Sectoral Profile - Overview

Energy consumption pattern and drivers

Economic growth

- GDP growth slowed down to 0.4% in 2023.
- After an historic decrease in 2020 due to Covid crisis (-5.6%), GDP returned to growth with a strong rebound (+6%) in 2021 and substantial growth in 2022 (+3.4%).
- Between 2010 and 2019, economic growth reached 1.5%/year.

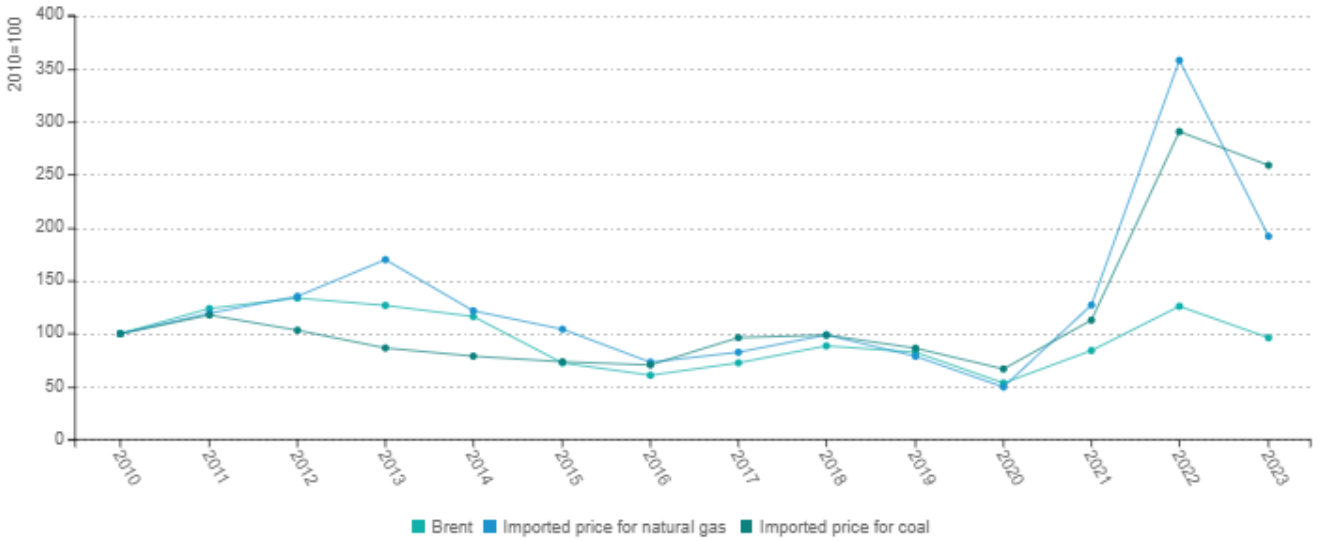
GDP growth in the EU



Energy prices

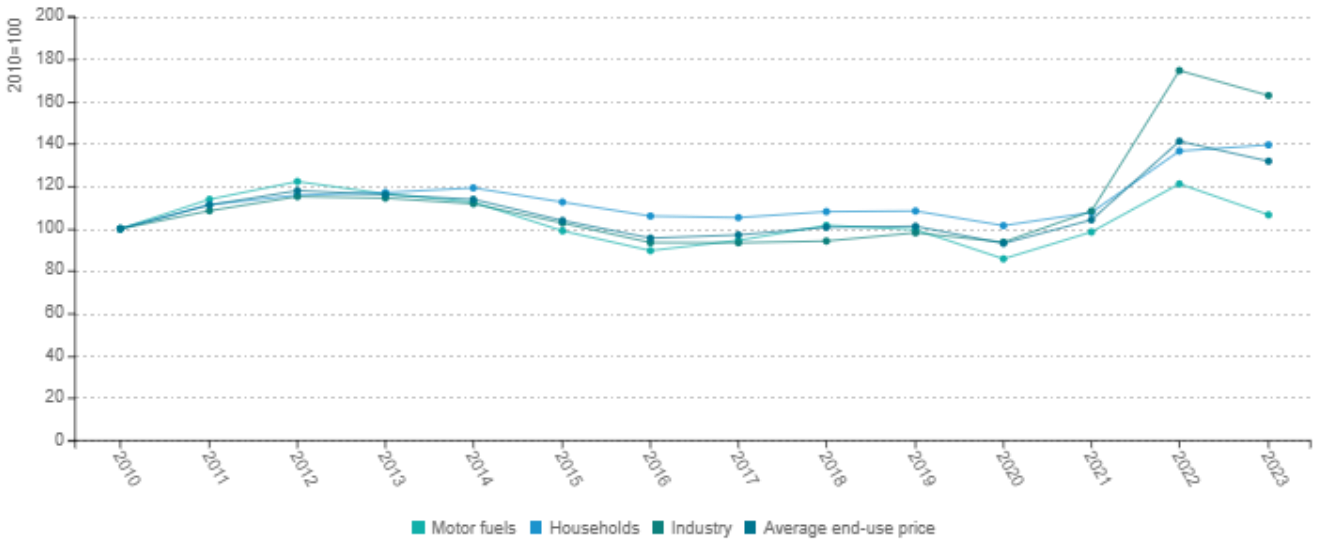
- International energy prices decreased in 2023 after 2022 peaks. However, gas and coal prices in 2023 are still 2.5 to 3 times higher than in 2019.
- International energy prices soared in 2022, particularly for gas and coal (+180% and +160% compared to 2021, respectively), following an already significant increase in 2021.
- Upward trend in international energy prices from 2016 to 2018 and decrease in 2019 and 2020.
- Significant decline in international prices over the period 2012-2016 after the sharp rise driven by the financial crisis of 2008.

International energy prices (EU)



- Decrease in motor fuels and industry energy prices in 2023 (respectively -12% and -7%), but households energy prices increased by 2% in 2023.
- This followed the surge in end-use energy prices in 2022 : +70% in the industry, +25% in the residential sector and +24% in the transport sector.
- Slight progression of end-use energy prices between 2016 and 2018.
- Between 2012 and 2016, rapid decrease of the average energy prices for final consumers

Average energy prices by sector (EU)

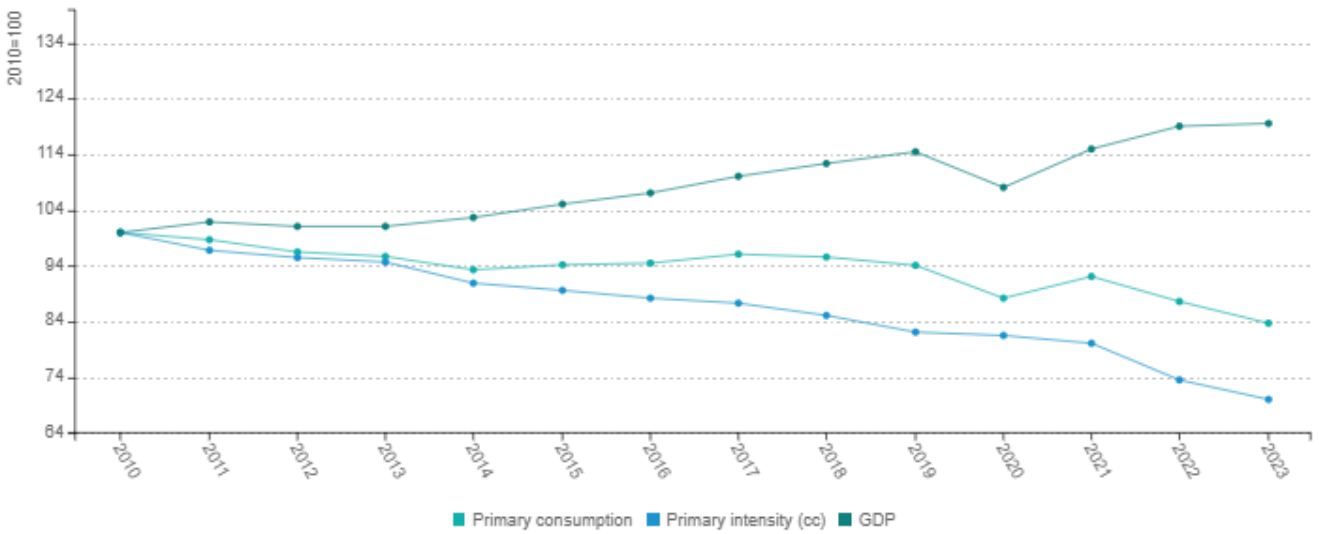


Source: Eurostat; energy prices by sector (at constant prices): weighted average prices by energy (electricity, gas, fuel, coal) on the basis of energy market shares.

