Energy accounts

Statistics Explained

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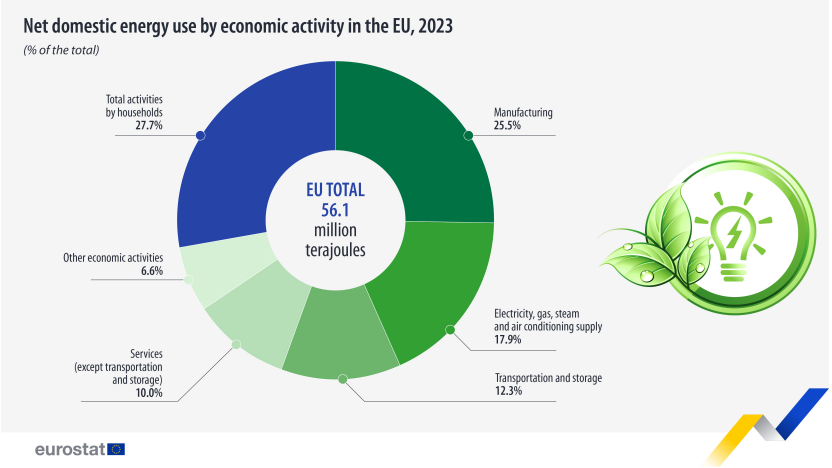
Highlights

2 economic activities – manufacturing and the supply of electricity, gas, steam and air conditioning – accounted for almost half of EU energy use in 2023 while generating less than 20% of its GDP.

Between 2014 and 2023, the EU's net domestic energy use dropped by 5 million terajoules while its gross value added increased by € 2.0 trillion. This resulted in a 25% decrease in the EU's energy intensity.



Source: Eurostat (env_ac_pefa04)

The European Union (EU) depends on a safe and reliable energy supply. In 2023, the EU's net domestic energy use was about 56 million terajoules . Of this, about 72% was used by businesses and government for their economic activities, powering a wide variety of economic sectors, and the remaining 28% was consumed by households. Across the EU, production activities were responsible for the largest share of net domestic energy use, in particular manufacturing (26% of overall net domestic energy use), electricity, gas, steam and air conditioning supply (18%), and transport and storage (12%).

This article is a part of the Eurostat online publication Statistics on climate change mitigation . The figures and statistics presented here are based on European environmental-economic accounts and macro-economic modelling using national accounts data, classifying economic activities according to the NACE classification . The article reports the economic activities with the largest shares of energy use across the EU, and compares the carbon dioxide (CO2) emissions caused by energy use. Such comparisons help decisionmakers and the public to better understand the changing profile of energy use, CO2emissions and economic activity across the EU.

Energy use by economic activity

Overall, the EU's net domestic energy use was stable from 2014 to 2019 but dipped significantly in 2020, during the COVID-19 pandemic. The drop was nearly reversed in 2021 as the economy reopened, followed by a declining trend through 2023. Figure 1 shows the evolution of overall net domestic energy use between 2014 and 2023 and the trends for economic activities . The main developments can be described as follows:

- Producers engaged in manufacturing decreased their net energy use by 12%, to 14.3 million terajoules in 2023.
- Households decreased their energy use by 1%, to 15.6 million terajoules.
- Producers of electricity, gas, steam and air conditioning supply reduced their net energy use by 26%, to 10.1 million terajoules. Energy use for this activity includes the transformation losses and own energy use incurred during the supply and distribution of electricity, gas and heat, whereas the end use of these products is assigned to the respective end user.
- Energy use by providers of transportation and storage services grew by 15%, reaching 6.9 million terajoules; this includes energy use only by businesses whose main activity is transportation and storage.
- Services (except for transportation and storage) decreased their energy use by 4%, to 5.6 million terajoules.

The following 2 sections take a closer look at the 2 largest energy users in the EU – manufacturing and households.

Figure 1 **Energy use in the manufacturing sector**

Figure 2 shows the net domestic energy use for selected manufacturing activities. The chemical industry (NACE code C20) is the largest energy user within manufacturing. It accounted for around 7% of the EU's overall net domestic energy use in 2023. Substantial amounts of this energy were used to transform or produce petroleum products and plastics. The second and third largest energy users in the manufacturing sector are the production of basic metals (NACE code C24) and manufacture of coke and refined petroleum products (NACE code C19), each with around 4% of overall net domestic energy use in the EU.

Figure 2 **Energy use by households**

Households account for about one quarter (28%) of the EU's net domestic energy use (15.6 million terajoules in 2023). As shown in Figure 3, at EU level more than half of this energy (53%) was used for heating and cooling. The remainder went to private transportation (38%) and other activities (9%), which includes for example electricity for home appliances. Over the period 2014 to 2023, the amount of energy that EU households used for heating and cooling decreased by 1%. After experiencing a sharp decline in 2020 during the COVID-29 pandemic, the amount of energy that households used for transport has returned to 2014 levels. The energy used by other household activities decreased by 4% during the same period in the EU.

