

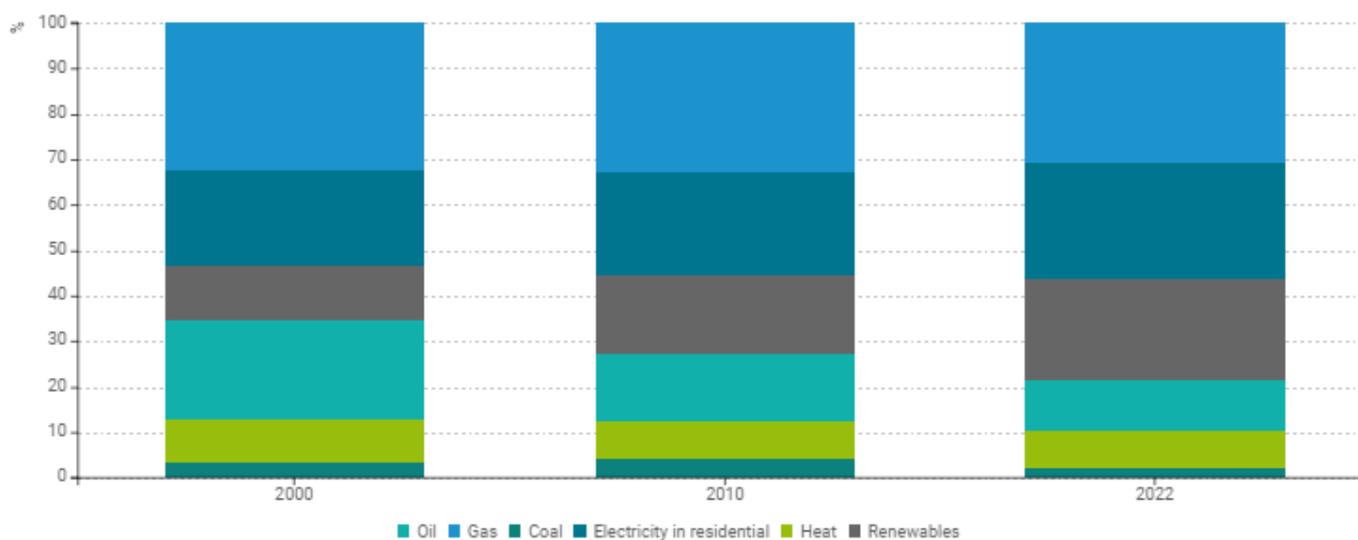
# Sectoral Profile - Households

## 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 has been relatively stable from 32% in 2000 to 33% in 2021. It decreased slightly in 2022 to 31% due to the energy crisis.
- Electricity comes second with a steadily increasing share, rising from 21% in 2000 to 22.5% in 2010 before reaching 25% in 2022. Malta and Sweden have the highest penetration of electricity with respective shares of 75%, 50% and 48%.
- Oil is slowly being replaced by other energy sources (11% in 2022 compared to 14.6% 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 22.5% in 2022. It has shown a consistent increase since 2000 (+10.5 points, of which 5 points since 2010). Four countries have a share twice higher: Croatia, Estonia, Slovenia and Latvia (between 40% and 45%).

*Household energy consumption by energy in the EU*

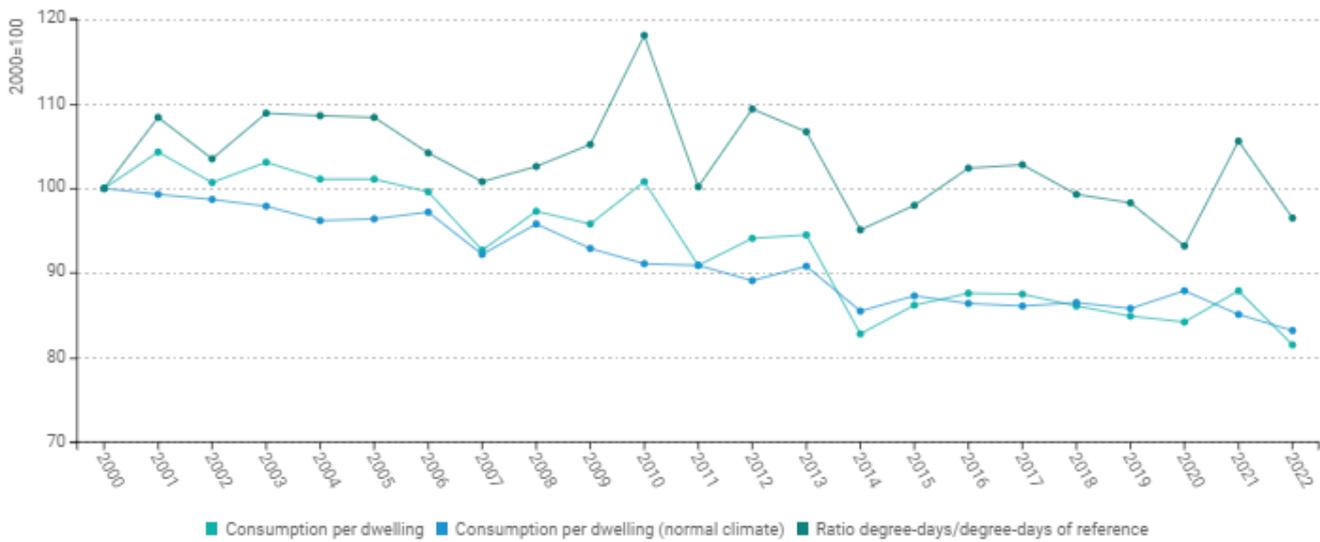


Note : energy consumption includes ambient heat consumption.

### 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

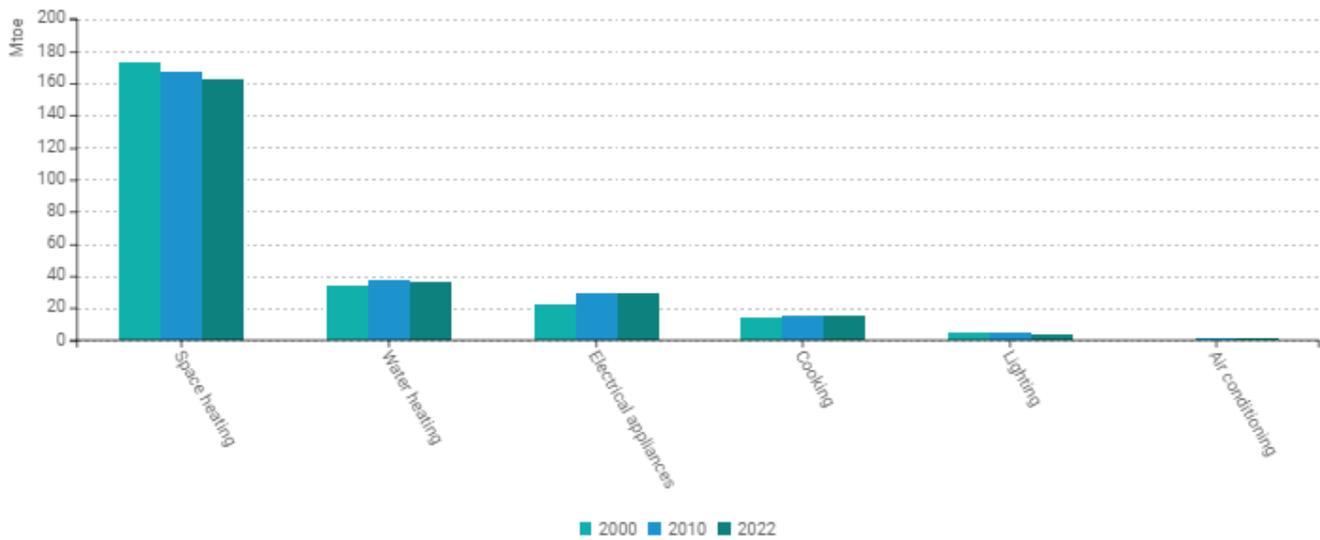


\*More information on reference (or normal) degree days calculation available in the Q&A.

### Declining share of space heating in the EU

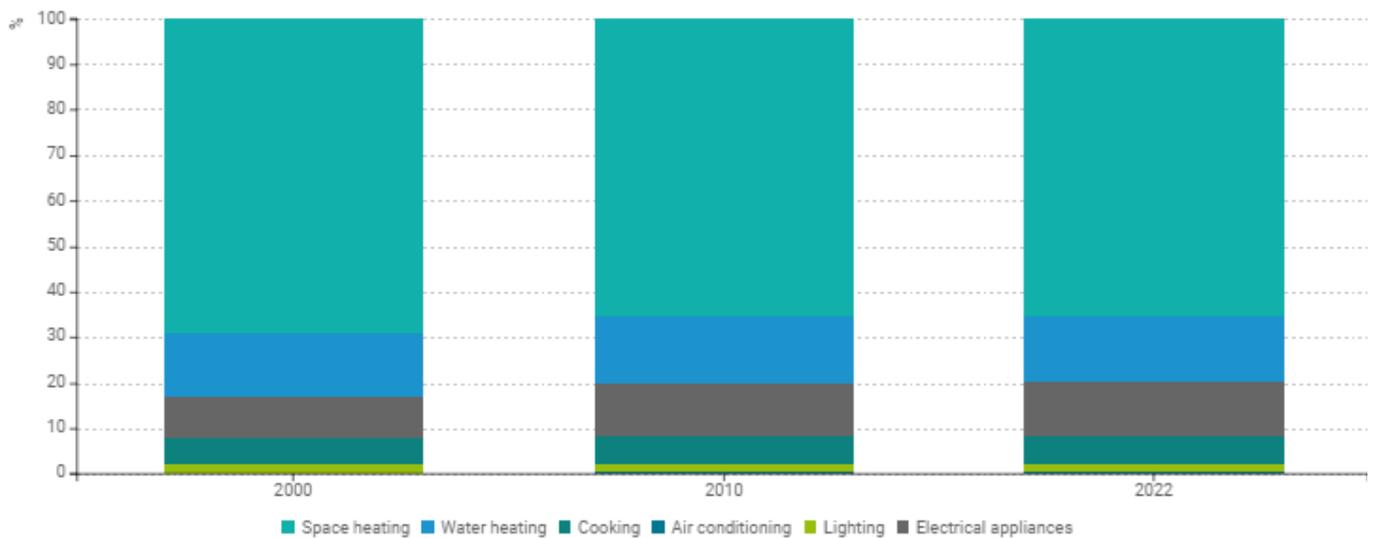
- The share of space heating in household energy consumption at normal climate has lost 4 points since 2000 (69% in 2000 to 65% in 2022). The most significant decrease was observed between 2000 and 2010 (-4 points), it is almost stable since then. This is due to a decreasing consumption (by 0.27%/year since 2000), with the most significant decrease observed between 2000 and 2010 (-0.4%/year).
- 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 remained stable since then.
- 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 12% in 2000 to 8% in 2022.
- Air conditioning is negligible (0.6% of energy consumption); it has however experienced a notable increase in its share of the electricity consumption (from 0.7% in 2000 to 3% in 2022).

### Household energy consumption in the EU



Note: Space heating consumption includes ambient heat consumption.