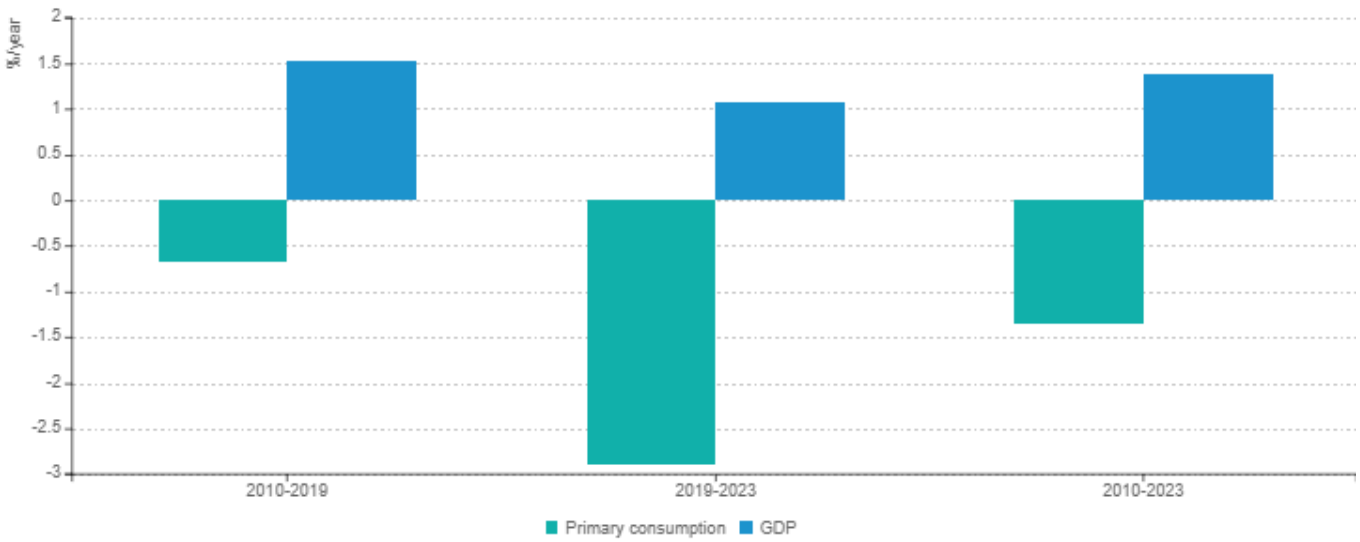
Primary consumption and GDP

- Decrease in primary consumption in 2023 (-4.5%) despite a slight increase in GDP (+0.4%).
- Stagnation of primary consumption between 2014 and 2019, although GDP increased by 2.2%/year. Downward trend in primary consumption since 2019 (-2.9%/year), despite GDP rising (+1.1%/year).
- This follows a decrease of 1.7%/year between 2010 and 2014.

Primary consumption (normal climate) and GDP trends in the EU

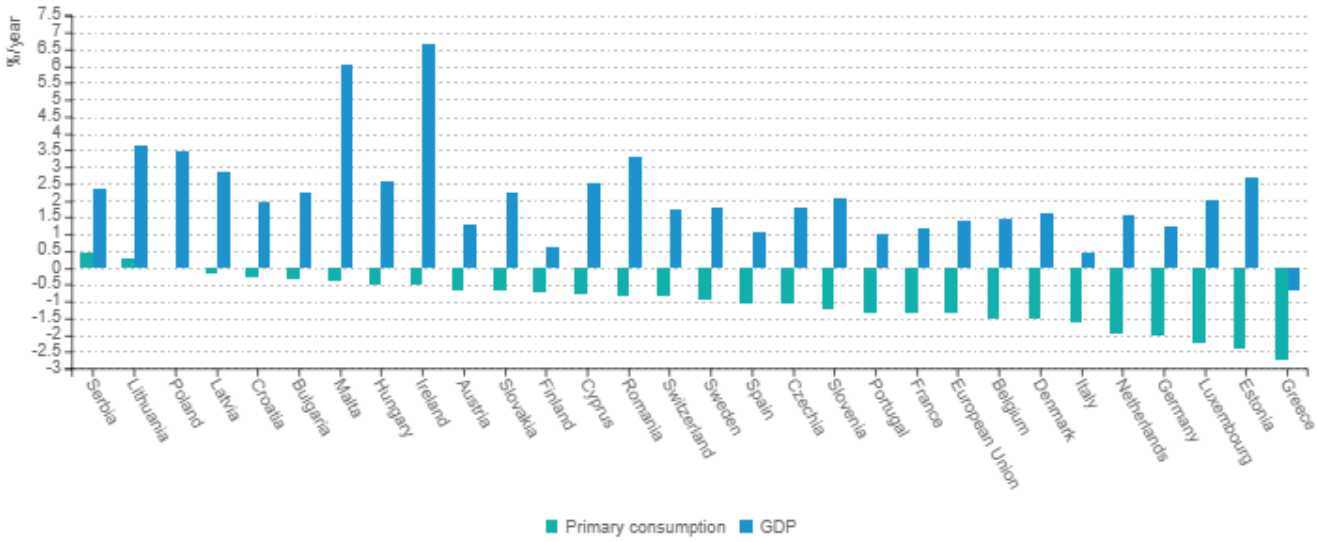


Annual growth rate of primary consumption (normal climate) and GDP trends (EU)



- Declining trend in primary consumption (at normal climate) in most countries since 2010: between -1% and -2% per year in 12 Member States and between -2%/year and -4%/year in 11 other Member States.

Primary consumption (normal climate) and GDP trends (2010-2023)

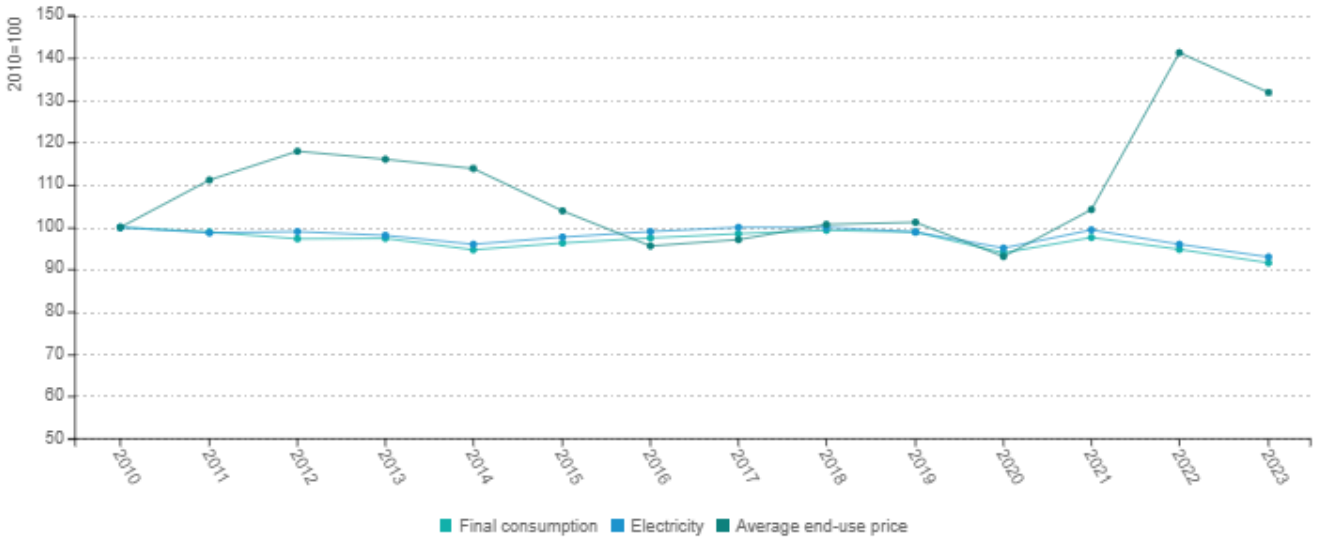


Final consumption

Consumption and energy prices

- Final energy consumption at normal climate decreased by 3.4% in 2023, down by 7.4% compared to 2019. In 2023, final energy consumption was around 8% lower than in 2010.
- Increasing trend of final energy consumption between 2014 and 2019 (1%/year), driven by a strong economic growth (2.2%/year) and decreasing energy prices.
- Before that, the trend was decreasing between 2010 and 2014 (-1.4%/year)
- Electricity consumption has followed final energy consumption trends since 2019: after a decreasing period between 2010 and 2014 (-1%/year), it has been stable until 2019.
- Since 2019, it has decreased by 1.5%/year while final consumption is decreasing.

Final energy trends and prices (EU)

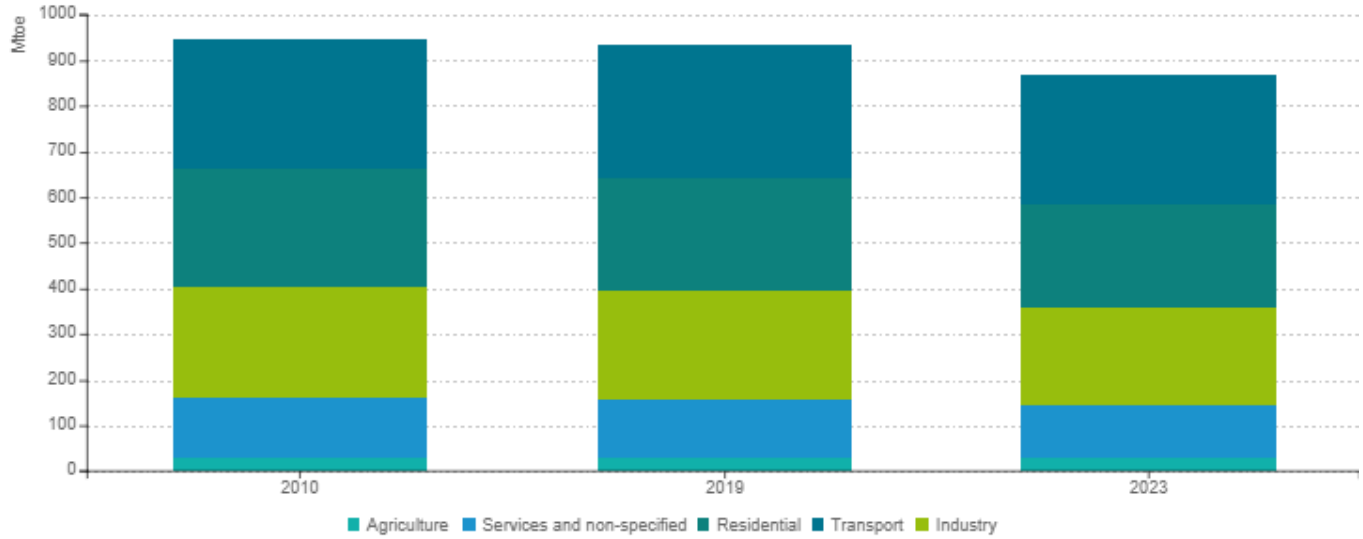


Note: Final consumption at normal climate.

