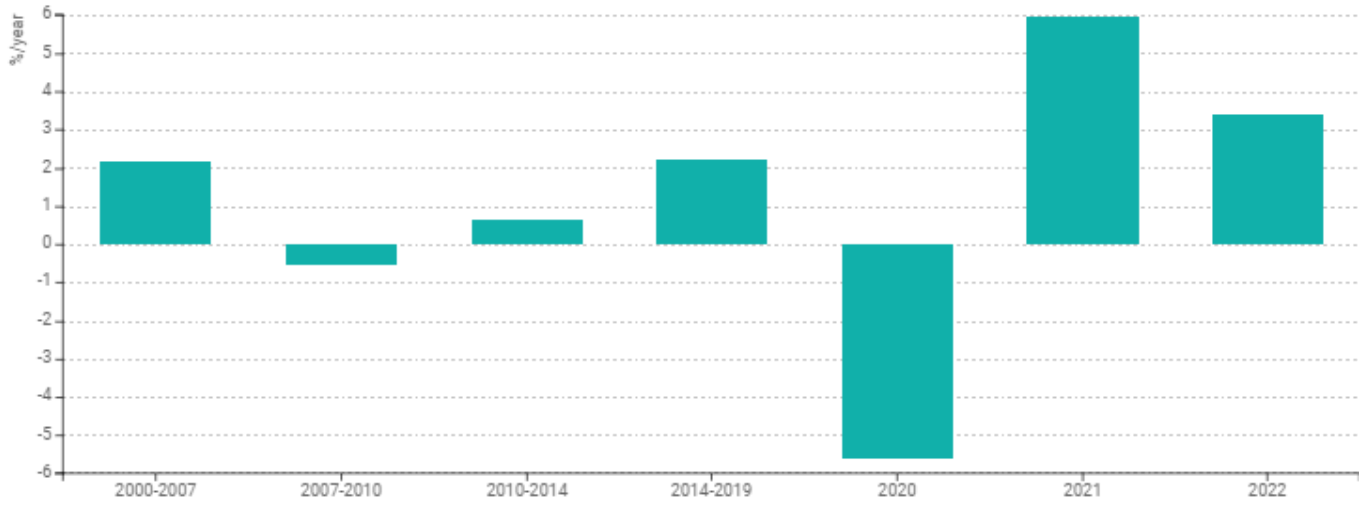
Sectoral Profile - Overview

Energy consumption pattern and drivers

Economic growth

- GDP returned to growth with a strong rebound (+6%) in 2021 and substantial growth in 2022 (+3.4%), after an historic decrease in 2020 due to Covid crisis (-5.6%).
- Economic growth almost returned since 2014 (1.9%/year), to the pace observed between 2000 and 2007, i.e. before the global economic crisis in 2008-2009.
- Slow growth between 2010 and 2014 due to debt crisis in some EU countries: 0.7%/year.

GDP growth in the EU



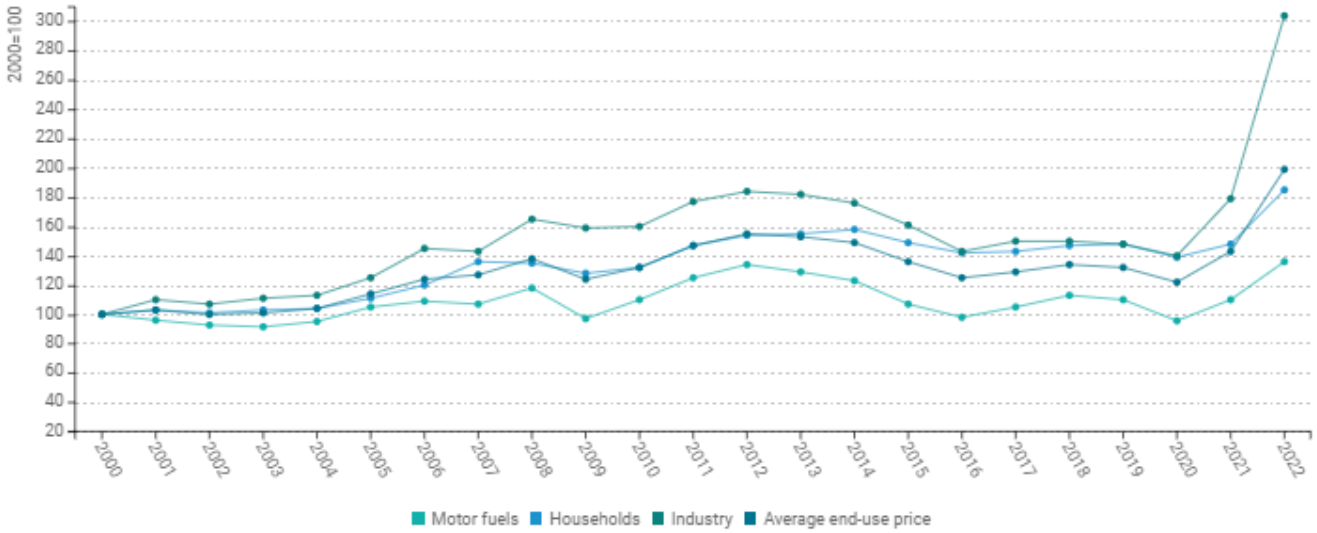
Energy prices

- Soaring international energy prices in 2022, particularly for gas and coal (+175% and +159% compared to 2021, respectively), following an already significant increase in 2021. Consequently, the price of coal and gas in 2022 reached a value of three to four times that of 2019.
- 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)

- Notable surge in end-use energy prices in 2022, following a rebound in 2021 after the 2020 drop due to the Covid crisis. This increase was particularly pronounced in industry (+70% in 2022, +106% since 2019) because of natural gas price increase. In 2022, prices increased by 24% in the transport sector, and by 25% in the residential sector. The increase is more limited in these sectors thanks to government support to limit price rise in several countries.
- 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 (-5.4%/year), mainly in transport (-7.5%/year for motor fuels) and industry (-6.0%/year). Moderate reduction for households (-1.9%/year).
- Very rapid increase of average end-use energy prices by sector between 2000 and 2012 (around 55%).

Average energy prices by sector (EU)

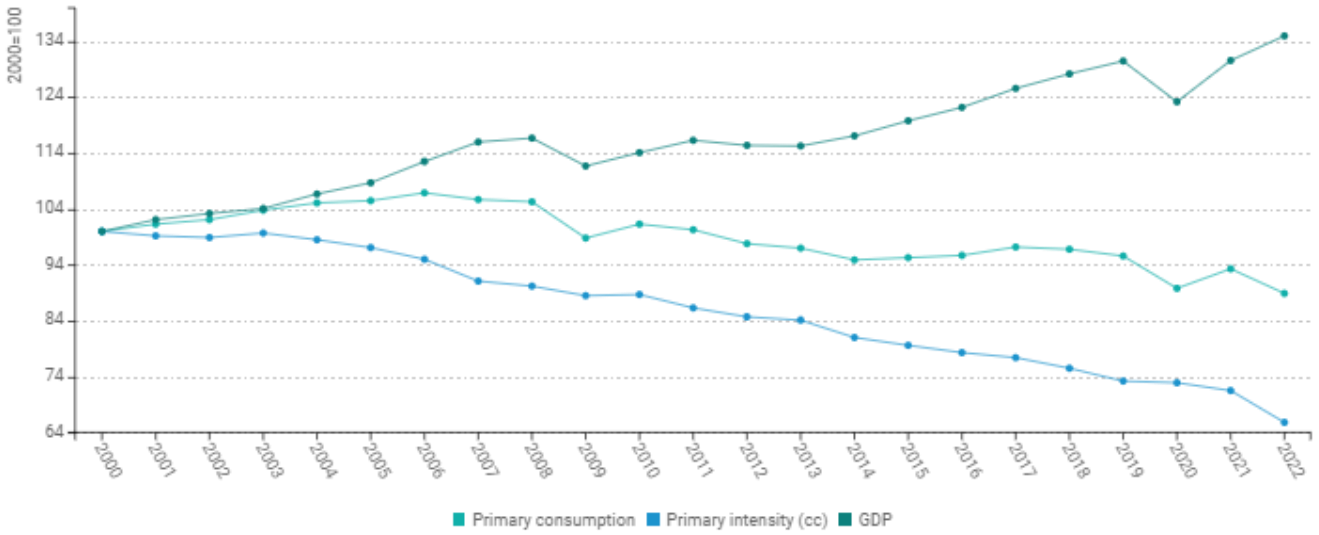


Source: Eurostat; energy prices by sector (at constant prices): weighted average prices by energy (electricity, gas, fuel, coal) on the basis of energy market shares.