Figure 3

Energy use and gross value added

Combining data from energy accounts with national accounts makes it possible to analyse net domestic energy use relative to the value added created by producers, also referred to as energy intensity . Gross value added measures the creation of value by each production activity , making it a suitable yardstick for comparing energy use across the whole economy. A decrease in energy intensity means less energy is needed to create the same amount of value added – or more value added is produced out of the same amount of energy – indicating that a production activity has become more energy efficient . Changes in energy intensity for the overall economy are driven both by changes in the energy intensity of particular production activities and by changes in the composition of the overall economy in terms of production activities. Energy use by households is not included in the calculation of energy intensity because households do not generate gross value added.

Evolution of energy intensity of gross value added

Map 1 shows the change in net domestic energy use intensity of the economy for the EU and EFTA countries over the period 2014 to 2023. The map shows the mixed pace across Europe as the continent moves toward greater energy efficiency in its production activities. Estonia, Ireland and the Netherlands saw the most rapid declines, with falls of 43%, 43% and 37% respectively. In Estonia, the main driver was a 90% decrease in energy use in electricity, gas, steam and air conditioning supply and a 35% decline in gross value added for that activity, which led to both a much smaller sector and 85% drop in its energy intensity. In Ireland, the decrease in energy intensity was driven mainly by significant changes in the energy intensity of manufacturing, which saw a 198% increase in gross value added and almost no change in energy use, as well as by dramatic growth in the information and communication sector, in which energy intensity is well below the average. In the Netherlands, the largest driver was a 95% drop in energy use and 85% drop in gross value added in the energy-intensive mining and quarrying sector. In addition, energy use in manufacturing dropped by 13% while gross value added in that sector increased by 33%, while the electricity, gas, steam and air conditioning supply sector experienced a similar decrease of 34% in energy use alongside growth of 23% in gross value added.

Lithuania represents a notable outlier, with an increase of 9% in energy intensity driven almost entirely by a 208% growth in energy use in transportation and storage, while gross value added in that activity increased at a much slower rate, by 28%.

Drivers behind the changes in energy intensity of gross value added

Figure 4 provides a a standardised comparison of changes in net domestic energy use, gross value added and energy intensity for the period 2014 to 2023, using indices. The figure shows that at EU level, with the exception of the year 2020, gross value added grew steadily while net domestic energy use dropped to 88% of its 2014 level. The combined effects of those 2 trends brought energy intensity in 2023 down to 75% of its 2014 level. This same basic story played out across the majority of EU countries. Notable exceptions were Lithuania and Malta, where energy intensity grew. Two European countries, Estonia and Ireland, experienced reductions in energy intensity of more than 40% during the period, followed closely by the Netherlands, Germany and Sweden, all of which had reductions of around 35%.

Figure 4 **Energy intensity of gross value added by economic activity**

In the EU, overall energy intensity of gross value added decreased by 25% between 2014 and 2023. The trends at the level of individual economic activities were the following:

- Mining and quarrying had the largest relative decline in energy intensity in the EU, dropping by 42%, from 21.8 to 12.7 terajoules per million euro); this was driven by a large drop (60%) in net domestic energy use while the gross value added declined by a smaller amount (-31%)

- Producers of electricity, gas, steam and air conditioning supply saw a 26% reduction in energy use from 2014 to 2023, by 3.6 million terajoules, while their gross value added dropped by 32%; this corresponds to an energy intensity increase of 9%

- Net domestic energy use by transportation and storage services rose by 0.89 million terajoules, the largest increase in energy use of any activity (15%)

- The manufacturing sector's energy intensity declined by 27%, driven by a combination of growth in gross value added (up 20% from 2014 to 2023) accompanied by a drop in energy use of 2.0 million terajoules (down 12%) over the period

The ongoing structural change of the European economy towards a more service-oriented economy is an important driver of energy intensity changes, because producing services generally takes less energy (meaning it is generally less energy intensive) than producing goods. Figure 5 shows the change in gross value added and net domestic energy for the period 2014 to 2023 for economic activities. Over this period, gross value added in services in the EU grew by 19% while net domestic energy use of services declined by 4%. As a result, the energy intensity of services in the EU decreased from 0.74 to 0.58 terajoules per million euro, a decline of 21%.

Figure 5

Energy use and carbon dioxide emissions

Carbon dioxide (CO2) emissions are the most significant contribution of energy use to climate change , resulting almost exclusively from the combustion of fossil fuels . However, not all energy use is equally damaging as regards emissions of CO2. Combining data on energy use of economic activities with their CO2emissions helps to identify the most important areas for decarbonisation strategies.

The CO2emissions intensity of energy use is defined as the CO2emissions per unit of net domestic energy use . Higher values mean more CO2is emitted for the same amount of energy used. Figure 6 shows the variation across economic activities for the year 2023. The CO2emissions intensity of production activities in the EU was 52 tonnes of CO2per terajoule in 2023. If household activities are included, the total intensity figure for the EU is slightly lower (49 tonnes of CO2per terajoule). Agriculture, forestry and fishing had the highest intensity level, at 68 tonnes of CO2per terajoule in 2023, followed by transportation and storage with 65 tonnes. Services (except transportation and storage) had the lowest intensity level, at 36 tonnes of CO2per terajoule in 2023.

