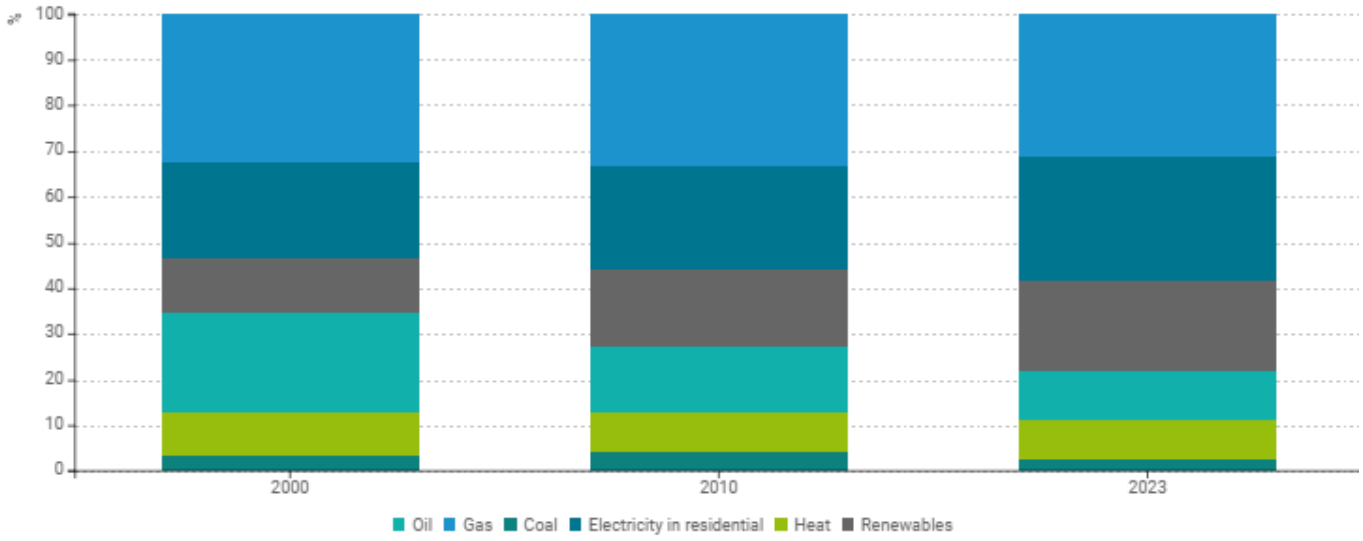
Sectoral Profile - Households

Energy consumption

Household energy consumption by energy in the EU

- Natural gas is the most widely used energy source by households in the EU. Its share remained relatively stable until 2021 (around 34%), before decreasing significantly by 3 points to 31% in 2023.
- Electricity comes second with a steadily increasing share, rising from 21% in 2000 to 22.5% in 2010, 25% in 2021 and 27% in 2023. This increase has accelerated significantly since 2021 (+2 pp in two years). Malta, Bulgaria and Sweden have the highest penetration of electricity with respective shares of 75%, 52% and 49%.
- Oil is slowly being replaced by other energy sources (11% in 2023 compared to 15% in 2010 and 22% in 2000) but its use remains important in the island countries (Ireland and Cyprus).
- The share of renewables (wood, solar) stood at 20% in 2023. It increased by 5 pp between 2000 and 2010, but has shown a much slower progression since then (+3 pp). Four countries have a share twice higher: Croatia, Latvia, Estonia, and Romania (between 39% and 45%).

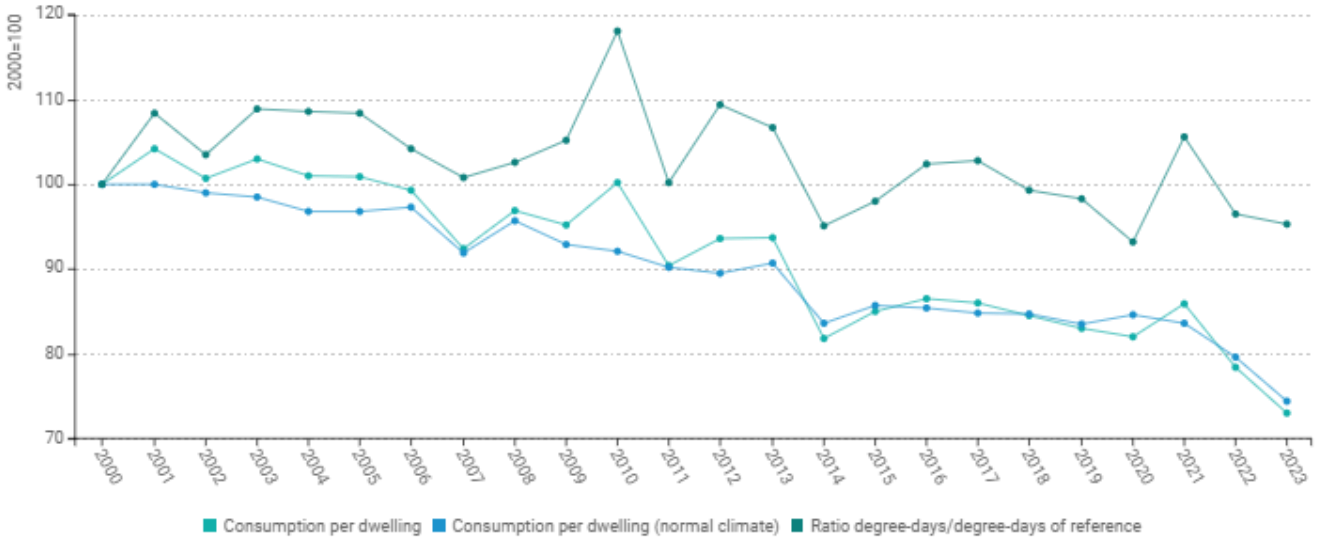
Household energy consumption by energy in the EU



Influence of climate on the consumption per dwelling

- Large variations in climate from one winter to another can influence energy consumption: higher consumption in cold winters and vice versa in mild winters, all other things being equal.
- Climate corrections provide a measure of consumption that is independent of annual climate variations. These corrections are based on the ratio of actual to normal degree days (i.e. reference degree days*).
- Energy efficiency indicators should be climate corrected and measured at normal climate.

Specific consumption per dwelling: actual value VS climate-corrected

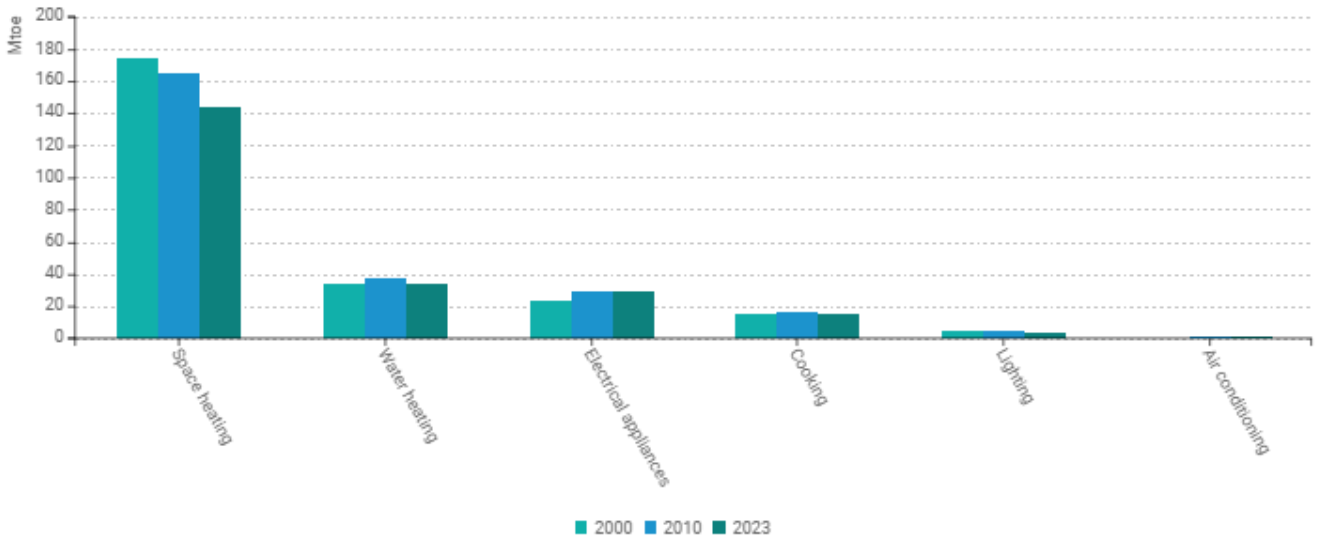


*More information on reference (or normal) degree days calculation available in the Q&A.

Declining share of space heating in the EU

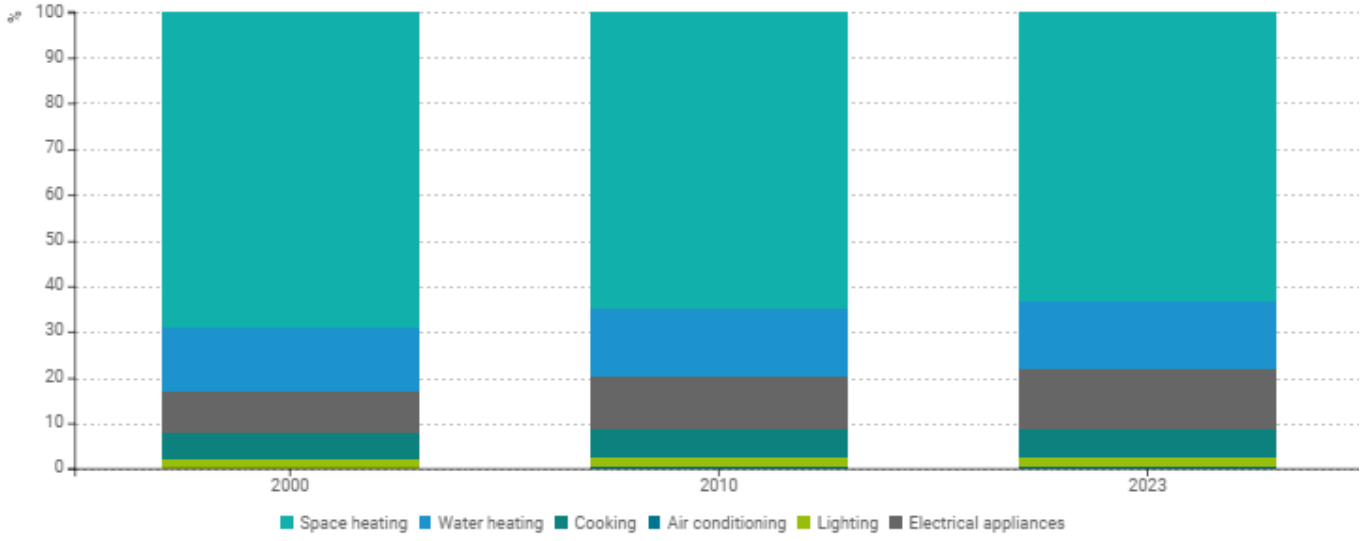
- The share of space heating in household energy consumption at normal climate has lost 6 points since 2000 (69% in 2000 to 63% in 2023), of which 5 points between 2000 and 2010. However, the most significant decrease in heating consumption has been observed since 2019 (-2.9%/year over 2019-2023, compared to -0.3%/year over 2010-2019 and -0.6%/year over 2000-2010).
- The second most important end-use is water heating (share stable around 14%).
- The share of electrical appliances has steadily increased from 9% in 2000 to 11.5% in 2010, and has then remained almost stable until 2020 (12%). It has increased more rapidly since then (+1 point) to reach 13% in 2023.
- The share of cooking is stable around 6%.
- Lighting accounts for just under 2% (stable share). However, its share in electricity consumption has declined from 10% in 2000 to 9% in 2010 and 7% in 2023, with the diffusion of efficient lamps (CFL and LED) .
- Air conditioning is negligible (0.6% of energy consumption); it has however experienced a notable increase in its share of the electricity consumption (from 0.6% in 2000 to 1.4% in 2010 and 2.5% in 2023).

Household energy consumption in the EU



Note: Space heating consumption at normal climate.