Final energy consumption by sector in EU

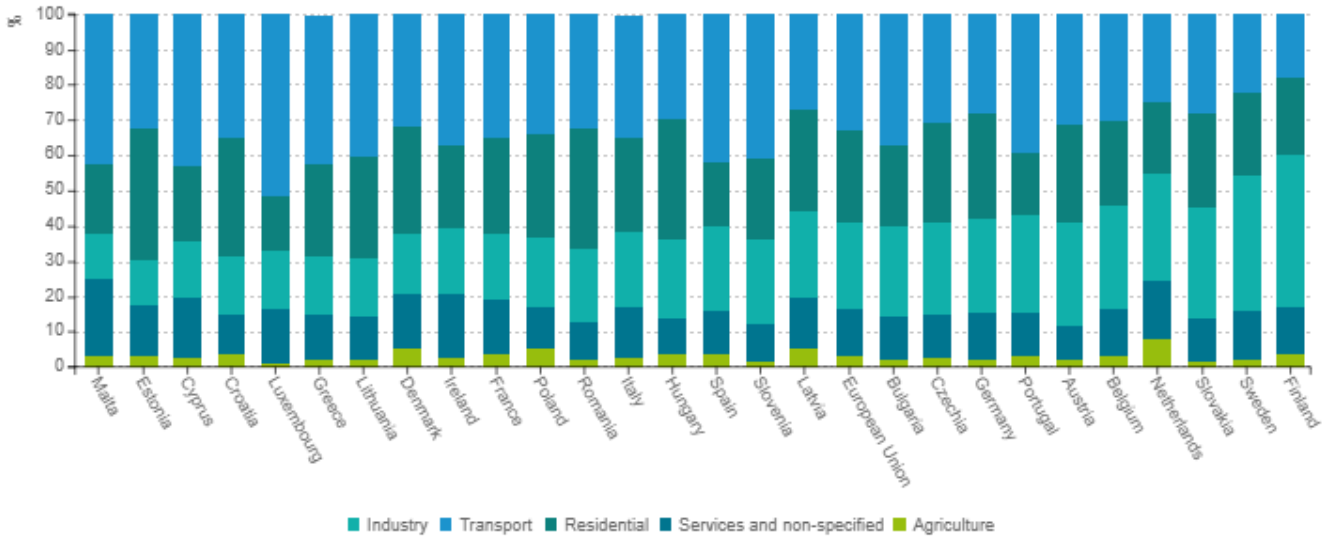
- Increasing share of transport (from 30% in 2010 to 31.4% in 2019 and 33% in 2023) and services (from 12 to 14%). The share of industry has decreased between 2010 and 2023 (from 26% to 24.5%) as did the shares of residential and services (from 27.5% to 26% and from 14% to 13.5%, respectively). The share of agriculture is stable around 3%.

Final consumption by sector (EU)



In the majority of EU Member States (18), transport is the largest energy consumer sector. In 5 MS, namely Germany, Estonia, Hungary, Latvia, and Romania, the residential sector is the largest consumer. For the 4 remaining MS (Sweden, Finland, Netherlands, and Slovakia), industry is the largest consumer.

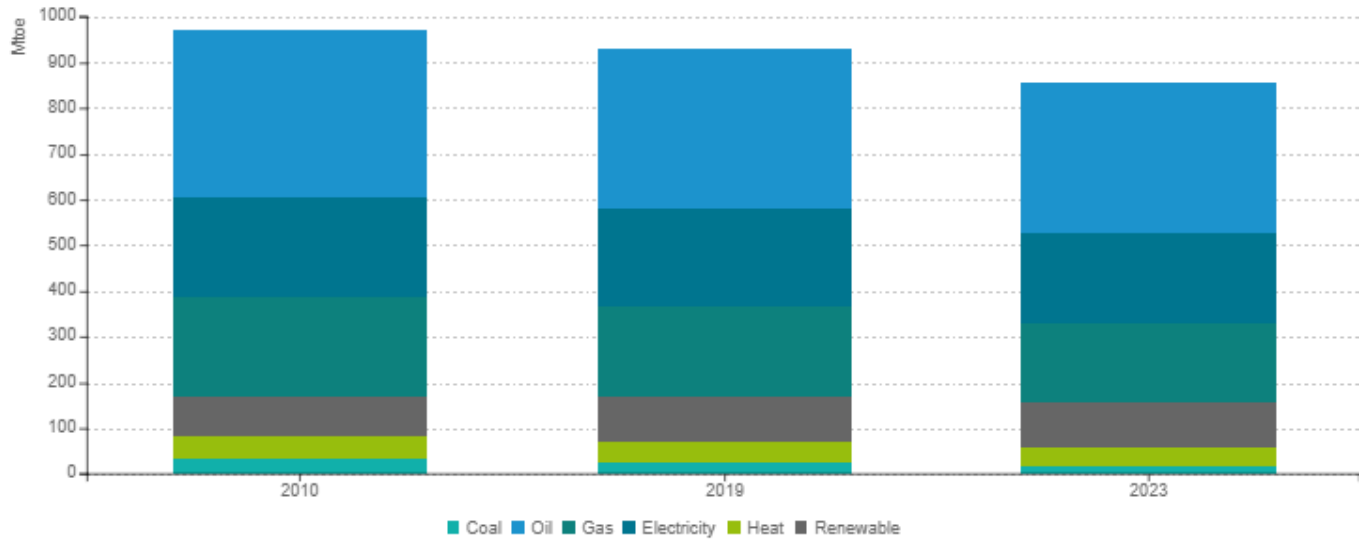
Final consumption by sector (EU countries, 2023)



Final consumption by energy (EU)

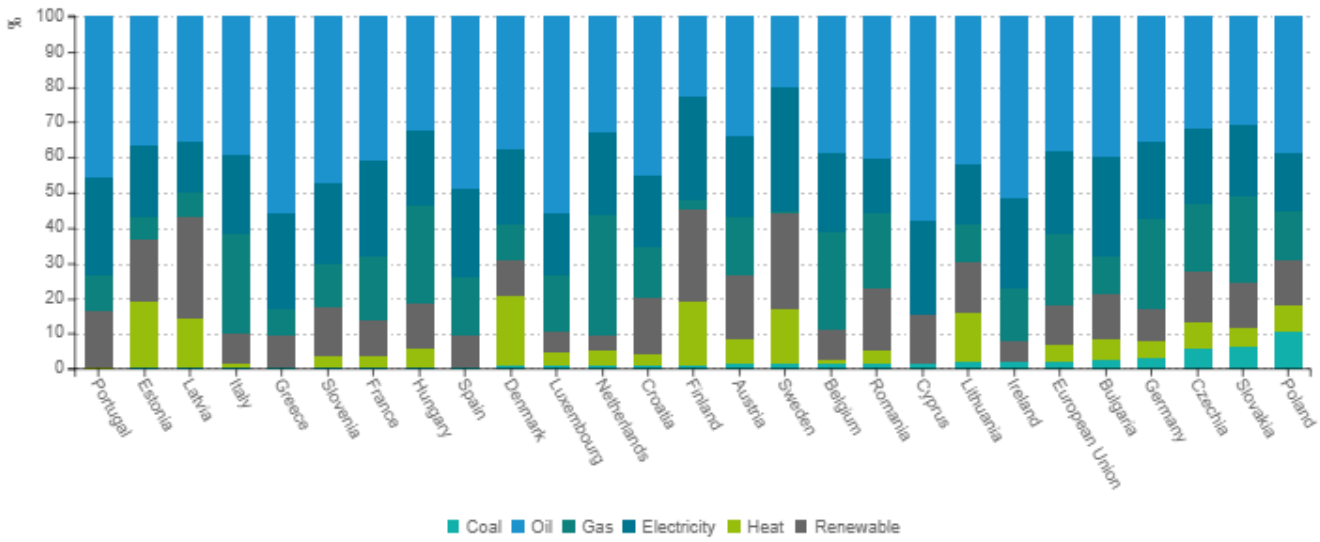
Moderate progression of the share of electricity in EU final energy consumption (from 22% in 2010 to 23% in 2019 and 23.5% in 2023) and for biomass and solar (renewable) (from 9% to 11.5%). Decreasing share for gas (from 22.5% in 2010 to 20% in 2023) and for coal (3.5% to 2%).Stable share for oil (38%) and heat (5%).

Fuel mix in the EU



- Oil is the main energy source consumed by final consumers in most EU countries, except in the Netherlands (main energy is gas), Finland and Sweden (electricity for both).

