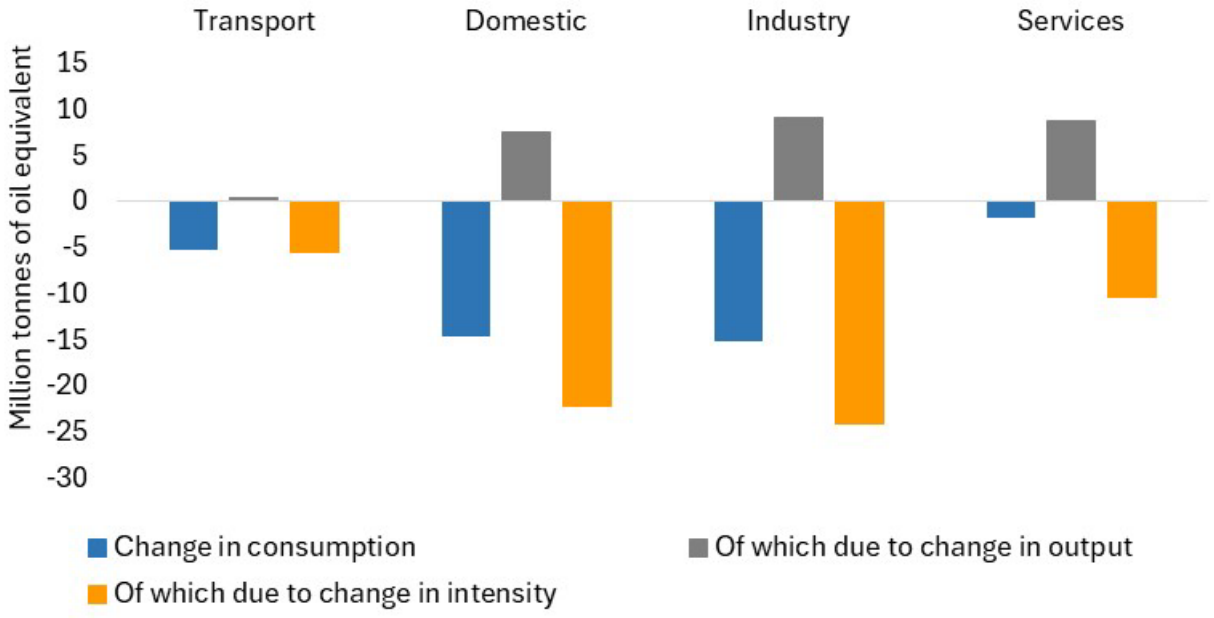
Output and intensity factors

Table I6 in the data tables shows a comparison of the effects on consumption due to output and intensity changes between 2000 and 2023 (2022 for transport). The output effect is the change in consumption which would have occurred had all other factors remained constant. The remaining difference is then the intensity effect.

Chart 2.5 shows the contributions of changes in output and changes in intensity to changes in energy consumption since 2000.

Decreased energy intensity has more than offset all the increased consumption we would have seen due to economic growth in services and industry. Similarly, in the domestic sector energy consumption has decreased despite increasing numbers of households. In the transport sector the change in consumption is almost exclusively a result of improved energy intensity, as there has been relatively little change in output since 2000.

Chart 2.5 Output and intensity effects by sector 2000 to 2023 (2022 for transport) (ECUK Table I6)



Chapter 3: Primary energy consumption

What is primary energy consumption?

Primary Energy Consumption is the amount of fuel used prior to any loss of energy through conversion or transformation. The primary energy equivalent includes the losses incurred during the transformation process.

