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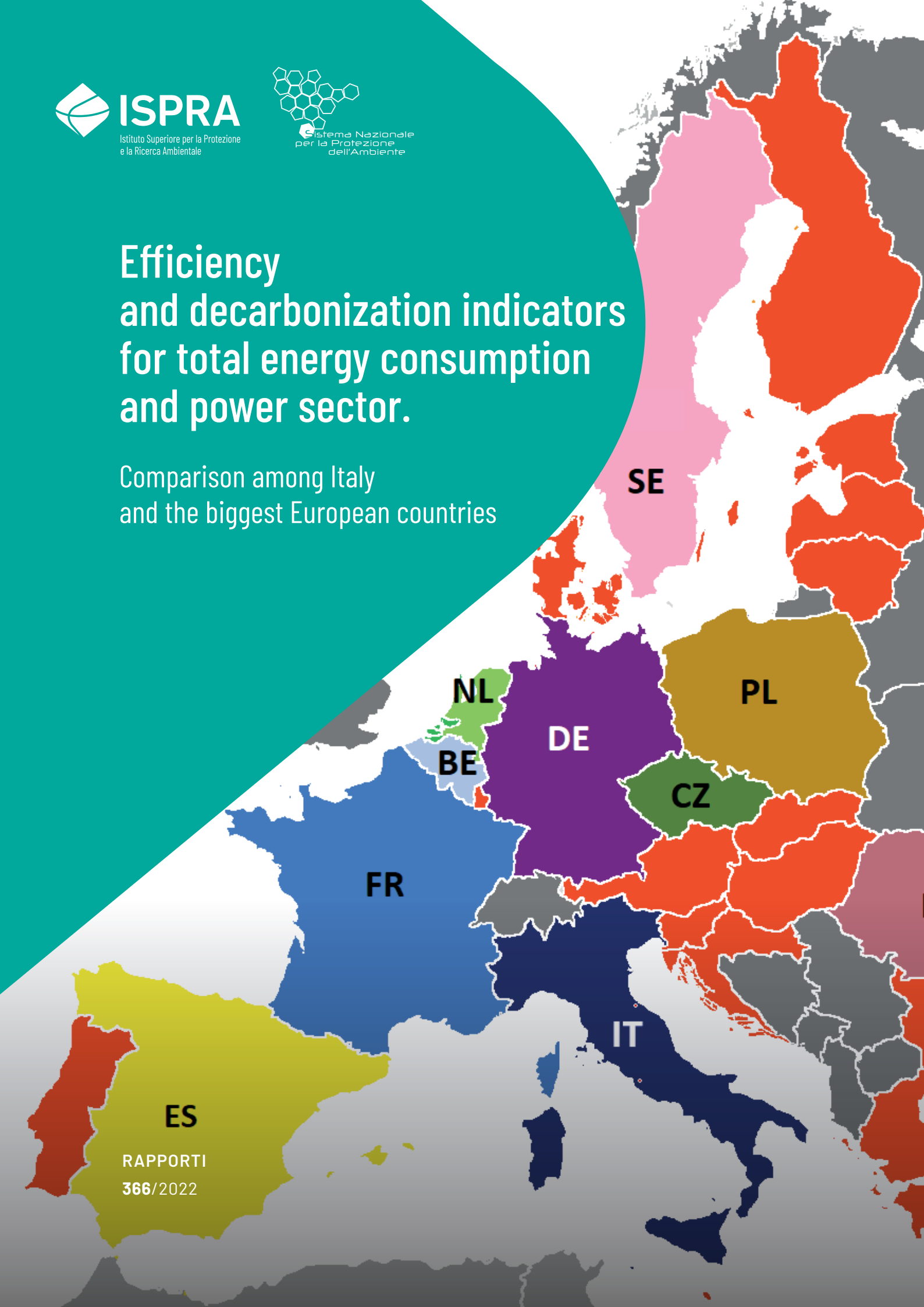
Efficiency and decarbonization indicators for total energy consumption and power sector.

Comparison among Italy and the biggest European countries



RAPPORTI
366/2022

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Informazioni legali

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"The masses never revolt of their own accord, and they never revolt merely because they are oppressed. Indeed, so long as they are not permitted to have standards of comparison, they never even become aware that they are oppressed."
George Orwell, 1984, 1949.

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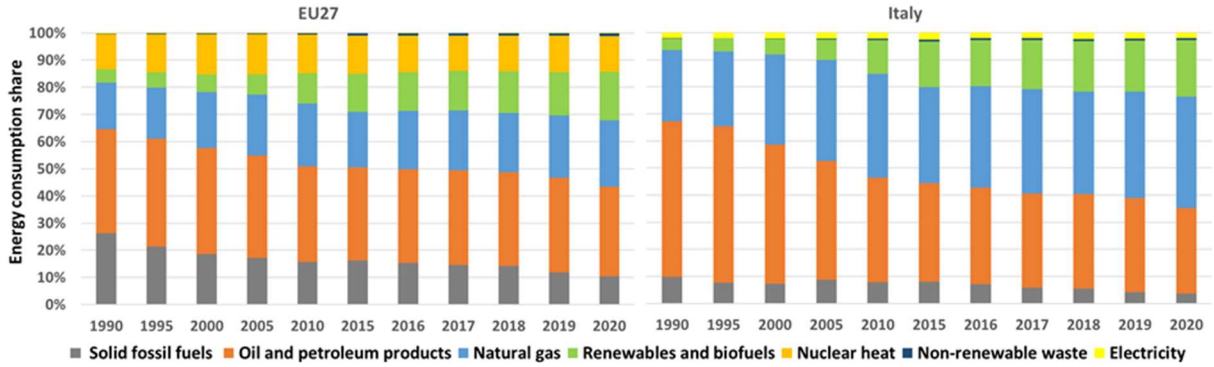
EXECUTIVE SUMMARY

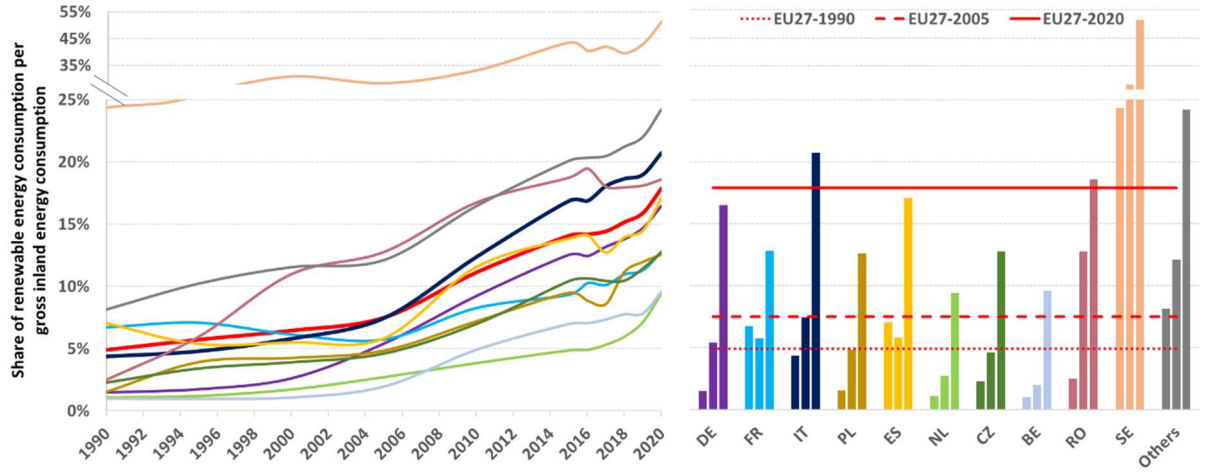
Efficiency and decarbonization indicators

Comparison of decarbonization and efficiency indicators is carried out among Italy and the largest European countries. The EU Member States with more than 3% of EU27 GHG emissions or more than 3% of EU27 GDP in 2020 are considered for comparison. The Member States examined (Germany, France, Italy, Spain, Poland, the Netherlands, Belgium, Romania and Sweden) represent 81.5% of the population in EU27 in 2020, 81.7% of GHG emissions and 83.1% of GDP. The gross inland energy consumption accounts for 82.5% of the energy consumption of EU27.

Since 1990, European environmental policies have led to a significant change of the energy mix in the Member States. The nuclear energy represents 13.1% of EU27 gross inland consumption in 2020, quite stable since 1990 (12.9%). On the other hand, solid fuels energy faces significant contraction since 1990. EU27 share decreased from 26.3% to 10.5% from 1990 to 2020, although there are still in 2020



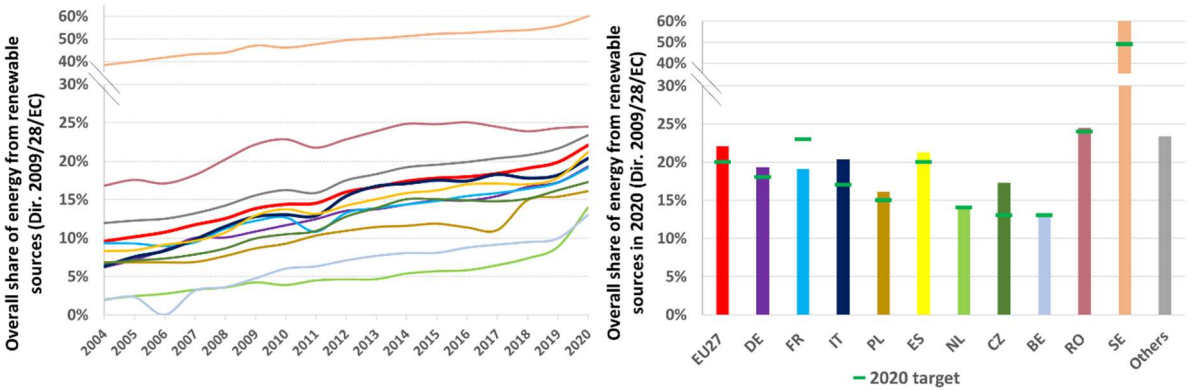
significant shares in some of the largest States such as Germany (15.7%), Poland (39.7%) and Czechia (30.7%). Oil and petroleum products, on the other hand, show a modest reduction at European level (from 38.3% in 1990 to 32.9% in 2020) with different trends among the States. Natural gas energy consumption shows a considerable increase in almost all States and at EU27 level ranges from 17.1% in 1990 to 24.4% in 2020. As concerns renewable energy, there has been a significant increase in EU27 from 4.9% in 1990 to 17.9% in 2020.



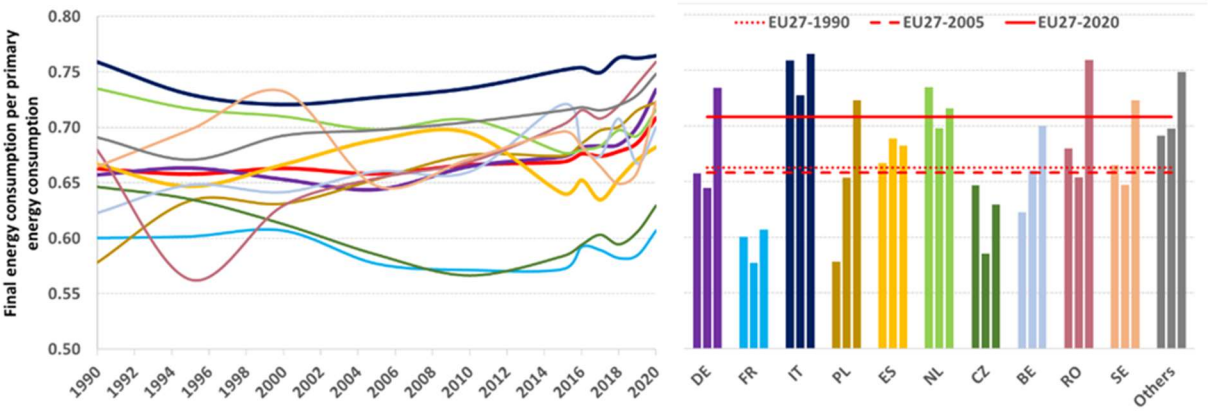
The Italian share of gross inland consumption of solid fuels, mainly coal, decreased from 9.9% in 1990 to 3.6% in 2020 with an acceleration in the last years. On the other hand, the share of natural gas for Italy goes from 26.3% to 41.2% from 1990 to 2020.The share of oil and petroleum products goes from 57.3% to 31.7% and renewable share grew from 4.4% to 20.7%. Italy's renewable share in 2020 is among the highest in the countries examined, only Sweden's share is higher than the Italian one. The share of fossil fuels is significantly reduced in almost all European countries. The EU27 average

decreased from 82% in 1990 to 68.9% in 2010. Among the examined countries, the Netherlands and Poland shares are still higher than 85% in 2020.

The overall share of renewable energy consumption according to European Directive 2009/28/EC in 2020 for Italy is 20.4%, over the 2020 target of 17%. Among the countries examined France has not achieved its target.

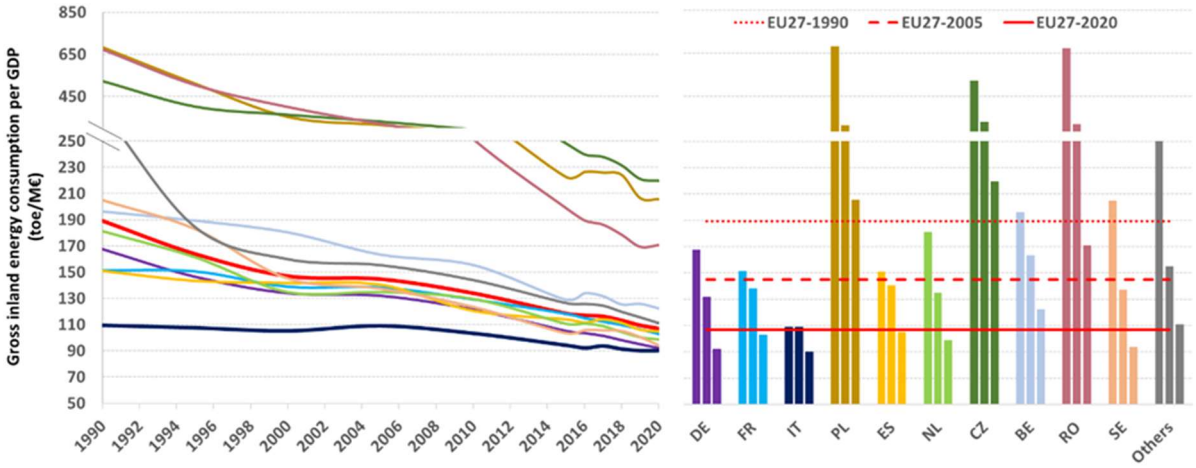


The ratio between the final energy consumption (including non-energy uses) and gross inland consumption is an indicator of energy efficiency. This indicator has always been higher for Italy than for the European average and shows values which, among the biggest countries, are comparable only with those of the Netherlands. Since 1990 the ratio for Italy has been around the average of 0.76, while for EU27 the average is 0.69. To evaluate energy transformation efficiency, it is useful to consider energy consumption without non-energy uses.



In other words, the ratio between final energy consumption and primary energy. The Italian energy transformation efficiency is higher than any other countries examined.

The gross inland energy consumption per unit of gross domestic product (GDP) is an indicator of the country's economic and energy efficiency (energy intensity). Italy was one of the European countries with lower energy intensity until 1995, when it was behind only to Denmark, then lost positions and in 2020 has the 5th lower values, upper than Ireland, Denmark, Malta and Luxembourg. Among the biggest EU27 countries, Italy continues having the lowest energy intensity followed by Germany.

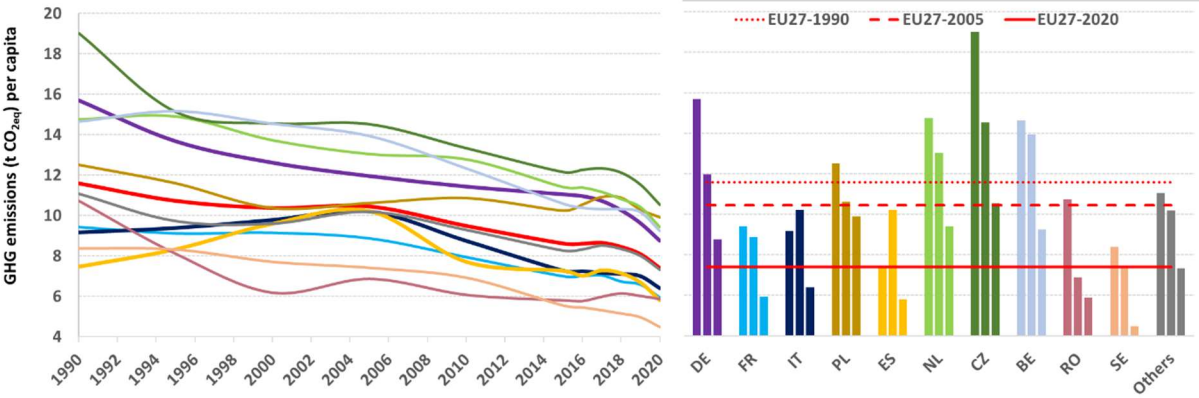


The final energy intensity (ratio between final energy consumption with non-energy uses and gross domestic product) follows similar trends of energy intensity with a sudden reduction in the European countries which, starting from higher levels than Italy, reach Italian figures and in some cases exceed them. Since 1990 Italy shows considerable energy and economic efficiency, the final energy intensity reduced by 17.7% from 1990 to 2020; much higher reductions have occurred in the other European countries (-37.8% in EU27). The reasons for the reduction in energy intensity observed are manifold such as the increase in building efficiency, industrial efficiency improvement, the electrification of final consumption and the shift of economy towards high value added and low energy consumption activities of services to the detriment of industrial sectors.

European countries show a wide range of electrification of final energy consumption (energy uses only) in 2020 ranging from 14.8% in Latvia to 40.5% in Malta. Italy is just below the EU27 average with 23% *vs* 23.2%. Among the biggest countries, Sweden, France and Spain have levels of electrification than Italy, respectively 33.7%, 27.6%, and 26.1%. At the lowest end there are Romania and Poland with 16.1% and 16.8% respectively.

At sectoral level, the Member States' electrification of final energy consumption shows fairly different figures although with a common growing trend. The electrification of industry final consumption in Italy is among the highest in Europe (42.3% in 2020). Services show the highest percentages of electrification of final energy consumption among sectors. The Italian share in 2020 is 39.1%, well below the EU27 average (47.9%), as well as the electrification in households (18.6% in Italy, 24.7% in EU27). The transport sector shows the lowest percentages of electrification and in 2020 Italy is one of the three EU27 countries with the highest share (3%), after Sweden (3.6%) and Austria (3.4%).

Italy's GHG emissions per capita from 1990 to 2020 is 8.8±1.2 t CO_2eq (ISPRA, 2022[a]).



Emissions per capita increased until 2004 when the maximum value of 10.3 t CO_2eq was reached, then a reduction of up to 6.4 t CO_2eq was observed in 2020. Italian emissions per capita have always been below the European average.

As for carbon intensity related to energy consumption all countries have reduced the GHG emissions per unit of gross inland energy consumption since 1990. Carbon intensity of Italy is higher than the European average, also for the contribute of nuclear power in many countries. By unbundling nuclear power from gross inland consumption, Italy's figures are below the EU27 average. Among the examined countries Belgium, the Netherlands and Sweden have lower values than the Italian ones.

The ratio between GHG emissions and gross domestic product is the carbon intensity related to economy. The indicator shows a reduction for all European countries and Italy's figures are just below the EU27 average in 2020. The trends of indicators such as greenhouse gas emissions per capita, energy and economy carbon intensity show that the biggest countries are gradually moving closer to the Italian values and in some cases such values have been exceeded.

The indicators show that Italy, compared to the biggest EU27 Member States, has historically high energy and economy efficiency with a significant share of renewable energy and natural gas in the energy mix, and one of the lowest emissions per capita in Europe. The energy intensity per unit of GDP in Italy is higher only to those of Ireland, Denmark, Malta and Luxembourg, while the carbon intensity per unit of GDP is below the EU27 average and higher than those of France and Sweden, among the biggest countries. The carbon intensity per unit of energy consumed without the nuclear power is, among the biggest countries, higher only than those of Belgium, the Netherlands and Sweden and comparable with that of the Germany. Although some indicators show that many countries have improved their GHG emission performance, sometimes achieving better results than Italy, the following factors need to be considered:

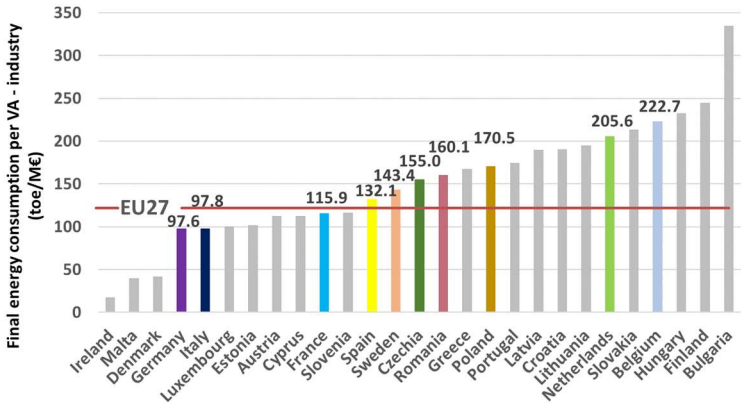
- countries with high shares of solid fuels or oil and petroleum products have greater potential for reducing emissions from fossil fuels than those available in Italy, where the fossil mix is mainly represented by natural gas and further GHG emissions reductions are possible increasing the renewable share and improving efficiency;
- in several countries there is a significant contribution of nuclear power with emissive advantages, a source of energy which is not without controversy and which some countries intend to phase out gradually (Germany, Belgium), even though recent events, such as Russian-Ukrainian war from February 2022 determined revisions of the nuclear plants decommissioning planning;
- the emissive performance of a country depends closely on its economic structure. Countries with a predominance of productive activities in the service sector or with significant shares of non-energy consumption, such as the Netherlands, show lower emissions per GDP and energy consumed.

The biggest European countries have very different contributions from international bunkers with regard to GHG emissions. The GHG emissions from such sectors are relevant in some countries and the EU27 average share in total emissions with bunkers in 2020 is 5.1% and, for the biggest countries, it ranges from 0.2% in Romania to 21.3% in the Netherlands.

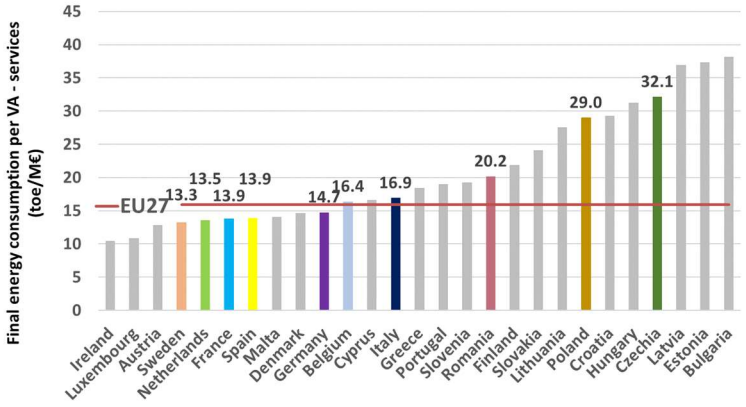
The gross available energy, which include the contribution of international bunkers, per unit of GDP highlights the different role of international bunkers energy consumption and shows that Italy's values are the lowest among the largest countries. With regard to the GHG emissions per unit of gross available energy, the contribution of nuclear power appears to be decisive. Energy emissions per unit of gross available primary energy without nuclear energy shows that Italy's figures are below the values recorded for the other countries, except for Sweden.

The comparison of efficiency and decarbonization indicators at sectoral level among Member States shows a rather heterogeneous situation. As for industry in Italy, the final energy intensity, ratio between final energy consumption and value added, have been comparable to those of Germany since 2005. Among the European countries only Ireland, Denmark, Malta have lower industry energy intensities than Italy and Germany in 2020. Among the countries examined the Netherlands and Belgium show the highest energy intensities for industry.

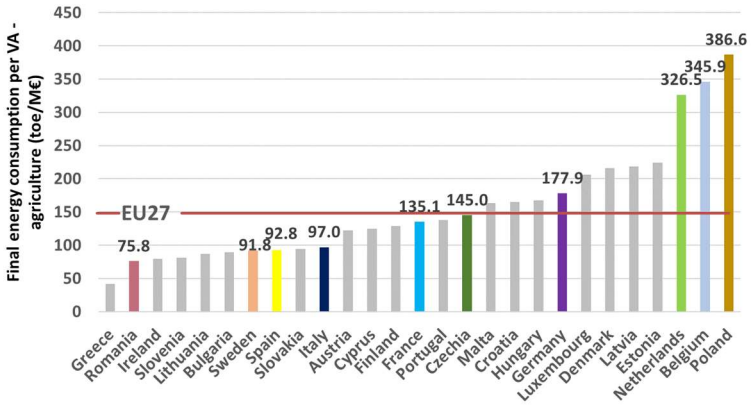
In commercial and public services Italy shows a countertrend of energy intensity from that of other European countries in recent years. In particular, in the last years, the accounting of energy consumed by heat pumps since 2017 has increased the sector energy intensity. The average annual rate of energy intensity from 2005 to 2020 shows an increase of 0.8% for Italy against a decrease of -1.6% for European average.



The agriculture sector shows a general decrease in energy intensity with an annual average rate of -0.7% since 2005 in EU27. The sector energy intensity for Italy in 2020 is higher than those recorded for Romania, Spain and Sweden, among the examined countries.



In the household sector, since 2005 the countries examined show significative reductions of energy consumption per unit of GDP (from -0.5% per annum in Spain to -3.2% per annum in Poland), while Italy do not show any relevant change. The energy intensity trend for Italian transport is broadly comparable to EU27 even though with lower levels and slightly higher average annual rate of decrease since 2005 (-1.9% vs -1.7%).



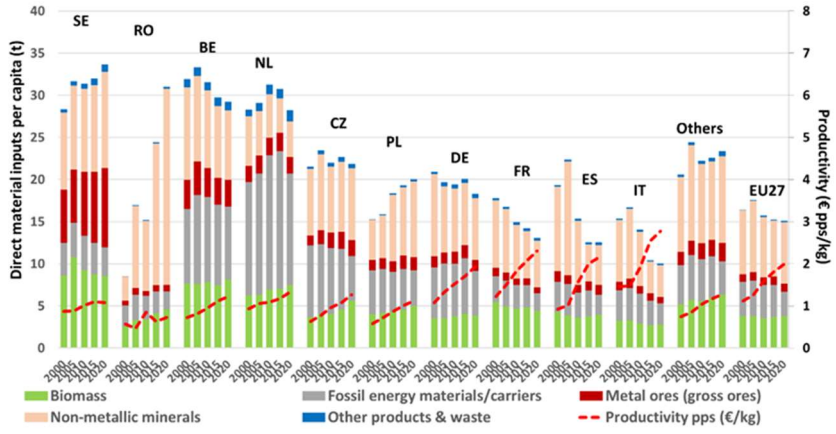
Among the biggest countries, the Italian industry has carbon intensities higher only than those of Sweden and Germany. For agriculture, the Italian carbon intensity in 2020 is among the lowest in Europe, after Greece and Sweden. The EU27 average is 74.6% higher than the Italian intensity. On the other hand, the civil sector (households and services) in Italy shows wide room for improvement with values higher than the EU27 average (+58.8% for services and +18.8% for households). The Italian civil sector therefore shows very wide emission reduction potentials, especially considering the sectoral electrification of final consumption in 2020 is much below the EU27 average (households: 18.6% *vs* 24.7%; services: 39.1% *vs* 47.9%).

Indicators of *direct material inputs (DMI)* and *domestic material consumption (DMC)* describe, in aggregate terms, the direct use and provenance of natural resources and products. The first indicator includes all materials which have an economic value and are used for production and consumption activities and the indicator is calculated as the sum of internal extractions and imports. The second indicator represents domestic consumption of matter in the national economy net of exports and is calculated by subtracting from direct material inputs the share of physical exports.

Since 2000, there has been an average decrease of DMC per capita in the European countries. In 2020 Italy has the lowest consumption per capita of matter among all EU27 countries. As far as productivity is concerned, there is a general increase since 2000, although the absolute values of

the countries are very different. Among the biggest countries, the Netherlands shows the highest value (4.6 €/kg in 2020), followed by Italy (3.6 €/kg). Germany and France productivities are 2.7 €/kg and 2.9 €/kg, respectively.

Direct material inputs represent domestic consumption without exports and it is useful for assessing actual material consumption, including that not used in domestic production and consumption activities and addressed to exports. Sweden and the Netherlands have high share of fossil extraction, biomass, and metal ores destined for exports and shows the highest DMI per capita among the biggest European countries, far above the European average. According also to this indicator, in 2020 Italy recorded the lowest value among all European countries.



As far as productivity is concerned, Romania in 2020 has the lowest value (0.7 €/kg) among the countries examined and one of the lowest in EU27. The productivity of the Netherlands for this indicator (1.4 €/kg) do not show high performance as for DMC. Italy has the highest productivity in Europe, with € 2.8 €/kg, followed by France (2.4 €/kg), Spain and Germany (both with 2 €/kg).

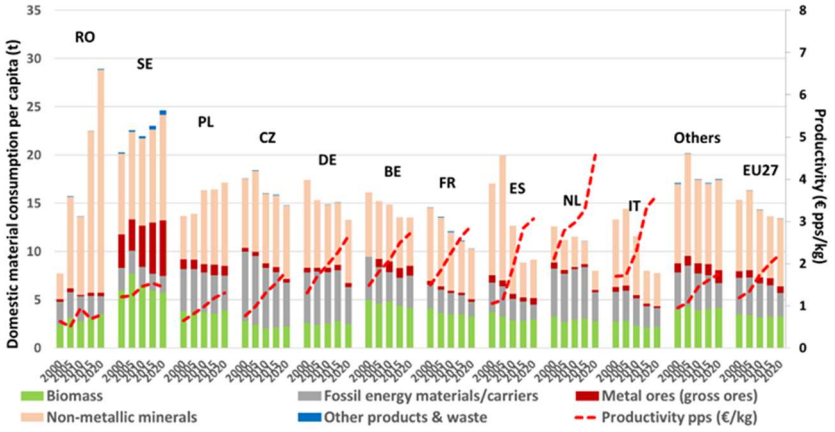
Although productivity provides information on the economic efficiency of a system as a whole, it is nevertheless necessary to consider that efficiency depends not only on maximizing the performance of the material used but also on structural factors. In this sense, the country's economy structure plays a decisive role as concerns the material consumption. A service-based economy will have lower material consumption than an economy based more on manufacturing industry. Industrial activities are more energy-intensive than service activities. This is true to a greater extent for the material consumption which is the subject of extraction and transformation of industrial activities.

The sectoral breakdown of domestic material consumption and direct material inputs shows that Italy, despite having a higher share of industrial value added than France and Spain, has a higher productivity of resources, a clear result of greater efficiency in the use of resources, especially in the industrial sector. This result is in line with what was seen for energy intensity indicators.

The trend of *kaya identity* parameters for EU27 show that the sharp reduction of GHG emissions since 2005 corresponds mainly to a decrease of driving factors such as final energy consumed per unit of GDP and share of renewable energy. The other factors (efficiency and carbon intensity) show lesser impacts, while the population and GDP per capita are the factors with increasing trend. Each country shows some degree of decoupling between GHG emissions and GDP per capita, although with a wide range and much differentiated role of driving factors. Higher decoupling is observed for those States with growing GDP per capita, such as Polonia and Romania.

Among the countries examined, Italy and Spain are the only States with 2020 GDP per capita below the level of 2005. Such factor contributes for its share to reduce of GHG emissions in the two States. In

the other States, there is evidence of a greater decoupling of economic growth and GHG emissions. Poland and Romania show the highest distance between the two parameters.



The decomposition analysis allows to quantify the contribution of each driving factor. The decomposition analysis shows that in Italy, the population and carbon intensity are the only factors that have contributed to the growth of GHG emissions: +2.4% and +0.7%, respectively. The remaining factors have led to the reduction of emissions. Among these, the final energy intensity (final energy consumption / GDP; -11.6%), the share of renewable energy (fossil energy consumption / gross inland energy consumption; -12.6%) played a significant role along with the GDP per capita (-10.5%) fall down in 2020 due to lockdown measures to contain SARS-CoV-2 pandemic. The contribution of all factors leads to the reduction of GHG emissions over the period 2005-2020 of -35.5%.

In summary higher decoupling between economy and GHG emissions has been registered in every country than that recorded in Italy and the reduction of economic activities played a role to decrease the emissions in Italy more relevant than in other countries. It should be considered that the Italian drastic GDP reduction in 2020 was due to the lockdown of economic activities and a more detailed decomposition analysis shows that the driving role of economy to reduce the GHG emissions is limited to the last year (ISPRA, 2022[b]).

The decoupling does not necessarily correspond to emission reductions in line with the targets to be achieved by 2020. According to EEA (2021), among the largest countries, France, Italy, the Netherlands, Spain, and Sweden had achieved their 2020 GHG reduction target from the Effort Sharing sectors, while Germany 2020 Effort Sharing emissions level (proxy EEA) do not reach the country's target; as for the renewable target, France do not meet the 2020 target; as for efficiency target Germany and Belgium, among the biggest countries, do not meet their final energy consumption targets in 2020 (proxy EEA). Moreover, it should be emphasized that the analysis of the decomposition focuses on the relative variations of the parameters without assigning any weight to the respective starting points. As already mentioned, the economic and energy efficiency of the Italian system is among the highest in Europe. *The 2018 International Energy Efficiency Scorecard,* issued by the *American Council for an Energy-Efficient Economy* (ACEEE), assigned the first position to Italy, together with Germany among 25 nations globally, with scores assigned according to quantitative and qualitative parameters, including efficiency indicators and policies aimed at reducing consumption. The last edition of the *International Energy Efficiency Scorecard*, issued by ACEEE on 1st April 2022, reported for Italy the drop of four ranks mainly due to buildings section, but Italy managed to rank within the top five, after France, UK, Germany, and the Netherlands.

Power sector

The power sector is one of the largest GHG emission sources in Europe. The sector's GHG emissions in 2005 in EU27 were around 33.6% of the energy emissions and about 26.4% of total emissions, both shares sharply decreasing to 26.3% and 19.8% in 2020, respectively. The power sector is therefore one of the main objectives of the measures aimed to decarbonize the economy, both for the amount of emissions and potential for deployment of renewable energy sources. The countries examined for comparison with Italy account for 83.2% of EU27 gross electricity production in 2020.

The installed capacity in 1990 consisted mainly of thermoelectric plants (54% in EU27), nuclear (21.8%) and hydroelectric (24%). Wind and photovoltaic sources had marginal shares. In 2020 the thermoelectric installed capacity was 40.5%, 11% nuclear, 15.7% hydroelectric, 18.4% wind, and 14.2% photovoltaic. The total installed capacity has increased by 42.1% in 2020 compared to 2005, from 676 GW to 960 GW. The nuclear capacity is the only one with a relevant reduction, from 123 GW to 106 GW (-10.7%).

There is considerable heterogeneity of power capacity among countries. In Poland, there is a clear prevalence of thermoelectric plants. The nuclear plants, which are not present in Italy and Poland, make up significant share of the capacity in France, Sweden, Belgium and Czechia, although the shares of other countries are not negligible. Since 1990, hydroelectric capacity has accounted for a considerable proportion of traditional renewable sources in Romania, Spain, France, Italy and Sweden. In all the countries examined, the share of thermoelectric and nuclear capacity shows a considerable reduction. Wind power has increased in all countries since 2005. Photovoltaic plants begun to have significant shares only after 2005.

Gross electricity production in Europe has shown a marked increase from 1990 to 2010, followed by stability up to 2019 and a sharp decrease in 2020 due to measures adopted to contain SARS-CoV-2 pandemic. In 2020, 12.7% of EU27 electricity production without pumping comes from solid fuels and 20.3% from natural gas. Oil and petroleum products account for 1.9%. Nuclear source accounts for 24.8% and 38.4% comes from renewable energy.

The energy mix in the examined countries is quite heterogeneous, mainly as far as fossil fuels are concerned. In 2020, solid fuels make up 68.3% of electricity production in Poland, 39.5% in Czechia, and 23.6% in Germany. Even more interestingly, 55.6% of EU27 electricity production from solid fuels originates from lignite. Germany, Poland, and Czechia are the main users of this fuel for electricity production and account collectively for 80.9% of the EU27's electricity production by lignite (46.4% Germany, 19.5% Poland, and 14.9% Czechia). Romania accounts for 4.7% and the group of smallest countries accounts collectively for the remaining 19.1% (mainly Bulgaria, Greece and Slovenia). The electricity produced from lignite in Germany, Poland and Czechia is 67.9%, 35.5%, and 93.8% of electricity from solid fuels respectively.

France has the highest electricity production from nuclear plants in Europe (67.1% in 2020), followed by Belgium (39%), Czechia (38.2%) and Sweden (30%), among the examined countries. In the other countries examined the nuclear electricity ranges from 11.4% in Germany to 22.4% in Spain, while the Netherlands have the lowest end share of electricity from nuclear source (3.3%). Poland and Italy do not have nuclear plants. At EU27 level, the nuclear source provides around a quarter of electricity production (24.8%).

The Netherlands and Italy have the highest share of electricity by natural gas in 2020, 58.8% and 48% respectively. Italy shows a massive conversion of its thermal power plants since 1990 with a sharp contraction of oil and petroleum products and the corresponding expansion of natural gas. Solid fuels show significant contractions in all countries although some countries as Germany, Poland, and Czechia still have relevant shares of such fuels.

As regards electricity production from renewable sources, the share in EU27 has increased from 13.4% to 38.4% since 1990 to 2020. In all the countries examined there is a marked increase of renewable electricity production with a strong acceleration since 2005. After 2015 the growth slowed down and has resumed in recent years although with different rates among the States. Sweden has one of the highest renewable shares in Europe. The Italian figure is higher than the European average and

Italy's renewable share of electricity is one of the highest among the biggest countries. Among such countries, apart from Sweden, Germany and Spain shares exceeded the Italian one only in 2019-2020 and the share of Romania has been always higher than the Italian value (Italy, 42%; Spain, 43.8%; Germany and Romania, 44.2%).

The renewable share for the achievement of the European 2020 targets, in accordance with the Directive 2009/28/EC, refers to gross inland consumption of electricity, i.e. electricity production without electricity from pumping plus the net import of electricity. For net importing countries, the share of renewable electricity consumption will therefore be lower than renewable electricity production. In other words, the electricity importing countries, such as Italy, face a relatively greater effort than exporting countries to achieve the renewable targets in the electricity sector.

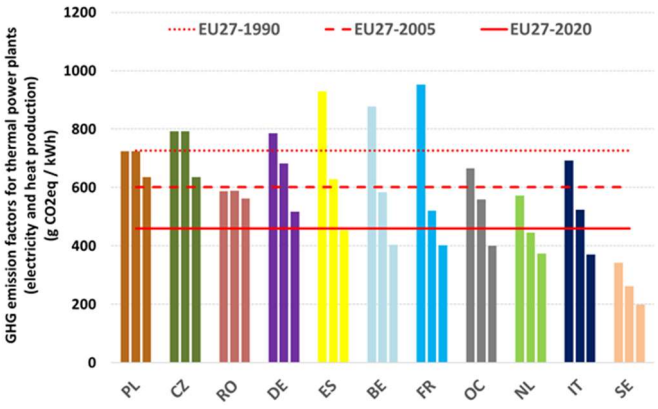
The most important parameter for assessing the efficiency of an electricity generation system is the transformation efficiency of fuels into electricity and heat. The electrical efficiency of Italian non-cogeneration plants (0.45 in 2020) is among the highest in the biggest European countries after Belgium (0.47) and the Netherlands (0.55). In 2020, the Italian average is over the EU27 average (0.43). As concerns the electrical efficiency of CHP plants, in 2020 Spain shows the highest value among the main European countries (0.64), far higher than the EU27 average (0.37). Italy's electrical efficiency is 0.39. The total efficiency, for electricity and heat production, of the Italian cogeneration plants (0.62) is below the EU27 average (0.64) and increased of 24.4% since 1990.

The Italian electrical efficiency for all power plants (CHP and electricity only) in 2020 is 0.41, exceeded by Spain, the Netherlands and Belgium, all with 0.49. Sweden has the lowest electrical efficiency among the examined countries (0.22), well below the EU27 average (0.40). The overall efficiency of Italian plants, for electricity and heat production, is 0.55, over the EU27 average (0.54). Sweden shows the highest value (0.79).

In order to compare the GHG emission factors for the electricity sector in different countries the Tier 1 approach has been adopted to estimate the GHG emissions. GHG emissions from the 27 European countries for the production of electricity and heat are 737.1 Mt CO_2eq in 2020, 41.4% lower than 1990 level and 41.8% lower than 2005 level. Since 2005 a significant reduction of GHG emissions in the electricity sector begun to take place. Overall, 2020 GHG emissions from power sector in the selected countries (616.2 Mt CO_2eq) account for 83.6% of EU27 sector's emissions and Italy's share is 12.1%.

Since 1990 there has been a decoupling between energy production and GHG emissions, although emissions show a significant decrease only after 2005, leading to the increase of the decoupling mainly due to the increasing share of renewables. Decoupling is evident in almost all European countries.

GHG emission factors for electricity and heat production due to fuel combustion in thermal power plants reduced since 1990. In 2020 the emission factor in Italy (371 g CO_2eq/kWh) is higher only than that of Sweden (198.7 g CO_2eq/kWh), where the thermal power plants are mainly fuelled by bioenergy. Belgium has the largest reduction since 2005 (-31%), followed by Italy (-29.2%). Germany reduced the emission factor by 24.1%. At the lowest end of reduction there are Romania (-4.6%), Poland (-12.2%), and the Netherlands (-16.1%).



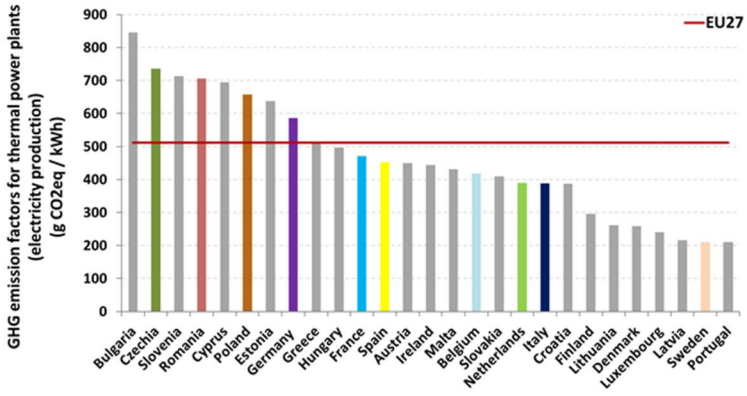
The emission factors for electricity and heat production by the whole electricity sector, including renewable and nuclear power production, in Italy are higher than the European average. The average EU27 emission factor in 2020 (231.4 g CO_2eq/kWh) shows a reduction of 37.6%, compared to the 2005 level, while the Italy reduced its emission factor (263.6 g CO_2eq/kWh) by 42.3%.

Countries with a significant share of electricity from nuclear power and renewable sources have a benefit in terms of GHG emissions. France has a relevant amount of energy from nuclear power plants, which allows the emission factor to be drastically reduced. Apart from Italy and Poland, even the other countries have significant shares of electricity from nuclear power (from 3.3% in the Netherlands to 39% in Belgium). Overall, nuclear electricity in EU27 was 24.8% in 2020, down from 32.3% in 1990. In 2020, 88.6% of EU27 nuclear electricity comes from the countries examined, with France accounting for 51.8%.

Considering only the electricity production the Italian emission factor by thermal plants in 2020 (388.1 g CO_2eq/kWh) is second only to that of Sweden (210.8 g CO_2eq/kWh), where the share of bioenergy in the thermoelectric plants is much higher. The Italian factor is well below the EU27 average of 512 g CO_2eq/kWh. Czechia, Romania, Poland, and Germany are the top four emission factors, from 735.6 g CO_2eq/kWh to 587 g CO_2eq/kWh, well above the European average.

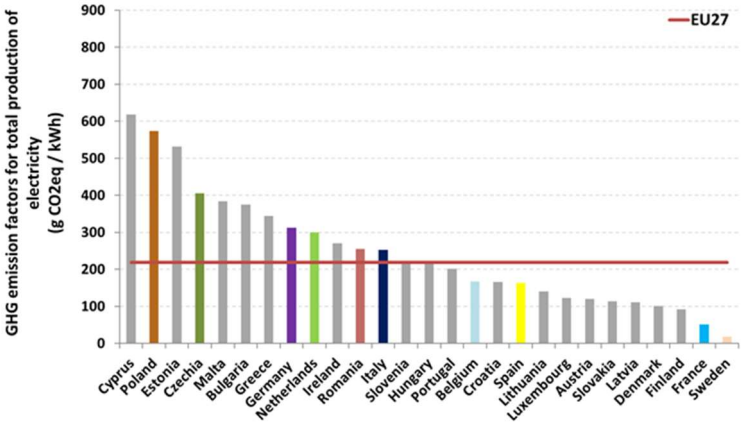
The average EU27 emission factors for total electricity generation have always been lower than the Italian ones, thanks also to the contribution of nuclear electricity. The increasing renewable share of electricity leads to a significant reduction of the emission factors. In addition, the reduction of nuclear electricity share in Europe brings the Italian emission factor closer to the EU27 average. The Italian emission factor in 2005 was greater than the EU27 average of 29.2%, while in 2020 it is greater than 15.5%.

The outcomes concerning the GHG emissions esteems allow to conclude that Italy have one of the lowest GHG emission factor for electricity and heat production by fuel mix combustion among the biggest European countries. The comparison between the share of power sector emissions and the share of electricity production from fuel combustion shows that Germany and Poland have shares for GHG emissions higher than their shares of electricity production. The same pattern is true for Czechia, Romania, and Sweden, while the opposite pattern is observed for all other countries.



Considering all 27 Member States, the Italian GHG emission factor for electricity production by thermal plants occupies the 9th position, well below the European average. The Italian fuels mix, with greater share of natural gas than in other countries and the contribution of bioenergy, is a driving factor for the emission factor in thermal power plants.

As for total electricity production, therefore considering the contribution of renewables other than bioenergy and the contribution of nuclear power plants, the Italian emission factor loses positions compared to other countries. Countries with nuclear power plants have a benefit in terms of avoided GHG emissions. The renewable share in Italy for the gross electricity production in 2020 is comparable with shares of Spain, which nevertheless have a significant share of nuclear energy. On the other hand, France and Belgium electricity renewable shares are much lower than the Italian one but have relevant amount of nuclear energy. The nuclear electricity plays a decisive role for the correct interpretation of the emission factors in Spain, Belgium, and France. The effect of nuclear energy is



particularly evident for France: although the renewable share of electricity production is almost half than the Italian one and the emission factor by thermal plants in higher, France has the lowest emission factor for total electricity production in Europe, second only to that recorded for Sweden. Germany has 11.4% of nuclear electricity and 44.2% of renewable electricity but the relevant presence of solid fuels in the fossil mix (23.6% of electricity production), mainly high-carbon content fuel as lignite, results into a higher emission factor than the Italian one.

As a result of many factors (fuel mix shift, efficiency, share of renewable) Italy reduced the emission factor for electricity and heat production by 54.4% from 1990 to 2020 (-42.3% since 2005), against a reduction of 47.4% in Germany (35.6% since 2005) and 20.2% in Poland (19.7% since 2005). The reduction rate in Poland is the lowest among the biggest emitters in Europe. If Germany and Poland had reduced their GHG emission factors since 1990 at the same rate of Italy, it would have led (with the same electricity and heat production) to avoid around 78 Mt CO_2eq in 2020, about 11% of EU27 emissions from power plants. The power plants in Germany and Poland are still fuelled by significant shares of high-carbon content solid fuels, such as lignite, and the transition to natural gas has been much slower than in Italy.

Heat-only producers

Heat production accounts for a significant share of energy transformation processes. Plants dedicated to heat production for district heating and other uses (mainly for industry) consume an important share of the energy in the European balance. was 16.3 Mtoe of which 0.64 Mtoe from geothermal and solar thermal, and 0.26 Mtoe from heat pumps. The energy consumption of fuels was 15.4 Mtoe, of which 5.1 Mtoe from bioenergy. Bioenergy consumption shows a rapidly growing share: the consumption in 2020 almost doubled the 2005 level and is around 7 times the consumption in 1990.

Total energy consumption in 2020 is much less than that recorded in 1990 and a marked fuel shift has occurred with decrease of solid fuels and, to a greater extent, of oil and petroleum products being replaced by natural gas and bioenergy. The contribution of other renewable sources (more than 90% from geothermal energy and the rest from solar thermal in 2020) and heat pumps recorded a constant increase up to represent 5.6% of total consumption in 2020.

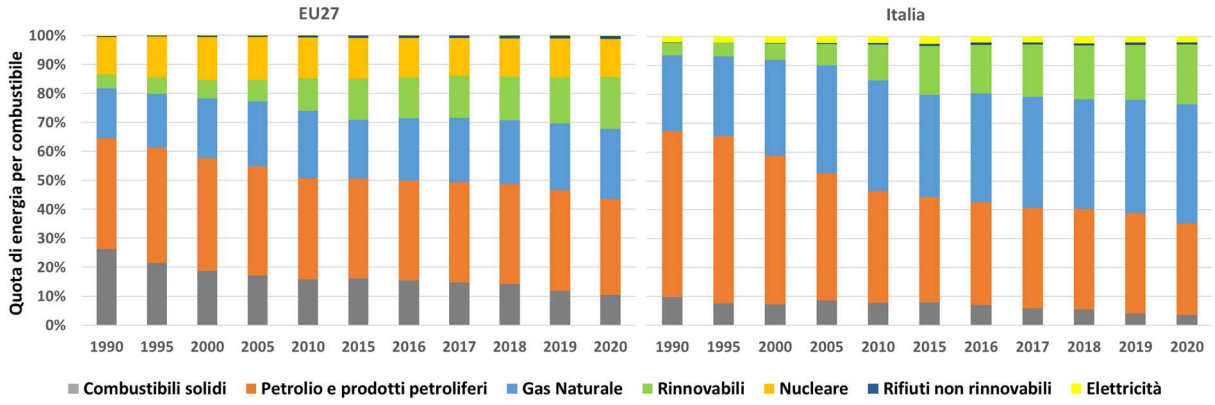
As a result of such fuel shift and decreasing energy consumed (-36.7%) and heat production (-28.1%), GHG emissions registered a sharp decrease by 56.8% since 1990. GHG emission factor decreased by 40%. At EU27 level the GHG emissions from these plants were 37.6 Mt CO_2eq in 2020. Since 2005 the emission factors decreased by 18.3% in EU27 (from 281.8 to 230.1 g CO_2eq / kWh). Italy's emission factor in 2020 is 18.5% lower than the EU27 average. The relevant solid fuels or non-renewable waste consumption in Poland and Germany results in higher emission factors, respectively 95.7% and 46.6% higher than the Italian one.

SOMMARIO (Italiano)

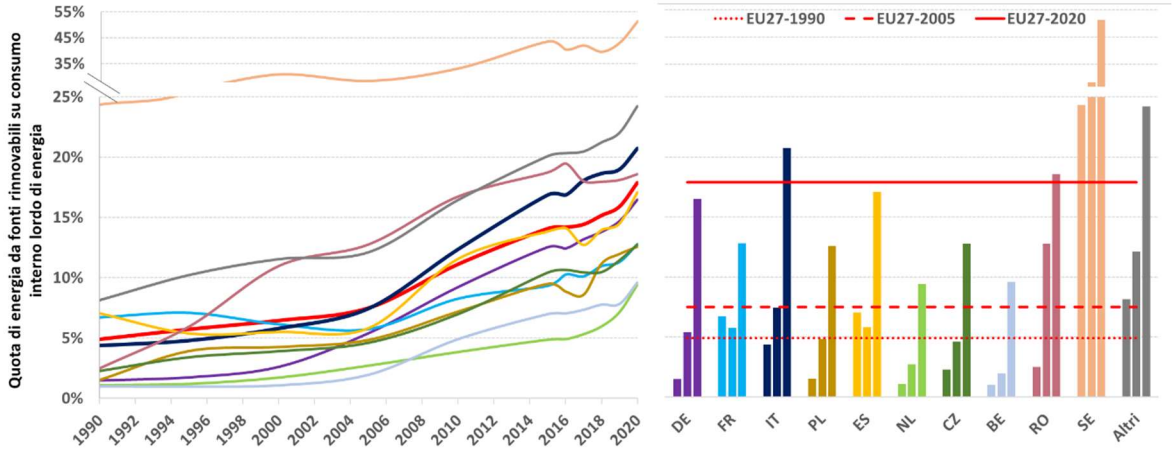
Indicatori di efficienza e decarbonizzazione

Il rapporto esamina gli indicatori di decarbonizzazione ed efficienza in Italia e nei maggiori paesi Europei selezionando gli Stati membri dell'UE27 con oltre il 3% delle emissioni di gas a effetto serra o più del 3% del PIL nel 2020. Gli Stati membri esaminati (Germania, Francia, Italia, Spagna, Polonia, Paesi Bassi, Belgio, Romania e Svezia) rappresentano nel 2020 l' 81,5% della popolazione nell'UE27, 81,7% delle emissioni di gas serra e 83,1% del PIL. Il consumo interno lordo di energia rappresenta l' 82,5% del consumo energetico dell'UE27.

Le politiche ambientali Europee hanno determinato un cambiamento significativo del mix energetico negli Stati membri fin dal 1990. In UE27 l'energia nucleare rappresenta il 13,1% del consumo interno lordo nel 2020, abbastanza stabile dal 1990 (12,9%). D'altra parte il consumo di energia da combustibili solidi subisce una riduzione significativa dal 1990. La quota in UE27 è scesa da 26,3% a 10,5% dal 1990 al 2020, anche se restano ancora quote significative in alcuni dei maggiori Stati come Germania (15,7%), Polonia (39,7%) e Cechia (30,7%). Il petrolio e i prodotti petroliferi, invece, mostrano una modesta riduzione a livello Europeo (dal 38,3% del 1990 al 32,9% del 2020) con tendenze diverse tra gli Stati. Il consumo di energia da gas naturale mostra un notevole aumento in quasi tutti gli Stati e a livello di UE27 passa da 17,1% nel 1990 a 24,4% nel 2020. Per quanto riguarda le energie rinnovabili, si registra un aumento significativo del consumo interno lordo in UE27 da 4,9% nel 1990 a 17,9% nel 2020.



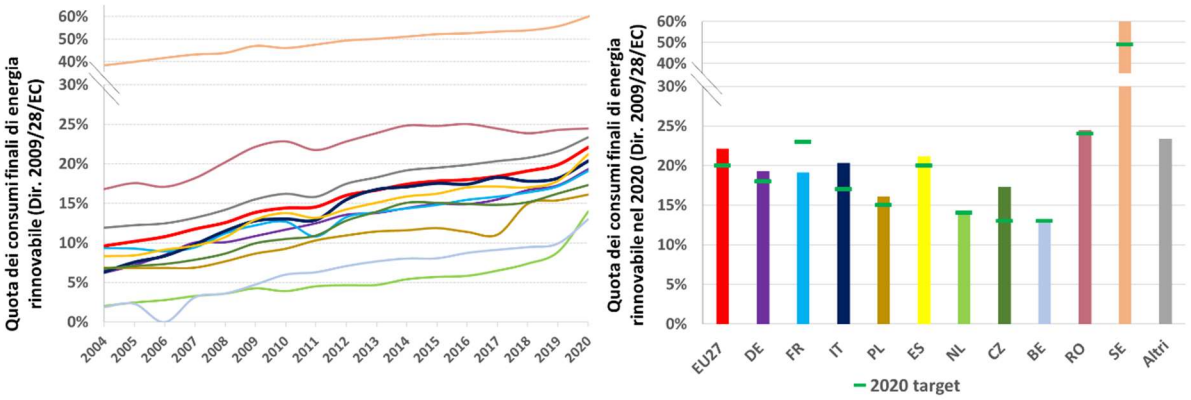
La quota italiana del consumo interno lordo di combustibili solidi, principalmente carbone, è scesa da 9,9% nel 1990 a 3,6% nel 2020, con un'accelerazione negli ultimi anni. La quota di gas naturale passa da 26,3% a 41,2% e la quota di petrolio e prodotti petroliferi passa da 57,3% al 31,7%. La quota italiana di rinnovabili è cresciuta dal 4,4% al 19%, la quota UE28 è cresciuta dal 4,3% al 15,4%. La quota di



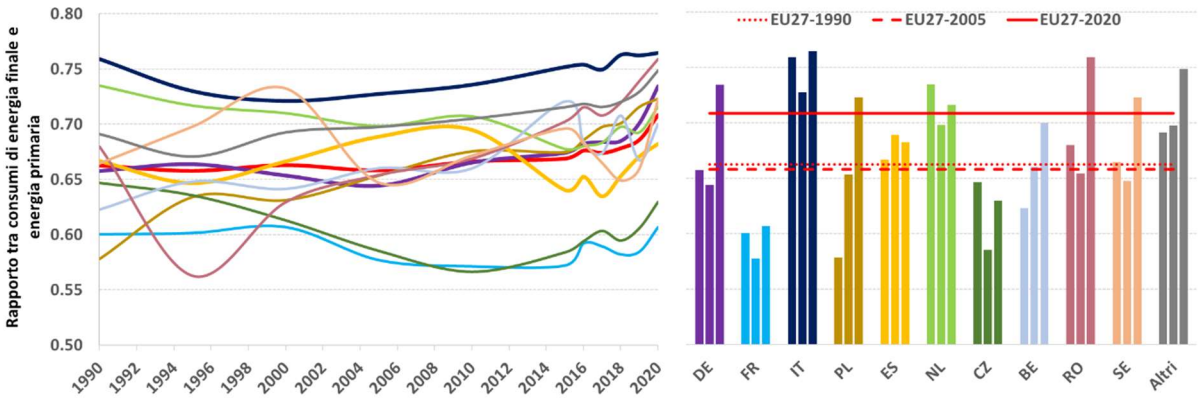
energia rinnovabile in Italia nel 2020 è tra le più alte nei paesi esaminati; solo la Svezia ha una quota maggiore. La quota di combustibili fossili è significativamente diminuita in quasi tutti i paesi Europei.

La media dell'UE27 è scesa da 82% nel 1990 a 68,9% nel 2020. Tra i paesi esaminati, i Paesi Bassi e la Polonia hanno una quota superiore all' 85% nel 2020.

La quota del consumo di energia rinnovabile ai sensi della Direttiva Europea 2009/28/CE nel 2020 per l'Italia è del 20,4%, rispetto all'obiettivo del 17% da raggiungere nel 2020. Tra i paesi esaminati solo la Francia non ha raggiunto il suo obiettivo.