### Household energy consumption in the EU, in %



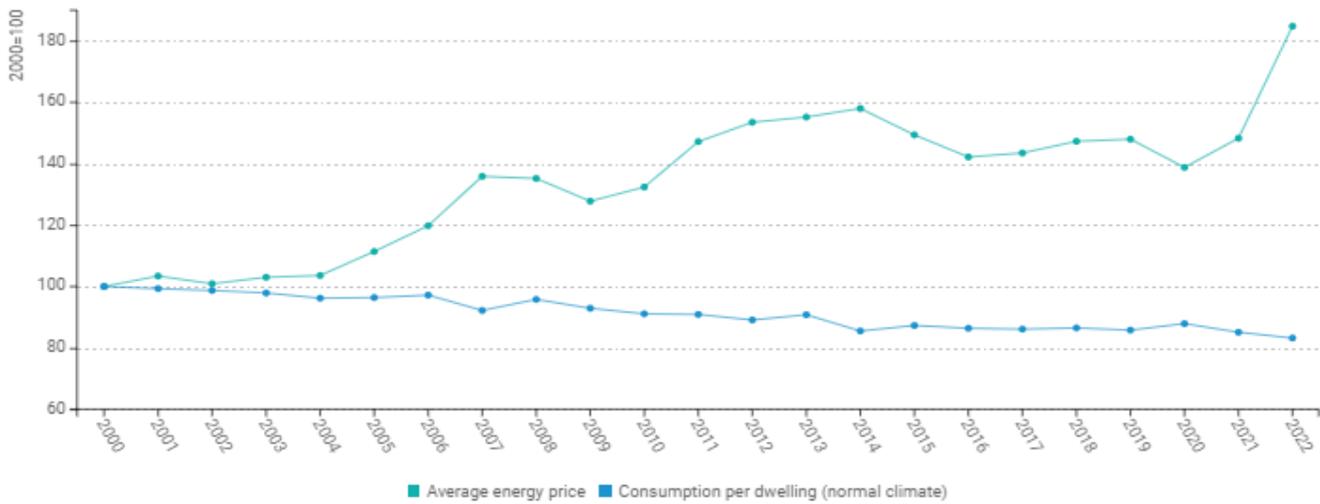
Note: Energy consumption at normal climate. Space heating consumption includes ambient heat consumption.

## Energy consumption per dwelling

### Consumption per dwelling and energy price

- Energy consumption per dwelling at EU level has been decreasing since 2000 (-0.8%/year), but at a lower rate since 2014 (-0.3%/year), after a fairly steady decline between 2000 and 2014 (-1.1%/year).
- In 2022, energy consumption per dwelling remained consistent with the previous years trend despite a notable rise in energy prices.

### Specific consumption per dwelling and energy price

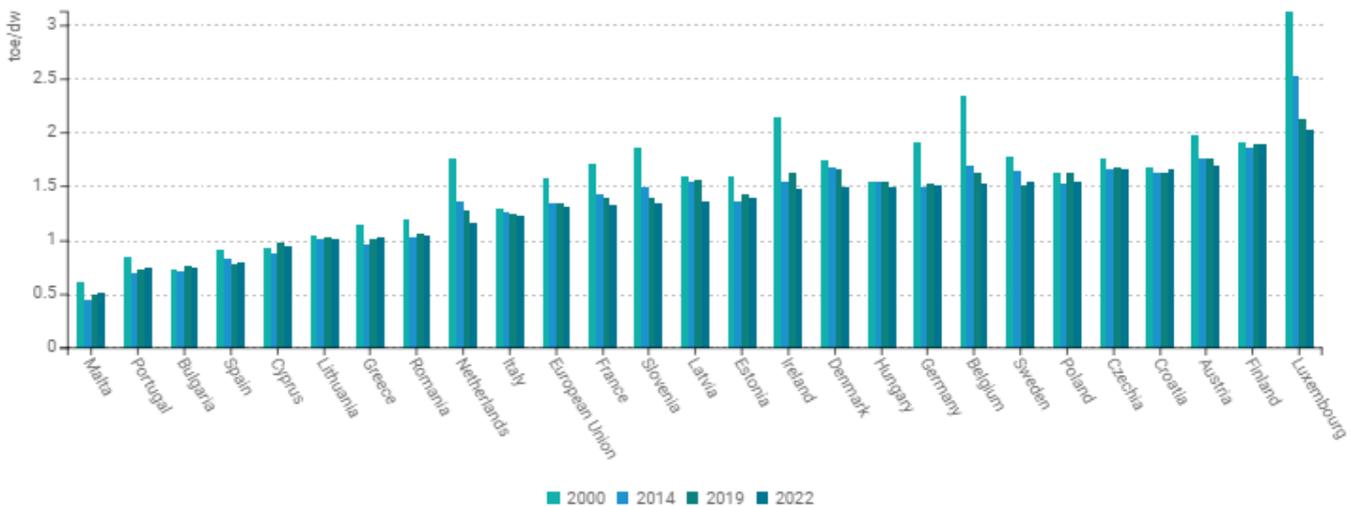


Note: Energy consumption at normal climate. Energy price at constant prices of 2015. Energy consumption includes ambient heat consumption.

### Average energy consumption per dwelling

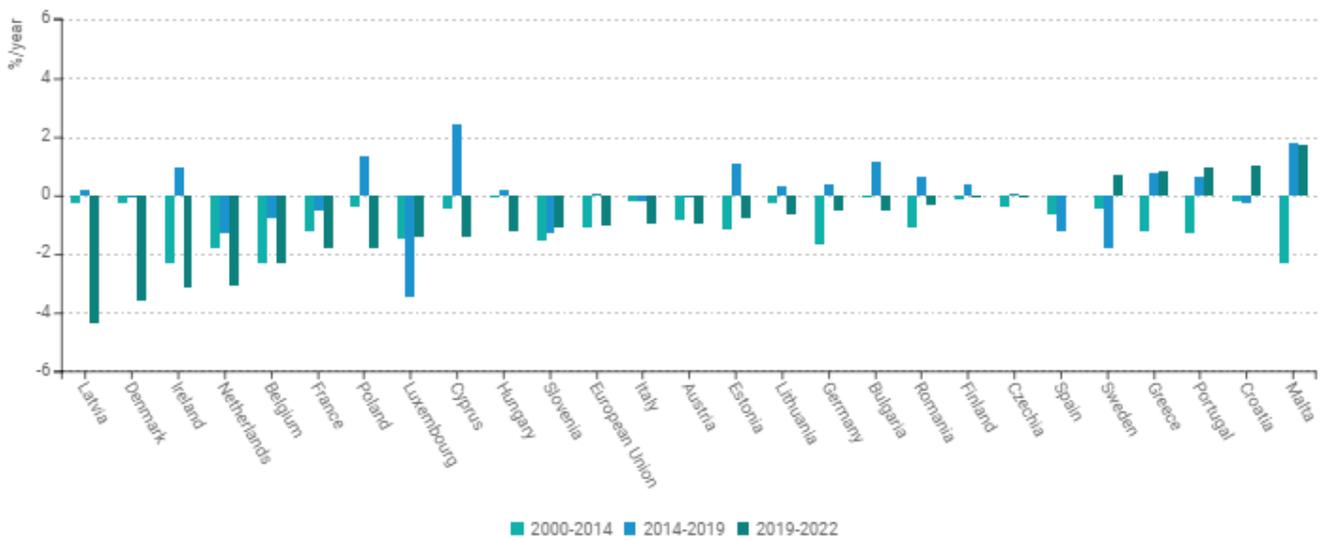
- Energy consumption per dwelling has decreased in almost all countries (-0.8%/year at EU level since 2000) with the largest reduction between 2000 and 2010, and since 2019 (-0.9% and -1%/year, respectively, at EU level) in most countries.
- Between 2014 and 2019, the reduction has slowed down significantly in most countries. Consumption even increased in 13 Member States (>1%/year in Cyprus, Malta, Slovakia, Poland, Bulgaria and Estonia).
- The EU average energy consumption per dwelling in 2022 was 1.3 toe, with values ranging from 0.5 to 2 toe/dwelling among Member States, i.e. by a factor 4. 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)



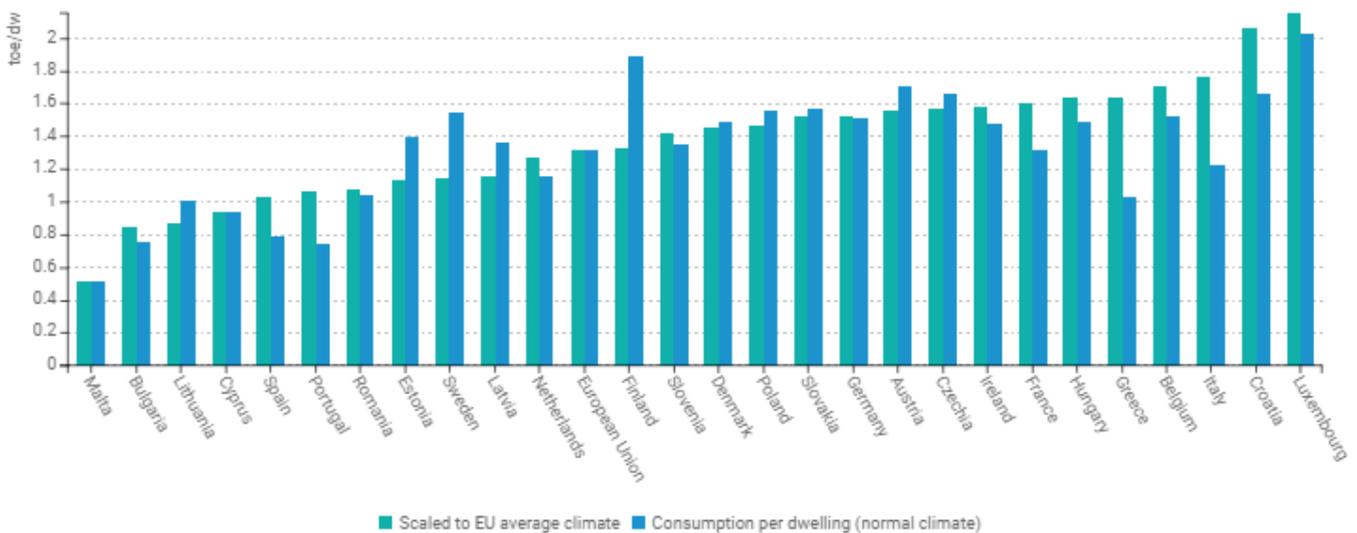
Note: Energy consumption includes ambient heat consumption.

### 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 0.85 toe/dwelling in Portugal to 2.15 toe/dwelling in Luxembourg. After adjustment, Luxembourg, Croatia, Italy, Belgium and Greece have the highest consumption per dwelling.

### Average consumption per dwelling (adjusted to EU climate, 2022)



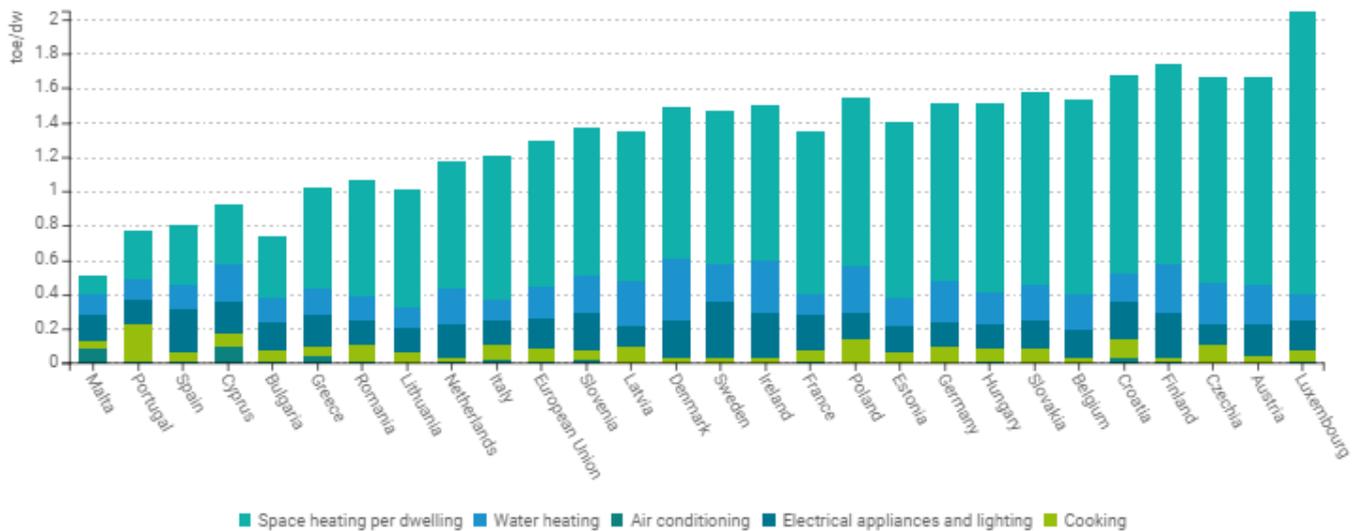
Note: Malta and Cyprus not adjusted. Energy consumption includes ambient heat consumption.