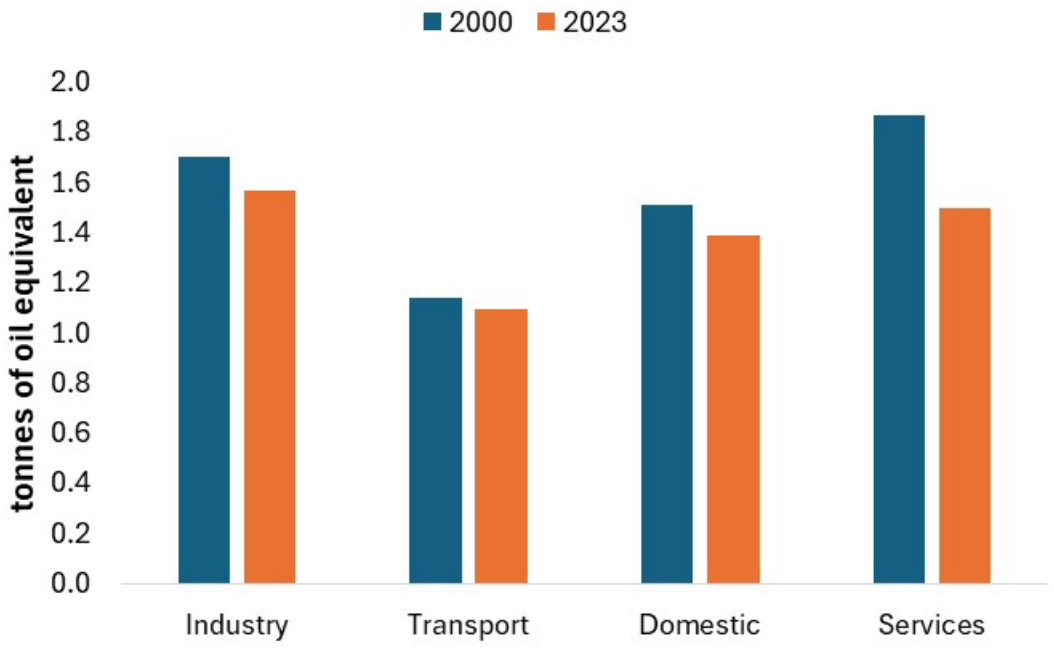
Primary consumption data are calculated by taking the final consumption fuel mix and apportioning to the fuel input required to produce the final unit of consumption. Most of the conversion losses are in generating electricity from combustible fuels so those sectors with a high proportion of electricity consumption have a relatively large absolute primary equivalent value. Further details on the definitions and terminology used in this release can be found in Chapter 5: Technical information and the DUKES glossary.

Primary energy consumption dropped by 2.9 per cent from 2022 to 2023 to 163.8 mtoe. The transport sector was the only sector with an increase in primary energy consumption from 2022 to 2023, increasing by 3.7 per cent to 57.6 mtoe. The services sector saw the largest fall, decreasing 7.7 per cent to 44.7 mtoe.

Conversion factors are a measure of the efficiency of transformation calculated as the ratio of primary energy and final energy consumption. These factors represent how many tonnes of oil equivalent are required to produce one tonne of oil equivalent final consumption.

Chart 3.1 shows a comparison of factors across the sectors between 2000 and 2023, and demonstrates the services sector saw the largest reduction in conversion factor, decreasing by 20 per cent (0.37 toe) over this time period. All sectors show a reduction in conversion factors indicating conversion efficiency improvements but also the effects of fuel switching away from fossil fuels, increasing the proportion of primary electricity generation, particularly renewables such as wind and solar, which are treated as having no conversion losses.