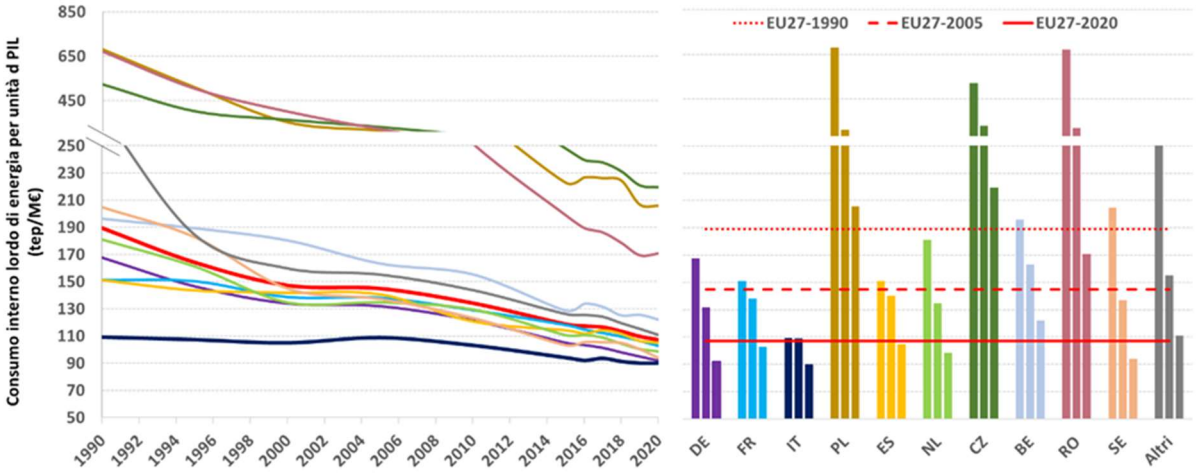


Il rapporto tra il consumo finale di energia (compresi gli usi non energetici) e il consumo interno lordo è un indicatore dell'efficienza energetica. Questo indicatore è sempre stato più elevato per l'Italia che per la media Europea e mostra valori che, tra i paesi più grandi, sono comparabili solo con quelli dei Paesi Bassi. Dal 1990 l'indicatore per l'Italia è stato intorno alla media di 0,76. Per l'UE27 la media è di 0,69. Per valutare l'efficienza della trasformazione energetica, è utile considerare il consumo



energetico senza usi non energetici. In altre parole, il rapporto tra consumo finale di energia e consumi di energia primaria. L'efficienza della trasformazione energetica italiana è superiore a quella dei paesi esaminati.

Il consumo interno lordo di energia per unità di prodotto interno lordo è un indicatore dell'efficienza economica ed energetica (intensità energetica) del paese. L'Italia è stata tra i paesi Europei con minore intensità energetica fino al 1995, quando era indietro solo alla Danimarca, per poi perdere posizioni fino al 5° posto nel 2020. Tra i maggiori paesi di UE27, l'Italia continua ad avere la più bassa intensità energetica seguita dalla Germania.

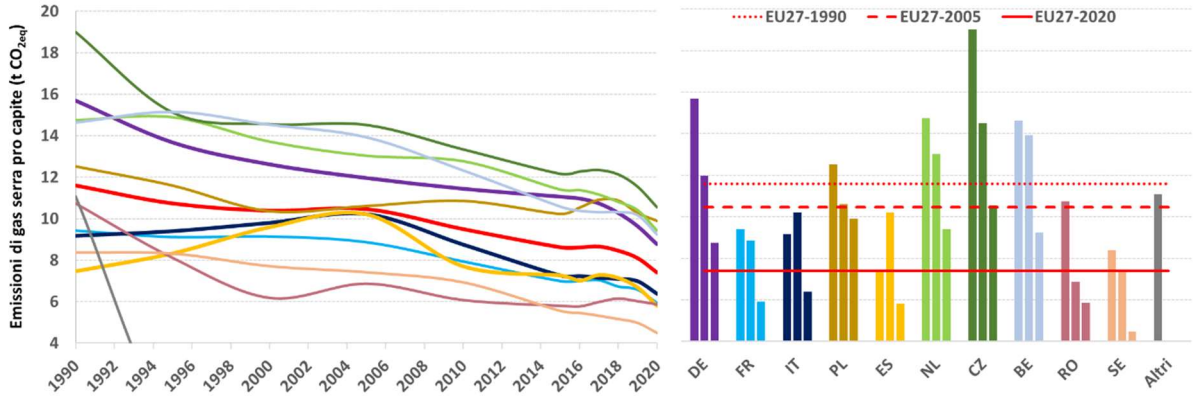


L'intensità energetica finale (rapporto tra consumi energetici finali compresi gli usi non energetici e il prodotto interno lordo) segue tendenze simili all'intensità energetica con una sensibile riduzione nei paesi Europei che, partendo da livelli superiori all'Italia, raggiungono i valori italiani e in alcuni casi li superano. Dal 1990 l'Italia mostra una notevole efficienza energetica ed economica con una riduzione del 17,7% dell'intensità energetica finale dal 1990 al 2020. Negli altri paesi Europei si sono verificate riduzioni molto più elevate: 37,8% in UE27. Le ragioni della riduzione dell'intensità energetica osservata sono molteplici, quali l'aumento dell'efficienza edilizia e nell'industria, l'elettrificazione dei consumi finali e lo spostamento dell'economia verso attività ad alto valore aggiunto e a basso consumo energetico dei servizi a scapito dei settori industriali.

I paesi Europei mostrano un ampio intervallo elettrificazione del consumo finale di energia (solo usi energetici) e nel 2020 vanno da 14,8% della Lettonia a 40,5% di Malta. L'Italia è appena al di sotto della media UE27: 23% vs 23,2%. Tra i paesi più grandi, Svezia, Francia e Spagna hanno livelli di elettrificazione più alti dell'Italia, rispettivamente 33,7%, 26,6% e 26,1%. All'estremo inferiore ci sono Romania e Polonia con 16,1% e 16,8% rispettivamente.

A livello settoriale, l'elettrificazione dei consumi finali degli Stati membri presenta cifre abbastanza diverse, sebbene con una tendenza comune alla crescita. L'elettrificazione dei consumi finali dell'industria in Italia è tra le più alte d'Europa (42,3% nel 2020). I servizi mostrano le percentuali più elevate di elettrificazione del consumo finale di energia tra i settori. La quota italiana nel 2020 è 39,1%, ben al di sotto della media UE27 (47,9%), analogamente alla quota di elettrificazione nel settore residenziale (18,1% in Italia e 24,7% in UE27). Il settore dei trasporti ha le percentuali più basse di elettrificazione e l'Italia è uno dei tre paesi Europei con la quota più alta (3%), dopo la Svezia (3,6%) e Austria (3,4%).

La media nazionale delle emissioni pro capite di gas serra dal 1990 al 2019 è 8,9±1,1 t CO_2eq (ISPRA, 2022[a]). Le emissioni pro capite sono aumentate fino al 2004, quando è stato raggiunto il valore massimo di10,3 t CO_2eq. Successivamente le emissioni si sono ridotte fino a 6.4 t di CO_2eq nel 2020. Le emissioni pro capite in Italia sono sempre state inferiori alla media Europea.



Per quanto riguarda l'intensità di carbonio legata al consumo energetico, tutti i paesi hanno ridotto le emissioni di gas serra per unità di consumo interno lordo di energia. L'intensità di carbonio dell'Italia è superiore alla media Europea, anche per il contributo dell'energia nucleare in Europa. Eliminando l'energia nucleare dal consumo interno lordo, le cifre dell'Italia sono inferiori alla media Europea. Tra i paesi esaminati solo Belgio, Paesi Bassi e Svezia hanno valori inferiori a quelli italiani.

Il rapporto tra emissioni di gas serra e prodotto interno lordo è l'intensità di carbonio legata all'economia. Questo indicatore mostra una riduzione per tutti i paesi Europei e i valori nazionali sono appena al di sotto della media UE27 nel 2020. L'andamento di indicatori quali le emissioni pro capite di gas serra, l'intensità energetica e l'intensità di carbonio dell'economia mostrano che i paesi più grandi si stanno gradualmente avvicinando ai valori italiani e in alcuni casi tali valori sono stati superati.

Gli indicatori mostrano che l'Italia, rispetto ai maggiori Stati membri dell'UE, ha storicamente un'elevata efficienza energetica ed economica con una quota significativa di energia rinnovabile e gas naturale nel mix energetico e una delle emissioni pro capite più basse d'Europa. L'intensità energetica per unità di PIL in Italia è maggiore solo a quelle dell'Irlanda, Danimarca, Malta e Lussemburgo, mentre l'intensità di carbonio per unità di PIL è inferiore a quella di UE27 e superiore a quelle di Francia e Svezia, tra i principali paesi. L'intensità di carbonio per unità di energia consumata senza l'energia nucleare è, tra i principali paesi, superiore solo a quelle di Belgio, Paesi Bassi e Svezia e paragonabile a quella della Germania. Sebbene alcuni indicatori mostrino che molti paesi hanno migliorato le loro prestazioni in termini di emissioni di gas serra, talvolta ottenendo risultati migliori dell'Italia, è necessario considerare i seguenti fattori:

- paesi con elevate quote di combustibili solidi o petroliferi hanno un maggior potenziale di riduzione delle emissioni da combustibili fossili rispetto a quelle disponibili in Italia, dove il mix fossile è rappresentato principalmente dal gas naturale e l'ulteriore riduzione delle emissioni è possibile aumentando la quota di energia rinnovabile e l'efficienza;
- in diversi paesi vi è un contributo significativo dell'energia nucleare con vantaggi emissivi, una fonte di energia che non è priva di controversie e che alcuni paesi intendono eliminare gradualmente (Germania, Belgio), sebbene la recente guerra Russo-Ucraina scoppiata nel febbraio 2022 ha determinato la revisione dei programmi di disattivazione degli inpianti nucleari;
- le emissioni di un paese dipendono strettamente dalla struttura economica. I paesi con una predominanza di attività produttive nel settore dei servizi o con quote significative di consumo non energetico, come i Paesi Bassi, mostrano minori emissioni per unità di PIL e di energia consumata.

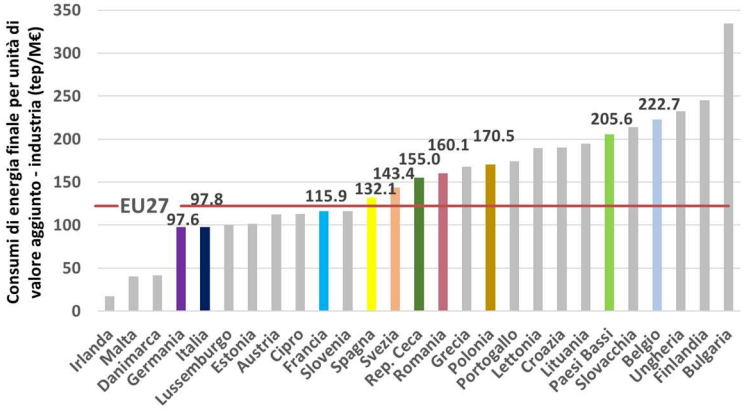
I maggiori paesi Europei hanno contributi emissivi molto diversi dai bunker internazionali. Le emissioni di questi settori sono rilevanti in alcuni paesi e la quota media per UE27 nel 2020 è del 5,1% delle emissioni con i bunker internazionali e per i paesi considerati varia da 0,2% in Romania a 21,3% nei Paesi Bassi.

L'energia lorda disponibile, che comprende il contributo dei bunker internazionali, per unità di PIL evidenzia il diverso ruolo dei consumi energetici dei bunker internazionali e mostra che i valori dell'Italia sono stati i più bassi tra i paesi UE27 più grandi. Per quanto riguarda le emissioni di gas serra per

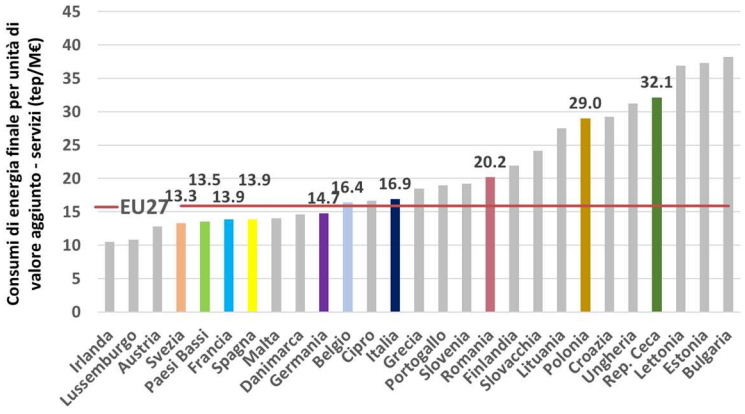
unità di energia lorda disponibile, il contributo dell'energia nucleare sembra essere decisivo. Le emissioni energetiche per unità di energia primaria lorda disponibile senza energia nucleare mostrano che i dati dell'Italia sono inferiori ai valori registrati per gli altri paesi, ad eccezione della Svezia.

Il confronto degli indicatori di efficienza e decarbonizzazione a livello settoriale mostra una situazione piuttosto eterogenea tra gli Stati membri. Per quanto riguarda l'industria in Italia, l'intensità energetica finale, il consumo finale di energia per unità di valore aggiunto, è paragonabile a quella della Germania dal 2005. Tra i paesi Europei, solo Irlanda, Danimarca e Malta hanno valori inferiori a quelli di Italia e Germania. Tra i paesi esaminati i Paesi Bassi e Belgio mostrano le più alta intensità energetica per l'industria.

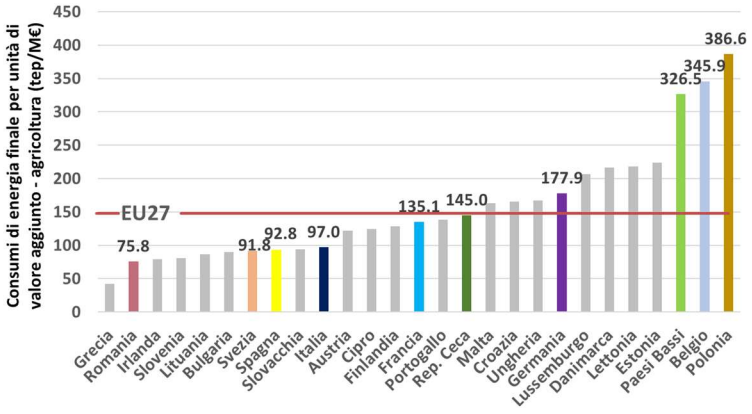
Nel settore dei servizi l'Italia mostra negli ultimi anni una controtendenza per l'intensità energetica rispetto a quella di altri paesi Europei. In particolare, negli ultimi anni, la contabilità dell'energia consumata dalle pompe di calore dal 2017 ha aumentato l'intensità energetica del settore. Il tasso medio annuo di intensità energetica dal 2005 al 2020 mostra un incremento dello 0,8% per l'Italia a fronte di una diminuzione del -1,6% nella media Europea.



Il settore dell'agricoltura mostra una diminuzione generale dell'intensità energetica con un tasso medio annuo di -0,7% dal 2005 nell'UE27. L'intensità energetica italiana del settore nel 2020 è più elevata di quelle registrate per Romania, Spagna e Svezia, tra i principali paesi.

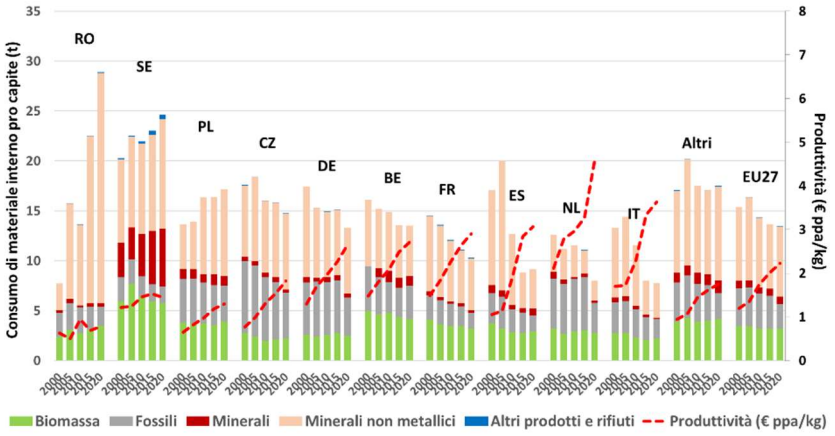


Nel settore residenziale, dal 2005 i paesi esaminati mostrano riduzioni dei consumi energetici per unità di PIL più elevate rispetto all'Italia (da -0,5% annuo in Spagna a -3,2% annuo in Polonia), mentre l'indicatore nazionale non mostra significative variazioni. I valori e le tendenze dell'intensità energetica italiana per i trasporti sono sostanzialmente paragonabili a quelli della media Europea con una diminuzione media annua del -1,9% dal 2005.



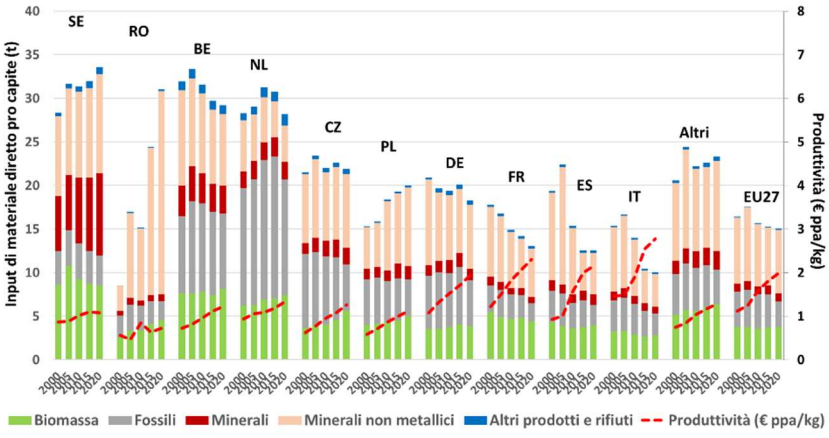
Tra i paesi più grandi, l'intensità di carbonio dell'industria italiana è maggiore di quelle svedese e tedesca. Per l'agricoltura, l'intensità di carbonio italiana è tra le più basse d'Europa, dopo Grecia e Svezia. La media UE27 è maggiore dell'intensità italiana del 74,6%. D'altra parte, il settore civile (residenziale e servizi) in Italia mostra ampi margini di miglioramento con valori della media europea (+58,8% per servizi e +18,8% for residenziale). Il settore civile italiano mostra quindi un ampio potenziale di riduzione delle emissioni, soprattutto considerando l'elettrificazione dei consumi finali del settore che nel 2020 più basso della media UE27 (residenziale: 18,6% *vs* 24,7%; servizi: 39,1% *vs* 47,9%).

Gli indicatori *input di materiale diretto (IMD)* e *consumo di materiale interno (CMI)* descrivono, in termini aggregati, l'utilizzo diretto e la provenienza di risorse naturali e di prodotti. Il primo indicatore include tutti i materiali che hanno un valore economico e che sono utilizzati nelle attività di produzione e consumo ed è calcolato come la somma delle estrazioni interne e delle importazioni. Il secondo indicatore rappresenta il consumo interno di materia nell'economia nazionale al netto delle esportazioni ed è calcolata sottraendo all'Input di materiale diretto la quota di esportazioni fisiche.



Dal 2000 si registra una generale diminuzione del consumo di materiale interno pro capite nei paesi Europei. Nel 2020 l'Italia ha il più basso consumo pro capite tra tutti i paesi Europei. Per quanto riguarda la produttività a parità di potere di acquisto, vi è un aumento dal 2000 al 2020, sebbene i valori assoluti dei paesi siano molto diversi. Tra i paesi più grandi, i Paesi Bassi mostrano il valore più alto (€ 4,6/kg nel 2020), seguito dall'Italia (€ 3,6/kg). Le produttività di Germania e Francia sono rispettivamente di € 2,6/kg e € 2,9/kg.

L'input di materiale diretto rappresenta il consumo interno senza esportazioni ed è utile per valutare il consumo effettivo di materiale, compreso quello non utilizzato nelle attività di produzione e consumo interno e destinato alle esportazioni. La Svezia e i Paesi Bassi hanno un'alta quota di estrazione fossile, biomassa e minerali metallici destinati alle esportazioni e mostrano il CMI pro capite più elevato tra i maggiori paesi Europei, molto al di sopra della media Europea. Secondo questo indicatore, nel 2019 l'Italia ha registrato il valore più basso tra tutti i paesi Europei.



Per quanto riguarda la produttività a parità di potere di acquisto, la Romania nel 2020 ha il valore più basso (0,7 €/kg) tra i paesi esaminati e uno dei più bassi d'Europa. La produttività dei Paesi Bassi per questo indicatore (1,4 €/kg) non ha le elevate performance registrate per il consumo di materiale interno. L'Italia ha la più alta produttività in Europa (2,8 €/kg), seguita da Francia (2,4 €/kg), Spagna e Germania (entrambe con 2 €/kg).

Sebbene la produttività fornisca informazioni sull'efficienza economica di un sistema nel suo insieme, è tuttavia necessario considerare che l'efficienza dipende non solo dalla massimizzazione delle prestazioni del materiale utilizzato, ma anche da fattori strutturali. In questo senso, la struttura produttiva di un paese svolge un ruolo decisivo per quanto riguarda il consumo di materia e energia. Un'economia basata sui servizi avrà un consumo di materiali inferiore rispetto a un'economia basata più sull'industria manifatturiera. Le attività industriali sono ad alta intensità energetica rispetto alle attività di servizio. Ciò vale in misura maggiore per il consumo di materiale che è oggetto di estrazione e trasformazione delle attività industriali.

La ripartizione settoriale del consumo di CMI e IMD mostra che l'Italia, pur avendo una quota di valore aggiunto industriale superiore a quella della Francia e della Spagna, ha una maggiore

produttività quale risultato di una maggiore efficienza nell'uso delle risorse, soprattutto nel settore industriale. Questo risultato è in linea con quanto osservato per gli indicatori di intensità energetica.

L'andamento dei parametri utilizzati per la *Kaya identity* per l'UE27 mostra che la forte riduzione delle emissioni di gas serra dal 2005 corrisponde principalmente a una diminuzione dei fattori trainanti come l'energia finale consumata per unità di PIL e la quota di energia rinnovabile consumata. Gli altri fattori (efficienza e intensità di carbonio) mostrano minori diminuzioni, mentre la popolazione e il PIL pro capite sono i fattori con una tendenza all'aumento. Ogni paese mostra un certo grado di disaccoppiamento tra le emissioni di gas serra e il PIL pro capite, sebbene si registri un'ampia varietà tra i paesi Europei e un ruolo molto differenziato dei fattori determinanti. Un disaccoppiamento più elevato si osserva per gli Stati in cui il PIL pro capite ha un andamento crescente.

Tra i paesi esaminati, Italia e Spagna sono i soli Stati in cui il PIL pro capite del 2020 è inferiore al livello del 2005. Tale fattore in Italia contribuisce per la sua quota alla riduzione delle emissioni di gas serra. Negli altri Stati si registra un maggiore disaccoppiamento della crescita economica e delle emissioni di gas serra. Polonia e Romania mostrano le distanze maggiori tra i due parametri.

L'analisi di decomposizione permette di quantificare il contributo di ogni fattore determinante per la variazione delle emissioni di gas serra. L'analisi mostra che in Italia la popolazione e l'intensità di carbonio sono i fattori che hanno contribuito alla crescita delle emissioni di gas serra: +2,4% e +0,7% rispettivamente. I restanti fattori hanno portato alla riduzione delle emissioni. Tra questi, l'intensità energetica finale (consumi energetici finali/PIL; -11,6%) e la quota di energia rinnovabile (consumo di energia fossile / consumo lordo di energia interna; -12,6%) hanno svolto un ruolo significativo insieme al PIL pro capite (-10,5%) che nel 2020 si è sensibilmente contratto in seguito alle misure di *lockdown* delle attività economiche adottate per contenere la pandemia SARS-CoV-2. Il contributo di tutti i fattori ha determinato la riduzione delle emissioni di gas serra nel periodo 2005-2020 del -35.5%.

In sintesi, in tutti i paesi è stato registrato un maggiore disaccoppiamento tra economia ed emissioni di gas serra rispetto a quello registrato in Italia e la riduzione delle attività economiche ha svolto un ruolo non trascurabile nella riduzione delle emissioni in Italia. La contrazione economica è particolarmente rilevante nel 2020 in seguito alle misure di *lockdown* messe in atto per contrastare la diffusione della pandemia di SARS-CoV-2. L'analisi della decomposizione più dettagliata (ISPRA, 2022[b]) mostra che il ruolo chiave dell'economia per la riduzione delle emissioni è limitato all'ultimo anno.

Il disaccoppiamento non corrisponde necessariamente a una riduzione delle emissioni in linea con gli obiettivi da raggiungere entro il 2020. Secondo EEA (2021), tra i principali Stati membri, Francia, Italia, Paesi Bassi, Spagna e Svezia hanno raggiunto i loro obiettivi di riduzione delle emissioni di gas serra dai settori *Effort Sharing*, mentre secondo le stime preliminari elaborate da EEA la Germania non avrebbe raggiunto il suo obiettivo per il 2020; in merito alle risorse rinnovabili la Francia non ha raggiunto l'obiettivo; per quanto riguarda gli obiettivi di riduzione dei consumi energetici Germania e Belgio, tra i principali paesi, non hanno sufficientemente ridotto i consumi di energia finale nel 2020 (proxy EEA). Inoltre, va sottolineato che l'analisi della decomposizione si concentra sulle variazioni relative dei parametri senza assegnare alcun peso ai punti di partenza degli stessi. Come già accennato, l'efficienza economica ed energetica del sistema italiano è tra le più alte d'Europa. Il rapporto *The 2018 International Energy Efficiency Scorecard, pubblicato* dall'*American Council for an Energy-Efficient Economy* (ACEEE), assegna la prima posizione all'Italia, insieme alla Germania tra 25 nazioni a livello globale, con punteggi assegnati in base a parametri quantitativi e qualitativi, inclusi indicatori di efficienza e politiche volte a ridurre i consumi. Nell'ultima edizione del rapporto ACEEE, pubblicata ad aprile 2022, l'Italia ha perso quattro posizioni soprattutto a causa del settore edilizio ma resta al quinto posto della classifica dopo Francia, Regno Unito, Germania e Paesi Bassi.

Settore elettrico

Il settore della produzione di energia elettrica e calore è una delle maggiori fonti di emissioni di gas a effetto serra in Europa. Le emissioni del settore nel 2005 nell'UE27 sono state circa il 33,6% delle emissioni energetiche e circa il 26,4% delle emissioni totali, con quote in forte diminuzione, rispettivamente al 26,3% e al 19,8% nel 2020. Il settore elettrico è quindi uno dei principali destinatari delle misure di decarbonizzazione dell'economia, sia per la quantità di emissioni che per il potenziale di utilizzo delle fonti rinnovabili. I paesi esaminati per il confronto con l'Italia rappresentano l'83,2% della produzione lorda di energia elettrica nel 2020 in UE27.

Nel 1990 la capacità installata in EU27 era costituita principalmente da centrali termoelettriche (54%), nucleari (21,8%), idroelettrico (24%). Le fonti eolica e fotovoltaica costituivano quote marginali. Nel 2020 la capacità installata è stata del 40,5% termoelettrico, 11% nucleare, 15,7% idroelettrico, 18,4% eolico e 14,2% fotovoltaico. La capacità installata totale è aumentata del 42,1% dal 2005 al 2020, da 676 GW a 960 GW. L'unica fonte con che si riduce sensibilmente è quella nucleare, da 123 GW a 106 GW (-10,7%).

Si registra una notevole eterogeneità nella capacità installata tra i paesi. In Polonia, vi è una chiara prevalenza di centrali termoelettriche. La fonte nucleare, non presente in Italia e Polonia, rappresenta una quota significativa della capacità in Francia, Svezia, Belgio e Cechia, anche se le quote di altri paesi non sono trascurabili. Dal 1990, la capacità idroelettrica ha rappresentato una parte considerevole delle fonti rinnovabili tradizionali in Romania, Spagna, Francia, Italia e Svezia. In tutti i paesi esaminati, la quota della capacità termoelettrica e nucleare mostra una notevole contrazione. L'energia eolica è aumentata in tutti i paesi dal 2005. Gli impianti fotovoltaici hanno iniziato ad avere quote significative solo dopo il 2005.

La produzione lorda di elettricità in Europa ha registrato un netto aumento dal 1990 al 2010, una relativa stabilità fino al 2019 e una riduzione nel 2020 in seguito alle misure adottate per contenere la pandemia SARS-CoV-2. Nel 2020, i combustibili solidi producono il 12,7% dell'elettricità dell'UE27 senza pompaggio, mentre la quota prodotta da gas naturale è 20,3%. Il petrolio e i prodotti petroliferi rappresentano il 1,9%. La fonte nucleare rappresenta 24,8% e il 38,4% proviene da energia rinnovabile.

Il mix energetico nei paesi esaminati è piuttosto eterogeneo, soprattutto per quanto riguarda i combustibili fossili. Nel 2020, i combustibili solidi rappresentano il 68,3% della produzione di elettricità in Polonia, il 39,5% in Cechia e il 23,6% in Germania. Ancora più interessante è che il 55,6% della produzione di elettricità da combustibili solidi in UE27 proviene dalla lignite. Germania, Polonia e Cechia sono i principali utilizzatori questo combustibile per la produzione di elettricità e rappresentano insieme l'80,9% della produzione di elettricità da lignite nell'UE27 (46,4% Germania, 19,5% Polonia e 14,9% Cechia). La Romania rappresenta il 4,7% e il gruppo di paesi più piccoli rappresenta il restante 19,1% (principalmente in Bulgaria, Grecia e Slovenia). L'elettricità prodotta da lignite in Germania, Polonia e Cechia è rispettivamente del 67,9%, del 35,5% e del 93,8% dell'elettricità prodotta da combustibili solidi.

In Francia si registra la più alta quota in Europa di elettricità da fonte nucleare (67,1 nel 2020), seguita da Belgio (39%), Cechia (38,2%) e Svezia (30%), tra i paesi esaminati. Negli altri paesi considerati la quota varia da 11,4% in Germania a 22,4% in Spagna, mentre i Paesi Bassi hanno la quota più bassa (3,3%). Polonia e Italia non hanno centrali nucleari. A livello UE27, la fonte nucleare fornisce circa un quarto della produzione elettrica.

Paesi Bassi e Italia hanno le quote più elevate di elettricità da gas naturale nel 2020, rispettivamente 58,8% e 48%. In Italia si registra una massiccia conversione delle centrali termiche dal 1990 con una forte contrazione del petrolio e dei prodotti petroliferi ed espansione del gas naturale. I combustibili solidi mostrano significative riduzioni in tutti i paesi, sebbene alcuni Stati come Germania, Polonia e Cechia abbiano ancora quote rilevanti di tali combustibili.

Per quanto riguarda la produzione di elettricità da fonti rinnovabili, la quota in UE27 è aumentata da 13,4% a 38,4% dal 1990 al 2020. In tutti i paesi esaminati si registra un marcato aumento della produzione di elettricità rinnovabile con una forte accelerazione dal 2005. Dopo il 2015 la crescita ha rallentato ed è ripresa negli ultimi anni anche se con tassi diversi tra gli Stati. La Svezia ha una delle

quote rinnovabili più alte d'Europa. Il dato italiano è superiore alla media Europea e la quota di energia elettrica rinnovabile in Italia è una delle più alte tra i principali paesi. Tra questi paesi, a parte la Svezia, le quote di Germania e Spagna hanno superato il valore italiano nel periodo 2019-2020 e la quota della Romania è sempre stata più alta della quota italiana (Italia, 42%; Spagna, 43,8%; Germania e Romania, 44,2%).

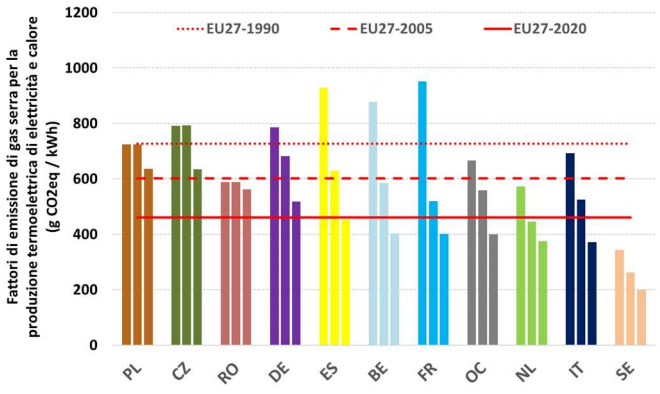
La quota rinnovabile per il raggiungimento degli obiettivi Europei al 2020, ai sensi della direttiva 2009/28/CE, si riferisce al consumo interno lordo di elettricità, vale a dire alla produzione di elettricità senza elettricità da pompaggio più l'importazione netta di elettricità. Per i paesi importatori di elettricità la quota dei consumi di elettricità rinnovabile è quindi inferiore rispetto alla quota della produzione di elettricità rinnovabile. Ciò comporta per i paesi importatori di elettricità, come l'Italia, uno sforzo relativamente maggiore rispetto ai paesi esportatori per raggiungere gli obiettivi di energia rinnovabile nel settore elettrico.

Il parametro più importante per valutare l'efficienza di un sistema di generazione di energia elettrica è l'efficienza della trasformazione dei combustibili in elettricità e calore. L'efficienza elettrica degli impianti non cogenerativi in Italia (0,45 nel 2020) è tra le più alte tra i maggiori paesi Europei, dopo Belgio (0,47) e Paesi Bassi (0,55). Nel 2020 la media italiana è superiore alla media UE27 (0,43). Per quanto riguarda l'efficienza elettrica degli impianti cogenerativi, nel 2020 la Spagna ha il valore più alto tra i principali paesi Europei (0,64), molto superiore alla media UE27 (0,37). L'efficienza elettrica dell'Italia è 0,39. L'efficienza totale degli impianti cogenerativi in Italia (0,62) è inferiore alla media UE27 (0,64) ed è aumentata del 24,4% dal 1990.

L'efficienza elettrica dell'intero parco termoelettrico italiano nel 2020 è 0,41, superata da Spagna, Paesi Bassi e Belgio, tutti con 0,49. La Svezia ha il valore più basso tra i paesi esaminati (0,22), sotto la media UE27 (0,40). L'efficienza totale, per la produzione di elettricità e calore, dell'intero parco termoelettrico italiano è 0,55, poco superiore alla media UE27 (0,54). La Svezia fa registrare il valore più elevato.

Al fine di confrontare i fattori di emissione dei gas serra nel settore elettrico dei diversi paesi, è stato adottato l'approccio *Tier 1* per stimare le emissioni. Le emissioni di gas serra dei 27 paesi Europei per la produzione di elettricità e calore sono 737,1 Mt CO_2eq nel 2020, 41,4% in meno rispetto al 1990 e 41,8% in meno rispetto al 2005. Dal 2005 si registra una significativa riduzione delle emissioni di gas serra. Nel complesso, nel 2020 le emissioni di gas serra del settore elettrico nei paesi selezionati (616,2 Mt CO_2eq) rappresentano l'83,6% delle emissioni dell'UE27; l'Italia rappresenta il 12,1%.

Dal 1990 si registra un disaccoppiamento tra produzione di energia elettrica ed emissioni di gas serra, benché le emissioni mostrino una significativa diminuzione solo dopo il 2005, con un aumento del disaccoppiamento dovuto principalmente alla crescente quota di energie rinnovabili. Il disaccoppiamento è evidente in quasi tutti i paesi Europei, anche se con dinamiche diverse.



I fattori di emissione di gas serra per la produzione di elettricità e calore dovuti alla combustione nelle centrali termiche si sono ridotti dal 1990. Nel 2020 il fattore di emissione in Italia (371 g CO_2eq/kWh) è superiore solo a quello della Svezia (198,7 g CO_2eq/kWh), dove le centrali termiche sono alimentate principalmente da bioenergia. Il Belgio ha la riduzione maggiore dal 2005 (-31%), seguito dall'Italia (-29,2%). La Germania ha ridotto il fattore di emissione del 24,1%. Le percentuali di riduzione più basse sono state registrate in Romania (-4,6%), Polonia (-12,2%) e Paesi Bassi (-16,1%).

I fattori di emissione per la produzione di elettricità e calore dell'intero settore elettrico, compresa la produzione di energia rinnovabile e nucleare, in Italia sono superiori alla media Europea. Il fattore di emissione medio dell'UE27 per la produzione di elettricità e calore nel 2020 (231,4 g

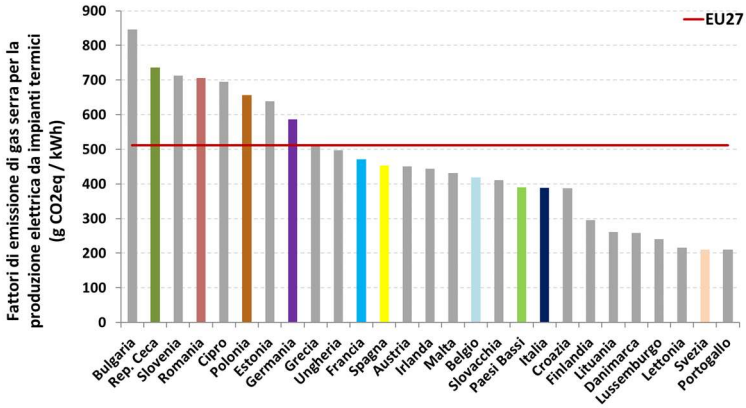
CO_2eq/kWh) mostra una riduzione del 37,6%, rispetto al 2005, mentre il fattore di emissione in Italia (263,6 g CO2eq/kWh) è diminuito del 42,3%.

I paesi con una quota significativa di elettricità da fonte nucleare e da fonti rinnovabili hanno un vantaggio in termini di emissioni di gas serra. La Francia produce una notevole quantità di elettricità da fonte nucleare che comporta la drastica riduzione del fattore di emissione. Fatta eccezione per Italia e Polonia che non dispongono di energia nucleare, anche gli altri paesi hanno quote non insignificanti di energia nucleare (da 3,3% nei Paesi Bassi a 39% in Belgio). Complessivamente, l'elettricità nucleare in UE27 nel 2020 è stata del 24,8%, in calo rispetto al 32,3% nel 1990. Nel 2020, l'88,6% dell'elettricità nucleare in UE27 proviene dai paesi esaminati, con la Francia che rappresenta da sola il 51,8%.

Il fattore di emissione italiano per la produzione di energia termoelettrica nel 2020 (388,1 g CO_2eq/kWh) è secondo solo a quello della Svezia (210,8 g CO_2eq/kWh), dove la quota di bioenergia nelle centrali termoelettriche è molto più elevata. Il fattore italiano è ben al di sotto della media UE27 di 512 g CO_2eq/kWh. Cechia, Romania, Polonia e Germania hanno i fattori di emissione più elevati, da 735,6 g CO_2eq/kWh a 587 g CO_2eq/kWh, ben al di sopra della media Europea.

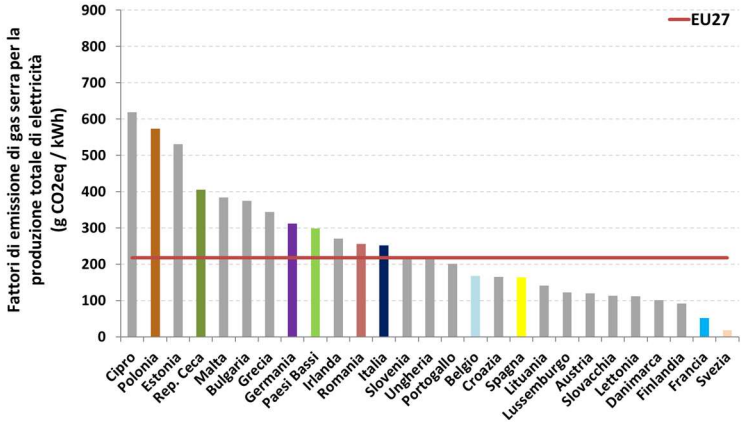
Il fattore di emissione medio UE27 per la produzione totale di energia elettrica è sempre stato inferiore al valore italiano, grazie anche al contributo dell'elettricità nucleare. L'aumento della quota di elettricità rinnovabile riduce significativamente i fattori di emissione. Inoltre, la riduzione della quota di elettricità nucleare in Europa avvicina il fattore di emissione italiano alla media UE27. Il fattore di emissione italiano nel 2005 è stato superiore alla media Europea del 29,2%, mentre nel 2020 è superiore al 15,5%.

I risultati relativi alle stime delle emissioni di gas serra consentono di concludere che tra i maggiori paesi Europei l'Italia ha uno dei più bassi fattori di emissione di gas serra per la produzione di elettricità e calore negli impianti termoelettrici. Il confronto tra la quota delle emissioni del settore termoelettrico e la relativa quota della produzione elettrica mostra che Germania e Polonia hanno quote di emissioni di gas serra superiori alle loro quote di produzione elettrica. Lo stesso vale per Cechia, Romania e Svezi, mentre lo schema opposto si osserva per tutti gli altri paesi.



Considerando tutti gli Stati membri dell'UE27, il fattore di emissione italiano di gas serra per la produzione di energia termoelettrica occupa la nona posizione, al di sotto della media Europea. Il mix di combustibili italiani, con una quota maggiore di gas naturale rispetto ad altri paesi e il contributo della bioenergia, è un fattore determinante per il fattore di emissione delle centrali termiche.

In merito alla produzione totale di energia elettrica, considerando quindi il contributo delle energie rinnovabili diverse dalla bioenergia e il contributo delle centrali nucleari, il fattore di emissione italiano perde posizioni. I paesi che dispongono di energia nucleare hanno un vantaggio in termini di emissioni evitate. La quota di energie rinnovabili per la produzione elettrica in Italia è paragonabile a quella registrata in Spagna, che tuttavia ha una quota



significativa di energia nucleare. D'altra parte, la quota di elettricità rinnovabile di Francia e Belgio è molto inferiore a quella italiana ma hanno elevata produzione di elettricità da fonte nucleare. La fonte nucleare gioca un ruolo decisivo per la comprendere i fattori di emissione di Spagna, Belgio e Francia. L'effetto dell'energia nucleare è particolarmente evidente in Francia: sebbene la quota rinnovabile della produzione elettrica sia molto inferiore a quella italiana e il fattore di emissione degli impianti termoelettrici sia più elevato, la Francia ha il fattore di emissione più basso per la produzione totale di elettricità in Europa, secondo solo a quello registrato per la Svezia. L'elettricità da fonte nucleare in Germania rappresenta l'11,4% e l'elettricità da fonti rinnovabili il 44,2% ma la presenza rilevante di combustibili solidi nel mix fossile (23,6% della produzione elettrica), principalmente lignite ad alto tenore di carbonio, si traduce in un impatto emissivo maggiore rispetto a quello italiano.

Come risultato di molti fattori (variazione del mix combustibile, efficienza, quota rinnovabile) l'Italia ha ridotto il fattore di emissione per la produzione di energia elettrica e calore del 54,4% dal 1990 al 2020 (42,3% dal 2005), contro una riduzione del 47,4% in Germania (35,6% dal 2005) e del 20,2% in Polonia (19,7% dal 2005). I tassi di riduzione in Polonia sono i più bassi tra i maggiori emettitori in Europa. La riduzione dei fattori di emissione in Germania e Polonia dal 1990 con lo stesso tasso dell'Italia avrebbe evitato l'emissione di 78 Mt CO_2eq nel 2020 (a parità di produzione di elettricità e calore), circa l'11% delle emissioni dell'UE27 dalle centrali termoelettriche. Le centrali termoelettriche in Germania e Polonia sono ancora alimentate da quote significative di combustibili solidi ad alto contenuto di carbonio, come la lignite, e la transizione verso il gas naturale è stata molto più lenta che in paesi come l'Italia.

Impianti per la produzione di calore

La produzione di calore rappresenta una quota significativa dei processi di trasformazione energetica. I consumi energetici degli impianti dedicati alla produzione di calore per teleriscaldamento e altri usi (principalmente per l'industria) rappresentano una quota importante del bilancio energetico Europeo. Nel 2020 il consumo energetico di tali impianti in UE27 è stato 16,3 Mtep, di cui 0,64 Mtep da geotermia e solare termico e 0,26 Mtep da pompe di calore. Il consumo di energia da combustibili è stato 15,4 Mtep, di cui 5,1 da Mtep bioenergia. Il consumo di bioenergia mostra una quota in rapida crescita: nel 2020 quasi doppio del consumo nel 2005 e circa 7 volte il consumo nel 1990.

Il consumo totale di energia nel 2020 è molto inferiore a quello registrato nel 1990. Si registra una notevole variazione del mix di combustibili con una diminuzione dei combustibili solidi e, in misura maggiore, del petrolio e dei prodotti petroliferi, sostituiti da gas naturale e bioenergia. Il contributo di altre fonti rinnovabili (nel 2020 oltre il 90% da energia geotermica e il resto da solare termico) e dalle pompe di calore ha registrato un costante incremento fino al 5,6% dei consumi totali nel 2020.

A seguito della variazione del mix di combustibili, della diminuzione dei consumi energetici (-36,7% e della produzione di calore (-28,1%) le emissioni di gas serra hanno registrato una diminuzione del 56,8% dal 1990. Nel 2020, le emissioni di gas serra da questi impianti in UE27 sono state 37,6 Mt CO_2eq e dal 2005 il fattore di emissione è diminuito del 18,3% (da 281,8 a 230,1 g CO_2eq / kWh). Il fattore di emissione italiano nel 2020 è inferiore del 18,5% rispetto alla media UE27. Le significative quote di combustibili solidi o di rifiuti non rinnovabili in Polonia e Germania determinano fattori di emissione più elevati, rispettivamente del 95,7% e 46,6% maggiori rispetto a quello italiano.

INTRODUCTION

Country's greenhouse gas (GHG) emissions depend on many factors related to the economic activities and lifestyle. In European Union (EU27), energy emissions accounted for about 76% of total emissions in 2020, from 67.7% in France to 83.5% in Germany, among the biggest countries. Italian GHG emissions from the energy sector are 78.4%. The energy system underlying economic activities is therefore the main area of investigation to understand the driving factors for GHG emissions. The fuel mix, as well as energy efficiency, in terms of transformation of primary energy and economic output, are key factors. The economic activities themselves, which are also driven by the users' demands, are driving factors of emissions, and the reduction of such activities inevitably leads to GHG emissions reduction. While energy efficiency can be considered as intrinsic driving factors of the energy system, the demand for goods and services can be regarded as an extrinsic economic factor, although both energy and economy systems are intertwined and difficult to be treated as separate systems. The economic crisis that has affected the world's major economies, including Italy, since 2007-2008, has made the task of discerning the driving factors or GHG emissions even more difficult. After more than a decade, Italy, after Greece, among the EU countries, has suffered the most significant impacts of the economic crisis. Even though there have been signs of recovery since 2015, up to 2019 Italy was the only country which had not yet filled the gap of GDP per capita loss in EU. Moreover in 2020 the SARS-CoV-2 pandemic caused a further decline of the economy in all the European countries. In 2021 the European economy experienced a marked recovery but the Russian-Ukrainian war that broke out in the first half of 2022 adversely affected the growth projections. Such events heavily impact on GHG emissions and development of European climate policy.

Climate and energy policies are undergoing an in-depth review following what was agreed at COP21 in Paris in 2015, when the Parties decided to keep the rise of global average temperature well below 2°C and to do everything possible to limit the increase to 1.5°C above pre-industrial levels. The historic significance of the Paris Agreement lies in the key point that virtually all the States of the world have committed to reduce their GHG emissions by 2030, through mitigation plans. In the context of emissions mitigation policies, the EU has already played an important role since the ratification of the Kyoto Protocol, when it committed to reducing the GHG emissions, in the period 2008-2012, by 8% compared to 1990. This commitment was shared among the Member States and Italy was allocated a reduction of emissions of 6.5%. In 2007, before what was agreed at the international level, the European Council had already expressed the need for the EU to initiate a transition to a low-carbon economy through an integrated approach that included energy policies to curb climate change. In particular, the Council had set binding targets to be achieved by 2020, such as 20% reduction of GHG emissions compared to 1990, the share for renewable energy consumption set to 20% of the EU energy consumption, the use of biofuels for 10% of the amount of fuel used in the transport sector and the indicative target of reducing energy consumption by 20% compared to the 2007 Reference Scenario projections for 2020. Following the Council's conclusions, the "Climate and Energy Package" was approved, i.e. a set of legislative measures aimed at implementing the commitments was put in place.

For 2030 the European reduction targets reflected the commitments made by the EU under the Paris Agreement: reduction of GHG emissions by at least 40% compared to 1990, achievement of at least 32% of energy consumption from renewables and the achievement of at least 32.5% increase in energy efficiency compared to projections of the expected energy used in 2030. Another target directly related to the electricity system is the achievement of 15% for electrical interconnections in 2030. With the European Green Deal, the European Commission proposed in September 2020 to raise the 2030 GHG emission reduction target, including carbon removals from forestry activities, to at least 55% compared to 1990. On 14 July 2021 the European Commission presented a proposal for amending the Renewable Energy Directive increasing the current target to at least 40% renewable energy sources in the EU's overall energy mix by 2030. Relevant actions are required across all sectors in order to achieve the new targets, including increased energy efficiency and renewable energy. Such actions are considered in the Italy's Recovery and Resilience Plan submitted in 2021 to European Commission in compliance with EU's extraordinary recovery effort, Next Generation EU: the plan agreed by EU leaders in July 2020 to

overcome the economic and social impact of the pandemic facing the environmental, technological and social challenges of our time.

The Commission started the process of making detailed legislative proposals by July 2021 to implement and achieve the increased ambition that will enable EU to move towards a climate-neutral economy by 2050 – an economy with net-zero GHG emissions.

In reaction to the Russian invasion of Ukraine since 24th February, there is growing support across the European Parliament to increase the EU's 2030 renewable energy target ending the EU's dependence on Russian fossil fuels. Currently, just over 22% of Europe's energy final consumption comes from renewables. From the 40% renewable energy target by 2030 proposed by European Commissions in July 2021, the European Parliament is now set to push for the target to be increased to 45%. On 18 May European Commission has presented the REPowerEU Plan to phase out EU dependency on Russian fossil fuels faster through energy savings, diversification of energy supplies, and accelerated deployment of renewable energy to replace fossil fuels in homes, industry and power generation.

Regardless any established target the negotiating processes among EU countries cannot ignore the peculiarities of Member States energy systems as well as the technical and economic potentials to change their systems. The development of a country's productive structure involves not only technological aspects but also the economic and social ones affecting the daily lives of millions of people. The definition of climate targets must therefore consider several factors. If GDP is an essential factor, as an expression of a country's investment capacity, it is equally essential to consider other aspects of energy and economy systems, such as industry share, fuel mix used by each country and the cost effectiveness for changes. In other words, the inertia of any complex systems and the decreasing returns of investments aimed at changing a particular equilibrium state cannot be ignored. This does not mean that a given situation cannot be changed, but we should be aware of both the resources needed and the consequences. In particular, as far as energy sources are concerned, there are different reduction potentials between countries with a significant share of high-carbon fuels and countries with a very small share of high carbon content fuels. While comparing GDPs among countries, it can be misleading to only consider GDP as the investment capacity without looking at the different reduction potentials and the related costs.

This report does not aim at the analysis of energy and production systems but at the analysis of Italian performance indicators and the comparison with the largest European countries concerning energy consumption and climate-changing emissions (Amici della Terra, 2009). The analysis will not go into details on factors determining the energy needs of the countries such as the geographical-climatic factor or demographic and social factors. No indicator is immune to criticism and weaknesses: the energy intensity (energy consumption per GDP) in the buildings sector is affected by climatic factors, not only by efficiency; the industry sector includes a wide range of activities with very different energy requirements, so the relative shares of activities is a crucial factor for sector's intensity. While aware of the role played by these factors on energy requirements and efficiency, the objective of the analysis is to examine at macroscopic level the main indicators of decarbonization and energy efficiency in the European countries *rebus sic stantibus*. If the former indicators provide information on climate-changing gases emissions per unit of energy used or per unit of wealth produced, the latter provide information on how efficiently energy is used to produce wealth. The two families of indicators are strongly interlinked because if the production of goods and services cannot be separated from energy consumption, the consumption of energy from fossil fuels in turn determines climate-changing gas emissions. The economy decarbonization can be pursued by acting both on the energy sources used to produce goods and services and on the efficiency of energy use, acting on both fronts are the most virtuous path that can be taken. Concerning the energy sources, useful strategies point at the shift towards a fuel mix with lower carbon content, therefore mainly made up of natural gas, or at increasing the renewable share of energy that are not without other environmental worries, e.g. the combustion of biomass and the consequent emission of atmospheric contaminants harmful to air quality or the consumption of soil by wind and photovoltaics power plants. On the energy efficiency side, the goal is obviously optimization, which consists in achieving more with less. In other words, to reduce as much as possible the losses and inefficiencies for the production of commodities (e.g. from the buildings heating system, to moving by vehicles, production of steel, cement, paper, textiles and so on).

In a highly interconnected system, the identification of the causes of a given phenomenon, such as GHG emissions, is a thorny issue, however it is possible to assess the role of the different driving factors according to a conceptual model that establishes coherent relationships between the factors considered. In order to assess the role of the factors behind the change in GHG emissions, Kaya analysis and decomposition analysis was applied to study the variation of a parameter in a time interval in relation to the variation of its driving factors.

The power sector is a key stone of any energy system. The electricity generation accounts for a significant share of the energy sector, around one third of European energy GHG emissions. The EU long-term strategy by 2050 (EC, 2018a, b) examines different development scenarios and highlights how electricity will become the main energy carrier, from 22% of final energy consumption in 2015, to 41%-53% in 2050. The growing role of the electricity sector requires an examination of electricity generation systems in the Member States. The analysis in the largest European countries was therefore carried out concerning the fuel mix, the transformation efficiency, and the GHG emission factors. The same analysis, although less detailed, was carried out for plants producing heat only that represent a significant share of energy consumption, especially in the countries of Northern Europe.

1 EFFICIENCY AND DECARBONIZATION INDICATORS

The chapter will examine the trends of efficiency and decarbonization indicators. The indicators are elaborated using the most updated data about Member States energy balances from the EUROSTAT database (https://ec.europa.eu/eurostat/data/database, last download on 08 March 2022). As concern the greenhouse gas (GHG) emissions CRFs (Common Reporting Formats) submitted in 2022 are downloaded from UNFCCC (https://unfccc.int/ghg-inventories-annex-i-parties/2022, last download on 28 April 2022).

Comparison with Italian values is carried out for European countries and, at an aggregate level, for EU27. The official exit of the United Kingdom from the European Union took place on 31 December 2020. The targets set by the Climate and Energy Package 2020 are applied to the UK. So, UK was a member State of EU in 2020 even though EUROSTAT does not update UK energy balance and financial data for 2020 nor EU28 data are available anymore.

The report focuses on decarbonization and efficiency indicators, so GHG emissions and gross domestic products are the driving parameters for comparisons. The EU Member States with more than 3% of EU27 GHG emissions or more than 3% of EU27 GDP in 2020 are considered for comparison. The Member States examined (Germany, France, Italy, Spain, Poland, the Netherlands, Czechia, Belgium, Romania, and Sweden) represent 81.5% of the population in EU27 in 2020. Countries' GHG emissions account for 81.7% of EU27 while GDP (chain linked volumes, reference year 2015) represents 83.1% of EU27 value. The gross inland energy consumption accounts for 82.5% of the energy consumption of EU27. Member States are reported with the international code alpha-2 (see Table A1.1 in Annex 1. In the Annexes also EU28 and UK data updated to 2019 are shown).

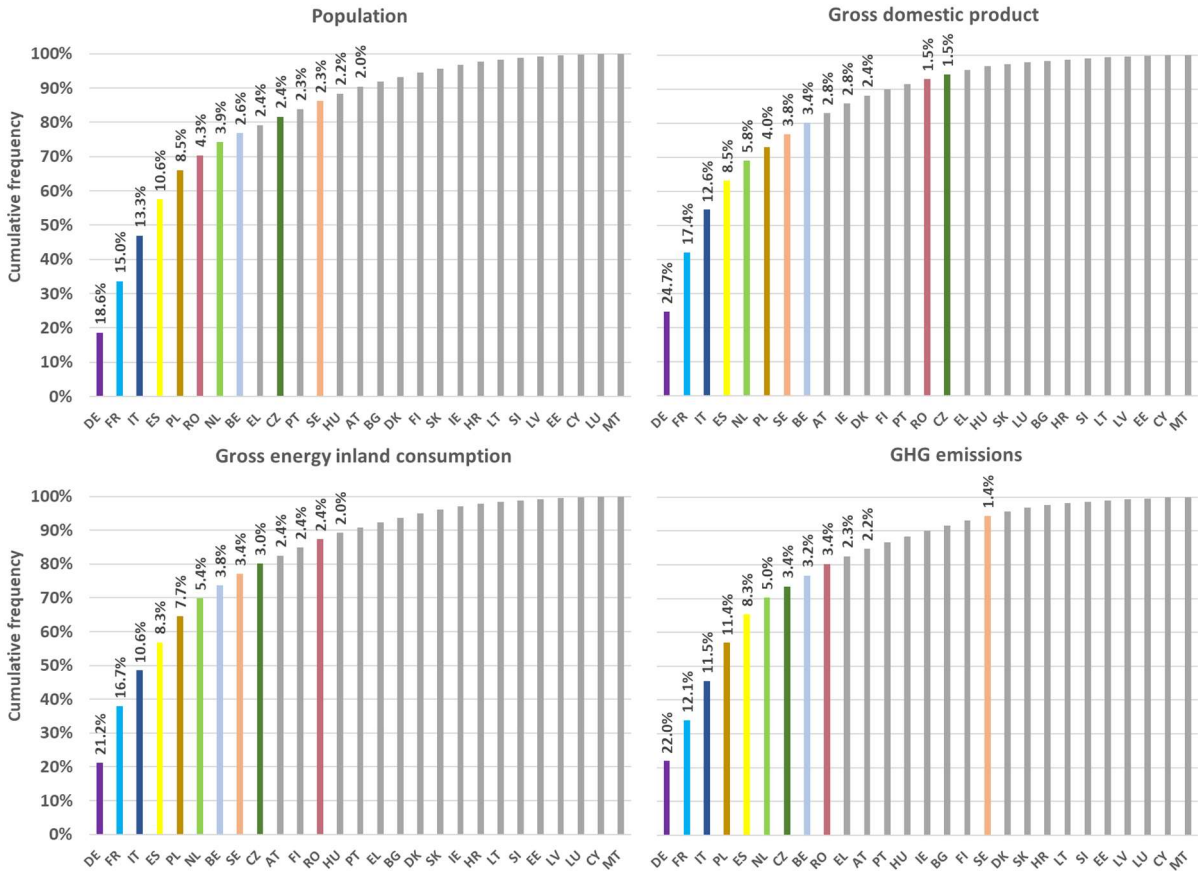


Figure 1.1 – *Cumulative frequencies for population, gross domestic product, gross inland energy consumption, and greenhouse gas emissions in the EU27 countries (data 2020). Labels of selected Member States or higher than 2% are reported.*

The following graph shows the breakdown of GHG emissions in 2020 for EU27 Member States.