### 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 0.85 toe/dwelling (in a range of 0.10 to 1.64 toe/dwelling).

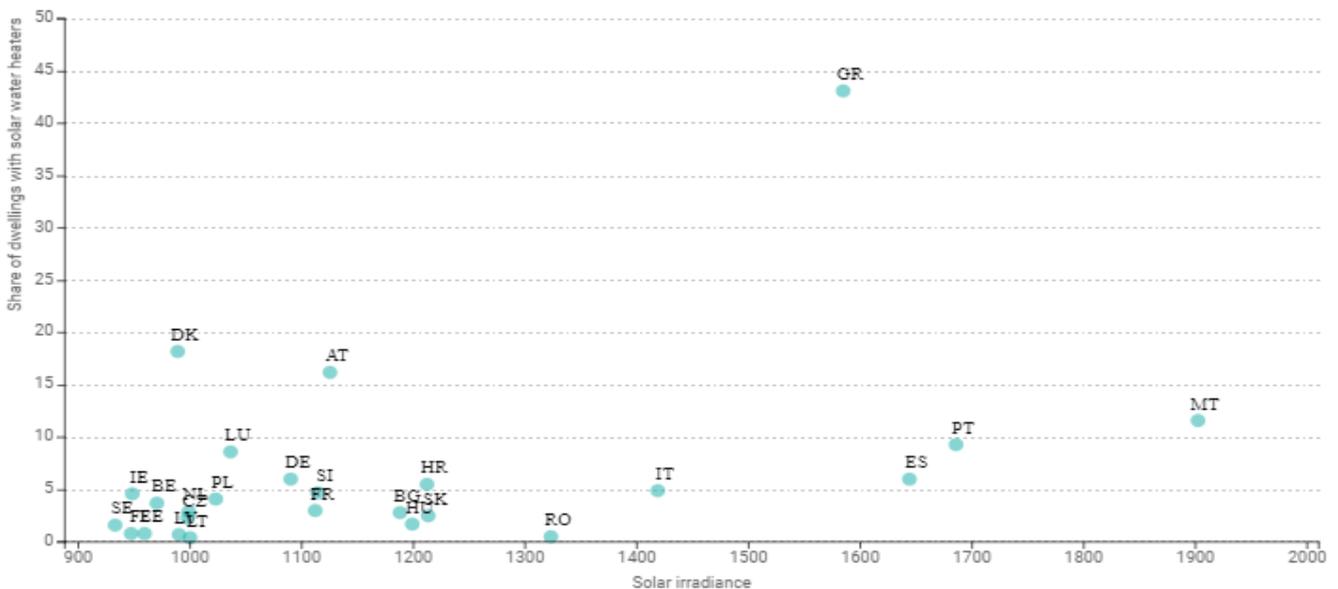
- The second highest share is electrical appliances and lighting or water heating depending on countries, except for Portugal where cooking comes second. Electrical appliances and lighting consumption ranges from 0.11 to 0.33 toe/dwelling.
- Water heating consumption varies from 0.12 to 0.36 toe/household.
- Air cooling still represents a marginal share of dwelling consumption in most countries except Malta and Cyprus (0.10 toe/dwelling), followed by Greece and Croatia, (0.03 toe/dwelling).

*Specific consumption of households by end-use (2022)*



- 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 (2022)*

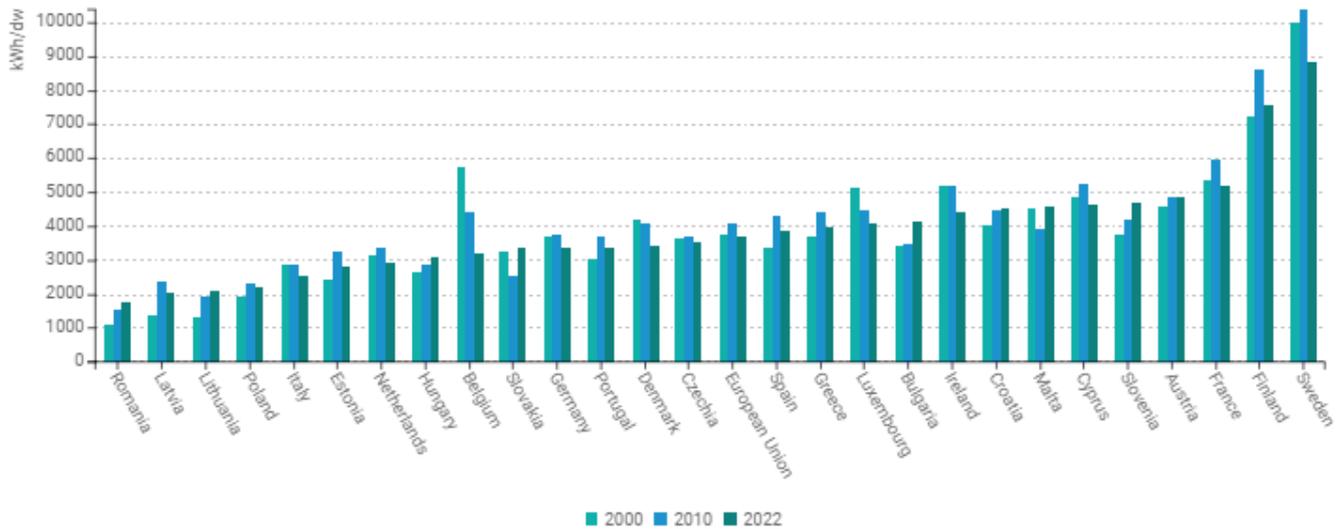


Note: Cyprus has almost 100% of dwellings with solar water heaters, for a solar irradiance of 1886 kWh/m<sup>2</sup>/year.

## Electricity consumption per dwelling

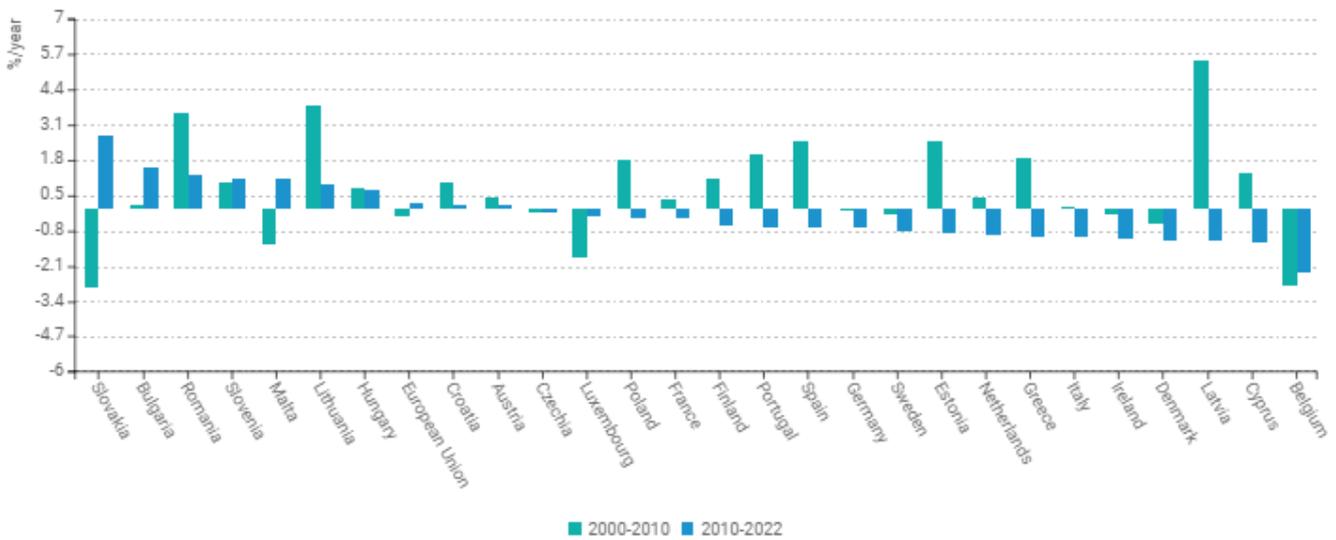
- There are significant disparities in the electricity consumption per dwelling among EU Member States: from 1.8 MWh in Romania to 10 MWh in Sweden (3.7 MWh for the EU average).
- This heterogeneity is partly due to the use of electricity for thermal uses, which is significant in Czechia, Bulgaria, France and Sweden (50-60%), for instance, as well as different equipment rates of electrical appliances and different levels of energy efficiency.

*Electricity consumption per dwelling*



- Since 2014, the electricity consumption per dwelling has remained roughly stable at EU level, (-0.3%/year). In 15 EU countries, electricity consumption increased, with a rapid progression in 10 EU Member States (Cyprus, Portugal and 8 Central and Eastern countries). This consumption has remained stable (less than +/-1%/year) in other Members States, or even decreased in the Netherlands, Denmark, Luxembourg and Belgium.
- Significant increase between 2000 and 2008 (+2%/year and above) in some Member States, including Southern countries mainly due to air conditioning (e.g. Spain, Greece, Portugal, Cyprus), but also in Lithuania, Latvia, Romania, Estonia and Poland.
- Decreasing trend at EU level (-0.16%/year) and in most countries after the economic crisis of 2008 until 2014.

### Trends in electricity consumption per dwelling

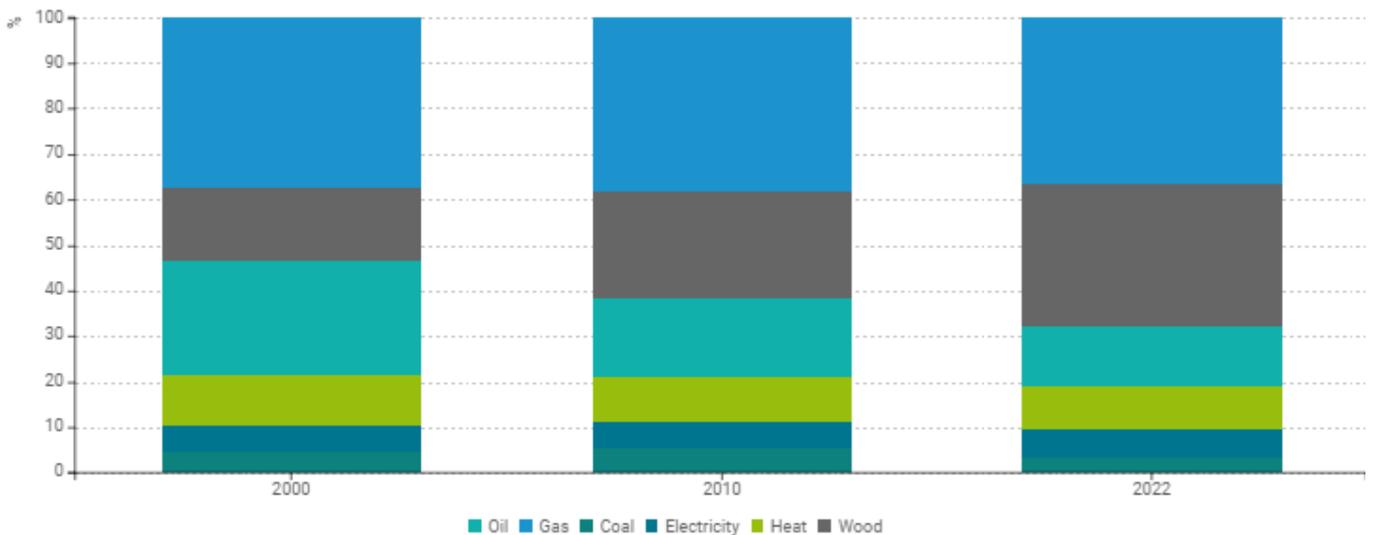


## Space heating

### Heating energy consumption by energy source

- Natural gas is the leading energy source for households space heating in the EU, with a rather stable share (37% in 2022, 38% in 2010 and 37% in 2000).
- The share of electricity stood at 6% in 2022, a similar level compared to 2000 and 2010.
- Oil is slowly being phased out (-12 points, from 25% in 2000 to 17% in 2010 and 13% in 2022) but remains significant in some Member States such as Cyprus.
- Renewables are progressing (+15 points, from 16% in 2000 to 23% in 2010 and 31% in 2022).
- The share of heat is almost stable, from 11% in 2000 to 10% in 2010 and 2022.