Household energy consumption in the EU, in %



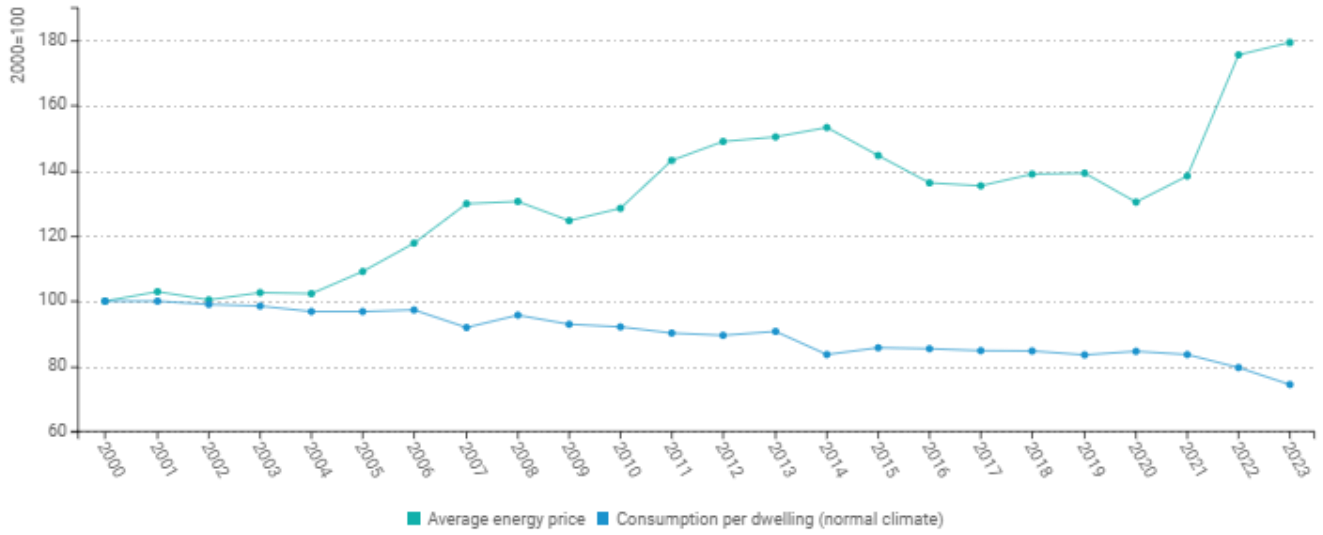
Note: Energy consumption at normal climate.

Energy consumption per dwelling

Consumption per dwelling and energy price

- Energy consumption per dwelling at EU level has been decreasing since 2010 (-1.6%/year), but at a low rate of 0.9%/year until 2021. It then declined very rapidly by 5.7%/year over 2021-2023, with the surge in energy prices.

Specific consumption per dwelling and energy price

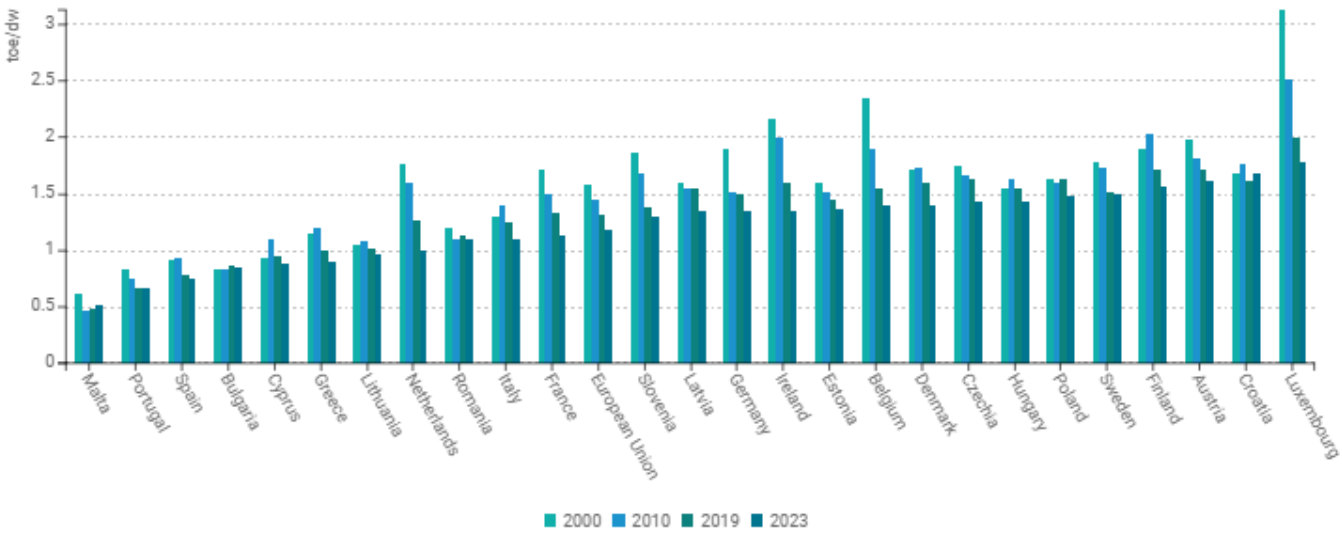


Note: Energy consumption at normal climate. Energy price at constant prices of 2015.

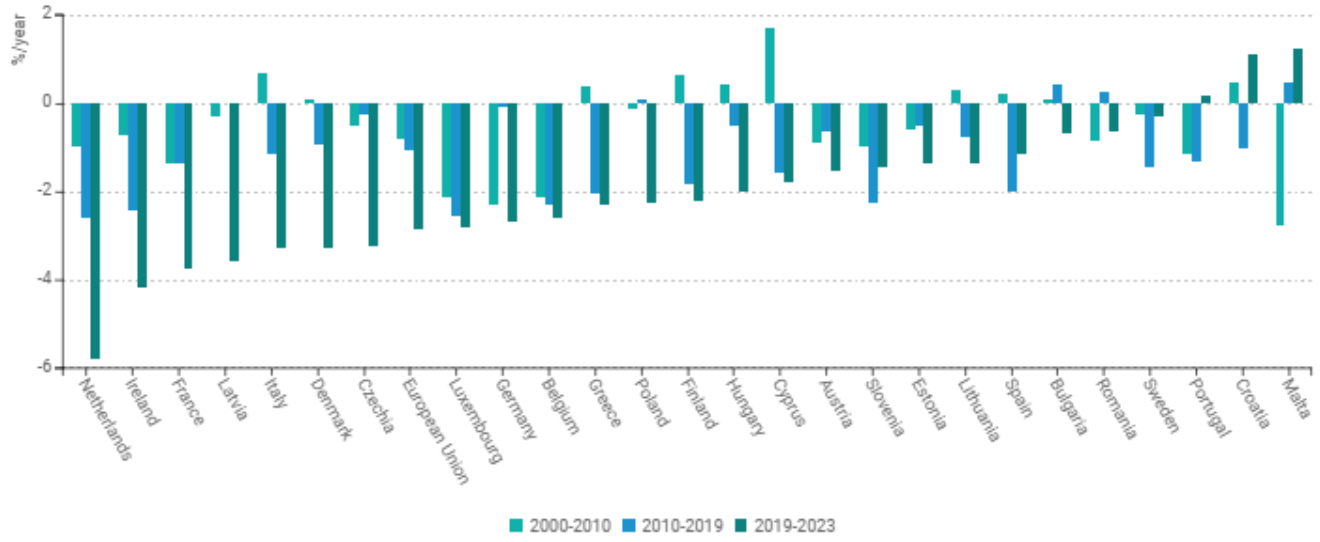
Average energy consumption per dwelling

- Energy consumption per dwelling has decreased in almost all countries (-1.1%/year at EU level since 2010) with the largest reduction since 2019 (-2.9%/year, at EU level) in most countries.
- Between 2010 and 2019, the reduction was significantly slow in most countries. Consumption even slightly increased in 5 Member States (Malta, Bulgaria, Romania, Poland and Latvia).
- The EU average energy consumption per dwelling in 2023 was 1.2 toe, with values ranging from 0.5 to 1.8 toe/dwelling among Member States. These values do not take into account climatic differences between countries (see below the comparison with an adjustment to the same climate).

Average consumption per dwelling (at normal climate)

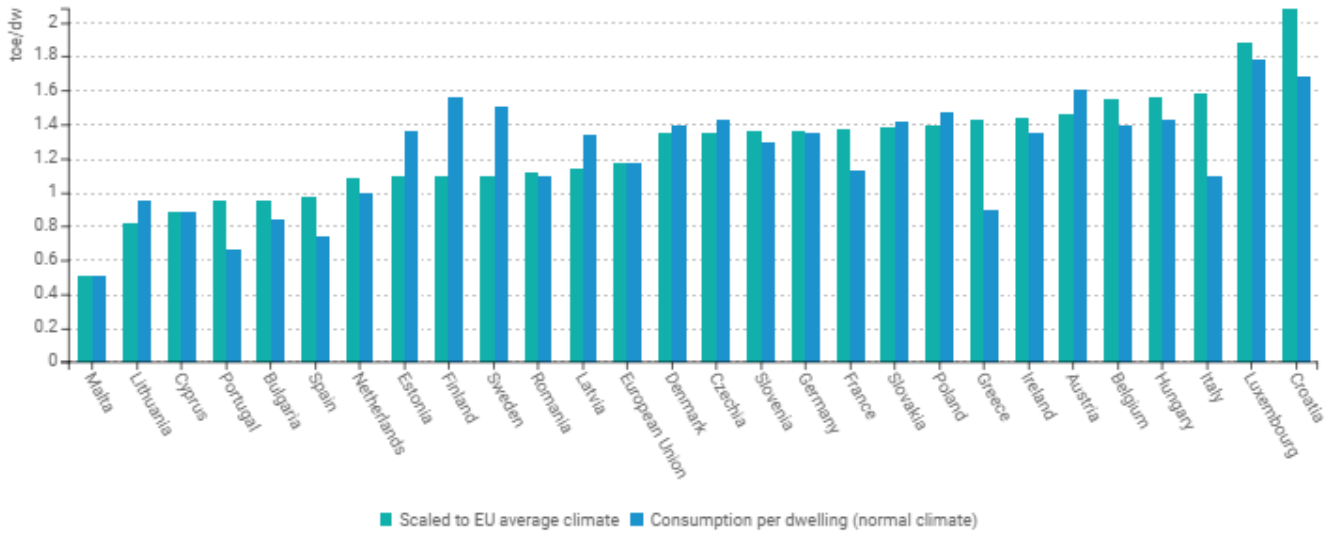


Variation of average consumption per dwelling (at normal climate)



- The comparison between countries is more relevant if the heating consumption is adjusted to the same climate (EU average climate).
- After adjustment to the average EU climate, the gap between countries is narrowing slightly (factor 2.5) with values ranging from 0.82 toe/dwelling in Lithuania to 2.1 toe/dwelling in Croatia. After adjustment, Croatia, Luxembourg, Italy, Hungary and Belgium have the highest consumption per dwelling.

Average consumption per dwelling (adjusted to EU climate, 2023)

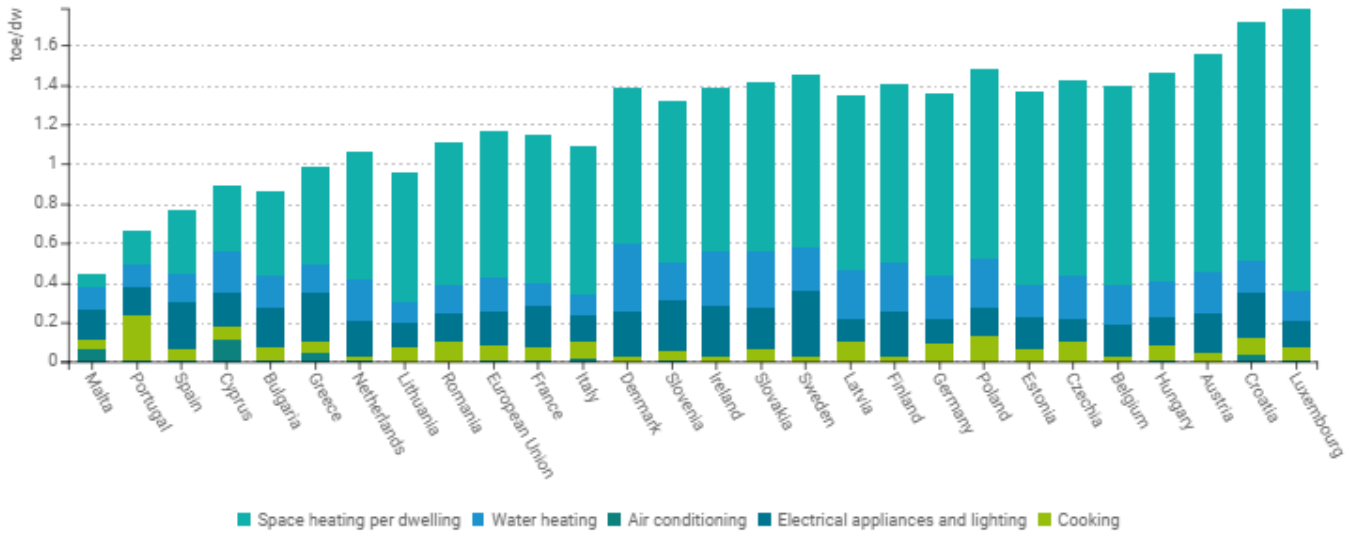


Note: Malta and Cyprus not adjusted.