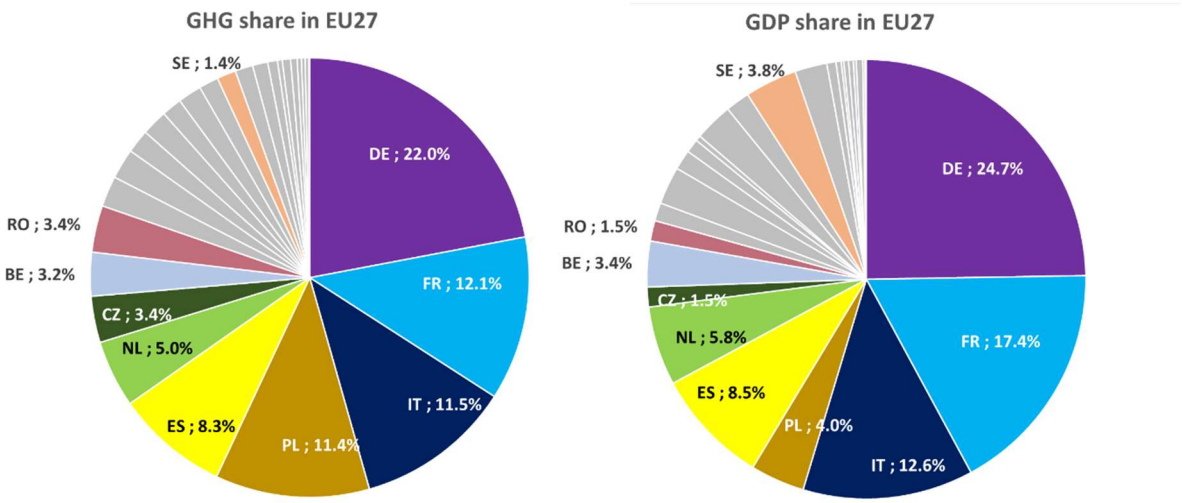


Figure 1.2 – *Breakdown of greenhouse gas emissions in 2020 for EU27 Member States. Labels of selected Member States or higher than 2% are reported.*

The values of the indicators considered for the comparisons are given in the Appendix for each Member State.

1.1 Energy consumption and gross domestic product

Since 1990, European environmental policies have led to a significant change of the energy mix in the Member States. As shown in the following graphs, each State has a specific energy mix. The nuclear source is relevant in France and Sweden, but there are also other States to which nuclear power is not negligible. The nuclear energy represents 13.1% of EU27 gross inland consumption in 2020. It is important to note the significant contraction of solid fuels energy since 1990, although there are still in 2020 significant shares in some of the largest States such as Germany (15.7%), Poland (39.7%) and Czechia (30.7%). Oil and petroleum products, on the other hand, show different trends from 1990 to 2020: there are States, e.g. Italy, showing a significant contraction (from 57.3% to 31.7%); other States, e.g. Germany, without relevant change (from 35.5% to 34.9%), and States, e.g. Poland, with a relevant increase (from 12.8% to 28.6%). Natural gas energy consumption shows a considerable increase in almost all States and at EU27 level ranges from 17.8% in 1990 to 24.4% in 2020. Among the selected States only Romania shows a relevant decrease of natural gas share (from 45.6% to 30.1%). As concerns renewable energy, there has been a significant increase in EU27 from 4.9% in 1990 to 17.9% in 2020. Italy's renewable energy share in 2020 (20.7%) is among the highest in the countries examined, only Sweden's share is higher than the Italian one.

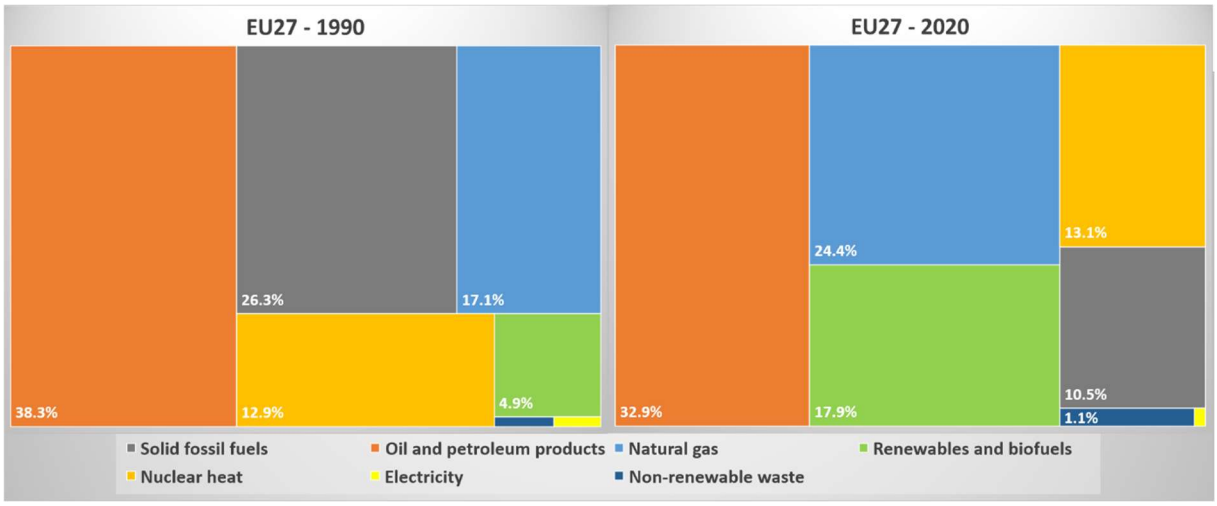


Figure 1.3 – *Share of energy sources in gross inland energy consumption of EU27.*

Figure 1.4a – *Share of energy sources in gross inland energy consumption in the selected European states.*

Figure 1.4b – *Share of energy sources in gross inland energy consumption in the selected European states.*

Figure 1.4c – *Share of energy sources in gross inland energy consumption in the selected European states and other states.*

In order to examine the shift to renewable sources and the role of a transition fuel such as natural gas, which among fossil fuels has the lowest carbon content, the following graph shows the pattern for these sources in the EU States in 1990 and 2020. Each Member State is located in the point defined by the percentage of energy consumption of natural gas, and the percentage of energy consumption of renewable energy. The remaining share of energy consumption is met by nuclear energy without GHG emissions, by solid fuels and oil-petroleum products, which are characterized by higher emission factors among fossil fuels. The European States moved to the upper right corner of the graph that indicates the shift towards a lower emissions fuel mix. EU27 is the centroids of the cloud. Sweden, among the selected States, travelled longer distance from 1990 to 2020, followed by Spain, Italy, and Romania, while France and the Netherlands travelled the shortest distance among the 27 Member States. Malta and Denmark

travelled the longest distances in EU27 countries. Such distances represent the country's change of energy supply in order to achieve environmental targets.

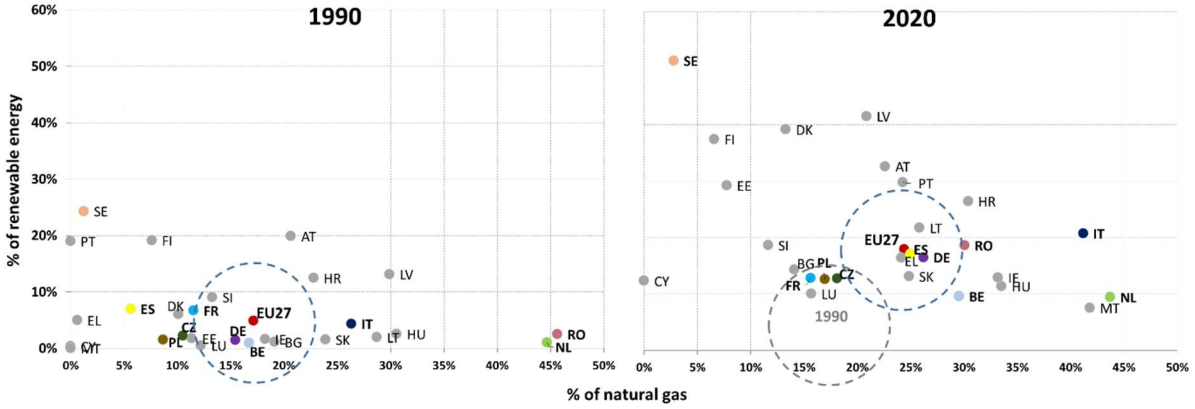


Figure 1.5 – *Each Member State is located in points defined by the share of energy consumption of natural gas (abscissa) and share of energy consumption by renewable energy (ordinate) in gross inland consumption. The circles are centred on EU27.*

The Italian share of gross inland consumption of solid fuels, mainly coal, decreased from 9.9% in 1990 to 3.6% in 2020 with an acceleration in the last years. EU27 share decreased from 26.3% to 10.5%. On the other hand, in the same period the share of natural gas for Italy goes from 26.3% to 41.2%, and the EU27 average goes from 17.1% to 24.4%. Italy has contracted the share of oil and petroleum products from 57.3% to 31.7% while EU27 share decreased from 38.3% to 32.9%. Italian renewable share grew from 4.4% to 20.7%, EU28 share grew from 4.9% to 17.9%. Such figures show that Italy changed the fuel mix more swiftly than the European average.

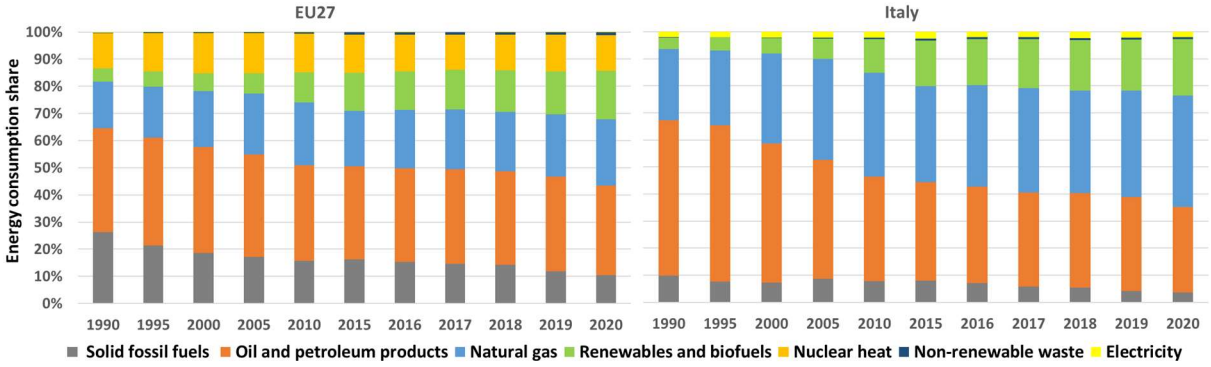


Figure 1.6 – *Fuel energy share in gross inland consumption for EU27 and Italy.*

The energy share from solid fuels in 2020 goes from about 2.4% in France to about 39.7% in Poland and 30.3% in Czechia, among the main member States. The Italian share of energy consumption from natural gas in 2020 (41.2%) is among the highest in Europe exceeded only by Malta (41.8%), and the Netherlands (43.7%). European countries have reduced the share of solid fuels and, to a lesser extent, oil and petroleum products since 1990. On the other hand, there is a significant increase of natural gas share (Figure 1.6).

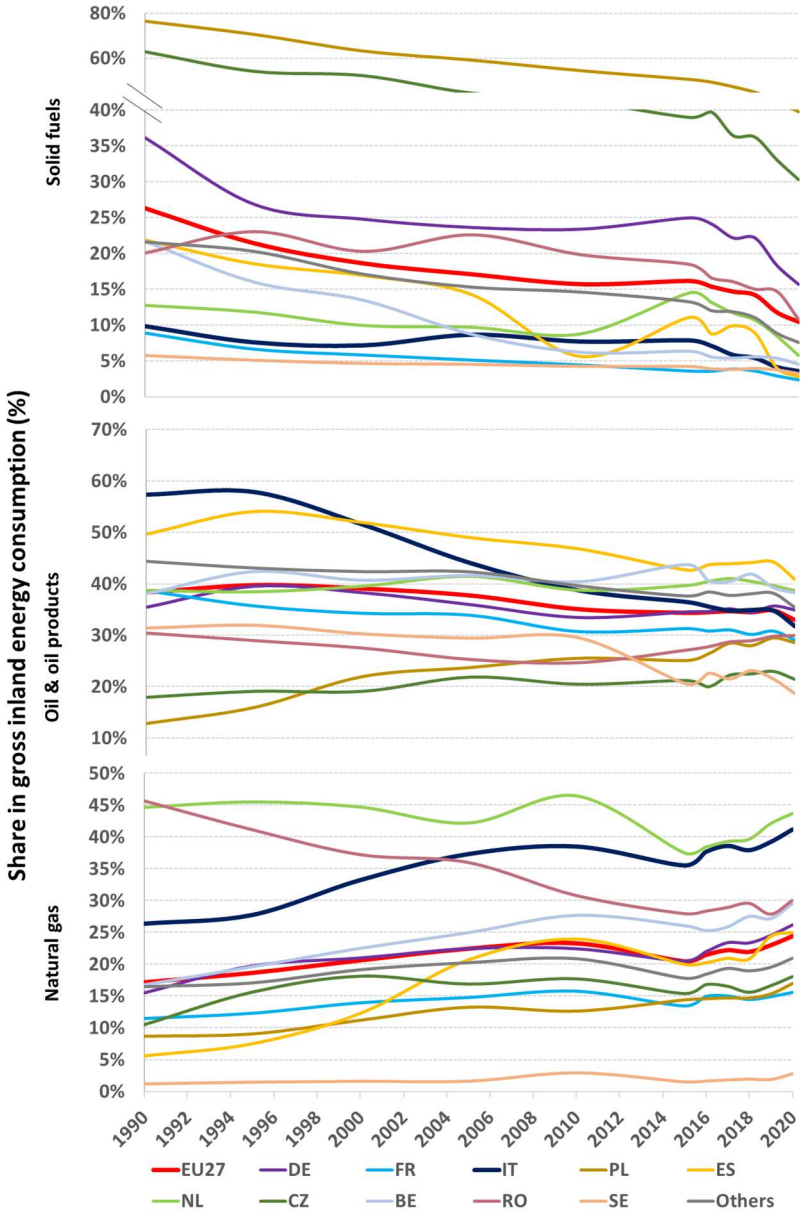


Figure 1.7 – *Share of solid fuels, natural gas, oil and petroleum products in gross energy inland consumption.*

The next graph shows the share of nuclear energy which is not negligible in many of the major European States and it is relevant in France and Sweden.

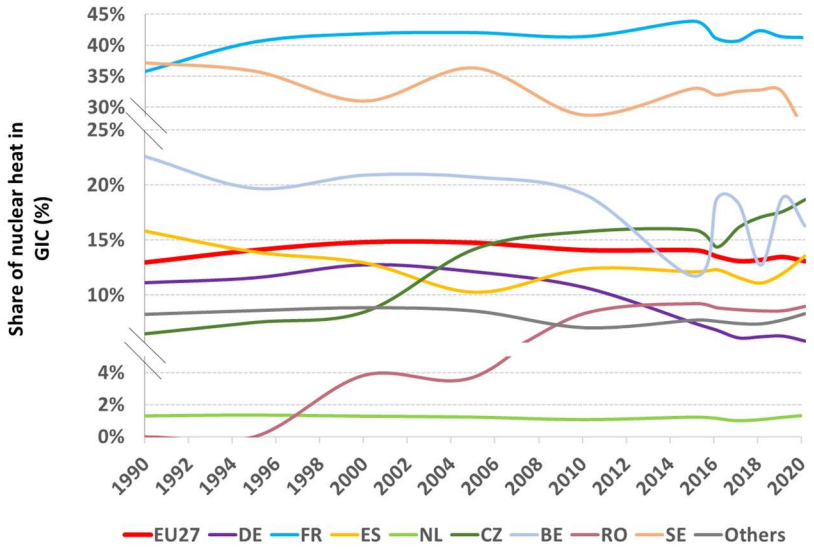


Figure 1.8 – *Share of nuclear energy in gross inland energy consumption.*

The share of fossil fuels is significantly reduced in almost all European countries. The EU27 average decreased from 82% in 1990 to 68.9% in 2020. Among the examined countries, the Netherlands and Poland shares are still higher than 85% in 2020.

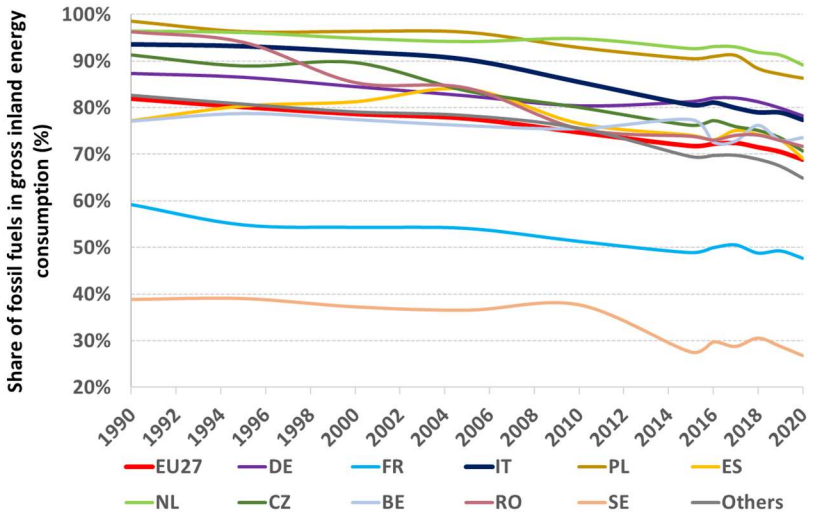


Figure 1.9 – *Share of fossil fuel energy in gross inland energy consumption.*

Figure 1.10 shows the renewable energy share in gross inland consumption. The Italian trend shows an acceleration compared to the European average since 2002. In 2020, the renewable share in Italy was 20.7% compared to 17.9% for EU27 and second only to Sweden (51.3%). All the biggest countries have trends quite similar to the Italian one, although with smaller shares. Among the countries examined, Belgium and the Netherlands have the lowest values. The renewable share in the group of 'other' Member States is greater than the Italian share with the average of 24.2% in 2020.

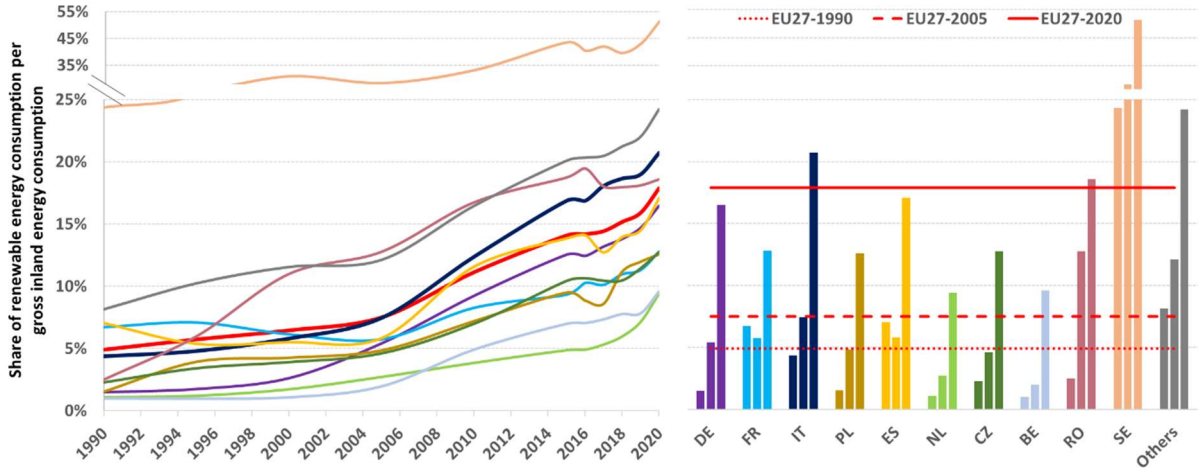


Figure 1.10 - *Share of renewable energy in gross inland energy consumption. For each country the bars on the right picture are 1990, 2005, and 2020 values.*

The renewable share reported in the previous graph represents the actual gross inland consumption. Although such indicator has the same nature of the share considered by the European Directive 2009/28/EC, it cannot be compared with the 2020 targets. The renewable target according to the Directive concerns the share of energy from renewable sources in the gross final energy consumption. Gross final energy consumption is defined in Directive 2009/28/EC on renewable energy sources as energy commodities delivered for energy purposes to final consumers (industry, transport, households, services, agriculture, forestry and fisheries), including the consumption of electricity and heat by the energy branch for electricity and heat production, and including losses of electricity and heat in distribution and transmission. The accounting rules in the Directive prescribe that electricity generated by hydropower and wind have to be normalised for annual variations (hydro 15 years and wind 5 years). Below is shown the trends of the indicator since 2004 according to the Directive. The overall share of renewable energy consumption in 2020 for Italy is 20.4%, over the target of 17% to be achieved in 2020. Among the countries examined France has not achieved its target.

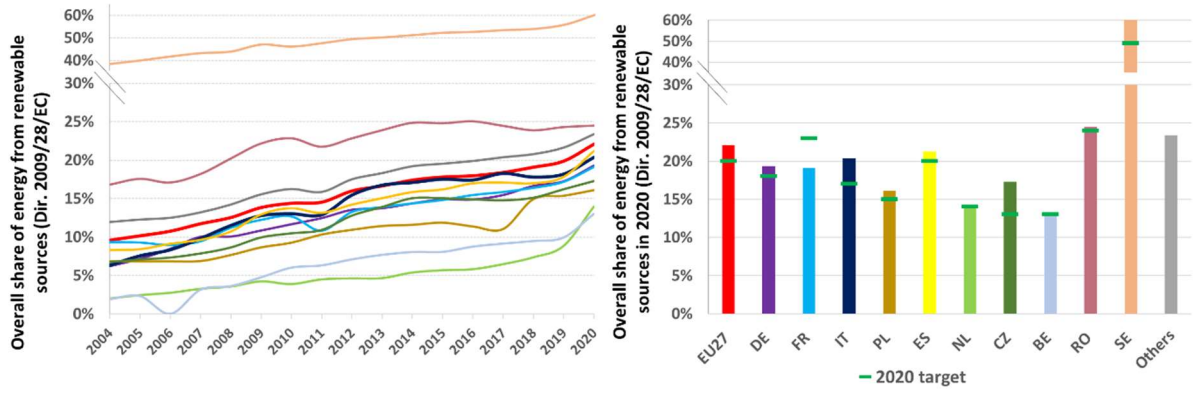


Figure 1.11 – *Trends of renewable energy share in gross final consumption (on the left) according to European Directive 2009/28/EC (source EUROSTAT). The shares in 2020 are compared with the 2020 targets on the right.*

Energy consumptions as well as GHG emissions trends are heavenly affected by SARS-CoV-2 pandemic in 2020 as consequence of different measures adopted by countries to contain the pandemic diffusion. Such measures have reduced the economic activities of the countries at different level.

Gross inland energy consumption per capita shows very different values in the European countries. Italian energy consumption per capita is well below the European average. Italian consumption increased from 2.61 toe (tonnes of oil equivalent) per capita in 1990 to 3.27 toe per capita in 2005. After 2005 the consumption falls to 2.37 toe per capita in 2020, while the EU27 average is 3 toe per

capita. In the last years, Italy has one of the lowest energy consumption per capita among the countries examined, only Romania (1.37) and Spain (2.36) registered lower values. Germany, France, Czechia, the Netherlands, Belgium, and Sweden have higher figures than EU27 averages. The trends show that energy consumption has decreased everywhere since 2005 up to 2015 with some fluctuations in the last years (EU27, -18.9% in the period 2005-2020). Spain shows the highest rates of reduction (-29.2% from 2005 to 2020), followed by Italy (-27.5%), France (-24.8%), and Sweden (-23.3%) among the biggest countries. Poland is the only exception to the observed trend for the countries examined, with a 11.9% increase of energy consumption per capita from 2005 to 2020.

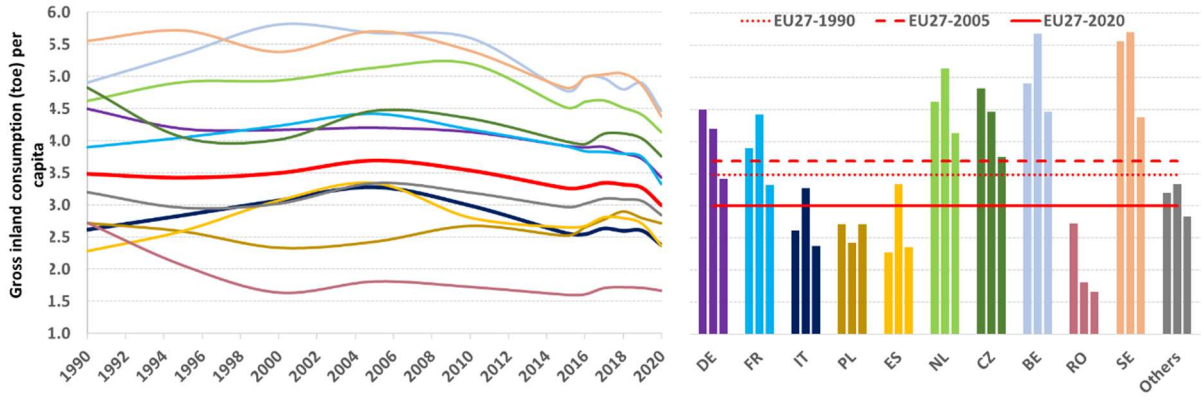


Figure 1.12 - *Gross inland energy consumption per capita. For each country the bars on the right picture are 1990, 2005, and 2020 values.*

The ratio between the final energy consumption (including non-energy uses) and gross inland consumption is an indicator of energy efficiency. This indicator has always been higher for Italy than for the European average and shows values which, among the biggest countries, are comparable only with those of the Netherlands. The Italy's figures decreased until 2000 and then they increased as a result of many causes including rising shares of electricity production from cogeneration plants, electrification of final energy consumption, transformation efficiency of fossil fuels and renewable energy.

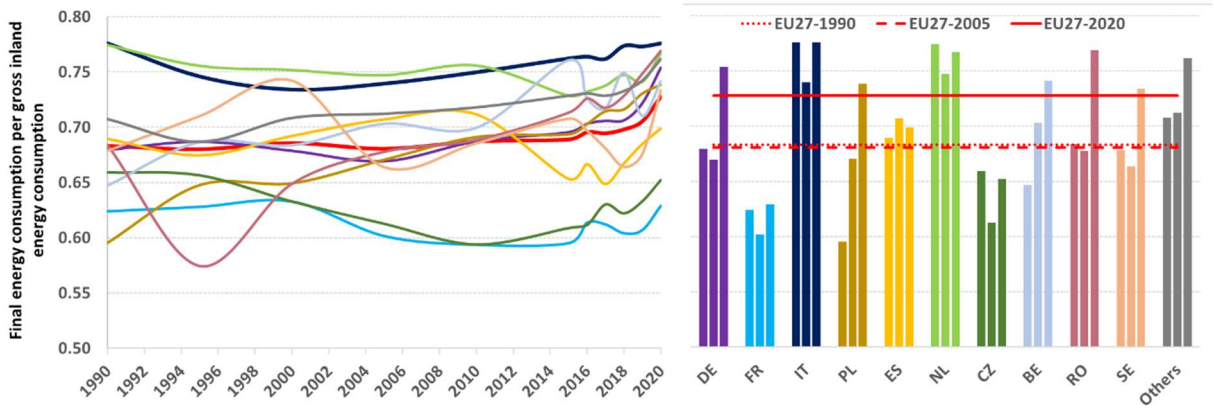


Figure 1.13 – *Ratio between final energy consumption (including non-energy uses) and gross inland energy consumption. For each country the bars on the right picture are 1990, 2005, and 2020 values.*

Since 1990 the ratio between final energy consumption and gross inland consumption for Italy has been around the average of 0.76, while both for EU27 the average is 0.69. In 2020 only seven EU27 Member States showed greater efficiency than Italy: Latvia, Lithuania, Luxembourg, Croatia, Austria, Denmark and Ireland. The Netherlands and Italian trends are comparable up to 2010 (Figure 1.13), while after this year the Italian efficiency increase and the Netherlands efficiency shows a sensible decrease with a recovery in the last years. As concerns the other States, except France and Czechia with

the lowest values since 2000, their efficiency fluctuates around the European average. The lowest values for France and Czechia are due to the low electrical conversion efficiency of nuclear power plants and the significant weight that the nuclear source has in the energy balance of such States (41.2% and 18.6% of gross inland consumption in 2020, respectively for France and Czechia). A sharp increase in efficiency made Poland reach and overcome the European average in recent years. It should be noted that also Germany, Spain, the Netherlands, Romania, Belgium, and Sweden have shares of nuclear heat in their energy consumption in 2020 (from 1.3% for Netherlands to 26.6% for Sweden).

To evaluate energy transformation efficiency, it is useful to consider energy consumption without non-energy uses. In other words, the ratio between final energy consumption and primary energy. The trend of this indicator is quite similar to that of the previous one, although it highlights some differences between Member States concerning the share of non-energy uses. This indicator reveals that the Netherlands' energy transformation efficiency is lower than Italy's energy transformation efficiency. In the Netherlands, non-energy uses account for about 15% of gross inland consumption with a slight increasing trend since 1990, while for Italy the average is 5% with a decreasing trend. The Netherlands' share of non-energy consumption in 2020 is the highest in Europe, followed by Lithuania (15%) and Belgium (13.8%). All the others States range from 0.7% of Luxembourg to 8.6% of Hungary (EU27, 6.7%).

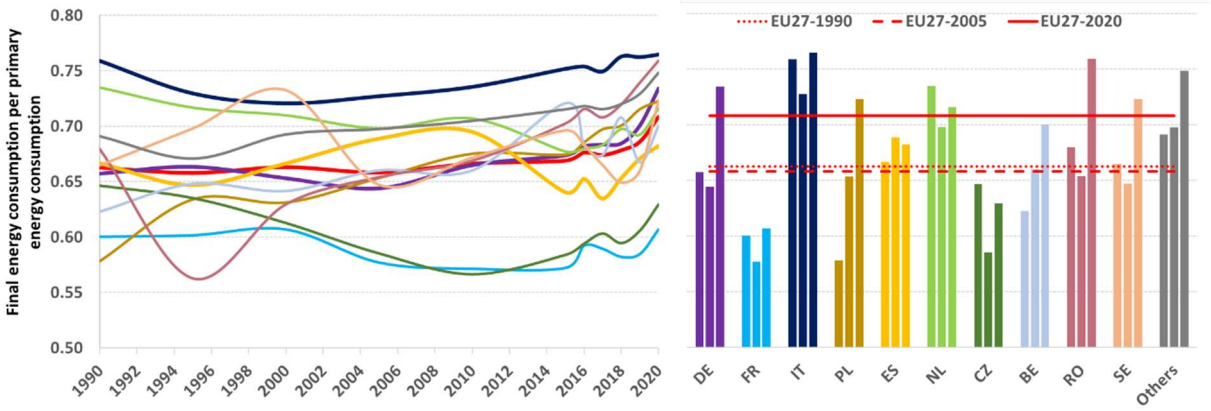


Figure 1.14 – *Ratio between final energy (w/o non-energy uses) and primary energy consumption. For each country the bars on the right picture are 1990, 2005, and 2020 values.*

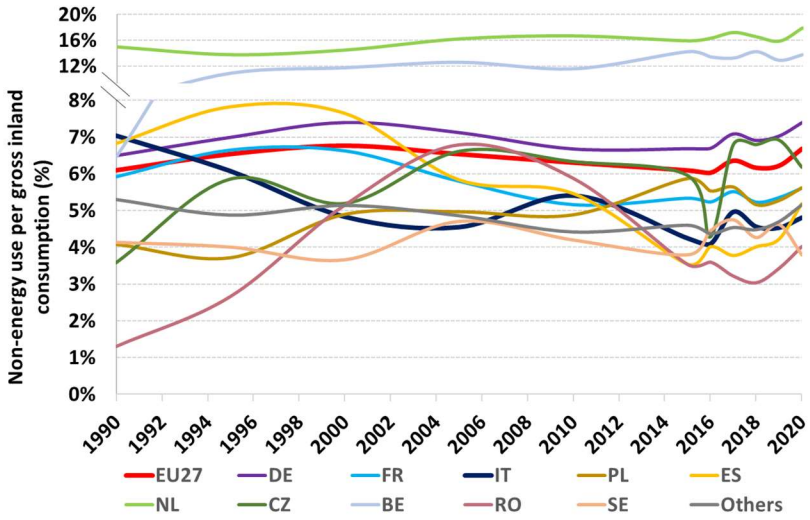


Figure 1.15 – *Ratio between final energy consumption (non-energy uses) and gross inland consumption.*

The gross inland energy consumption per unit of gross domestic product (GDP - chain linked volumes, reference year 2015) is an indicator of the country's economic and energy efficiency (energy intensity). Such indicator is sensible to the country's energy mix and economy structure, in terms of

industry-service share. Without considering the efficiency improvement an industry-based economy is generally more energy intensive than a service-based economy. Moreover, the GDP is also determined by activities related to international bunkers, such as international maritime bunkers, whose energy consumption is not included in gross inland energy consumption. The role of international bunkers will be considered in the paragraph 1.2.1.

Italy was one of the EU27 countries with lower energy intensity until 1995, when it was behind only to Denmark, then lost positions and in 2020 has the 5th lower values, upper than Ireland, Denmark, Malta and Luxembourg. Among the biggest European countries, Italy continues having the lowest energy intensity followed by Germany.

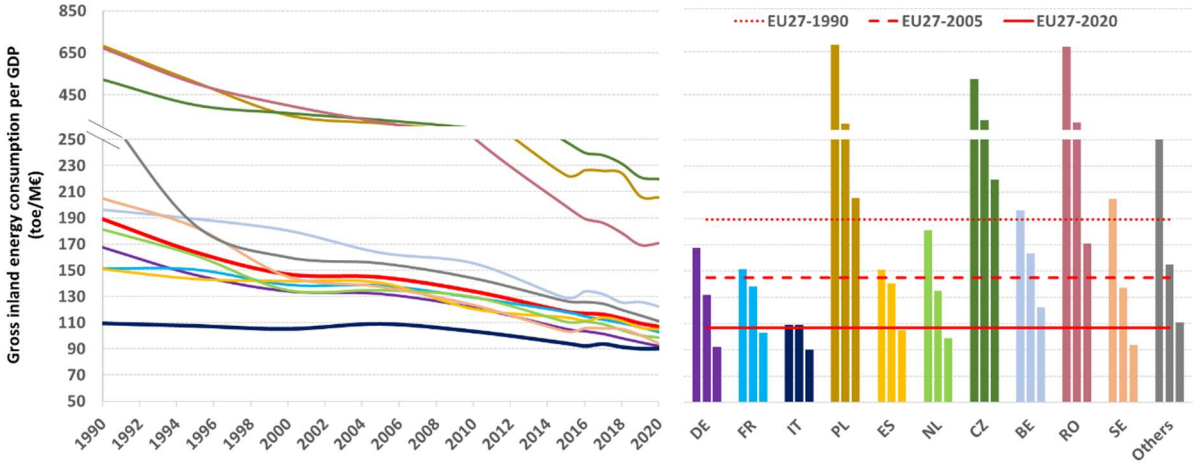


Figure 1.16 – *Gross inland energy consumption per unit of GDP (chain linked volumes, reference year 2015). For each country the bars on the right picture are 1990, 2005, and 2020 values.*

Economic activities are strictly dependent on energy consumption. A highly significant correlation between gross inland consumption and gross domestic product is evident for the European countries. In the next graph each State has a distance along the perpendicular from the correlation line, which represents a measure of the country's economic efficiency. Countries above the line have above-average EU27 economic efficiency, while the opposite is true for countries below the correlation line.

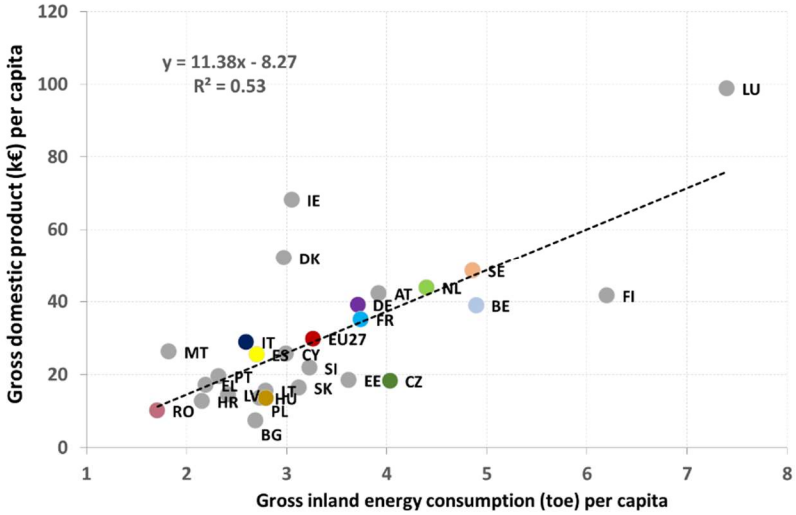


Figure 1.17 – *Relationship between gross inland energy consumption and gross domestic product in EU27 (2020).*

The final energy intensity reported in Figure 1.18 (the ratio between final energy consumption including non-energy uses and gross domestic product) follows similar trends of energy intensity with

a sudden reduction in the EU27 countries which, starting from higher levels than Italy, reach Italian figures and in some cases became lower. Since 1990 Italy shows considerable energy and economic efficiency, the final energy intensity reduced by 17.7% from 1990 to 2020; much higher reductions have occurred in the other countries (-39.8% in EU27). Romania, Poland and Czechia show rapid decrease since 1990 (-71.4%, -62.6% and -58.3% in 2020 respectively) but their energy intensities are still very higher and far from the European average. The same reduction is also recorded for the group of other countries (-56.6%) whose average energy intensity in 2020 is lower than the Belgium one and higher than the European one.

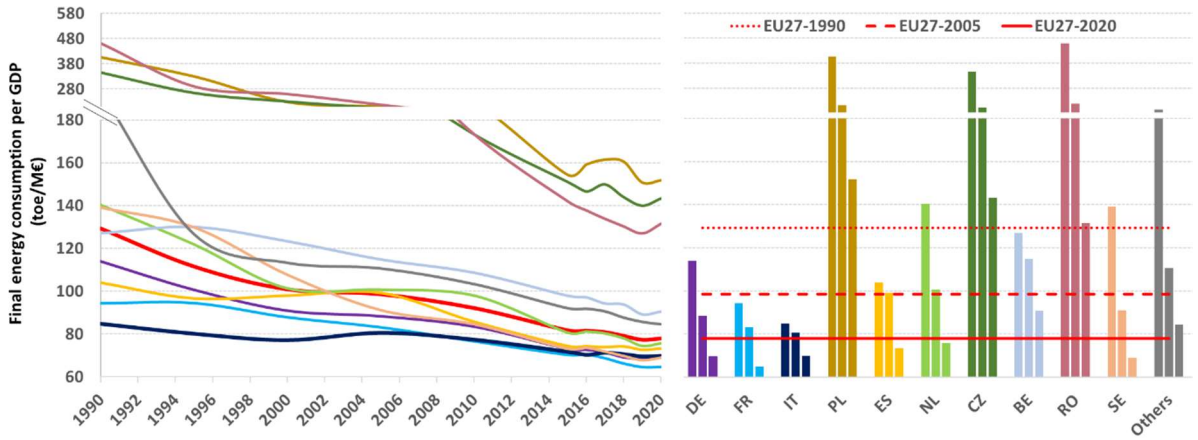


Figure 1.18 – *Final energy consumption per unit of GDP. For each country the bars on the right picture are 1990, 2005, and 2020 values.*

The reasons for the observed reduction in energy intensity are manifold such as the increase in building efficiency, industrial efficiency improvement, the electrification of final consumption and the shift of economy towards high value added and low energy consumption activities of services to the detriment of industrial sectors. The last aspect is particularly relevant considering the long-term growth of GDP in the countries and the increasing share of the value added from services, which in EU27 represents 72.8% of the value added of all economic activities in 2020, while in1995 it represented 69.5%. On the other hand, the share of value added in industry (except construction), the most energy-intensive sector, was 28.3% in 1995 and 25.4% in 2020.

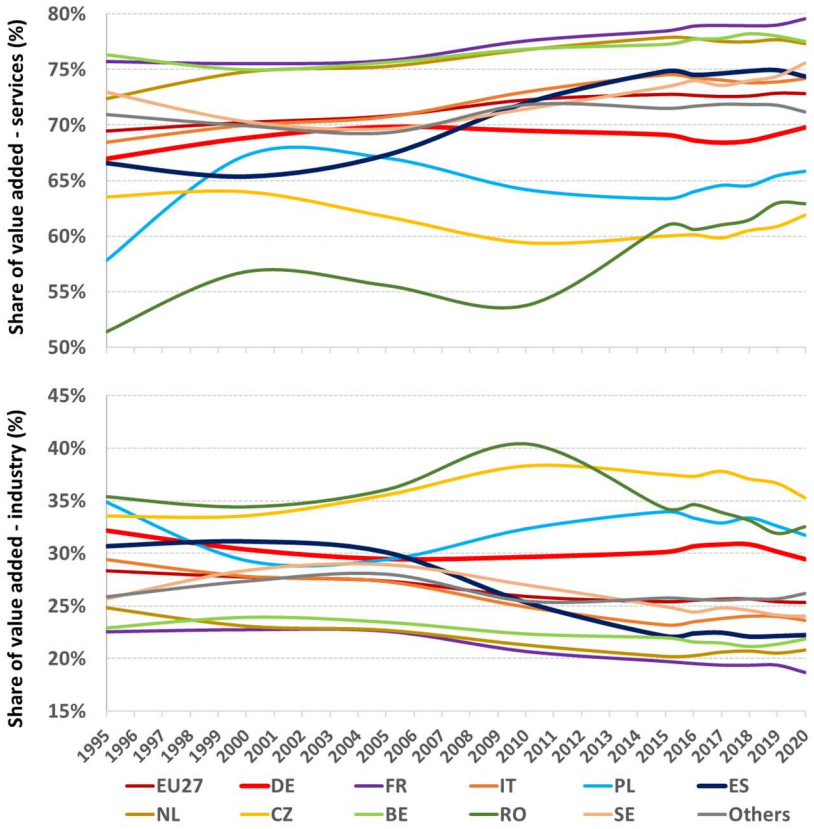


Figure 1.19 - *Shares of value added in services and industry in EU27 countries.*

In Italy, the share of value added in services increased from 68.4% to 74.2% from 1995 to 2020. Such increase is reflected in the reduction of the share in industry, from 29.4% to 23.6%, characterized by much greater energy demand per unit of value added than services.

1.1.1 *Electrification of final consumption (energy uses)*

The performances of the power sector are analysed in the next chapter, where parameters such as efficiency and GHG emissions due to electricity generation of the biggest European countries were analysed in details. Here only the electrification of final consumption and the share of renewable electricity will be considered.

Figure 1.20 show the increasing trends of electrification in almost all the European countries except Sweden whose highest level is quite constant.

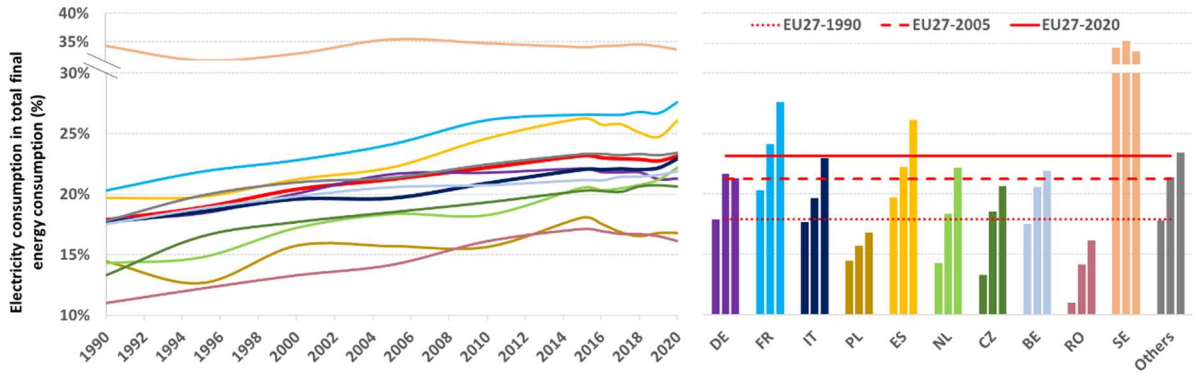


Figure 1.20 – *Share of final electricity consumption in total final energy consumption. For each country the bars on the right picture are 1990, 2005, and 2020 values.*

European countries show a wide range of electrification of final energy consumption (energy uses only) in 2020 ranging from 14.8% in Latvia to 40.5% in Malta. Italy is just below the EU27 average with 23% *vs* 23.2%. Among the biggest countries, Sweden, France and Spain have higher levels of electrification than Italy, respectively 33.7%, 27.6%, and 26.1%. At the lowest end there are Romania and Poland with 16.1% and 16.8% respectively.

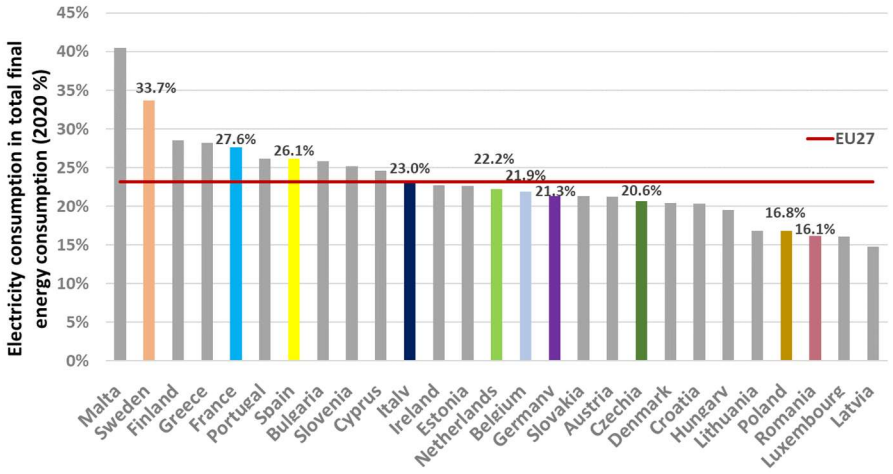


Figure 1.21 – *Share of final electricity consumption in total final energy consumption in EU27 countries (2020).*

The final electricity consumption in the main sectors shows considerable heterogeneity among sectors and countries. At sectoral level, the Member States show fairly different figures although they share a common growing trend (Figure 1.22). The electrification of industry final consumption in Italy is among the highest in Europe (42.3% in 2020). Only three States in EU27 have higher rates: Malta (68%), Ireland (44.9%), and Luxembourg (43.1%). The sharp boost of industry electrification recorded in Poland, Czechia and Romania is particularly interesting, the countries are approaching the EU27 average (32.9%). Equally important is the reduction in Germany from 36.4% in 2005 to 33.5% in 2020 and the substantially unchanged values registered in France, Spain, the Netherlands, and Sweden.

Services show the highest percentages of electrification of final energy consumption among sectors. The Italian share in 2020 is 39.1%, well below the EU27 average (47.9%) and falling sharply in the last years also for the inclusion of heat pumps final consumption in the energy balance not recorded before 2017. Italy accounts for 19.4% heat pumps final energy consumption in EU27 in 2020, almost entirely recorded in the service sector.

Table 1.1 – *Final energy consumption from heat pumps in EU27 and percentage of consumption in the selected countries since 2017. Countries in descending order of 2020 value.*

	2017	**2018**	**2019**	**2020**
France	20.7%	20.6%	21.9%	21.5%
Italy	25.1%	23.1%	20.7%	19.4%
Sweden	12.2%	12.0%	11.2%	11.4%
Germany	10.1%	10.3%	10.5%	10.8%
Spain	5.8%	6.5%	7.0%	7.5%
Netherlands	1.7%	1.9%	2.2%	2.5%
Poland	1.7%	1.9%	2.1%	2.3%
Czechia	1.4%	1.5%	1.7%	1.8%
Belgium	0.7%	0.8%	0.9%	1.0%
Romania	0.0%	0.0%	0.0%	0.0%
Others	0.0%	0.0%	0.0%	0.0%
EU27 (Mtoe)	**10.6**	**11.3**	**12.1**	**12.8**

Among the largest countries Sweden and Spain show the highest electrification shares in services in 2020, 62.7% and 61.2% respectively, although there has been a sudden reduction since 2010, when the

share of electricity consumption in final consumption was 73.7%. Germany, Romania, Belgium, and Italy are at the lower end with shares from 40.3% to 39.1%.

The Italian electrification share in households (18.6% in 2020) is well below the European average (24.7% in EU27) and, after Poland (12.2%) and Romania (14.6%), it is the lowest value among the considered countries. Malta has the highest share followed by Sweden, 72% and 50.8% respectively.

The transport sector shows the lowest percentages of electrification and in 2020 Italy is one of the three EU27 countries with the highest share (3%), after Sweden (3.6%) and Austria (3.4%). Electricity consumption in the mobility sector has been limited so far to public transport (train, tram, metro), while for private mobility the electricity plays a marginal role. The decline in the electrification rate in Poland, Czechia and Romania is explained by the strong growth of final consumption in this sector, especially due to road transport, and decreasing consumption of electricity as consequence of decrease of public transport demand.

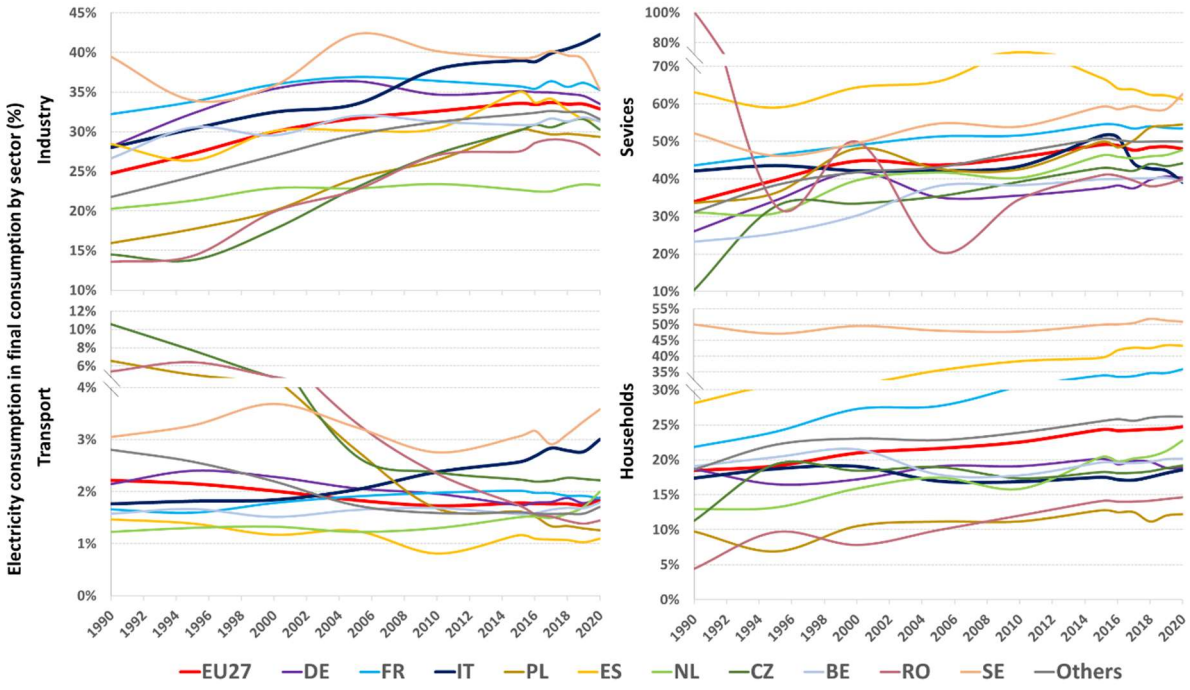


Figure 1.22 – *Share of electricity consumption in final consumption by sector.*

The share of sectoral electricity consumption can provide indications on the emission mitigation performance of each sector if the figure is read together with sectoral consumption of renewable energy and above all with the share of renewable electricity production. The following graph shows the renewable energy share of gross final consumption for each country, in accordance with Directive2009/28/EC. Among the European countries, France is the only one to have not achieved its 2020 target of 23% for the share of energy from renewable sources by 2020 (GSE, 2020). Italy have overachieved its target of 17% with 20.4%.

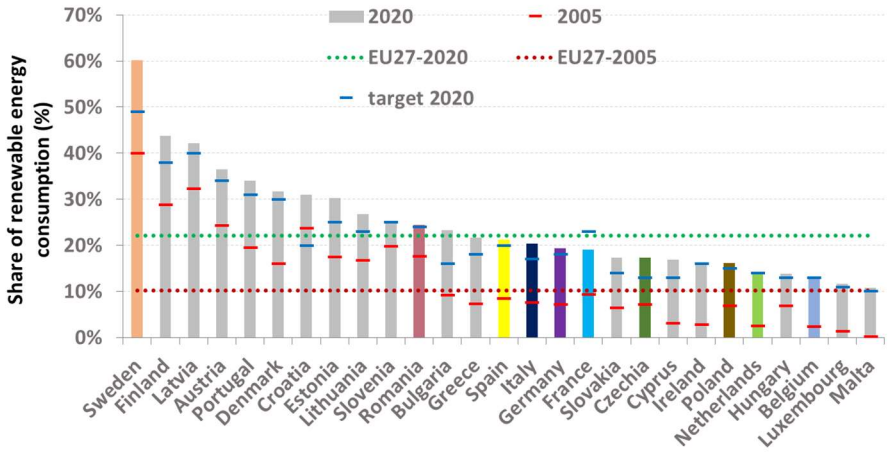


Figure 1.23 – *Share of renewable energy in gross final consumption in 2020 according to Directive 2009/28/EC (source EUROSTAT). Countries in descending order.*

The Italian share of energy from renewable sources in gross electricity consumption is 38.1% in 2020, higher than the indicative national target of 26.4% set by the National Renewable Energy Action Plan (2010).

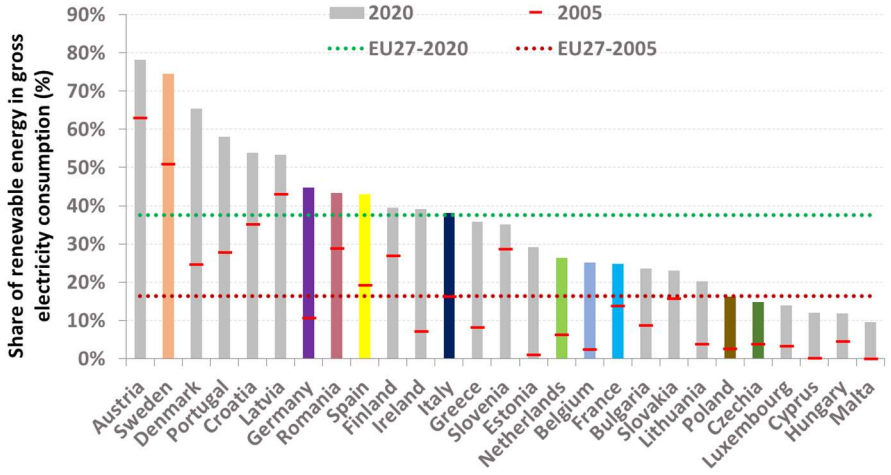


Figure 1.24 – *Share of renewable energy in 2020 in gross electricity consumption according to Directive 2009/28/EC (source EUROSTAT). Countries in descending order.*

The following graphs show the renewable energy share for transport and for heating and cooling.

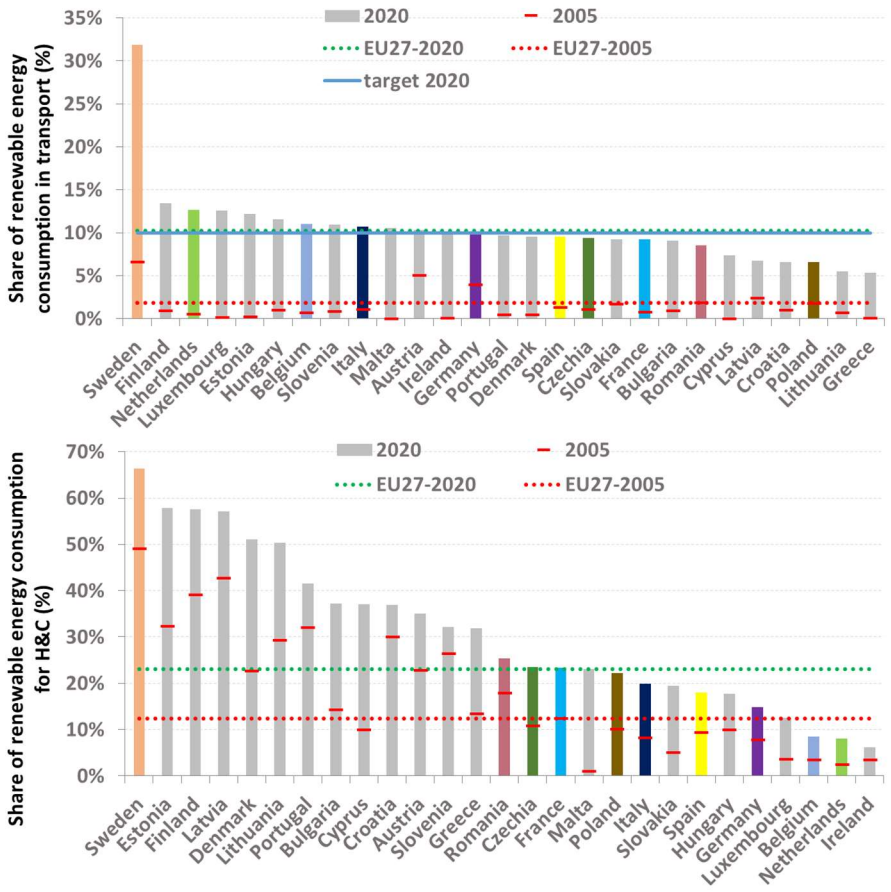


Figure 1.25 – *Share of renewable energy consumption in 2020 for transport (up) and for heating and cooling (down) according to Directive 2009/28/EC (source EUROSTAT). Countries in descending order.*

The renewable energy consumption, as well as the sectoral electrification, must be considered both concerning the final consumption of each Member State and the relative weight of each State in EU27. Italian consumption in 2020 accounts for 10.4% of EU27's renewable energy consumption, the third after Germany (19.1%) and France (12.6%).