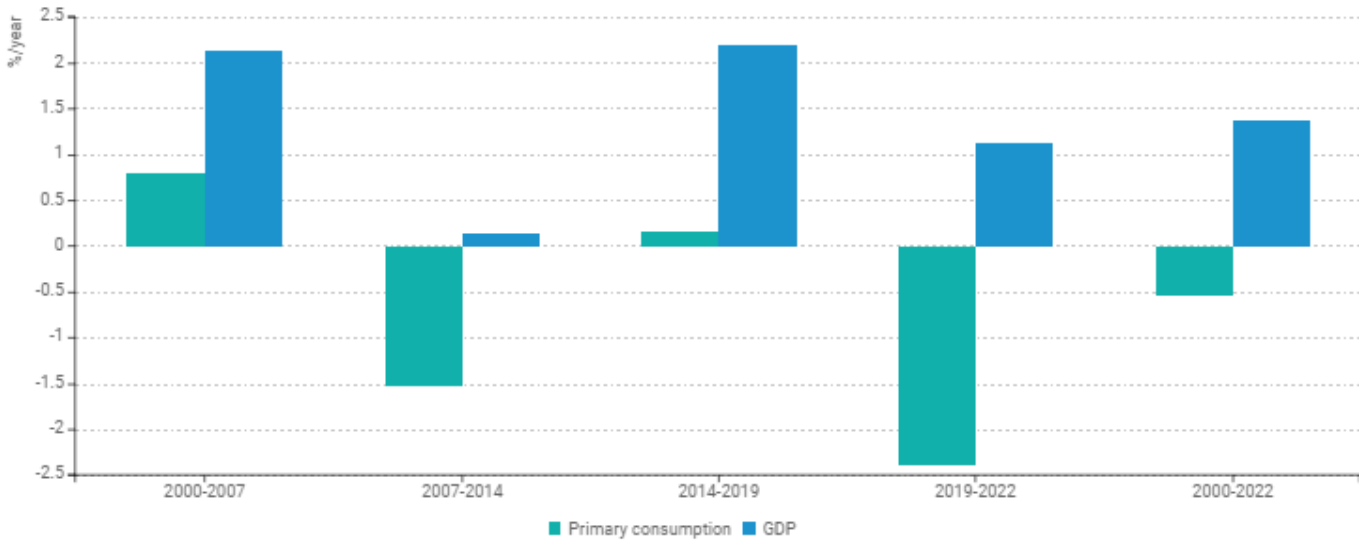
Primary consumption and GDP

- Decrease in primary consumption in 2022 (-4.8%) despite an increase in GDP (+3.4%).
- Stagnation of primary consumption between 2014 and 2019, although GDP increased by 2.2%/year. Downward trend in primary consumption since 2019 (-2.4%/year), despite GDP rising (+1.1%/year).
- This follows a decrease of 1.5%/year between 2007 and 2014.
- Regular and rapid decrease in primary energy intensity since 2007 (-2.1%/year)

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

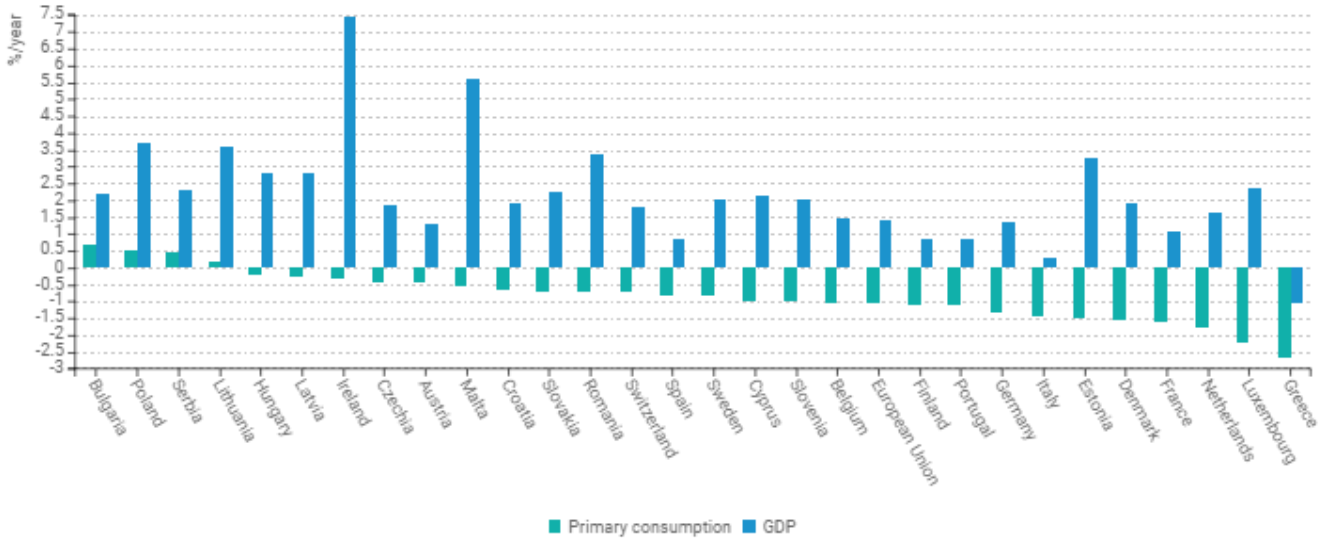


Annual growth rate of primary consumption (normal climate) and GDP trends (EU)



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

Primary consumption (normal climate) and GDP trends (2010-2022)



Final consumption

Consumption and energy prices

- Final energy consumption at normal climate decreased by 2.1% in 2022, down by 3.5% compared to 2019. In 2022, final energy consumption was around 1% lower than in 2000.
- 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 2007 and 2014 (-1.1%/year) and increasing before 2007 (+0.7%/year).
- Electricity consumption follows final energy consumption trends: after a decreasing period between 2007 and 2014 (-0.6%/year), it has been increasing again (+0.6%/year) until 2019. Since 2019, it has decreased by 0.9%/year.

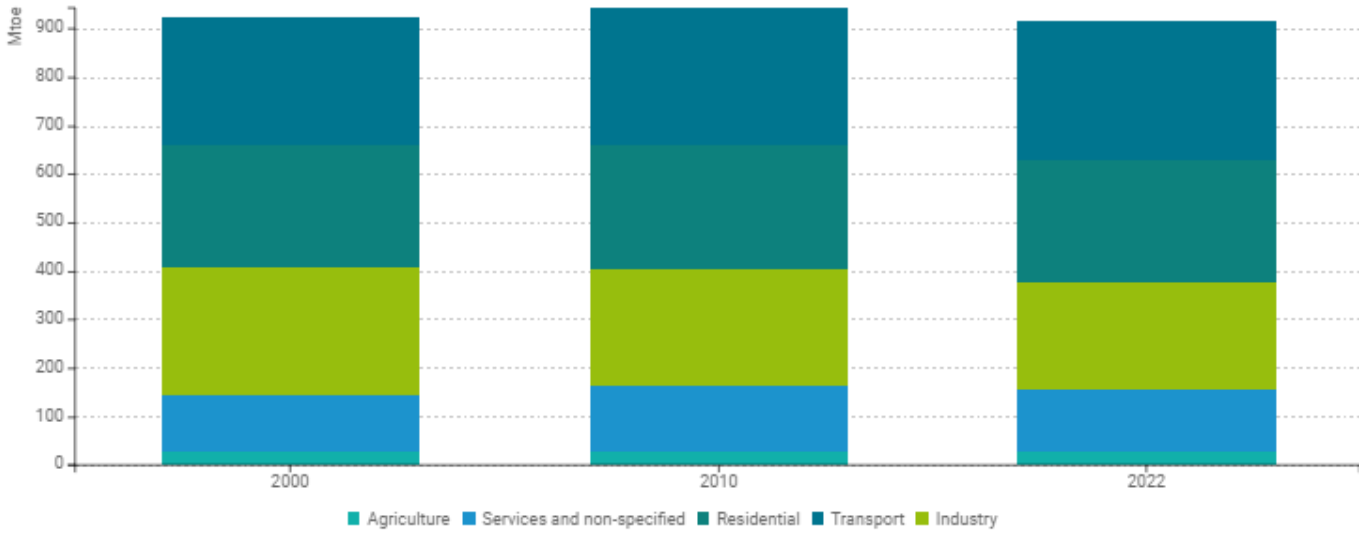
Final energy trends and prices (EU)

Note: Final consumption at normal climate.