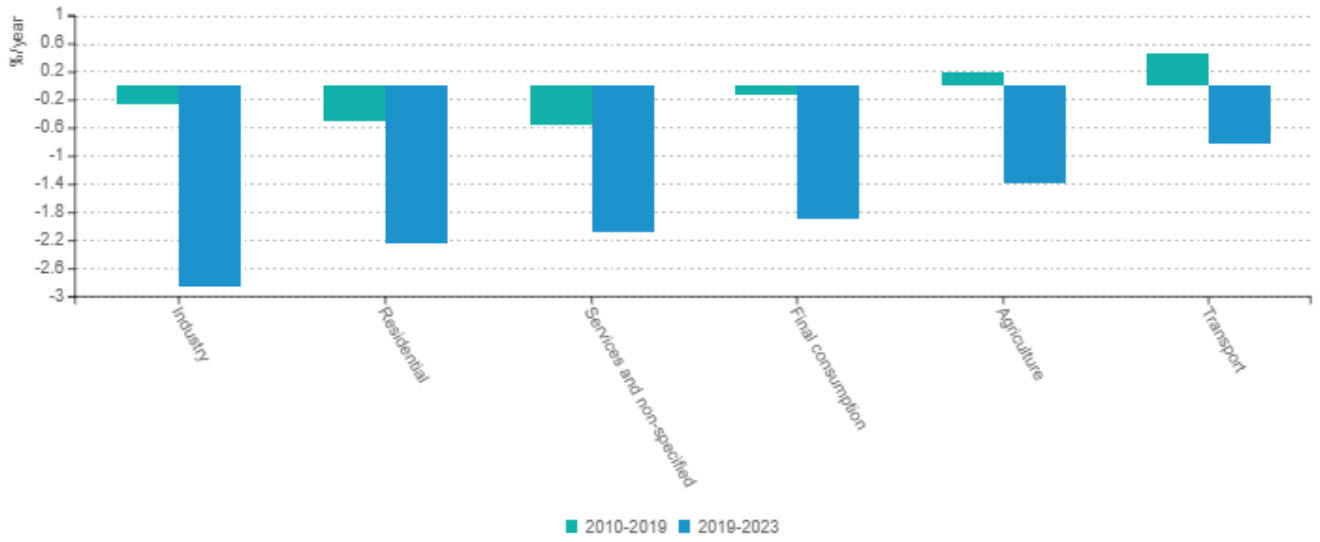
Fuel mix in the EU, 2023 (in %)



Decreasing energy consumption in all sectors

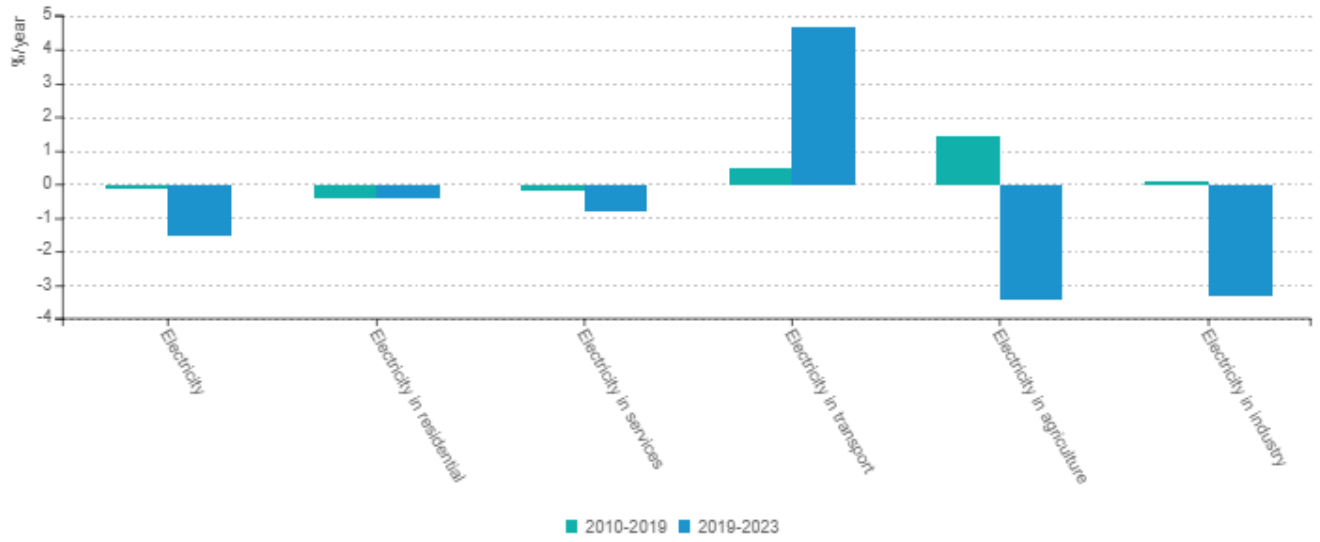
- Final energy consumption is decreasing at EU level since 2019 in all sectors , especially in industry and buildings (above 2%/year) : -2.9%/year for industry, -2.3%/year for residential, -2.1%/year for services; lower reduction in transport and agriculture (-1.4%/year for agriculture and -0.8%/year for transport).
- This decrease began with the financial crisis of 2008/2009 and continued between 2010 and 2019 in industry, residential and services but at a much slower rate (from 0.2%/year to 0.5%/year). Agriculture and transport consumption have increased between 2010 and 2019 (by 0.2%/year and by 0.5%/year, respectively).

Final energy consumption trends (EU, normal climate)



- Total electricity consumption decreased by 1.5%/year between 2019 and 2023 as a result of opposing sectoral trends.
- Consumption decreased rapidly in industry and agriculture (-3%/year), as well as in buildings, at a lower rate; it increased significantly in transport (5%/year), which however represents a low share of electricity consumption (2%).
- Between 2010 and 2019, electricity consumption slightly decreased in buildings and increased in agriculture and transport. Total electricity consumption remained almost stable.

Final electricity consumption trends (EU)

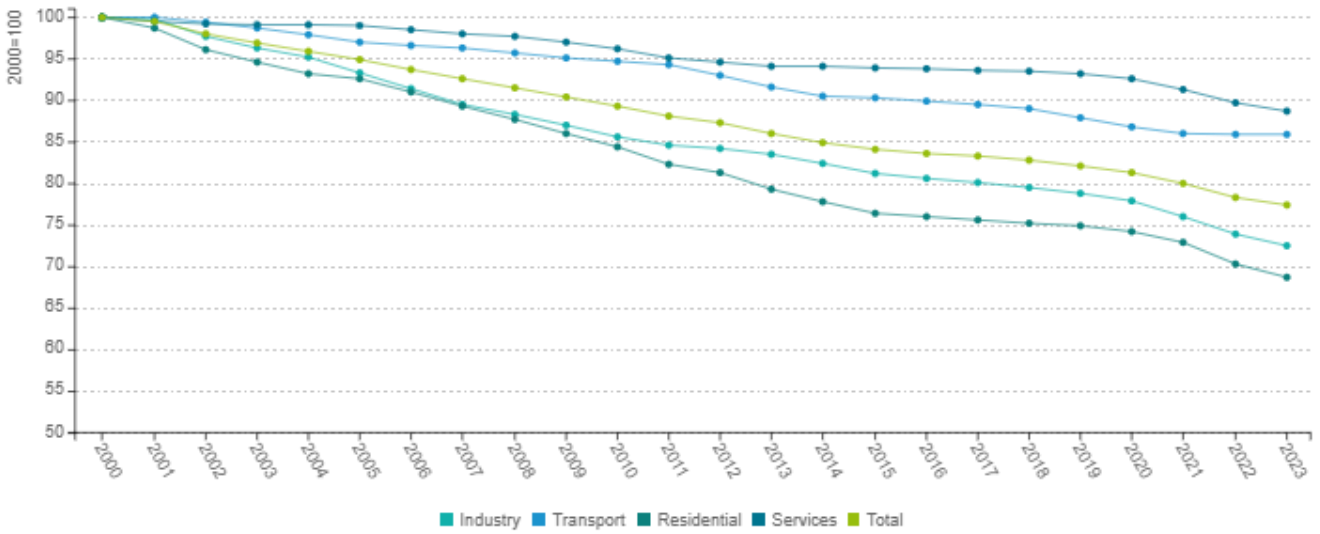


Energy efficiency trends

Energy efficiency trends of final consumers

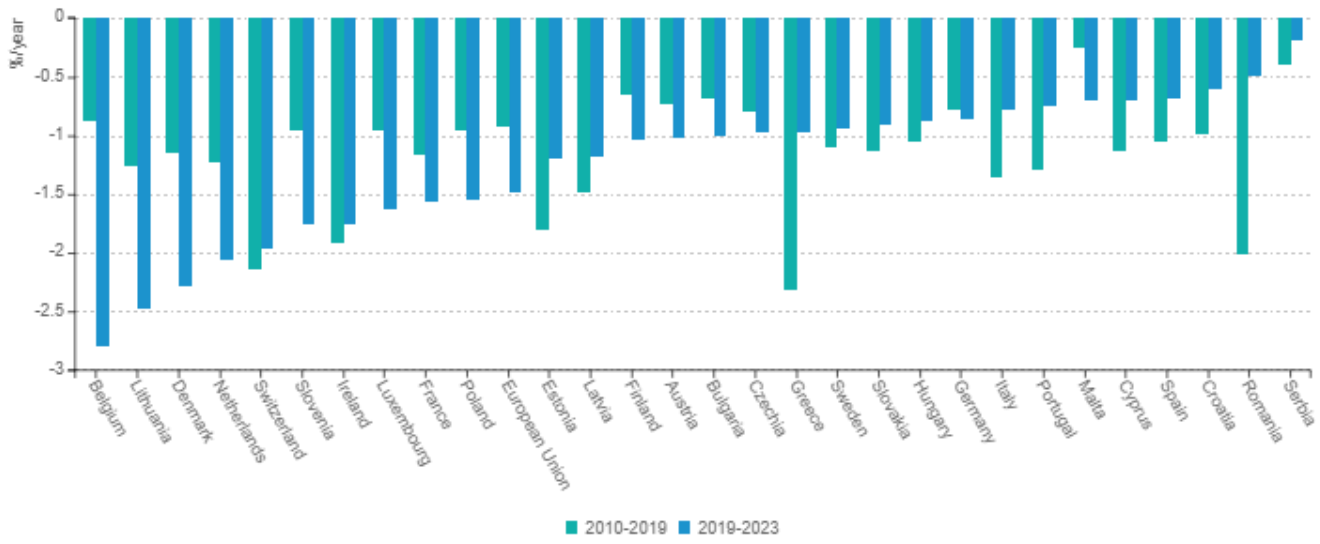
- Energy efficiency of final consumers improved by 1.1 %/year between 2000 and 2023. These improvements have accelerated since 2019 (1.5%/year on average), after a slow progression over 2014-2019 (0.7%/year). The recent intensification in energy efficiency progress may be partly linked to high energy prices from 2021.
- The largest gains are for households and industry (1.6%/year and 1.4%/year since 2000, respectively).
- A slighter slowdown is visible for industry after the 2008 economic crisis (0.9%/year from 2008 to 2020 against 1.6%/year previously). However, the trend seems accelerating again since 2020 (-2%/year).
- Slower improvement in transport (0.7%/year), with a stabilisation since 2021.
- Energy efficiency in services has improved at an average pace of 0.5%/year since 2000.