### Household energy consumption for heating by energy

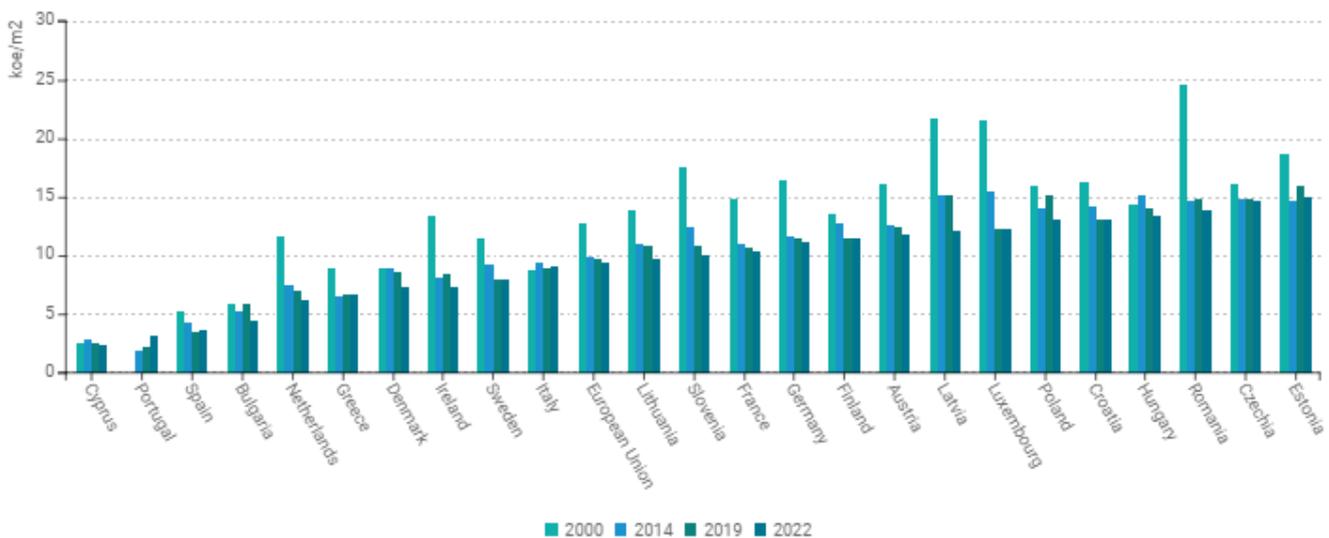


Note : heating energy consumption includes ambient heat consumption.

## Heating consumption per m<sup>2</sup> and per dwelling

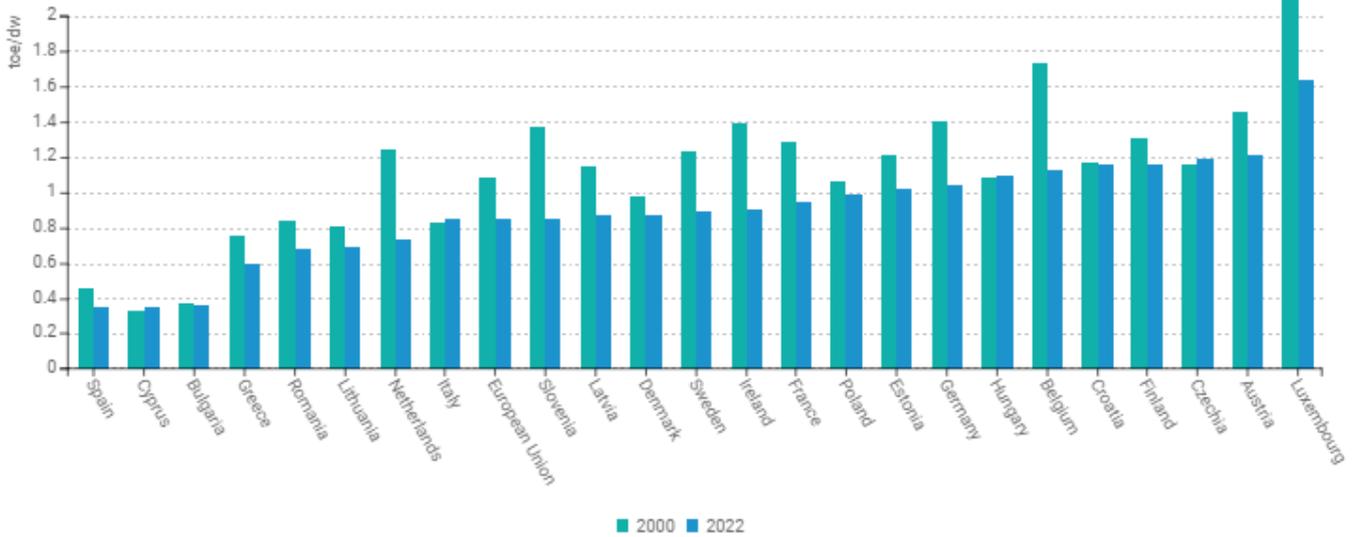
- Heating consumption per m<sup>2</sup> and per dwelling (with climatic corrections) has decreased since 2000 in EU MS thanks to the implementation of stricter building codes, combined with financial incentives to promote the thermal retrofitting of existing dwellings and the adoption of more efficient heating systems (e.g. gas condensing boilers, heat pumps, pellet boilers). The reduction in heating consumption per m<sup>2</sup> was 1.4%/year on average in the EU between 2000 and 2022. It was above 2%/year in 6 EU MS (The Netherlands, Ireland, Latvia, Luxembourg, Romania and Slovenia).
- The reduction in heating consumption per m<sup>2</sup> has slowed down significantly since 2014 at EU level (-0.6%/year) and in 10 MS, including some of the largest EU countries (Germany and France). This trend can be attributed to several factors, including a decrease in new construction projects that typically exhibit high energy efficiency performance: construction rate has decreased by 32% since the financial crisis and represents only 0.9% of the existing housing stock each year (i.e. only 9% of the new stock after 10 years). The spread of efficient heating systems (condensing boilers, heat pumps) has also slowed down, and the number of renovation projects is also comparatively lower, although it is difficult to gather consolidated data on this matter.
- Since 2019, there has been a very rapid decline in the heating consumption per m<sup>2</sup> in 7 countries (by more than 5%/year in Bulgaria, Denmark, Latvia and Poland; and between 3 and 4%/year in Ireland, Lithuania and The Netherlands). This is probably explained by the very steep price increases. At EU level, there has been an acceleration compared to the period before. For the other countries, the situation is quite diverse.
- Significant differences between countries from less than 5 koe/m<sup>2</sup> in countries with warmer climate, such as Bulgaria, Spain, Cyprus, Portugal and Malta to around 15 koe/m<sup>2</sup> in Czechia, Estonia and Romania, due to less efficient homes and space heating technologies and a large use of biomass.

*Heating consumption per m<sup>2</sup>*



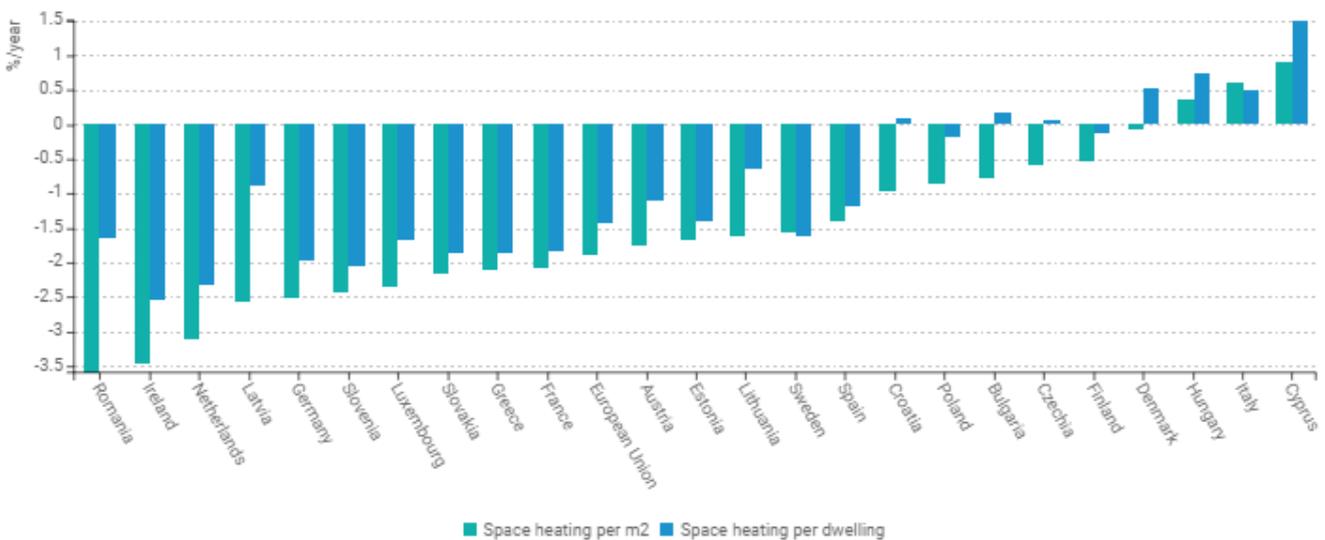
Note: Heating consumption includes ambient heat consumption.

### Heating consumption per dwelling



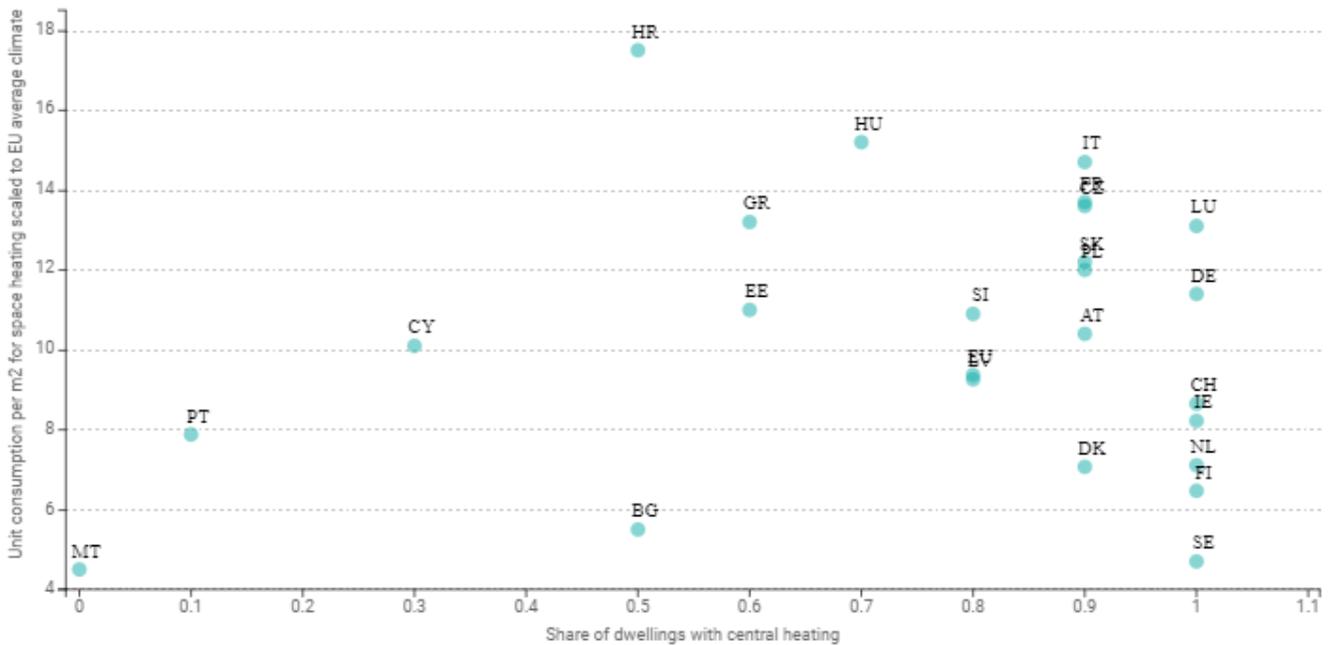
- Until 2014, the energy consumption per dwelling has generally decreased less than the energy consumption per m<sup>2</sup> because of an increase in the average size of dwellings (-1.4%/year over 2000-2014 at EU level for the consumption per dwelling vs -1.9%/year for the consumption per m<sup>2</sup>, which means that the dwelling size has increased by 0.5%/year). This means that, until 2014, around 30% 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 2014 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 m<sup>2</sup> VS per dwelling: effect of change in dwelling size (2000-2014)