Energy consumption by end-use

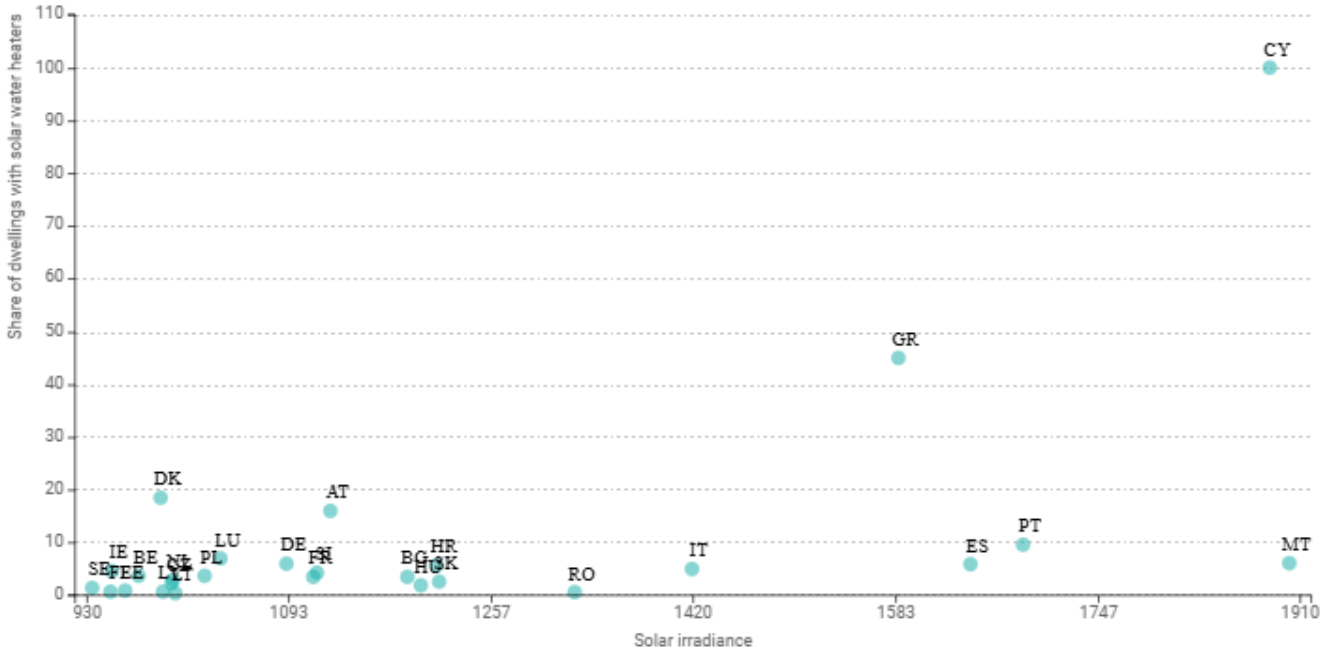
- The breakdown of household energy consumption by end-use differs substantially between Member States.
- Space heating has the highest share in this consumption in most countries (except Malta). It represents on average 0.74 toe/dwelling (in a range of 0.06 to 1.42 toe/dwelling).
- The second highest share is electrical appliances and lighting or water heating depending on countries, except for Portugal where cooking comes second. Electrical appliances and lighting consumption ranges from 0.11 to 0.33 toe/dwelling.
- Water heating consumption varies from 0.10 to 0.35 toe/household.
- Air cooling still represents a marginal share of dwelling consumption in most countries except Cyprus and Malta (0.11 and 0.06 toe/dwelling respectively), followed by Greece and Croatia, (0.04 and 0.03 toe/dwelling respectively).

Specific consumption of households by end-use (2023)



- Large discrepancies between Members States in the spread of solar water heaters equipment for dwellings. As expected, southern countries, with the highest solar radiation have a higher rate of equipment (especially Cyprus with around 100%, followed by Greece with 45%). However, some countries with a low radiation achieve relatively high equipment rates, such as Denmark and Austria, compared to countries with higher solar radiation (e.g Portugal, Spain or Italy).

Percentage of dwellings with solar water heaters (2023)

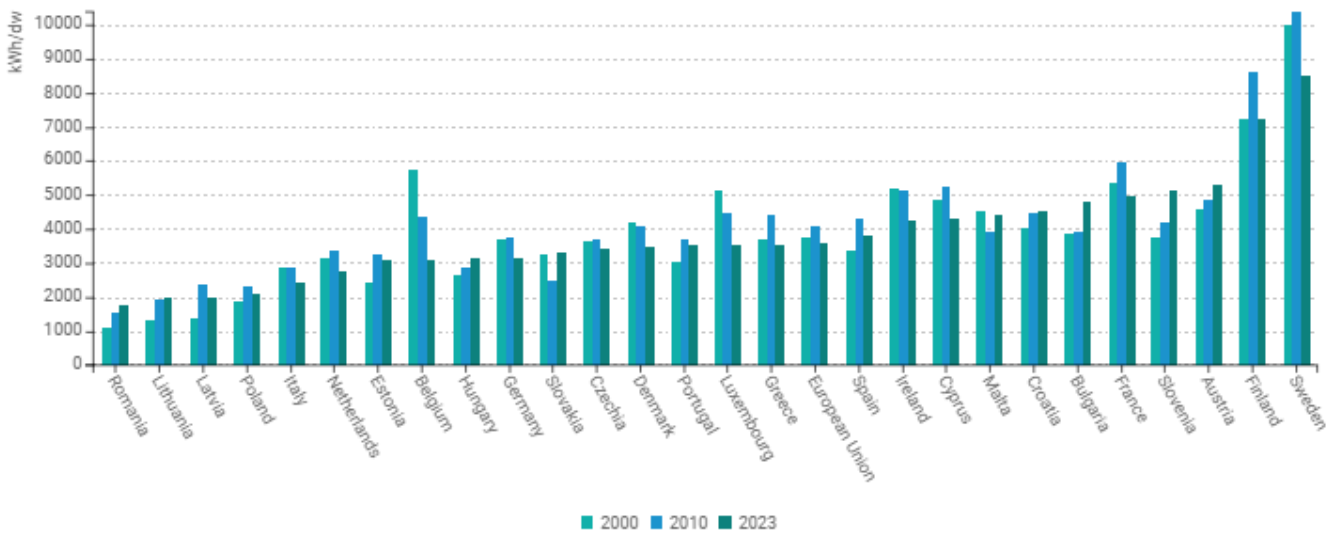


Note: Cyprus has almost 100% of dwellings with solar water heaters, for a solar irradiance of 1,886 kWh/m²/year.

Electricity consumption per dwelling

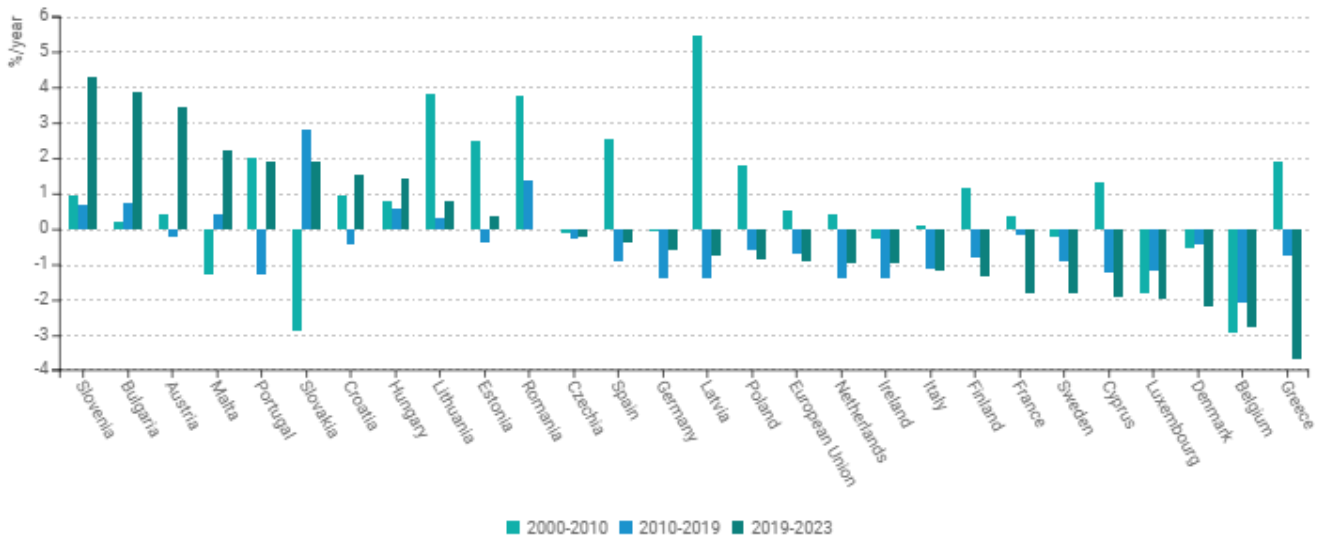
- There are significant disparities in the electricity consumption per dwelling among EU Member States: from 1.8 MWh in Romania to 8.5 MWh in Sweden (3.6 MWh for the EU average).
- This heterogeneity is partly due to the use of electricity for thermal uses, which is significant in Czechia, Bulgaria, France, Finland and Sweden for instance, as well as different equipment rates of electrical appliances and different levels of energy efficiency.

Electricity consumption per dwelling



- Since 2019, the electricity consumption per dwelling has decreased by 0.9%/year at EU level. However, it hides huge discrepancies between Member States. In 11 EU countries, electricity consumption increased, with a rapid progression (> 2%/year) in 5 countries (Slovenia, Bulgaria, Austria, Malta and Portugal). On the opposite, it has decreased strongly in 7 EU MS (Greece, Belgium, Denmark, Luxembourg, Cyprus, Sweden and France), with rate between -1.8%/year and 3.7%/year.
- Over 2010-2019, the electricity consumption per dwelling decreased at EU level, (-0.7%/year) and in most EU countries. It increased slightly in 5 MS (less than 1%/year), and quite rapidly in two countries: Romania and Slovakia (+1.4%/year and +2.8%/year respectively).
- Significant increase between 2000 and 2010 (+1.5%/year and above) in some Member States, including Southern countries mainly due to air conditioning (e.g. Spain, Greece, Portugal), but also in Lithuania, Latvia, Romania, Estonia and Poland.

Trends in electricity consumption per dwelling

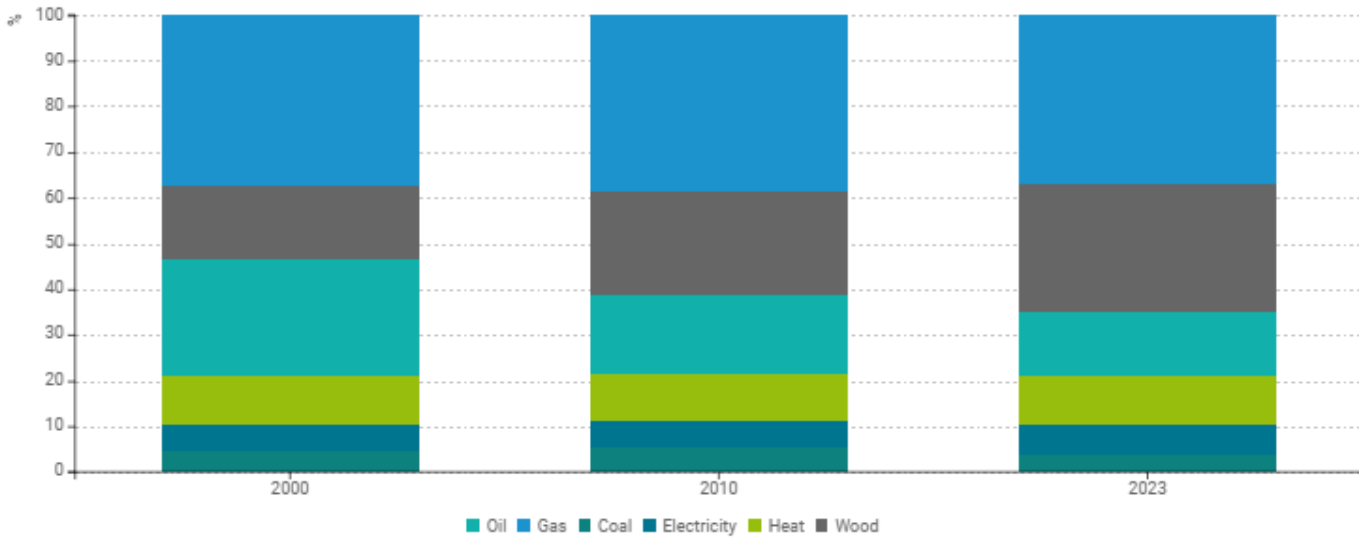


Space heating

Heating energy consumption by energy source

- Natural gas is the leading energy source for households space heating in the EU, with a decreasing share since 2021 (37% in 2023, 39% in 2010 and 37% in 2000).
- The share of electricity stood at 7% in 2023, slightly above 2000 and 2010 levels (around 6%).
- Oil is slowly being phased out (-11 points, from 25% in 2000 to 18% in 2010 and 14% in 2023) but remains significant in some Member States such as Cyprus and Ireland (>50%).
- Renewables are progressing (+12 points, from 16% in 2000 to 23% in 2010 and 28% in 2023).
- The share of heat is almost stable, from 11% in 2000 to 10% in 2010 and 11% in 2023.