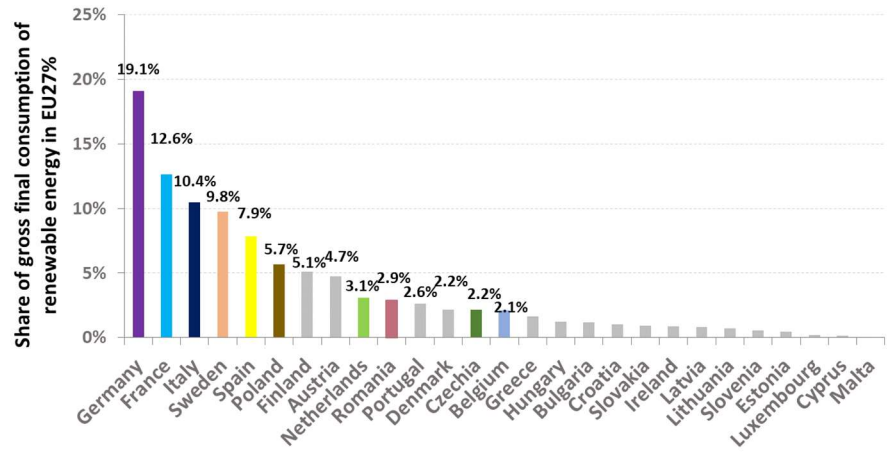


Figure 1.26 – *Share of gross final consumption of renewable energy (2020). Percentages higher than 2% are reported. Countries in descending order.*

The countries examined for comparison with the Italian figures represent 75.7% of EU27 gross final consumption of renewable energy in 2020. Such figures show clearly that the electrification of the final consumption of the biggest countries, such as Italy, involve a significant contribution to the consumption of renewable energy in Europe, both because of the size of consumption and because a significant amount of electricity should be produced from renewable energy.

1.2 Total greenhouse gas emissions and energy processes

The average of Italy's GHG emissions per capita from 1990 to 2020 is 8.8±1.2 t CO_2eq (ISPRA, 2022[a]). Emissions per capita increased until 2004 when the maximum value of 10.3 t CO_2eq was reached, then a reduction of up to 6.4 t CO_2eq was observed in 2020. Such figure has to be compared with the EU27 average of 7.4 t CO_2eq per capita.

The next graph shows that Italian emissions per capita have always been below the European average. The graph also shows that, apart for Italy and Spain, the trend of emission reductions began as early as 1990. Emissions per capita in Spain increased with higher rate than in Italy until 2005, when the emissions per capita of the two countries reached the same level. After 2005 the emissions per capita decreased also in Italy and Spain. In recent years, emissions per capita in France, Spain, Romania, and Italy are very close. Czechia, the Netherlands, Germany, Belgium, and Poland have the highest emissions per capita among the biggest countries. Among the countries examined Sweden has the lowest GHG emissions per capita.

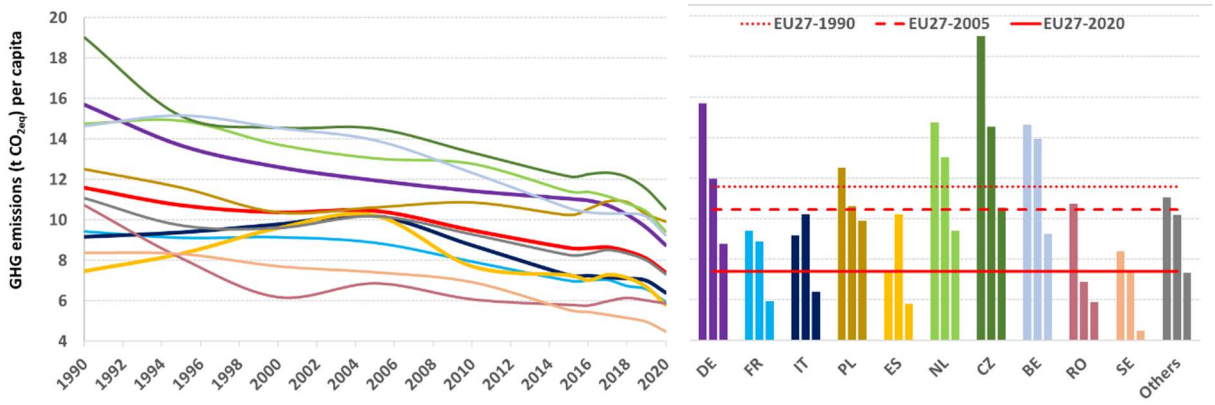


Figure 1.27 - *Greenhouse gas emissions per capita. For each country the bars on the right picture are 1990, 2005, and 2020 values.*

The trends of GHG emissions per unit of gross inland energy consumption (carbon intensity related to energy) in the countries examined is shown in Figure 1.28. Such indicator is sensible to the country's energy mix. It should be considered that sources of energy, as renewables and nuclear heat, do not contribute to GHG emissions, so countries with higher share of such sources are more likely to have low carbon intensity. Moreover, the share of net imported electricity plays a positive role in reducing the indicator. Other relevant factors to consider when reading this indicator is the economy structure of the countries. The industry activities are generally more energy consuming than service activities, so the countries' economy structure is a relevant parameter for such indicator.

All countries have reduced the carbon intensity since 1990. Among the examined countries Poland and Romania have the highest values in 2020 (3.7 t CO_2eq/toe and 3.5 t CO_2eq/toe, respectively), while Sweden and France have the lowest ones (1 t CO_2eq/toe and 1.8 t CO_2eq/toe, respectively). The significant weight of nuclear energy and/or renewable energy in such countries makes reason for the distance from other countries. The Italian carbon intensity for energy consumption is higher than the EU27 average (2.7 *vs* 2.5 t CO_2eq/toe in 2020).

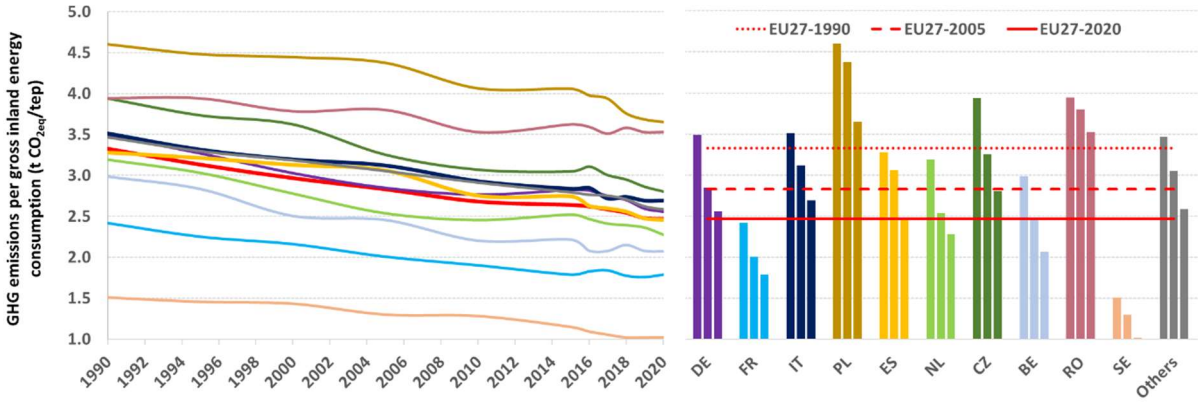


Figure 1.28 – *Greenhouse gas emissions per gross inland energy consumption. For each country the bars on the right picture are 1990, 2005, and 2020 values.*

By unbundling nuclear power, which is not a source of GHG emissions, from gross inland consumption, the carbon intensity so calculated is due to the mix of fossil fuels and renewable energy. According to this approach the trend of carbon intensities has been revised in the following graph. Italy's figures are below the EU27 average and higher only to those recorded for Sweden, the Netherlands, and Belgium.

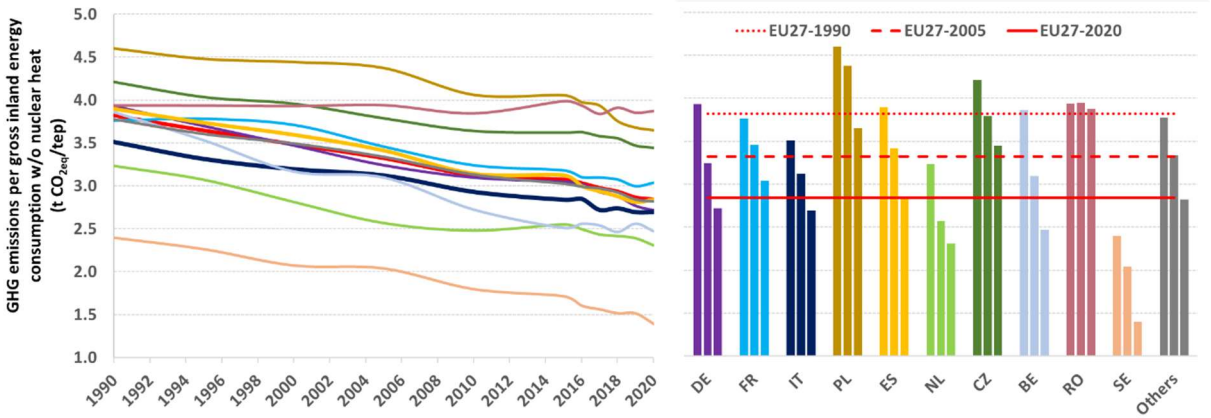


Figure 1.29 – *Greenhouse gas emissions per unit of gross inland energy consumption without nuclear energy consumption. For each country the bars on the right picture are 1990, 2005, and 2020 values.*

Apart from Sweden, whose fossil share is much lower than the Italian one (26.8% *vs* 77.3% in 2020), this result is in apparent contrast to what was previously said about the energy mix of the Netherlands which, compared to Italy, have a higher share of fossil fuels (89.1%) and a lower share of renewable energy (9.4% *vs* 20.7%). Even for Belgium, despite the lower fossil share compare to the Italian one (7.6%), the renewable energy share is significantly lower (9.6%). In order to overcome the apparent contrast, Figure 1.29 should be read considering the role of non-energy consumption in the energy mix of countries. The Netherlands and Belgium have significantly higher shares of non-energy consumption than Italy (17.9% for the Netherland, 13.8% for Belgium *vs* 4.8% for Italy in 2020). While primary energy consumption has a direct relationship with greenhouse gas emissions, the same is not true for non-energy uses. These consumptions include industrial processes in sectors such as the petrochemical, pharmaceutical, *etc*., where oil and its products are not used as fuels, but for transformation into other products. Therefore, the comparison of decarbonization indicators between countries with significantly different shares of non-energy uses can be corrected by considering the GHG emissions per unit of primary energy consumption. This indicator highlights the decarbonization of a country's energy sector. GHG emissions per unit of primary energy without nuclear energy intake (Figure 1.30) show that in 2020 the Italian figures are quite intertwining those of France and Spain and in the last year the

indicator's value is very close to the Belgian one. Sweden has the lowest values, together with the group of smaller countries, while the other countries examined have higher values than Italy.

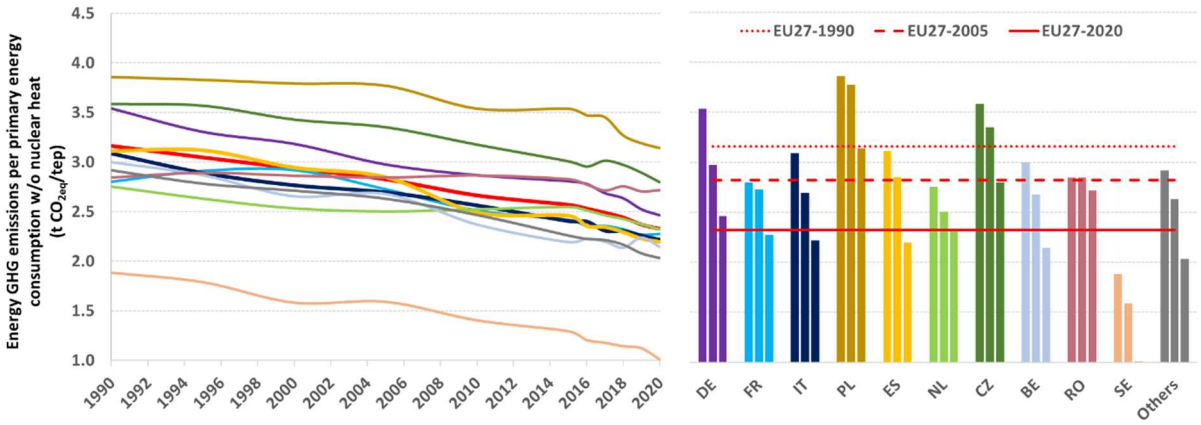


Figure 1.30 – *Greenhouse gas emissions from primary energy consumption without nuclear energy consumption. For each country the bars on the right picture are 1990, 2005, and 2020 values.*

The ratio between GHG emissions and gross domestic product is the carbon intensity related to economy (Figure 1.31). Such indicator is sensible to the country's energy mix, as the intensity related to energy, and even more sensible to economy. The countries' GDP is also determined by activities related to international bunkers, whose emissions are memo items in the emissions inventories. The GHG emissions in the following graphs do not include memo items. The role of such items will be considered in the next paragraph.

The carbon intensity per GDP decreases for all European countries and Italy's figures are just below the EU27 average in 2020 (0.26 t CO_2eq/k€ *vs* 0.24 t CO_2eq/k€ in 2020). Sweden and France have the lowest values: 0.1 t CO_2eq/k€ and 0.18 t CO_2eq/k€, respectively. Poland is at the upper end with 0.75 t CO_2eq/k€, followed by Czechia and Romania with 0.62 t CO_2eq/k€ and 0.6 t CO_2eq/k€ .

The reduction rate since 1995 for EU27 is -48.5% and range from -31.9% for Italy to -69.6% for Romania. The causes of such reductions are manifold and concern both the common increase in efficiency of industry and the increasing share of value added from services, whose carbon intensity is far lower than those of manufacturing industries.

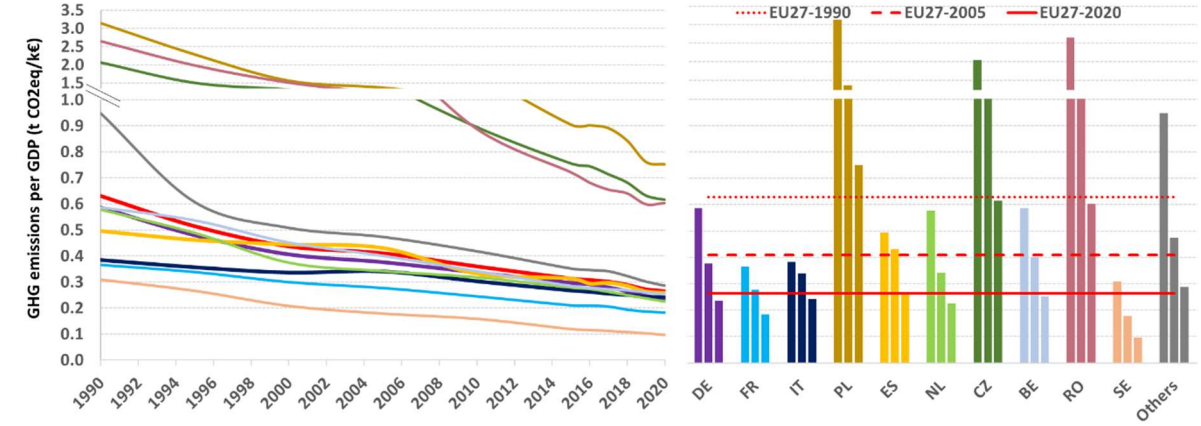


Figure 1.31 – *Greenhouse gas emissions per unit of GDP. For each country the bars on the right picture are 1990, 2005, and 2020 values.*

In the phase space defined by GHG emissions per unit of GDP and GHG emissions per capita, each point represents the position of a Member State. For each year considered in Figure 1.32, all the Member States are shown on the left side, while on the right one there is the enlarged box that inscribes the

biggest Member States in 2020. Poland, Czechia and Romania are excluded from such box because, although approaching the European average in the recent years, they remain far from the group of the other countries. Poland, together with other eastern countries, had GHG emissions per GDP greater than 2 t CO_2eq/k€ in 1995. Since 2005, all countries have economy carbon intensity below 1.5 t CO_2eq/k€, apart from Bulgaria. The graphs show that States have moved to the bottom left corner of the phase space, becoming more and more numerous in the box. In 1995 only Sweden was already in the box while all other States were outside: the further shift towards the space with lower emissions per capita and GDP has brought them in. Since 2005 France was in the box while Italy was the only country approaching the box boundary.

The distance that each country has travelled since 1995 in the phase space defined by the two indicators provides a measure of the progress made in the decarbonization process. The distance of two points in the two-dimension Euclidean space, $P = (p_x , p_y)$ and $Q = (q_x , q_y)$, is calculated as:

$$\sqrt{(p_x - q_x)^2+(p_y - q_y)^2}$$

According to this metric, Italy travelled 3 units from 1995 to 2020 against EU27 average of 3.3 units. Among the biggest countries, the Netherlands, Germany and Czehcia travelled the greatest distances with 5.5, 4.9, and 4.7 units respectively, while the distances travelled by Spain and Poland are the lowest with 2.5 and 2.3 units, respectively. In addition to the distance travelled, it is also appropriate to consider the starting points of each State as concerns the efficiency and decarbonization indicators and the mix of energy resources used to meet their needs. Moreover, differently from Italy, many States had significant share of solid fuels to displace and even today benefit significant shares of nuclear energy without GHG emissions.

As we have seen before the Italian GHG emissions per capita have been among the lowest since 1990 in Europe, the same can be said of the energy and economy carbon intensity. The trends of these indicators show that the biggest countries are gradually moving closer to the Italian values and in some cases such values have been exceeded.

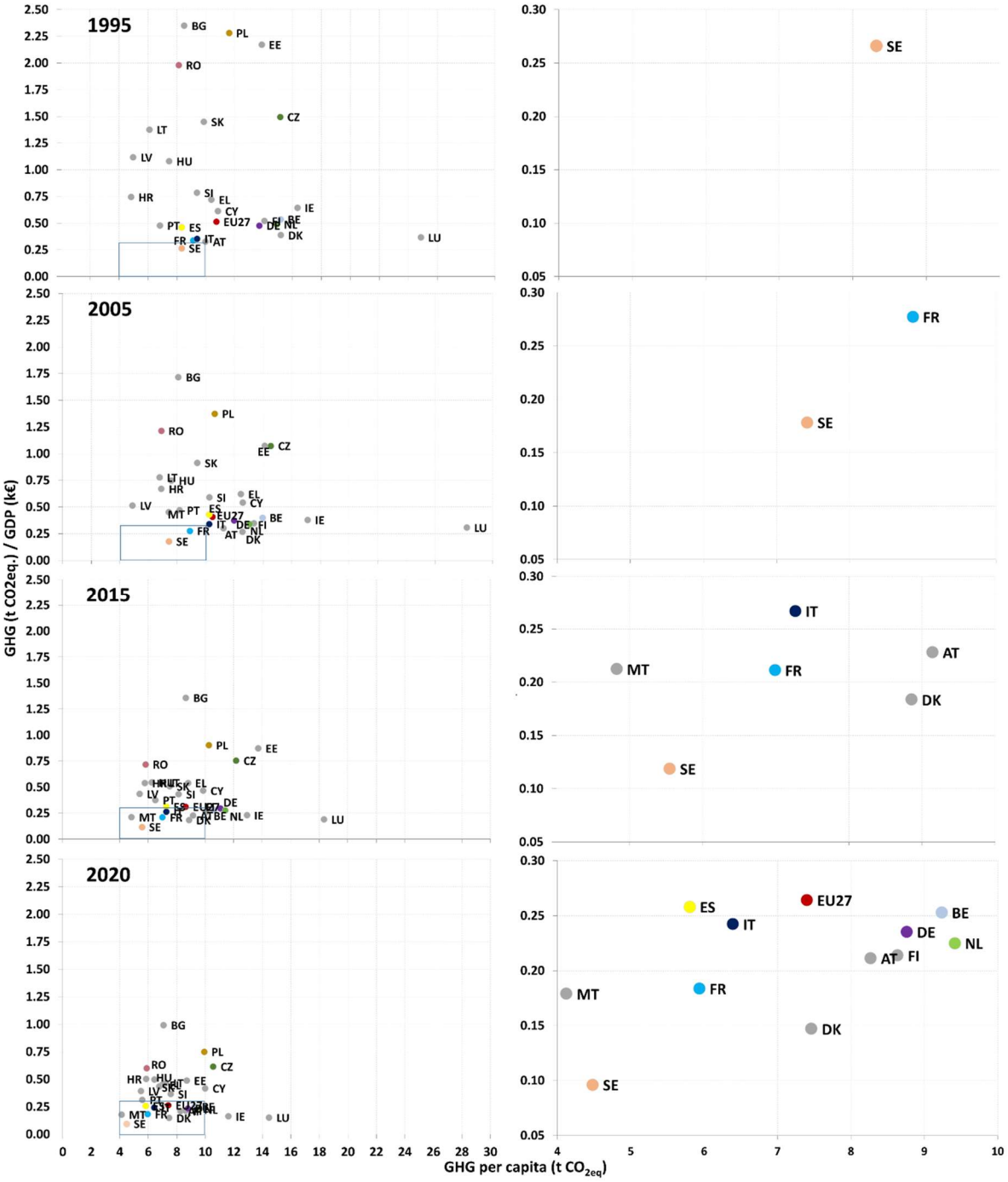


Figure 1.32 – *In the phase space defined by emissions per capita (abscissa) and economy carbon intensity (ordinate) is shown the position for each Member State on the left. On the right the enlarged box that inscribes the biggest Member States in 2020 is shown.*

Even more interesting is the countries positioning in the space defined by GHG emissions per GDP and gross inland consumption per GDP (Figure 1.33). The pictures on the right are zoomed box which inscribes the biggest Member States in 2020. In such picture both abscissa and ordinate report intensities indicators. No country occupies in 1995 the box where the biggest countries are in 2020. The Denmark was the first one to enter in the box since 2005. EU27 average approaches the zoom box boundary in 2015 with five biggest countries inside the box. In 2020 Poland, Czechia, Romania and Belgium remain off the box scale in 2020.

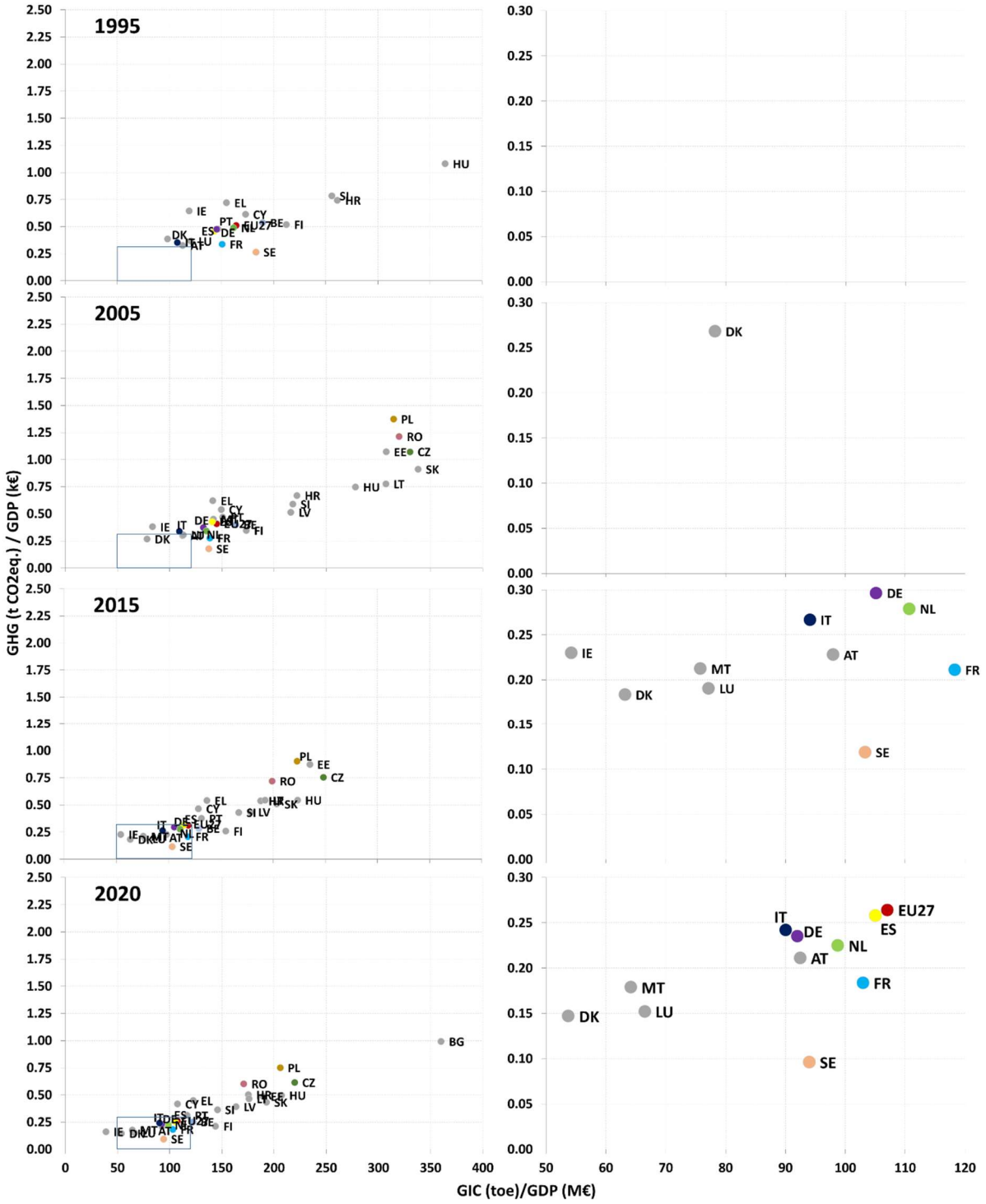


Figure 1.33 – *In the phase space defined by economy energy intensity (abscissa) and economy carbon intensity (ordinate) is shown the position for each Member State on the left. On the right the enlarged box that inscribes the biggest Member States in 2020 is shown.*

The indicators examined show that Italy, compared to the biggest EU Member States, has historically high energy and economy efficiency (Figures 1.13, 1.14, 1.16, 1.18) with a significant share of renewable energy and natural gas in the energy mix (Figures 1.4a, 1.5, 1.10, 1.11, 1.23-1.26), and one of the lowest emissions per capita among the biggest countries (1.27, 1.32). The energy intensity per unit of GDP in Italy (Figures 1.16, 1.33) is higher only to those of Ireland, Denmark, Malta and Luxembourg, while the carbon intensity per unit of GDP is below the EU27 average and higher than

those of France and Sweden, among the biggest countries. Italian values for such indicator are very near the values recorded for Germany and the Netherlands (Figures 1.31, 1.32, 1.33). The carbon intensity per unit of energy consumed without the nuclear power is, among the biggest countries, higher only than those of Belgium, the Netherlands and Sweden and quite similar to that of Germany in 2020 (Figure 1.29). Although some indicators show that many countries have improved their GHG emission performance, sometimes achieving better results than Italy, the following factors need to be considered:

- countries with high shares of solid fuels or oil and petroleum products (Figure 1.4a-c, 1.7) have greater potential for reducing emissions from fossil fuels than those available in Italy, where the fossil mix is mainly represented by natural gas and further GHG emissions reductions are possible increasing the renewable share and improving efficiency;
- in several countries there is a significant contribution of nuclear power with emissive advantages (Figures 1.4a-c, 1.8), a source of energy which is not without controversy and which some countries intend to phase out gradually (Germany, Belgium), even though recent events, such as Russian-Ukrainian war from February 2022 determined revisions of the nuclear plants decommissioning planning;
- the emissive performance of a country depends closely on its economic structure. Countries with a predominance of productive activities in the service sector (Figures 1.19) or with significant shares of non-energy consumption, such as Belgium and the Netherlands (Figure 1.15), show lower GHG emissions per GDP (Figure 1.31) and energy consumed (Figures 1.29).

1.2.1 *International bunkers*

The decarbonization and efficiency indicators with GHG emissions from international bunkers (international flights and shipping) require a premise on the composition of national emission inventories and energy balance.

GHG emission inventories submitted to the UNFCCC Secretariat include emissions from international aviation and maritime activities. Such emissions, although methodologically consistent with IPCC guidelines, are reported as "memo" items and are not included in total national emissions.

Similarly, for energy consumption, the items that make up a country's gross inland energy consumption must be considered in relation to GHG emissions from international bunkers. In EUROSTAT's energy balance, gross inland energy consumption includes the consumption of international aviation but not those of international maritime activities.

In particular, the main items in the budget can be explained by the following equations:

$$GAE = PPRD + RCV\_RCY + IMP - EXP + STK\_CHG \quad (1)$$

where

GAE: gross available energy;

PPRD: primary production;

*RCV*_RCY: recovered or recycled products;

IMP: import;

EXP: export;

STK_CHG: stock changes.

$$GIC = GAE - INTMARB \quad (2)$$

where

GIC: gross inland energy consumption;

INTMARB: international maritime bunkers;

$$NRGSUP = GIC - INTAVI \quad (3)$$

where

NRGSUP: total energy supply;

INTAVI: international aviation;

$$AFC = NRGSUP - (TI\_E - TO) - NRG\_E - DL \quad (4)$$

$$AFC = FC\_E + FC\_NE \quad (5)$$

where

AFC: energy available for final consumption;

*TI*_E: transformation input of energy:

TO: transformation output;

NRG_E: energy consumption in the energy sector;

DL: distribution losses;

FC_E: energy uses of final energy;

FC_NE: non-energy uses of final energy.

Equations (2) and (3) show that in the gross inland energy consumption is not considered the energy consumption by international maritime bunkers, while the consumption by international aviation is included. Therefore, a decarbonization indicator that considers total emissions reported in the inventories should be the ratio between GHG emissions to total energy supply *(NRGSUP),* as both terms are without international bunkers. Similarly, decarbonization indices can be drawn up with gross inland energy consumption *(GIC)* or with gross available energy *(GAE)* considering the contribution of international aviation in the first case and of all international bunkers in the second case.

The energy available for final uses (*AFC*) consist of energy and non-energy uses. The former component is directly related to greenhouse gas emissions from combustion, while the latter is involved in transformation processes not directly related to atmospheric emissions. Final uses consist of total energy without transformation losses, energy branch sector consumption and distribution losses.

This report has not the aim to examine in detail the components of gross domestic product, but in the first approximation it can be considered that GDP is also determined by activities related to flights and international navigation.

The biggest European countries have very different contributions from international bunkers with regard to GHG emissions. The GHG emissions from such sectors are relevant in some countries. The EU27 average share of total emissions with memo items is 5.1% in 2020 and, for the biggest countries, it ranges from 0.2% in Romania to 21.3% in the Netherlands.

In the light of such different contributions, it is reasonable to investigate the dynamics of decarbonization and efficiency indicators considering the role of international bunkers. Carbon intensity related to gross domestic product and energy consumption will be considered. The first indicator is equal to the ratio between GHG emissions including contribution from international bunkers and gross domestic product (GDP). The second indicator is equal to the ratio between energy GHG emissions including contribution from international bunkers and gross available energy (GAE) without final consumption for non-energy uses (FC_NE), a measure that can be defined as gross available primary energy. With regard to the efficiency indicator, carbon and energy intensities will be calculated through the ratio between gross available energy (GAE) and gross domestic product (GDP).

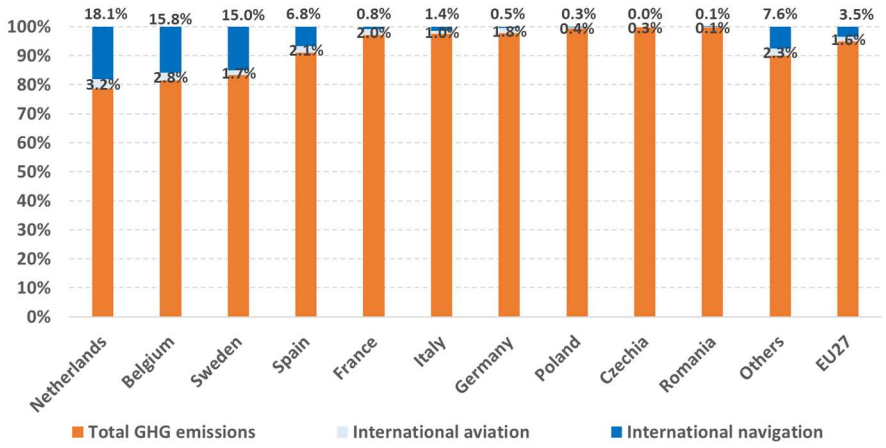


Figure 1.34 – *Share of national emissions in the inventories and international bunkers emissions (2020 data). Countries in descending order of international bunkers emissions share.*

The following graph shows the GHG emissions per unit of GDP. The indicator, which is related to figure 1.31, is affected by the role of bunkers and highlights the increase in carbon intensity per GDP in countries where bunkers have a significant share, such as the Netherlands. Whereas in Figure 1.31 the intensity of Netherlands is quite below the EU27 average, in Figure 1.35 the intensity is greater than the European average.

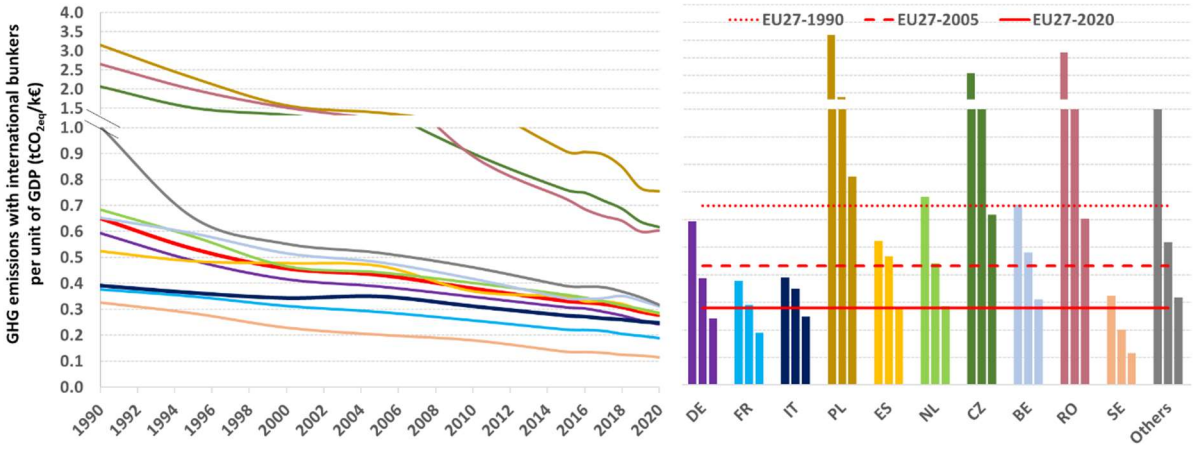


Figure 1.35 – *Greenhouse gas emissions including international bunkers per unit of GDP. For each country the bars on the right picture are 1990, 2005, and 2020 values.*

The gross available energy per unit of GDP (Figure 1.36) highlights the role of international bunkers energy consumption (cf. Figure 1.16) and shows that Italy's values are the lowest among the largest countries. Figure 1.36 makes evident the relevant amount of energy consumed by international bunkers in the Netherlands and Belgium moves these countries toward higher values of the indicator.

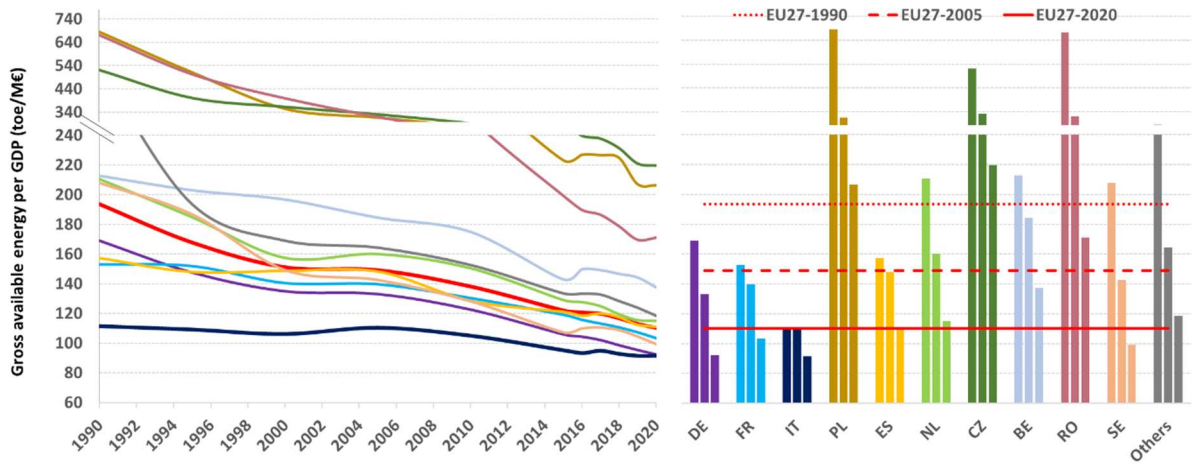


Figure 1.36 – *Gross available energy per unit of GDP. For each country the bars on the right picture are 1990, 2005, and 2020 values.*

With regard to the GHG emissions per unit of gross available energy, the contribution of nuclear power in France appears to be decisive for the reduction of carbon intensity (Figure 1.37, 1.38). The trend in Figure 1.37 can be compared with that observed in Figure 1.28, although the two indicators are different.

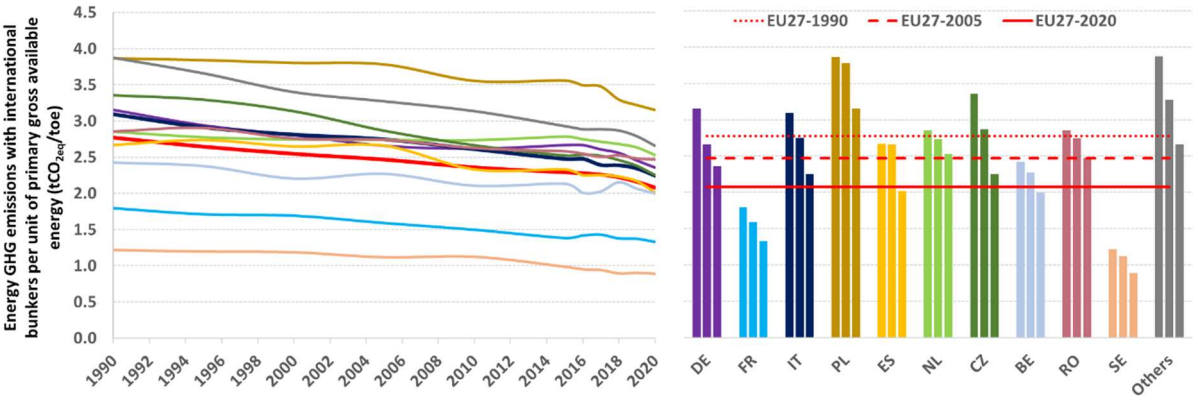


Figure 1.37 – *Energy GHG emissions including bunkers per gross available energy without non-energy final consumption. For each country the bars on the right picture are 1990, 2005, and 2020 values.*

Energy emissions per unit of gross available primary energy without nuclear energy in Figure 1.38 should be compared with those observed in Figure 1.30. The indicator shows that the higher the share of bunker emissions in countries compared to Italy, the greater the differences among carbon intensities of countries. As shown in Figure 1.30 the carbon intensities per unit of primary energy consumption of Italy, Spain, Belgium and France are quite overlapping in the recent years whereas in Figure 1.38 the carbon intensities per unit of gross available primary energy of the same countries are more parted and Italy's figures are below the values recorded for the other countries, except for Sweden.

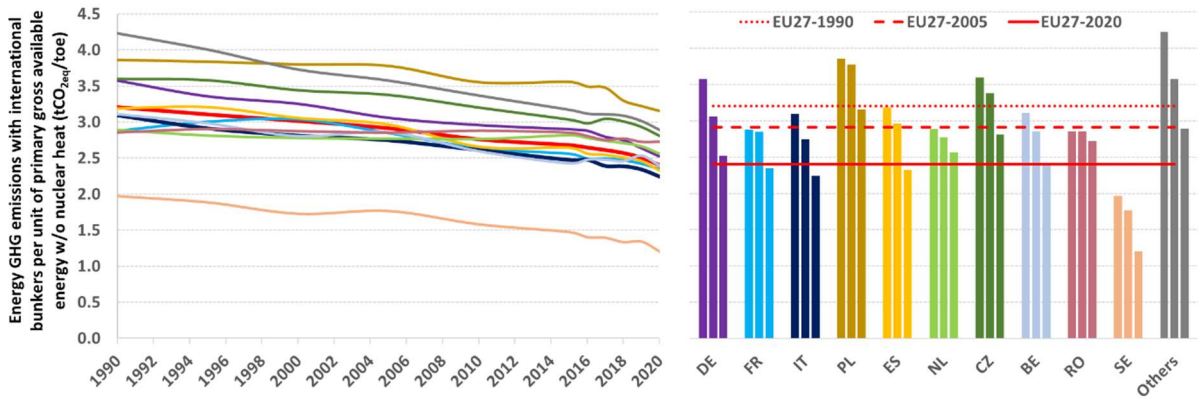


Figure 1.38 – *Energy GHG emissions including bunkers per gross available energy without non-energy final consumption and without nuclear energy. For each country the bars on the right picture are 1990, 2005, and 2020 values.*

1.2.2 *Sectoral efficiency and decarbonization*

Efficiency and decarbonization indicators have been developed at sectoral level considering final energy consumption and GHG emissions by value added. For households and transport the GDP is considered. The final energy consumption in industrial and transport sectors includes non-energy uses. Non-energy uses for the "other sectors" reported by EUROSTAT have been entirely attributed to the agriculture sector.

The comparison of efficiency and decarbonization indicators at sectoral level among Member States shows a rather heterogeneous situation. As for industry in Italy, the final energy intensity, final energy consumption by value added, have been overlapped to those of Germany since 2005. Among the European countries only Ireland, Denmark, Malta have lower industry energy intensities than Italy and Germany in 2020. Since 2005 the Italian average annual rate of energy intensity reduction is -1.4% (-1.6% in EU27). Poland, Czechia and Romania had the highest industry energy intensities, although higher annual average rates of reduction is registered (from -3.9% to -4.9% per annum). The industry intensities of the three countries decrease significantly and around 2007 are lower than levels recorded for the Netherlands and Belgium that, among the countries examined, show even in 2020 the highest energy intensity for industry.

In commercial and public services Italy shows a countertrend of energy intensity from other European countries in recent years. In particular, in the last years, the accounting of energy consumed by heat pumps since 2017 has increased the sector energy intensity. The average annual rate of energy intensity from 2005 to 2020 shows an increase of 0.8% for Italy against a decrease of -1.6% for EU27 average.

The agriculture sector shows a general decrease in energy intensity with an annual average rate of -0.7% since 2005 in EU27. The sector energy intensity for Italy in 2020 is higher than those recorded for Romania, Spain and Sweden, among the examined countries. The trend of Germany's indicator appears quite unrealistic.

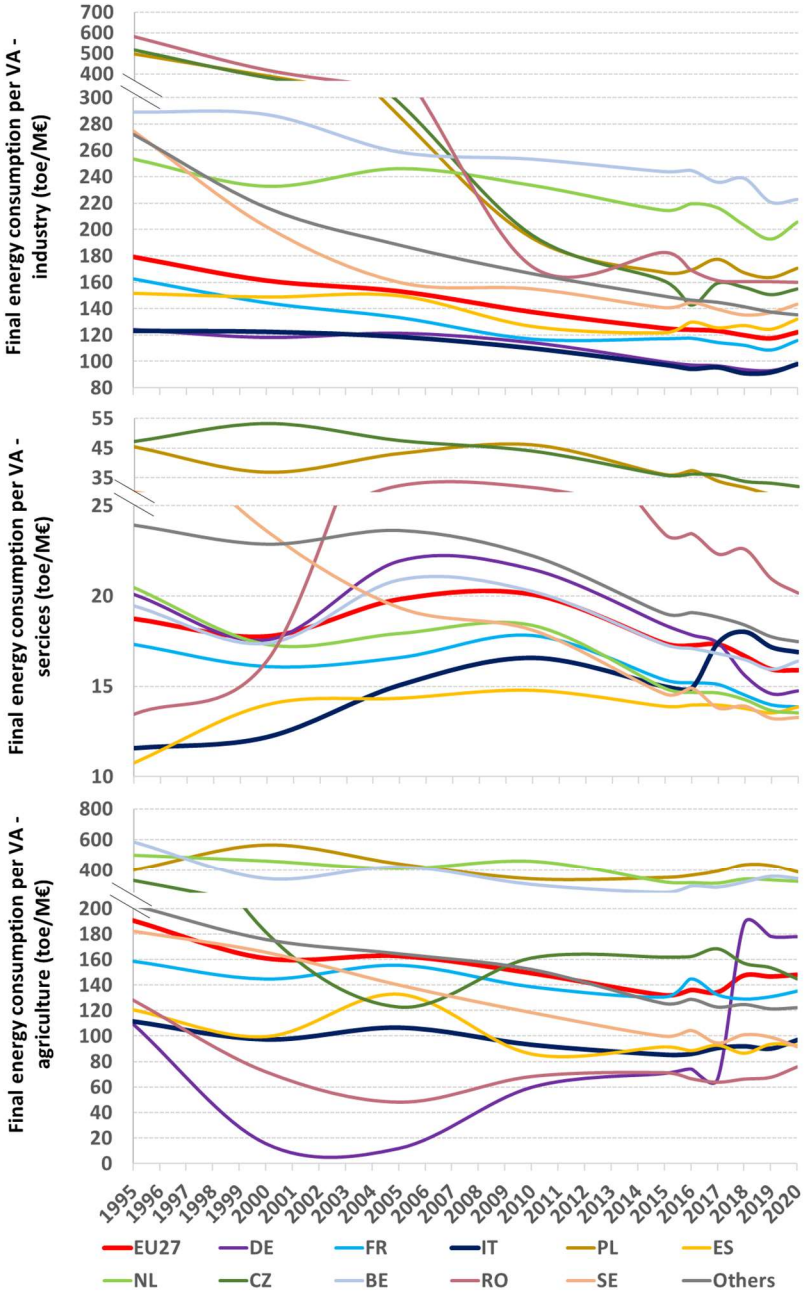


Figure 1.39 – *Final energy consumption per unit of sectoral value added.*

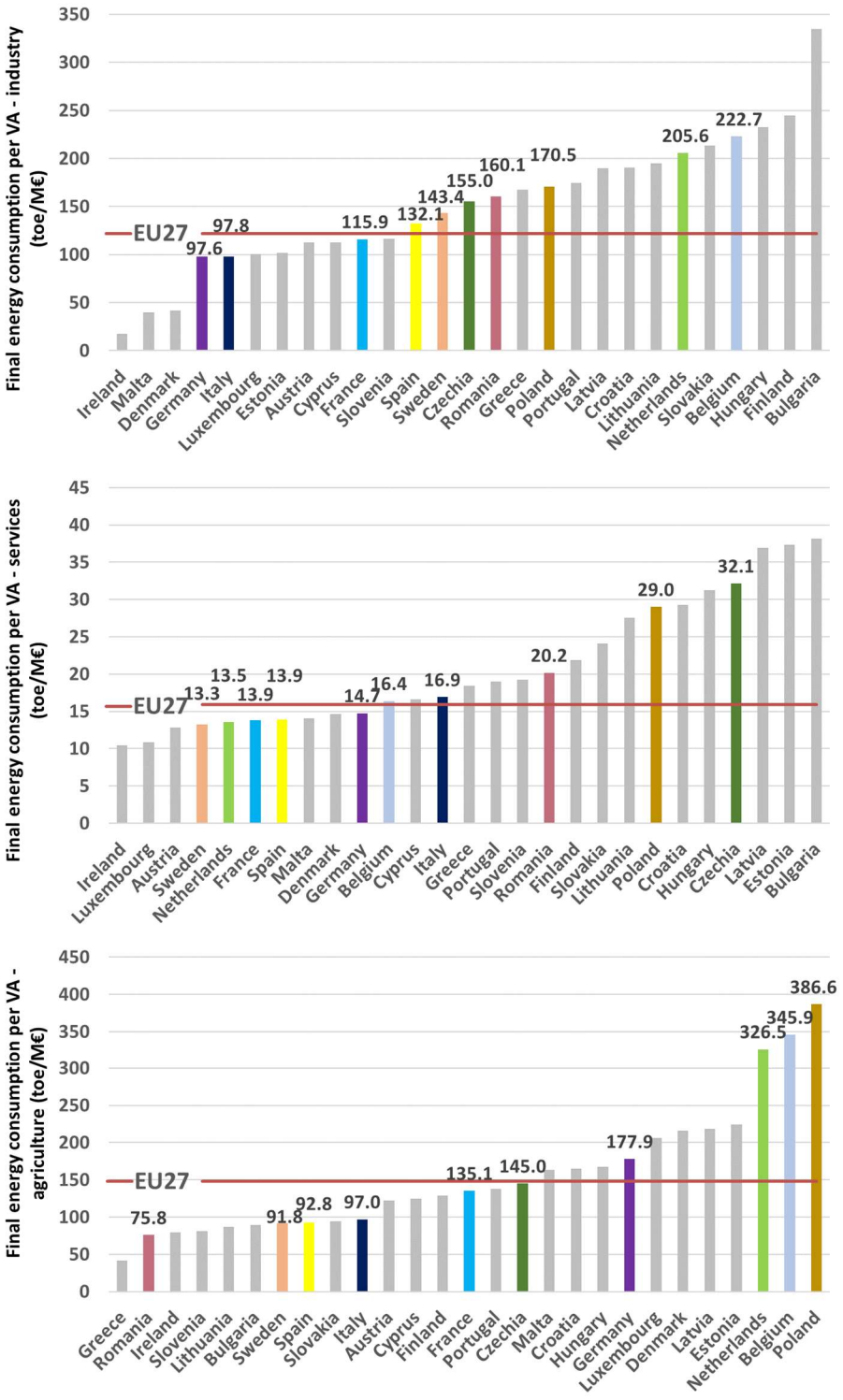


Figure 1.40 – *Final energy consumption per unit of sectoral value added in 2020. Countries in ascending order.*

The GDP will be considered to assess the energy intensity of those sectors not directly related to value added output, such as households and transport (Figure 1.41). In the household sector, since 2005 the countries examined show significative reductions of energy consumption per unit of GDP (from -0.5% per annum in Spain to -3.2% per annum in Poland), while Italy do not show any relevant change. The energy intensity trend for Italian transport is broadly comparable to EU27 even though with lower levels and slightly higher average annual rate decrease since 2005 (-1.9% vs -1.7%).

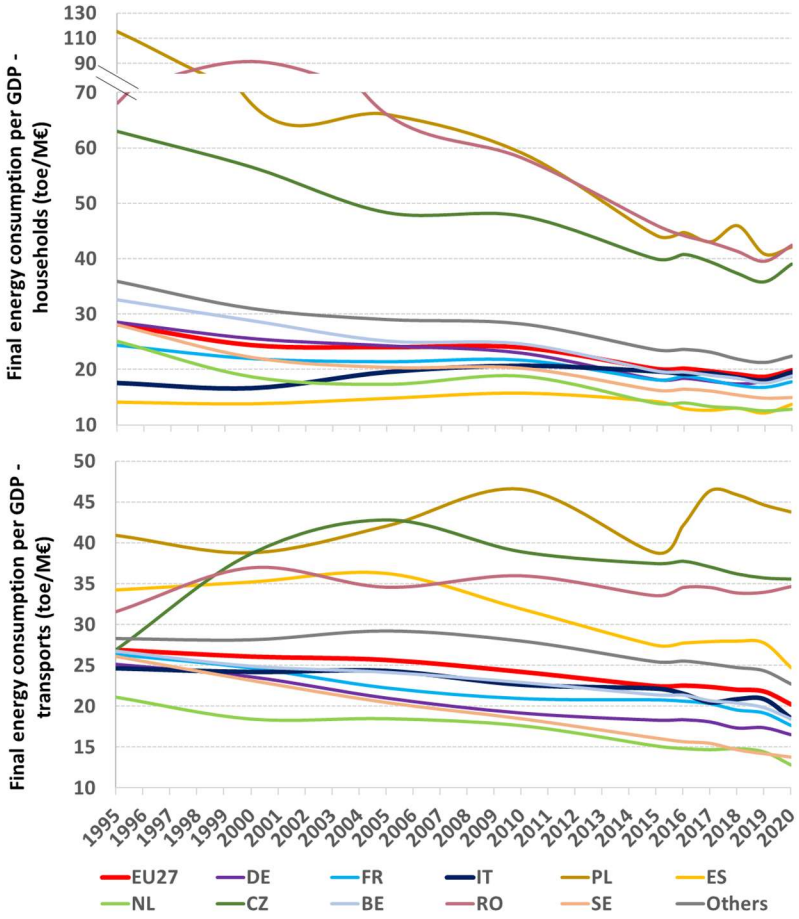


Figure 1.41 – *Final energy consumption per unit of GDP.*

What is seen for energy intensity is reflected in the carbon intensity (t CO_2eq/M€), but this indicator is sensible to the role of renewable energies, nuclear power and electricity import in the countries' energy balance because such sources are not related to GHG emissions. Among the biggest countries, the Italian industry has carbon intensities higher only than those of Sweden and Germany. For agriculture, the Italian carbon intensity in 2020 is among the lowest in Europe, after Greece and Sweden. The European average is 74.6% higher than the Italian intensity.

On the other hand, the civil sector (households and services) in Italy shows wide room for improvement with values higher than the EU27 average (+58.8% for households and +18.8% for residentials). The Italian civil sector therefore shows very wide emission reduction potentials, especially considering the sectoral electrification of final consumption in 2020 is much below the EU27 average (households: 18.6% *vs* 24.7%; services: 39.1% *vs* 47.9%).

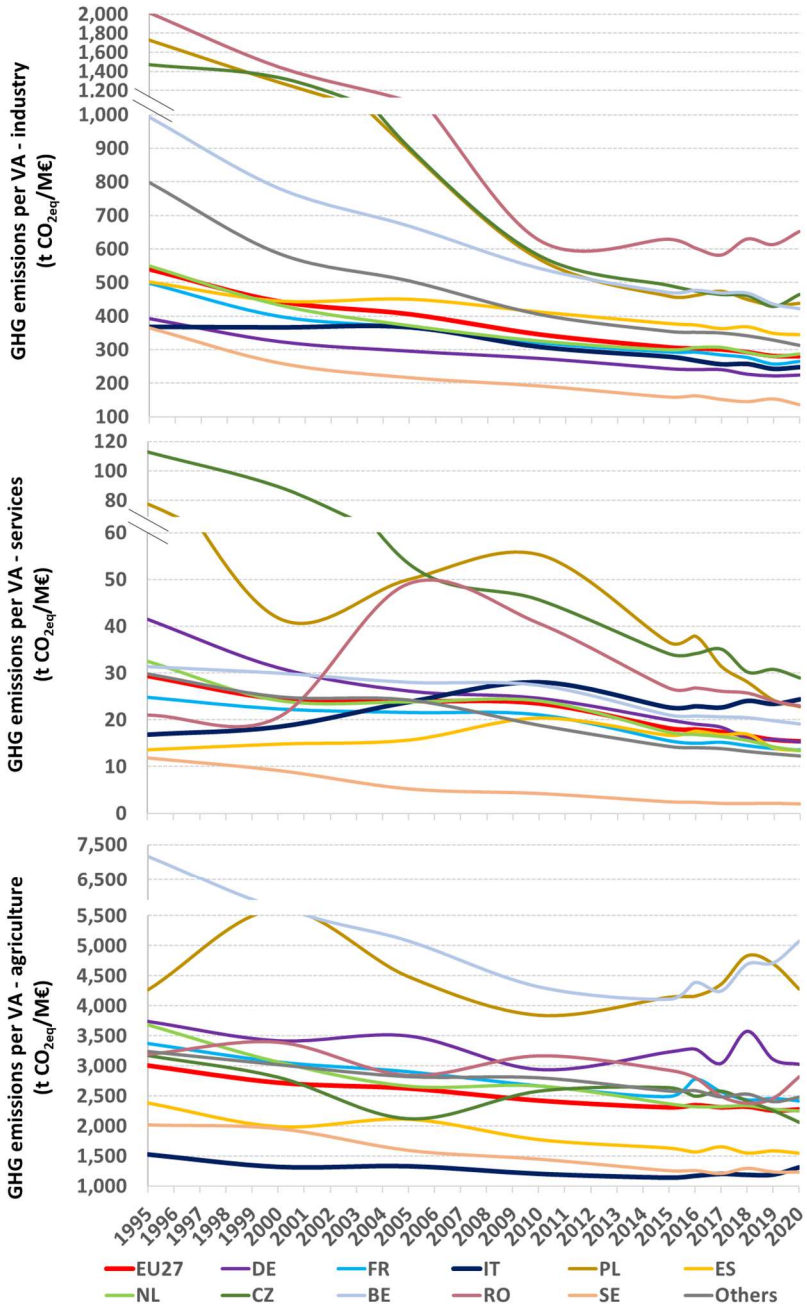


Figure 1.42 – *Greenhouse gas emissions per unit of sectoral value added.*

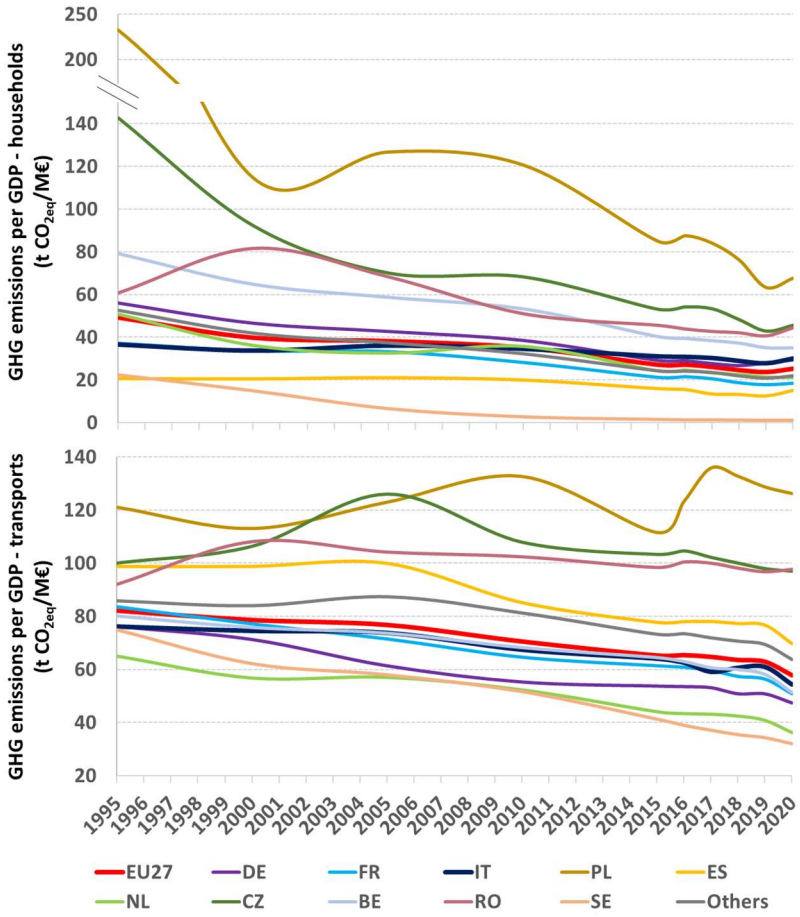


Figure 1.43 – *Greenhouse gas emissions per unit of gross domestic product.*

The following graphs show the position of the EU States in the space defined by the carbon and final energy intensities by sector added value. For each sector, it is evident that all countries move to the lower left corner from 2005 to 2020.