Final energy consumption by sector in EU

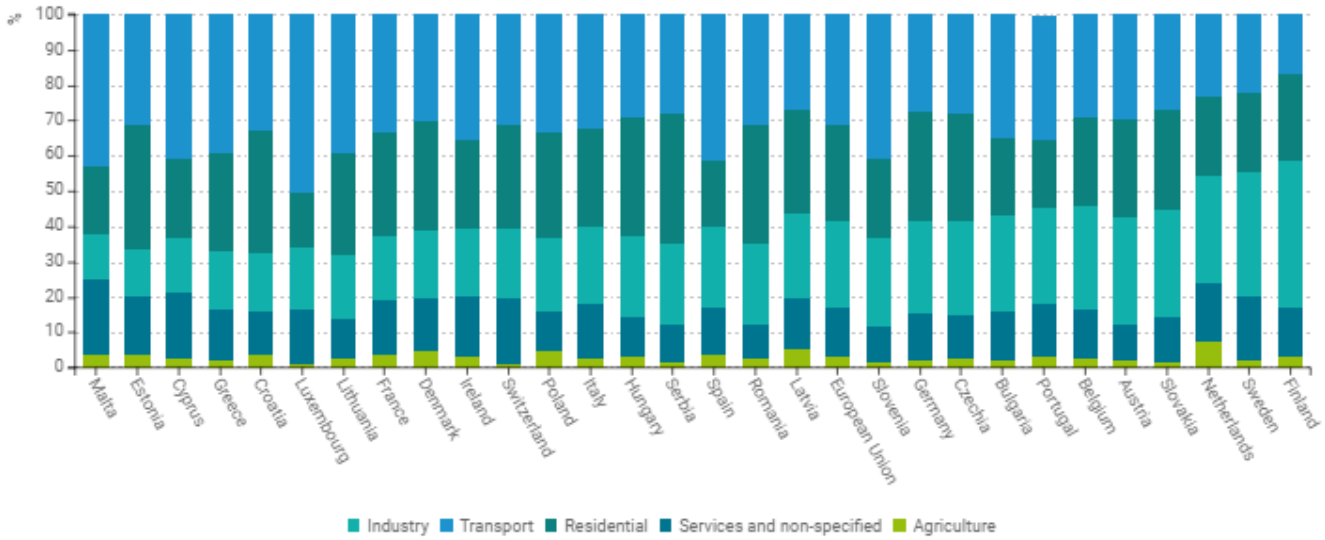
- Increasing share of transport (from 28% in 2000 to 30% in 2010 and 31% in 2022) and services (from 12 to 14%). The share of industry has decreased by 5 points since 2000, from 29% in 2000 to 25% in 2010 and 24% in 2022. The share of households is stable at around 28%, as is the share of agriculture at around 3%.

Final consumption by sector (EU)



In half of EU Member States (13), transport is the largest energy consumer sector. In 8 MS, namely Germany, Croatia, Denmark, Estonia, Hungary, Latvia, Czechia, and Romania, the residential sector is the largest consumer. For the 6 remaining MS (Austria, Sweden, Finland, Belgium, Netherlands, and Slovakia), industry is the largest consumer.

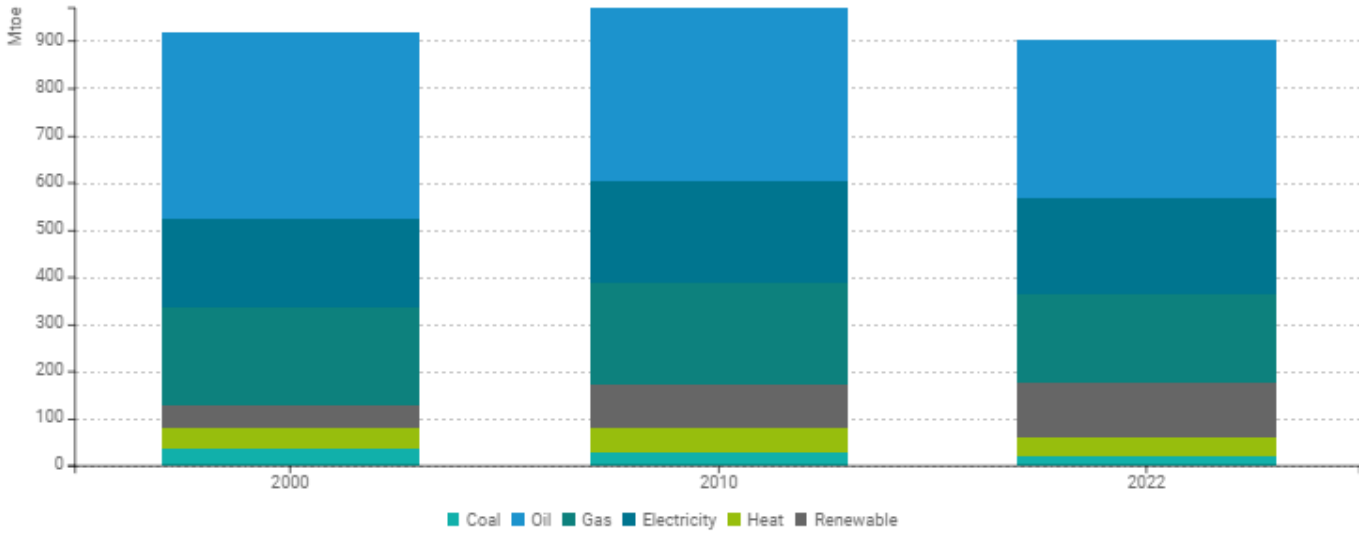
Final consumption by sector (EU countries, 2022)



Final consumption by energy (EU)

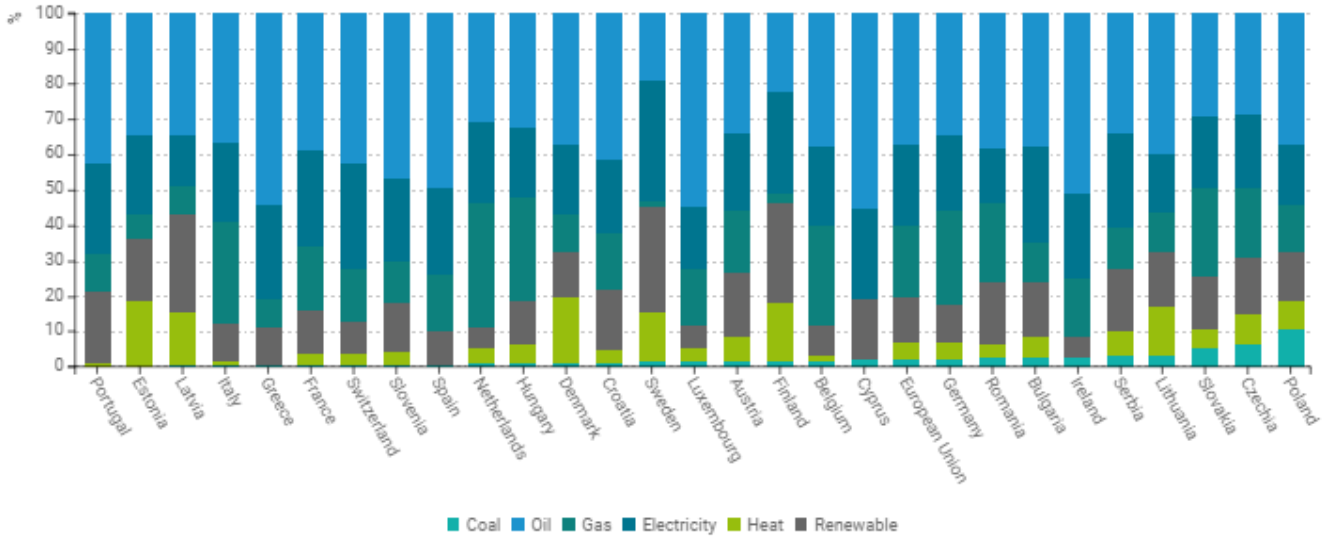
Increasing share of electricity in EU final energy consumption (from 21% in 2000 to 22% in 2010 and 23% in 2022) and for biomass and solar (renewable) (from 5% to 13%).Decreasing share for oil (from 43% in 2000 to 37% in 2022) and for coal (4% to 2%).Stable share for gas (22%) and heat (5%).

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).