- 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 m<sup>2</sup> at european average climate (2022)



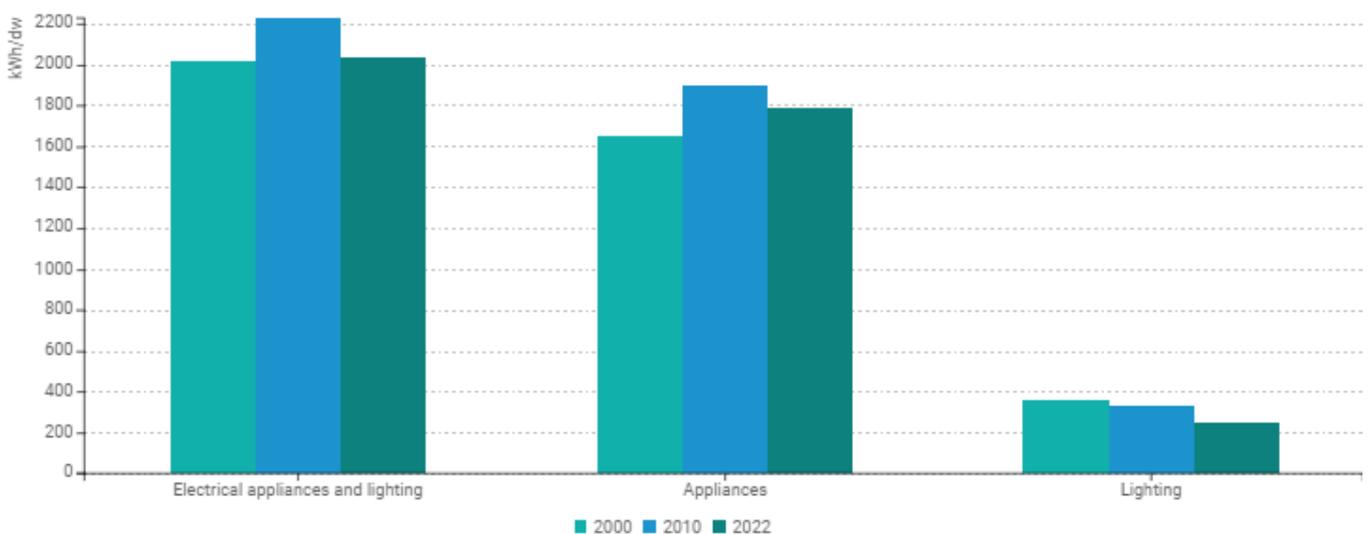
Note : Space heating energy consumption includes ambient heat consumption.

## 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 2022.
- 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).

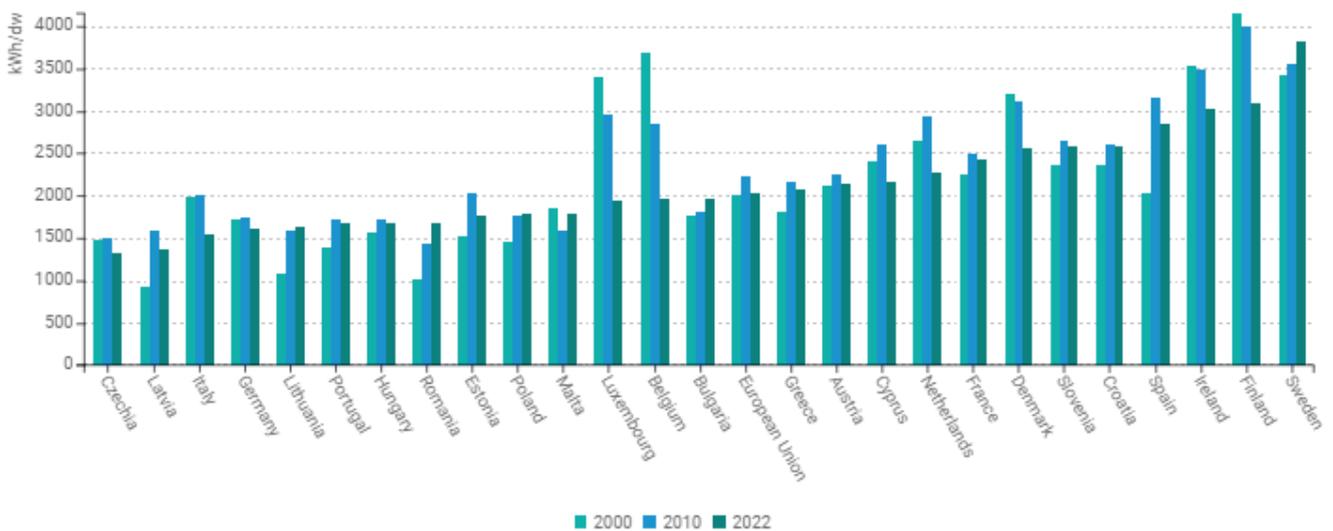
### Consumption per dwelling for appliances and lighting (EU)



## Electricity consumption per dwelling for electrical appliances and lighting

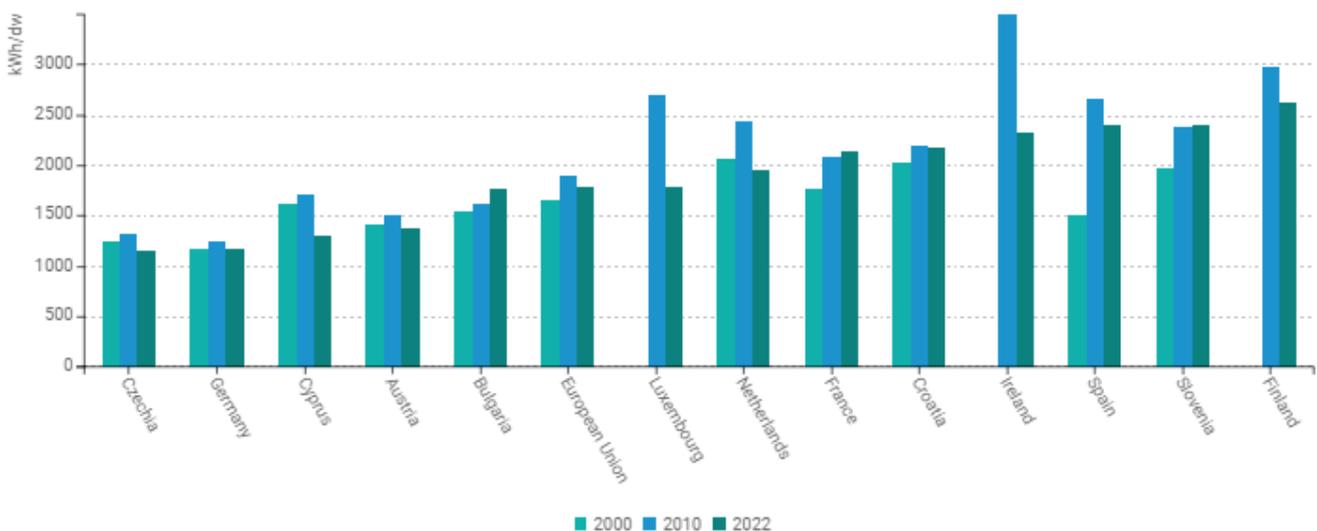
- Significant differences between countries in terms of electricity consumption for electrical appliances and lighting: from less than 1500 kWh/dwelling in Latvia and Czechia, to around 2000 kWh at EU level, up to 3000 kWh in Ireland and Finland, and 3800 kWh in Sweden.
- This specific consumption has decreased in around 10 MS since 2000 and is almost at the same level as in 2000 in 2 other MS and at EU level. This reflects the effects of regulation on appliances and lighting which have more that offset the increase in appliances ownership.

*Electricity consumption per dwelling for electrical appliances and lighting*



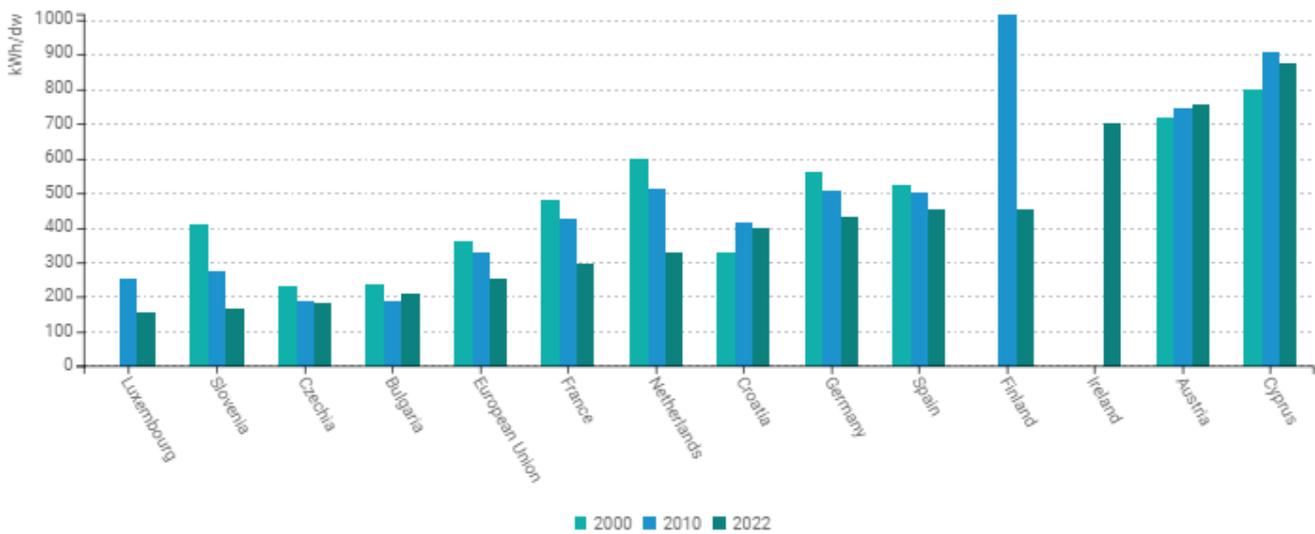
- Similar comments can be made for electrical appliances only (i.e. without lighting), but only for 14 MS for which the consumption for lighting is separated from that of appliances.
- The specific consumption for electrical appliances varies from around 1200 kWh/dwelling in Czechia and Germany, to 1800 kWh at EU level, and up to 2400 kWh in Slovenia and Spain and 2600 kWh in Finland.

*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 Slovenia and the Netherlands.
- Significant differences between countries: from 154 kWh/dwelling in Luxembourg, to 251 kWh at EU level, up to 875 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.