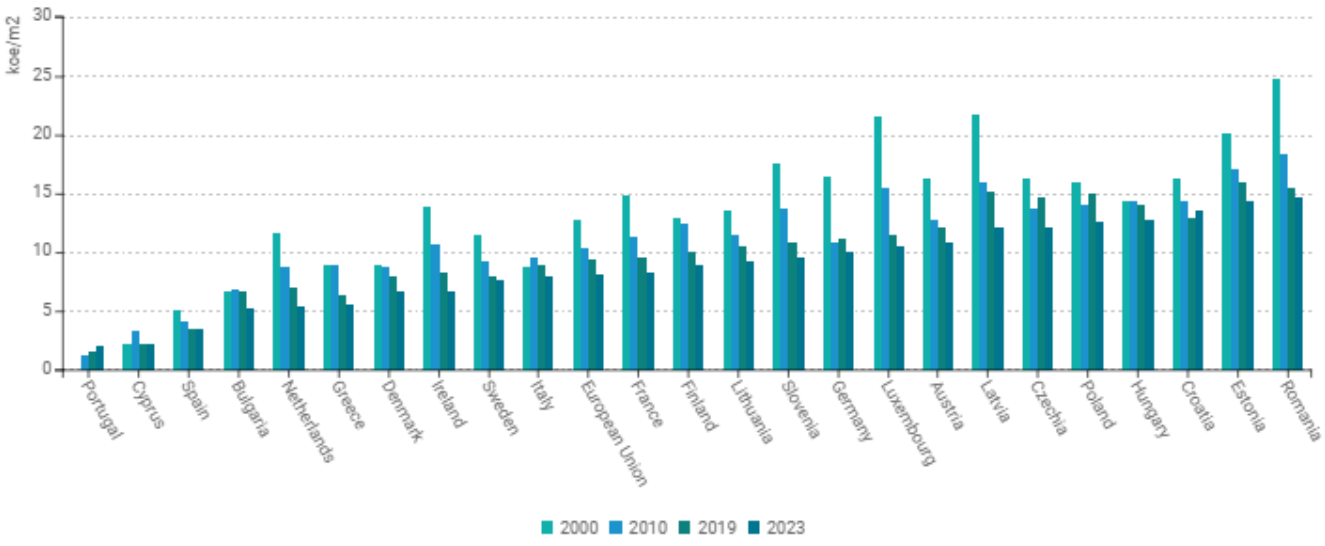
Household energy consumption for heating by energy



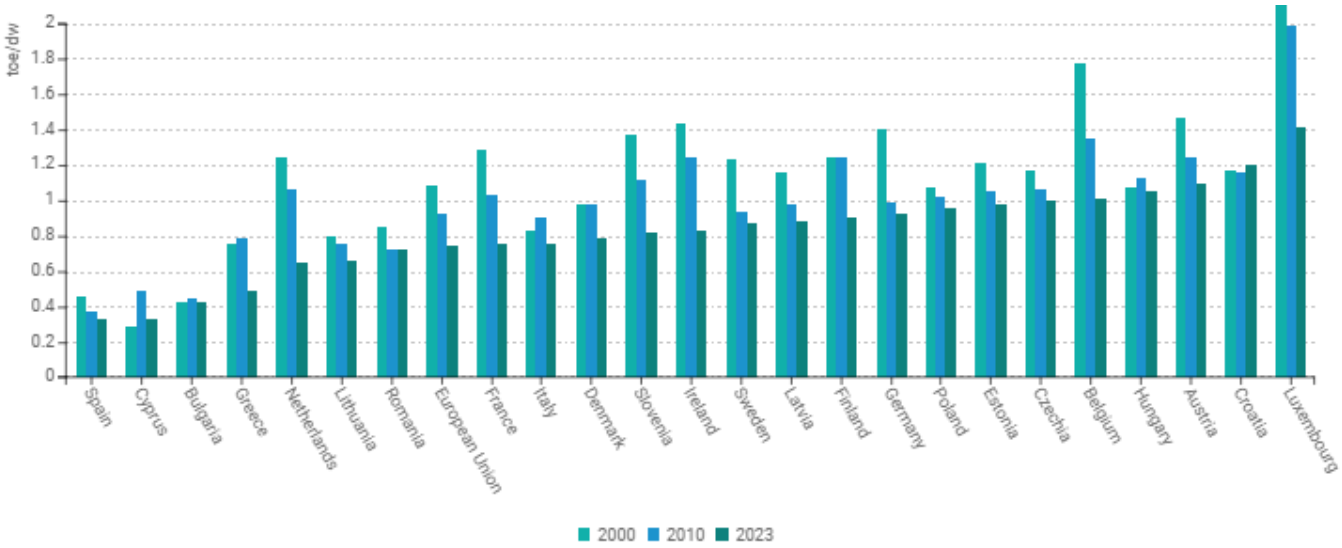
Heating consumption per m² and per dwelling

- Heating consumption per m2 and per dwelling (with climatic corrections) has decreased since 2000 in EU MS thanks to the implementation of stricter building codes, combined with financial incentives to promote the thermal retrofitting of existing dwellings and the adoption of more efficient heating systems (e.g. gas condensing boilers, heat pumps, pellet boilers). The reduction in heating consumption per m2 was 1.9%/year on average in the EU between 2000 and 2023. It was above 2%/year in 8 EU MS (The Netherlands, Ireland, Luxembourg, Slovenia, Latvia, France, Romania and Germany).
- Since 2019, the decline in the heating consumption per m2 has accelerated at EU level (-3.6%/year) and in 18 countries (by more than 5%/year in Slovakia, the Netherlands, Bulgaria, Latvia and Ireland. This is probably explained by the very steep price increase. For the other countries, the situation is quite diverse.
- Significant differences between countries from less than 5 koe/m2 in countries with warmer climate, such as Spain, Cyprus and Portugal to more than 12 koe/m2 in Latvia, Czechia, Poland, Hungary, Croatia, Estonia and Romania, due to less efficient homes and space heating technologies and a large use of biomass.

Heating consumption per m²

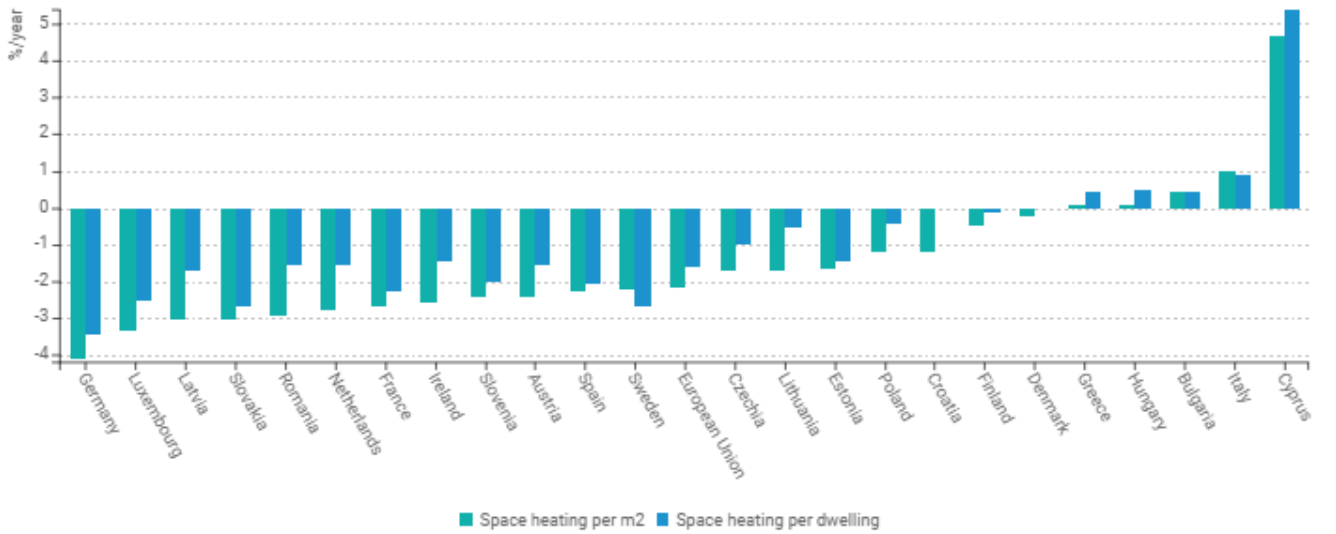


Heating consumption per dwelling

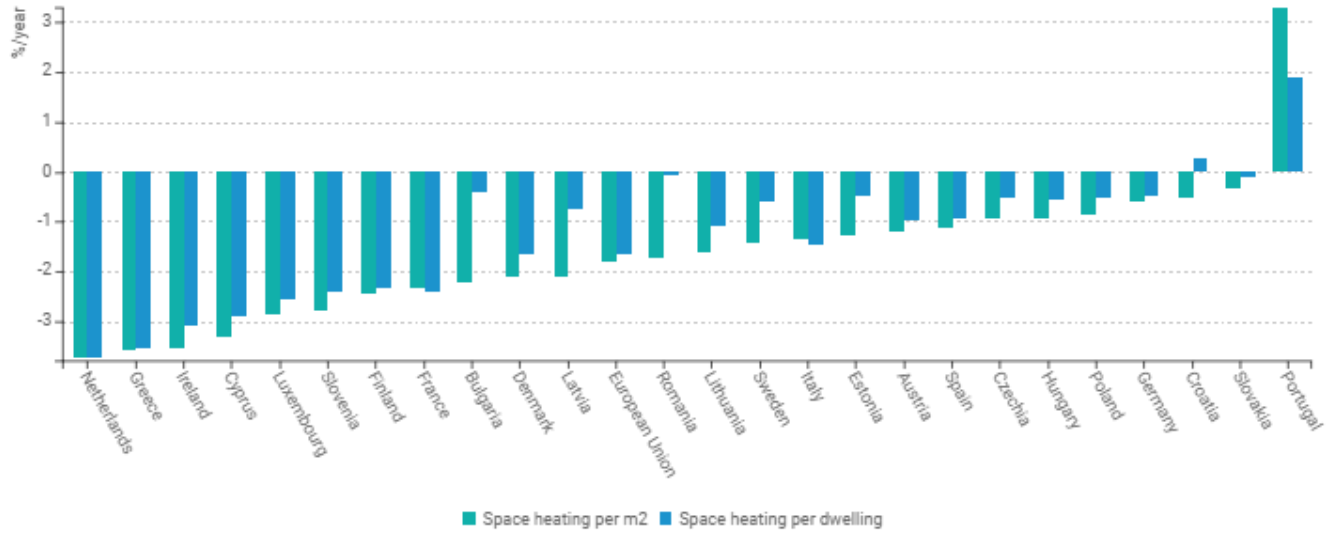


- Until 2010, the energy consumption per dwelling has generally decreased less than the energy consumption per m2 because of an increase in the average size of dwellings (-1.6%/year over 2000-2010 at EU level for the consumption per dwelling vs -2.4%/year for the consumption per m2, which means that the dwelling size has increased by 0.8%/year). This means that, until 2010, around 33% of the progress in energy efficiency for heating at EU level has been offset by the increase in dwelling size. This has been particularly important in the less developed Member States (e.g. Romania, Lithuania). This size effect has become negligible since 2010 at EU level and in the most developed MS as the average size of dwellings has remained almost stable. It is still significant in Eastern European countries, which had smaller dwellings.