Energy efficiency trends of final consumers (EU)



- Energy efficiency has been progressing faster after 2019 than before in 15 Member States.
- Belgium, Lithuania, Denmark, Netherlands and Switzerland show the steadiest progress since 2019, higher than 2%/year, while the EU average is 1.5%/year.

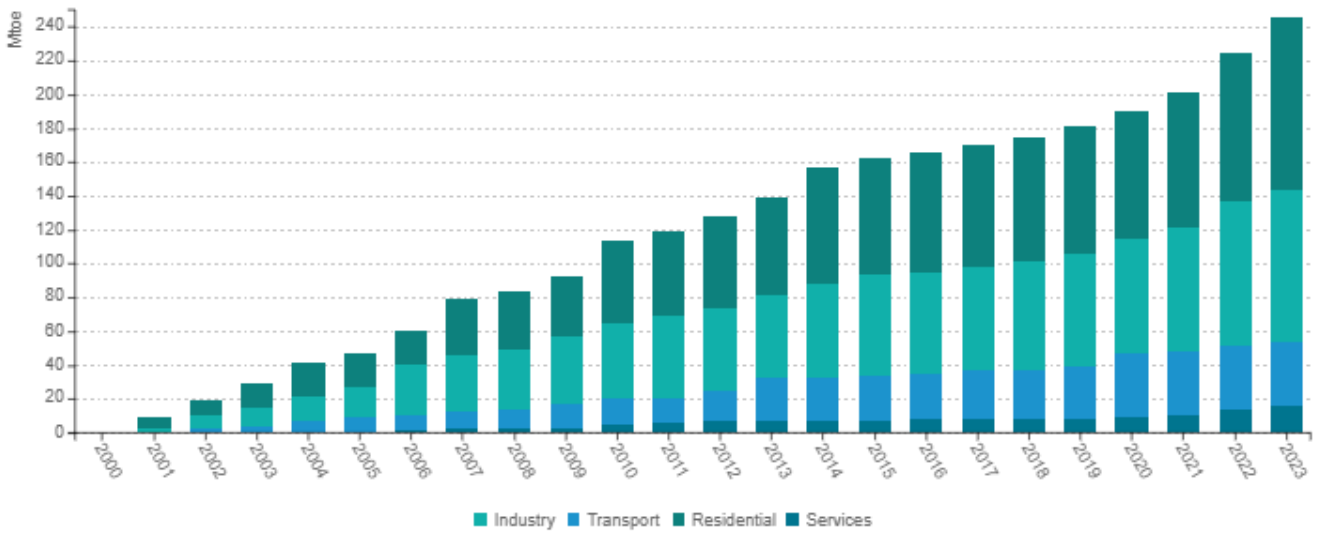
Energy efficiency trends of final consumers (All countries)



Evaluation of energy savings

Around 250 Mtoe of energy has been saved in 2023 compared to 2000 (29% of final energy consumption). Without these savings the final energy consumption would have been 29% higher in 2023.Households, which is the sector with the highest number of regulations and financial measures, comes in first position, with a share of total savings of 42%, which is much higher than its share in final consumption (26%).Industry comes in second position with 36% of total savings, while it is only in third place in total final consumption (after transport and households).Savings in transport and services lag behind with savings much lower than their share in consumption (16% vs 33% and 6% vs 13%, respectively).

Energy savings in the EU

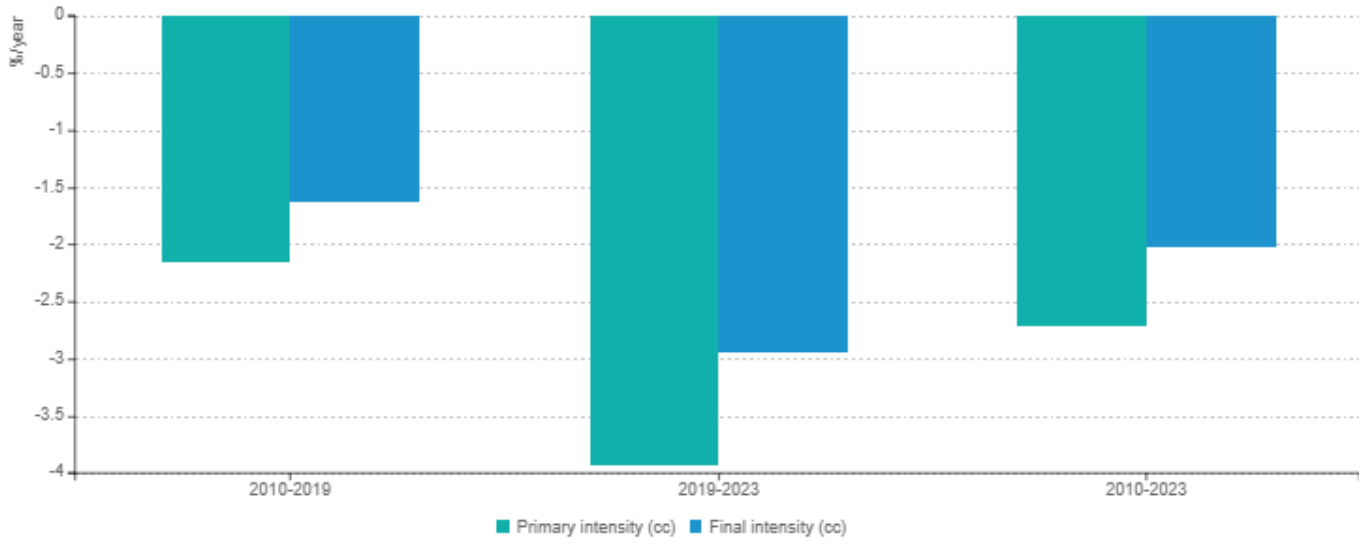


Energy intensity

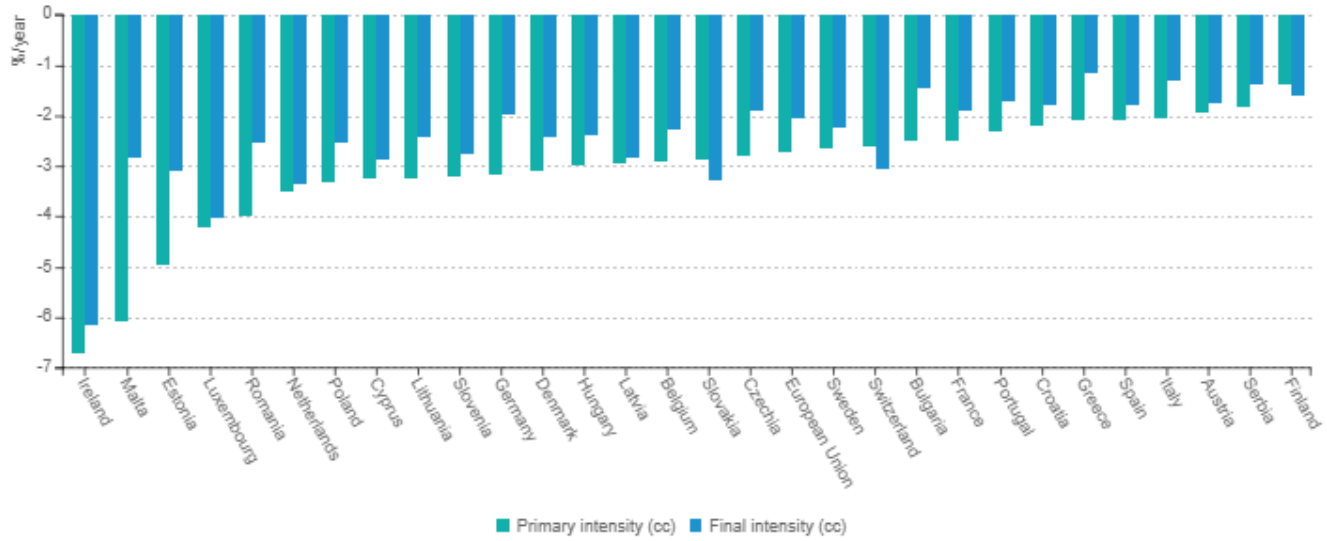
Primary and final energy intensities trends in the EU (normal climate)

- Since 2010, primary intensity has decreased faster than final intensity at EU level and in most EU Member States due to decreasing losses in the power sector (diffusion of renewables, increasing efficiency of thermal generation, increasing imports, etc.). This is especially significant since 2014 since 2019 with the very rapid penetration of renewables.
- An opposite trend can be seen in Switzerland, Slovakia and Finland due to specific factors.