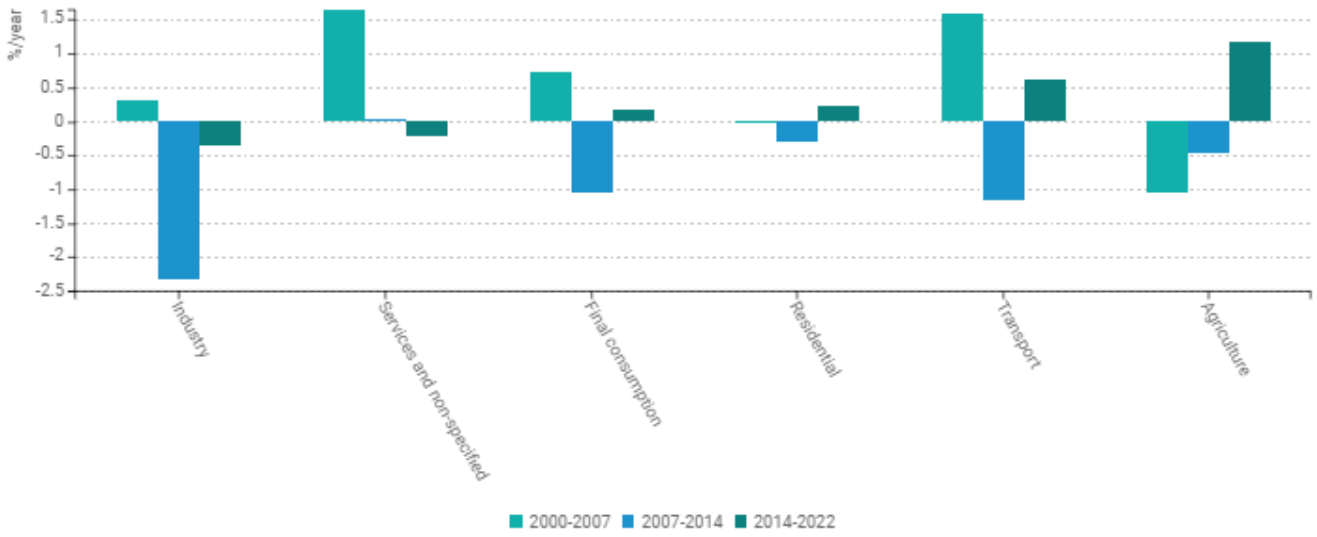
Fuel mix in the EU, 2022 (in %)



Increasing energy consumption in all sectors except services and industry

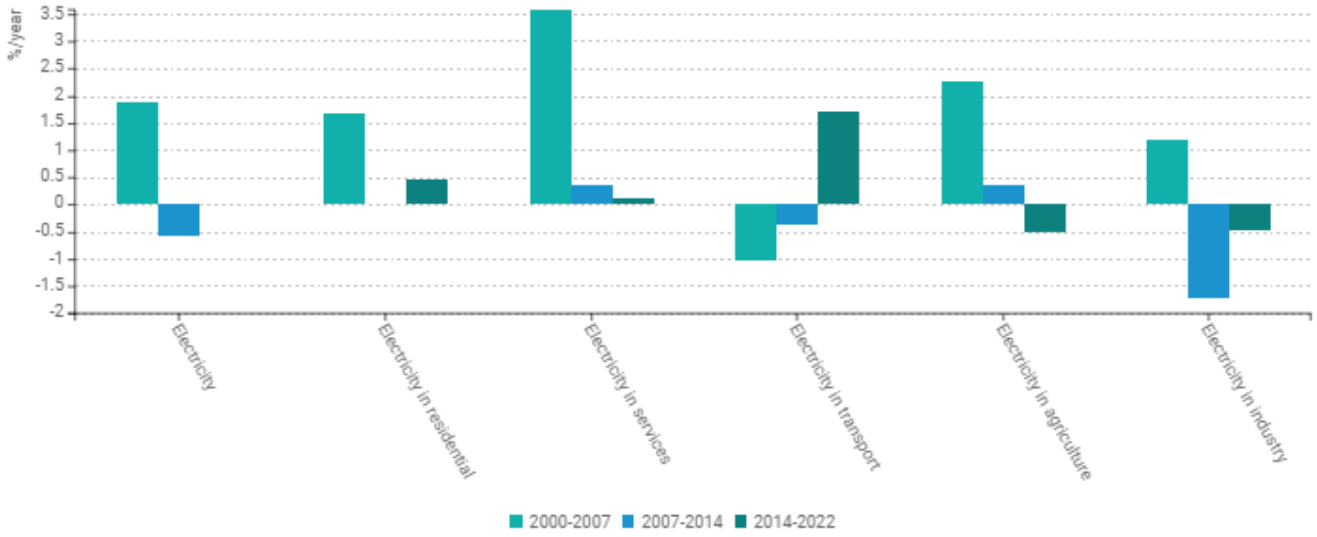
- Final energy consumption is increasing at EU level since 2014 for agriculture (+1.2%/year), transport (+0.6%/year) and residential (+0.2%/year). However it is decreasing for services (-0.2%/year) and for industry (-0.4%/year).
- Following the financial crisis of 2008/2009, this consumption was on the contrary decreasing for all sectors between 2007 and 2014, with the greatest reduction observed in the industrial sector (-2.3%/year).

Final energy consumption trends (EU, normal climate)



- Electricity consumption decreased by 3.2% in 2022, and returned to its 2014 level.
- Electricity consumption decreased between 2007 and 2014 (-0.6%/year) and grew rapidly before (+1.9%/year), that was mainly explained by residential and services sectors.

Final electricity consumption trends (EU)



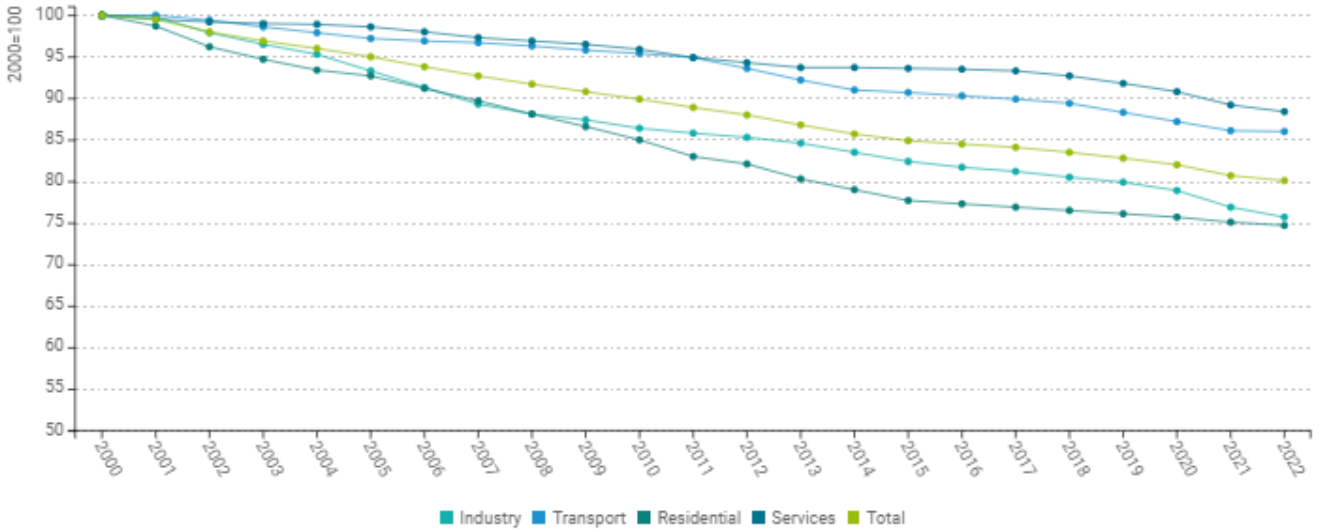
Energy efficiency trends

Energy efficiency trends of final consumers

- Energy efficiency of final consumers improved by 1%/year between 2000 and 2022. These improvements have accelerated since 2019 (1.1%/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 in 2021 and 2022.
- The largest gains are for households and industry (1.3%/year since 2000), although progress has been halved in households since 2014 (0.7%/year against 1.7%/year previously).