Variation of consumption per m² VS per dwelling: effect of change in dwelling size (2000-2010)

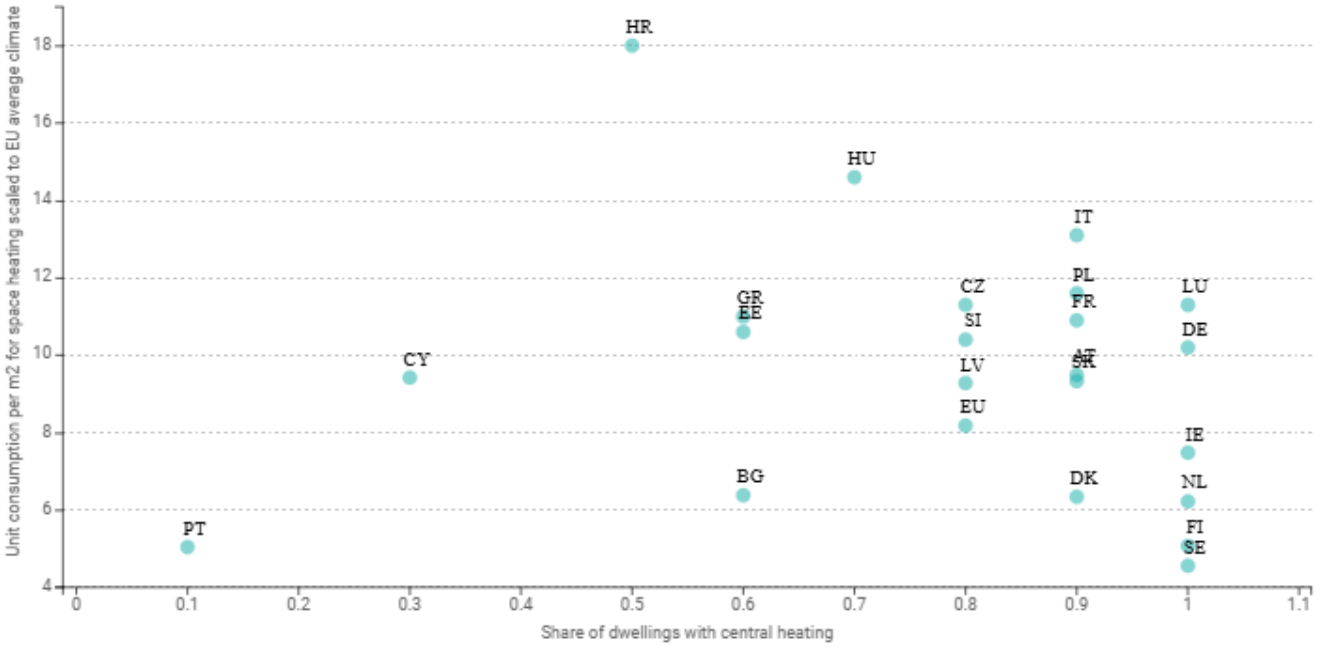


Variation of consumption per m² VS per dwelling: effect of change in dwelling size (2010-2023)



- Specific consumption of space heating increases as the central heating rate rises. However there are large differences between countries for high central heating rates: Sweden and Finland have the best performance among the EU countries well equipped with central heating, their specific consumptions for space heating are twice lower than that of Luxembourg.

Space heating consumption of households per m² at european average climate (2023)

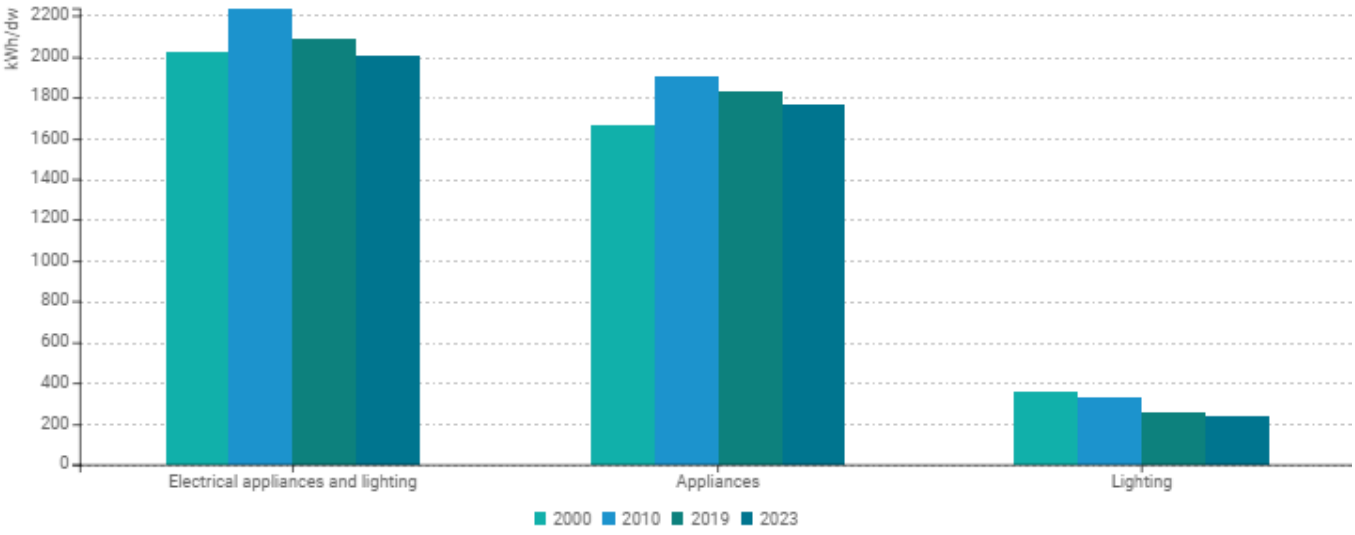


Appliances and lighting

Captive uses of electricity in the EU

- Electrical appliances (both large and small) and lighting are the so-called captive uses of electricity. They exclude thermal uses.
- Electrical appliances represent the largest share of captive uses of electricity. This share has been increasing over the years, from 82% in 2000 to 85% in 2010 and 88% in 2023.
- The specific consumption per dwelling for lighting is decreasing thanks to the phase out of incandescent light bulbs and the generalization of LEDs. It now currently accounts for 12% of captive electricity, compared to 18% in 2000 (15% in 2010).

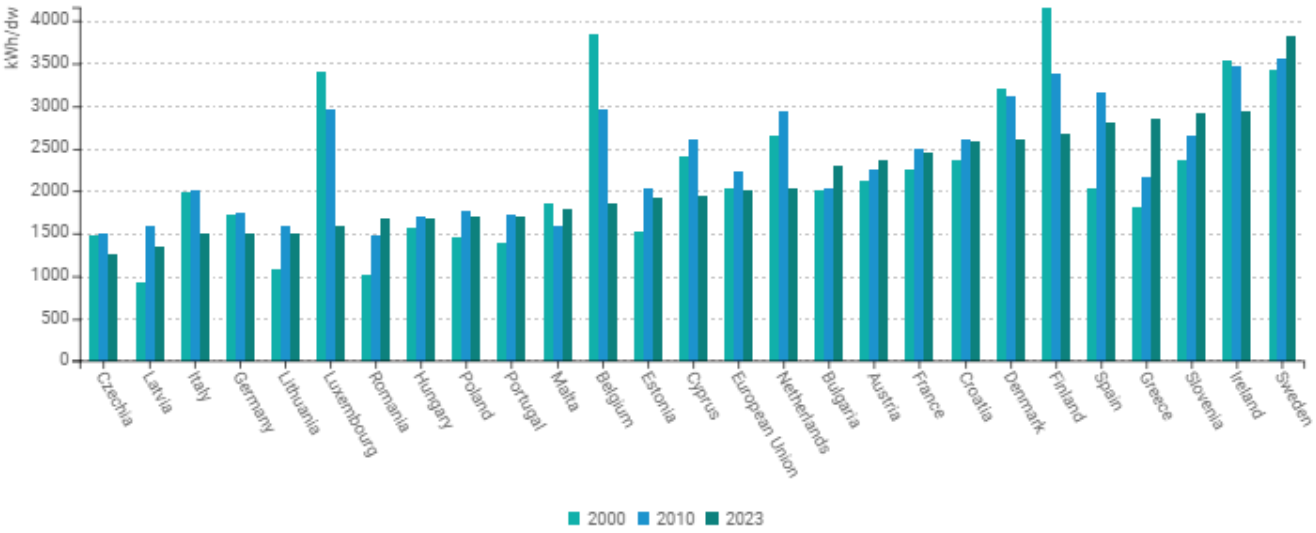
Consumption per dwelling for appliances and lighting (EU)



Electricity consumption per dwelling for electrical appliances and lighting

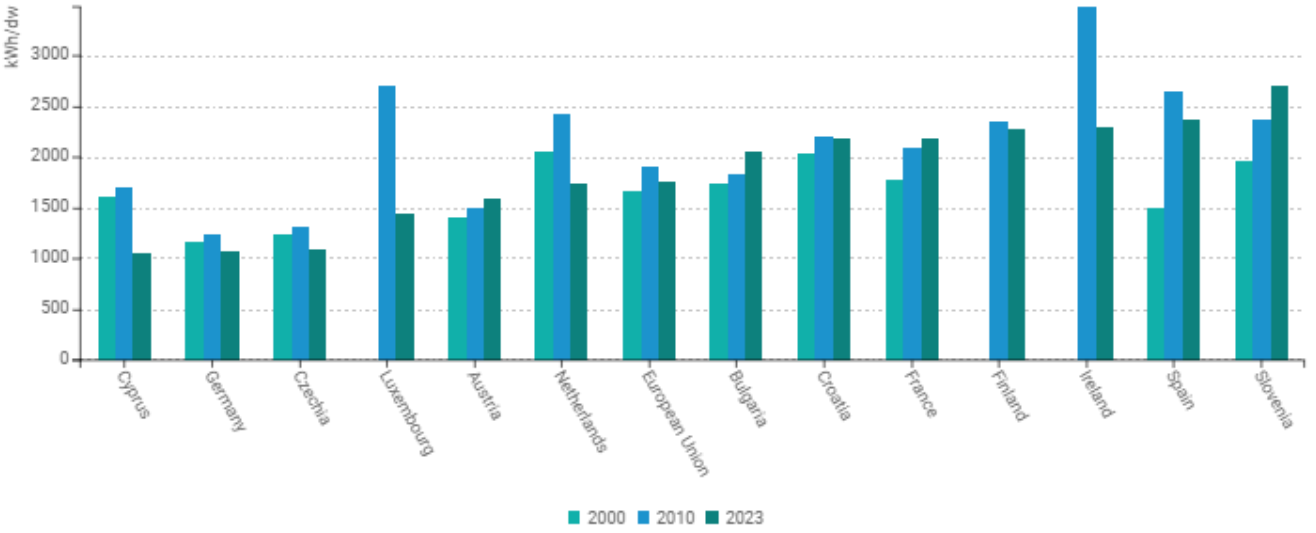
- Significant differences between countries in terms of electricity consumption for electrical appliances and lighting: from less than 1500 kWh/dwelling in Latvia and Czechia, to around 2000 kWh at EU level, up to 3000 kWh in Ireland and 3800 kWh in Sweden.
- This specific consumption has decreased in around 20 MS since 2010 and is almost at the same level as in 2000 at EU level. This reflects the effects of regulation on appliances and lighting which have more than offset the increase in appliances ownership.

Electricity consumption per dwelling for electrical appliances and lighting



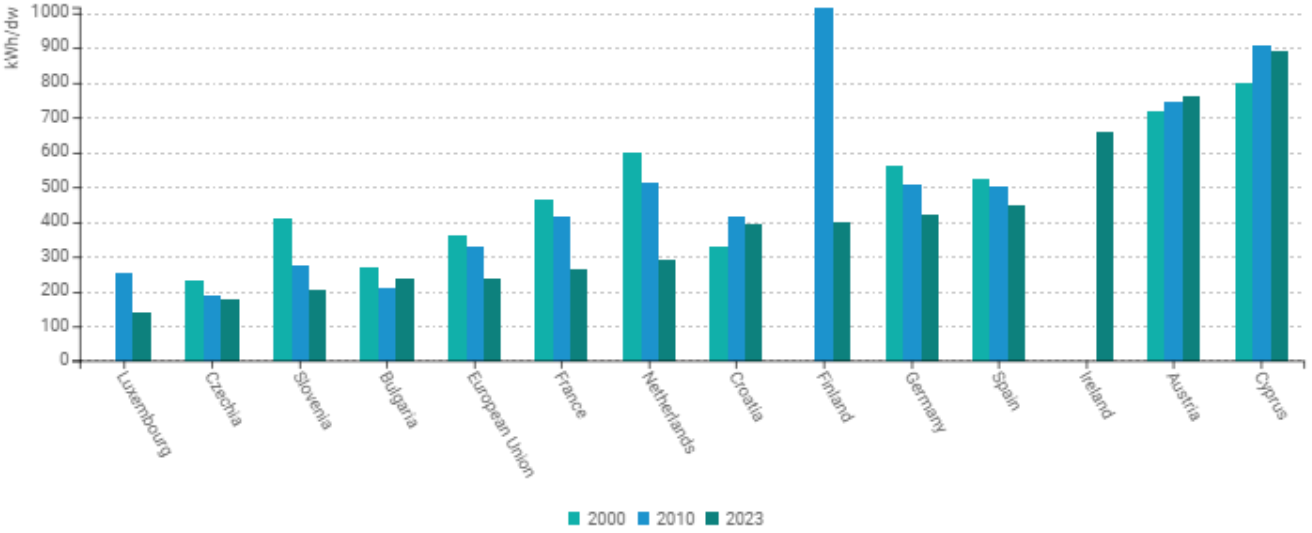
- There is 15 MS for which the consumption for of appliances and lighting can be separated.
- The specific consumption for electrical appliances varies from less than 1100 kWh/dwelling in Czechia, Germany and Cyprus, to 1800 kWh at EU level, and up to 2400 kWh in Spain and 2700 kWh in Slovenia.