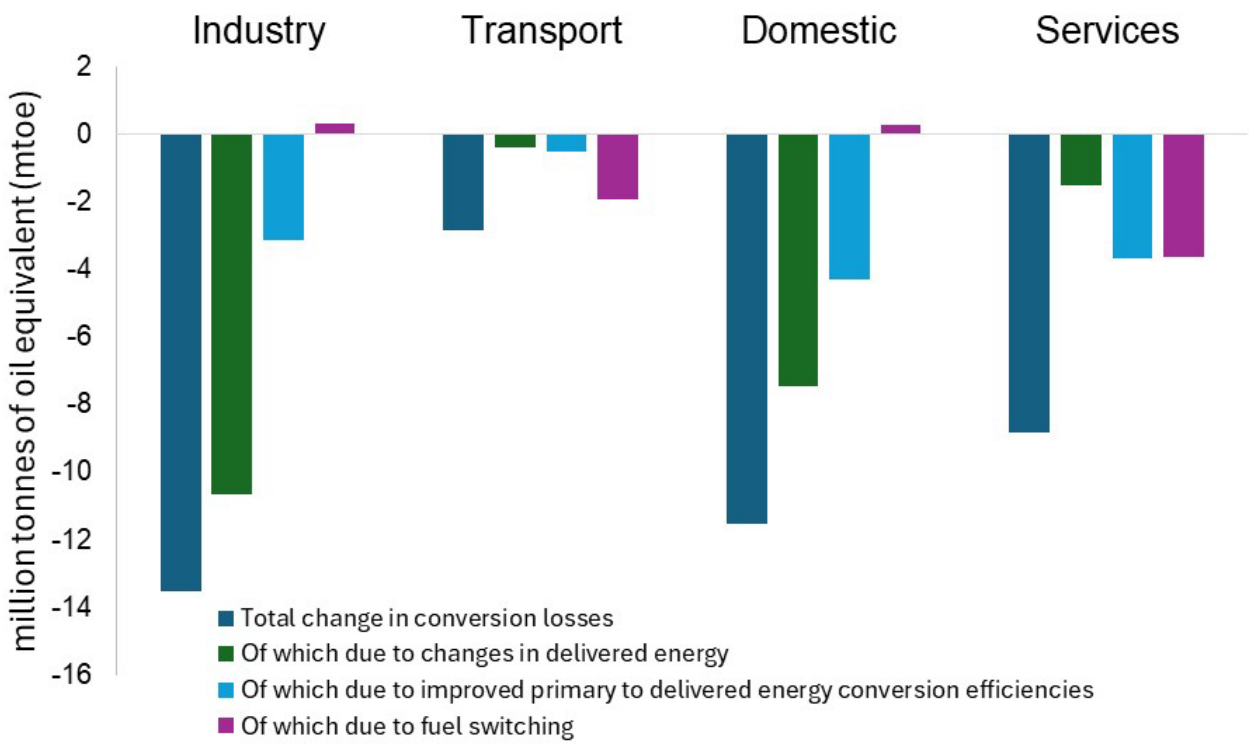
Chart 3.1 Changes in conversion factors from 2000 to 2023 (Table P3)



Between 2000 and 2023 there was a 71.0 mtoe overall reduction in primary energy consumption. This was contributed to almost equally by a reduction in delivered energy (34.3 mtoe) and changes in conversion losses (36.7 mtoe).

Chart 3.2 quantifies the changes in conversion losses due to changes in final consumption (conversion losses will fall if less fuel is being converted), efficiency improvements and fuel switching. All sectors show a reduction in conversion losses, which for industry and domestic has mainly been contributed to by reductions in final consumption and improved conversion efficiencies. The effect of fuel switching is seen more in the transport and services sector.

Chart 3.2 Changes in conversion losses from 2000 to 2023 (Table P5)



Chapter 4: Additional tables

End uses

The end uses tables show how energy is being used, for example for space or water heating. Understanding what energy is eventually used for is useful in assessing consumer behaviours which in turn contributes to developing policies and establishing future strategies. Estimating end uses is difficult and some sectors are more challenging than others due to data availability. Most estimates are modelled and use assumptions.

Final consumption data are sourced from Consumption Table C1 and proportions are applied to estimate end uses. For the domestic sector (Table U3) the assumptions are updated each year using data collected for the English Housing Survey. For the industry sector, end use splits are based on estimates last updated in 2014. The splits for the services sector are sourced from the Building Energy Efficiency Survey (BEES) which was undertaken by the Department for Business, Energy and Industrial Strategy (BEIS) in 2015. For further information see the ECUK methodology note.