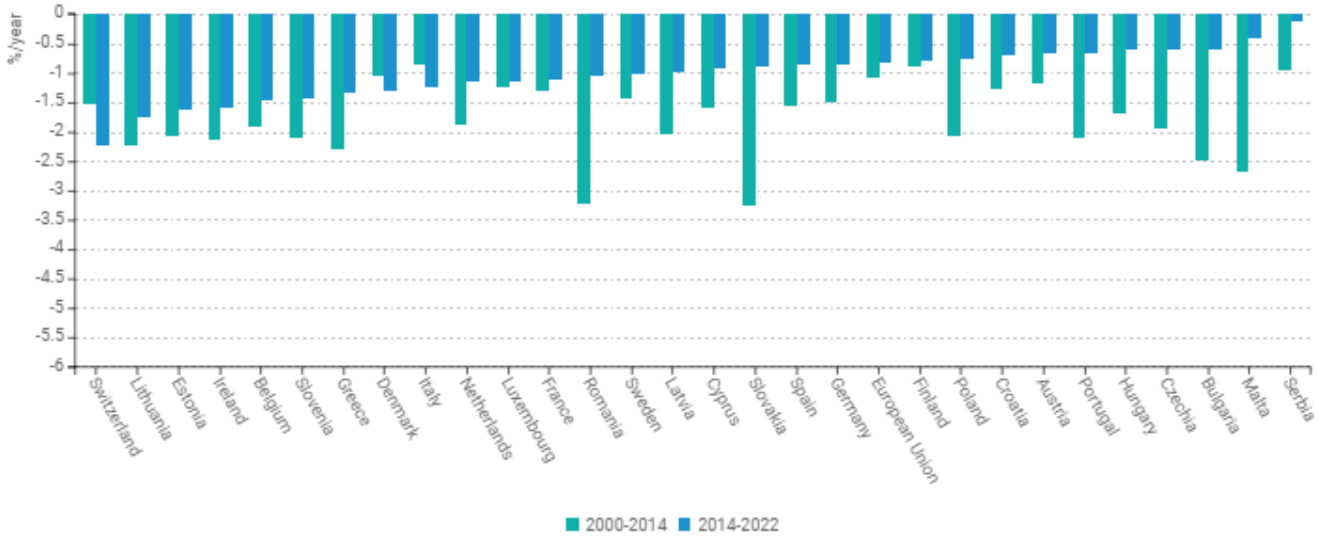
- A slighter slowdown is visible for industry after the 2008 economic crisis (0.9%/year from 2008 to 2020 against 1.6%/year previously). However, the trend seems accelerating again since 2020 (-2%/year).
- Slower improvement in transport (0.7%/year), with, however, a strong acceleration since 2018 (1%/year).
- Energy efficiency in services has improved at an average pace of 0.9%/year since 2000.

Energy efficiency trends of final consumers (EU)



- In most countries, energy efficiency has also been progressing much slower since 2014. Only Switzerland, Italy and Denmark see the energy efficiency improving faster since 2014.
- Switzerland, Lithuania, Estonia and Ireland show the steadiest progress since 2014, higher than 1.6%/year, twice the EU average.

Energy efficiency trends of final consumers (All countries)

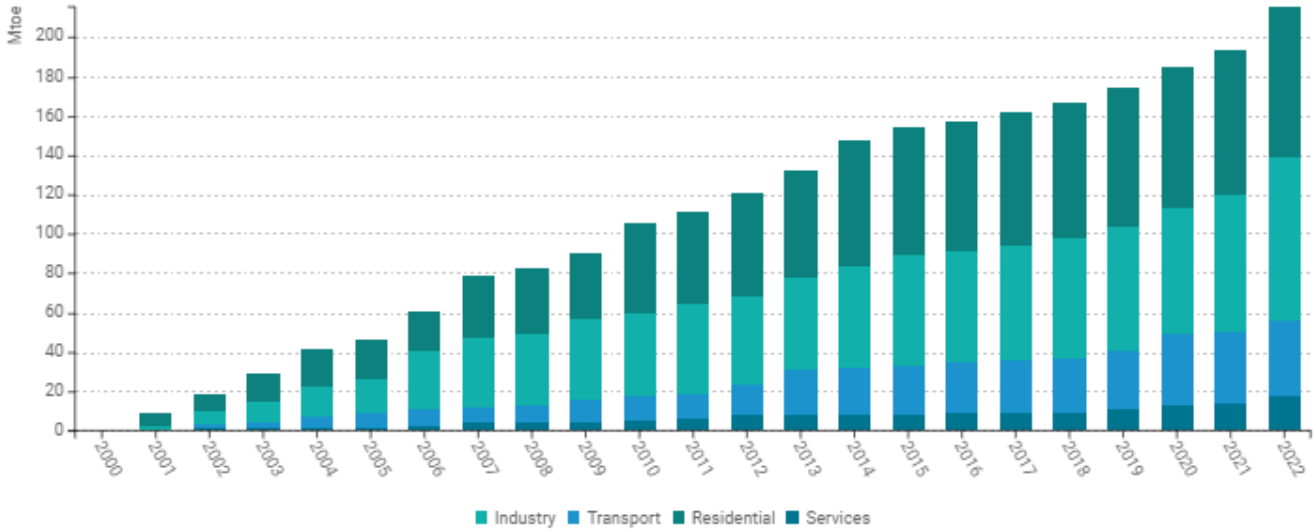


Evaluation of energy savings

Around 216 Mtoe of energy has been saved in 2022 compared to 2000 (24% of final energy consumption). Without these savings the final energy consumption would have been 24% higher in 2022.Industry comes in first position with 38% of total

savings, while it is only in third place in total final consumption (after transport and households).Households, which is the sector with the highest number of regulations and financial measures, is also overrepresented, with a share of total savings of 36%, which is much higher than its share in final consumption (28%).Savings in transport lag behind with savings much lower than their share in consumption (18% vs 31%).

Energy savings in the EU

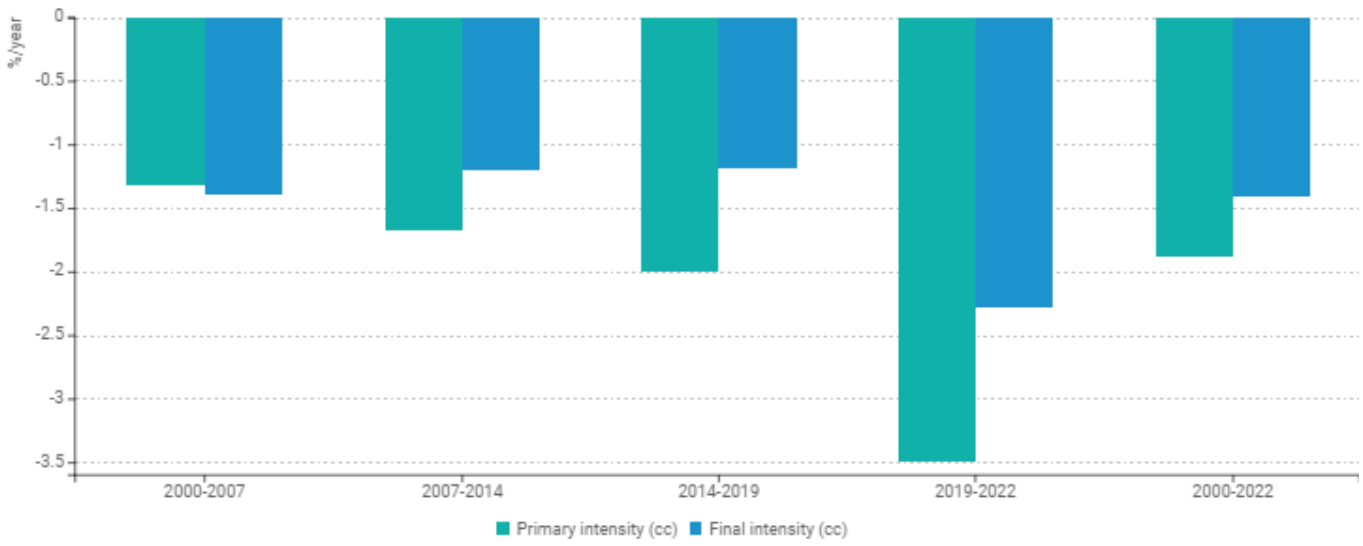


Energy intensity

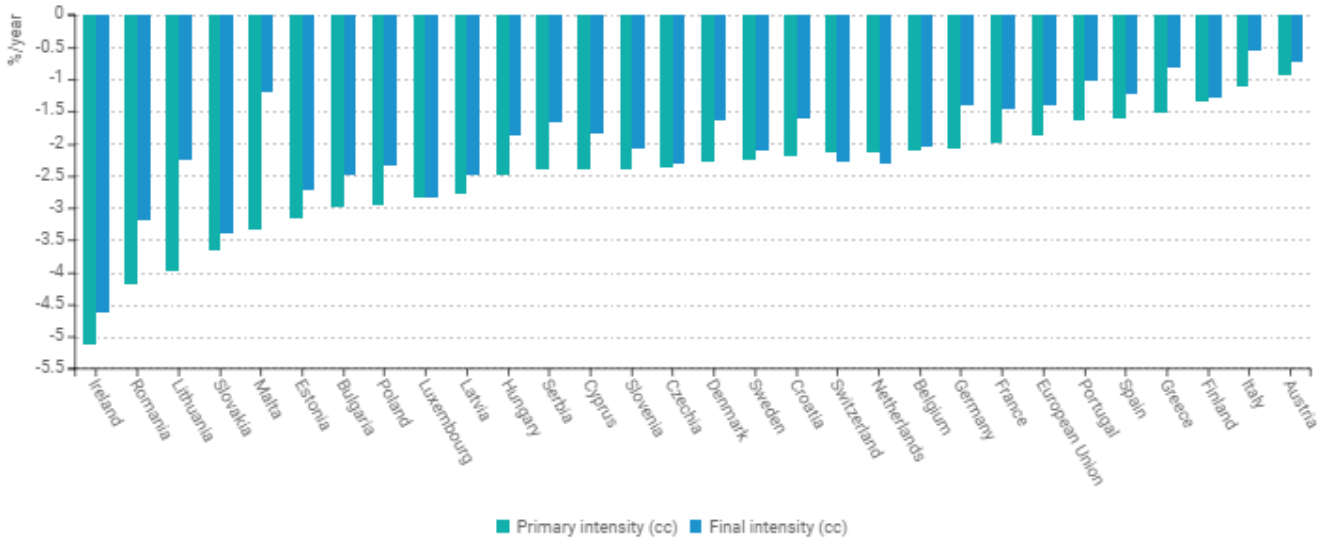
Primary and final energy intensities trends in the EU (normal climate)

- Since 2000, 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 (increasing efficiency of thermal generation, diffusion of renewables, increasing imports, etc.). This is especially significant since 2014, and even since 2019, with the very rapid penetration of renewables.
- An opposite trend can be seen in Switzerland and in the Netherlands, due to specific factors (non-energy uses in the Netherlands).