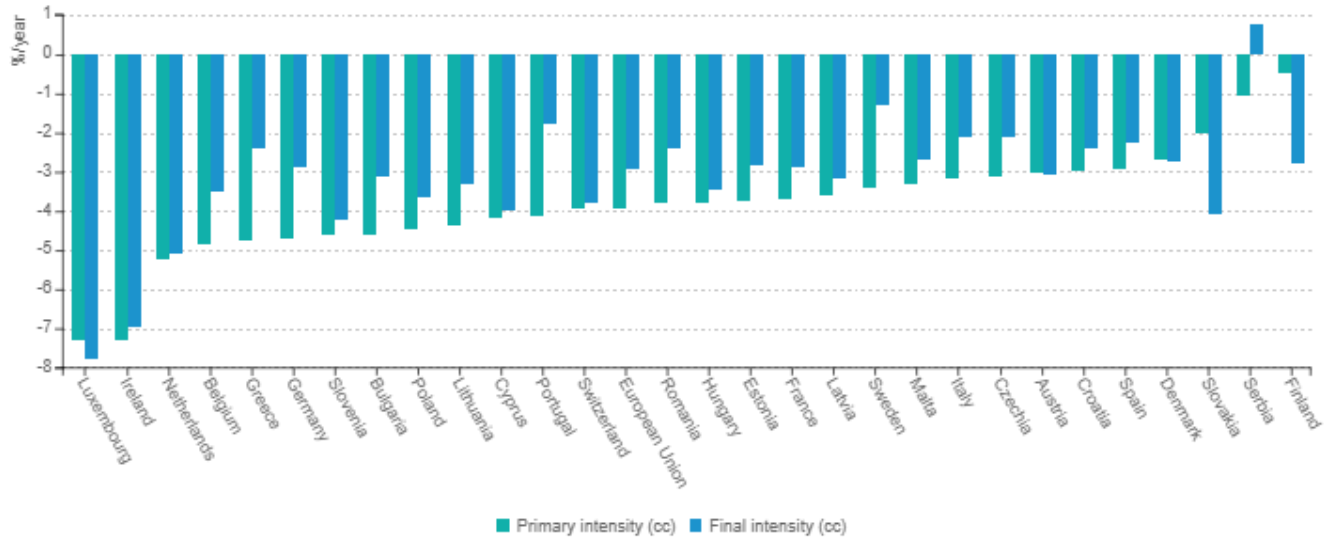
Primary and final energy intensities trends in the EU (normal climate)



Primary and final energy intensities trends (2010-2023)



Primary and final energy intensities (2019-2023)



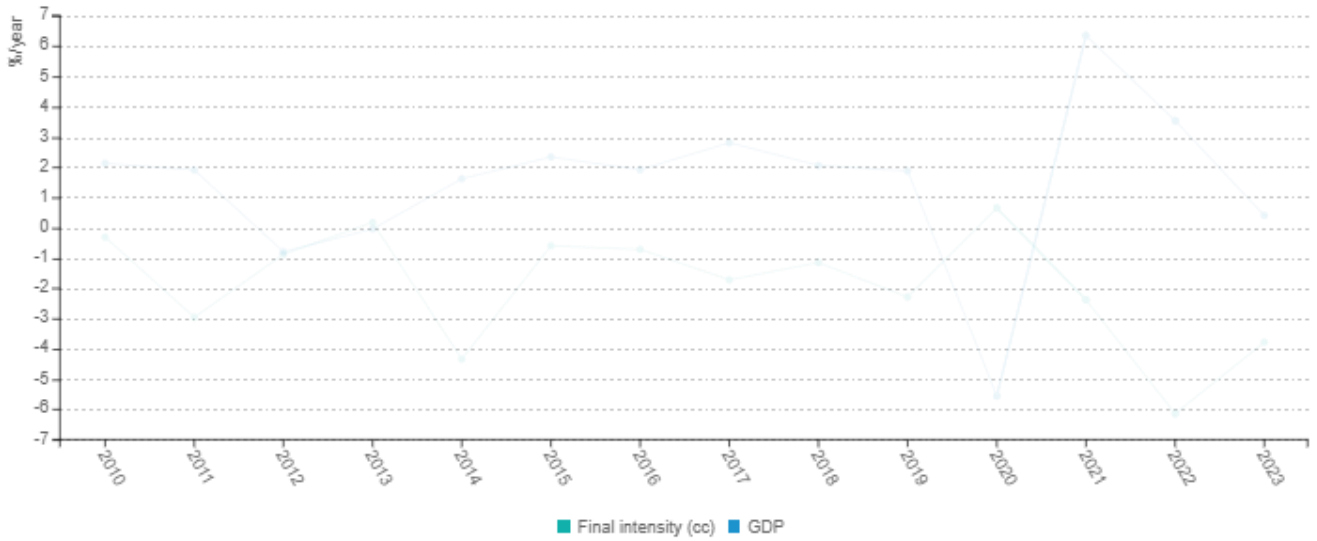
Note: Energy consumption at normal climate.

GDP and final energy intensity growth (EU)

- In general, the highest the economic growth, the more rapid the decrease of the intensity.

- Increasing final energy intensity when low or negative GDP growth: part of final consumption is not dependent on GDP; 2020 is a good example of this phenomenon.

GDP and final energy intensity growth (EU)

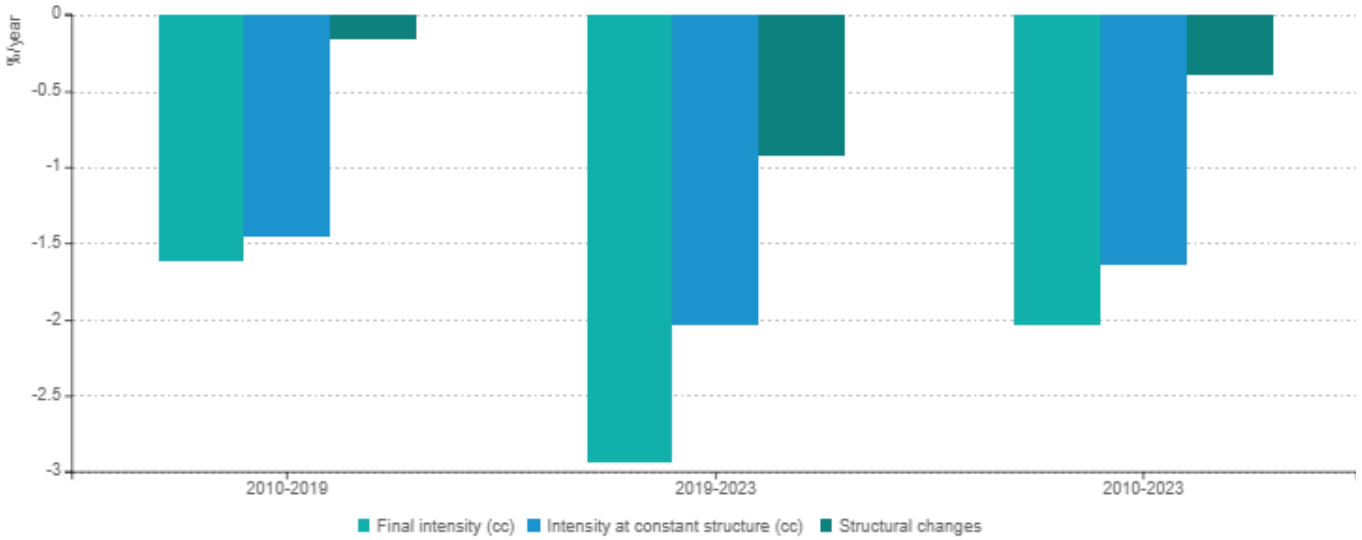


Note: Final energy intensity at normal climate.

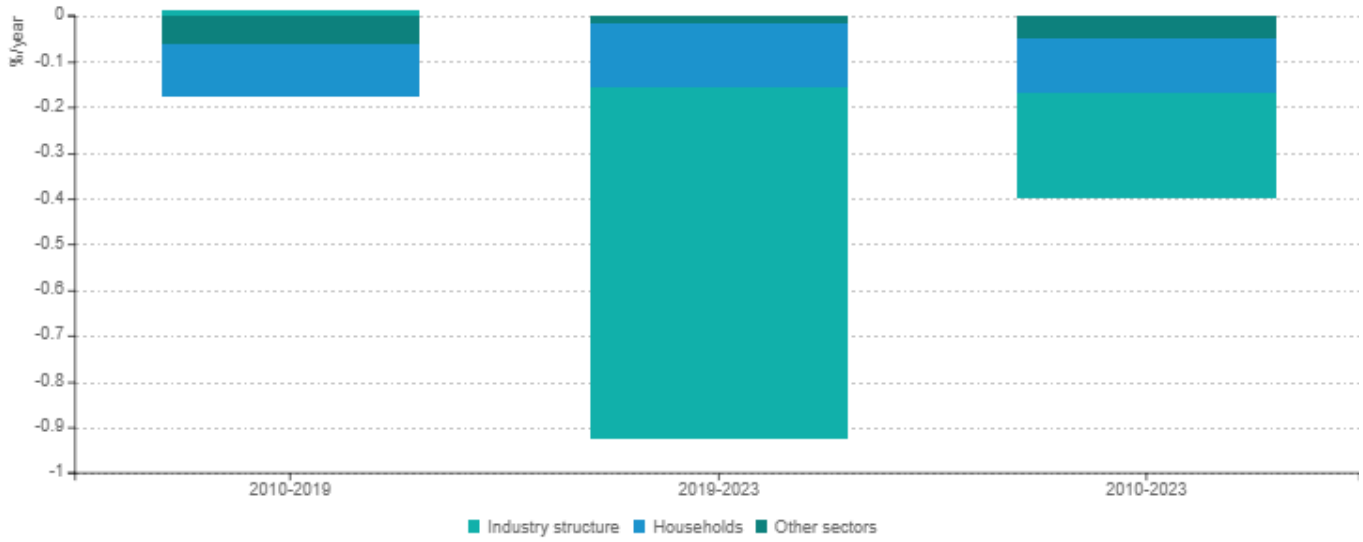
Impact of structural changes on final intensity

- The difference between the variations of the intensity and of the intensity at constant structure measures the effect of structural changes.
- Structural changes explain only 20% of the decrease in final intensity since 2010.
- The structural changes are mainly due to changes within industry (higher share of less energy intensive branches, especially since 2019) and in the structure of GDP (higher share of services).