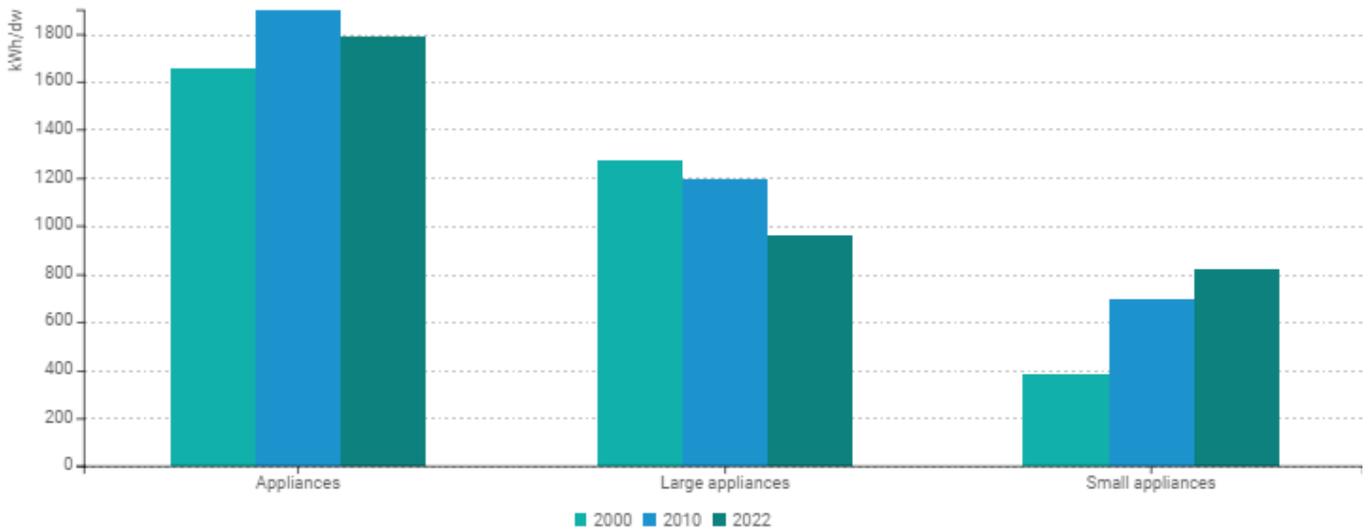
*Electricity consumption per dwelling for lighting*



## Energy consumption of large appliances per dwelling

- EU households' consumption for small appliances grew by 113% between 2000 and 2022 (821 kWh/dwelling in 2022, 699 kWh/dwelling in 2010 and 385 kWh/dwelling in 2000) due to higher equipment rates. On the opposite, specific consumption of large appliances decreased by 24% over the same period, thanks to labels and standards.
- Large appliances still account for the largest share of appliance consumption: 54% of the specific consumption of appliances in 2022, compared to 63% in 2010 and 76% in 2000.
- 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 (-6%).

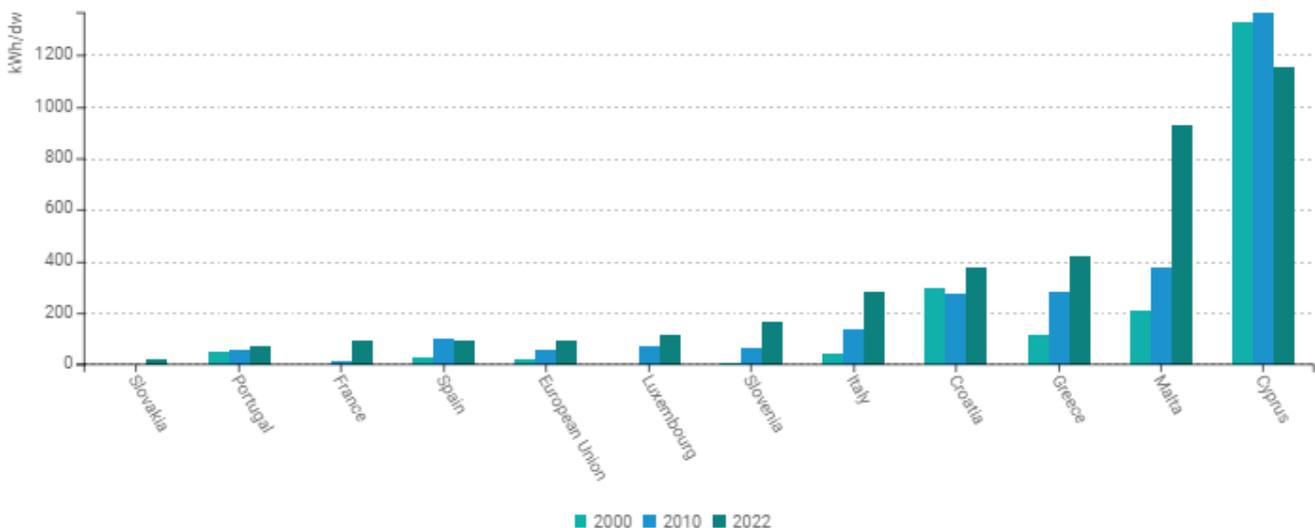
### Consumption of electrical appliances in the EU



### Unit consumption of air conditioning

- In 2022, air conditioning represented only 2.5% 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 93 kWh/household in 2022, driven by the growing use of air conditioning appliances.
- This end-use is significant in Cyprus, Malta, Greece, Croatia and Italy (from 8% to 25% of household electricity consumption).

### Consumption per dwelling for air conditioning



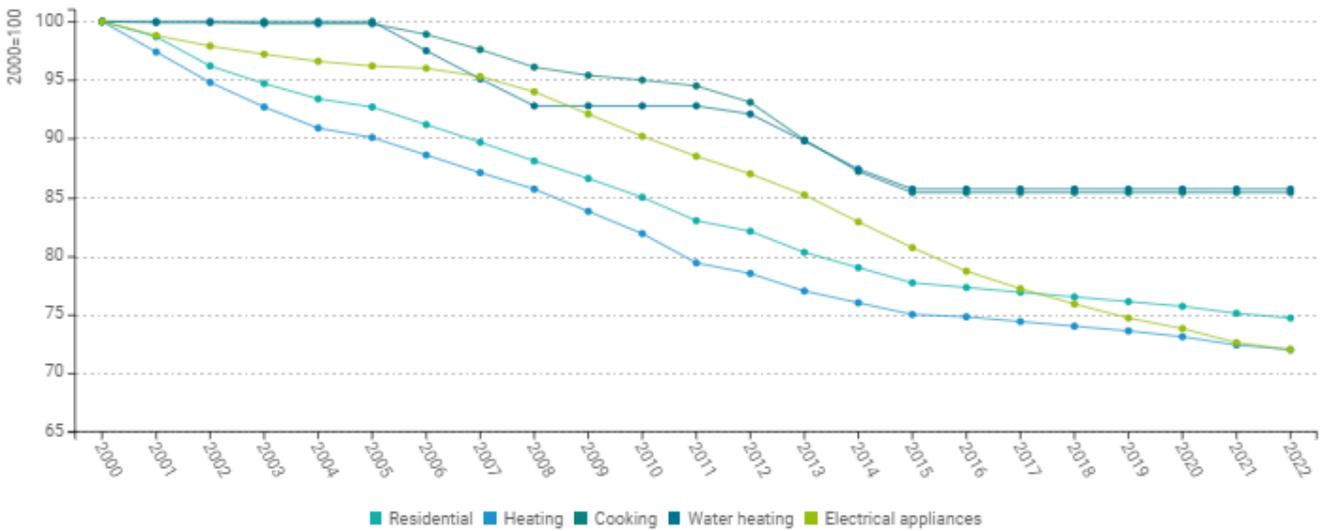
Note: The average consumption per dwelling is obtained by dividing the total consumption for air conditioning by the total number of dwellings, not only those with air conditioning.

# Energy efficiency and savings

## Energy efficiency trends for households in the EU

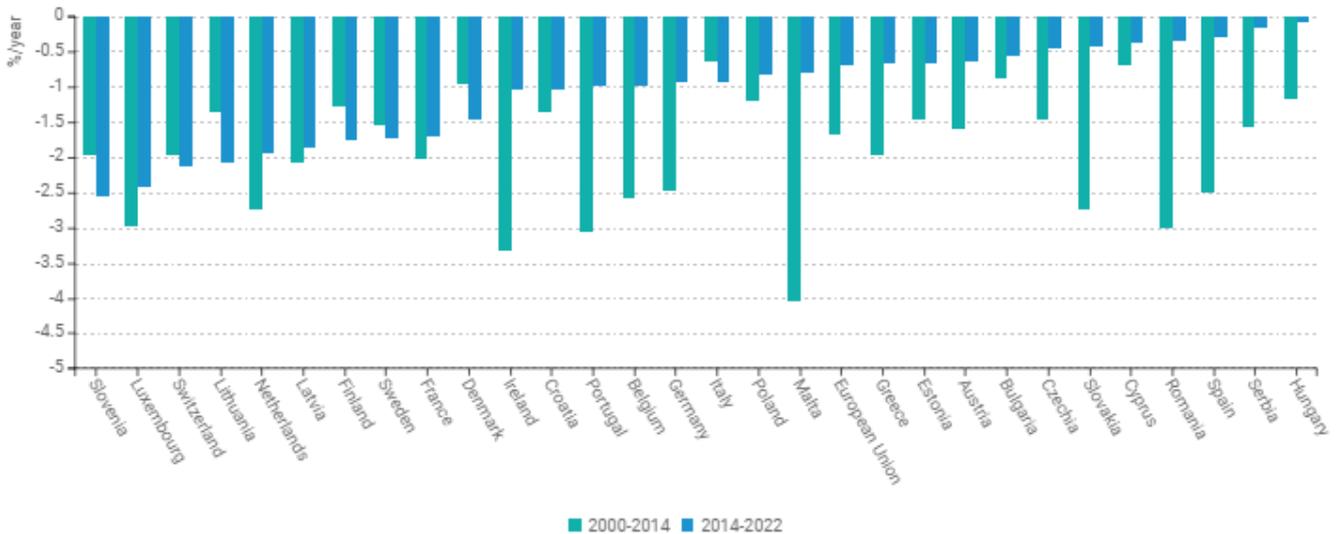
- Households energy efficiency, as measured by ODEX, has improved by around 25% (1.3%/year) over the period 2000-2022 at EU level (ODEX equals 75 in 2022), mainly through improvements in space heating and large appliances.

*Energy efficiency progress in the EU*



- In most countries, energy efficiency has been progressing much slower since 2014, except Denmark, Finland, Italy, Lithuania, Slovenia and Sweden, who have accelerated the pace of progress.
- Slovenia, Luxembourg and Lithuania have demonstrated the steadiest progress since 2014, with rates exceeding 2%/year, almost three times the EU average of 0.7% per year.

*Energy efficiency progress in EU countries*

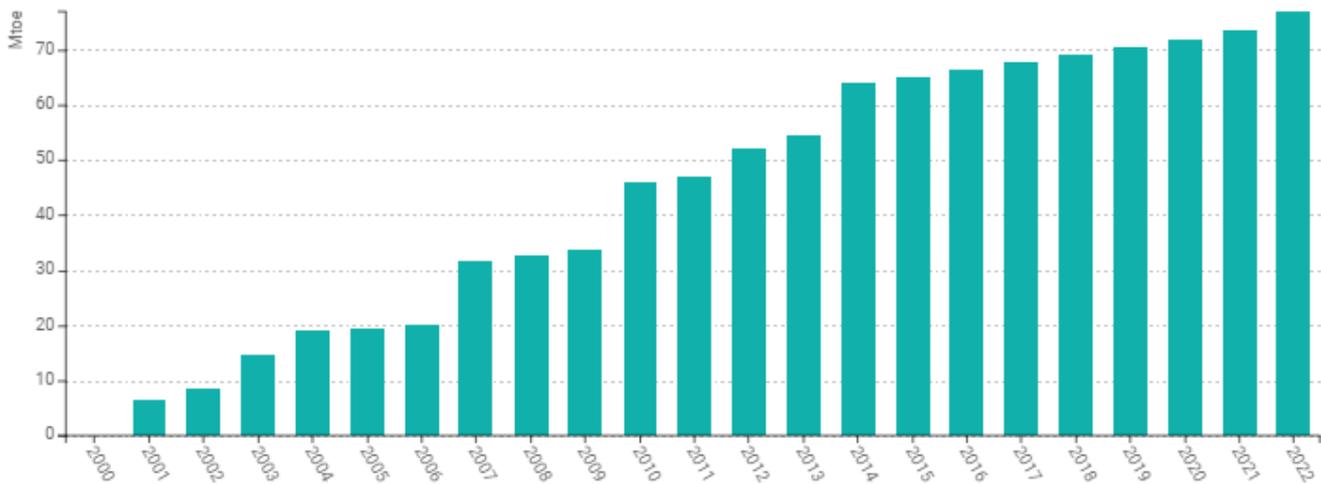


Note: ODEX aggregates energy efficiency gains by end-use, measured by the reduction in unit consumption. ODEX is calculated on the basis of 11 end-uses or large appliances: heating (toe/m<sup>2</sup>, separation between new and existing dwellings), water heating, cooking, lighting, cooling (toe/dwelling), 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 77 Mtoe since 2000, which means that without energy efficiency improvements, energy consumption would have been 77 Mtoe higher in 2022.
- Due to the slowdown in the rate of energy efficiency improvements, the annual additional savings have been decreasing by 62% since 2014: from an average volume of 4.2 Mtoe/year over 2000-2013 to 1.6 Mtoe/year since 2014.