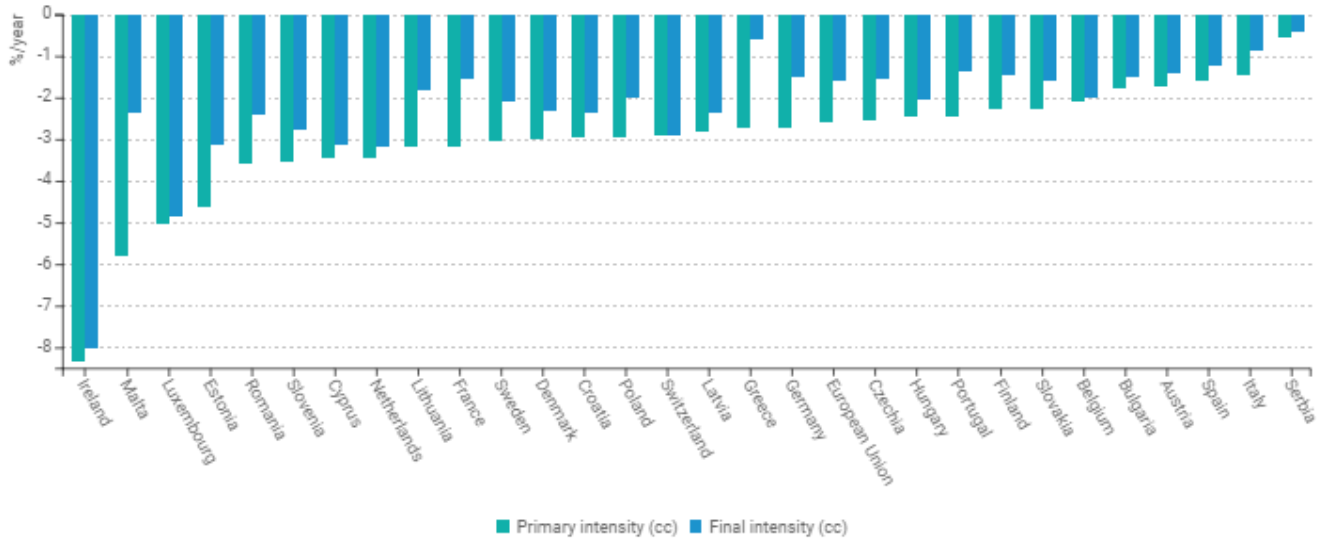
Primary and final energy intensities trends in the EU (normal climate)



Primary and final energy intensities trends (2000-2022)



Primary and final energy intensities (2014-2022)

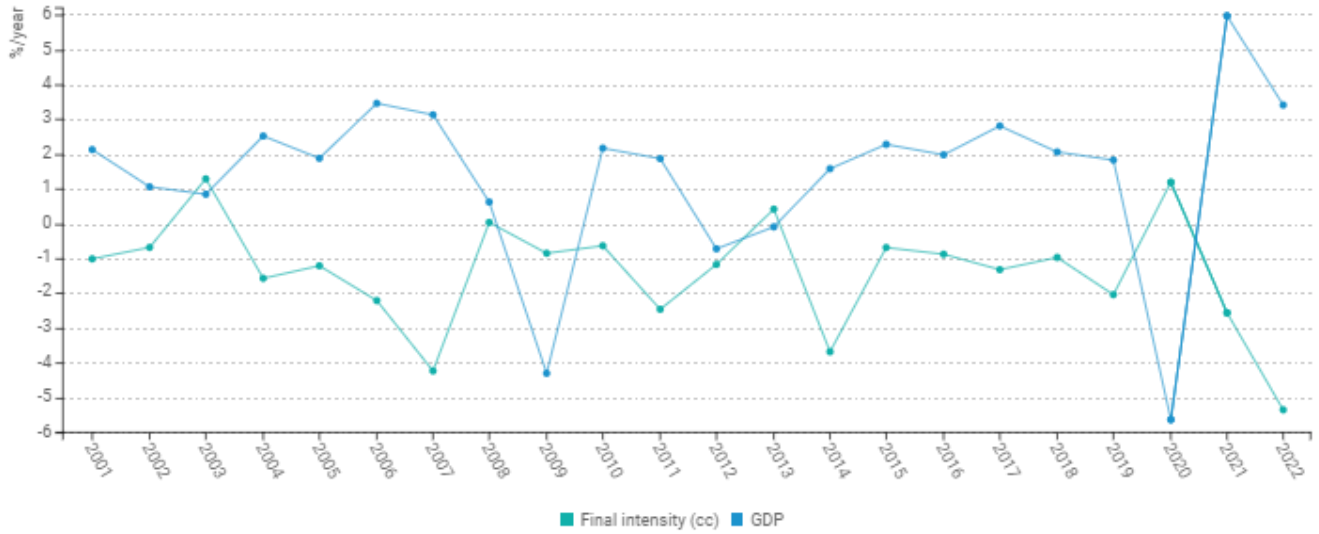


Note: Energy consumption at normal climate.

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. 2009 did not follow that trend because of deep structural changes in industry (greater contraction of activity in energy intensive branches).

GDP and final energy intensity growth (EU)

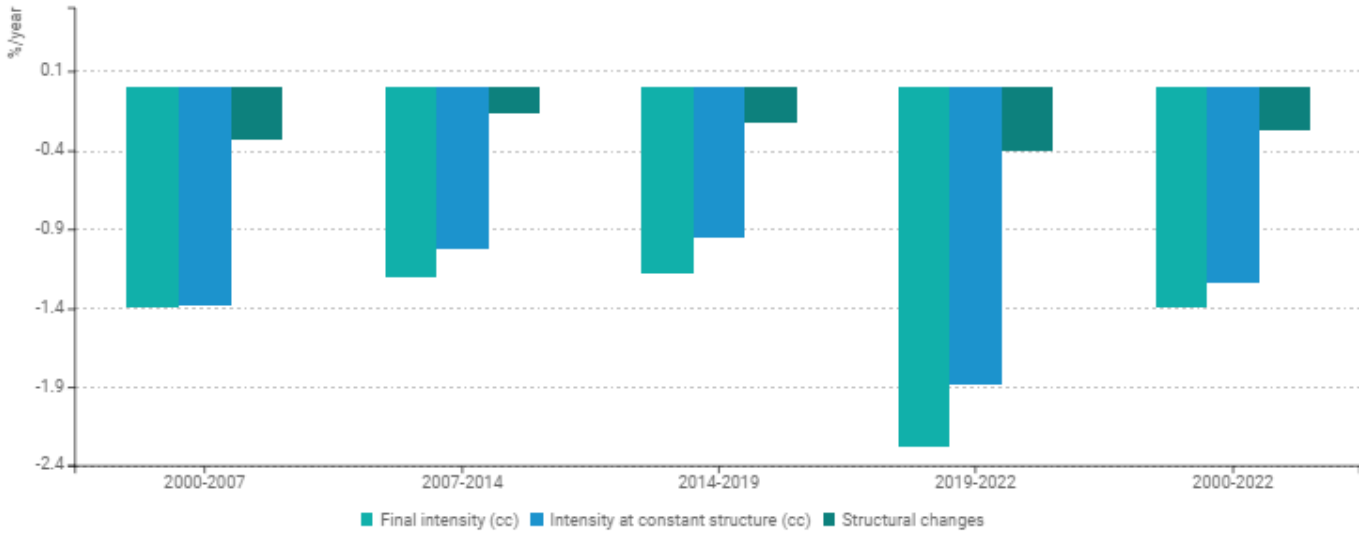


Note: Final energy intensity at normal climate.