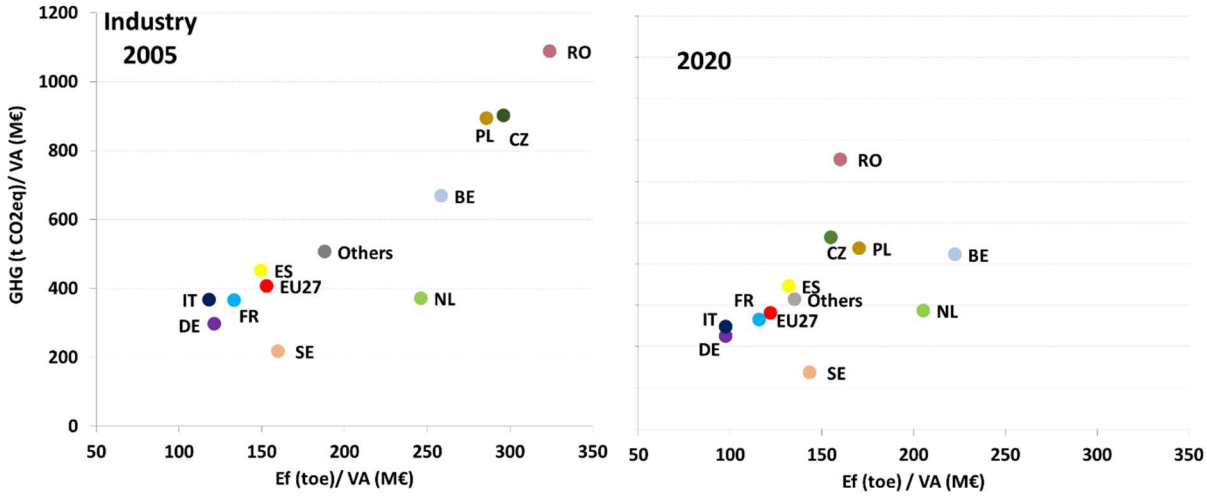


Figure 1.44 – *It is reported the position in the phase space defined by the energy (abscissa) and carbon intensities (ordinate) by value added of industry for the biggest European countries and for the groups of other countries.*

Unlike industry, the intensity for services shows that Italy has lost many positions compared to other countries. In particular, energy intensity increased from 15.1 toe/M€ to 16.9 toe/M€ from 2005 to 2020

and carbon intensity increased from 23.8 t CO_2eq/M€ to 24.4 t CO_2eq/M€, while other countries and EU27 show significative decreases.

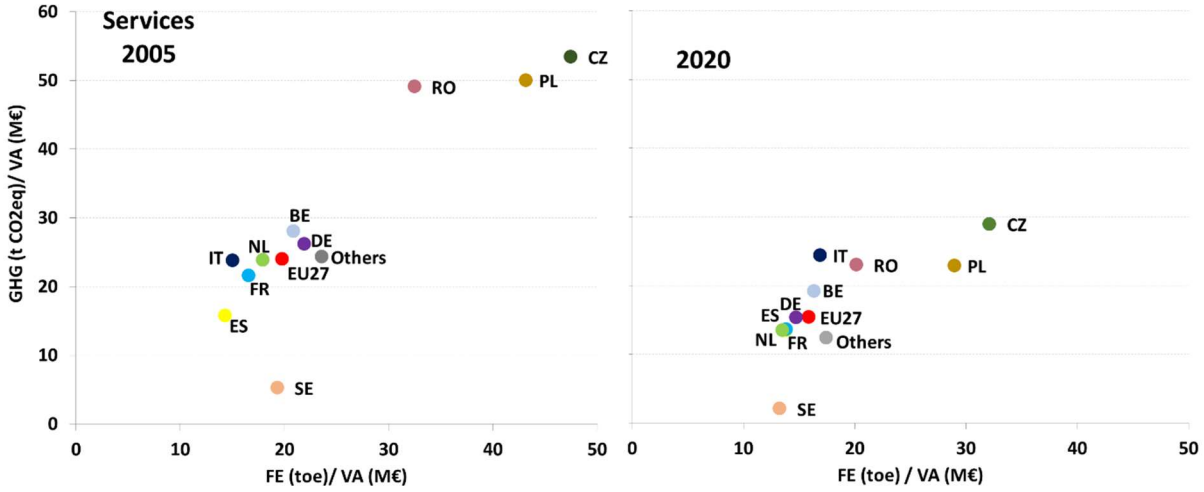


Figure 1.45 – *It is reported the position in the phase space defined by the energy (abscissa) and carbon intensities (ordinate) by value added of services for the biggest European countries and for the groups of other countries.*

The agriculture is the sector with highest intensities and the following graphs show that in 2020 Italy occupies the position at the lower left corner of the graph, together with Sweden and Spain.

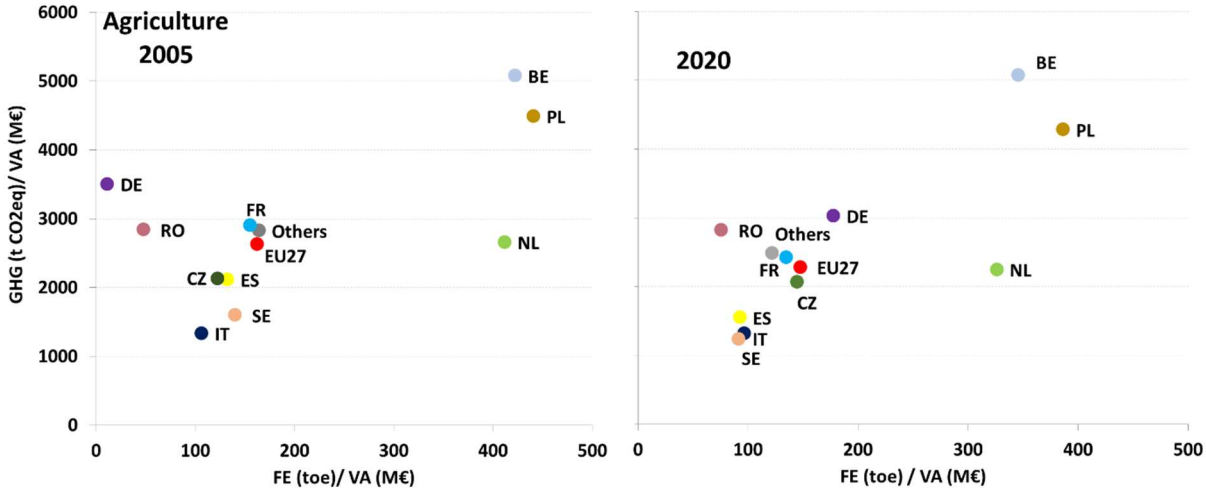


Figure 1.46 – *It is reported the position in the phase space defined by the energy (abscissa) and carbon intensities (ordinate) by value added of agriculture for the biggest European countries and for the groups of other countries.*

For the household and transport sectors, the intensities related to GDP are reported in the following graphs. For the household sector, too, it is clear that the Italian intensity has been overcome or reached by countries that had higher values in 2005, such as Germany and Belgium (Figure 1.47).

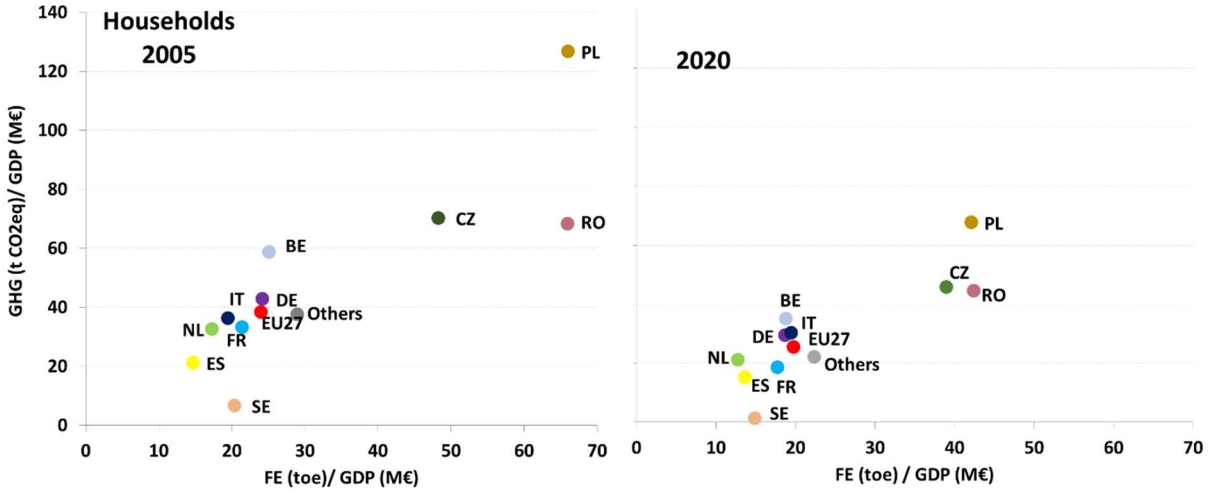


Figure 1.47 – *It is reported the position in the phase space defined by the energy (abscissa) and carbon intensities (ordinate) by value added of households for the biggest European countries and for the groups of other countries.*

The sector of transport shows the high linear correlation between GHG emissions and energy consumption, mainly made up of fossil fuels. For this sector too, it is possible to observe the shift of countries towards lower carbon and energy intensities, with the sole exception of Poland, which instead recorded an increase of both intensities (Figure 1.48).

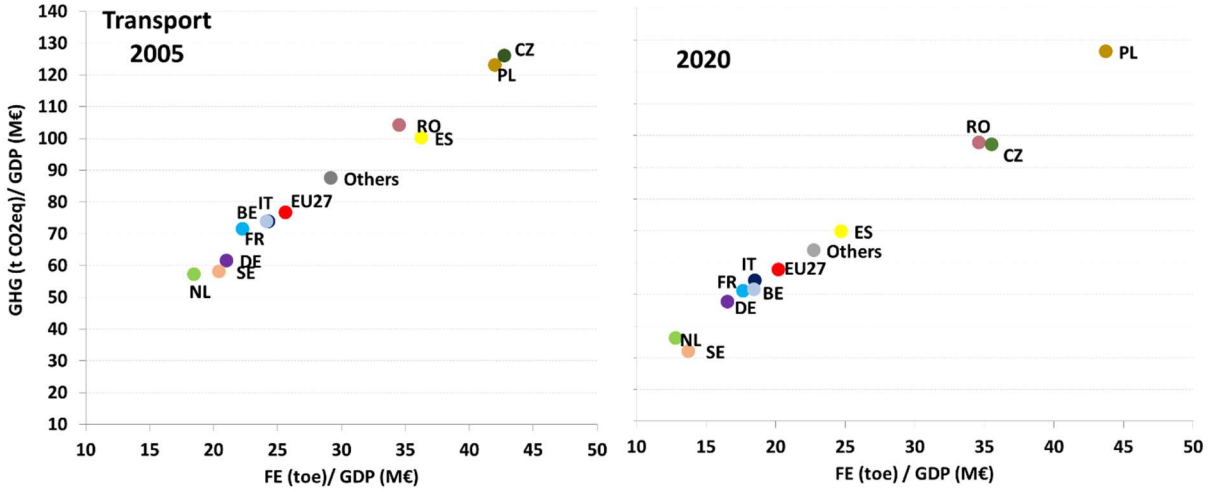


Figure 1.48 – *It is reported the position in the phase space defined by the energy (abscissa) and carbon intensities (ordinate) by value added of households for the biggest European countries and for the groups of other countries.*

1.3 Material flow accounts

This paragraph compares material flow accounts among countries *(EW-MFA Economy Wide - Material flow Accounts)*. The material flows for Italy are processed by ISTAT (2022) and communicated to EUROSTAT in whose database the material flows of the other Member States are also available (last download on 15 May 2022). For Italy, the historical series is drawn up from 1990 to 2020 (provisional data). The availability of data from other countries allows comparison only from 2000.

The EW-MFA is a measure of the interactions between the environment and the anthropogenic system, that is, the exploitation of resources used in human activities. EW-MFA provides an aggregate measure (mass) of material flows in and out of an economic system. In Eurostat's EW-MFA material inputs to the economy cover extractions of natural resources (excluding water and air) from the natural environment and imports of material products (goods) from the rest of the world economy.

Material outputs are disposals of materials to the natural environment and exports of material products and waste to the rest of the world. EW-MFA is a satellite account of national accounts prepared by ISTAT in accordance with the European Regulation 691/2011 on environmental accounting and is developed with harmonized methodologies at European and international level (ISTAT, 2022).

Indicators of *direct material inputs (DMI)* and *domestic material consumption (DMC)* describe, in aggregate terms, the direct use and provenance of natural resources and products. The first indicator includes all materials which have an economic value and are used for production and consumption activities and the indicator is calculated as the sum of internal extractions and imports. The second indicator represents domestic consumption of matter in the national economy net of exports and is calculated by subtracting from direct material inputs the share of physical exports.

The indicators make possible to analyse the material aspects of socio-economic metabolism related to the environmental sustainability of production and consumption patterns, and - in conjunction with the traditional national accounts, with which they are consistent - allow economic activity to be dissociated from environmental pressures and the intensity/efficiency of resource use (Femia and Paolantoni, 2012; Paolantoni and Femia, 2016). One economic system which, with the same flow of matter, produces more wealth than another is a more efficient system.

The following graph shows the consumption per capita of domestic material (DMC) by type of material. For each State or group of States, the material consumptions per capita and the resource productivity in the years 2000, 2005, 2010, 2015 and 2020 are reported. The resource productivity is a measure of the wealth produced per kg of material consumed and is calculated by the ratio of GDP (at purchasing power standard) to the mass of material consumed.

Since 2000, there has been an average decrease in domestic material consumption per capita in the European countries (-0.66% per annum in EU27), although countries show different rates of variation ranging from +6.84% per year in Romania Sweden to -3.15% in Spain. For Italy, the average annual rate of domestic material consumption per capita is -1.7%. Poland and Sweden increase the consumption with an average annual rate of 1.11% and 0.98% respectively. In 2020 Italy has the lowest domestic material consumption per capita among all EU27 countries.

As far as productivity is concerned, there is a general increase from 2000 to 2020, although the absolute values of the countries are very different. In most cases the increase was rather rapid with average annual growth rates ranging from 0.9% for Sweden to 5.5% for Spain. Italy showed an average annual increase of 3.9%. Among the biggest countries, the Netherlands shows the highest value in 2020 (4.6 €/kg), followed by Italy (3.6 €/kg). Germany and France productivities are 2.7 €/kg and 2.9 €/kg, respectively.

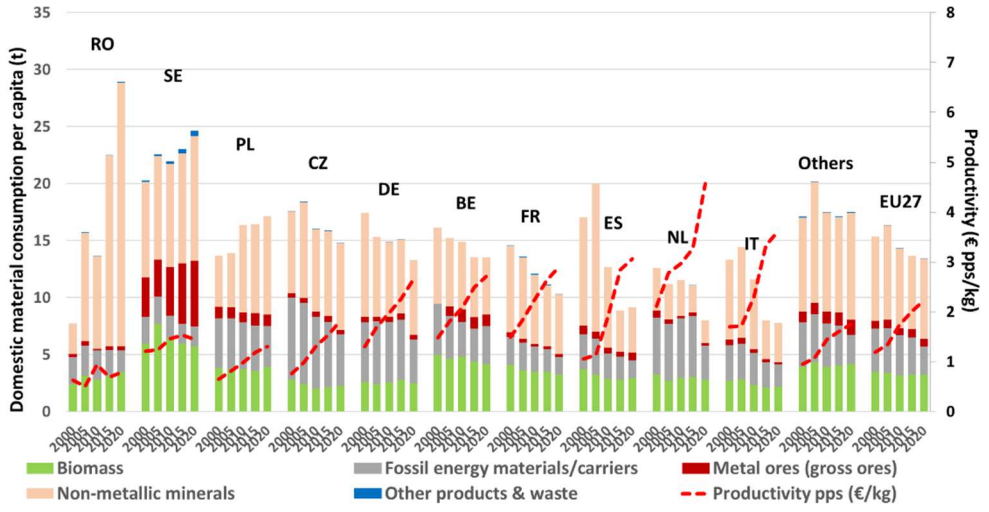


Figure 1.49 – *Domestic material consumption per capita by type of material and economic productivity at purchasing power standard. Countries sorted in descending order by DMC per capita in 2020.*

As already reported, direct material inputs (DMI) include all materials which are economically valued and are directly used in production and consumption activities. Such indicator is equal to the sum of internal extractions and imports. Since this indicator represents domestic consumption without exports, it is useful for assessing actual material consumption, including that not used in domestic production and consumption activities and addressed to exports.

The following graph, realized in the same way as the previous one, shows the direct material inputs per capita and the productivity. Sweden, Romania, Belgium and the Netherlands have high share of fossil extraction, biomass, and metal ores destined for exports and shows the highest DMI per capita among the biggest European countries, far above the European average. It is also clear the increasing DMI per capita recorded in Romania. According also to this indicator, Italy recorded in 2020 the lowest value among all European countries.

As far as productivity is concerned, Romania in 2020 has the lowest value (0.7 €/kg) among the countries examined and one of the lowest in Europe after Bulgaria. The productivity of the Netherlands for this indicator (1.4 €/kg) do not show high performance as for DMC. Italy has the highest productivity in Europe, with 2.8 €/kg, followed by France (2.4 €/kg), Spain and Germany (both with 2 €/kg).

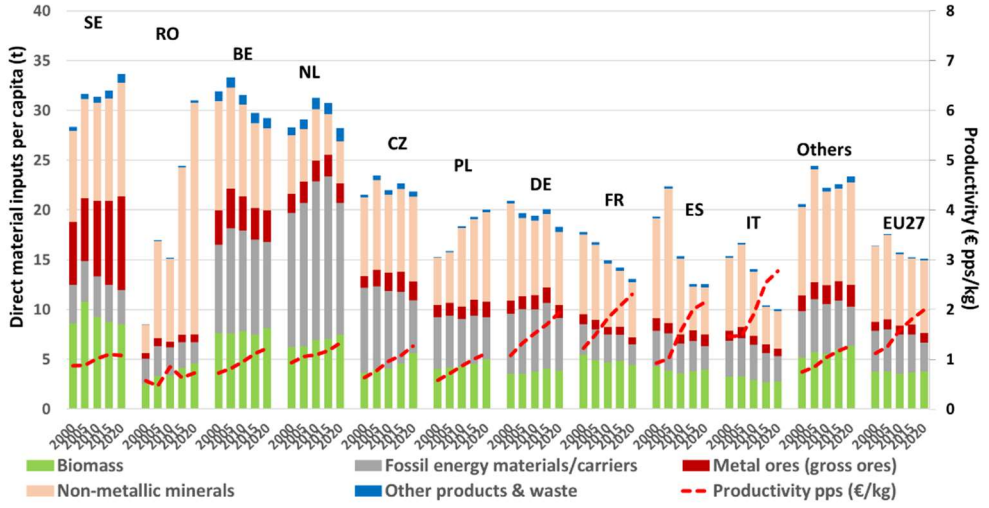


Figure 1.50 – *Direct material inputs by type of material per capita and economic productivity at purchasing power standard. Countries sorted in descending order by DMI per capita in 2020.*

The direct material inputs are far greater than the domestic material consumption due to the amount of material exported. The surplus percentage of DMI per capita relative to DMC per capita is on average 11.9% for EU27 in 2020, and ranges from 7.2%% in Romania to 253.5% in the Netherlands. Also for Belgium the share of export is quite relevant and the surpluses is 120.5%. The Italian figure is 30.2%, in line with the other biggest countries (France 26.5%; Germany 37.6%; Spain 39.7%).

It should be noted that the productivity reciprocal is an indicator of material intensity (Fischer-Kowalski *et al.*, 2011), *i.e.* a measure of the exploitation of material resources. The countries with the lowest productivity are therefore the countries with the greatest pressure on their material reserves.

Although productivity provides information on the economic efficiency of a system as a whole, it is nevertheless necessary to consider that efficiency depends not only on maximizing the performance of the material used but also on structural factors. In this sense, the country's economy structure plays a decisive role as concerns the material consumption. A service-based economy will have lower material consumption than an economy based more on manufacturing industry. As seen in the previous chapters, industrial activities are more energy-intensive than service activities. This is true to a greater extent for the material consumption which is the subject of extraction and transformation of industrial activities.

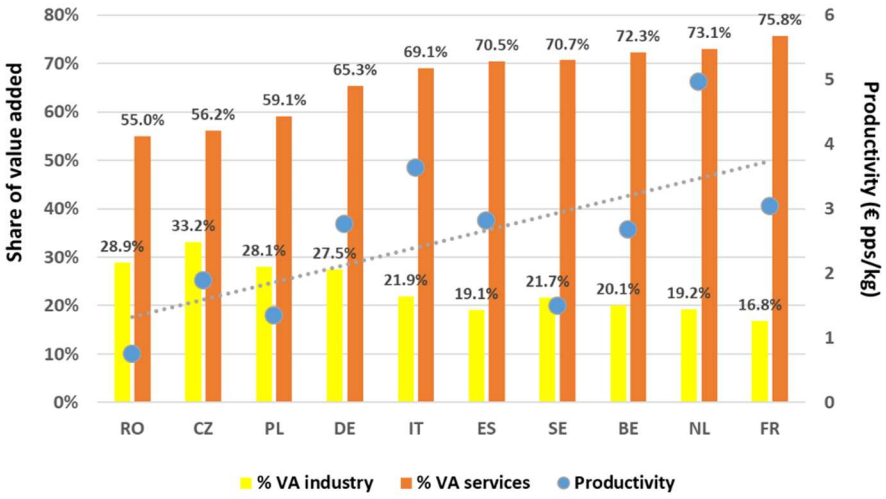


Figure 1.51 – *Share of value added for industry and services in 2020 and productivity for domestic material consumption. The data are sorted in increasing order for the share of services value added.*

It is therefore clear that resource productivity depends jointly both on the efficiency of resource use in each sector and on sector's share for each State. Material consumption at sectoral level is not available so it is possible to assess the role of each sector only using *proxy* variables to unbundle material consumptions at the level of single sector. In order to assess the impact of economic sectors on the productivity index, final energy consumption was used as a proxy to disaggregate the material consumption among sectors. The material consumption, similar to energy consumption, also takes place in sectors that do not have a corresponding value added, such as the households and transport sectors. In addition, transport is a cross-cutting sector which contributes to the value added of the productive sectors. No breakdown of transport energy consumption in the economic sectors was made for the following elaboration. The purpose of the breakdown is to assess the productivity range of the following economic sectors: industry (including construction), services and agriculture.

Domestic material consumption of each country has been broken down into sectors (including households and transport) according to their share of final energy consumption. The value added for industry and construction, services and agriculture has been divided by their estimated material consumption. Sectoral productivity highlights the contribution of each sector to total productivity. The following graph makes it clear that a predominantly service-based economy has a higher resource productivity than an industry-based economy regardless of the efficiency of individual sectors. The median sector productivity in 2020 is €0.9/kg in the industry and construction sector, € 6.5/kg in services and €1.1/kg in agriculture.

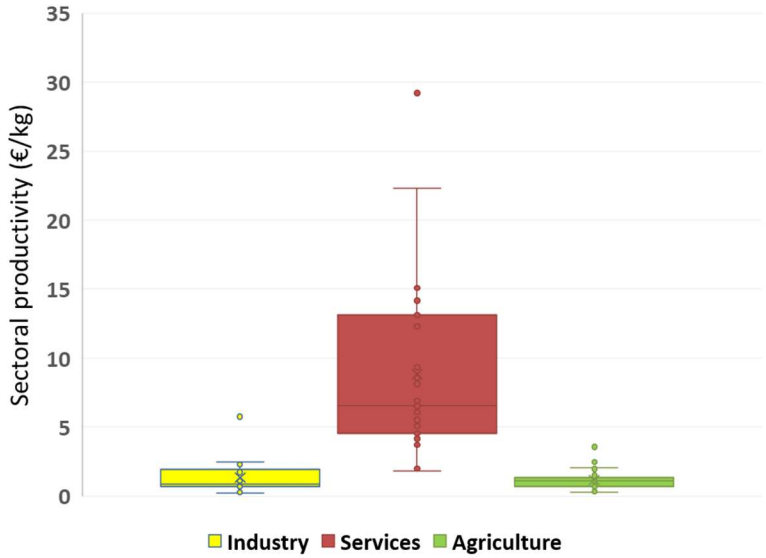


Figure 1.52 – *Estimated productivity by sector. For each sector, the minimum and maximum are reported outside the box. The box is delimited by the 25th and 75th percentiles. The whiskers are 5th and 95th percentiles. Line within the box is the median.*

The sectoral productivities in the countries examined range from 0.3 €/kg (Romania) to 2.4 €/kg (Italy) for industry and construction, 2.2 €/kg (Romania) to 29.2 €/kg (the Netherlands) for services and 0.3 €/kg (Poland) to 2.5 €/kg (Italy) for agriculture. What is shown in Figures 1.52 should therefore be combined with the share of value added for services and industry in the countries (Figure 1.51). Among the biggest countries Germany and Italy have relevant share of industrial value added, while the Netherlands, France and Spain have higher shares of value added from services.

The left side of the following graph shows that Italy, despite having a higher share of industrial value added than France and Spain, has a higher productivity of resources (DMC), a clear result of greater efficiency in the use of resources, especially in the industrial sector. This result is in line with what was previously seen for energy intensity indicators. Considering the DMI the right side of the graph shows that the productivity of resources decreases significantly. In particular, productivity in the Netherlands falls by 71.7% with regard to domestic material consumption productivity. For the other countries the reduction ranges from 6.7% for Romania to 54.6% for Belgium. The Italian figure shows a reduction of 23.2%.

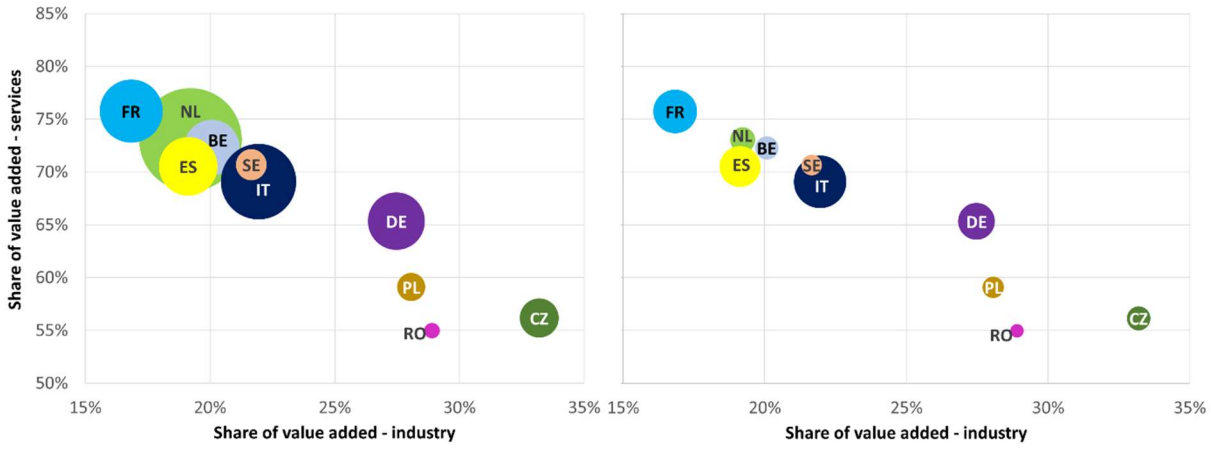


Figure 1.53 – *The examined countries are arranged in the space defined by the percentage of added value of industry (abscissa) and services (ordinate). For each country the circle size is proportional to the productivity for the domestic material consumption (left) and direct material inputs (right).*

1.4 Decomposition analysis: driving factors of GHG emissions in EU

Decomposition analysis is a technique for studying the variation over time of an indicator allowing the identification of the main drivers. In other words, the variation of a parameter is decomposed in the variation of its drivers.

The starting point of the analysis is the construction of an identity equation, where the variable of interest is represented as the product of components considered as the causes of the observed variation. This identity is provided *a priori* and have to be realized according to a conceptual model consistent with the physical constraints of the studied variable, and also considering data availability and the aims of the analysis.

This analysis has been developed in the economic literature with the aim of studying the impact of changes in the production structure on the industry energy demand. The analysis allows to examine the driving factors for energy uses in a given sector. This approach has also been extended in the environmental field, in the context of the analysis of atmospheric emissions, in order to understand the underlying causes of the variations (Zhang *et al.*, 2012: Malla, 2009).

Two main decomposition categories are available in the literature: *Structural decomposition analysis* (SDA) and *Index decomposition analysis* (IDA), (Hoekstra and van der Bergh, 2003; de Boer and Rodrigues, 2020). The two methodologies have been developed independently and have different characteristics both in relation to the scope and to the data they need. The main difference is the data model. IDA can only be applied to aggregated data at the sectoral level in vector form and allows to evaluate only the direct effects of the driving factors variation, while SDA allows both to use of *input-output* matrices with the evaluation of indirect effects and the use of sectoral data. Among the different IDA methodologies*, Logarithmic Mean Divisia Index* (LMDI) has a wide application in energy and environmental studies (Ang and Zhang, 2000).

For the purposes of this study, the aggregated data model does not allow preferences to be established between the two methodologies and LMDI has been applied due to the lower need for calculation and faster application. This methodology was applied according to the model proposed by Ang (2005).

Although the analysis of decomposition can be used to describe the driving factors for the GHG emissions, it should be stressed that the identity equation has among its assumptions the independence among factors, this assumption is also a limit of the analysis whose results can nevertheless be tested with the help of other statistical techniques, such as regression analysis.

1.4.1 *Index Decomposition Analysis (IDA)*

Index decomposition analysis has several approaches, a brief description of the methodology used in this work will be presented below: the *Logarithmic Mean Divisia Index* (LMDI) proposed by Ang (2005).

Let V be a variable subject to time variation in the range $(0, t)$. The variation of V from V^0 to V^t is determined by n factors ($X_1, X_2, ..., X_n$). Let i be the subcategories which drive the structural variations of V for each factor, so that for each subcategory is true the equation:

$$V_i = X_{1.i} \times X_{2.i} \times ... \times X_{n,i}$$

The aim is to derive the contribution of the n factors in the variation of V which can be expressed both in additive terms and multiplicative terms:

$$\Delta V = V^t - V^0 = \Delta V_{X1} + \Delta V_{X2} + ... + \Delta V_{Xn} \qquad \text{additive form}$$

$$\Delta V = V^t / V^0 = D_{X1} \times D_{X2} \times ... \times D_{Xn} \qquad \text{multiplicative form}$$

The general formula for applying the LMDI are as follows:

$$\Delta V_{xk} = \sum_i L(V_i^t, V_i^0) \ln\left(\frac{X_{k,i}^t}{X_{k,i}^0}\right)$$

$$D_{xk} = \exp(\sum_i \frac{L(V_i^t, V_i^0)}{L(V^t, V^0)} \ln(\frac{X_{k,i}^t}{X_{k,i}^0}))$$

where $L(a, b) = (a - b)/(\ln a - \ln b)$and $L(a, a) = a$

1.4.2 *Kaya Identity and driving factors of greenhouse gas emissions*

The driving factors of greenhouse gas emissions considered in this report were borrowed from the report published in 2014 by the European Environmental Agency which had among its objectives the evaluation of the role of the economic crisis in the reduction of greenhouse gas emissions (EEA, 2014).

The starting point of the analysis is an identity equation (*Kaya Identity*), which breaks down the time variation of greenhouse gas emissions into the different factors. In the EEA study, the decomposition concerned energy emissions, directly associated with primary energy consumption. In this study total emissions, including process emissions, are considered.

In the simplest form, 4-factor formulation, the *Kaya Identity* is:

$$\mathbf{E = P \times g \times e \times f}$$

where:
E = CO_2eq emissions
P = Population
g = GDP per capita (GDP / P)
e = Energy intensity of the economy (Energy consumed / GDP)
f = Carbon intensity of energy (Emission / Energy consumed)

Such formulation is a useful tool because mitigation policies act directly on energy and carbon intensities. Moreover, it is possible to process a 6-parameter version in which the term *f* (carbon intensity of energy) is divided into further three terms that consider:

- efficiency in energy production (from fuel)
- how many non-fossil fuels are used
- what fossil fuels are used (carbon content)

the 6-parameter *Kaya Identity* is therefore:

$$\mathbf{E = P \times g \times e \times k \times c \times s}$$

Where:
e = Energy intensity of the economy (final energy consumption / GDP)
k = Energy efficiency index (gross inland energy consumption / final energy consumption)
c = Consumption of fossil fuels (fossil fuel consumption / gross domestic energy consumption)
s = Average emission factor of fossil fuels (fossil fuel emissions/ fossil energy consumption)

The c factor is inversely correlated to the renewable share, so it provides information about the role of renewable consumption in the reduction of GHG emissions.

The trend of *kaya identity* parameters for EU28 and EU27 in the period 1995-2019 is shown in the next graph, with values normalized to 2005. The sharp reduction of GHG emissions since 2005 corresponds mainly to a decrease of driving factors such as final energy consumed per unit of GDP and share of renewable energy consumed. The other factors (efficiency and carbon intensity) show lesser decreases, while the population and GDP are the factors with increasing trend. The GHG emission change is the integrated result of the driving factors change.

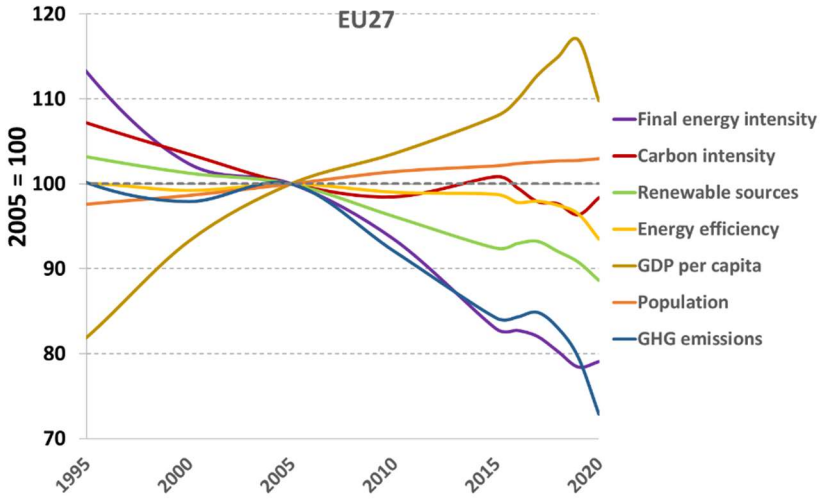


Figure 1.54 – *Trend of kaya identity parameters normalized to 2005 in EU27.*

Moreover, the pictures show the marked decoupling between GHG emissions and GDP following the increasing share of renewable energy, the increase of efficiency, and the decrease of energy intensity. As for 2020 it is important to consider that GHG emissions, as well as the GDP, have been heavily affected by the measures adopted at different level by States to contain SARS-CoV-2 pandemic.

The trend of the *Kaya Identity* for the examined countries is reported in Figure 1.53. Each country shows some degree of decoupling between GHG emissions and GDP per capita, although with a wide range and much differentiated role of driving factors. Higher decoupling is observed for those States where the GDP per capita has a growing trend.

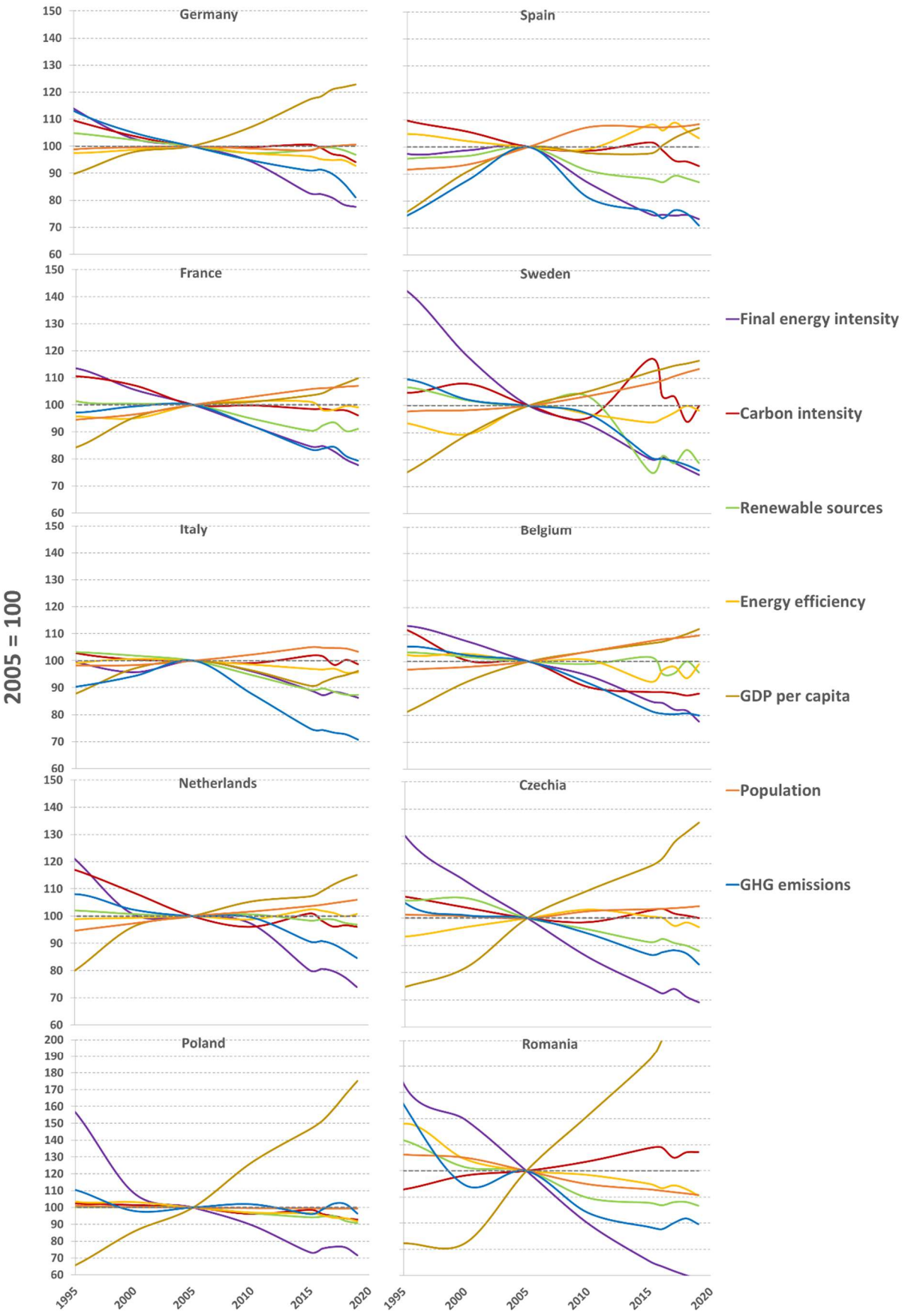


Figure 1.55 – *Trend of Kaya identity parameters normalized to 2005 in the biggest European countries.*

Among the countries examined, Italy and Spain are the only States with 2020 GDP per capita below the level of 2005. Such factor contributes for its share to reduce GHG emissions in the two States. In the other States, there is evidence of a greater decoupling of economic growth and GHG emissions. Poland and Romania show the highest distance between the two parameters.

The decomposition analysis allows to quantify the contribution of each driving factor. The identity is expressed in logarithmic form:

$$ln(GHG) = ln(POP)\, x\, ln\left(\frac{GDP}{POP}\right)\, x\, ln\left(\frac{GIC}{FEC}\right)\, x\, ln\left(\frac{FFC}{GIC}\right)\, x\, ln\left(\frac{GHG}{FFC}\right)\, x\, ln\left(\frac{FEC}{GDP}\right)$$

where

GHG: greenhouse gas emissions;

POP: population (effect of population);

GDP/POP: Gross domestic product per capita (effect of economic growth);

GIC/FEC: gross inland energy consumption on final energy consumption, including non-energy uses (efficiency effect);

FFC/GIC: fossil fuel energy consumption on gross inland energy consumption (effect of renewable energy);

GHG/FFC: total GHG emissions from fossil fuels energy consumption (effect of carbon intensity from fossil fuels);

FEC/GDP: final energy intensity on gross domestic product (effect of energy intensity).

The individual terms of the equation therefore allow us to consider the effect of population, economy, efficiency, renewable sources, carbon intensity, and energy intensity.

Below are the values of the parameters for the years 2005 and 2019.

Table 1.2 – *Values of the parameters used for the decomposition analysis of GHG emissions change in the years 2005 and 2020 for EU27, and for the States examined.*

	EU27	
	2005	**2020**
GDP (Bln €, chain linked volumes - 2015)	11,079.1	12,522.6
Gross inland energy consumption - CIL (Mtoe)	1,603.9	1,340.1
Renewable energy – RE (Mtoe)	1,091.5	975.3
Final energy consumption – FEC (Mtoe)	120.0	239.7
Fossil energy consumption –FFE (Mtoe)	1,245.9	922.9
Population – POP (Millions)	434.4	447.3
CO_2eq – GHG (Mt CO_2eq)	4,540.6	3,308.9

	Germany		France		Italy		Spain	
	2005	**2020**	**2005**	**2020**	**2005**	**2020**	**2005**	**2020**
GDP (Bln €, chain linked vol. - 2015)	2,624.6	3,096.7	2,005.2	2,173.3	1,737.6	1,573.2	1,028.7	1,064.6
Gross inland consumption - CIL (Mtoe)	346.5	284.7	277.3	223.7	189.4	141.6	144.5	111.8
Renewable energy – RE (Mtoe)	231.9	214.6	166.8	140.7	140.1	109.9	102.1	78.1
Final consumption – FEC (Mtoe)	18.8	46.9	15.9	28.6	14.1	29.3	8.4	19.1
Fossil consumption –FFE (Mtoe)	286.1	222.8	150.0	106.8	171.1	109.5	121.3	77.2
Population – POP (Millions)	82.5	83.2	62.8	67.3	57.9	59.6	43.3	47.3
CO_2eq – GHG (Mt CO_2eq)	986.7	728.7	556.1	399.4	590.9	381.2	442.3	274.7

	Poland		Netherlands		Czechia		Sweden	
	2005	**2020**	**2005**	**2020**	**2005**	**2020**	**2005**	**2020**
GDP (Bln €, chain linked vol. - 2015)	294.6	500.6	620.7	728.5	137.9	183.1	374.5	481.2
Gross inland consumption - CIL (Mtoe)	92.6	103.0	83.7	71.9	45.5	40.2	51.4	45.2
Renewable energy – RE (Mtoe)	62.1	76.0	62.5	55.2	27.9	26.2	34.1	33.2
Final consumption – FEC (Mtoe)	4.5	13.0	2.3	6.8	2.1	5.1	14.6	23.2
Fossil consumption –FFE (Mtoe)	89.0	88.9	78.8	64.1	38.1	28.4	18.8	12.1
Population – POP (Millions)	38.2	38.0	16.3	17.4	10.2	10.7	9.0	10.3
CO_2eq – GHG (Mt CO_2eq)	405.2	376.0	212.4	163.9	148.1	112.8	66.8	46.3

	Belgium		Romania	
	2005	**2020**	**2005**	**2020**
GDP (Bln €, chain linked vol. - 2015)	362.9	420.8	121.0	188.5
Gross inland consumption - CIL (Mtoe)	59.3	51.4	38.7	32.2
Renewable energy – RE (Mtoe)	41.7	38.1	26.2	24.8
Final consumption – FEC (Mtoe)	1.2	4.9	4.9	6.0
Fossil consumption –FFE (Mtoe)	45.1	37.8	32.6	23.1
Population – POP (Millions)	10.4	11.5	21.4	19.3
CO_2eq – GHG (Mt CO_2eq)	145.5	106.4	146.9	113.6

The following graph shows the results of the decomposition analysis for EU27.

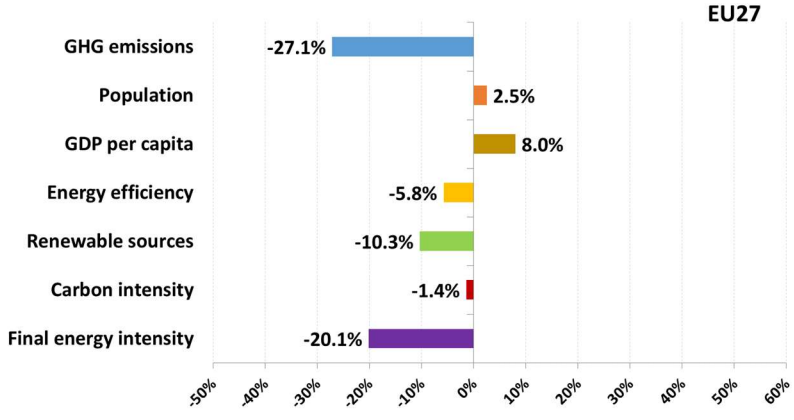


Figure 1.56 – *Decomposition analysis of GHG emissions in EU27 in the period 2005-2020.*

The decomposition analysis for each country shows that in the period 2005-2020 the effect of the factors that led to the emission reductions prevailed over the effect of the factors that led to the increase. In Italy, the population and carbon intensity are the only factors that have contributed to the growth of GHG emissions: +2.4% and +0.7%, respectively. The remaining factors have led to the reduction of emissions. Among these, the final energy intensity (final energy consumption / GDP; -11.6%), the share of renewable energy (fossil energy consumption / gross inland energy consumption; -12.6%) played a significant role along with the GDP per capita (-10.5%) fall down in 2020 due to lockdown measures to contain SARS-CoV-2 pandemic. The contribution of all factors leads to the reduction of GHG emissions over the period 2005-2020 of -35.5%.

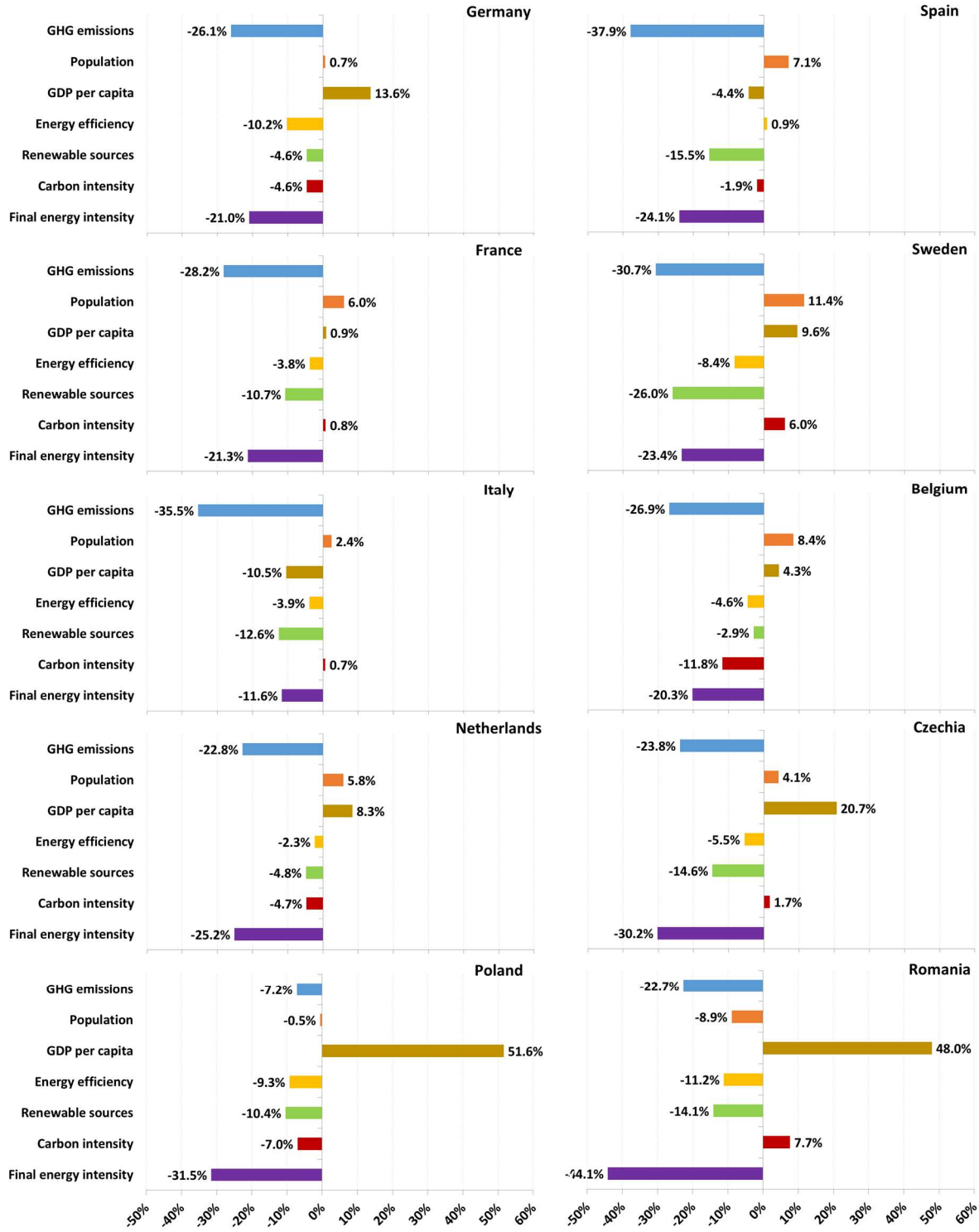


Figure 1.57 – *Decomposition of GHG emissions in the period 2005-2020.*

In summary, higher decoupling between economy and GHG emissions has been registered in every country than that recorded in Italy and the reduction of economic activities played a role to decrease the emissions in Italy more relevant than in other countries. It should be considered that the Italian drastic GDP reduction in 2020 was due to the lockdown of economic activities and a more detailed decomposition analysis shows that the driving role of economy to reduce the GHG emissions is limited to the last year (ISPRA, 2022[b]).

The decoupling does not necessarily correspond to emission reductions in line with the targets to be achieved by 2020. According to EEA (2021), among the largest countries, France, Italy, the Netherlands, Spain, and Sweden had achieved their 2020 GHG reduction target from the Effort Sharing sectors, while Germany 2020 Effort Sharing emissions level (proxy EEA) do not reach the country's target; as for the renewable target, France do not meet the renewable share targets outlined in its national renewable energy action plans; as for efficiency target Germany and Belgium, among the biggest countries, do not meet their final energy consumption targets in 2020 (proxy EEA). Moreover, it should be emphasized that the analysis of the decomposition focuses on the relative variations of the parameters without assigning any weight to the respective starting points. As already mentioned, the economic and energy efficiency of the Italian system is among the highest in Europe. *The 2018 International Energy Efficiency Scorecard,* issued by the *American Council for an Energy-Efficient Economy* (ACEEE), assigns the first position to Italy, together with Germany among 25 nations globally, with scores assigned according to quantitative and qualitative parameters, including efficiency indicators and policies aimed at reducing consumption. The last edition of the *International Energy Efficiency Scorecard*, issued by ACEEE on 1st April 2022, reported for Italy the drop of four ranks mainly due to buildings section, but Italy managed to rank within the top five, after France, UK, Germany, and the Netherlands.

The efficiency improvement cannot be separated from the assessment of the potentials and cost effectiveness of the energy system change, as well as a mindful assessment of the economy structure have to be considered, especially concerning the role of services and industry.

2 POWER SECTOR

The power sector is one of the largest GHG emission sources in Europe. Sector 1.A.1.a., according to the classification adopted by the *Common Reporting Formats* submitted to UNFCCC, represents emissions from "Public electricity and heat production", *i.e.* thermoelectric plants that supply electricity to the grid. The sector's GHG emissions in 2005 in EU27 were around 33.6% of the energy emissions and about 26.4% of total emissions, both shares sharply decreasing to 26.3% and 19.8% in 2020, respectively. However, it should be noted that sector 1.A.1.a does not represent the whole electricity system, since emissions from auto producers shall be allocated/accounted for in the specific categories and subcategories (refineries, other energy industries, iron and steel plants and other manufacturing industries) of the Energy sector. In 2005, auto produced electricity from fossil energy in EU27 accounted for 12.3% with an increasing share up to 19.7% in 2020. GHG emissions due to electricity generation are therefore higher than the figures reported in sector 1.A.1.a. of CRF.

The electricity sector is therefore one of the main objectives for measures aimed to decarbonize the economy, both for the amount of GHG emissions and potential for deployment of renewable energy sources. Since 2005, such sources have more than doubled their share of electricity production in EU27 from 15.4% to 38.4% in 2020.

The physical peculiarities of emission sources are important in this respect since the electricity sector is characterized by a relatively small number of large point sources, unlike other sectors, such as transport, which is equally relevant in emissive terms although characterized by millions of small and mobile sources with greater inertia as far as the deployment of renewable energies is concerned.

The renewable energy consumption must be 32% of gross energy consumption by 2030 and a significant role will be played by the electricity sector. According to JRC (2017) "to reach the target of 30% renewable energy[1], in 2030 it is necessary that 54% of the gross electricity production in EU is from renewable energy." The current target of 32.5% for renewable energy by 2030 has been revised with the proposal of European Commission for amending the Renewable Energy Directive setting the target to at least 40% for renewable energy sources in the EU's overall energy mix. Following the events of the Russia-Ukraine war the European Parliament proposed to raise the target to 45%. The new targets require massive actions across power sector to phase out the EU's dependence on Russian fossil fuels and to move towards a climate-neutral economy.

2.1 Methodological notes and sources of data

The data related to the electricity sector in the European countries are from EUROSTAT database as for the previous chapter.[2] The renewable energy share required to achieve the European 2020 target are communicated by Member States in accordance with Directive 2009/28/EU.[3]

For the estimation of GHG emissions from the electricity sector, fuels used in the thermoelectric sector are considered according to the EUROSTAT fuel classification given in the following table. The default emission factors for CO_2, CH_4, and N_2O of the IPCC guidelines (2006) are also reported:

[1] the target was subsequently revised.

[2] http://ec.europa.eu/eurostat/data/database

[3] http://ec.europa.eu/eurostat/web/energy/data/shares

Table 2.1 – *List of fuels used in the thermoelectric sector according to the EUROSTAT classification and default emission factors of CO_2, CH_4, and N_2O for stationary sources in the energy industries (IPCC, 2006).*

Type	Fuels	Emission factors		
		CO_2 t/TJ	**CH_4 kg/TJ**	**N_2O kg/TJ**
Solid	Patent fuels	97.5	1.0	1.5
	Anthracite	98.3	1.0	1.5
	Coking coal	94.6	1.0	1.5
	Other bituminous coal	94.6	1.0	1.5
	Sub bituminous coal	96.1	1.0	1.5
	Coke oven coke	107.0	1.0	1.5
	Gas coke	107.0	1.0	0.1
	Coal tar	80.7	1.0	1.5
	Lignite	101.0	1.0	1.5
	Brown coal briquettes	97.5	1.0	1.5
	Peat	106.0	1.0	1.5
	Peat products	106.0	1.0	1.5
	Oil shale and oil sands	107.0	1.0	1.5
Oil	Crude oil	73.3	3.0	0.6
	Natural gas liquid	64.2	3.0	0.6
	Refinery gas/Refinery feedstocks	57.6	1.0	0.1
	Liquefied petroleum gas	63.1	1.0	0.1
	Other kerosene	71.9	3.0	0.6
	Kerosene-type jet fuel (excluding biofuel portion)	71.5	3.0	0.6
	Naphtha	73.3	3.0	0.6
	Gas oil and diesel oil (excluding biofuel portion)	74.1	3.0	0.6
	Fuel oil	77.4	3.0	0.6
	Bitumen	80.7	3.0	0.6
	Petroleum coke	97.7	3.0	0.6
	Other oil products n.e.c.	73.3	3.0	0.6
Natural gas	Natural gas	56.1	1.0	0.1
Derived gases	Coke oven gas	44.4	1.0	0.1
	Blast furnace gas	260.0	1.0	0.1
	Gas works gas	44.4	1.0	0.1
	Other recovered gases	50.3	1.0	0.1
Other non-renewable	Industrial waste (non-renewable)	143.0	30.0	4.0
	Non-renewable municipal waste	91.7	30.0	4.0
Other renewables	Renewable municipal waste	-	30.0	4.0
	Primary solid biofuels	-	30.0	100.0
	Biogases	-	1.0	0.1
	Pure biodiesel	-	3.0	0.6
	Other liquid biofuels	-	3.0	0.6

The analysis of the main parameters of the electricity sector will concern the selected European countries, as illustrated in the previous chapter, and at aggregate level the group of other countries and EU27. The countries examined for comparison with Italy account for 83.2% of EU27 gross electricity production in 2020. As for the previous chapter energy data of EU28 and UK are no more available in EUROSTAT database.

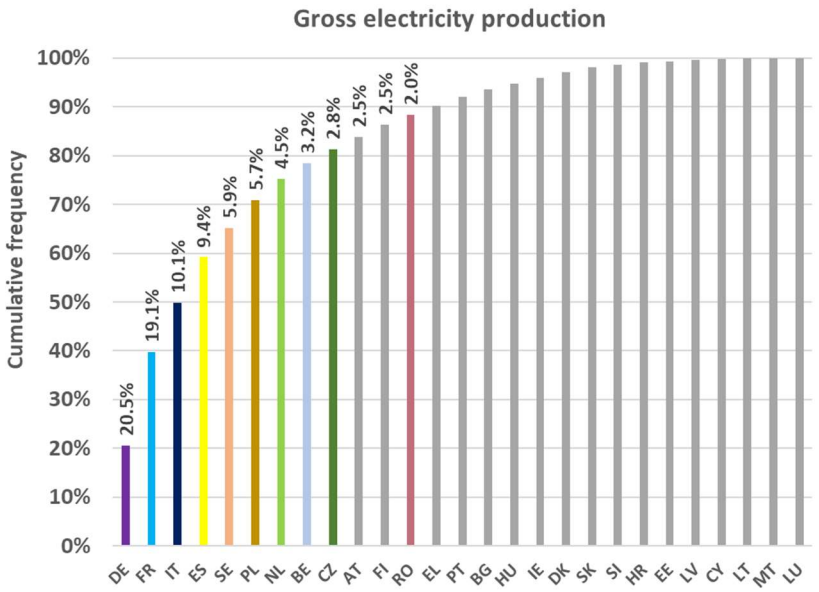


Figure 2.1 – *Cumulative frequencies for gross electricity production in the EU27 countries (data 2020). The labels of country frequencies higher than 2% are reported.*

The amounts of energy allocated to the production of electricity and heat in cogeneration plants have been calculated according to the methodology proposed by EUROSTAT (2016) for the compilation of national questionnaires by Member States.

The following equation defines the total efficiency (ε):

$$\varepsilon = (H + E) / F \qquad (1)$$

where H is the heat produced, E is the electricity produced and F is the fuel energy.

The fuel used for electricity production, F*e*, and that used for heat production, F*h*, are given by the equations:

$$Fe = F - (H / \varepsilon = F \times [E/ (E + H)] \qquad (2)$$

$$Fh = F - (E / \varepsilon = F \times [H/ (E + H)] \qquad (3)$$

In this way it is possible to allocate the fuel energy used in cogeneration plants for the production of electricity and heat in order to calculate the emission factor for electricity production.