*Energy savings for households in the EU*

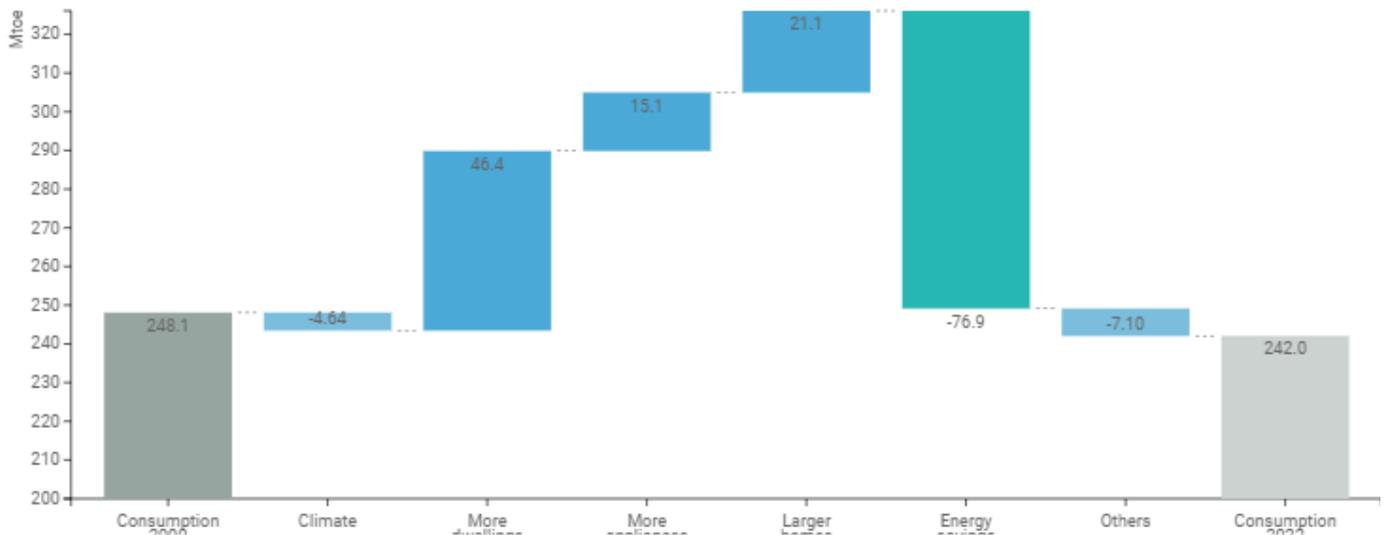


## Decomposition of energy consumption

### Drivers of energy consumption per dwelling (EU)

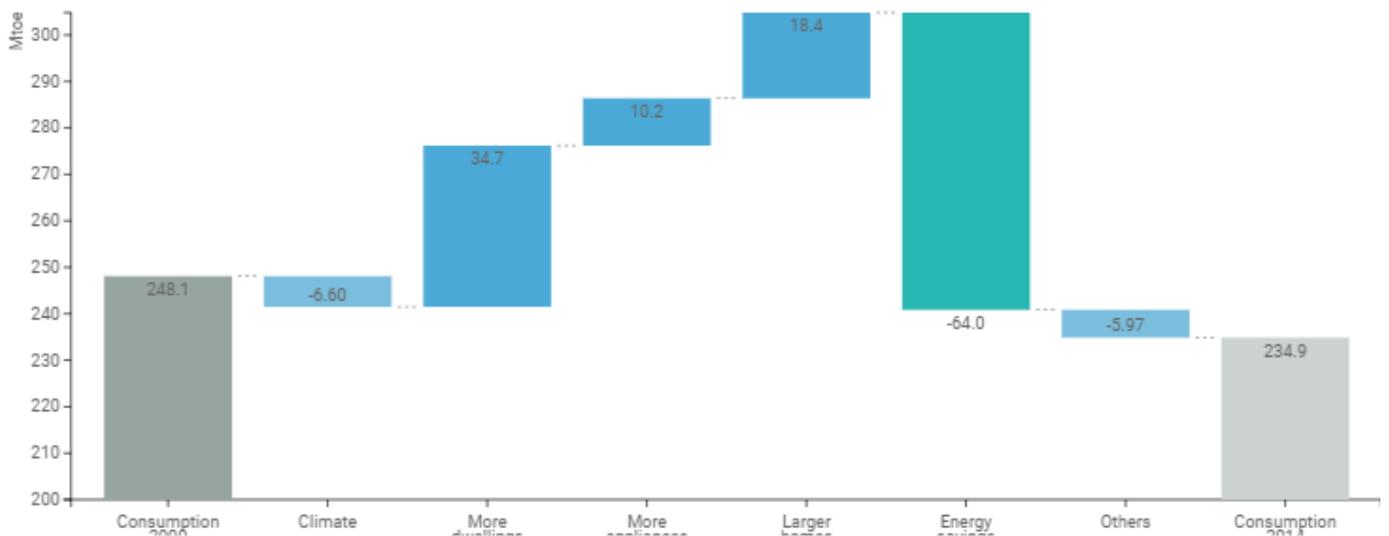
- Between 2000 and 2022, household energy consumption increased by 6.1 Mtoe at EU level.
- Several factors related to activity have contributed to increase consumption: the increase in the number of dwellings (46 Mtoe) and the number of appliances per dwelling (15 Mtoe), as well as the trend towards larger dwellings (21 Mtoe), corresponding to a total “activity effect” of around 82 Mtoe.
- The consumption increase due to more dwellings was higher during 2000-2014 (35 Mtoe) than 2014-2022 (12 Mtoe).
- Energy savings have offset most of this activity, amounting to around 77 Mtoe.
- The largest part of energy savings was observed between 2000 and 2014 (64 Mtoe), while only 13 Mtoe were added between 2014 and 2022.
- Behavioral effects (“Others”) and climate difference between the two years have decreased consumption by 7 and 4.6 Mtoe, respectively.

*Drivers of energy consumption variation in residential at EU level (2000-2022)*



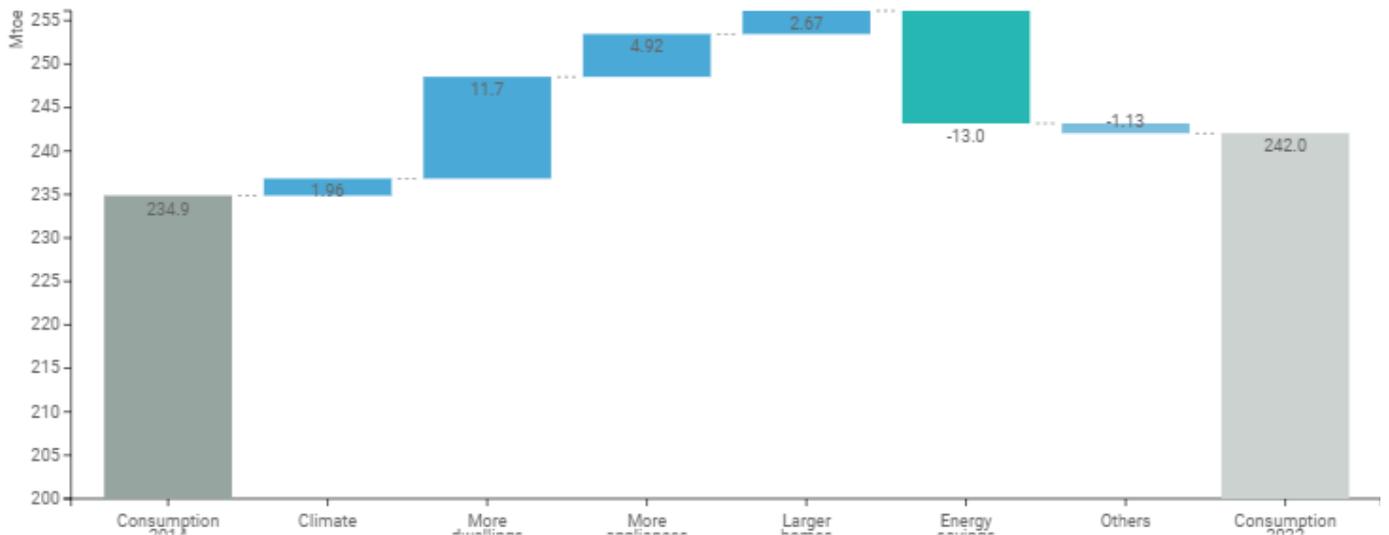
- Between 2000 and 2014, household energy consumption has decreased by 13.2 Mtoe.
- The “activity effect” would have increased consumption by around 63 Mtoe.
- Energy savings have totally offset this activity effect, amounting to 64 Mtoe.
- Behavioral effects and climate differences have decreased consumption by around 6 Mtoe each.

*Drivers of energy consumption variation in residential at EU level (2000-2014)*



- Between 2014 and 2022, household energy consumption has increased by 7.1 Mtoe.
- The “activity effect” would have increased consumption by around 19 Mtoe.
- Energy savings have reduced consumption by 13 Mtoe.
- Behavioral effects have slightly decreased consumption (-1.1 Mtoe), while climate differences contributed to raise consumption by almost 2 Mtoe.

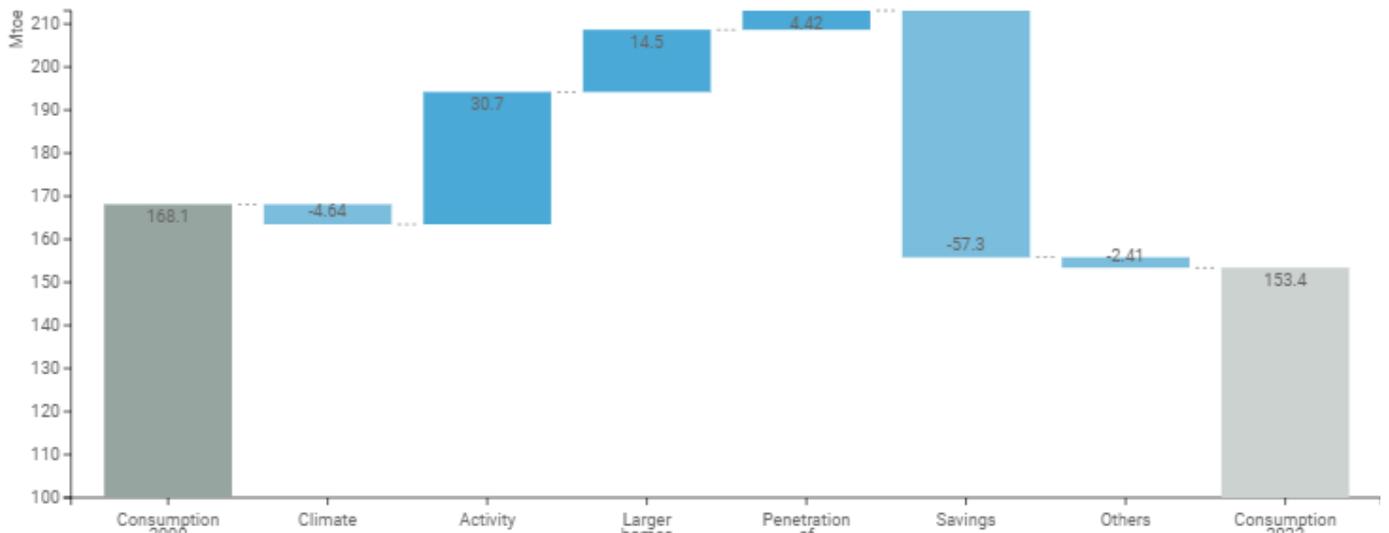
*Drivers of energy consumption variation in residential at EU level (2014-2022)*