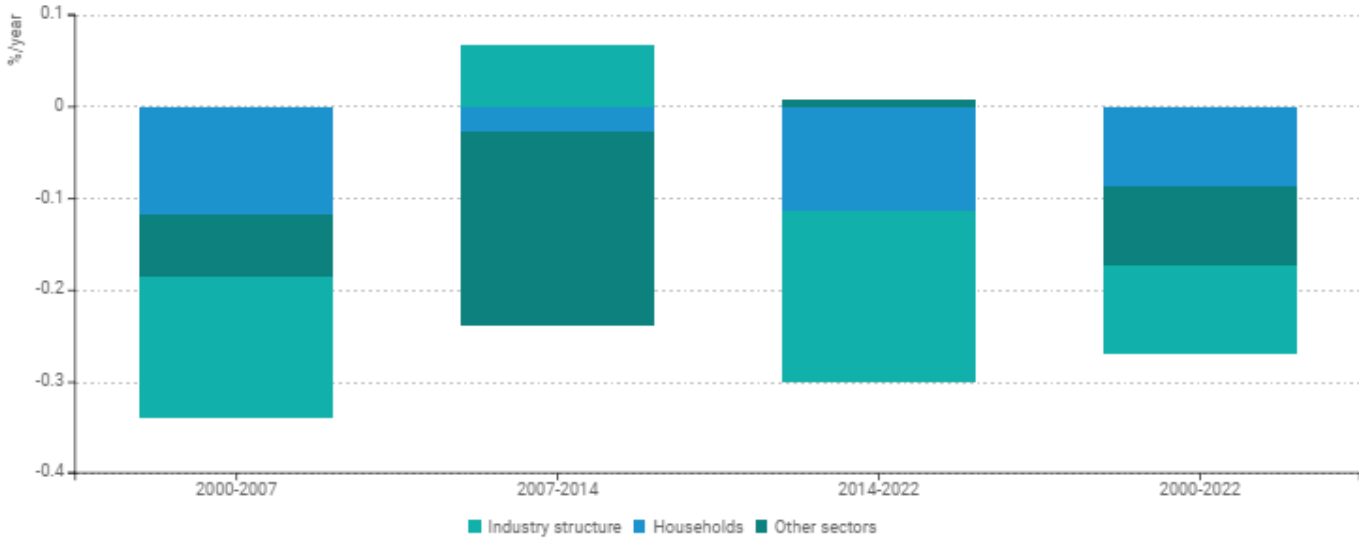
Impact of structural changes on final intensity

- 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 19% of the decrease in final intensity since 2000 (rather stable share over the period).
- The structural changes are mainly due to changes within industry (higher share of less energy intensive branches) and in the structure of GDP (higher share of services).

Impact of structural changes on the final intensity (EU)

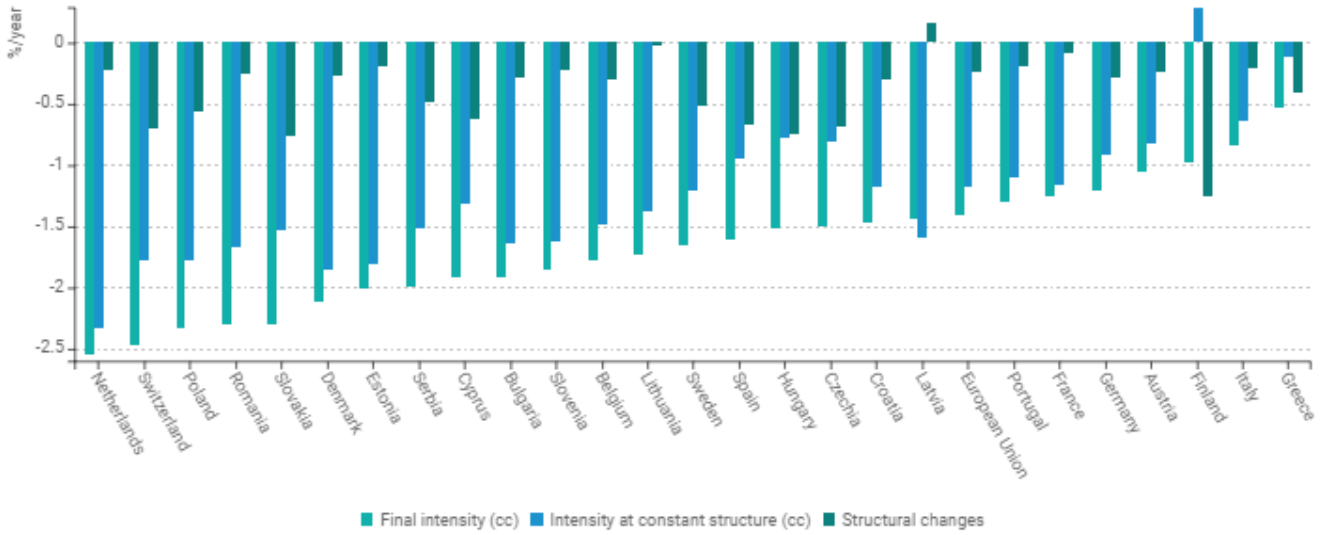


Contribution of structural changes (EU)



- Most countries have shifted to less energy-intensive sectors. Structural changes were negligible in Lithuania and contributed to slowing down the decrease in final intensity in Latvia.
- In half of the EU MS, structural changes explain more than 20% of the decrease in final energy intensity.
- In Finland and Greece, they explain a large part of the intensity decrease (more than 75%), as well as in Hungary (around 50%).

Impact of structural changes on the final intensity in EU countries (2007-2022)



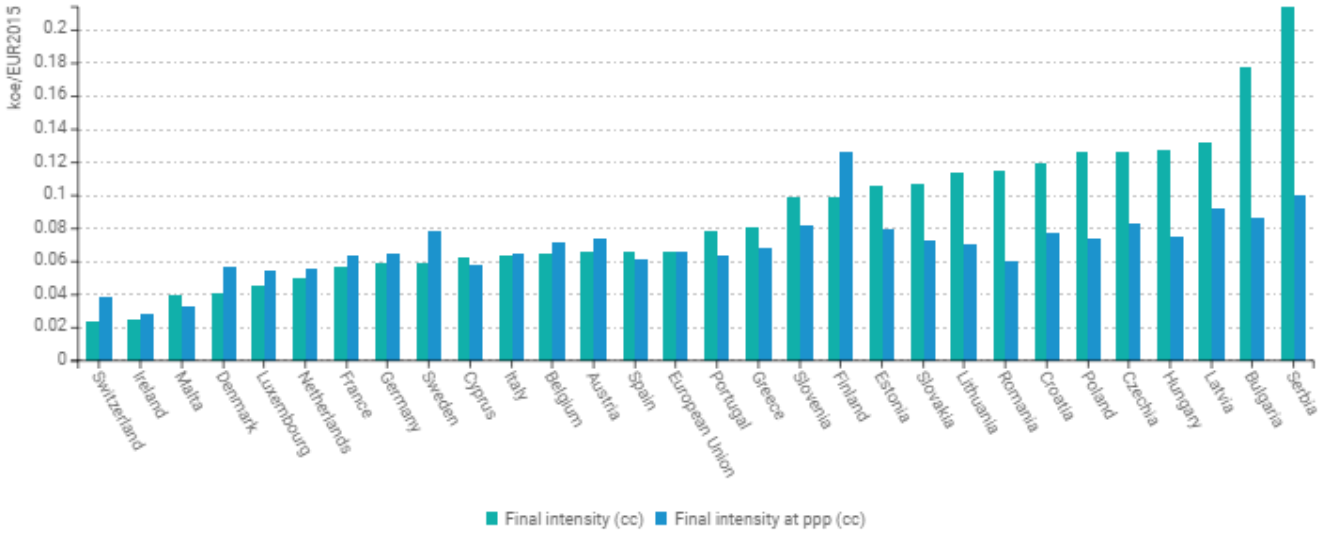
Note: Final energy intensity at normal climate.

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.