The total efficiency (ε_t) and the electrical efficiency (ε_{el}) are calculated with the equations:

$$\varepsilon_t = (H + E) / F \qquad (4)$$

$$\varepsilon_{el} = E / F \qquad (5)$$

Another way for comparing the electrical efficiency of different countries considers only the share of fuel allocated to electricity generation after having parted the share of fuel for heat generation (according to equations 2 and 3). The electrical efficiency thus defined (equivalent electrical efficiency), ε'_{el}, will be given by the equation:

$$\varepsilon'_{el} = E / Fe \qquad (6)$$

2.2 Structure of the electricity sector

2.2.1 *Net electrical capacity*

The graphs in the following picture show the breakdown of the installed net capacity in EU27 in the years 1990, 2005 and 2020. The installed capacity in 1990 consisted mainly of thermoelectric plants (54% in EU27), nuclear (21.8%) and hydroelectric (24%). Wind and photovoltaic sources had marginal shares. In 2005 there was a significant increase in the share of wind farms (5.7%), which have been increasing further in the following years, reaching 18.4% of installed capacity in 2020. Photovoltaic plants, still marginal in 2005, has reached 14.2% of installed capacity in 2020. Geothermal and tidal sources, used to a significant extent only by Italy and France, remain marginal at European level. In EU27 the net electrical capacity has increased by 42.1% in 2020 compared to 2005, from 676 GW to 960 GW. The nuclear capacity is the only one with a relevant reduction, from 123 GW to 106 GW (-10.7%).

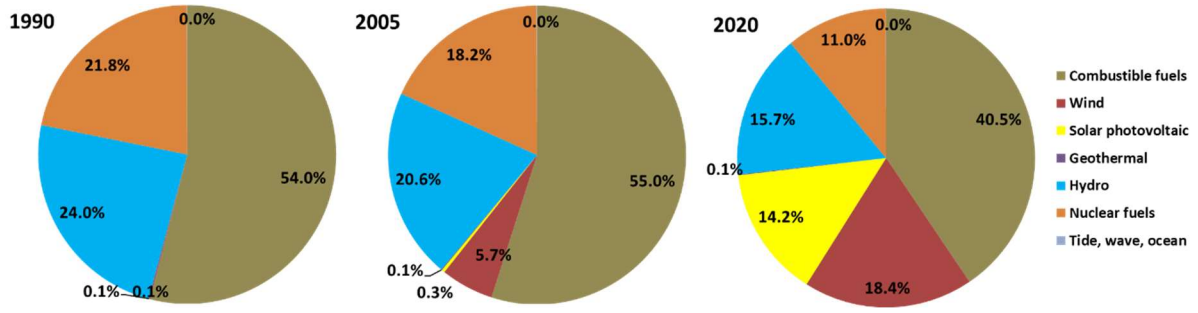
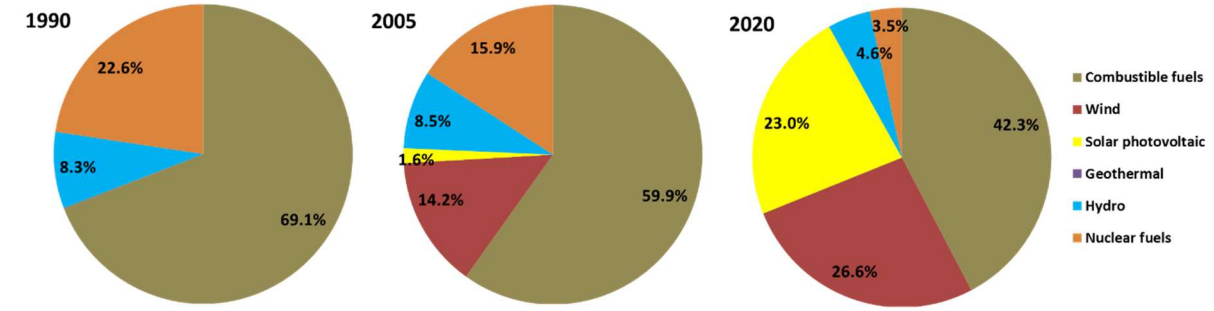


Figure 2.2 – *Distribution of net electrical* capacity *in EU27.*

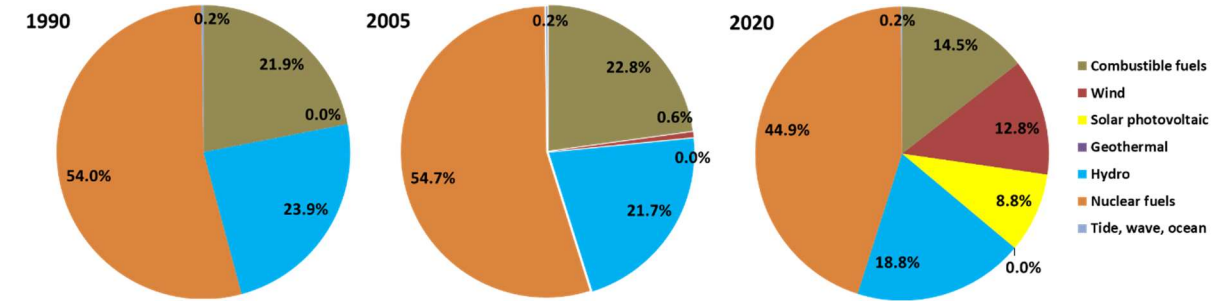
It is also noteworthy the increase of bioenergy net capacity from 15.8 GW in 2005 to 36.5 GW in 2020, representing 9.4% of total thermoelectric capacity.

The graphs in Figure 2.3a-b show the breakdown of net capacity by type in the countries examined. The graphs show considerable heterogeneity among countries. In Poland, there is a clear prevalence of thermoelectric plants. The nuclear plants, which are not present in Italy and Poland, make up significant share of the capacity in France, Sweden, Belgium and Czechia, although the shares of other countries are not negligible. Since 1990, hydroelectric capacity has accounted for a considerable proportion of traditional renewable sources in Romania, Spain, France, Italy and Sweden.

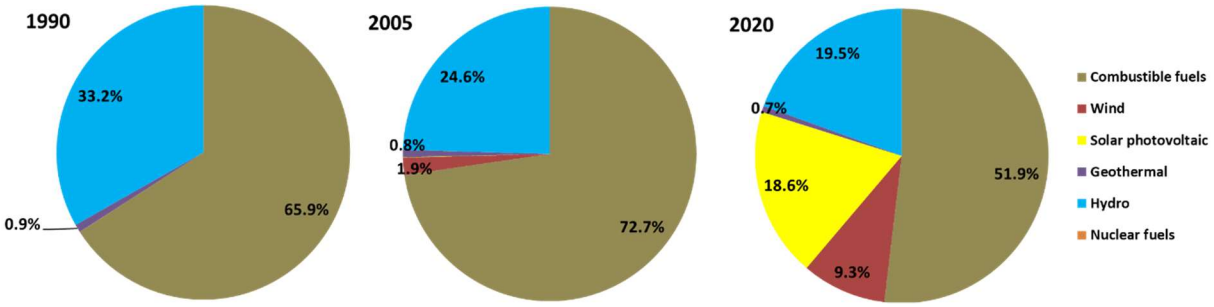
Germany



France



Italy



Spain

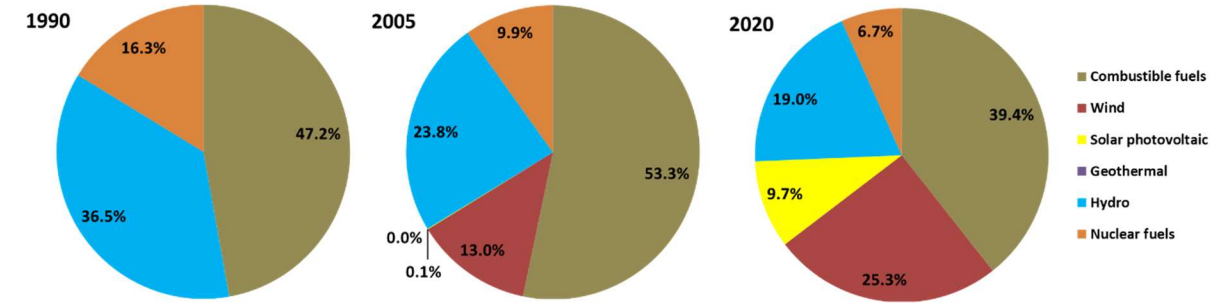


Figure 2.3a – *Distribution of net electrical capacity in the European countries.*

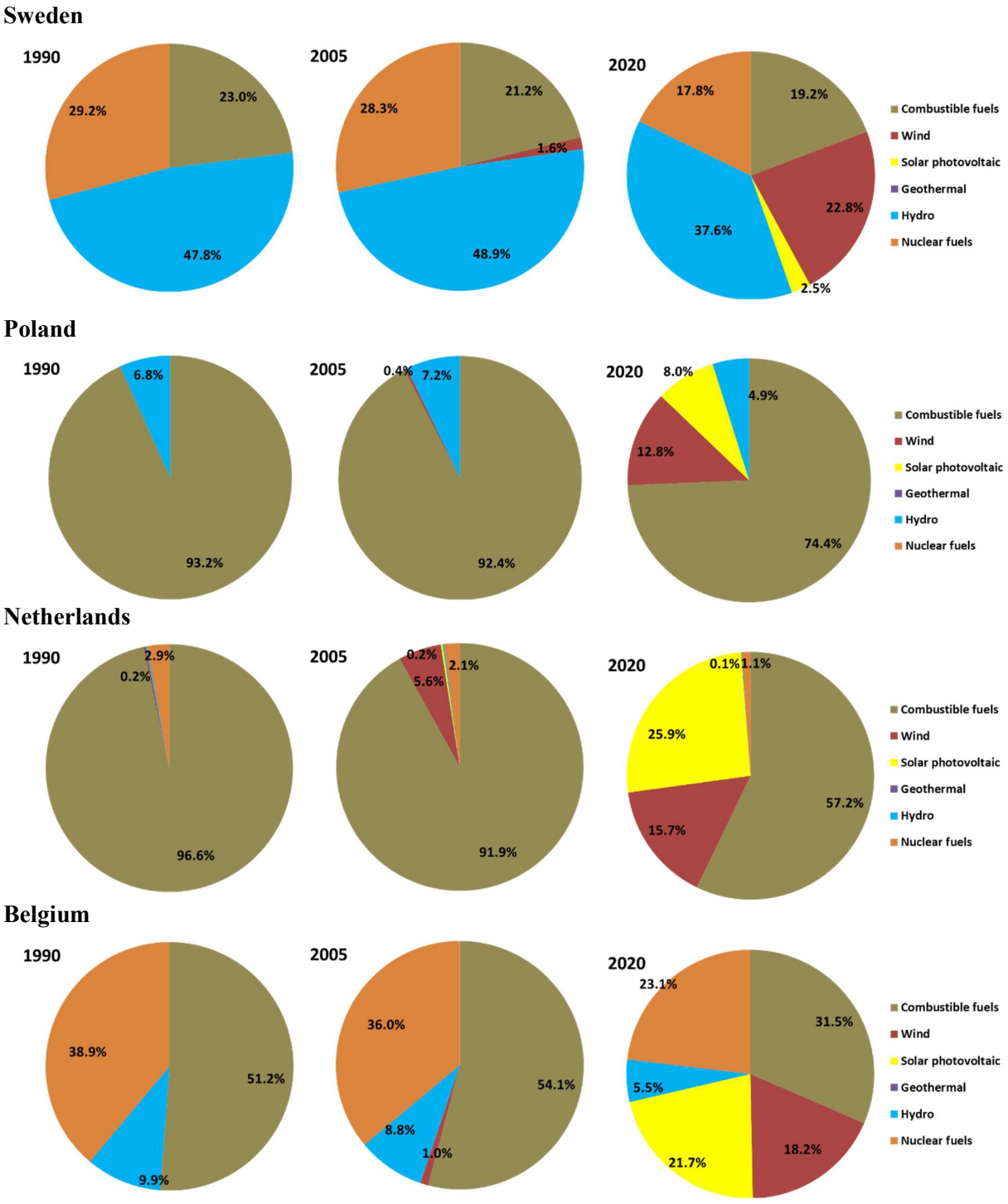


Figure 2.3b – *Distribution of net electrical capacity in the European countries.*

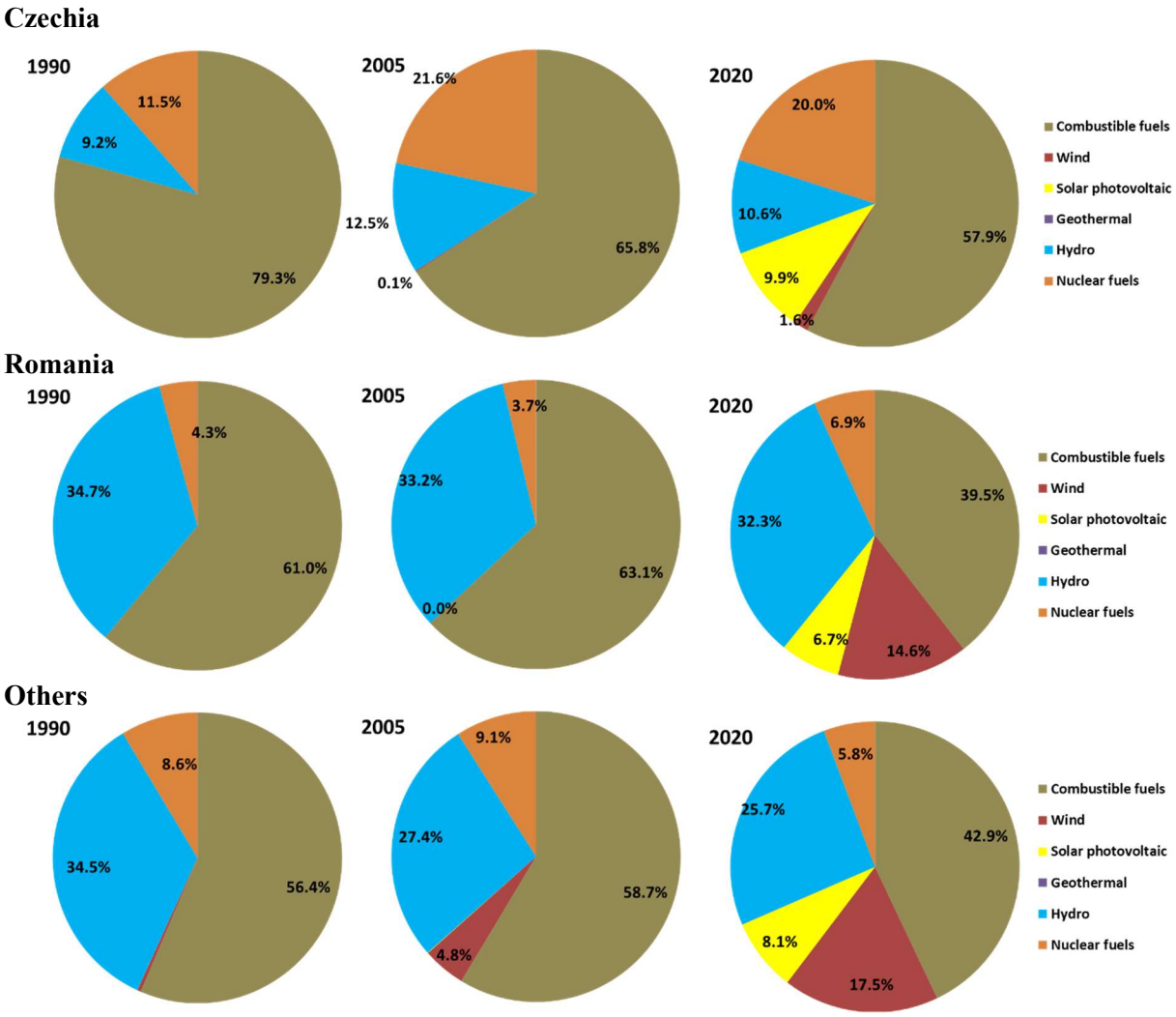


Figure 2.3c – *Distribution of net electrical capacity in the European countries.*

In all the countries examined, the share of thermoelectric and nuclear capacity shows considerable reductions since 1990. Wind power has increased in all countries since 2005. Photovoltaic plants begun to have significant shares only after 2005 and Germany, Italy, Belgium, and the Netherlands have shown a significant increase of this source in recent years.

With regard to thermoelectric capacity, it is useful to highlight the specificity of Sweden, whose share of capacity fuelled by bioenergy and waste is particularly high: 51% of the thermoelectric sector in 2020 with a sharp decrease from 70.3% in 2019. The 2020 share in the other examined countries ranges from 3% in Poland to 13.1% in Belgium. The Italian share is 6.4%. As for the group of other countries the average share is 12.5%.

2.2.2 *Electricity production*

The following graphs show gross electricity production by source for EU27 and the countries examined. In 2020, 12.7% of EU27 electricity production without pumping comes from solid fuels and 20.3% from natural gas. Oil and petroleum products account for 1.9%. Nuclear source accounts for 24.8% and 38.4% comes from renewable energy.

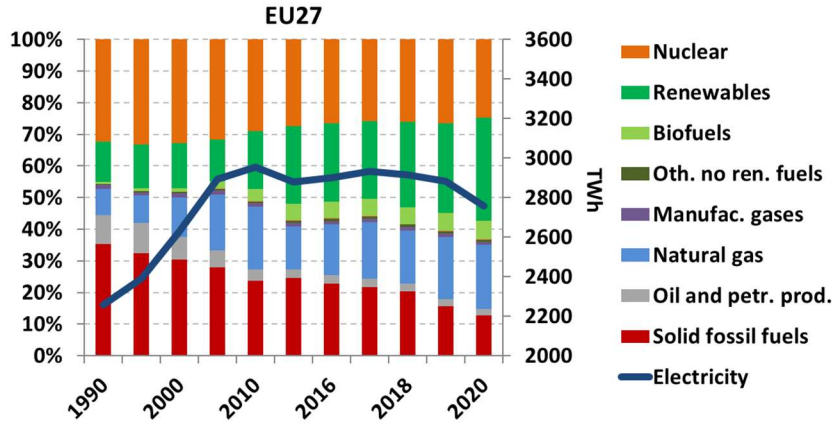


Figure 2.4 – *Gross electricity production by source in EU27. Share (%) on the left axis, production (TWh) on the right axis.*

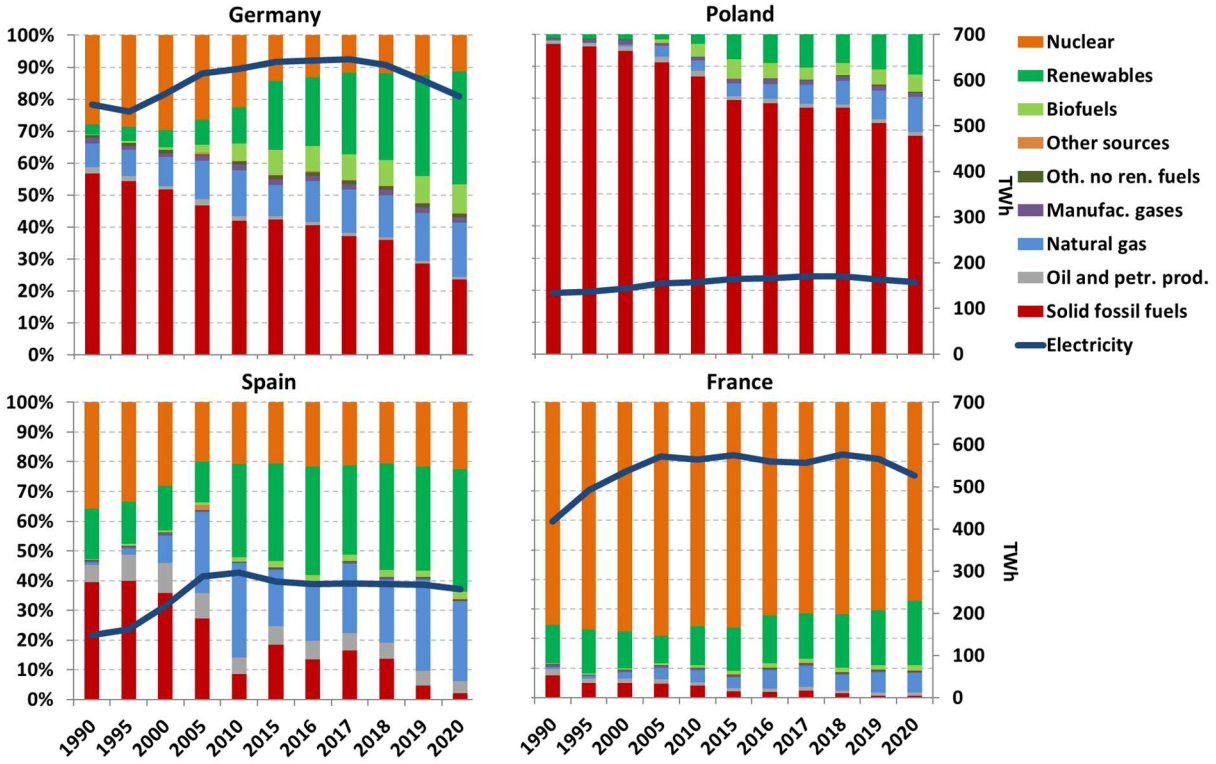


Figure 2.5b – *Gross electricity production by source in the selected countries. Share (%) on the left axis, production (TWh) on the right axis.*

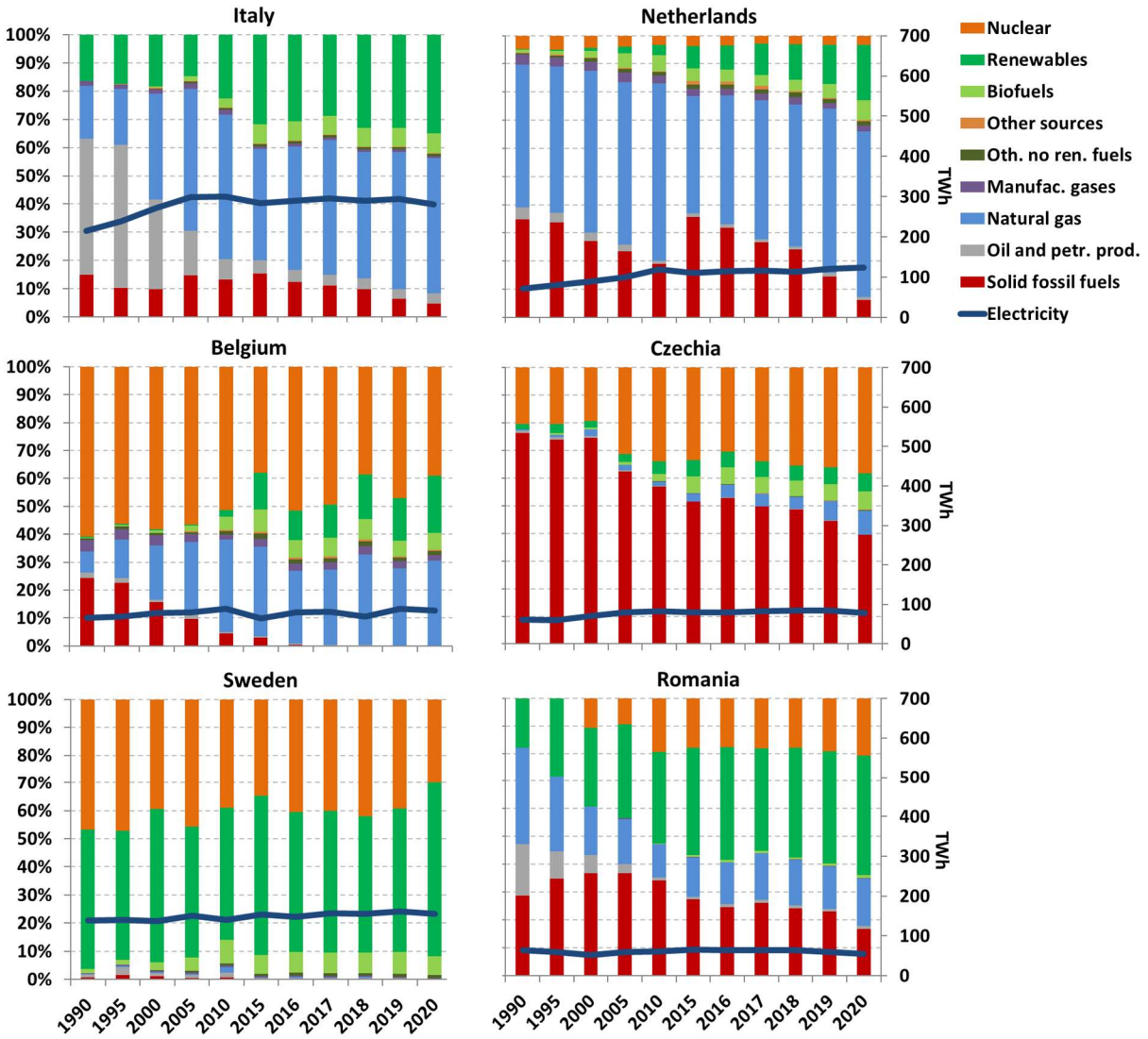


Figure 2.5b – *Gross electricity production by source in the selected countries. Share (%) on the left axis, production (TWh) on the right axis.*

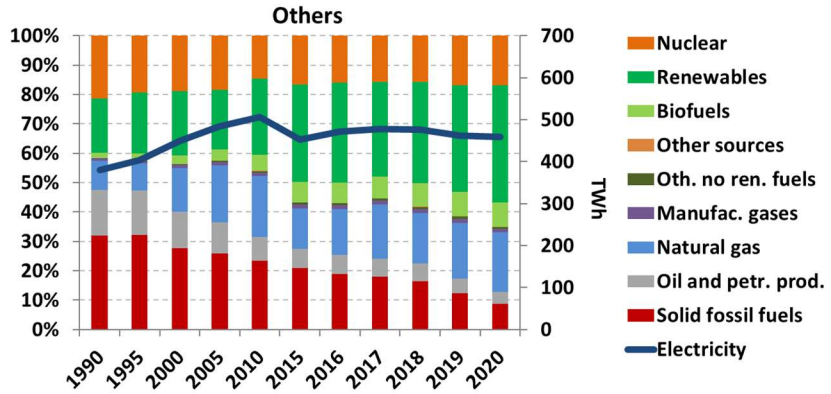


Figure 2.5c – *Gross electricity production by source in other countries. Share (%) on the left axis, production (TWh) on the right axis.*

Gross electricity production has shown in EU27 a marked increase from 1990 to 2010, a relative stability up to 2019 and a sharp decrease in 2020 due to measures adopted to contain SARS-CoV-2 pandemic. The countries are characterized by different trends. Some countries, such as Germany and Poland, show increasing trends up to 2017-2018, although with a slowdown after 2005 and relevant reductions in the recent years. Sweden, the Netherlands, Belgium and Czechia show slightly increasing trends of electricity production up to 2019. Spain, Italy reduced significantly the electricity production after 2010. The electricity production in France has been quite stable since 2005. All the examined countries reduced the electricity production in 2020 as compared to the 2019, apart from the Netherlands.

The energy mix in the examined countries is quite heterogeneous, mainly as far as fossil fuels are concerned. In 2020, solid fuels make up 68.3% of electricity production in Poland, 39.5% in Czechia, and 23.6% in Germany. Even more interestingly, 55.6% of EU27 electricity production from solid fuels in 2020 originates from lignite. Germany, Poland, and Czechia are the main countries that use this fuel for electricity production accounting collectively for 80.9% of the EU27's electricity production by lignite (46.4% Germany, 19.5% Poland, and 14.9% Czechia). Romania accounts for 4.7% and the group of smallest countries accounts collectively for the remaining 19.1% (mainly Bulgaria, Greece and Slovenia). The electricity produced from lignite in Germany, Poland and Czechia is 67.9%, 35.5%, and 93.8% of electricity from solid fuels respectively.

France has the highest electricity production from nuclear plants in Europe (67.1% in 2020), followed by Belgium, Czechia and Sweden, among the examined countries, with 39%, 38.2% and 30% respectively. In the other countries examined the nuclear electricity ranges from 11.4% in Germany to 22.4% in Spain, while the Netherlands have the lowest end share of electricity from nuclear source (3.3%). Poland and Italy do not have nuclear plants. At EU27 level, the nuclear source provides around a quarter of electricity production (24.8%).

The Netherlands and Italy have the highest share of electricity by natural gas in 2020, 58.8% and 48% respectively. Italy shows a massive conversion of its thermal power plants since 1990 with a sharp contraction of oil and petroleum products and the corresponding expansion of natural gas. A significant contraction of solid fuels is observed in all countries although some countries as Germany, Poland, and Czechia still have relevant shares of such fuels.

As regards electricity production from renewable sources, the share has increased since 1990 to 2020 from 13.4% to 38.4% in EU27. Sweden, which already had 51% of electricity from renewable sources in 1990 has increased to 68.5% in 2020. Czechia, Poland, and France had the lowest shares of electricity from renewable sources in 2020, 13.2%, 18%, and 23.7% respectively. Apart from Sweden other countries with relevant renewable share already in 1990 are Spain, Italy and France (17.2%, 16.4%, and 13.4%, respectively) mainly due to hydroelectric source. In 2020 France recorded the lowest increase among the examined countries (23.7%), Italy rose to 42% and Spain to 43.8%. The renewable share in the group of other countries rose from 20.3% in 1990 to 48.1% in 2020.

The following graph shows in more details the electricity production without pumping from renewable sources and the mix of sources. In all the countries examined there is a marked increase of renewable electricity production with a strong acceleration since 2005. After 2015 the growth slowed down and has resumed in recent years although with different rates among the States.

In 1990, almost all electricity from renewable sources was from hydroelectric (94% in EU27). Countries show different development dynamics for the renewable sources related to the specificities of their electrical systems and national circumstances. Hydropower continues to cover more than 30% of Europe's renewable production in 2020. Among the examined countries, hydroelectric power supplies 62.5% of renewable production in Romania and 64.6% in Sweden, but the shares recorded in France, Italy, and Spain are not less important (49.8%, 40.7%, and 26.8% respectively). The wind source shows considerable development in Germany, Spain, Poland, the Netherlands, and Belgium, with shares ranging from 46.5% to 56%. Photovoltaic electricity production plays a significant role in Germany, Italy, the Netherlands, and Czechia with shares from 19.4% to 26.6%. Among the biggest countries lower shares are recorded in Spain for photovoltaics and solar thermal (18.2%) and France (10.7%). Bioenergy covers over 50% of renewable production in Czechia, followed by Poland with 29.6%. The

shares for the other countries range between 2.2% in Romania and 26.8% in the Netherlands. The electricity from this source represents 16.8% in Italy. Among the countries under examination, the geothermal source is present significantly only in Italy (5.2%).

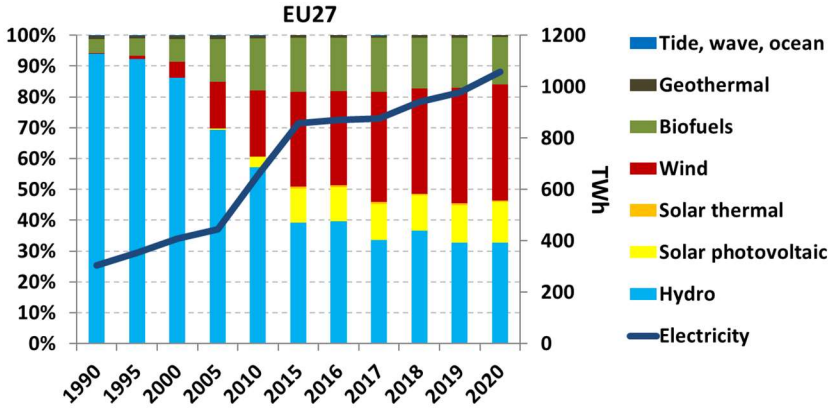


Figure 2.6 – *Gross electricity production without pumping from renewable sources in EU27. Production share per source on the left axis, electricity production on the right axis.*

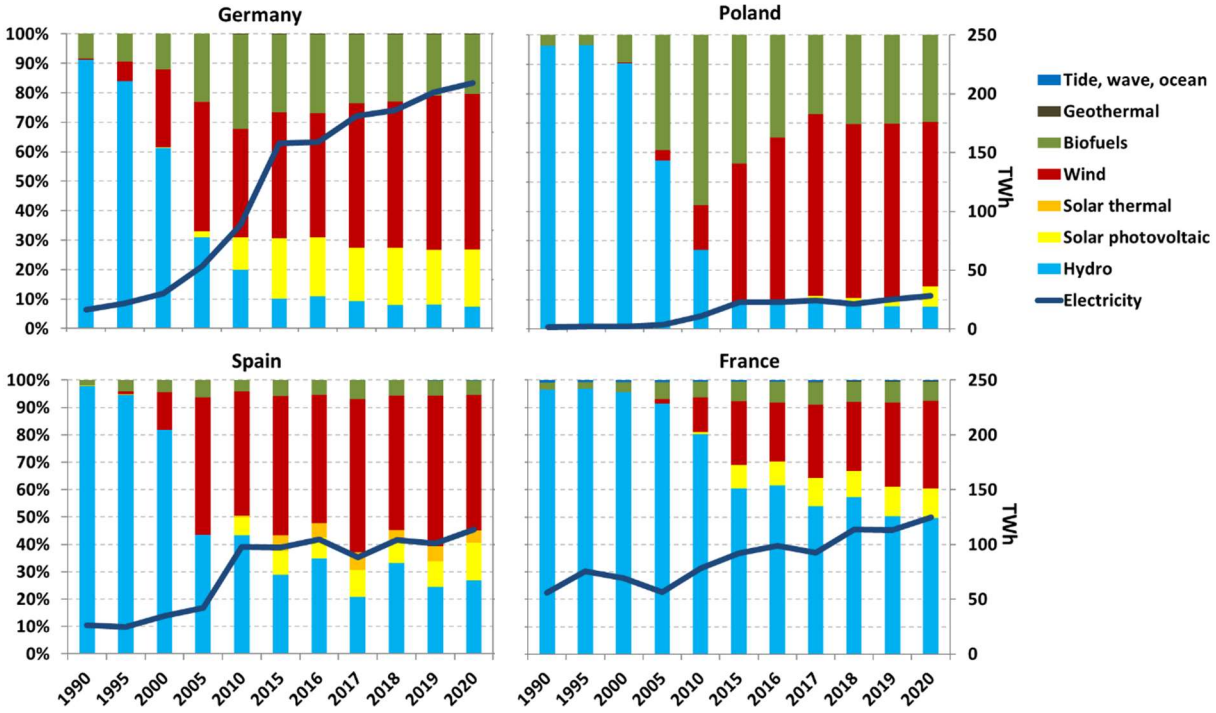


Figure 2.6a – *Gross electricity production without pumping from renewable sources in the selected countries. Production share per source on the left axis, electricity production on the right axis.*

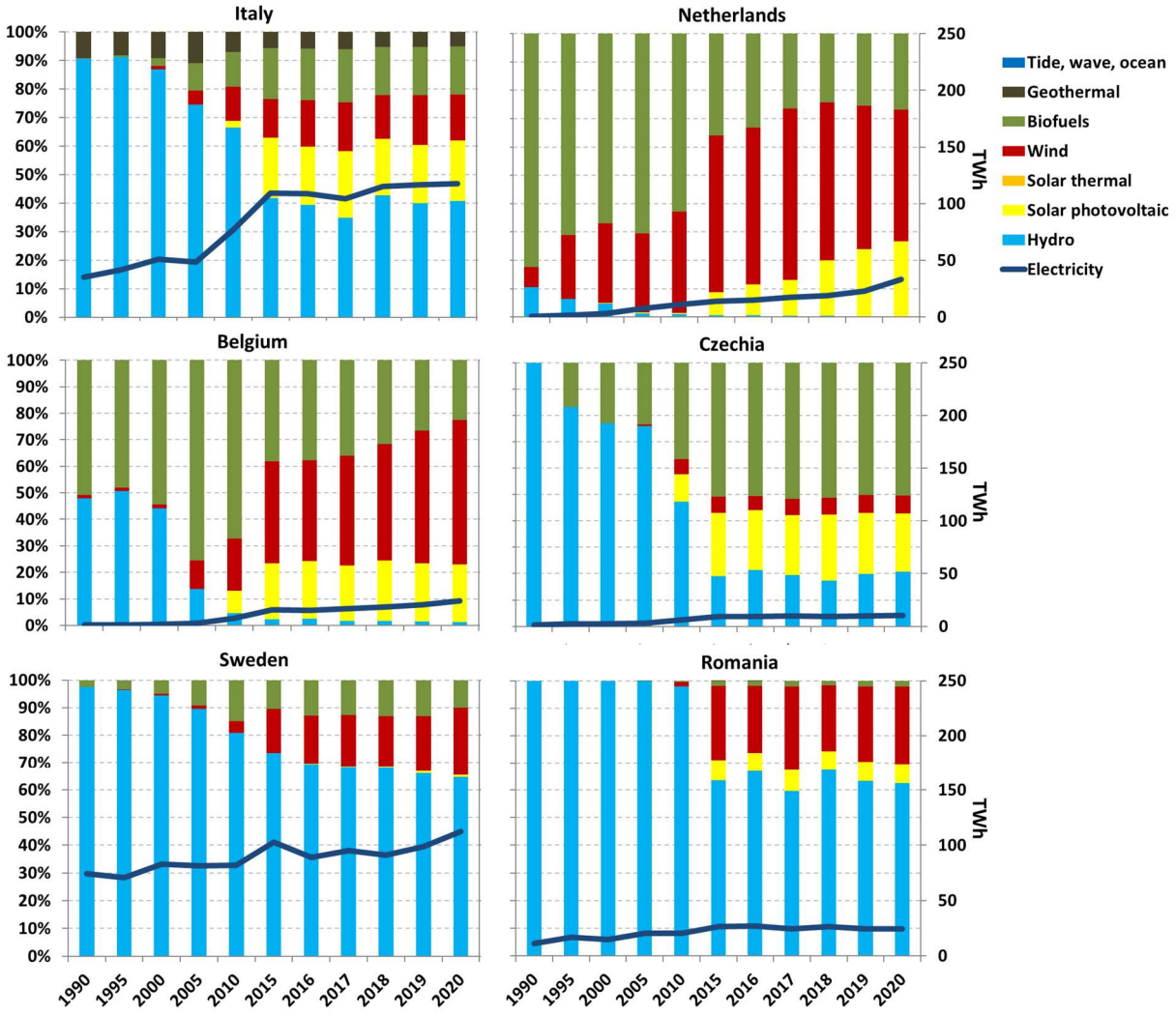


Figure 2.6b – *Gross electricity production without pumping from renewable sources in the selected countries. Production share per source on the left axis, electricity production on the right axis.*

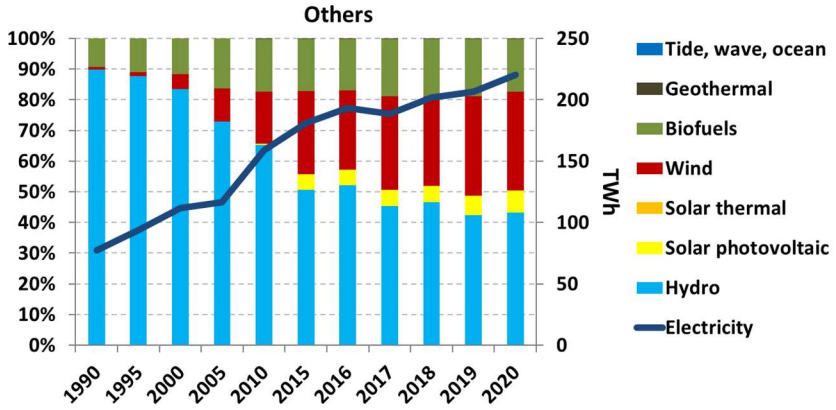


Figure 2.6c – *Gross electricity production without pumping from renewable sources in the other countries. Production share per source on the left axis, electricity production on the right axis.*

The following graph shows the trend in the renewable share of electricity production without pumping. Sweden has one of the highest shares in Europe. At European level the share has been growing

rapidly since 2005. The Italian figure is higher than the EU27 average and Italy's renewable share of electricity is one of the highest among the biggest countries. Among such countries, apart from Sweden, Germany and Spain shares exceeded the Italian one only in 2019-2020 and the share of Romania has been always higher than the Italian value (Italy, 42%; Spain, 43.8%; Germany and Romania, 44.2%).

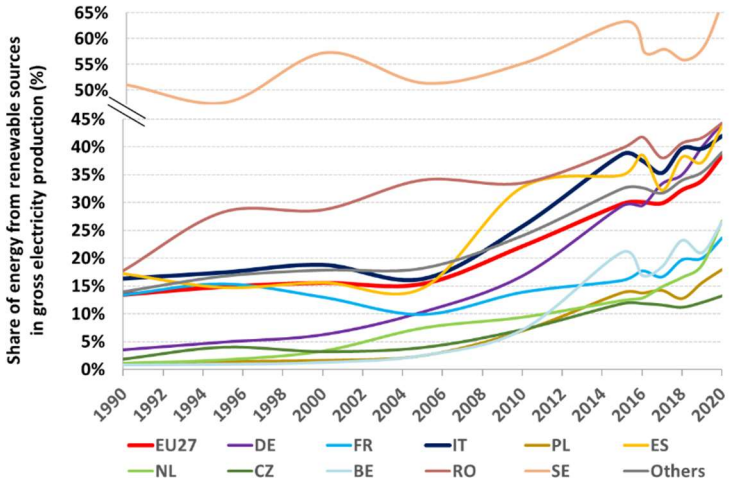


Figure 2.7 – *Renewable share of gross electricity production.*

The renewable share for the achievement of the European 2020 targets, in accordance with the Directive 2009/28/EC, refers to gross inland consumption of electricity, i.e. electricity production without electricity from pumping plus the net import of electricity. For net importing countries, the share of renewable electricity consumption will therefore be lower than renewable electricity production. This shows that electricity importing countries, such as Italy, face a relatively greater effort than exporting countries to achieve their renewable targets in the electricity sector.

2.2.3 *Electricity consumption*

As already reported, gross inland consumption of electricity for the calculation of renewable targets is given by gross electricity production without pumping added to the net import of electricity. The countries examined account for 81.3% of the gross inland electricity consumption of EU27. The countries have different electricity import/export balance. Without considering the annual variability, the examined countries can be divided into exporting countries, such as France or Sweden and countries that import a significant share of electricity, such as Italy. Germany and Sweden have seen increasing shares of electricity exported in recent years, while Czechia increased the export already in 2005. On the other hand, Spain do not show relevant change in its import/export balance.

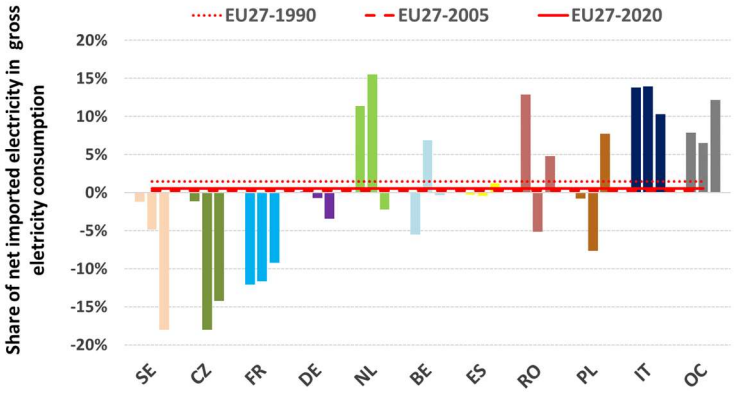


Figure 2.8 – *Share of imported electricity compared to gross inland consumption. Data in ascending order of the 2020 value. For each country the bars on the right picture are 1990, 2005, and 2020 values. OC – Other countries.*

The import share is relevant for the assessment of GHG emissions and the calculation of the electricity renewable share, as required by the Directive 2009/28/EC. While a significant share of imports brings a non-emissions benefit to the satisfaction of inland electricity demand, it has a negative impact on the renewable share in gross inland consumption, as noted above. The following graph shows trends in the renewable electricity in gross final electricity consumption since 2005 according to the aforementioned Directive. The distance between Italy and Germany become higher than what was seen in Figure 2.7. Spain also has a higher renewable share than Italy due to the much lower share of imports.

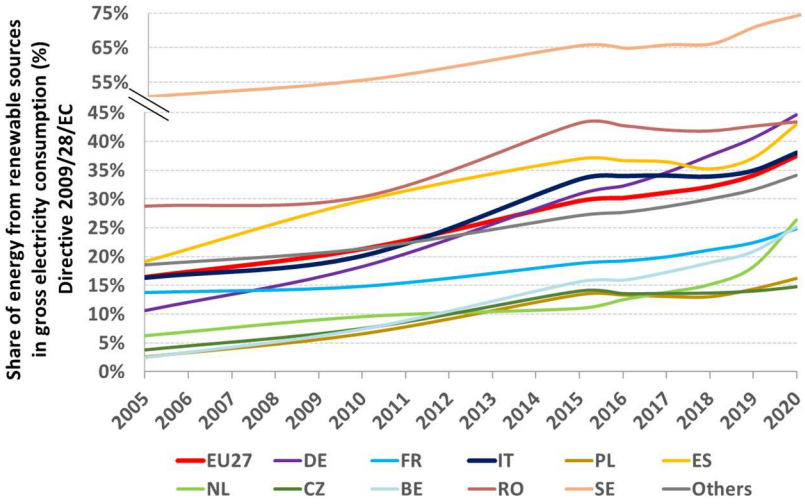


Figure 2.9 – *Trend of the renewable share in gross inland electricity consumption since 2005 according to Directive 2009/28/EC.*

The comparison of the data in Figure 2.7 and Figure 2.9 highlights the role of electricity import/export in the compliance with the target for the gross electricity consumption. An insight of the penalty for net importing countries and the benefit to exporting countries in terms of the targets to be achieved is shown in the following graph.

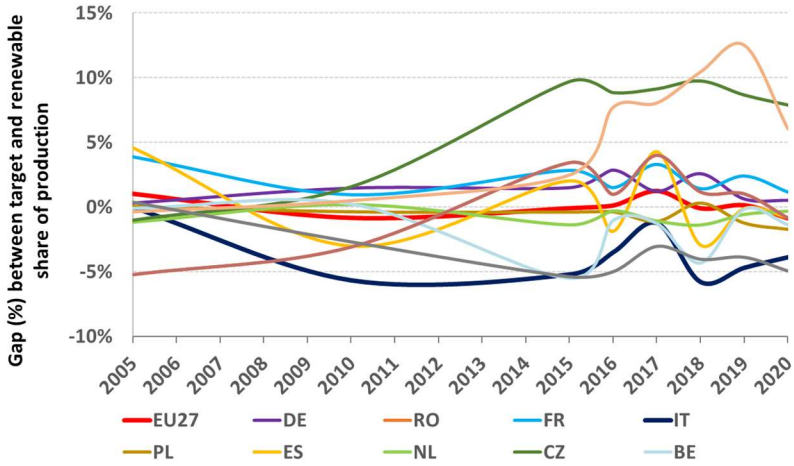


Figure 2.10 – *Gap between the renewable share of gross inland consumption of electricity and gross production.*

The graph shows that Italy has, among the countries examined, the lowest gap between the target renewable share and the share of renewable electricity production. The difference between the two shares is significantly reduced in 2016 and 2017 when the import decreased compared to domestic production.

2.2.4 *Efficiency of thermal power plants*

The performance of the countries' electrical systems will be compared through parameters such as the share of own consumption, the distribution losses and above all the transformation efficiency of the fuel energy for electricity and heat generation. In the case of cogeneration plants, it should be considered that not all the electricity and heat produced in such plants can be regarded to as cogeneration production.[4] However, it is reasonable to compare the overall efficiency of the thermoelectric plants in different countries in terms of the transformation of the fuel energy into the final products regardless of the way in which the plants were used. In this respect, the distinction between cogeneration and non-cogeneration plants was made by considering the activities classified by Eurostat: "*combined heat and power*" and "*electricity only*".

Figure 2.11 shows the percentages of own consumption out of gross electricity production. In summary, own consumption is the consumption of electricity utilities functional to the electricity production and is an indicator of the energy required by the electricity generation system. The share of own consumption in Italy has always been below the EU27 average and in 2020 it is higher only than that recorded in the Netherlands and Sweden. In general terms, thermoelectric, geothermal and nuclear generation are the sources with the greatest demand of energy, while renewable sources, such as hydroelectric, wind and photovoltaic, have very low own consumption. The greatest own consumption in thermoelectric plants is related to plants powered by solid fuels and bioenergy, less energy is required by plants fuelled by oil and petroleum products and even less energy is required by plants fuelled by natural gas. Therefore, in addition to the efficiency, a decisive parameter is represented by the fuel mix used by each country.

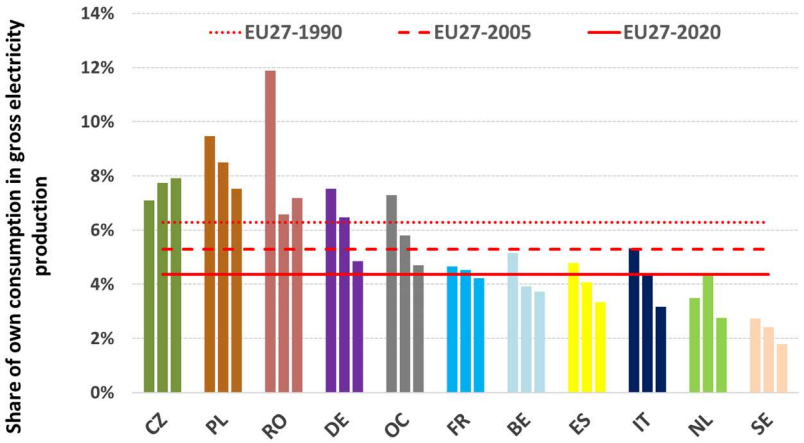


Figure 2.11 – *Own consumption compared to gross electricity production. Data in descending order of 2020 value. For each country the bars on the right picture are 1990, 2005, and 2020 values. OC – Other countries.*

Distribution losses give insight on the network performance, higher losses determine higher energy consumption to supply the electricity demand. In 2020 the distribution losses compared to the energy required for final consumption in Italy are higher than those recorded for Germany, Belgium and the Netherlands. The Italian share has always been lower than the EU27 average.

[4] EEA, 2018 https://www.eea.europa.eu/data-and-maps/indicators/combined-heat-and-power-chp-1

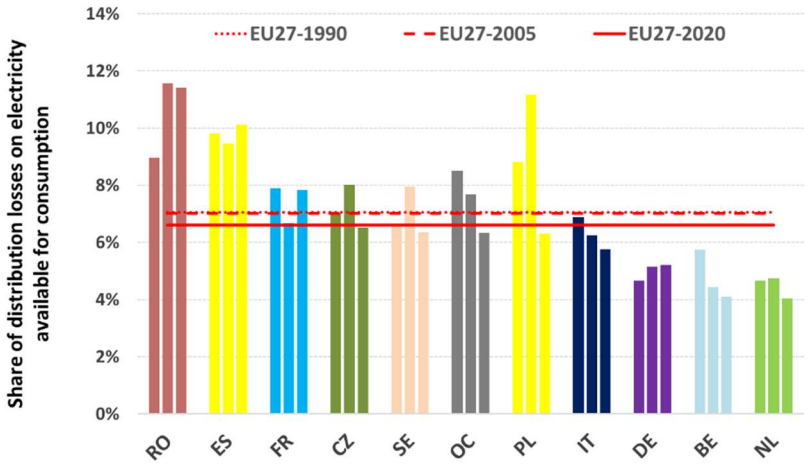


Figure 2.12 – *Distribution losses on electricity available for final consumption. Data in descending order of 2020 value. For each country the bars on the right picture are 1990, 2005, and 2020 values. OC – Other countries.*

The most important parameter for assessing the efficiency of electricity generation systems is the transformation efficiency of fuels into electricity and heat. The following graph shows that the electrical efficiency of Italian non-cogeneration plants (0.45 in 2020) is among the highest in the biggest European countries after Belgium (0.47) and the Netherlands (0.55). In 2020, the Italian average is over the EU27 average (0.43). Since 1990 there has been an increase in Italy's efficiency of 12.9% against 15.3% of the EU27 average which had a lower starting point. The group of smallest countries shows the higher increase (27.8% in 2020 compared to1990), while the efficiency in Sweden decreased of 49.3%.

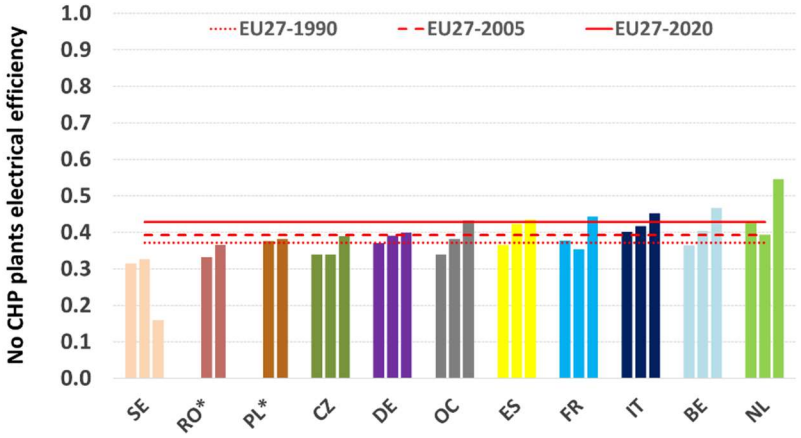


Figure 2.13 – *Electrical efficiency of non-cogeneration plants. Data in ascending order of 2020 value. OC – Other countries. For each country the bars on the right picture are 1990, 2005, and 2020 values. OC – Other countries. * 2005 and 2020.*

With regard to the electrical efficiency of CHP plants, it should be underlined that Spain does not record heat production from these plants since 1990, while heat production has been recorded since 1995 in France and since 2004 in Italy. Without heat production, electrical efficiency will coincide with total efficiency.

In 2020, electrical efficiency in Spain is the highest among the main European countries (0.64), far higher than the EU27 average (0.37). Italy's efficiency is 0.39. The total efficiency of the Italian cogeneration plants (0.62) is just below the EU27 average (0.64) and increased of 24.4% since 1990.

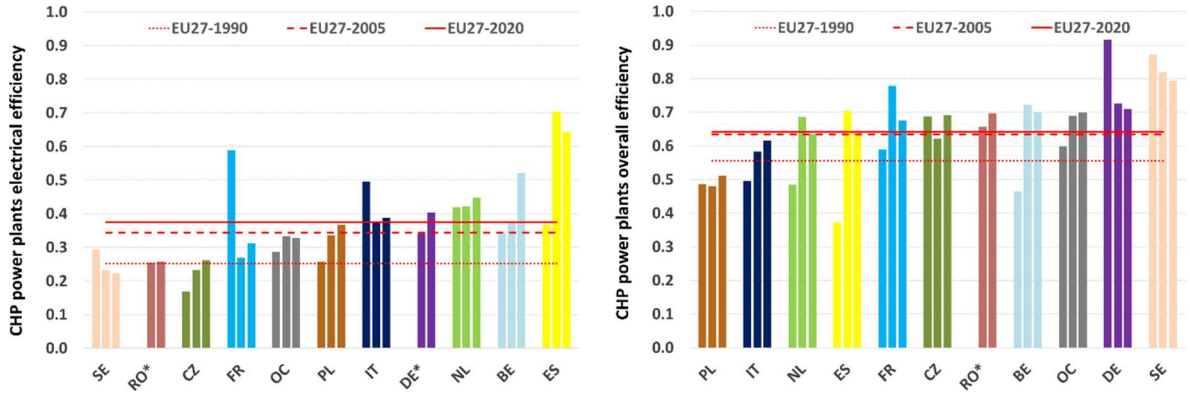


Figure 2.14 – *Electrical and total efficiency of CHP plants. Data in ascending order of the 2020 value. For each country the bars on the right picture are 1990, 2005, and 2020 values. OC – Other countries. * 2005 and 2020.*

Total efficiency lesser than 0.75-0.80 in CHP plants shows that these plants produce electricity mainly not in cogeneration mode, except in Sweden.

The ratio between heat and electricity, H/E ratio, explains the significant differences between electrical and total efficiency. Sweden has one of the highest H/E ratios in Europe in 2020, which explains the low electrical efficiency against one of the highest total efficiency.

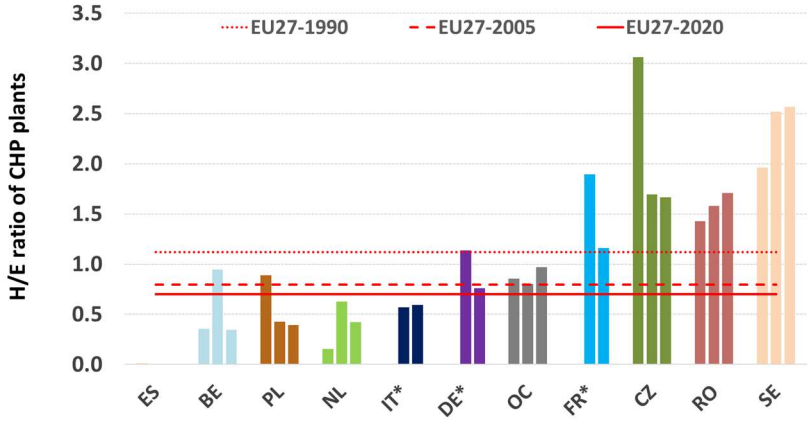


Figure 2.15 – *H/E ratio of CHP plants. The 1990 value for Germany is not given because Eurostat DB reports heat production without electricity production. Data in ascending order of 2020 value. For each country the bars on the right picture are 1990, 2005, and 2020 values. OC – Other countries. * 2005 and 2020.*

The following graphs show the efficiency of all power plants (CHP and electricity only). The Italian electrical efficiency in 2020 is 0.41, exceeded by Spain, the Netherlands and Belgium, all with 0.49. Sweden has the lowest electrical efficiency among the examined countries (0.22), well below the EU27 average (0.40). As for the overall efficiency the Italian value is 0.55, just a little higher than the EU27 average (0.54) and Sweden shows the highest value (0.79).