**Drivers of heating consumption per dwelling (EU)**

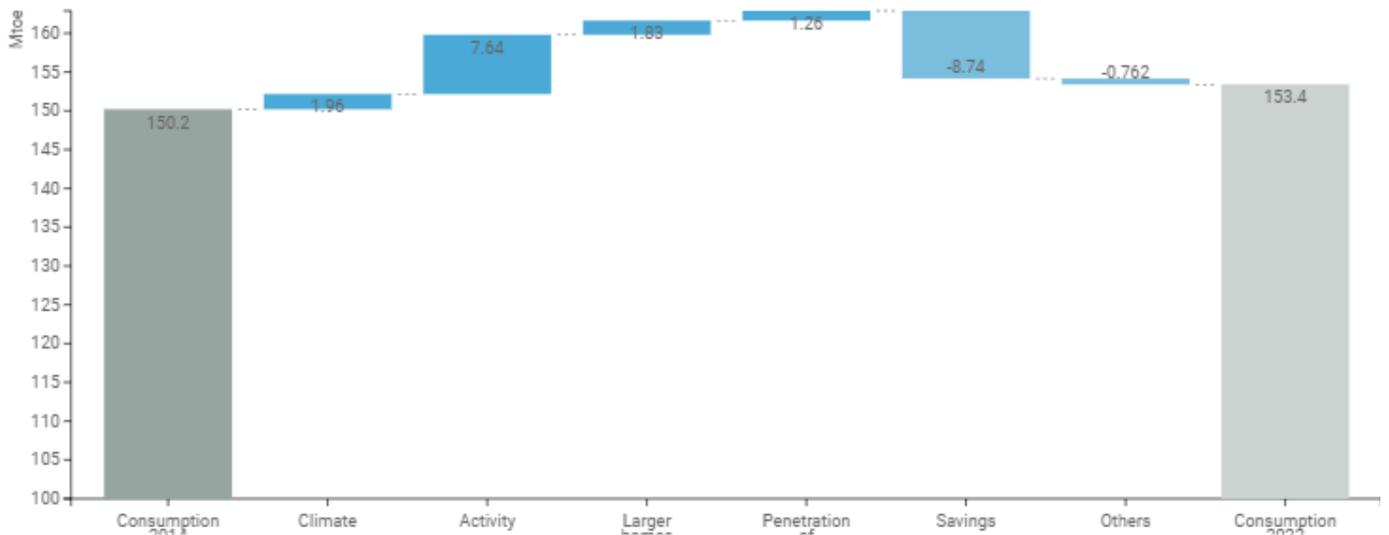
- At EU level, the increase in the number of dwellings and the larger size of dwellings have offset, respectively, 54% and 25% of the energy savings since 2000.

*Drivers of the variation in heating consumption per dwelling*



- Since 2014, heating consumption increased as a result of the sustained impact of both the number and size of dwellings, as well as the influence of climate and penetration of central heating. Collectively, these factors have offset the energy savings by 4 Mtoe.

*Drivers of the variation in heating consumption per dwelling (2014-2022)*

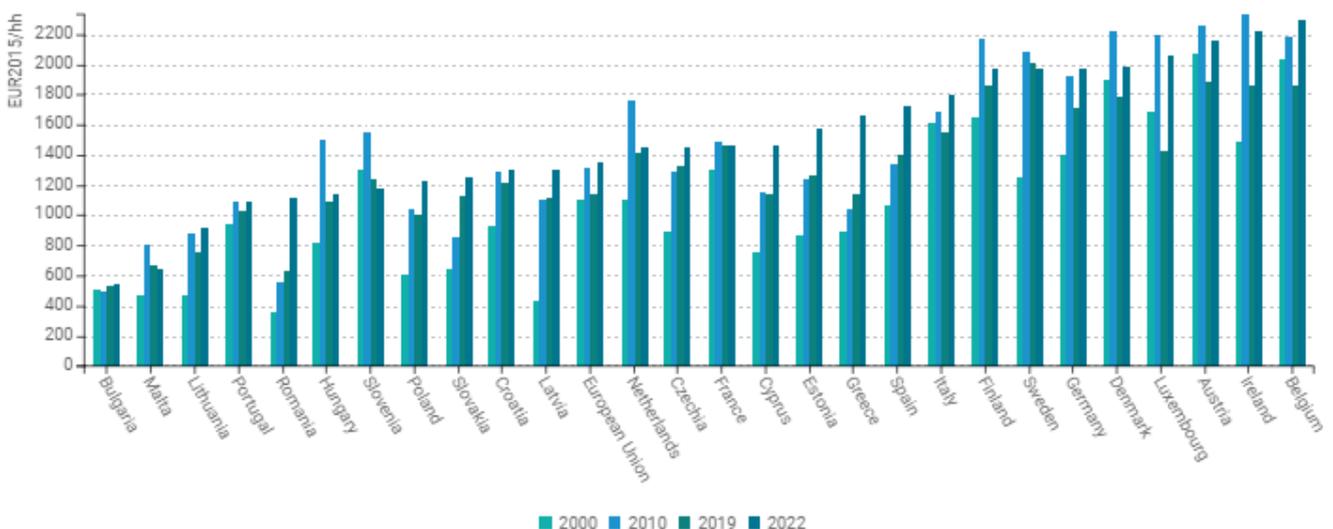


## Financial indicators

### Energy expenditures of households

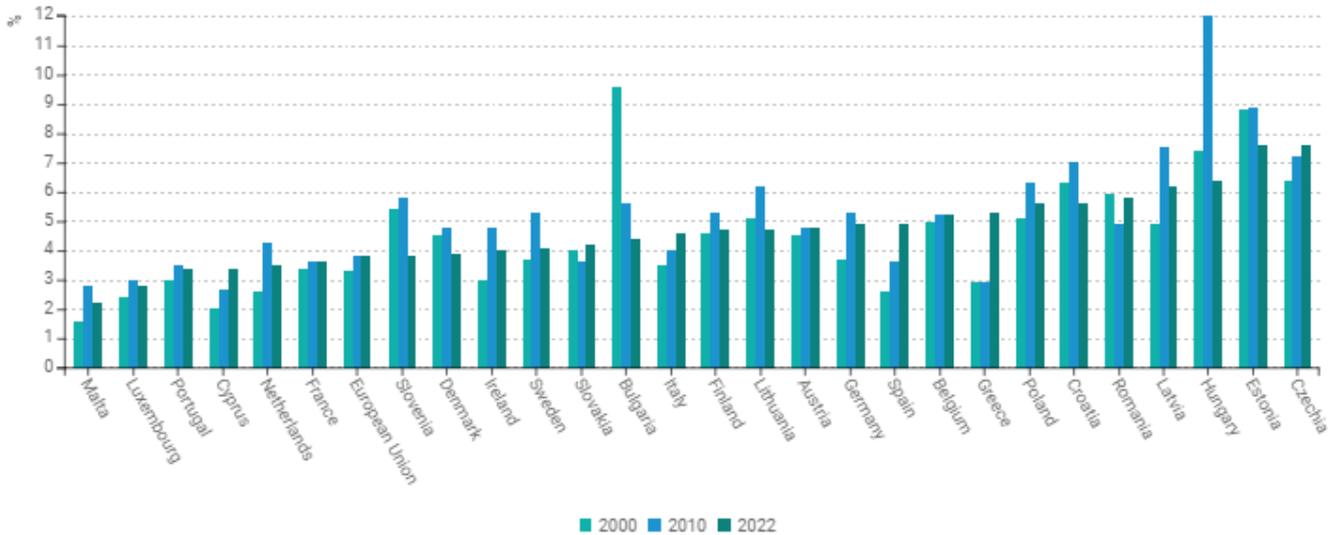
- Since 2000, annual energy expenditures of households increased in the EU and in the majority of its Member States. At EU level, energy expenditures rose by 1.8%/year until 2014. Then it strongly decreased by 3.7%/year until 2020. The considerable rise in energy prices since 2021 has a significant impact on energy expenditures for households, with an increase by 12.4%/year to reach 1351 EUR at EU level in 2022, exceeding the 2010 level. However, it decreased in 11 MS over 2010-2022. This is particularly evident in countries with high energy expenditure.
- In 2022, energy expenditures per household significantly increased compared to 2021, correlated to the surge of energy prices. It ranged, at constant prices, from 547 EUR in Bulgaria to more than 2000 EUR in Austria, Ireland, Belgium or Luxembourg. 8 of the 10 countries with the highest GDP per capita have the highest energy expenditures (except France and The Netherlands).

*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 2010-2022, at EU level (-0.1 percentage points) and in most (20) of the MS. It varied from 2.2% in Malta to more than 7% in Czechia or Estonia, with an average of 3.8% at EU level.
- The highest decreased happened in Hungary and Slovenia, with a reduction of more than 5 and 2 percentage points, respectively, since 2010.

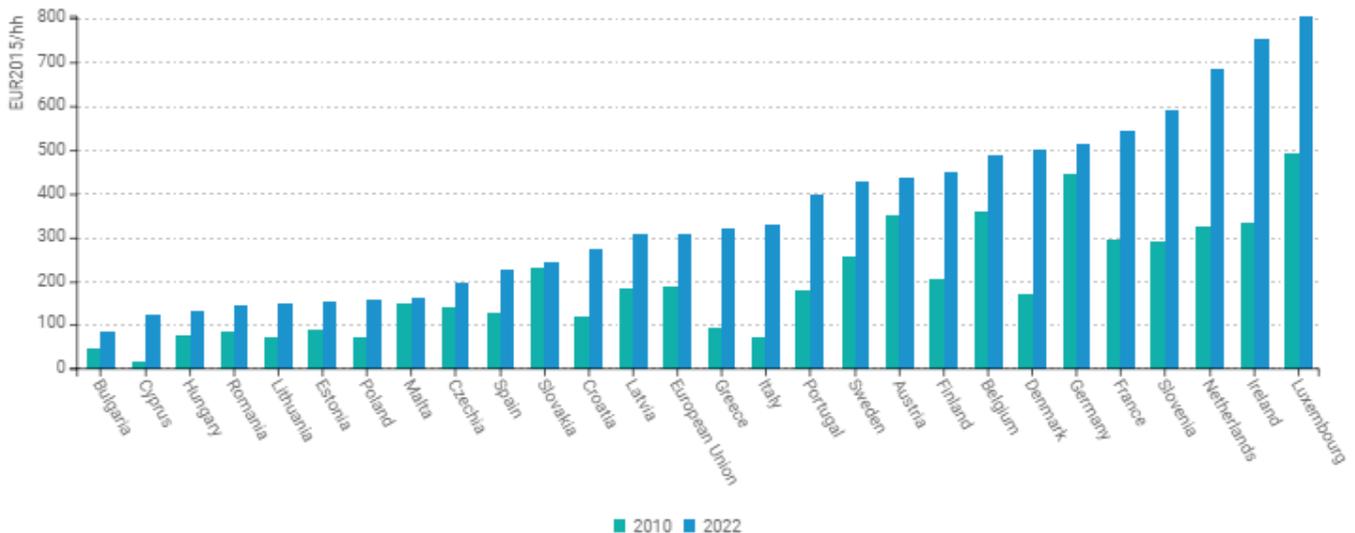
*Share of energy expenditures for housing in the households budget*



## Financial savings through energy efficiency

- Energy savings contributed to lower the energy expenditure of households; in 2022, these monetary savings ranged from 86 EUR in Bulgaria to more than 750 EUR in Ireland and Luxembourg. It appears that countries with the highest energy expenditures have the highest monetary savings.
- Since 2010, these monetary savings increased by 63% at EU level and more than doubled in 12 MS, with the highest increase in Cyprus, Italy and Greece where it more than triple.

*Monetary energy savings per household in housing*



- In 2022, energy savings allowed households across MS to save from 8.5% to 50% of their energy expenditures, with an average of 23% at EU level. This means that without energy efficiency gains, energy expenditures would have been 23% higher.
- This share increased in all MS except Romania and Slovakia, due to a significant increase in energy expenditures since 2010 (+3.3%/year and +6%/year respectively).

*Share of monetary energy savings in energy expenditures for housing*