Electricity consumption per dwelling for electrical appliances



- Downward trend in electricity consumption for lighting at EU level and in most EU MS, with the highest decrease in Finland and the Netherlands.
- Significant differences between countries: from 140 kWh/dwelling in Luxembourg, to 239 kWh at EU level, up to 891 kWh in Cyprus. These differences can be explained by the difference in the number of lamps per dwelling.
- In average, Nordic countries have higher electricity consumption for lighting, due to longer lighting hours.

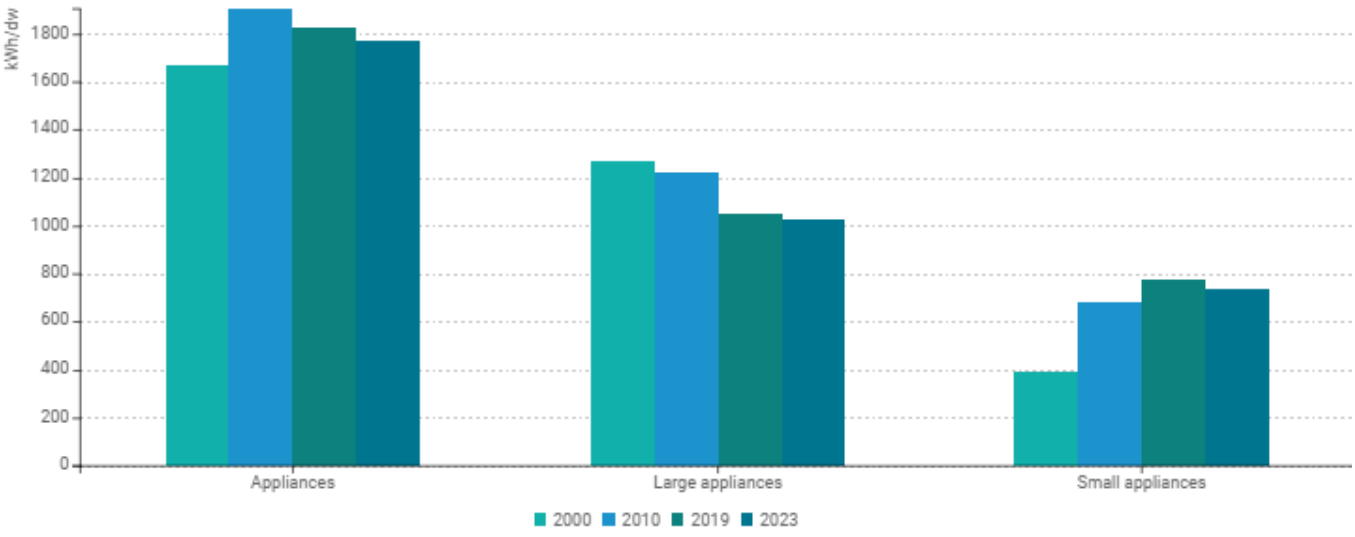
Electricity consumption per dwelling for lighting



Energy consumption of large appliances per dwelling

- EU households' specific consumption for small appliances grew by 3.6%/year between 2000 and 2019 (from around 400 kWh/dwelling in 2000 to 770 kWh in 2019,) due to higher equipment rates, and has decreased since then to 740 kWh in 2023.
- The specific consumption of large appliances decreased regularly, by 1%/year over the period 2000-2023, thanks to labels and standards.
- Large appliances still account for the largest share of appliance consumption: 57% of the specific consumption of appliances in 2023, compared to 64% in 2010 and 76% in 2000. This share is stable since 2019.
- Energy efficiency of large electrical appliances is improving rapidly, which allow to compensate the fast-growing consumption of small appliances. This has resulted in a small decline in appliance consumption since 2010 (-0.6%/year).

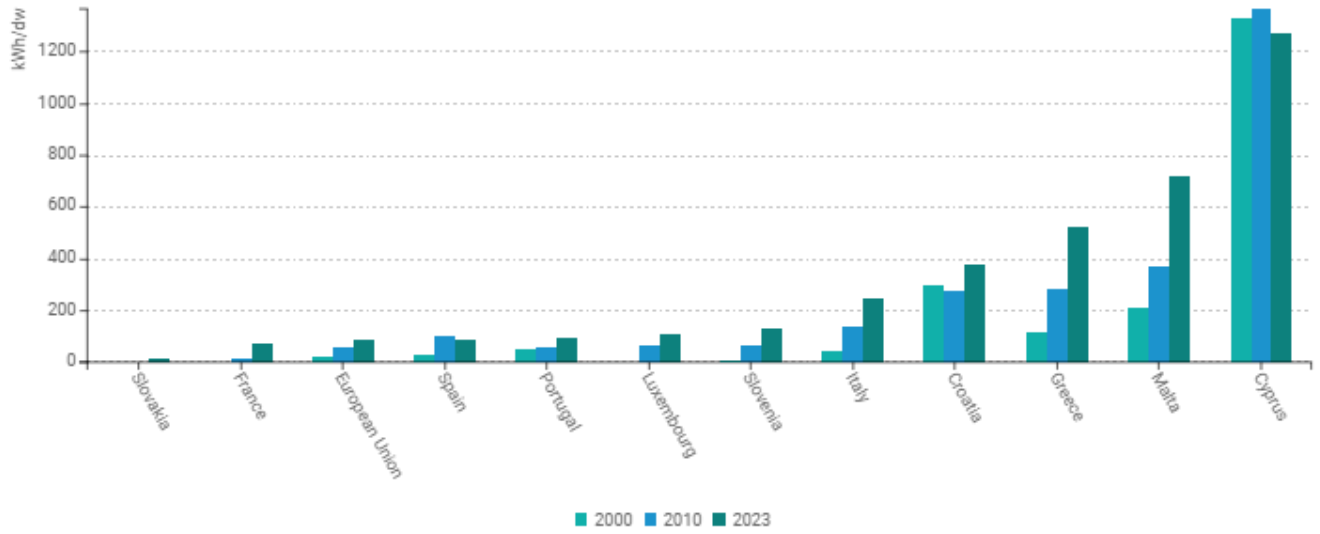
Consumption of electrical appliances in the EU



Unit consumption of air conditioning

- In 2023, air conditioning represented only 2.4% of the household electricity consumption in the EU. However, the average per-dwelling consumption for this end use is on the rise, increasing from 21 kWh/household in 2000 to 87kWh/household in 2023, driven by the growing use of air conditioning appliances.
- This end-use is significant in Cyprus, Malta, Greece, Croatia and Italy (from 8% to 29% of household electricity consumption).

Consumption per dwelling for air conditioning



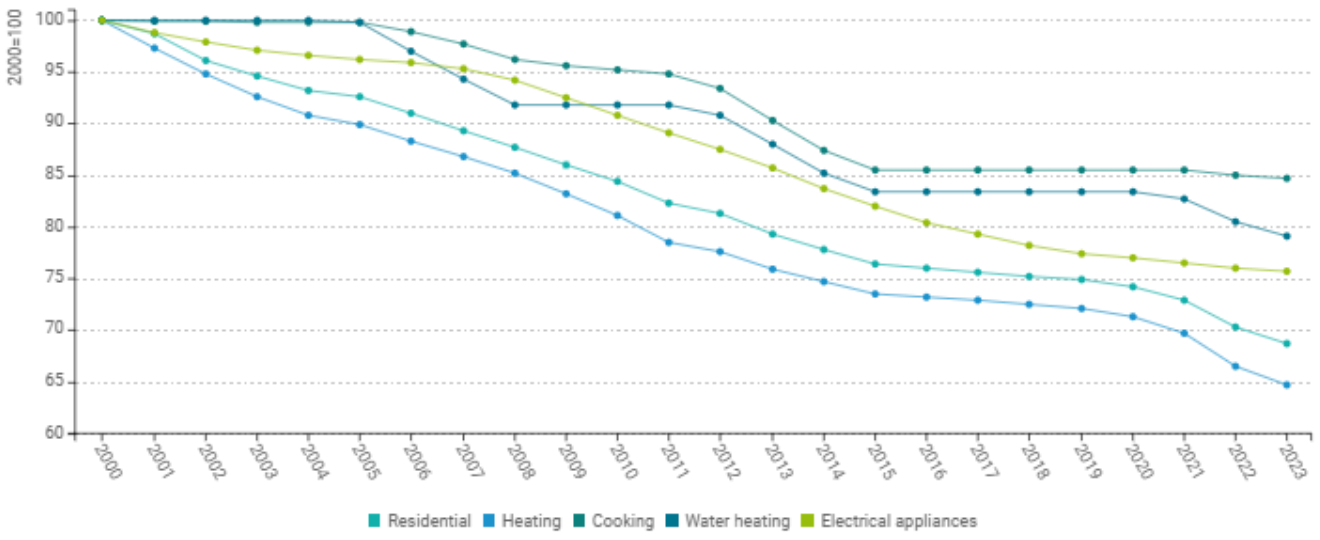
Note: The average consumption per dwelling is obtained by dividing the total consumption for air conditioning by the total number of dwellings, not only those with air conditioning.

Energy efficiency and savings

Energy efficiency trends for households in the EU

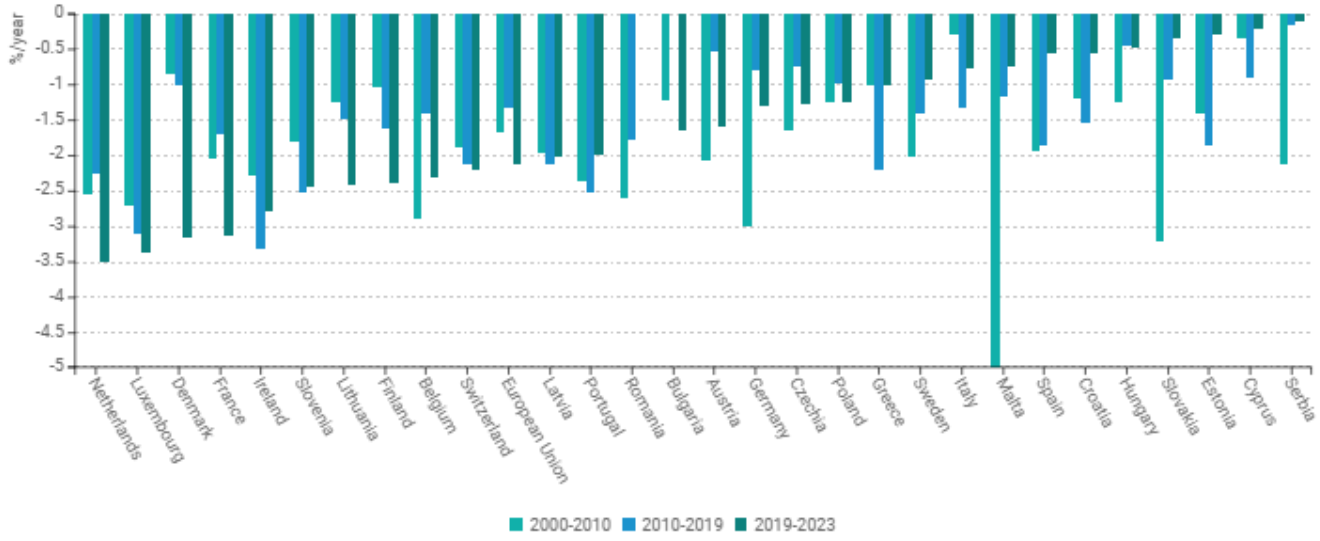
- Households energy efficiency, as measured by ODEX, has improved by around 31% (1.6%/year) over the period 2000-2023 at EU level (ODEX equals 69 in 2023), mainly through improvements in space heating and appliances.

Energy efficiency progress in the EU



- Energy efficiency has been progressing faster at EU level since 2019, reaching -2.1%/year, compared to the period 2010-2019 (-1.3%/year). However, this hides huge discrepancies across MS. 9 EU countries saw significant progress since 2019 (improvement rate of more than 2%/year), of which 7 of them show an acceleration of energy efficiency progress compared to 2010-2019; while 10 others saw a low rate of progress (less than 1%/year), of which 9 showed significant reduction compared to 2010-2019.
- The Netherlands, Luxembourg, Denmark and France have demonstrated the steadiest progress since 2019, with rates exceeding 3%/year.