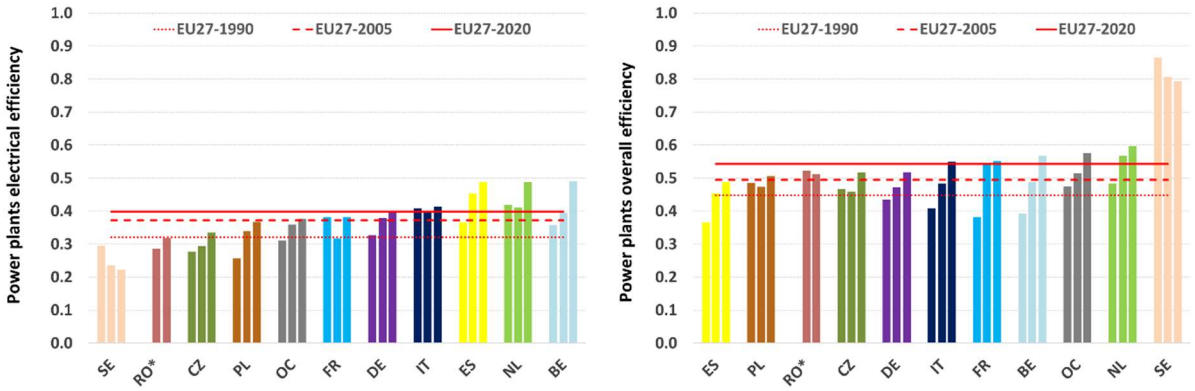


Figure 2.16 – *Electrical and total efficiency of thermal power plants. Data in ascending order of 2020 value. For each country the bars on the right picture are 1990, 2005, and 2020 values. OC – Other countries. * 2005 and 2020.*

The equivalent electrical efficiency of CHP plants, calculated after unbundling the share of fuels for heat production, is 0.62 for Italy, below the EU27 average (0.63), with a growing trend (+11.4% since 2005). The equivalent electrical efficiency ranges from 0.50 in Poland to 0.72 in Sweden and Belgium. The average for group of smallest countries is 0.87.

As for the equivalent electrical efficiency for all power plants in 2020, Italy (0.53) is exceeded Belgium (0.56), the Netherlands (0.59) and Sweden (0.72), among the biggest countries. The EU27 average is 0.51.

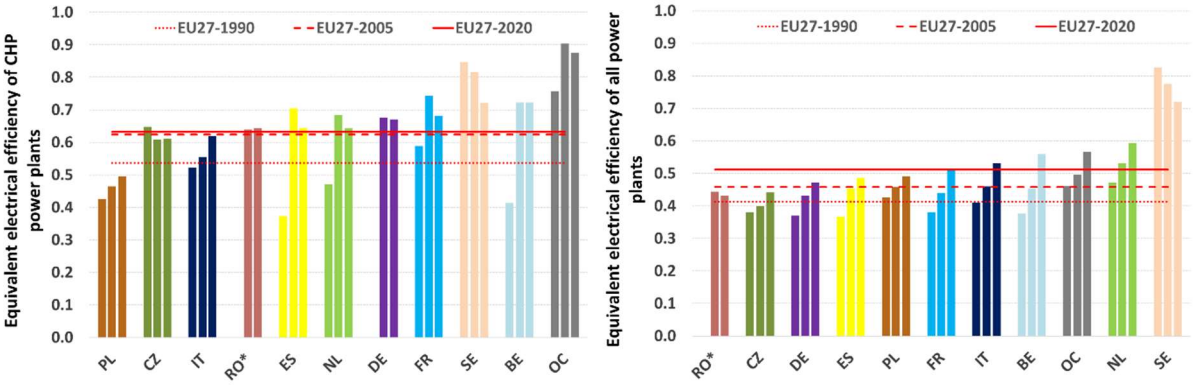


Figure 2.17 – *Equivalent electrical efficiency* for *CHP plants (left) and all thermal plants (right). Data in ascending order of 2020 value. OC – Other countries.*

2.3 Greenhouse gas emissions from the electricity sector

In order to compare the GHG emission factors for the electricity sector in different countries the Tier 1 approach has been adopted to estimate the GHG emissions. Tier 1 estimates require data on the amount of fuel consumptions and default emission factors, as reported in Table 2.1. The GHG emissions from each fossil fuel are calculated using the default emission factors reported in the IPCC guidelines (2006) for stationary sources in the energy industries. The reference approach used for GHG emissions National Inventories submitted by Annex I countries to UNFCCC has been followed. Tier 1 methodology is adopted only for international comparison purpose. Such purpose requires a common methodology for the States to be compared, although a more detailed approach, with national emission factors, is available for Italy (ISPRA, 2022[b]).

GHG emissions from the 27 European countries for the production of electricity and heat are 737.1 Mt CO_2eq in 2020, 41.4% lower than 1990 level and 41.8% lower than 2005 level. Since 2005 a significant reduction of GHG emissions in the electricity sector begun to take place.

Table 2.2 – *Estimation of GHG emissions (Mt CO_2eq) for electricity and heat production in thermal power plants. Countries in descending order of 2020 value.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU27	**1257.4**	**1188.6**	**1178.6**	**1266.3**	**1160.4**	**1040.5**	**1021.5**	**1023.5**	**966.1**	**850.8**	**737.1**
Germany	393.5	350.7	333.3	341.8	328.0	318.9	318.6	298.8	283.2	235.5	201.4
Poland	181.5	150.3	146.7	154.6	149.6	143.3	142.2	143.7	142.1	130.2	120.1
Italy	123.3	130.5	137.1	160.2	137.1	110.8	110.5	110.8	102.9	98.1	89.1
Netherlands	45.1	52.6	53.6	57.7	61.2	61.7	60.7	57.9	53.8	50.7	43.4
Spain	66.4	77.6	98.2	117.9	71.5	84.5	70.2	82.8	73.8	56.6	42.5
Czechia	63.9	64.2	64.0	64.6	63.1	53.9	55.0	53.4	53.0	49.0	42.4
France	46.4	38.4	48.7	59.2	50.0	37.5	40.0	44.5	37.1	36.6	33.1
Romania	73.3	56.8	37.5	36.2	31.2	27.6	25.5	26.4	25.4	23.5	18.1
Belgium	26.2	28.3	26.1	25.9	23.9	18.1	16.9	16.8	16.9	17.4	16.5
Sweden	5.3	9.1	8.5	11.0	13.9	9.6	10.6	10.9	11.3	10.8	9.6
Others	232.4	230.3	224.9	237.1	230.9	174.7	171.3	177.5	166.5	142.3	120.9

Overall, in 2020 GHG emissions from power sector in the selected countries (616.2 Mt CO_2eq) account for 83.6% of EU27 sector's emissions. The share of emissions in 2020 is shown in the following graph. Germany accounts for more than a quarter of EU27's emissions, followed by the group of smallest countries (16.4%, Poland (16.3%) and Italy (12.1%).

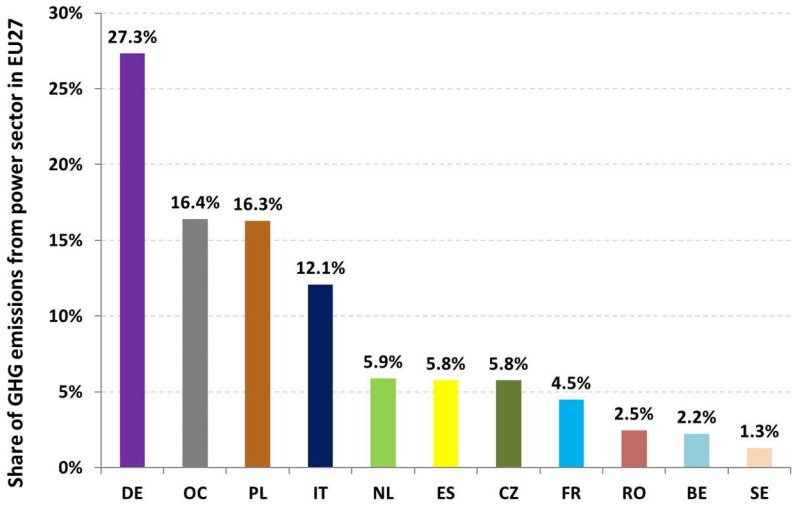


Figure 2.18 – *Share of GHG emissions from power sector in 2020 for the EU27 countries. Countries in descending order. OC – Other countries.*

GHG emissions from power sector in EU27 show a slight increase from 1990 to 2005 (0.7%) with higher increasing of electricity and heat production, respectively +28.2% and 6.4%. At EU27 level, therefore, there has been a decoupling since 1990 between electricity and heat production and GHG emissions, although emissions show a significant decrease only after 2005, leading to the increase of the decoupling mainly due to the increasing share of renewables. In other words, there has been a gradual increasing distance between the rates of change of electricity and heat production, which have increased up to 2005 to became quite stable in the next years, and the rates of change of GHG emissions, which have been falling with higher speed since 2005.

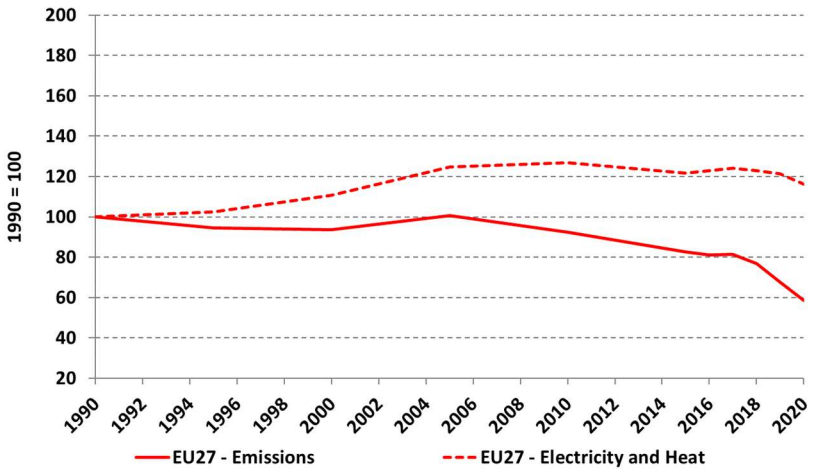


Figure 2.19 – *Rates of change for electricity and heat production and greenhouse gas emissions from the power sector compared with 1990.*

Decoupling is evident in almost all countries although with different dynamics. Among the selected countries in Poland there is the lowest decoupling, while Sweden represents an exception because there is a decoupling in the opposite direction, i.e. sharp increase of emissions with lesser increase of electricity and heat production. It should be pointed out, however, that GHG emissions from Sweden's power sector account for little more than 1% of emissions from the European countries.

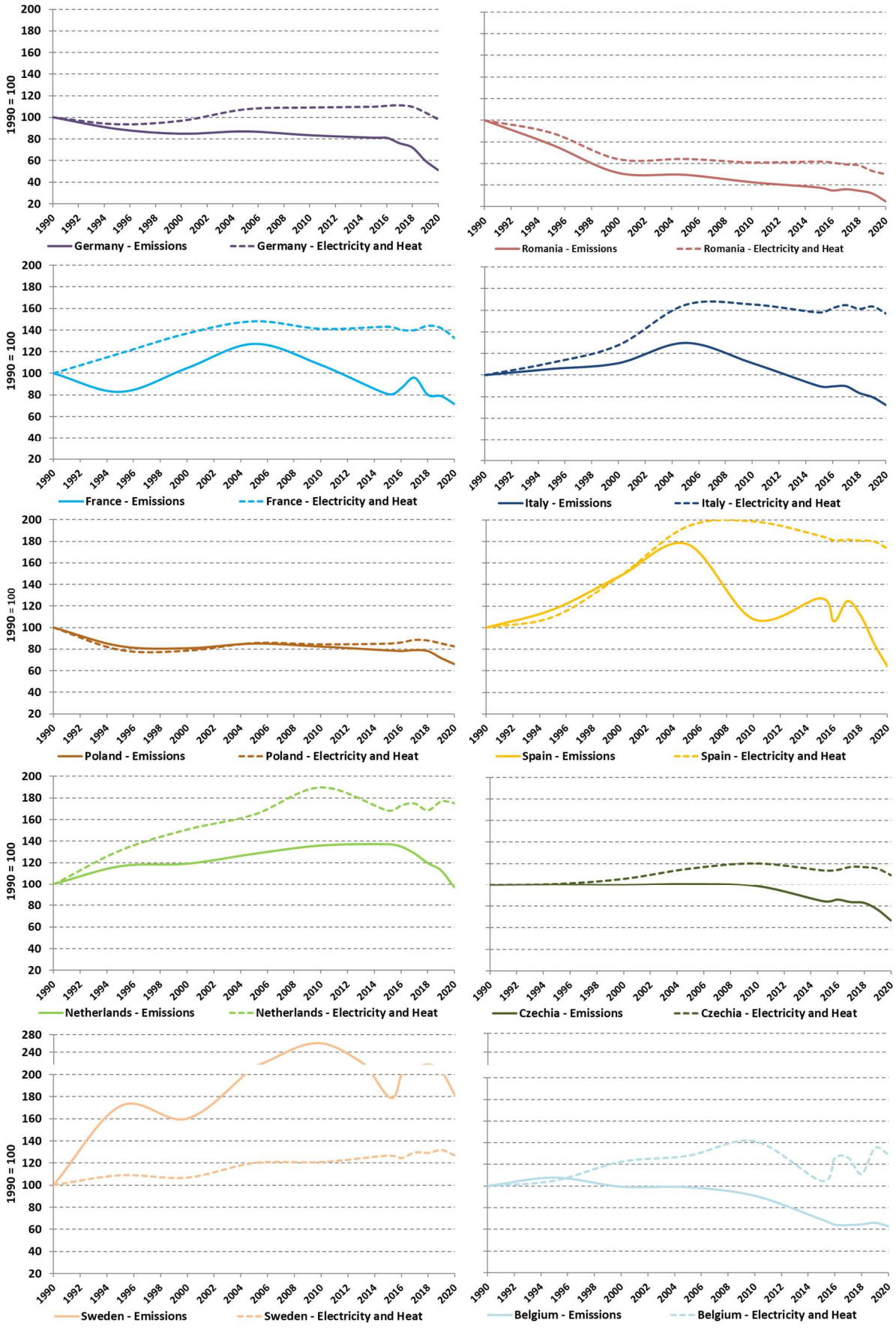


Figure 2.20a – *Rates of change compared to 1990 of electricity and heat production and GHG emissions from power sector.*

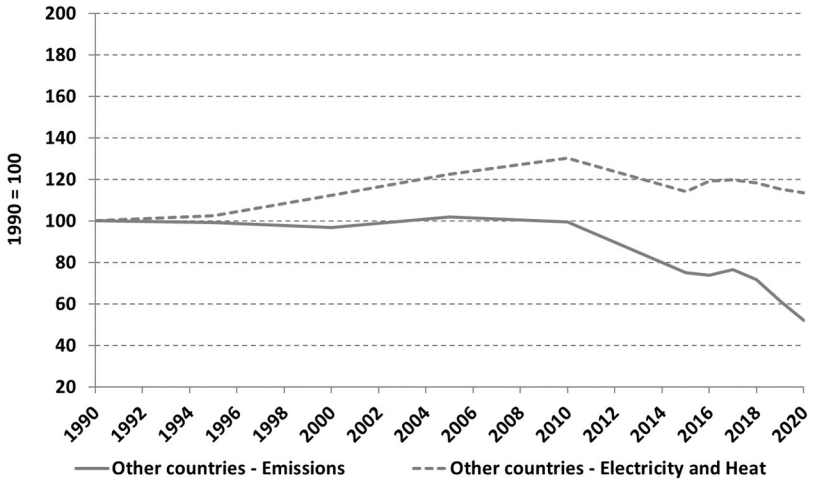


Figure 2.20b – *Rates of change compared to 1990 of electricity and heat production and GHG emissions from power sector in the group of smallest countries.*

Considering the distance between the rates of change in GHG emissions and energy production as a measure of decoupling, the data show that in the period 2005-2020 Poland has the lowest decoupling (0.23). The decoupling shown by Italy is 0.43, lower only than those of the smallest countries (0.47) and Spain (0.54).

Table 2.3 – *Rates of change of GHG emissions and electricity and heat production in the periods 1990-2005 and 2005-2020. Countries in ascending order of decoupling between the two parameters in 2005-2020.*

	Change 1990-2005 (%)		**Change 2005-2020 (%)**	
	CO_2eq	**Electricity and heat**	**CO_2eq**	**Electricity and heat**
EU27	**0.7%**	**24.7%**	**-32.8%**	**-2.6%**
Poland	-14.8%	-14.3%	-15.8%	-0.5%
Sweden	107.6%	20.1%	-2.3%	9.7%
France	27.4%	48.1%	-38.2%	-4.3%
Czechia	1.1%	15.4%	-24.2%	-0.1%
Germany	-13.1%	7.3%	-31.1%	-2.7%
Romania	-50.6%	-35.9%	-35.0%	-17.5%
Belgium	-1.2%	28.0%	-33.1%	5.6%
Netherlands	28.2%	64.7%	-12.2%	7.4%
Italy	29.9%	65.0%	-38.7%	-0.9%
Others	2.0%	22.5%	-40.0%	-5.8%
Spain	77.4%	93.5%	-52.0%	-7.1%

GHG emissions for electricity production have been estimated after unbundling the fuel energy consumption for heat production in CHP plants according to the methodology set out in paragraph 2.1. EU27 emissions in 2020 are 601.4 Mt CO_2eq and the countries examined account for 84.3%. With regard to the trend of emissions and electricity production and the decoupling, there is no difference from what was observed for the production of electricity and heat.

Table 2.4 – *Estimation of GHG emissions (Mt CO_2eq) for electricity production in thermal power plants. Countries in descending order of 2020 value.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU27	**1004.5**	**998.8**	**1015.4**	**1070.0**	**968.2**	**881.6**	**858.2**	**862.9**	**813.5**	**703.9**	**601.4**
Germany	350.7	322.9	306.6	308.5	293.8	288.5	287.4	267.6	254.0	207.6	176.6
Poland	110.6	108.0	110.0	115.3	112.5	109.5	108.2	109.0	108.5	98.2	90.2
Italy	122.7	129.8	134.4	141.8	116.8	91.4	89.8	90.5	83.5	78.4	70.2
Spain	66.4	77.6	98.1	117.9	71.5	84.5	70.2	82.8	73.8	56.6	42.5
Netherlands	40.9	42.1	42.1	45.7	48.4	53.3	52.5	49.6	46.2	43.3	36.9
Czechia	46.2	43.3	49.8	48.4	46.5	41.5	42.1	41.6	41.4	38.0	31.8
France	46.4	37.0	40.9	45.7	43.2	31.7	33.6	38.1	31.2	30.4	26.9
Belgium	25.3	27.3	24.9	23.5	21.4	16.0	14.8	14.9	14.9	15.5	14.8
Romania	16.9	25.5	20.6	24.8	23.0	21.2	19.3	20.8	20.4	19.1	14.2
Sweden	1.8	3.5	3.3	3.7	5.1	2.8	3.0	3.2	3.4	3.6	2.9
Others	176.6	181.7	184.7	194.7	186.0	141.2	137.2	144.9	136.1	113.1	94.4

At EU27 level, GHG emissions increased by 6.5% from 1990 to 2005, while electricity production increased by 28.6%. From 2005 to 2020, emissions fell by 43.8% compared with a decrease in electricity production of 4.8%. These figures also show that the decoupling between GHG emissions and electricity production in Europe began since 1990 but that the emission reductions began only after 2005.

Table 2.5 – *Rates of change of GHG emissions and electricity generation in the periods 1990-2005 and 2005-2020. Countries in ascending order of decoupling between the two parameters in 2005-2020.*

	Change 1990-2005 (%)		Change 2005-2020 (%)	
	CO_2eq	**Electricity**	**CO_2eq**	**Electricity**
EU27	**6.5%**	**28.6%**	**-43.8%**	**-4.8%**
Sweden	111.0%	8.1%	-22.6%	3.4%
Poland	4.3%	15.1%	-21.8%	0.7%
Romania	46.7%	-7.6%	-42.8%	-5.9%
Netherlands	11.6%	38.8%	-19.1%	23.6%
Czechia	4.7%	28.9%	-34.3%	-0.1%
Germany	-12.0%	13.3%	-42.7%	-8.1%
France	-1.5%	36.9%	-41.2%	-7.7%
Others	10.3%	27.5%	-51.5%	-4.5%
Italy	15.5%	40.2%	-50.5%	-7.6%
Belgium	-6.9%	20.8%	-37.2%	4.3%
Spain	77.5%	93.6%	-64.0%	-10.4%

2.3.1 *GHG emission factors for electricity and heat production*

Table 2.6 reports the GHG emission factors for electricity and heat production due to fuel combustion in thermal power plants.

Table 2.6 – *GHG emission factors for electricity and heat production by thermal power plants (g CO_2eq / kWh). Countries in descending order of 2020 value.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU27	**727.3**	**707.3**	**656.3**	**601.8**	**559.1**	**567.1**	**543.8**	**535.2**	**530.4**	**487.9**	**460.5**
Poland	723.8	761.0	749.8	724.0	714.6	705.8	697.9	694.5	683.1	657.8	635.3
Czechia	791.8	791.2	760.7	792.6	775.7	722.4	704.8	698.9	708.2	675.0	635.1
Romania	588.0	548.5	562.5	589.2	615.2	596.1	575.7	591.5	610.7	651.7	562.3
Germany	785.3	780.3	745.8	681.9	639.2	636.9	620.5	600.0	586.4	547.4	517.4
Spain	929.3	894.1	780.8	629.3	502.3	655.2	618.2	622.2	624.8	483.3	453.1
Belgium	877.9	818.9	649.2	584.2	457.1	449.0	437.3	433.8	425.4	431.7	403.2
France	952.2	856.6	547.4	520.1	578.9	510.1	446.7	448.2	454.7	417.3	401.4
Netherlands	572.8	505.9	449.0	446.2	412.3	494.7	475.3	457.1	445.9	407.4	374.4
Italy	691.8	666.4	623.9	524.3	478.3	442.1	425.4	410.4	408.9	384.4	371.0
Sweden	343.0	280.8	274.8	262.6	225.0	189.7	195.2	200.2	206.9	198.0	198.7
Others	665.8	656.7	595.7	559.0	521.0	511.6	482.3	487.1	479.2	434.6	400.4

The data show the emission factors reduction since 1990. Among the considered countries the 2020 emission factor in Italy (371 g CO_2eq/kWh) is higher only than that of Sweden (198.7 g CO_2eq/kWh), where the thermal power plants are mainly fuelled by bioenergy. Belgium has the largest reduction since 2005 (-31%), followed by Italy (-29.2%). Germany reduced the emission factor by 24.1%. At the lowest end of reduction there are Romania (-4.6%), Poland (-12.2%), and the Netherlands (-16.1%).

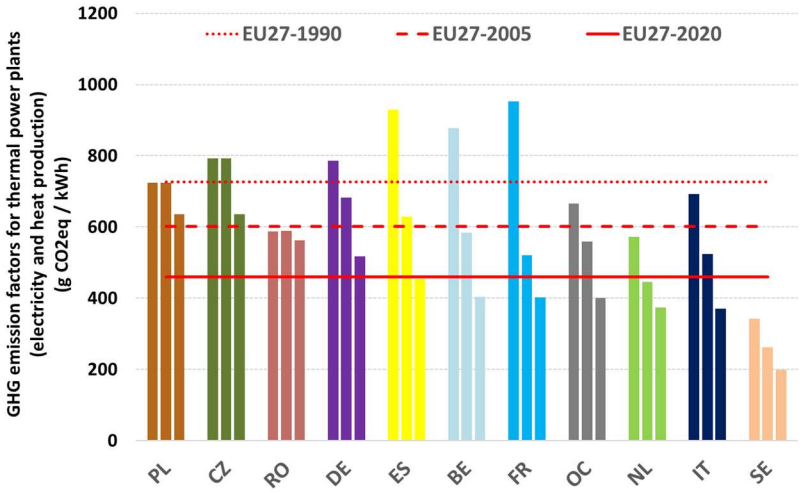


Figure 2.21 – *GHG emission factors for electricity and heat production by thermal power plants (g CO_2eq / kWh). Data in descending order of 2020 value. OC – Other countries.*

Table 2.7 reports the emission factors for electricity and heat production by the whole electricity sector, including renewable and nuclear power production. Heat from nuclear power plants is added up to calculate the emission factor due to total heat and electricity production. Heat from nuclear plants represents around 0.2% of the heat produced in EU27 from power plants. Among the examined countries there is little production of heat from nuclear power plants in Germany in the first half of the 1990s and in Czechia since 2005.

Table 2.7 – *GHG emission factor for total electricity and heat production (g CO_2eq / kWh). Countries in descending order of 2020 value.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU27	**457.3**	**423.2**	**388.2**	**370.7**	**333.6**	**311.9**	**302.7**	**300.9**	**286.4**	**255.2**	**231.4**
Poland	719.7	753.8	741.8	715.2	699.0	663.7	650.3	639.8	636.6	602.9	574.6
Czechia	676.5	673.1	643.4	592.9	556.1	506.6	513.4	486.6	483.0	452.7	414.7
Germany	585.3	559.9	514.6	477.5	451.2	435.2	431.3	403.0	387.0	337.9	307.7
Netherlands	546.3	484.0	430.4	425.0	390.6	444.0	424.9	400.8	386.8	347.5	300.0
Romania	538.7	472.3	431.5	415.2	378.0	329.8	311.1	330.5	322.7	329.0	267.6
Italy	578.7	549.6	507.7	457.2	386.2	325.2	316.6	312.0	296.1	278.6	263.6
Belgium	360.0	370.9	293.5	279.5	232.7	238.9	184.3	183.3	210.0	176.2	175.5
Spain	439.3	468.5	444.3	407.2	239.8	304.3	258.9	303.1	271.4	208.9	163.5
France	111.3	77.5	85.3	95.7	85.0	62.8	68.4	76.3	61.8	61.8	59.8
Sweden	34.0	53.5	50.9	58.7	73.2	48.3	54.4	53.7	55.8	52.2	48.5
Others	460.6	445.7	397.5	383.6	351.6	303.4	285.5	294.4	279.8	244.9	211.6

The average EU27 emission factor in 2020 for electricity and heat production (231.4 g CO_2eq/kWh) shows a reduction of 37.6%, compared to the 2005 level, while the emission factor in Italy (263.6 g CO_2eq/kWh) decreased by 42.3%. Among the countries examined Spain shows the highest reduction (-59.9%) followed by Italy. Sweden, Poland, and the Netherlands recorded the lowest percentages of reductions (-17.3%, -19.7%, and -29.4% respectively). France reduced the emission factor of 37.5%, while for Germany and Czechia the reductions are respectively 35.6% and 30.1%.

Countries with a significant share of electricity from nuclear power and renewable sources have a benefit in terms of GHG emissions. France has a relevant amount of energy from nuclear power plants, which allows the emission factor to be drastically reduced. Apart from Italy and Poland, even the other countries have significant shares of electricity from nuclear power (from 3.3% in the Netherlands to 39% in Belgium). Overall, nuclear electricity in EU27 was 24.8% in 2020, down from 32.3% in 1990. In 2020, 88.6% of EU27 nuclear electricity comes from the countries examined, with France accounting for 51.8%.

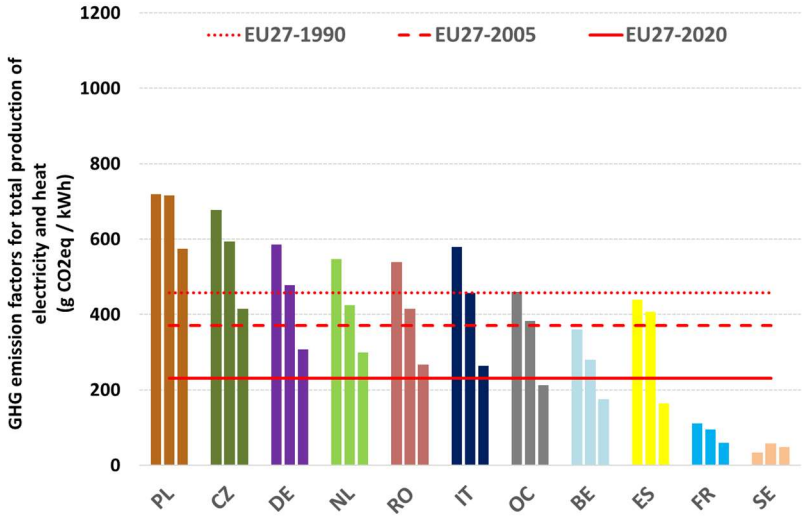


Figure 2.22 – *GHG emission factors for total electricity and heat production (g CO_2eq / kWh). Data in descending order of 2020 value. OC – Other countries.*

The emission factors for electricity production, shown in the following graphs and tables, was drawn up considering the only share of fuel energy for electricity production, after unbundling the energy for heat production in CHP plants.

Table 2.8 – *GHG emission factor for electricity production by thermal power plants (g CO_2eq / kWh). Countries in descending order of 2020 value.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU27	**810.1**	**791.2**	**729.9**	**675.4**	**622.7**	**639.1**	**610.3**	**597.1**	**595.9**	**544.3**	**512.0**
Czechia	964.3	945.2	900.6	928.8	918.4	858.6	831.9	826.3	828.8	786.5	735.6
Romania	319.4	601.9	657.4	736.6	797.8	739.8	720.0	724.5	747.6	803.7	706.4
Poland	831.2	799.3	779.7	755.2	738.2	722.9	715.2	715.9	702.9	676.1	657.0
Germany	928.5	906.6	825.1	767.9	711.7	703.1	685.0	662.0	658.9	621.1	587.0
France	952.2	918.0	771.1	684.9	696.0	620.3	525.8	522.4	541.6	489.3	471.7
Spain	929.4	894.0	780.6	629.3	502.3	655.2	618.2	622.2	624.8	483.3	453.1
Belgium	925.2	859.2	730.6	653.3	499.2	482.4	467.7	456.9	450.1	450.1	418.6
Netherlands	600.5	550.8	497.8	488.6	435.9	555.6	524.8	499.2	481.9	432.9	389.6
Italy	688.5	663.2	611.8	562.8	506.8	477.3	452.0	433.2	434.5	402.1	388.1
Sweden	332.3	342.8	374.3	302.8	244.6	202.6	196.8	205.4	215.7	218.0	210.8
Others	770.7	751.9	694.5	657.0	619.0	624.3	584.1	585.7	578.3	522.8	477.7

Italian emission factor by thermal plants in 2020 (388.1 g CO_2eq/kWh) is second only to that of Sweden (210.8 g CO_2eq/kWh), where the share of bioenergy in the thermoelectric plants is much higher. The Italian factor is well below the EU27 average of 512 g CO_2eq/kWh. Czechia, Romania, Poland, and Germany are the top four emission factors, from 735.6 g CO_2eq/kWh to 587 g CO_2eq/kWh, well above the European average.

Figure 2.23 shows that all countries reduced their GHG emission factors since 2005, from -4.1% in Romania to -35.9% in Belgium. The Italian reduction rate is -31%.

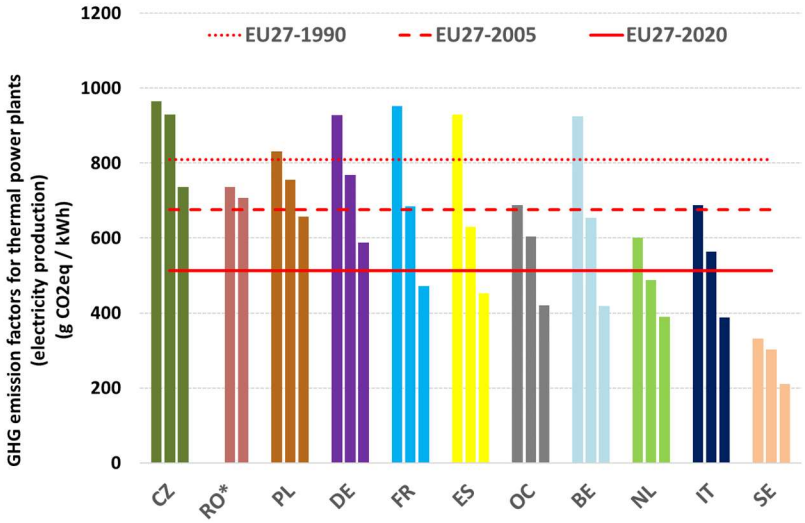


Figure 2.23 – *GHG emission factors for electricity production in thermal power plants (g CO_2eq / kWh). Data in descending order of the 2020 value. OC – Other countries. * 2005 and 2020.*

The emission factors are obviously much lower when all renewable electricity is considered (Table 2.9).

Table 2.9 – *GHG emission factor for total electricity production (g CO_2eq / kWh). Countries in descending order of 2020 value.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU27	**444.7**	**417.9**	**386.0**	**369.7**	**327.5**	**306.2**	**295.8**	**294.2**	**278.9**	**244.3**	**218.1**
Poland	822.3	788.3	768.2	742.3	716.2	666.3	651.0	641.4	639.9	601.5	573.5
Czechia	749.4	721.2	705.0	610.9	564.1	519.7	530.1	498.4	489.5	454.2	405.1
Germany	640.3	606.1	535.7	500.5	468.8	449.1	445.7	413.2	400.4	345.4	312.0
Netherlands	568.7	518.8	469.2	457.1	405.6	483.7	455.7	423.5	404.1	356.4	299.0
Romania	262.8	431.8	399.4	417.2	379.1	321.0	299.5	324.9	316.8	323.0	255.1
Italy	575.9	546.9	497.8	477.7	391.0	324.6	311.9	307.7	289.9	268.6	251.9
Belgium	359.3	371.8	301.3	278.6	229.4	232.6	174.7	174.3	201.7	167.4	167.1
Spain	439.1	468.5	444.2	407.2	239.8	304.3	258.9	303.1	271.4	208.9	163.5
France	111.3	75.4	76.5	80.0	76.5	55.3	60.1	68.4	54.2	53.7	51.0
Sweden	12.0	23.5	22.9	23.4	34.1	17.4	19.1	19.4	20.6	21.2	17.5
Others	460.0	446.5	407.3	398.3	362.4	307.1	286.4	298.5	282.1	240.9	202.4

The average EU27 emission factors for total electricity generation have always been lower than the Italian ones, thanks also to the contribution of nuclear electricity. The increasing renewable share of electricity leads to a significant reduction of the emission factors. In addition, the reduction of nuclear electricity share in Europe brings the Italian emission factor closer to the EU27 average. The Italian emission factor in 2005 was greater than the EU27 average of 29.2%, while in 2020 it is greater than 15.5%. It is interesting to note that 2018 has been the year with the smallest gap between the Italian and European values (3.9%)

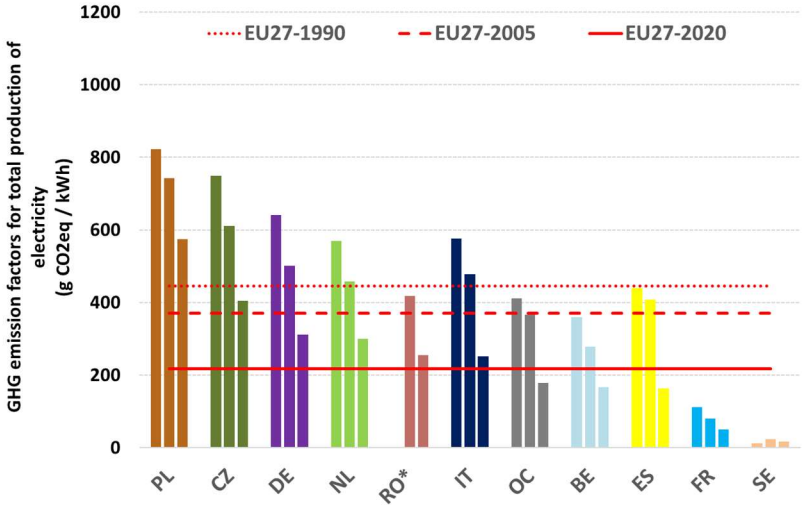


Figure 2.24 – *GHG emission factors for total electricity production (g CO_2eq / kWh). Data in descending order of the 2019 value.*

The outcomes concerning the GHG emissions esteems allow to conclude that Italy have one of the lowest GHG emission factor for electricity and heat production by fuel mix combustion among the biggest European countries (Figure 2.21). The following graph shows the share of power sector GHG emissions of the EU27 countries, already seen in Figure 2.18, compared with the share of electricity production from fuel combustion. Among the biggest countries the shares of GHG emissions for Germany and Poland are higher than their shares of electricity production. The same pattern is true for Czechia, Romania, and Sweden. The opposite pattern is observed for all other countries.

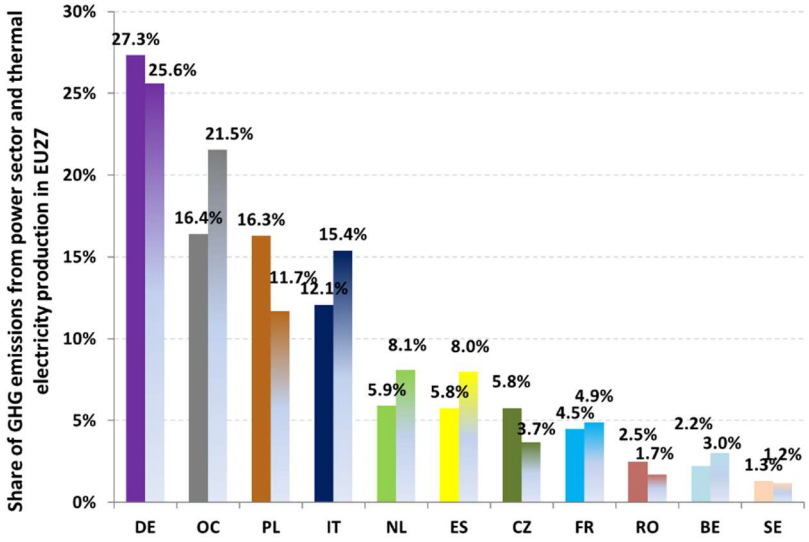


Figure 2.25 – *Share of GHG emissions in the power sector for electricity and heat production in 2020 for the EU27 countries (full colour bars) and share of electricity production from fuel combustion (shaded colour bars). Countries in descending order of GHG emissions share. OC – Other countries.*

Considering all Member States in EU27, the Italian GHG emission factor for electricity production by thermal plants occupies the 9th position, well below the European average. The Italian fuels mix, with greater share of natural gas than in other countries and the contribution of bioenergy, is a driving factor for the emission factor in thermal power plants. Moreover, the equivalent electrical efficiency of thermal plants in Italy is higher than EU27 average and exceeded only by Belgium, the Netherlands and Sweden, among the countries examined.

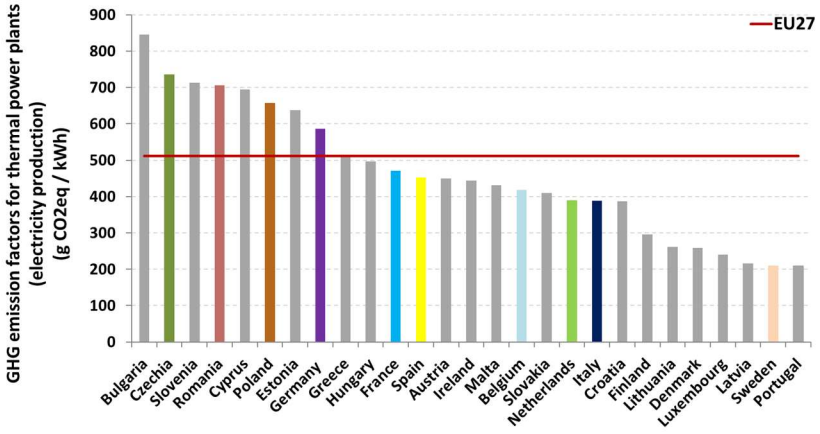


Figure 2.26 – *GHG emission factors electricity production by thermal power plants (g CO_2eq / kWh) in 2020. Data in descending order.*

Considering total electricity production, therefore the role of renewables other than bioenergy and the role of nuclear power plants, the Italian emission factor loses positions compared to other countries. Countries with nuclear power plants have a benefit in terms of avoided GHG emissions. The renewable share in Italy for the gross electricity production in 2020 is comparable with shares of Spain (Figure 2.7 and Figure 2.28), which nevertheless have significant shares of nuclear energy. On the other hand, France and Belgium electricity renewable shares are much lower than the Italian one but have relevant amount of nuclear energy. The nuclear electricity plays a decisive role for the correct interpretation of the emission factors in Spain, Belgium, and France. The effect of nuclear energy is particularly evident for France: although the renewable share of electricity production is almost half than the Italian one

(Figure 2.28) and the emission factor by thermal plants in higher (Table 2.8, Figure 2.23), France has the lowest emission factor for total electricity production in Europe, second only to that recorded for Sweden. Germany has 11.4% of nuclear electricity and 44.2% of renewable electricity but the relevant presence of solid fuels in the fossil mix (23.6% of electricity production), mainly high-carbon content fuel as lignite, results into a higher emission factor than the Italian one.

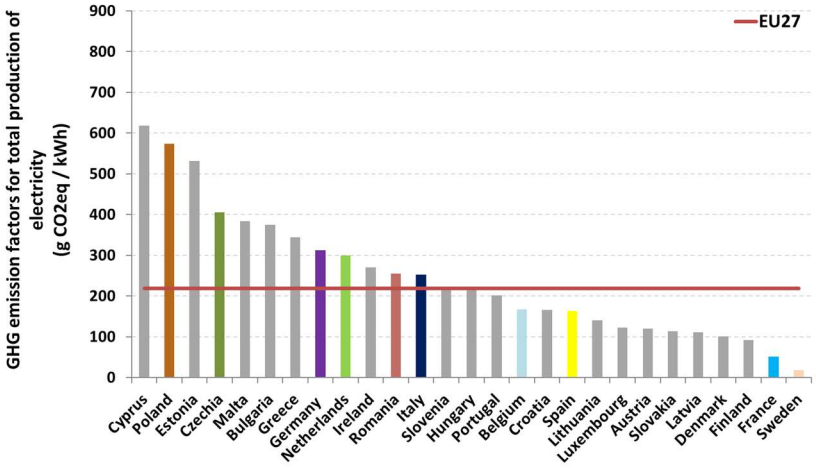


Figure 2.27 – *GHG emission factors for total electricity production (g CO_2eq / kWh) in 2020. Data in descending order.*

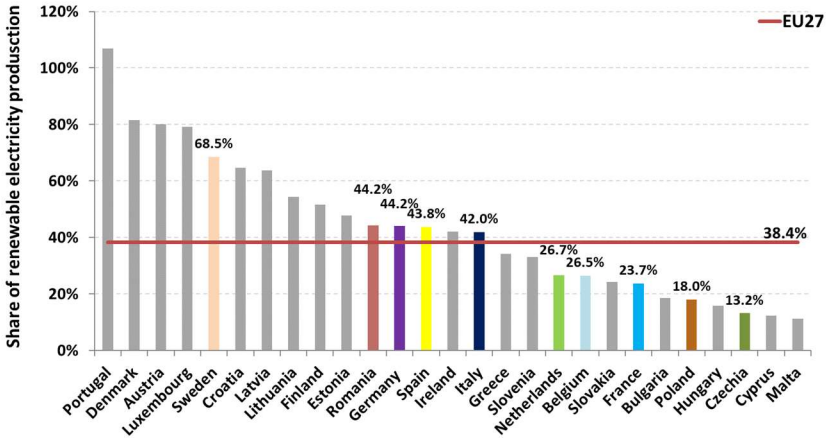


Figure 2.28 – *Share of renewable electricity production without pumping in 2020. Data in descending order.*

The following graph shows GHG emissions from the thermal power sector of European countries with more than 3 Mt CO_2eq for the production of electricity and heat.

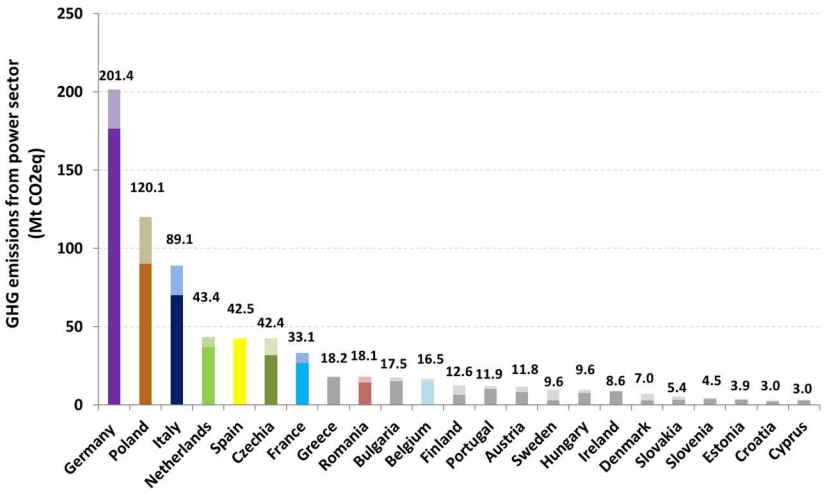


Figure 2.29 – *GHG emissions from power sector in European countries in 2020. The countries with more than 3 Mt CO_2eq are reported. Each bar shows the amount due to electricity generation (bottom) and heat (top). The remaining countries (Lithuania, Latvia, Malta, and Luxembourg) emit a total of 3.8 Mt CO_2eq.*

Data reported in Figure 2.29 make clear the contribution of the thermal power plants of each country and the potential for reducing emissions from power sector. As a result of many factors (fuel mix shift, efficiency, share of renewable) Italy reduced the emission factor for electricity and heat production by 54.4% from 1990 to 2020 (-42.3% since 2005), against a reduction of 47.4% in Germany (35.6% since 2005) and 20.2% in Poland (19.7% since 2005). The reduction rate in Poland is the lowest among the biggest emitters in Europe. If Germany and Poland had reduced their GHG emission factors since 1990 at the same rate of Italy, it would have led (with the same electricity and heat production) to avoid around 78 Mt CO_2eq in 2020, about 11% of EU27 emissions from power plants. The power plants in Germany and Poland are still fuelled by significant shares of high-carbon content solid fuels, such as lignite, and the transition to natural gas has been much slower than in Italy.

2.4 Heat-only producers

Heat production accounts for a significant share of energy transformation processes. Plants dedicated to heat production for district heating and other uses (mainly for industry) consume an important share of the energy in the European balance.

In this paragraph the main parameters of such plants will be summarized with an approach similar to that used for power plants.

2.4.1 *Energy consumption, heat production and greenhouse gas emissions*

In 2020 the energy consumption of plants for heat production in EU27 was 16.3 Mtoe of which 0.64 Mtoe from geothermal and solar thermal, and 0.26 Mtoe from heat pumps. The energy consumption of fuels was 15.4 Mtoe, of which 5.1 Mtoe from bioenergy. Bioenergy consumption shows a rapidly growing share: the consumption in 2020 almost doubled the 2005 level and is around 7 times the consumption in 1990.

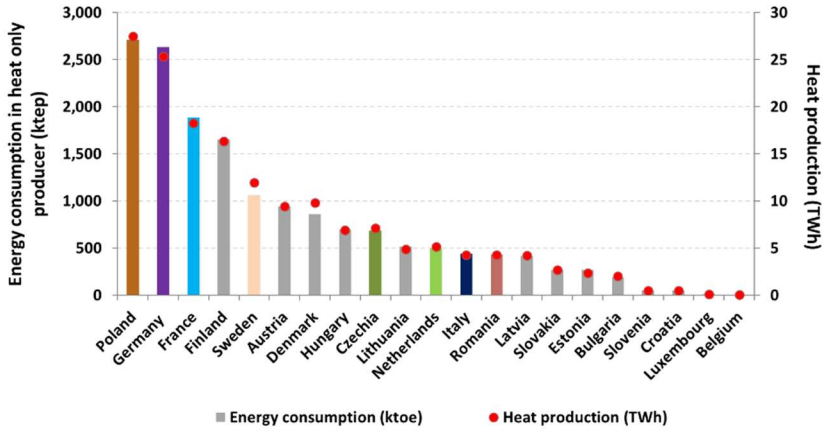


Figure 2.30 – *Energy consumption and heat produced by heat only producer plants in European countries (2020). Data in descending order for energy consumption.*

Total energy consumption in 2020 is much less than that recorded in 1990 and a marked fuel shift has occurred. The trend shown in the following graph shows the decrease of solid fuels and, to a greater extent, of oil and petroleum products being replaced by natural gas and bioenergy. The contribution of other renewable sources (more than 90% from geothermal energy and the rest from solar thermal) and heat pumps recorded a constant increase up to represent 5.6% of total consumption in 2020.

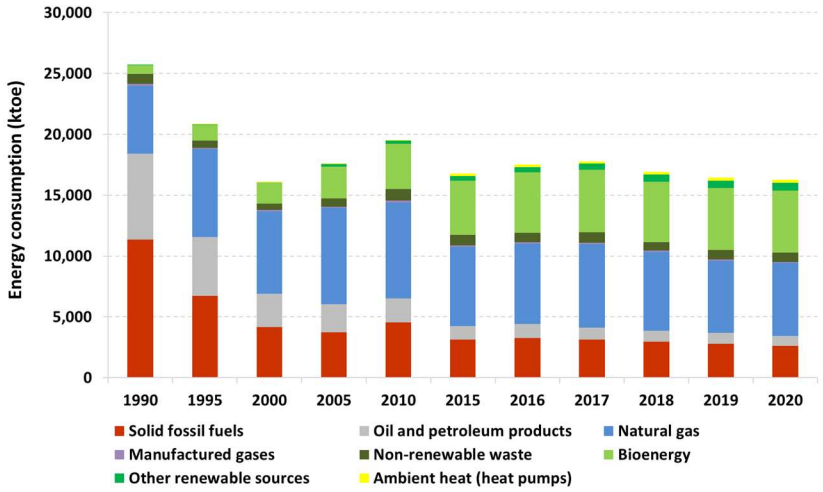


Figure 2.31 – *Energy consumption by source in heat only producer in EU27.*

As a result of such fuel shift and decreasing energy consumed (-36.7%) and heat production (-28.1%), GHG emissions registered a sharp decrease by 56.8% since 1990. GHG emission factor decreased by 40%. At EU27 level the GHG emissions from these plants are 37.6 Mt CO_2eq in 2020.

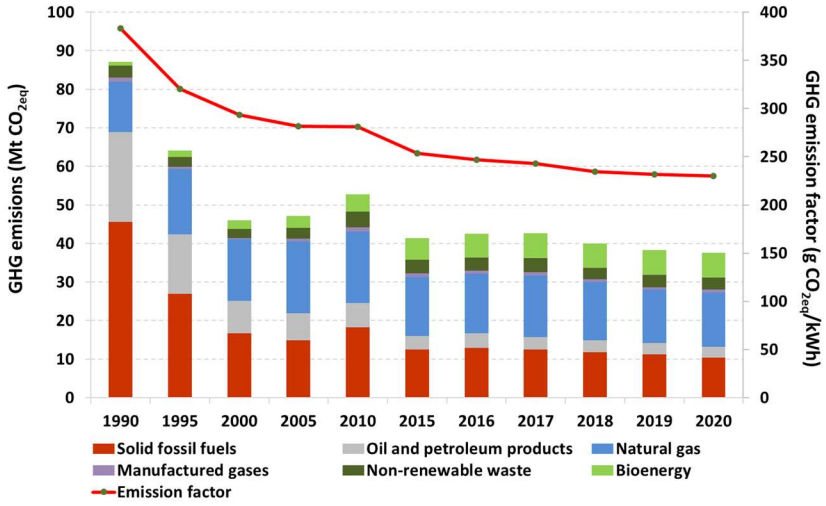


Figure 2.32 – *GHG emissions by source and average GHG emission factor for heat only producers in EU27.*

Table 2.10 shows the energy consumption of the examined countries. In 2020, such countries account for about 63.7% of energy consumed at EU27 level in plants dedicated to heat production and 63.5% of heat produced (Table 2.11). For Spain there is no energy consumption or heat production from such plants throughout the historical series. In addition to the countries examined, the other countries with more than 4 TWh of heat produced in 2020 are Finland (10% in EU27), Denmark (6%), Austria (5.8%), Hungary (4.2%), Lithuania (3%), Latvia (2.6%). Italy heat production from dedicated plants is 4.3 TWh (2.6% in EU27).

The GHG emissions from countries shown in Table 2.12 represent 69.4% of the emissions of EU27.

Table 2.10 – *Energy consumption in the biggest countries and EU27 from heat only producer plants (ktoe). Countries in descending order of the 2020 value.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU27	**25,704**	**20,793**	**16,073**	**17,578**	**19,490**	**16,790**	**17,511**	**17,775**	**16,897**	**16,425**	**16,271**
Poland	10,560	5,997	4,167	3,450	3,722	2,670	2,853	2,794	2,762	2,661	2,708
Germany	-	1,985	1,198	3,747	4,324	3,576	3,535	3,533	2,867	2,787	2,635
France	510	199	156	308	1,670	1,745	1,912	1,932	1,920	1,925	1,889
Sweden	1,039	1,169	1,136	1,268	1,483	1,166	1,212	1,167	1,178	1,138	1,065
Czechia	1,186	1,379	956	898	940	652	713	721	706	715	687
Netherlands	274	958	1,343	1,331	603	552	521	447	316	444	501
Italy	-	-	-	-	110	128	137	386	423	413	438
Romania	-	1,834	1,740	826	688	477	373	470	551	476	430
Belgium	9	6	39	20	9	8	6	5	6	5	5
Spain	-	-	-	-	-	-	-	-	-	-	-
Others	12,128	7,266	5,338	5,732	5,940	5,817	6,248	6,319	6,169	5,862	5,912

Table 2.11 – *Heat produced (TWh) in the biggest countries and EU27 from heat only producer plants. Countries in descending order of the 2020 value.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU27	**227.2**	**200.0**	**156.7**	**167.5**	**187.6**	**163.2**	**172.5**	**175.8**	**170.2**	**165.0**	**163.5**
Poland	87.6	54.5	40.0	32.3	36.1	26.3	28.7	28.4	28.0	26.8	27.5
Germany	-	22.2	12.4	34.1	38.8	31.0	31.3	31.3	27.8	26.3	25.3
France	2.8	0.9	0.9	1.7	16.6	17.0	18.5	18.8	18.7	18.9	18.2
Sweden	10.6	12.2	11.6	13.2	14.7	13.5	13.5	12.9	12.8	12.7	11.9
Czechia	10.3	13.5	9.7	8.7	9.9	6.7	7.3	7.4	7.3	7.4	7.1
Netherlands	2.8	8.7	12.3	13.0	6.0	4.6	4.7	4.6	3.2	4.5	5.1
Italy	-	-	-	-	0.8	1.0	1.1	3.8	4.1	4.0	4.3
Romania	-	17.4	17.3	7.7	5.7	3.7	3.8	4.7	5.6	4.8	4.2
Belgium	0.1	0.0	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spain	-	-	-	-	-	-	-	-	-	-	-
Others	113.0	70.6	52.5	56.6	59.1	59.3	63.5	63.8	62.6	59.5	59.7

Table 2.12 – *Estimation of GHG emissions in the biggest countries and EU27 from heat only plants (Mt CO_2eq.). Countries in descending order of the 2020 value.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU27	**87.1**	**64.1**	**46.0**	**47.2**	**52.8**	**41.4**	**42.6**	**42.7**	**39.9**	**38.3**	**37.6**
Poland	41.2	23.7	16.1	13.1	14.2	10.2	10.8	10.6	10.4	10.0	10.1
Germany	-	4.8	2.8	9.6	12.2	9.8	9.5	9.5	7.6	7.4	6.8
France	2.0	0.8	0.6	0.5	4.3	3.7	3.9	3.7	3.5	3.4	3.3
Czechia	3.9	4.4	2.8	2.5	2.4	1.6	1.8	1.8	1.7	1.7	1.7
Sweden	3.4	2.8	2.4	2.4	2.5	1.5	1.7	1.6	1.5	1.4	1.4
Netherlands	0.6	2.3	3.3	3.3	1.6	1.3	1.2	1.0	0.7	1.0	1.1
Romania	0.0	5.1	4.4	2.0	1.7	1.1	0.9	1.1	1.3	1.1	1.0
Italy	-	-	-	-	0.1	0.1	0.1	0.7	0.8	0.8	0.8
Belgium	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spain	-	-	-	-	-	-	-	-	-	-	-
Others	36.0	20.4	13.5	13.7	13.7	12.1	12.7	12.7	12.4	11.4	11.5

The following graph shows, for the greatest heat producers (≥ 4 TWh), the share of energy sources and the emission factor in 2005 and 2020. For Italy there is no heat production in 2005. The reduction of solid fuels and petroleum products and the increase of bioenergy has been recorded in many countries.

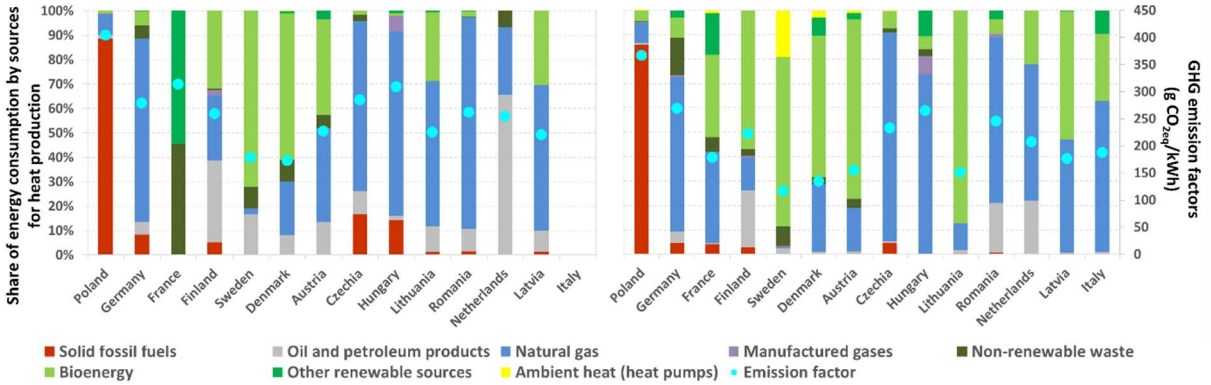


Figure 2.33 – *Share of energy sources for heat only producer plants and GHG emission factor in the greatest heat producers in 2005 (left) and 2020 (right). Countries in descending order of heat produced in 2020.*

Fuel shift and increase of efficiency result in 18.3% reductions in the emission factors from 2005 to 2020 in EU27 (from 281.8 to 230.1 g CO_2eq / kWh). Italy's emission factor in 2020 is 18.5% lower than the EU27 average. The relevant solid fuels or non-renewable waste consumption in Poland and Germany results in higher emission factors in 2020, respectively 95.7% and 46.6% higher than the Italian one.

Table 2.13 – *GHG emission factors in EU27 and countries with heat production from heat only producers greater than 4 TWh (g CO_2eq / kWh). Countries in descending order of heat produced in 2020.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU27	**383.4**	**320.5**	**293.4**	**281.8**	**281.3**	**253.9**	**246.8**	**242.8**	**234.6**	**232.0**	**230.1**
Poland	470.7	433.7	402.2	404.9	393.3	386.0	377.8	372.2	371.3	372.8	366.9
Germany		214.2	229.6	280.1	315.4	314.2	302.3	303.7	273.7	282.3	269.2
Hungary	383.0	322.9	223.7	310.1	360.9	254.3	223.9	260.3	264.8	253.2	265.1
Romania		293.2	252.3	262.6	298.3	312.0	242.5	235.0	234.5	236.8	245.2
Czechia	374.5	324.1	290.8	285.5	246.5	243.8	242.1	241.1	239.1	234.1	233.0
Finland	297.5	264.0	270.0	260.5	260.8	234.5	238.7	222.6	222.1	223.2	222.5
Netherlands	227.0	265.3	269.5	256.0	269.8	280.0	259.3	224.3	222.3	217.0	207.3
Italy					131.5	110.8	110.6	189.7	190.1	188.6	187.5
France	719.3	823.8	713.8	314.3	260.4	216.4	209.3	196.7	187.3	177.6	178.6
Latvia	362.8	287.3	238.3	221.6	211.6	186.0	178.3	188.0	189.3	176.7	176.2
Austria	281.2	227.6	226.8	228.2	187.2	175.7	177.8	176.6	166.7	159.6	155.1
Lithuania	303.1	285.6	269.3	226.2	202.8	163.7	150.5	152.4	156.3	148.0	151.2
Denmark	261.2	225.0	220.5	173.5	168.4	159.5	158.0	150.1	147.7	138.7	134.2
Sweden	317.0	225.3	202.8	179.4	170.3	110.5	124.0	122.1	116.5	112.9	117.0

CONCLUSIONS

The analysis of decarbonization and efficiency indicators and the comparison among the largest European countries has been carried out for the overall and sectoral energy consumption. The decomposition analysis was carried out on driving factors of GHG emissions. Decarbonization and efficiency indicators are also elaborated for the power sector with the same task of comparing the performance of largest European countries.