Impact of structural changes on the final intensity (EU)

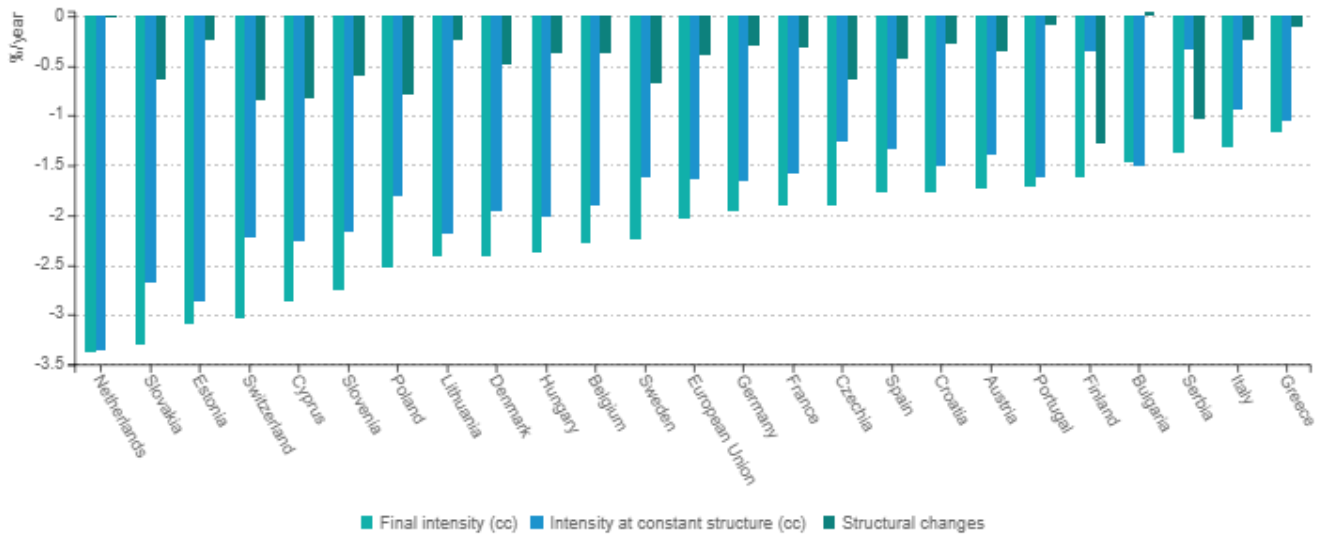


Contribution of structural changes (EU)



- Most countries have shifted to less energy-intensive sectors. Structural changes were negligible in Portugal, The Netherlands and Greece and contributed to slowing down the decrease in final intensity in Bulgaria.
- Structural changes explain the majority of the decrease in final intensity in Finland and Serbia.
- In 9 EU MS, structural changes explain more than 20% of the decrease in final energy intensity.

Impact of structural changes on the final intensity in EU countries (2010-2023)

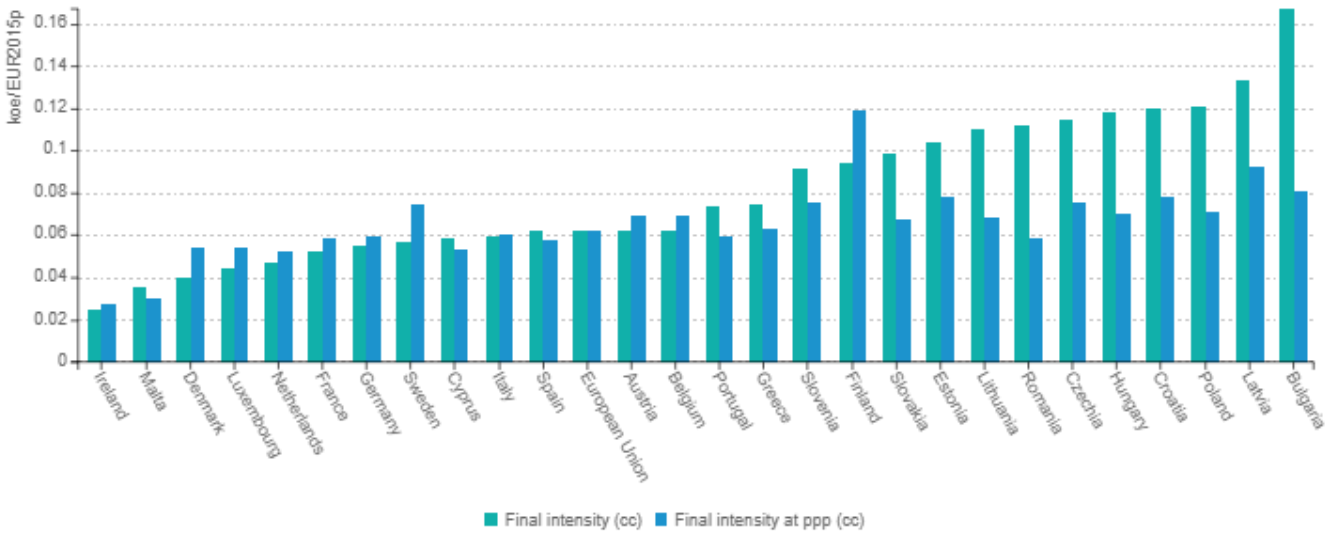


Note: Final energy intensity at normal climate.

Adjusted energy intensities

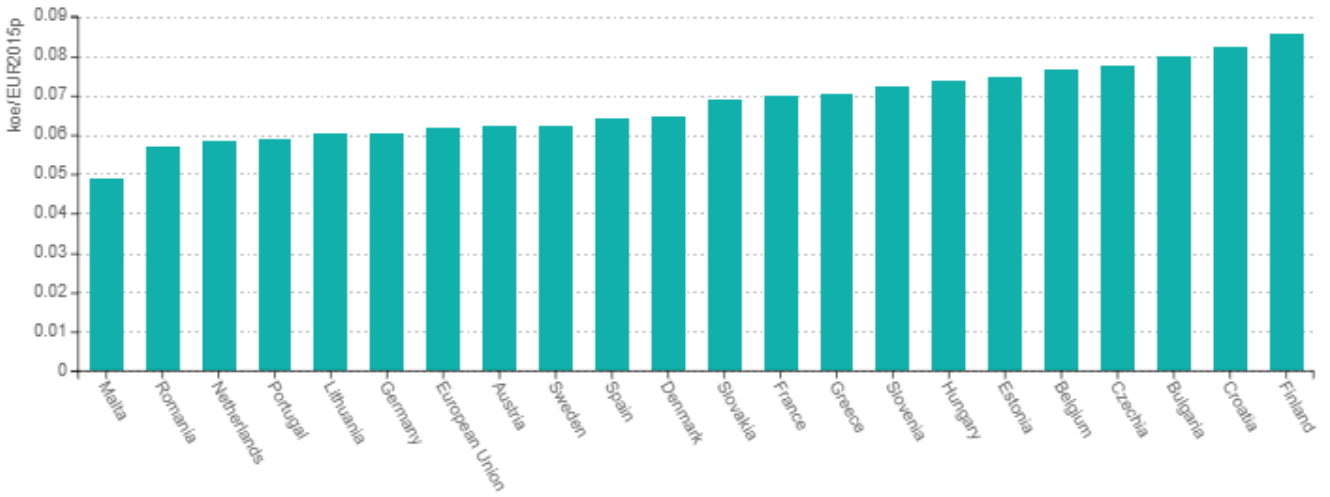
- After adjusting for differences in general price levels, by converting GDP at purchasing power parities (ppp), final intensities decrease for countries with low prices (such as the central-eastern or southern countries). For example, in Bulgaria, Romania, Poland and Hungary the adjusted intensity is about 40% lower than the observed intensity; in Lithuania, Croatia, Czechia, Slovakia and Latvia it is more than 30% lower than the observed intensity.
- After adjustment, the gap between EU countries is significantly reduced.

Final energy intensities at ppp in 2023 (normal climate)



- Some of the observed differences in final energy intensity levels after ppp corrections can be further adjusted to account for some other quantifiable national characteristics, such as climate and the structure of economic and industrial activities. The adjustment to the average economic structure and climate of the EU makes the comparison of final energy intensities more meaningful and reduces the gap between countries.
- Malta, Romania, Netherlands and Portugal have the lowest adjusted energy intensities, below 0.06 koe/EUR2015ppp.