Energy efficiency progress in EU countries

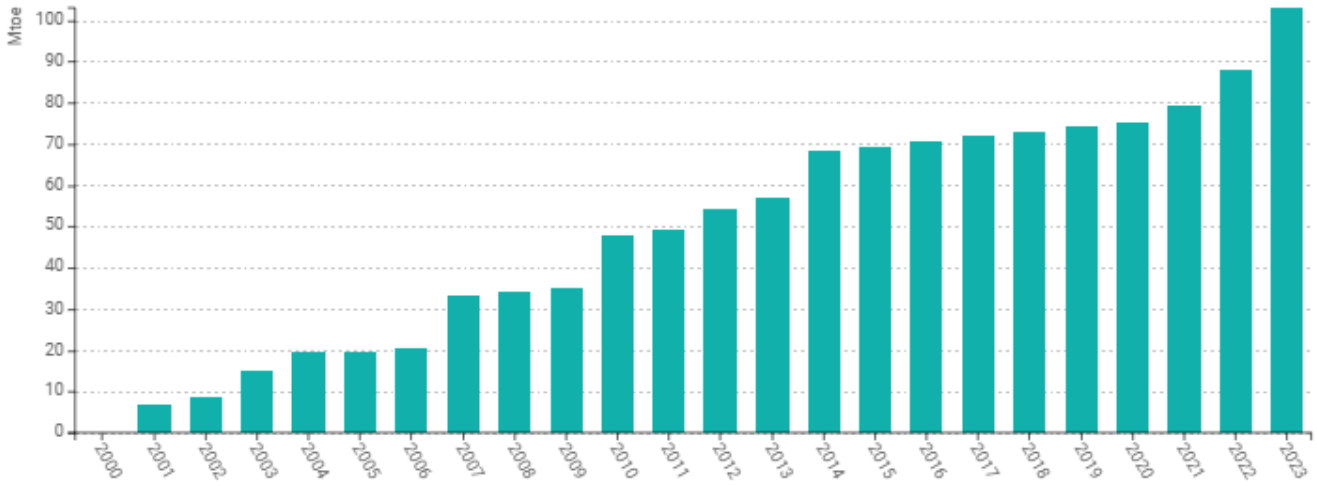


Note: ODEX aggregates energy efficiency gains by end-use, measured by the reduction in unit consumption. ODEX is calculated on the basis of 11 end-uses or large appliances: heating (toe/m2, separation between new and existing dwellings), water heating, cooking, lighting, cooling (toe/dwelling), refrigerator, freezer, washing machine, dishwasher, dryer and TV (kWh/appliance).

Energy savings for households in the EU

- Cumulated annual energy savings for households have reached 103 Mtoe since 2000, which means that without energy efficiency improvements, energy consumption would have been 103 Mtoe higher in 2023.
- Since 2021, the annual additional savings increased to an average of 11.7 Mtoe/year, seven times higher than the average over 2014-2021 when energy savings were only around 1.6 Mtoe/year due to the slowdown in the rate of energy efficiency improvements. Previously, it was around 4.9 Mtoe/year on average over 2000-2014.

Energy savings for households in the EU

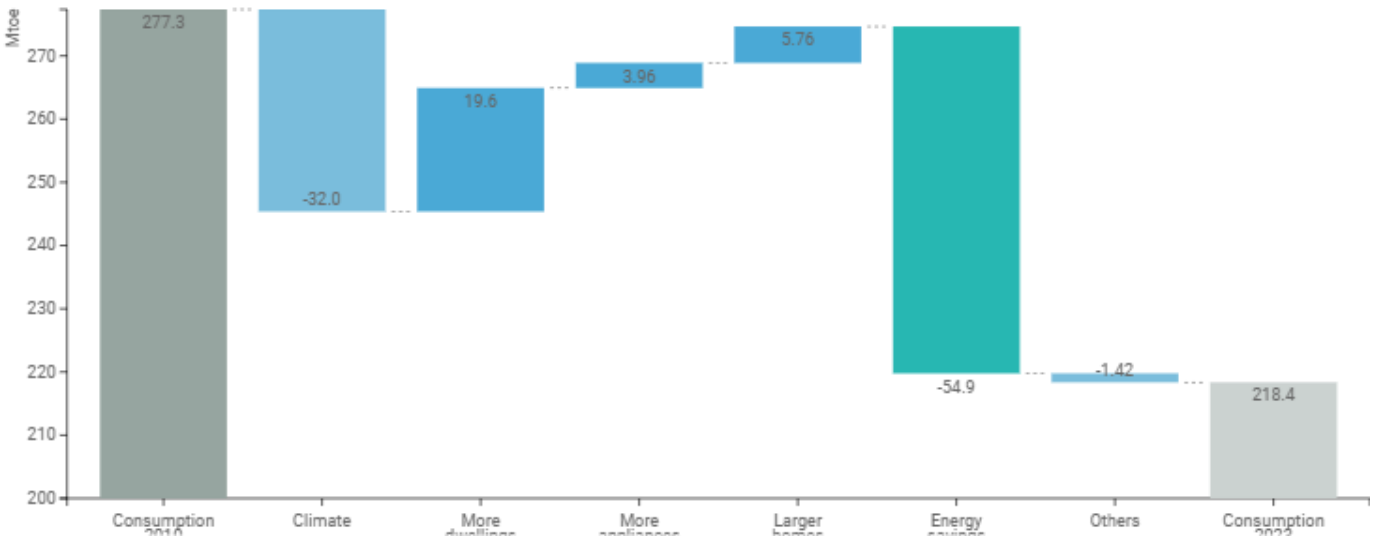


Decomposition of energy consumption

Drivers of energy consumption per dwelling (EU)

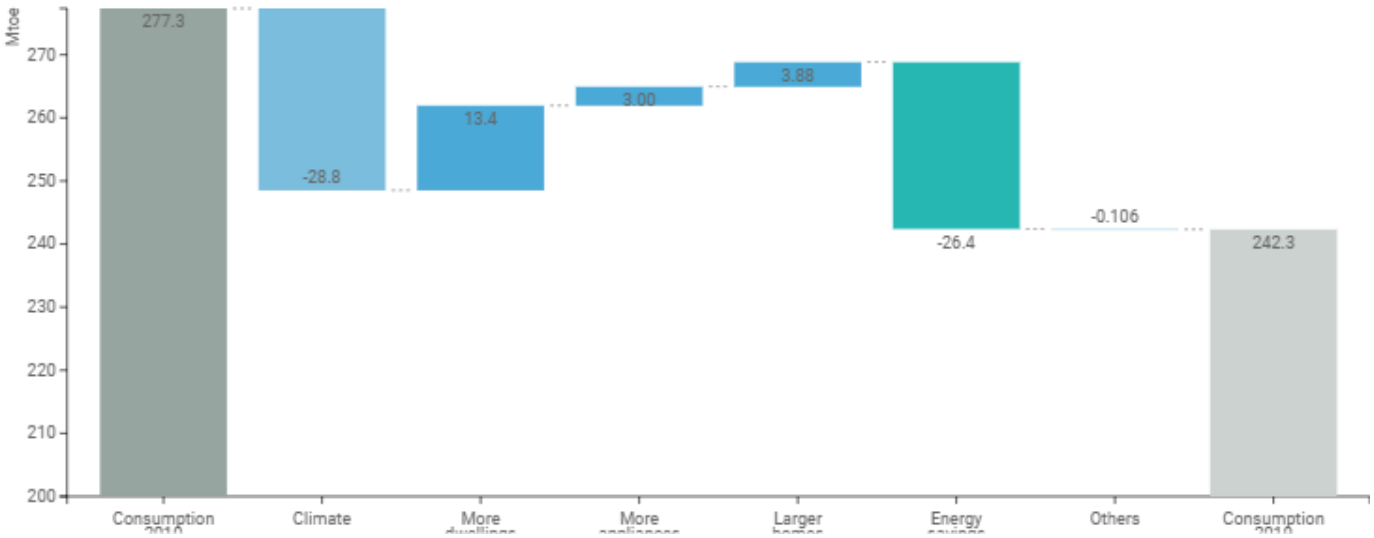
- Between 2010 and 2023, household energy consumption decreased by 59 Mtoe at EU level.
- Several factors have contributed to increase consumption: the increase in the number of dwellings (20 Mtoe) and the number of appliances per dwelling (4 Mtoe), as well as the trend towards larger dwellings (6 Mtoe), corresponding to a total “activity effect” of around 29 Mtoe.
- However, this increase in activity was offset by significant energy savings (-55 Mtoe) and also by climate difference (-32 Mtoe) as 2023 was almost 20% warmer than 2010.
- The largest part of energy savings was observed since 2019 (28.5 Mtoe), while only 26.5 Mtoe were added between 2010 and 2019.
- Behavioral effects (“Others”) decreased consumption by 1.4 Mtoe over 2010-2023.

Drivers of energy consumption variation in residential at EU level (2010-2023)



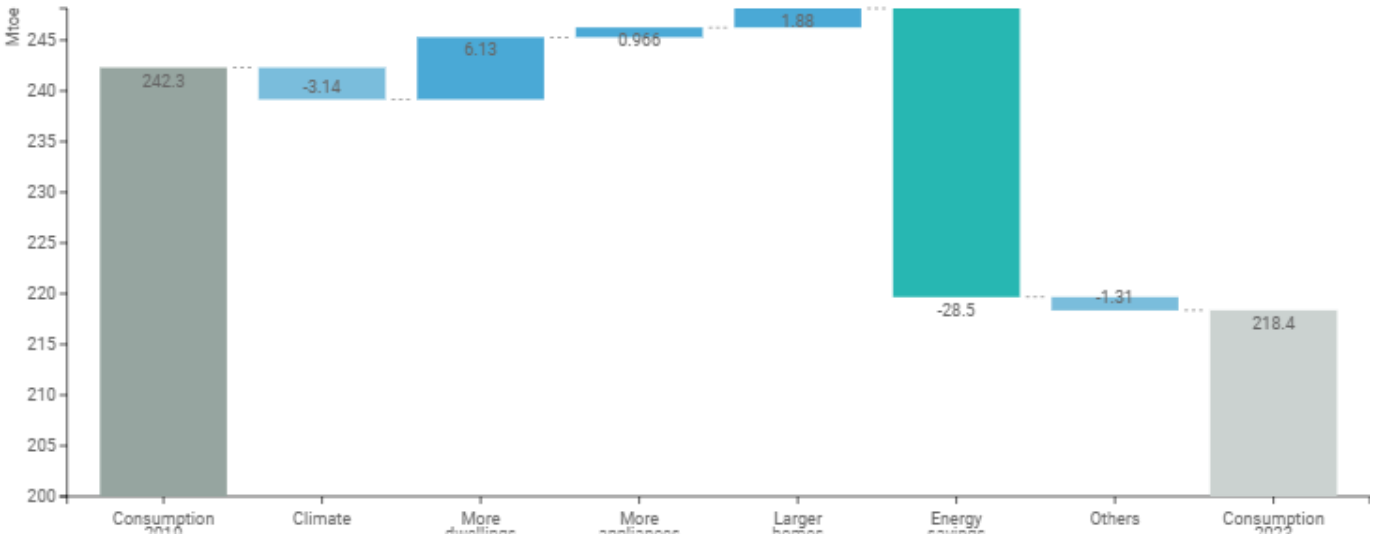
- Between 2010 and 2019, household energy consumption has decreased by 35 Mtoe.
- The “activity effect” would have increased consumption by around 20 Mtoe.
- Energy savings have totally offset this activity effect, amounting to 26 Mtoe, and climate differences have decreased consumption by around 29 Mtoe, as 2019 was 17% warmer.

Drivers of energy consumption variation in residential at EU level (2010-2019)



- Between 2019 and 2023, household energy consumption has decreased by 24 Mtoe.
- The “activity effect” would have increased consumption by around 9 Mtoe.
- Energy savings have reduced consumption by 28.5 Mtoe.
- Behavioral effects have slightly decreased consumption (-1.3 Mtoe), as well as climate differences (-3 Mtoe).