Electrical products

The electrical products tables show the stock of certain domestic and non-domestic appliances, including electricity consumption and efficiency bands. The data are derived from modelling individual products and are therefore not representative of total electricity consumption in the domestic and non-domestic sectors.

Data in the electrical products tables are the results of modelling against a prescribed but quite wide-ranging set of electrical products used in the home and workplace. The model provides estimates of the annual electricity consumption of certain domestic appliances (Table A1) and the number of appliances owned (Table A2). Average consumption per appliance (Table A3) is calculated by dividing the total consumption by the total stock. The resulting outputs are a sub-set of energy consumption in the home and workplace which can be used to assess trends in consumption. New modelling developed to inform updated Ecodesign policy has been used for lighting (2022 data onwards) and electric ovens and hobs (2015 data onwards) in Tables A1 – A3.

In 2021 the UK adopted new regulations on energy labels for refrigerators, washing machines, washer dryers, dishwashers, televisions and light sources. Table A6 has not been updated with the new labelling scheme. Details of the changes made to the labelling of electrical products and links to further information on relevant legislation can be found on the Label 2020 website.

Chapter 5: Technical information

Definitions

DUKES glossary	This covers definitions commonly used in energy statistics reporting. The majority of terms used in this publication are covered in the DUKES glossary
Energy Intensity	The amount of energy required to produce one unit of output. A reduction in energy intensity could imply an improvement in energy efficiency.
Energy Ratio	Temperature corrected total inland consumption of primary energy per 1 million Gross Domestic Product (GDP) at market prices; it is a measure of how much energy is consumed per unit of economic activity (in this case 1m GDP).
Final Consumption	Energy consumed by final users after transformation.
Tonne Kilometres	The measure of how much freight has been moved using weight and distance.
Passenger Kilometres	This measure is based on how far each passenger travels; i.e. it is dependent not only on how many passengers, but also how far each one has travelled.
Primary Energy Equivalents	Final consumption plus energy in the transformation sector and losses incurred during conversion and transformation.
Temperature Corrected Consumption	Energy consumption adjusted for changes due to fluctuations in the weather, to allow underlying trends to be identified. DESNZ and the ONS have published methodology notes on temperature adjustments.
Tonne of oil equivalent	A common unit of energy measurement which enables different fuels to be directly compared and aggregated. One tonne of oil equivalent is set equal to 41.868 Giga Joules (GJ) or 11,630 kilo Watt hours (kWh). Quantities in this report are generally quoted in thousand or million tonnes of oil equivalent (ktoe, mtoe) apart from the electrical products tables where comparison with other tables is not relevant and the more usual GWh are provided.

Chapter 6: Further information

Accredited official statistics

These statistics are accredited official statistics. Accredited official statistics are called National Statistics in the Statistics and Registration Service Act 2007.

These accredited official statistics were independently reviewed by the Office for Statistics Regulation (OSR) in June 2014. They comply with the standards of trustworthiness, quality and value in the Code of Practice for Statistics.

Our statistical practice is regulated by the Office for Statistics Regulation.

OSR sets the standards of trustworthiness, quality and value in the Code of Practice for Statistics that all producers of official statistics should adhere to.

You are welcome to contact us by emailing energy.stats@energysecurity.gov.uk with any comments about how we meet these standards.

Alternatively, you can contact OSR by emailing regulation@statistics.gov.uk or via the OSR website.

Pre-release

Some ministers and officials receive access to these statistics up to 24 hours before release. Details of the arrangements for doing this and a list of the ministers and officials that receive pre-release access to these statistics can be found in the DESNZ statement of compliance with the Pre-Release Access to Official Statistics Order 2008.

User engagement

Users are encouraged to provide comments and feedback on how these statistics are used and how well they meet user needs. Comments on any issues relating to this statistical release are welcomed.

Contact

- Responsible statistician: Ashley Goddard
- Email: energy.stats@energysecurity.gov.uk
- Media enquiries: 0207 215 1000

This publication is available from: https://www.gov.uk/government/collections/energy-consumption-in-the-uk

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