Final energy intensities adjusted at ppp and EU average structure and climate (2023)



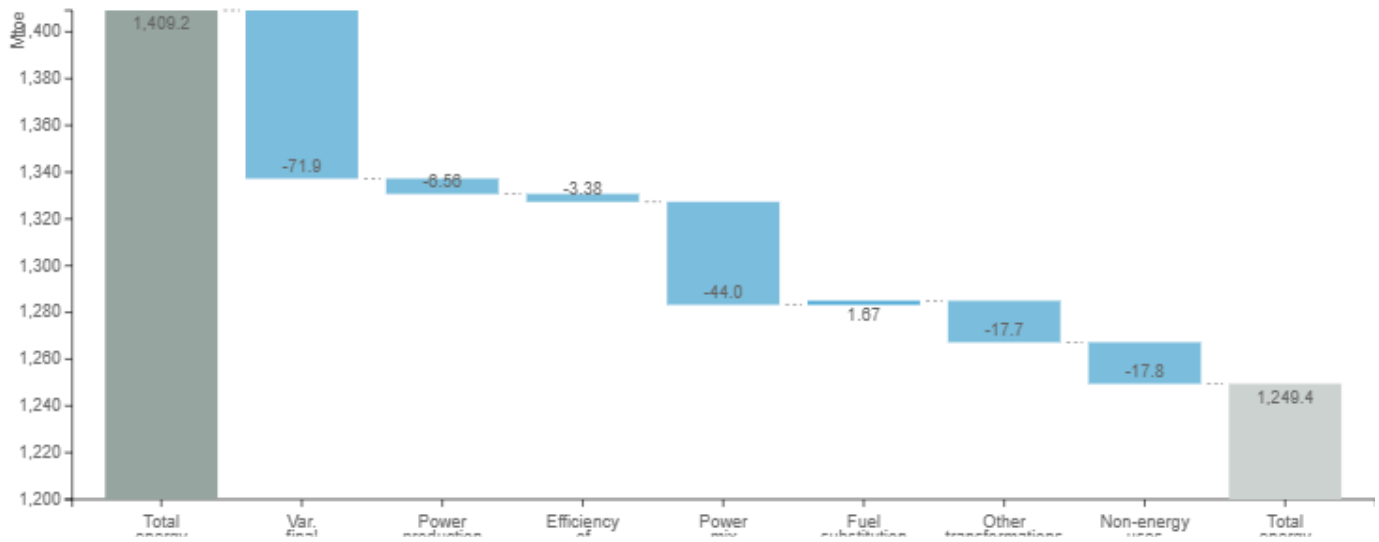
Note : some countries are missing due to incomplete data on value added by industrial sector.

Decomposition of energy consumption

Drivers of total energy supply variation

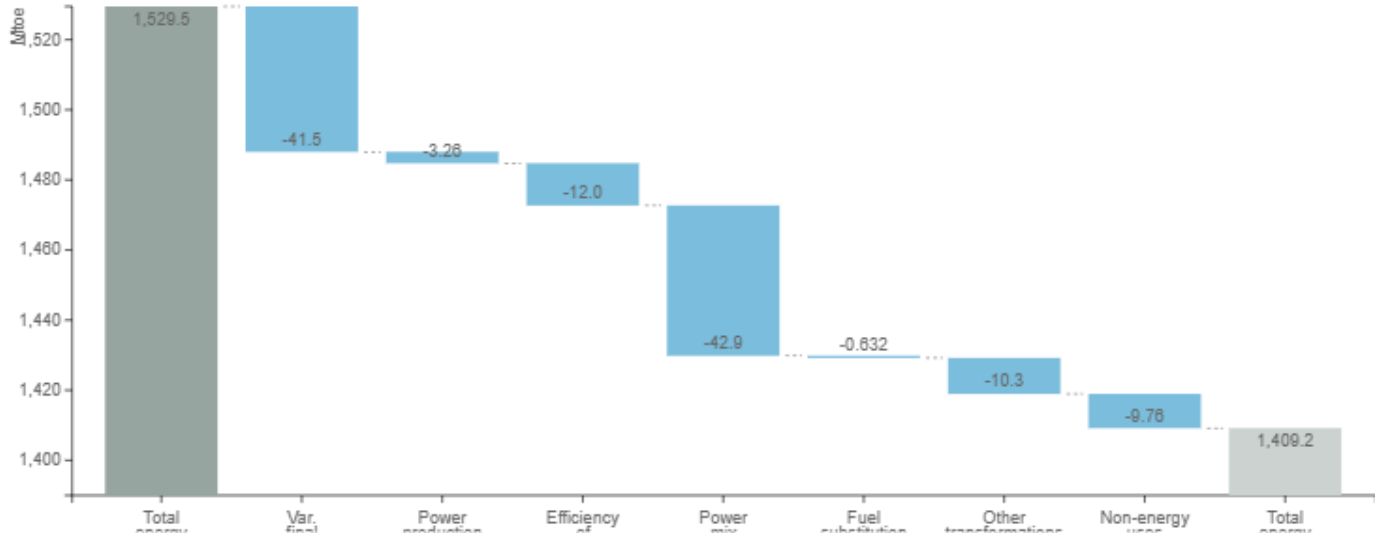
- Between 2019 and 2023, total energy supply decreased by 160 Mtoe at EU level.
- Final consumption decreased by 72 Mtoe and only explained 45% of this reduction.
- Changes in the power mix explained around 30% of the reduction in total energy supply (-44 Mtoe), thanks to important renewable electricity development).
- The rest of the reduction is explained by changes in other transformations and non-energy uses (-18 Mtoe, each) and to a reduction in power production (-7 Mtoe).

Variation in total energy supply 2019-2023 (EU)



- Between 2010 and 2019, total energy supply at EU level decreased by 120 Mtoe.
- Final consumption only explained 40% of that decrease (- 42 Mtoe).
- Changes in the power sector had even a greater contribution to this reduction (-55 Mtoe), mostly linked to changes in the power mix, with the diffusion of renewables (-43 Mtoe) and the rest to efficiency improvements of thermal power plants (12 Mtoe).
- The rest of the reduction was equally due to non-energy uses and changes in other transformations (-10 Mtoe each).

Variation in total energy supply 2010-2019 (EU)

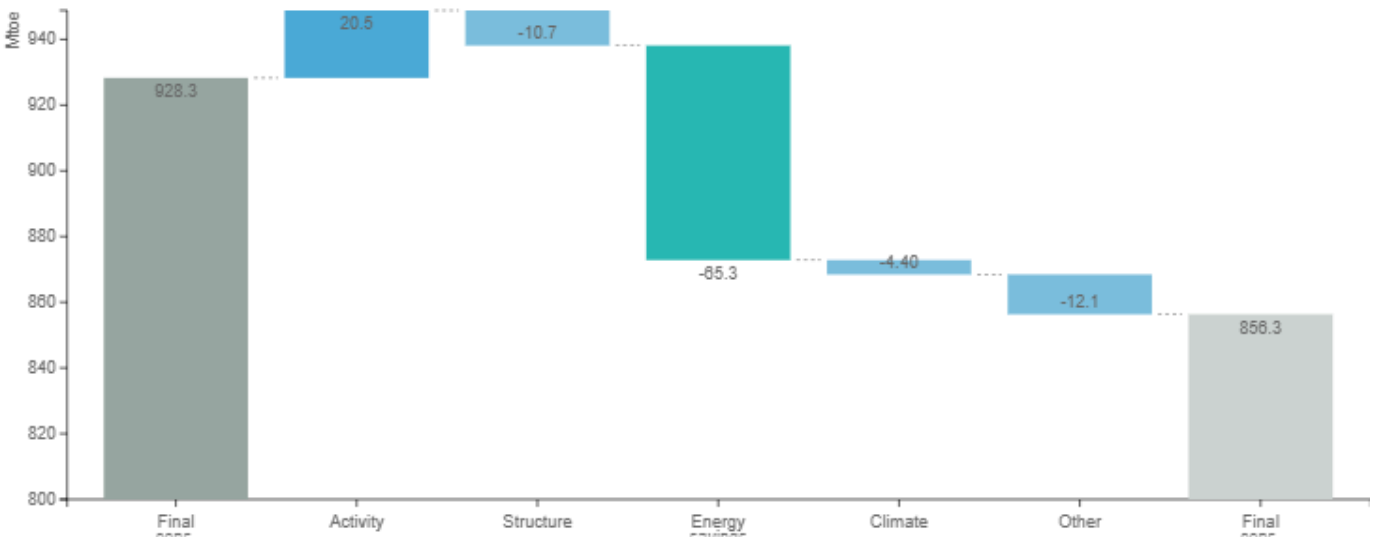


Drivers of final energy consumption variation

- Final energy consumption has decreased by 72 Mtoe since 2019 to 856 Mtoe.
- This is the result of opposite effects: factors contributing to rise consumption (mostly liked to higher economic activity) and other factors that reduce it (mostly energy savings).
- The higher level of activity ("activity effect") in industry and services, and an increase in the number of dwellings and their size, as well as in the number of households appliances, partly offset by a reduction in transport traffic, increased the final energy consumption, by 20.5 Mtoe (+16 Mtoe in buildings, 6.5 Mtoe in industry and -2 Mtoe in transport).
- Energy savings reduced consumption by about 65 Mtoe (55% of which in buildings,35% in industry and 10% in transport).

- Structural effects (mainly the transition to less energy-intensive branches in industry) contributed to a reduction of 11 Mtoe.
- Lower heating comfort and other behavioral changes, driven by soaring energy prices ("other effects") decreased consumption by 12 Mtoe.
- Climate differences decreased consumption by a further 4 Mtoe, as 2023 was warmer than 2019.

Variation in final energy consumption 2019-2023 (EU)



- Between 2010 and 2019, final consumption decreased by 41 Mtoe.
- The activity effect increased the final energy consumption by 88 Mtoe (43% of which in buildings, 31% in transport and 26% in industry).
- Energy savings reduced consumption by about 68 Mtoe (43% in buildings, 30% in industry, 27% in transport).
- Structural effects (mainly the transition to less energy-intensive branches in industry) had a marginal effect (-9 Mtoe).
- Climate differences (2019 being much warmer than 2010) contributed to decrease consumption by 40 Mtoe.
- Other effects, mainly linked to lower comfort, and other behavioral changes decreased consumption by 13 Mtoe.

Variation in final energy consumption 2010-2019 (EU)