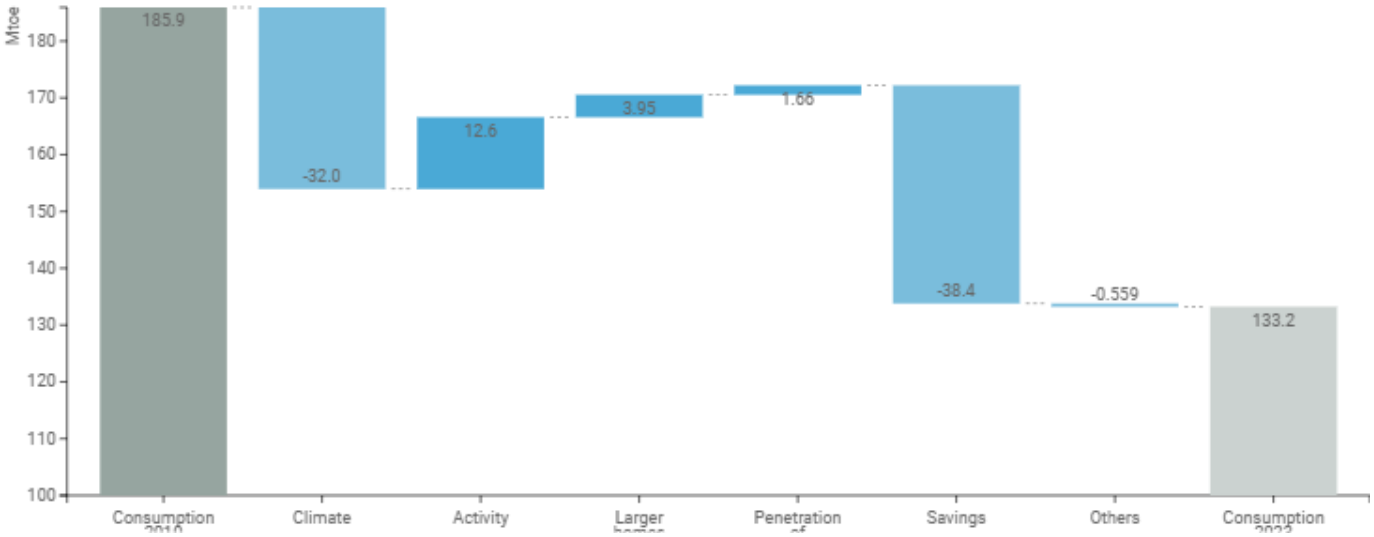
Drivers of energy consumption variation in residential at EU level (2019-2023)



Drivers of heating consumption per dwelling (EU)

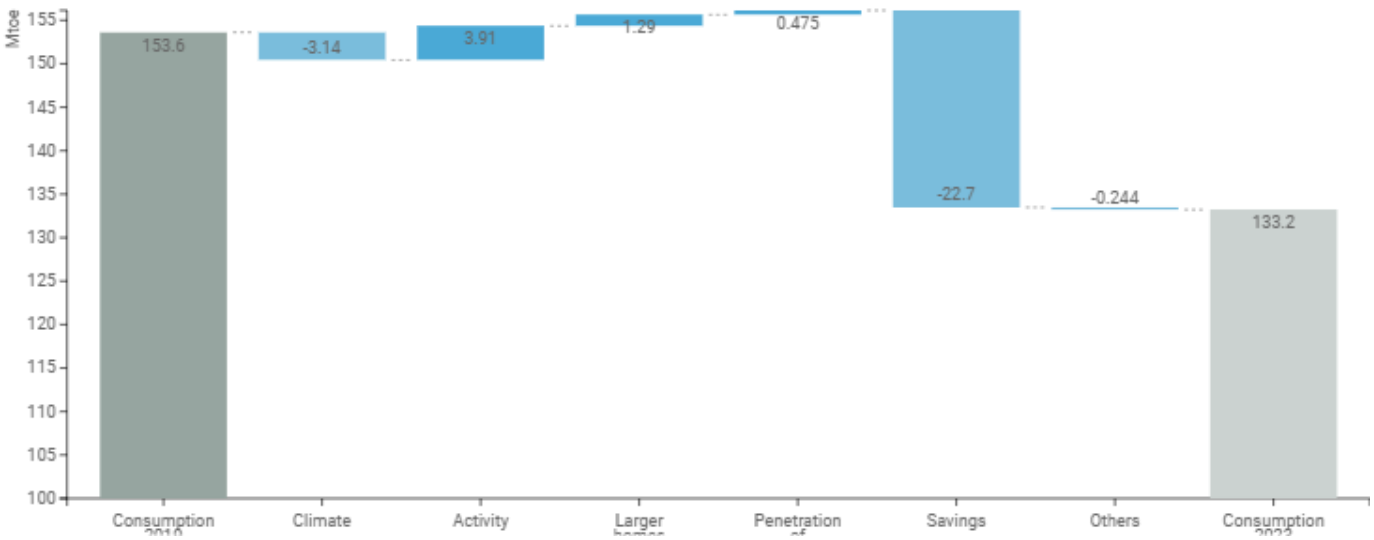
- At EU level, the increase in the number of dwellings and the larger size of dwellings have offset, respectively, 32% and 10% of the energy savings since 2010.
- In addition to energy savings, climate differences is the second major factor of the decrease in heating consumption, pointing out a hotter climate in the EU in 2023 compared to 2010.

Drivers of the variation in heating consumption per dwelling



- Since 2019, heating consumption decreased by 20 Mtoe due to large energy savings and, in a lesser extent, climate differences. Activity effects as the number and size of dwellings, as well as the influence of penetration of central heating, only offset 6 Mtoe collectively.

Drivers of the variation in heating consumption per dwelling (2019-2023)

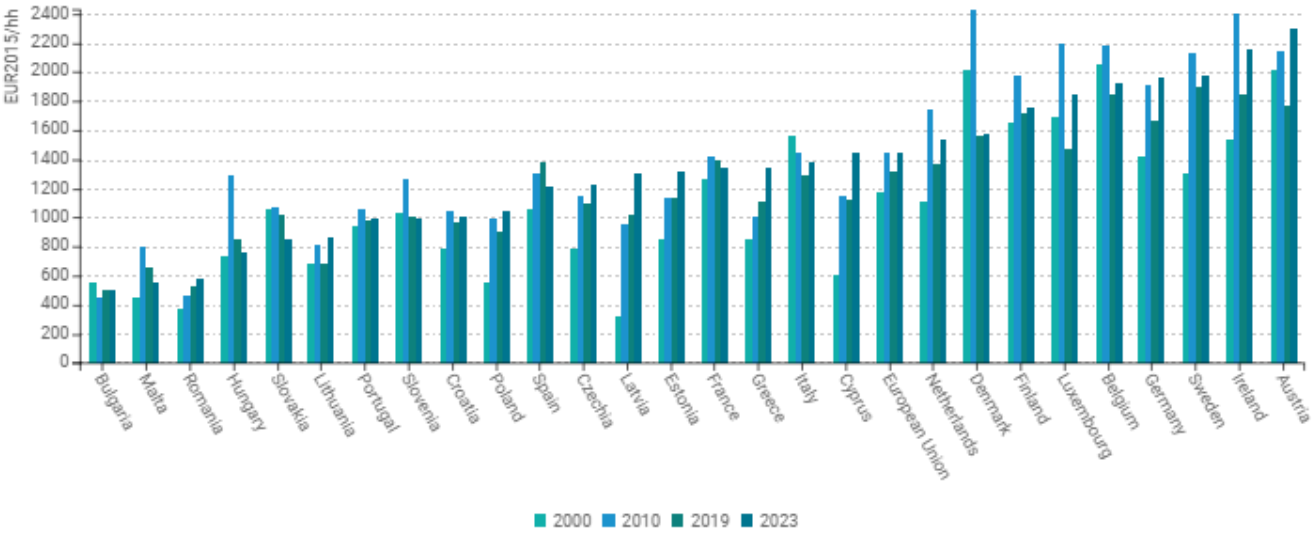


Financial indicators

Energy expenditures of households

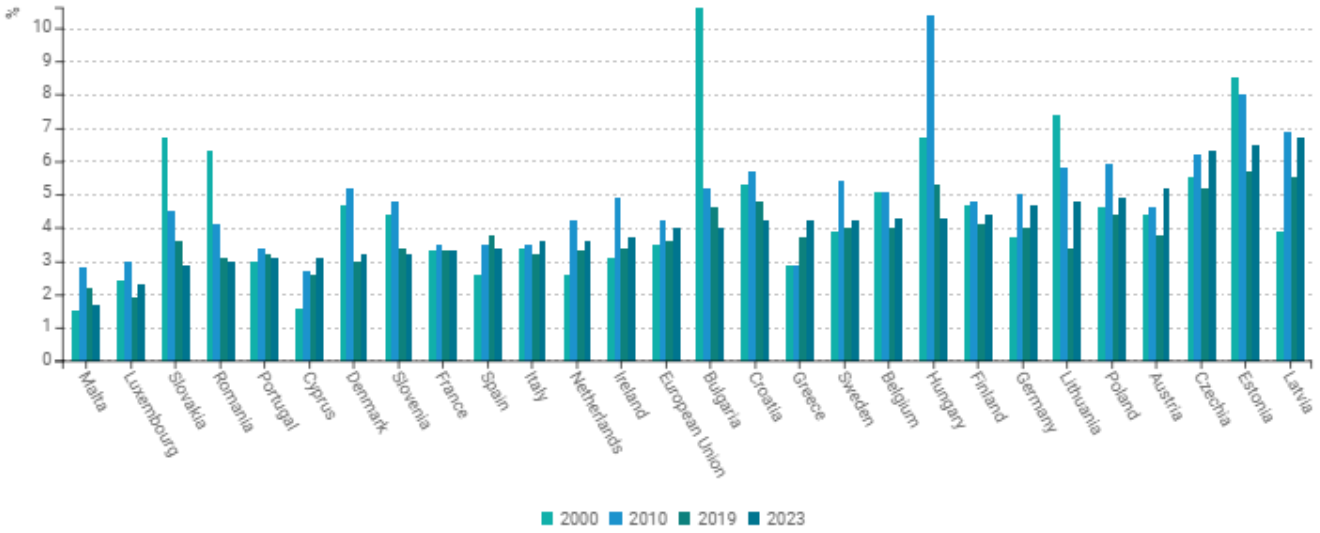
- Since 2019, annual energy expenditures of households for housing increased by 2.5%/year in the EU to reach around 1450 EUR2015 per household, the same level as in 2010. Previously, it has decreased by 1.1%/year between 2010 and 2019.
- The majority of EU MS have seen an increase in energy expenditures since 2019, except in France, Spain, Hungary, Malta, Slovakia and Slovenia.
- Over 2010-2019, energy expenditures decreased in most of the EU countries, particularly in countries with high energy expenditure.
- In 2023, energy expenditures per household significantly increased compared to 2021, correlated to the surge of energy prices. It ranged, at constant prices, from 507 EUR in Bulgaria to more than 2000 EUR in Austria and Ireland. 9 of the 10 countries with the highest GDP per capita have the highest energy expenditures (except France).

Annual energy expenditures of households for housing



- Despite the persistent growth in energy expenditures, the share of households budgets allocated to energy expenditures slightly declined over 2010-2023, at EU level (-0.2 percentage points) and in 23 MS. It varied from 1.7% in Malta to more than 6% in Czechia, Estonia and Latvia, with an average of 4% at EU level.
- The highest decreased happened in Hungary and Denmark, with a reduction of 6 and 2 percentage points, respectively, since 2010.

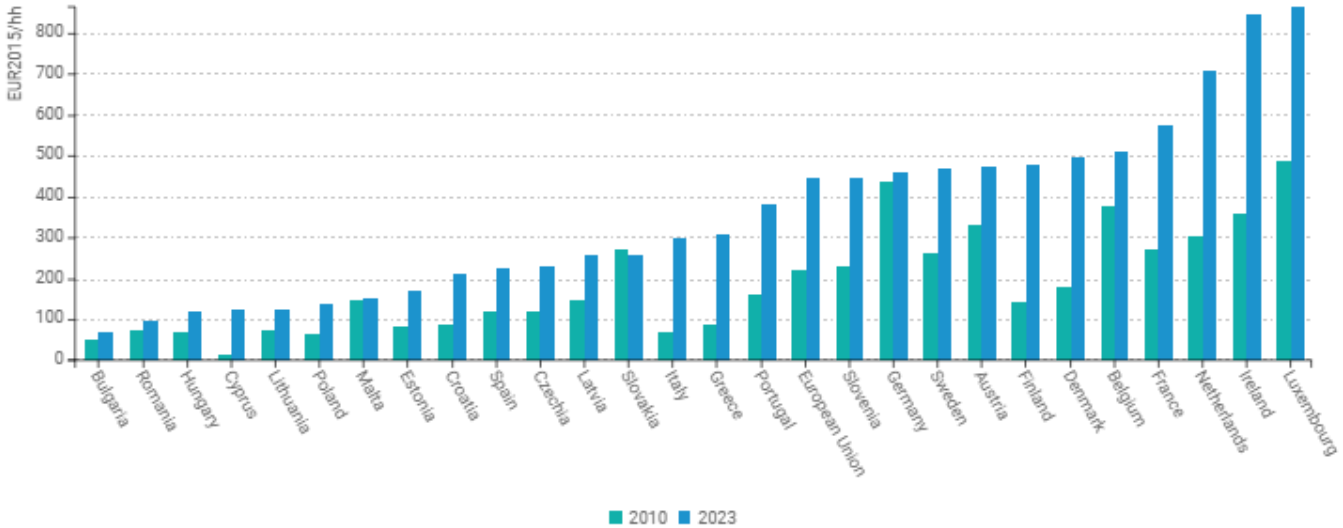
Share of energy expenditures for housing in the households budget



Financial savings through energy efficiency

- Energy savings contributed to lower the energy expenditure of households; in 2023, these monetary savings ranged from 67 EUR in Bulgaria to more than 800 EUR in Ireland and Luxembourg. It appears that countries with the highest energy expenditures have the highest monetary savings.
- Since 2010, these monetary savings more than doubled at EU level (+103%) and in 12 MS, with the highest increase in Cyprus, Italy, Greece and Finland where it more than triple.

Monetary energy savings per household in housing



- In 2023, energy savings allowed households across MS to save from 8.5% to 47% of their energy expenditures, with an average of 31% at EU level. This means that without energy efficiency gains, energy expenditures would have been 31% higher.
- This share increased in all MS since 2010, with the highest increase in Cyprus, Italy, Denmark and Finland, while it was almost stable in Germany and Romania.

Share of monetary energy savings in energy expenditures for housing