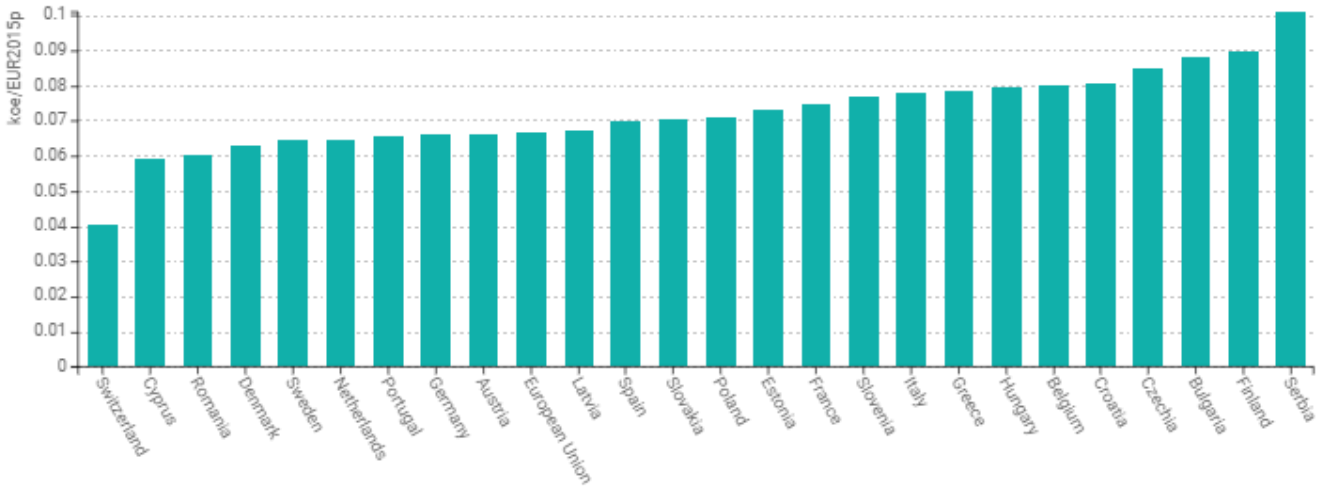
- After adjustment, the gap between EU countries is significantly reduced. For instance, Bulgaria, which has an intensity without adjustment 5 times higher than the average of the 3 countries with the lowest intensity, has an intensity only three times higher than the lowest countries after adjustment. Before adjustment Romania, is the 7th country with the highest intensity and after adjustment, it is the 7th lowest. The other countries the most affected by the adjustment, in terms of ranking, are Lithuania, Portugal and Greece.

Final energy intensities at ppp in 2022 (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.

Final energy intensities adjusted at ppp and EU average structure and climate (2022)

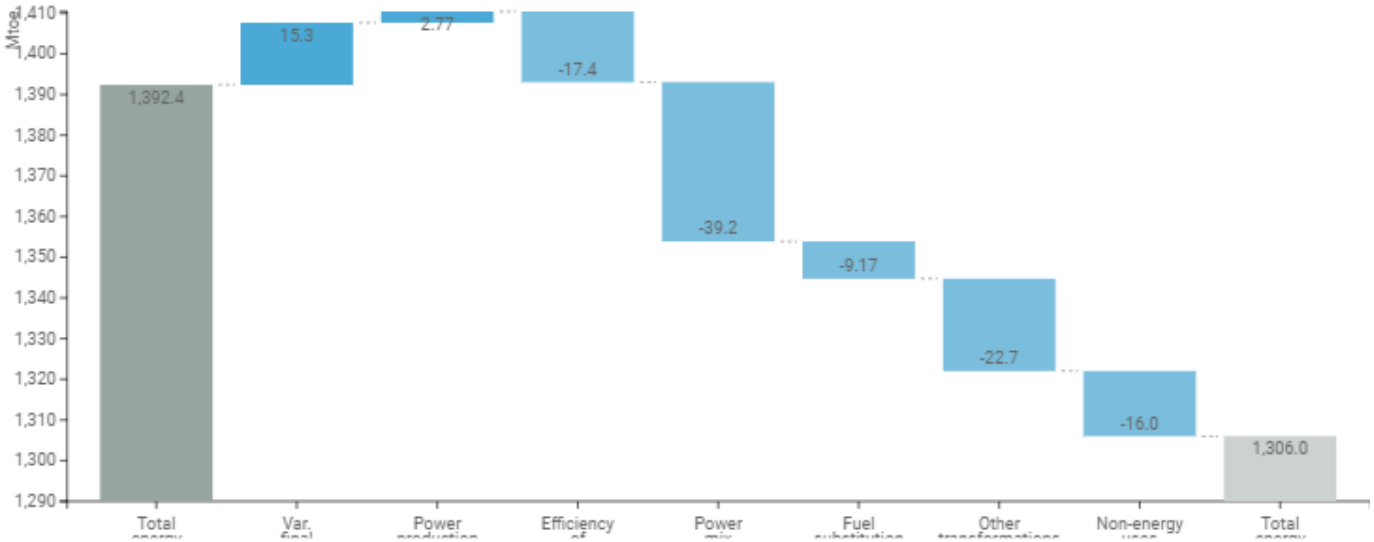


Decomposition of energy consumption

Drivers of total energy supply variation

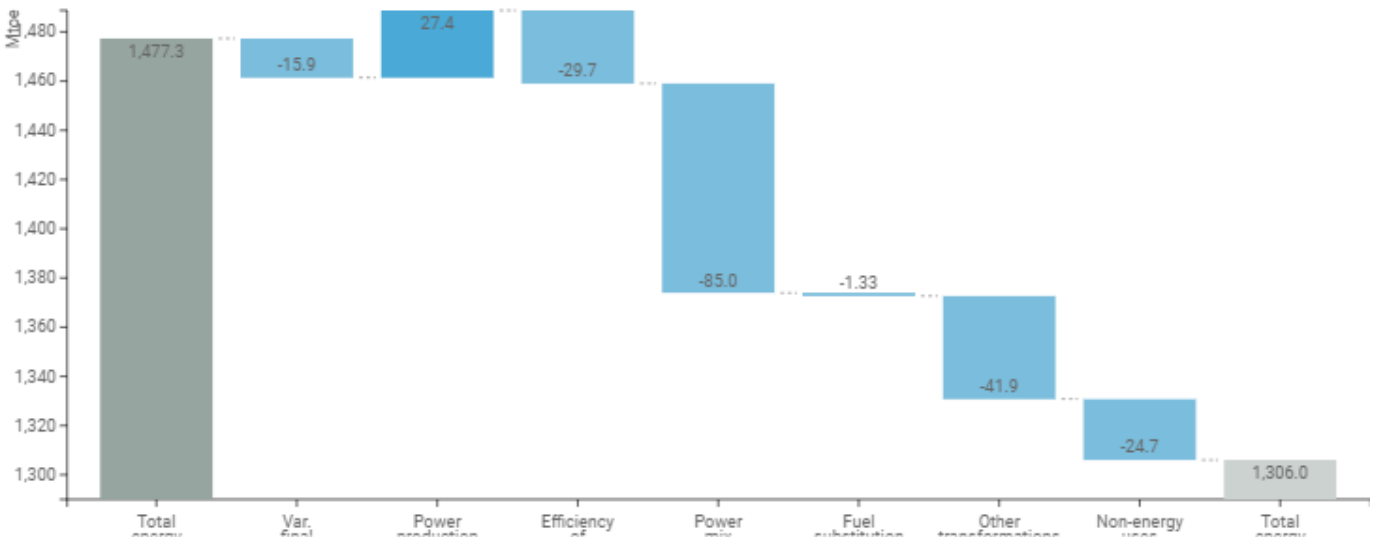
- Between 2014 and 2022, total energy supply decreased by 86 Mtoe at EU level while final consumption increased by 15 Mtoe.
- This decrease was explained by changes in the power mix (-39 Mtoe, thanks to important renewable electricity development), improved efficiency of thermal generation (-17 Mtoe), fuel substitution in thermal power production (-9 Mtoe) and changes in other transformations (-23 Mtoe).

Variation in total energy supply 2014-2022 (EU)



- Between 2000 and 2022, total energy supply at EU level decreased by 171 Mtoe. Meanwhile, final consumption decreased by 16 Mtoe.
- This decrease was explained by changes in the power mix (-85 Mtoe), improved efficiency of thermal generation (- 30 Mtoe) and changes in other transformations (-42 Mtoe).

Variation in total energy supply 2000-2022 (EU)



Drivers of final energy consumption variation

- In 2022, final energy consumption (902 Mtoe) is slightly lower than in 2000 (-16 Mtoe).
- This is the result of two contradictory effects. On the one hand, an activity effect (evolution of the value added of services and agriculture, of the production index of industry, of the traffic in transport, of the number of dwellings and their size as well as of the number of appliances used by the households) which increased the final energy consumption by 206 Mtoe.
- On the other hand, technical energy savings reduced consumption by about 216 Mtoe.
- Structural effects (mainly the transition to less energy-intensive branches in industry) had a marginal effect (-15 Mtoe).
- Climate differences (2000 being cooler than 2022) contributed to decrease consumption by 7 Mtoe.
- Other effects, mainly linked to greater comfort, and other behavioral changes increased consumption by 15 Mtoe.

Variation in final energy consumption 2000-2022 (EU)