Figure 6

Comparing countries also reveals significant variations in the CO2emission intensity of net domestic energy use. As shown in Figure 7, Cyprus, Poland, Malta, Ireland and Greece had the highest intensity levels in 2023, with over 60 tonnes of CO2per terajoule, whereas Sweden, Finland, and France had significantly lower CO2emissions intensities. Compared with 2014, nearly all EU countries reduced their CO2emission intensity of net domestic energy use, except for the Netherlands and Slovenia, which experienced slight increases over the period. The CO2emission intensity of net domestic energy use depends mainly on the type of energy source that is used to generate the energy (e.g. coal vs biomass or wind) as well as on the efficiency of the process (e.g. how much energy can be generated from a piece of coal).

Figure 7

Data sources

This article presents data on net domestic energy use from Eurostat's energy accounts (full name: physical energy flow accounts), one of the environmental-economic accounts . Energy accounts have been developed in line with

the accounting structures and principles of the System of Environmental-Economic Accounting (SEEA) and record energy flow data as follows:

- From the environment to the economy, called natural energy inputs (for example, extractions of oil resources)
- Within the economy, called energy products (for example, transport diesel)
- From the economy back to the environment, called energy residuals (for example, losses in form of heat)

Energy accounts thus present the supply and use of natural energy inputs, energy products and energy residuals. Since energy can neither be created nor destroyed, the same energy can flow into multiple economic activities, either as an unchanged energy product or as energy that has been transformed from one form into another. This aspect is important to consider when looking at energy flows at the level of the overall economy to avoid double counting the energy.

The concept of net domestic energy use avoids double counting by denoting only the energy that a given economic activity makes unavailable elsewhere by using that energy. The 2 major forms of unavailable energy are:

1. dissipative heat released to the environment
2. energy temporarily stored in a product for non-energy purposes such as plastics, bitumen or lubricants

Energy accounts complement traditional energy statistics, balances and derived indicators, which are the reference data source to monitor EU energy policies. The economic scope of energy accounts is identical to that of GDP and other macroeconomic statistics, and they also use the same classifications of economic actors, economic activities (using the NACE classification) and economic transactions. This alignment makes energy accounts ideal for comparing energy production and consumption with gross domestic product (GDP) , gross value added , investment and other economic variables. This article is an example of the possibilities of such analyses. At the economy-wide level, net domestic energy use corresponds closely to 2 main indicators derived from Eurostat's energy balances , namely gross inland consumption and gross available energy .

In energy accounts, the data are organised by economic activity, using the NACE classification . Eurostat's energy accounts offer a detailed analysis by 64 economic activities following the EU's statistical classification of economic activities (NACE Rev. 2) from 2008 . The scope encompasses production by all businesses resident in the country, including those operating ships, aircraft and other transportation equipment in other countries. The NACE Rev. 2 groups used in this article are:

- Agriculture, forestry and fishing — NACE Rev. 2 Section A
- Mining and quarrying — NACE Rev. 2 Section B
- Manufacturing — NACE Rev. 2 Section C
- Electricity, gas, steam and air conditioning supply — NACE Rev. 2 Section D
- Water supply; sewerage, waste management and remediation activities — NACE Rev. 2 Section E
- Construction — NACE Rev. 2 Section F
- Transportation and storage — NACE Rev. 2 Section H
- Services (except transportation and storage) — NACE Rev. 2 Sections G to U, excluding H, in other words all remaining economic activities as defined in NACE without transportation and storage
- Total — all NACE activities

More detailed data on individual economic activities such as the manufacture of chemicals (C20) or of basic metals (C24) can be accessed through the data tables specified below each graph.

Energy accounts also include households as consumers. More detailed information can be found in Eurostat's Physical Energy Flow Accounts (PEFA) Manual 2014 .

Context

In the European Union, Regulation (EU) 691/2011 on European environmental economic accounts (including its amendments in 2014, 2022 and 2024) has established a common framework for the collection, compilation, transmission and evaluation of European environmental economic accounts , for the purpose of setting up environmental economic accounts as satellite accounts to the European System of Accounts (ESA). The environmental economic accounts in the Regulation are grouped in the following 6 modules:

- Air emissions accounts
- Economy-wide material flow accounts
- Environmental taxes
- Environmental protection expenditure accounts
- Environmental goods and services sector (EGSS) accounts
- Physical energy flow accounts

More information on these modules can be found through Eurostat's dedicated section on environment .

The most recent amendment of the Regulation - through Regulation (EU) 2024/3024 - introduced 3 further modules:

- Forest accounts
- Environmental subsidies and similar transfers accounts
- Ecosystem accounts

Preparing the implementation of these new modules is one of the key objectives of the European Strategy for environmental accounts (ESEA) for the period 2024-2028.

In line with the EU's commitment to tackling environmental challenges and becoming climate-neutral, the environmental accounts are vital for providing better information for supporting Europe's sustainable prosperity and competitiveness and its quality of life as well as for implementing the 8th Environmental Action Programme and the Sustainable Development Goals (SDGs) .

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