The main results of the report can be summarized as follows:

- the ratio between final energy consumption and primary energy consumption in Italy is the highest among the European countries considered, showing high energy transformation efficiency. Italy is one of the largest European countries with the lowest gross inland energy consumption per unit of GDP;

- the share of renewable energy consumption per unit of gross inland consumption in Italy is greater than the EU27 average since 2005. The Italian share of renewable energy accelerated sharply since 2007, with an increase in the distance between the Italian and European average. In 2020 Italy is, among the countries considered, second only to Sweden;

- Italian emissions per capita increased until 2004, unlike other European countries, which have seen decreasing emissions per capita since 1990. Emissions per capita of Italy were always below the EU27 average and in 2020 are higher to those recorded in France, Romania, Spain and Sweden where the nuclear energy represents a not negligible share of inland consumption. Italian emissions per unit of gross inland energy consumption without nuclear share are some of the lowest among the largest European countries;

- at sectoral level, the final energy and carbon intensities per unit of value added show that Italian industry has one of the lowest values among the 27 European States with one the highest levels of electrification. The agriculture intensities are among the lowest in Europe. On the other hand, the Italian civil sector shows wide margins for reducing emissions if compared with other countries, especially considering the level of electrification of final consumption that is among the lowest in Europe both for households and for services;

- the energy intensity per unit of GDP considering the energy consumption by international bunkers confirms that among the largest countries Italy has the lowest intensity;

- productivity per domestic material consumption or direct material inputs show that Italian productivity is one of the highest among the biggest countries despite the relevant share of energy intensive industrial activities.

- the results of decomposition analysis show that the reduction of final energy intensity and the increasing share of renewables have played a key role among the factors determining the European GHG emission reduction since 2005;

- the reduction of GHG emissions in the period 2005-2020 in Italy is also due to the reduction of economy activities. The comparison with the largest States of the European Union shows greater decoupling between GDP and GHG emissions in other countries than the one observed in Italy, although indicators such as energy efficiency, energy consumption per GDP, and GHG emissions per capita show that Italy had already a better performance than European average and many countries with much higher values are approaching Italian values.

- the Italian GHG emission factors in power sector for electricity and heat production are higher than the EU27 average also for the contribution of nuclear energy that do not play any role in Italy. Italy

in 2020 has one of the highest shares of electricity from renewable sources among the European countries considered.

The results show that Italy has one of the most efficient energy and economic systems among the biggest countries in Europe. The figures show that energy intensity per unit of GDP is among the lowest in Europe despite a relevant role of industry in the Italian economy. Low energy intensity often corresponds to more service-based economies with a minor role of industrial activities. EU27's carbon intensity per unit of energy consumption is on average lower than Italian one, since in several countries is present a not negligible share of nuclear energy. Without such share the carbon intensity of Italy is well below the European average.

GHG emissions trends depend on many factors. The economic crisis since 2008 has led to a drastic reduction in gross domestic product and a consequent reduction in GHG emissions. Although the emission reductions are mainly due to the decreasing energy intensity and increasing renewable energy consumption, the contraction of economy played a not insignificant role. Moreover, the measures adopted in 2020 to contain the diffusion of SARS-CoV-2 pandemic heavily affected the European economy and GHG emissions. Independently from particular contingencies there is clear decoupling between GDP and GHG emissions in the European countries, although decoupling does not necessarily correspond to the emission reductions in line with the targets to be achieved, as for Germany. It is clear from the analyses carried out that the potential for reducing emissions must be assessed in parallel with the starting points of the driving factors for GHG emissions and the costs to change the energy system, as well as assessments of the economy structure, especially concerning the services and industry assets.

Sectoral decarbonization indicators in Italy show sectors such as industry and agriculture with energy intensities among the lowest in Europe and sectors such as households and services occupying one of the last positions among European countries with very wide emission reduction potentials, especially considering the level of electrification of final consumption that for such sectors is among the lowest in Europe.

As for the power sector Italy reduced its emission factor for electricity and heat production by 54.4% from 1990 to 2020, compared with a reduction of 47.4% in Germany and 20.2% in Poland, the last one is the lowest reduction rate among the major emitters in Europe. Poland and Germany have the highest share of lignite consumption and the highest emission factors among the biggest countries. In such countries the transition to natural gas has been slower than in Italy. The reduction of GHG emission factors since 1990 in Germany and Poland on an equal footing with that recorded for Italy, at parity of electricity and heat production, would have avoided around 78 Mt CO_2eq in 2020, about 11% of the EU27’s GHG emissions from power sector.

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ANNEX 1

Table A1.1 – *Gross inland consumption of energy per capita (toe/inhabitant). In all tables EU28 and UK data updated to 2019 are shown.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**3.51**	**3.48**	**3.55**	**3.72**	**3.52**	**3.23**	**3.23**	**3.28**	**3.25**	**3.19**	
EU27	**3.48**	**3.42**	**3.50**	**3.69**	**3.54**	**3.26**	**3.28**	**3.35**	**3.32**	**3.27**	**3.00**
AT - Austria	3.31	3.43	3.65	4.19	4.17	3.93	3.93	3.97	3.85	3.92	3.62
BE - Belgium	**4.90**	**5.35**	**5.81**	**5.67**	**5.60**	**4.78**	**4.99**	**4.97**	**4.80**	**4.90**	**4.46**
BG - Bulgaria	3.22	2.77	2.28	2.61	2.41	2.59	2.56	2.67	2.70	2.69	2.57
CY - Cyprus	2.83	3.06	3.51	3.48	3.37	2.72	2.91	3.01	3.05	3.00	2.57
CZ - Czechia	**4.82**	**4.05**	**4.02**	**4.46**	**4.35**	**3.99**	**3.95**	**4.11**	**4.11**	**4.03**	**3.76**
DE - Germany	**4.50**	**4.18**	**4.17**	**4.20**	**4.13**	**3.92**	**3.89**	**3.90**	**3.80**	**3.71**	**3.42**
DK - Denmark	3.50	3.85	3.66	3.66	3.68	3.05	3.11	3.11	3.10	2.98	2.73
EE - Estonia	6.84	3.89	3.36	4.04	4.44	3.69	4.58	4.49	4.33	3.62	3.38
EL - Greece	2.19	2.23	2.59	2.83	2.55	2.22	2.19	2.27	2.22	2.20	1.91
ES - Spain	**2.28**	**2.59**	**3.06**	**3.34**	**2.80**	**2.65**	**2.67**	**2.80**	**2.79**	**2.70**	**2.36**
FI - Finland	5.76	5.73	6.34	6.65	6.88	5.97	6.17	6.23	6.33	6.20	5.81
FR - France	**3.90**	**4.05**	**4.23**	**4.42**	**4.17**	**3.91**	**3.83**	**3.83**	**3.79**	**3.74**	**3.32**
HR - Croatia	2.02	1.69	1.88	2.28	2.20	2.01	2.05	2.14	2.11	2.16	2.05
HU - Hungary	2.81	2.52	2.47	2.82	2.66	2.56	2.60	2.72	2.73	2.73	2.68
IE - Ireland	2.93	3.01	3.80	3.76	3.31	3.05	3.17	3.06	3.08	3.05	2.76
IT - Italy	**2.61**	**2.84**	**3.07**	**3.27**	**2.99**	**2.56**	**2.54**	**2.63**	**2.60**	**2.60**	**2.37**
LT - Lithuania	4.41	2.43	2.09	2.68	2.25	2.46	2.55	2.70	2.79	2.79	2.73
LU - Luxembourg	9.26	8.20	8.43	10.41	9.25	7.42	7.27	7.33	7.48	7.40	6.33
LV - Latvia	2.98	1.85	1.62	2.04	2.18	2.21	2.23	2.33	2.48	2.42	2.29
MT - Malta	2.18	2.10	2.08	2.32	2.27	1.72	1.60	1.79	1.78	1.83	1.48
NL - Netherlands	4.62	4.91	4.93	5.13	5.20	4.52	4.60	4.63	4.51	4.40	4.13
PL - Poland	2.72	2.59	2.33	2.43	2.67	2.52	2.65	2.77	2.90	2.79	2.71
PT - Portugal	1.72	2.07	2.48	2.61	2.31	2.27	2.27	2.39	2.33	2.32	2.08
RO - Romania	**2.72**	**2.06**	**1.64**	**1.81**	**1.72**	**1.60**	**1.61**	**1.71**	**1.72**	**1.71**	**1.67**
SE - Sweden	**5.56**	**5.72**	**5.38**	**5.71**	**5.40**	**4.83**	**4.99**	**5.03**	**5.05**	**4.86**	**4.38**
SI - Slovenia	2.87	3.06	3.30	3.79	3.54	3.15	3.25	3.34	3.31	3.23	3.02
SK - Slovakia	4.02	3.32	3.28	3.48	3.29	3.00	3.01	3.17	3.13	3.12	3.01
UK - United Kingdom	3.71	3.86	3.97	3.90	3.41	2.95	2.88	2.83	2.81	2.74	

Table A1.2 – *Ratio of final energy consumption to gross domestic energy consumption (toe/toe).*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**0.68**	**0.68**	**0.68**	**0.67**	**0.68**	**0.69**	**0.69**	**0.69**	**0.70**	**0.71**	
EU27	**0.68**	**0.68**	**0.69**	**0.68**	**0.69**	**0.69**	**0.70**	**0.69**	**0.70**	**0.71**	**0.73**
Austria	0.77	0.77	0.81	0.79	0.80	0.81	0.82	0.81	0.82	0.82	0.84
Belgium	**0.65**	**0.69**	**0.68**	**0.70**	**0.70**	**0.76**	**0.73**	**0.72**	**0.75**	**0.71**	**0.74**
Bulgaria	0.62	0.51	0.51	0.52	0.51	0.53	0.55	0.54	0.54	0.54	0.56
Cyprus	0.55	0.62	0.60	0.63	0.63	0.63	0.62	0.62	0.62	0.63	0.68
Czechia	**0.66**	**0.66**	**0.63**	**0.61**	**0.59**	**0.61**	**0.61**	**0.63**	**0.62**	**0.63**	**0.65**
Germany	**0.68**	**0.69**	**0.68**	**0.67**	**0.69**	**0.70**	**0.70**	**0.71**	**0.71**	**0.72**	**0.75**
Denmark	0.74	0.73	0.73	0.76	0.74	0.79	0.79	0.79	0.79	0.80	0.84
Estonia	0.52	0.49	0.54	0.55	0.50	0.59	0.47	0.50	0.53	0.61	0.65
Greece	0.66	0.66	0.67	0.68	0.69	0.68	0.70	0.68	0.67	0.69	0.75
Spain	**0.69**	**0.67**	**0.69**	**0.71**	**0.71**	**0.65**	**0.67**	**0.65**	**0.67**	**0.68**	**0.70**
Finland	0.78	0.77	0.74	0.72	0.71	0.75	0.75	0.76	0.76	0.76	0.77
France	**0.62**	**0.63**	**0.63**	**0.60**	**0.59**	**0.60**	**0.61**	**0.61**	**0.60**	**0.61**	**0.63**
Croatia	0.73	0.76	0.78	0.80	0.82	0.82	0.82	0.83	0.83	0.83	0.84
Hungary	0.71	0.66	0.68	0.71	0.71	0.74	0.75	0.75	0.75	0.75	0.76
Ireland	0.74	0.75	0.76	0.80	0.77	0.75	0.75	0.76	0.78	0.77	0.81
Italy	**0.78**	**0.75**	**0.73**	**0.74**	**0.75**	**0.76**	**0.76**	**0.76**	**0.77**	**0.77**	**0.78**
Lithuania	0.64	0.58	0.60	0.60	0.77	0.82	0.82	0.84	0.84	0.85	0.84
Luxembourg	0.79	0.84	0.89	0.85	0.85	0.85	0.85	0.84	0.84	0.84	0.83
Latvia	0.81	0.83	0.85	0.88	0.88	0.87	0.86	0.87	0.86	0.86	0.89
Malta	0.35	0.48	0.39	0.42	0.44	0.62	0.65	0.61	0.62	0.62	0.66
Netherlands	**0.77**	**0.76**	**0.75**	**0.75**	**0.76**	**0.73**	**0.73**	**0.74**	**0.75**	**0.74**	**0.77**
Poland	**0.60**	**0.65**	**0.65**	**0.67**	**0.69**	**0.69**	**0.70**	**0.71**	**0.72**	**0.73**	**0.74**
Portugal	0.78	0.74	0.77	0.76	0.78	0.72	0.71	0.69	0.70	0.73	0.76
Romania	**0.68**	**0.57**	**0.65**	**0.68**	**0.69**	**0.71**	**0.73**	**0.72**	**0.73**	**0.75**	**0.77**
Sweden	**0.68**	**0.71**	**0.74**	**0.66**	**0.69**	**0.71**	**0.70**	**0.68**	**0.66**	**0.68**	**0.73**
Slovenia	0.65	0.69	0.73	0.72	0.72	0.74	0.75	0.74	0.75	0.75	0.72
Slovakia	0.73	0.61	0.64	0.63	0.64	0.61	0.62	0.64	0.66	0.66	0.66
United Kingdom	0.65	0.65	0.65	0.63	0.65	0.67	0.69	0.69	0.70	0.70	

Table A1.3 – *Gross domestic product per capita, k€/inhabitant (chain linked volumes, 2015).*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**19.2**	**22.0**	**25.1**	**27.1**	**27.9**	**29.2**	**29.7**	**30.4**	**30.9**	**31.4**	
EU27	**18.4**	**20.9**	**23.8**	**25.5**	**26.4**	**27.5**	**28.0**	**28.8**	**29.3**	**29.8**	**28.0**
Austria	27.3	30.5	35.0	37.3	39.1	40.1	40.4	40.9	41.7	42.2	39.1
Belgium	**25.0**	**28.3**	**32.2**	**34.7**	**36.0**	**37.1**	**37.3**	**37.8**	**38.3**	**38.9**	**36.5**
Bulgaria	3.9	3.6	3.3	4.7	5.8	6.4	6.6	6.8	7.1	7.4	7.1
Cyprus	16.2	17.7	20.3	23.3	23.7	21.1	22.4	23.6	24.6	25.6	23.9
Czechia	**9.3**	**10.1**	**11.1**	**13.5**	**14.9**	**16.1**	**16.5**	**17.3**	**17.8**	**18.3**	**17.1**
Germany	**26.8**	**28.6**	**31.1**	**31.8**	**34.0**	**37.3**	**37.6**	**38.5**	**38.8**	**39.1**	**37.2**
Denmark	35.5	39.2	44.5	46.8	46.3	48.2	49.4	50.4	51.1	52.0	50.8
Estonia	4.3	6.4	8.9	13.1	13.1	15.7	16.2	17.1	17.8	18.4	17.8
Greece	12.5	14.4	16.8	20.0	19.4	16.2	16.3	16.5	16.8	17.1	15.6
Spain	**15.1**	**18.1**	**21.6**	**23.8**	**23.2**	**23.2**	**23.9**	**24.6**	**25.1**	**25.4**	**22.5**
Finland	28.3	27.0	34.2	38.4	39.4	38.6	39.6	40.8	41.1	41.6	40.4
France	**25.8**	**26.9**	**30.5**	**31.9**	**32.3**	**33.1**	**33.4**	**34.0**	**34.6**	**35.1**	**32.3**
Croatia	5.4	6.5	7.9	10.3	10.6	10.7	11.2	11.6	12.1	12.6	11.7
Hungary	6.0	6.9	8.1	10.2	10.2	11.4	11.7	12.3	13.0	13.6	12.9
Ireland	16.6	25.3	37.8	45.0	41.5	56.2	56.7	61.1	65.9	68.1	71.3
Italy	**23.9**	**26.4**	**29.2**	**30.0**	**28.9**	**27.2**	**27.6**	**28.1**	**28.4**	**28.9**	**26.4**
Lithuania	3.5	4.4	5.8	8.7	9.9	12.8	13.3	14.0	14.8	15.5	15.5
Luxembourg	55.1	68.0	83.9	92.0	97.0	96.2	98.6	97.5	97.6	98.8	95.2
Latvia	3.2	4.5	6.0	9.4	9.8	12.4	12.8	13.3	14.0	14.4	14.0
Malta	0.0	0.0	15.5	16.4	18.6	22.7	22.9	25.0	25.7	26.2	23.1
Netherlands	**25.5**	**30.4**	**36.6**	**38.1**	**40.1**	**40.8**	**41.5**	**42.5**	**43.2**	**43.8**	**41.9**
Poland	**4.0**	**5.1**	**6.6**	**7.7**	**9.8**	**11.3**	**11.7**	**12.3**	**12.9**	**13.5**	**13.2**
Portugal	11.7	14.3	17.0	17.3	17.7	17.3	17.7	18.4	19.0	19.5	17.8
Romania	**4.1**	**4.1**	**4.1**	**5.7**	**6.9**	**8.1**	**8.5**	**9.2**	**9.6**	**10.1**	**9.8**
Sweden	**27.1**	**31.3**	**37.1**	**41.6**	**43.8**	**46.7**	**47.2**	**47.7**	**48.0**	**48.5**	**46.6**
Slovenia	9.8	12.0	14.6	17.4	18.6	18.8	19.4	20.3	21.2	21.8	20.7
Slovakia	5.8	6.8	8.0	10.3	13.1	14.7	15.0	15.4	16.0	16.4	15.6
United Kingdom	29.9	29.5	34.7	38.8	38.3	40.8	41.1	41.6	41.8	42.2	

Table A1.4 – *Gross inland energy consumption per unit of gross domestic product, toe/M€ (chain linked volumes, 2015).*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**182.3**	**158.3**	**141.5**	**136.9**	**126.2**	**110.4**	**108.9**	**107.9**	**105.1**	**101.5**	
EU27	**189.3**	**164.0**	**147.0**	**144.8**	**134.0**	**118.5**	**117.2**	**116.4**	**113.3**	**109.5**	**107.0**
Austria	121.2	112.7	104.2	112.3	106.6	98.0	97.4	96.9	92.4	93.1	92.5
Belgium	**196.2**	**189.3**	**180.3**	**163.3**	**155.4**	**128.8**	**133.8**	**131.6**	**125.3**	**125.7**	**122.3**
Bulgaria	830.8	766.4	680.0	555.6	417.8	407.8	387.5	390.4	381.5	363.7	360.0
Cyprus	174.0	173.0	173.1	149.4	141.9	128.6	129.5	127.7	123.6	117.1	107.6
Czechia	**521.5**	**400.8**	**362.6**	**330.2**	**291.6**	**248.0**	**239.6**	**237.7**	**231.3**	**220.9**	**219.6**
Germany	**167.7**	**146.5**	**134.0**	**132.0**	**121.5**	**105.1**	**103.4**	**101.4**	**98.1**	**95.0**	**91.9**
Denmark	98.6	98.3	82.2	78.2	79.5	63.2	63.0	61.6	60.5	57.2	53.7
Estonia	1578.3	609.1	375.5	307.6	338.5	235.1	283.1	262.6	243.9	196.5	189.5
Greece	174.8	154.8	153.6	141.4	131.2	136.6	134.8	137.5	132.1	128.3	122.4
Spain	**151.0**	**143.4**	**141.7**	**140.4**	**120.6**	**114.1**	**111.6**	**114.1**	**111.4**	**106.2**	**105.0**
Finland	203.8	212.1	185.4	173.3	174.7	154.5	155.8	152.8	154.0	149.0	143.9
France	**151.3**	**150.4**	**138.8**	**138.3**	**129.2**	**118.3**	**114.9**	**112.4**	**109.8**	**106.6**	**102.9**
Croatia	373.3	261.2	238.3	221.9	208.4	188.2	183.4	183.6	174.3	170.6	175.5
Hungary	471.1	364.5	305.7	278.0	260.9	223.4	221.3	221.7	210.8	201.7	207.2
Ireland	176.8	118.8	100.7	83.5	79.8	54.2	55.9	50.1	46.8	44.8	38.8
Italy	**109.4**	**107.5**	**105.1**	**109.0**	**103.3**	**94.1**	**92.0**	**93.6**	**91.2**	**90.0**	**90.0**
Lithuania	1266.5	548.4	362.8	307.1	228.4	192.4	192.1	192.7	188.7	179.7	176.0
Luxembourg	167.9	120.6	100.5	113.2	95.4	77.2	73.7	75.2	76.7	74.9	66.5
Latvia	921.1	416.4	269.2	216.0	223.4	178.2	174.6	175.1	177.4	167.8	163.4
Malta			133.8	141.8	122.2	75.8	69.7	71.7	69.4	69.7	64.2
Netherlands	**181.2**	**161.3**	**134.8**	**134.8**	**129.6**	**110.7**	**110.9**	**108.9**	**104.4**	**100.4**	**98.7**
Poland	**681.8**	**509.0**	**351.8**	**314.2**	**273.0**	**222.7**	**226.5**	**226.1**	**224.3**	**206.5**	**205.7**
Portugal	147.6	145.3	145.6	150.8	130.1	131.3	128.3	129.9	123.0	119.2	116.6
Romania	**671.5**	**502.9**	**399.6**	**319.7**	**251.6**	**199.0**	**189.6**	**186.3**	**178.7**	**169.5**	**170.8**
Sweden	**204.9**	**182.8**	**145.0**	**137.3**	**123.4**	**103.3**	**105.6**	**105.5**	**105.0**	**100.3**	**93.9**
Slovenia	294.4	255.9	225.4	218.0	190.6	167.3	167.4	164.2	155.9	148.4	145.7
Slovakia	693.6	487.9	409.5	338.0	250.9	203.6	200.7	205.7	195.8	190.6	192.6
United Kingdom	123.9	130.5	114.2	100.7	89.0	72.2	70.0	68.1	67.1	65.0	

Table A1.5 – *Final energy consumption per unit of gross domestic product, toe/M€ (chain linked volumes, 2015).*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**123.9**	**107.0**	**96.3**	**92.4**	**86.1**	**75.8**	**75.7**	**74.9**	**73.3**	**71.6**	
EU27	**129.3**	**111.5**	**100.8**	**98.5**	**92.1**	**81.7**	**81.5**	**80.8**	**79.1**	**77.3**	**77.9**
Austria	93.7	87.1	83.9	89.2	85.0	79.2	79.6	78.5	75.8	75.9	77.2
Belgium	**127.0**	**129.9**	**123.3**	**114.8**	**108.7**	**98.0**	**97.2**	**94.4**	**93.9**	**89.3**	**90.7**
Bulgaria	512.4	392.3	349.6	289.1	212.7	218.1	212.1	210.7	205.8	196.3	201.5
Cyprus	95.1	106.5	103.8	93.8	89.0	81.0	80.4	78.9	76.1	74.3	73.7
Czechia	**343.8**	**263.2**	**229.5**	**202.3**	**173.2**	**151.0**	**146.5**	**149.8**	**143.9**	**139.9**	**143.2**
Germany	**114.0**	**100.7**	**91.0**	**88.4**	**83.5**	**73.1**	**72.8**	**71.6**	**69.3**	**68.6**	**69.3**
Denmark	72.6	71.3	60.4	59.3	59.0	50.2	49.7	48.5	47.5	45.5	45.2
Estonia	816.8	300.7	204.2	169.3	169.6	137.7	134.4	130.8	128.4	120.7	122.6
Greece	114.7	101.8	102.7	95.6	90.1	93.2	93.9	93.5	89.0	88.9	91.6
Spain	**104.1**	**96.7**	**98.1**	**99.3**	**85.8**	**74.5**	**74.4**	**74.0**	**74.3**	**72.8**	**73.4**
Finland	159.4	163.0	137.6	125.1	124.7	115.3	117.1	115.9	116.3	113.7	110.6
France	**94.4**	**94.5**	**87.9**	**83.2**	**76.7**	**70.4**	**70.5**	**68.8**	**66.3**	**64.7**	**64.8**
Croatia	272.6	199.0	186.1	177.0	170.0	155.3	150.7	151.5	144.0	141.6	147.1
Hungary	334.8	241.3	208.7	198.3	184.9	166.1	166.3	166.9	158.4	151.7	157.2
Ireland	130.9	89.7	76.1	66.5	61.1	40.8	41.7	38.0	36.3	34.6	31.3
Italy	**84.9**	**80.2**	**77.2**	**80.6**	**77.4**	**71.7**	**70.3**	**71.3**	**70.6**	**69.6**	**69.8**
Lithuania	808.7	315.5	217.4	183.1	174.8	157.9	158.0	161.5	158.9	153.3	148.3
Luxembourg	132.4	100.9	89.0	96.0	80.7	65.9	62.8	63.2	64.3	63.1	55.3
Latvia	744.0	347.2	230.1	190.9	196.6	154.4	150.8	152.4	152.7	144.9	145.9
Malta			52.8	60.0	53.4	46.8	45.3	43.7	43.0	43.3	42.6
Netherlands	**140.3**	**121.9**	**101.3**	**100.7**	**98.0**	**80.7**	**81.2**	**80.3**	**78.0**	**74.5**	**75.7**
Poland	**406.0**	**329.7**	**228.5**	**210.7**	**188.7**	**154.5**	**159.3**	**161.5**	**160.6**	**150.9**	**151.9**
Portugal	115.6	107.6	112.6	114.5	101.3	94.0	91.6	90.1	86.5	87.4	89.1
Romania	**459.3**	**288.8**	**259.1**	**216.6**	**173.2**	**141.9**	**137.6**	**133.7**	**130.1**	**126.9**	**131.4**
Sweden	**139.0**	**129.8**	**107.6**	**91.1**	**84.6**	**73.1**	**73.6**	**71.8**	**69.7**	**67.8**	**68.9**
Slovenia	190.2	175.6	164.3	156.3	138.2	124.6	125.3	121.3	116.3	110.9	105.4
Slovakia	504.0	298.4	261.1	211.2	161.8	125.0	125.3	131.2	128.3	126.0	126.8
United Kingdom	80.4	84.2	73.9	63.9	57.7	48.2	48.2	47.2	47.0	45.8	

Table A1.6 – *Value added of industry per capita, k€/inhabitant (chain linked volumes, 2015).*

	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**5.6**	**6.2**	**6.5**	**6.3**	**6.4**	**6.6**	**6.8**	**6.9**	**6.9**	
EU27	**5.3**	**5.9**	**6.2**	**6.1**	**6.3**	**6.4**	**6.6**	**6.7**	**6.8**	**6.3**
Austria	8.1	9.3	9.9	9.7	10.1	10.3	10.5	10.8	10.8	10.1
Belgium	**5.8**	**6.8**	**7.2**	**7.2**	**7.3**	**7.2**	**7.2**	**7.2**	**7.4**	**7.2**
Bulgaria	0.6	0.8	1.1	1.4	1.5	1.6	1.6	1.6	1.6	1.5
Cyprus	3.4	3.2	4.1	3.3	2.2	2.5	2.7	3.0	3.3	3.0
Czechia	**3.0**	**3.3**	**4.3**	**5.1**	**5.4**	**5.5**	**5.9**	**5.9**	**6.0**	**5.5**
Germany	**8.1**	**8.4**	**8.4**	**9.1**	**10.1**	**10.4**	**10.7**	**10.8**	**10.6**	**9.8**
Denmark	9.9	11.1	10.7	9.4	9.6	10.1	10.6	10.7	11.0	10.9
Estonia	1.4	2.0	3.0	3.0	3.7	4.0	4.2	4.5	4.4	4.2
Greece	2.9	3.5	4.1	3.3	2.4	2.4	2.4	2.5	2.5	2.6
Spain	**5.1**	**6.1**	**6.4**	**5.4**	**4.7**	**4.8**	**5.0**	**5.0**	**5.1**	**4.5**
Finland	5.9	8.7	10.1	10.1	9.0	9.3	9.9	9.6	9.7	9.6
France	**5.4**	**6.2**	**6.4**	**6.0**	**5.8**	**5.8**	**5.9**	**6.0**	**6.1**	**5.4**
Croatia	1.5	2.0	2.6	2.3	2.2	2.4	2.4	2.5	2.6	2.6
Hungary	1.6	2.2	2.9	2.7	3.0	3.0	3.2	3.3	3.5	3.2
Ireland	7.5	12.7	14.7	11.9	21.6	21.1	21.7	23.7	24.0	28.5
Italy	**6.9**	**7.2**	**7.3**	**6.4**	**5.7**	**5.8**	**6.0**	**6.1**	**6.2**	**5.6**
Lithuania	1.0	1.3	2.4	2.5	3.4	3.5	3.7	3.9	4.1	4.2
Luxembourg	10.1	11.9	12.5	10.4	11.1	11.5	10.4	10.3	11.3	10.5
Latvia	1.1	1.5	2.3	2.0	2.4	2.4	2.6	2.7	2.8	2.8
Malta		3.3	2.9	2.9	2.8	2.8	2.9	3.1	3.3	3.1
Netherlands	**6.7**	**7.5**	**7.7**	**7.6**	**7.4**	**7.6**	**7.9**	**8.0**	**8.1**	**7.8**
Poland	**1.6**	**1.7**	**2.0**	**2.8**	**3.4**	**3.5**	**3.6**	**3.8**	**3.9**	**3.7**
Portugal	3.4	4.2	3.9	3.6	3.4	3.4	3.6	3.7	3.8	3.6
Romania	**1.3**	**1.2**	**1.8**	**2.4**	**2.4**	**2.6**	**2.7**	**2.8**	**2.8**	**2.8**
Sweden	**7.1**	**9.4**	**10.7**	**10.5**	**10.4**	**10.2**	**10.5**	**10.5**	**10.4**	**9.9**
Slovenia	3.3	4.2	5.2	5.3	5.3	5.5	5.8	6.1	6.5	6.2
Slovakia	1.2	1.7	2.8	3.7	4.5	4.5	4.5	4.8	5.0	4.3
United Kingdom	8.1	8.5	8.4	7.7	7.5	7.6	7.8	7.8		

Table A1.7 – *Value added of service per capita, k€/inhabitant (chain linked volumes, 2015).*

	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**13.6**	**15.7**	**17.3**	**18.2**	**19.3**	**19.6**	**20.0**	**20.4**	**20.8**	
EU27	**12.9**	**14.8**	**16.1**	**17.1**	**17.9**	**18.2**	**18.7**	**19.0**	**19.4**	**18.2**
Austria	18.4	21.3	22.9	24.7	25.2	25.3	25.5	26.0	26.4	24.4
Belgium	**19.3**	**21.4**	**23.3**	**24.7**	**25.7**	**25.9**	**26.2**	**26.7**	**27.1**	**25.4**
Bulgaria	2.3	1.8	2.6	3.5	3.7	3.8	4.0	4.2	4.5	4.3
Cyprus	11.3	13.8	15.5	17.0	15.9	16.7	17.5	18.1	18.7	17.6
Czechia	**5.8**	**6.3**	**7.5**	**8.0**	**8.7**	**8.9**	**9.3**	**9.7**	**10.0**	**9.6**
Germany	**16.9**	**19.0**	**19.9**	**21.3**	**23.2**	**23.2**	**23.7**	**23.9**	**24.3**	**23.3**
Denmark	17.2	19.3	20.9	22.3	23.2	23.5	23.6	23.8	24.0	23.6
Estonia	4.0	5.5	8.0	8.2	9.4	9.7	10.3	10.7	11.2	10.9
Greece	9.1	10.6	12.7	12.9	11.4	11.3	11.6	11.7	11.8	10.5
Spain	**11.0**	**12.8**	**14.4**	**15.2**	**15.8**	**16.1**	**16.6**	**17.0**	**17.3**	**15.2**
Finland	17.5	21.0	22.9	23.6	23.5	23.9	24.5	25.0	25.4	24.5
France	**18.1**	**20.5**	**21.5**	**22.4**	**23.2**	**23.5**	**24.0**	**24.3**	**24.8**	**22.9**
Croatia	3.5	4.2	5.6	6.1	6.4	6.6	6.9	7.1	7.4	6.8
Hungary	3.9	4.3	5.3	5.5	6.2	6.4	6.7	7.1	7.5	7.2
Ireland	17.0	22.7	26.1	26.7	30.1	30.7	32.9	36.0	37.8	36.1
Italy	**16.1**	**18.1**	**18.9**	**18.8**	**18.2**	**18.5**	**18.7**	**18.9**	**19.2**	**17.6**
Lithuania	2.7	3.6	5.1	6.0	7.7	8.0	8.5	9.0	9.4	9.3
Luxembourg	52.1	63.6	70.2	77.4	76.7	78.6	78.4	78.4	78.6	76.8
Latvia	2.6	3.6	5.8	6.5	8.1	8.4	8.6	9.0	9.3	8.9
Malta		9.8	10.7	12.9	17.2	17.4	19.1	19.5	20.0	17.6
Netherlands	**19.6**	**24.2**	**25.4**	**27.5**	**28.6**	**29.0**	**29.6**	**30.1**	**30.6**	**29.1**
Poland	**2.7**	**4.0**	**4.6**	**5.6**	**6.4**	**6.6**	**7.0**	**7.4**	**7.8**	**7.7**
Portugal	8.6	10.0	10.6	11.4	11.4	11.6	12.0	12.3	12.7	11.7
Romania	**1.9**	**2.1**	**2.8**	**3.2**	**4.3**	**4.5**	**4.9**	**5.2**	**5.6**	**5.4**
Sweden	**20.1**	**23.2**	**25.7**	**27.7**	**30.5**	**30.9**	**31.1**	**31.6**	**32.1**	**31.3**
Slovenia	6.6	7.8	9.3	10.3	10.6	10.9	11.4	11.9	12.1	11.5
Slovakia	5.0	5.7	6.2	8.0	8.4	8.7	9.0	9.1	9.3	9.3
United Kingdom	18.6	22.1	25.8	26.2	28.6	28.8	29.0	29.3		

Table A1.8 – *Value added of agriculture per capita, k€/inhabitant (chain linked volumes, 2015).*

	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**0.38**	**0.40**	**0.40**	**0.40**	**0.43**	**0.42**	**0.43**	**0.42**	**0.43**	
EU27	**0.40**	**0.42**	**0.42**	**0.43**	**0.45**	**0.44**	**0.45**	**0.45**	**0.45**	**0.45**
Austria	0.41	0.44	0.43	0.43	0.45	0.46	0.48	0.49	0.49	0.47
Belgium	**0.20**	**0.23**	**0.23**	**0.25**	**0.25**	**0.23**	**0.24**	**0.22**	**0.22**	**0.20**
Bulgaria	0.31	0.31	0.33	0.26	0.26	0.28	0.31	0.30	0.32	0.31
Cyprus	0.83	0.79	0.73	0.49	0.40	0.46	0.43	0.41	0.44	0.43
Czechia	**0.36**	**0.35**	**0.44**	**0.32**	**0.36**	**0.37**	**0.36**	**0.37**	**0.39**	**0.41**
Germany	**0.23**	**0.24**	**0.22**	**0.27**	**0.26**	**0.25**	**0.26**	**0.21**	**0.24**	**0.25**
Denmark	0.45	0.50	0.47	0.49	0.46	0.39	0.44	0.43	0.52	0.54
Estonia	0.16	0.27	0.29	0.37	0.45	0.34	0.36	0.30	0.40	0.37
Greece	0.72	0.71	0.72	0.59	0.63	0.59	0.66	0.65	0.69	0.66
Spain	**0.46**	**0.65**	**0.55**	**0.57**	**0.63**	**0.67**	**0.64**	**0.69**	**0.66**	**0.69**
Finland	0.74	0.73	0.71	0.82	0.87	0.89	0.90	0.90	0.94	0.98
France	**0.46**	**0.51**	**0.49**	**0.51**	**0.53**	**0.46**	**0.50**	**0.52**	**0.51**	**0.50**
Croatia	0.35	0.38	0.43	0.43	0.32	0.34	0.34	0.36	0.37	0.39
Hungary	0.33	0.32	0.45	0.36	0.43	0.49	0.46	0.48	0.47	0.43
Ireland	0.66	0.58	0.45	0.40	0.50	0.55	0.57	0.51	0.63	0.61
Italy	**0.54**	**0.61**	**0.56**	**0.56**	**0.56**	**0.56**	**0.54**	**0.55**	**0.55**	**0.52**
Lithuania	0.29	0.29	0.31	0.32	0.44	0.43	0.43	0.39	0.43	0.47
Luxembourg	0.54	0.49	0.27	0.28	0.22	0.21	0.19	0.21	0.20	0.18
Latvia	0.22	0.23	0.31	0.34	0.43	0.42	0.43	0.42	0.50	0.51
Malta		0.20	0.31	0.23	0.21	0.24	0.19	0.21	0.14	0.11
Netherlands	**0.61**	**0.62**	**0.63**	**0.68**	**0.70**	**0.72**	**0.72**	**0.70**	**0.71**	**0.71**
Poland	**0.32**	**0.22**	**0.27**	**0.30**	**0.27**	**0.27**	**0.28**	**0.25**	**0.25**	**0.28**
Portugal	0.38	0.34	0.33	0.33	0.36	0.36	0.37	0.37	0.38	0.36
Romania	**0.36**	**0.26**	**0.35**	**0.29**	**0.34**	**0.35**	**0.41**	**0.45**	**0.43**	**0.37**
Sweden	**0.52**	**0.52**	**0.61**	**0.63**	**0.68**	**0.66**	**0.69**	**0.61**	**0.63**	**0.63**
Slovenia	0.33	0.36	0.36	0.36	0.39	0.39	0.37	0.45	0.41	0.42
Slovakia	0.10	0.09	0.15	0.21	0.32	0.35	0.33	0.37	0.30	0.32
United Kingdom	0.24	0.26	0.27	0.23	0.26	0.25	0.26	0.25		

Table A1.9 – *Total GHG emissions per capita, t CO_2eq/inhabitant.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**11.9**	**11.0**	**10.6**	**10.6**	**9.5**	**8.5**	**8.5**	**8.5**	**8.3**	**7.9**	**7.2**
EU27	**11.6**	**10.7**	**10.4**	**10.5**	**9.5**	**8.6**	**8.6**	**8.6**	**8.4**	**8.1**	**7.4**
Austria	10.3	10.0	10.0	11.2	10.1	9.1	9.1	9.3	8.9	9.0	8.3
Belgium	**14.6**	**15.2**	**14.5**	**13.9**	**12.3**	**10.6**	**10.4**	**10.3**	**10.3**	**10.2**	**9.2**
Bulgaria	11.2	8.5	7.0	8.1	8.0	8.6	8.4	8.9	8.6	8.5	7.1
Cyprus	9.7	10.8	12.0	12.6	11.6	9.9	10.4	10.5	10.2	10.2	10.0
Czechia	**19.0**	**15.1**	**14.6**	**14.5**	**13.3**	**12.2**	**12.3**	**12.3**	**12.1**	**11.5**	**10.5**
Germany	**15.7**	**13.7**	**12.6**	**12.0**	**11.4**	**11.1**	**11.0**	**10.7**	**10.3**	**9.6**	**8.8**
Denmark	13.9	15.2	13.5	12.6	11.7	8.9	9.1	8.7	8.6	7.9	7.5
Estonia	25.6	13.9	12.5	14.1	15.9	13.7	15.0	15.9	15.3	11.0	8.7
Greece	10.2	10.4	11.7	12.4	10.7	8.8	8.5	8.9	8.6	8.0	7.0
Spain	**7.5**	**8.3**	**9.6**	**10.2**	**7.7**	**7.3**	**7.0**	**7.3**	**7.1**	**6.7**	**5.8**
Finland	14.3	14.0	13.6	13.3	14.1	10.0	10.5	10.0	10.2	9.6	8.6
France	**9.4**	**9.1**	**9.1**	**8.9**	**7.9**	**7.0**	**7.0**	**7.0**	**6.7**	**6.6**	**5.9**
Croatia	6.6	4.8	5.7	6.9	6.5	5.8	5.9	6.1	5.9	6.0	5.9
Hungary	9.1	7.5	7.3	7.6	6.6	6.2	6.3	6.6	6.6	6.6	6.4
Ireland	15.5	16.3	18.1	17.1	13.6	12.9	13.3	13.0	12.9	12.2	11.6
Italy	**9.2**	**9.4**	**9.8**	**10.2**	**8.7**	**7.3**	**7.2**	**7.2**	**7.1**	**7.0**	**6.4**
Lithuania	13.0	6.1	5.5	6.8	6.6	7.0	7.0	7.2	7.2	7.3	7.2
Luxembourg	33.6	24.9	22.3	28.2	24.2	18.3	17.5	17.4	17.5	17.5	14.5
Latvia	9.7	5.0	4.2	4.9	5.6	5.4	5.4	5.5	5.8	5.8	5.5
Malta	7.4	7.1	7.2	7.4	7.1	4.8	4.1	4.4	4.3	4.3	4.1
Netherlands	**14.7**	**14.9**	**13.7**	**13.0**	**12.8**	**11.4**	**11.4**	**11.2**	**10.8**	**10.4**	**9.4**
Poland	**12.5**	**11.6**	**10.4**	**10.6**	**10.9**	**10.2**	**10.5**	**10.9**	**10.9**	**10.3**	**9.9**
Portugal	5.8	6.8	7.9	8.2	6.5	6.5	6.4	6.9	6.5	6.2	5.6
Romania	**10.7**	**8.1**	**6.2**	**6.9**	**6.1**	**5.8**	**5.8**	**6.0**	**6.2**	**6.0**	**5.9**
Sweden	**8.4**	**8.3**	**7.7**	**7.4**	**6.9**	**5.6**	**5.5**	**5.3**	**5.2**	**5.0**	**4.5**
Slovenia	9.3	9.4	9.3	10.2	9.6	8.1	8.6	8.6	8.5	8.2	7.6
Slovakia	13.9	9.9	9.0	9.4	8.5	7.5	7.6	7.8	7.7	7.3	6.8
United Kingdom	13.9	12.9	12.2	11.5	9.7	7.9	7.4	7.2	7.0	6.7	6.1

Table A1.10 – *Energy GHG emissions per capita*, tCO_2*eq/inhabitant.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**9.1**	**8.4**	**8.2**	**8.3**	**7.6**	**6.6**	**6.6**	**6.6**	**6.4**	**6.1**	**5.5**
EU27	**8.9**	**8.3**	**8.0**	**8.2**	**7.5**	**6.7**	**6.7**	**6.7**	**6.5**	**6.2**	**5.6**
Austria	6.9	6.8	6.9	8.2	7.1	6.2	6.2	6.4	6.2	6.2	5.6
Belgium	**10.4**	**10.6**	**10.4**	**10.1**	**9.2**	**7.7**	**7.5**	**7.5**	**7.5**	**7.5**	**6.7**
Bulgaria	8.1	6.1	5.0	6.0	6.2	6.4	6.0	6.3	5.9	5.7	5.0
Cyprus	6.9	8.0	9.2	9.8	9.2	7.2	7.7	7.8	7.6	7.5	7.2
Czechia	**15.6**	**12.5**	**11.9**	**11.9**	**10.8**	**9.4**	**9.5**	**9.5**	**9.3**	**8.8**	**7.9**
Germany	**13.1**	**11.3**	**10.6**	**10.1**	**9.8**	**9.4**	**9.4**	**9.1**	**8.7**	**8.1**	**7.3**
Denmark	10.5	11.8	10.3	9.7	9.2	6.3	6.6	6.1	6.1	5.5	4.9
Estonia	23.1	12.2	10.8	12.3	14.2	12.0	13.3	14.1	13.5	9.2	7.1
Greece	7.6	7.7	9.0	9.8	8.4	6.6	6.2	6.5	6.3	5.7	4.8
Spain	**5.5**	**6.3**	**7.2**	**8.0**	**5.7**	**5.5**	**5.3**	**5.6**	**5.4**	**5.0**	**4.2**
Finland	10.7	10.8	10.4	10.3	11.3	7.4	7.9	7.4	7.6	7.1	6.2
France	**6.4**	**6.2**	**6.4**	**6.3**	**5.6**	**4.8**	**4.8**	**4.9**	**4.6**	**4.5**	**4.0**
Croatia	4.5	3.4	4.1	5.0	4.6	3.9	4.1	4.2	4.0	4.0	3.8
Hungary	6.7	5.7	5.5	5.7	5.0	4.5	4.6	4.8	4.8	4.7	4.5
Ireland	8.8	9.4	11.2	11.1	8.9	7.9	8.1	7.7	7.6	7.2	6.7
Italy	**7.5**	**7.7**	**8.1**	**8.4**	**7.2**	**5.9**	**5.9**	**5.8**	**5.7**	**5.6**	**5.0**
Lithuania	9.0	3.9	3.1	3.9	4.2	3.9	4.0	4.0	4.2	4.3	4.2
Luxembourg	27.2	20.4	18.7	25.0	21.4	15.8	15.0	14.9	15.1	15.1	12.2
Latvia	7.3	3.8	3.1	3.6	4.0	3.6	3.7	3.7	4.0	3.9	3.6
Malta	6.8	6.5	6.5	6.6	6.3	3.8	3.0	3.3	3.3	3.3	3.1
Netherlands	**10.6**	**11.0**	**10.5**	**10.6**	**10.8**	**9.5**	**9.5**	**9.3**	**9.0**	**8.7**	**7.7**
Poland	**10.1**	**9.5**	**8.4**	**8.7**	**9.0**	**8.4**	**8.7**	**9.0**	**9.0**	**8.4**	**8.0**
Portugal	4.1	5.0	5.8	6.1	4.6	4.7	4.6	5.0	4.7	4.3	3.7
Romania	**7.6**	**5.8**	**4.3**	**4.6**	**4.2**	**4.0**	**3.9**	**4.1**	**4.2**	**4.1**	**3.9**
Sweden	**6.1**	**6.2**	**5.6**	**5.3**	**5.1**	**3.9**	**3.8**	**3.7**	**3.6**	**3.4**	**3.1**
Slovenia	7.3	7.6	7.5	8.3	8.0	6.5	6.9	6.9	6.9	6.6	6.0
Slovakia	10.6	7.2	6.7	6.7	5.9	5.0	5.1	5.2	5.2	4.9	4.5
United Kingdom	10.5	9.6	9.4	9.1	8.0	6.2	5.9	5.7	5.5	5.3	4.7

Table A1.11 – *Total GHG emissions per unit of gross domestic product, t CO_2eq/M€ (chain linked volumes, 2015).*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**617.0**	**500.6**	**421.7**	**389.7**	**341.1**	**291.5**	**284.6**	**278.2**	**267.1**	**251.7**	
EU27	**629.6**	**513.5**	**436.4**	**409.8**	**359.3**	**312.9**	**307.2**	**300.8**	**288.3**	**271.3**	**264.2**
Austria	375.4	327.5	285.5	300.6	257.6	228.0	226.3	227.8	213.5	213.5	211.3
Belgium	**586.1**	**536.6**	**451.7**	**401.1**	**342.1**	**285.5**	**278.3**	**273.1**	**269.3**	**261.1**	**253.0**
Bulgaria	2897.5	2350.2	2078.9	1717.3	1383.2	1359.2	1274.0	1305.6	1210.8	1147.6	992.7
Cyprus	599.6	613.2	592.6	539.9	486.5	466.6	462.2	446.4	415.9	396.9	417.4
Czechia	**2054.4**	**1496.2**	**1313.9**	**1073.8**	**895.1**	**755.8**	**744.8**	**714.0**	**682.2**	**632.1**	**615.8**
Germany	**585.5**	**479.0**	**405.7**	**375.9**	**336.2**	**296.7**	**291.4**	**278.8**	**264.9**	**246.5**	**235.3**
Denmark	392.0	387.3	304.0	268.1	253.9	183.6	185.0	172.6	169.0	152.9	147.0
Estonia	5898.8	2172.8	1393.8	1072.3	1210.1	874.2	926.7	931.2	858.4	599.7	487.9
Greece	815.0	720.6	696.9	620.9	548.4	541.1	523.1	538.8	511.8	466.2	447.9
Spain	**495.1**	**460.9**	**443.4**	**430.0**	**331.9**	**313.1**	**293.3**	**296.4**	**285.0**	**262.9**	**258.1**
Finland	505.2	520.2	396.8	347.3	359.0	260.1	266.3	245.5	247.4	229.7	213.8
France	**365.5**	**338.4**	**299.8**	**277.3**	**245.5**	**211.3**	**209.8**	**206.6**	**194.7**	**187.2**	**183.8**
Croatia	1217.7	743.9	718.9	670.0	614.2	538.9	526.1	526.7	490.2	478.0	501.8
Hungary	1532.6	1080.2	907.8	748.0	647.6	545.1	540.0	538.4	511.3	487.7	497.6
Ireland	936.2	645.1	479.6	379.7	328.1	230.1	233.9	212.5	195.8	179.1	163.1
Italy	**384.0**	**356.1**	**335.7**	**340.1**	**302.3**	**266.9**	**262.0**	**254.3**	**249.7**	**242.2**	**242.3**
Lithuania	3720.0	1377.1	959.6	776.7	669.2	543.7	530.9	514.2	485.5	468.9	465.4
Luxembourg	608.9	365.8	265.6	306.5	250.0	190.6	177.3	178.2	179.8	176.9	152.1
Latvia	2995.6	1118.1	700.9	514.4	569.4	435.6	425.1	413.0	415.7	400.9	391.4
Malta			461.6	451.6	383.4	212.4	178.0	175.5	166.3	164.9	178.9
Netherlands	**578.5**	**489.1**	**374.6**	**342.2**	**318.3**	**279.2**	**273.8**	**262.6**	**249.9**	**237.5**	**225.0**
Poland	**3139.7**	**2281.9**	**1564.4**	**1375.2**	**1109.5**	**904.0**	**901.1**	**890.3**	**842.5**	**760.4**	**751.2**
Portugal	499.8	478.2	467.0	470.2	366.6	375.8	358.3	372.9	343.7	316.7	313.1
Romania	**2646.0**	**1980.9**	**1510.9**	**1213.9**	**887.2**	**720.6**	**680.8**	**653.8**	**639.4**	**597.6**	**602.7**
Sweden	**309.0**	**266.0**	**207.7**	**178.5**	**158.2**	**118.8**	**115.5**	**111.4**	**107.3**	**102.5**	**96.2**
Slovenia	955.1	784.7	638.3	589.9	516.1	432.2	440.4	421.8	400.0	376.8	365.3
Slovakia	2391.3	1449.7	1124.9	912.6	646.3	508.9	505.0	503.4	483.5	445.4	433.2
United Kingdom	465.6	437.4	349.8	296.4	254.7	192.6	180.0	172.9	167.5	159.6	

Table A.12 – *Total GHG emissions per unit gross inland energy consumption, t CO_2eq/toe.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**3.38**	**3.16**	**2.98**	**2.85**	**2.70**	**2.64**	**2.61**	**2.58**	**2.54**	**2.48**	
EU27	**3.33**	**3.13**	**2.97**	**2.83**	**2.68**	**2.64**	**2.62**	**2.59**	**2.55**	**2.48**	**2.47**
Austria	3.10	2.91	2.74	2.68	2.42	2.33	2.32	2.35	2.31	2.29	2.28
Belgium	**2.99**	**2.84**	**2.50**	**2.46**	**2.20**	**2.22**	**2.08**	**2.08**	**2.15**	**2.08**	**2.07**
Bulgaria	3.49	3.07	3.06	3.09	3.31	3.33	3.29	3.34	3.17	3.16	2.76
Cyprus	3.45	3.54	3.42	3.61	3.43	3.63	3.57	3.50	3.36	3.39	3.88
Czechia	**3.94**	**3.73**	**3.62**	**3.25**	**3.07**	**3.05**	**3.11**	**3.00**	**2.95**	**2.86**	**2.80**
Germany	**3.49**	**3.27**	**3.03**	**2.85**	**2.77**	**2.82**	**2.82**	**2.75**	**2.70**	**2.60**	**2.56**
Denmark	3.98	3.94	3.70	3.43	3.19	2.91	2.94	2.80	2.79	2.67	2.74
Estonia	3.74	3.57	3.71	3.49	3.58	3.72	3.27	3.55	3.52	3.05	2.57
Greece	4.66	4.66	4.54	4.39	4.18	3.96	3.88	3.92	3.87	3.63	3.66
Spain	**3.28**	**3.21**	**3.13**	**3.06**	**2.75**	**2.75**	**2.63**	**2.60**	**2.56**	**2.47**	**2.46**
Finland	2.48	2.45	2.14	2.00	2.05	1.68	1.71	1.61	1.61	1.54	1.49
France	**2.42**	**2.25**	**2.16**	**2.01**	**1.90**	**1.79**	**1.83**	**1.84**	**1.77**	**1.76**	**1.79**
Croatia	3.26	2.85	3.02	3.02	2.95	2.86	2.87	2.87	2.81	2.80	2.86
Hungary	3.25	2.96	2.97	2.69	2.48	2.44	2.44	2.43	2.42	2.42	2.40
Ireland	5.30	5.43	4.76	4.55	4.11	4.25	4.18	4.24	4.19	4.00	4.21
Italy	**3.51**	**3.31**	**3.19**	**3.12**	**2.93**	**2.84**	**2.85**	**2.72**	**2.74**	**2.69**	**2.69**
Lithuania	2.94	2.51	2.65	2.53	2.93	2.83	2.76	2.67	2.57	2.61	2.64
Luxembourg	3.63	3.03	2.64	2.71	2.62	2.47	2.41	2.37	2.35	2.36	2.29
Latvia	3.25	2.69	2.60	2.38	2.55	2.44	2.43	2.36	2.34	2.39	2.40
Malta	3.38	3.39	3.45	3.19	3.14	2.80	2.55	2.45	2.40	2.37	2.79
Netherlands	**3.19**	**3.03**	**2.78**	**2.54**	**2.46**	**2.52**	**2.47**	**2.41**	**2.39**	**2.36**	**2.28**
Poland	**4.60**	**4.48**	**4.45**	**4.38**	**4.06**	**4.06**	**3.98**	**3.94**	**3.76**	**3.68**	**3.65**
Portugal	3.39	3.29	3.21	3.12	2.82	2.86	2.79	2.87	2.79	2.66	2.69
Romania	**3.94**	**3.94**	**3.78**	**3.80**	**3.53**	**3.62**	**3.59**	**3.51**	**3.58**	**3.53**	**3.53**
Sweden	**1.51**	**1.46**	**1.43**	**1.30**	**1.28**	**1.15**	**1.09**	**1.06**	**1.02**	**1.02**	**1.02**
Slovenia	3.24	3.07	2.83	2.71	2.71	2.58	2.63	2.57	2.57	2.54	2.51
Slovakia	3.45	2.97	2.75	2.70	2.58	2.50	2.52	2.45	2.47	2.34	2.25
United Kingdom	3.76	3.35	3.06	2.94	2.86	2.67	2.57	2.54	2.50	2.46	

Table A1.13 – *GHG emissions from combustion per unit of primary energy consumption*, tCO_2*eq/toe.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**2.76**	**2.59**	**2.47**	**2.39**	**2.28**	**2.18**	**2.16**	**2.13**	**2.09**	**2.03**	
EU27	**2.72**	**2.59**	**2.47**	**2.38**	**2.26**	**2.18**	**2.16**	**2.14**	**2.10**	**2.03**	**2.00**
Austria	2.23	2.10	2.01	2.04	1.80	1.66	1.68	1.69	1.70	1.68	1.66
Belgium	**2.27**	**2.23**	**2.02**	**2.04**	**1.86**	**1.89**	**1.74**	**1.73**	**1.82**	**1.75**	**1.74**
Bulgaria	2.66	2.32	2.32	2.38	2.64	2.53	2.40	2.44	2.23	2.19	2.02
Cyprus	2.51	2.69	2.73	2.89	2.83	2.69	2.69	2.62	2.52	2.54	2.85
Czechia	**3.34**	**3.28**	**3.12**	**2.84**	**2.64**	**2.50**	**2.51**	**2.49**	**2.43**	**2.35**	**2.24**
Germany	**3.12**	**2.89**	**2.74**	**2.58**	**2.54**	**2.58**	**2.58**	**2.51**	**2.46**	**2.35**	**2.31**
Denmark	3.04	3.12	2.86	2.68	2.52	2.11	2.14	2.00	2.00	1.86	1.84
Estonia	3.45	3.24	3.31	3.17	3.24	3.31	2.94	3.22	3.18	2.61	2.19
Greece	3.58	3.53	3.56	3.54	3.42	3.04	2.90	2.99	2.93	2.71	2.63
Spain	**2.58**	**2.65**	**2.53**	**2.54**	**2.17**	**2.15**	**2.05**	**2.06**	**2.03**	**1.95**	**1.88**
Finland	1.97	1.97	1.69	1.60	1.69	1.30	1.34	1.24	1.25	1.19	1.12
France	**1.73**	**1.65**	**1.61**	**1.51**	**1.41**	**1.30**	**1.33**	**1.34**	**1.28**	**1.28**	**1.28**
Croatia	2.40	2.26	2.34	2.36	2.22	2.08	2.11	2.08	2.01	2.01	2.00
Hungary	2.53	2.42	2.39	2.18	2.03	1.90	1.91	1.91	1.90	1.89	1.86
Ireland	3.22	3.30	3.10	3.06	2.75	2.63	2.61	2.57	2.51	2.39	2.46
Italy	**3.09**	**2.89**	**2.77**	**2.70**	**2.56**	**2.41**	**2.40**	**2.31**	**2.31**	**2.26**	**2.22**
Lithuania	2.15	1.70	1.63	1.59	2.04	1.85	1.83	1.77	1.77	1.80	1.82
Luxembourg	2.95	2.52	2.25	2.42	2.33	2.15	2.08	2.05	2.04	2.06	1.94
Latvia	2.48	2.09	1.95	1.81	1.87	1.68	1.69	1.62	1.64	1.64	1.59
Malta	3.15	3.10	3.11	2.90	2.80	2.21	1.91	1.88	1.86	1.87	2.12
Netherlands	**2.71**	**2.59**	**2.49**	**2.47**	**2.49**	**2.51**	**2.48**	**2.43**	**2.40**	**2.34**	**2.28**
Poland	**3.86**	**3.83**	**3.79**	**3.77**	**3.54**	**3.54**	**3.47**	**3.45**	**3.27**	**3.19**	**3.14**
Portugal	2.69	2.66	2.61	2.57	2.16	2.17	2.11	2.21	2.08	1.95	1.90
Romania	**2.85**	**2.89**	**2.75**	**2.73**	**2.61**	**2.56**	**2.52**	**2.47**	**2.51**	**2.47**	**2.46**
Sweden	**1.15**	**1.12**	**1.07**	**0.98**	**0.98**	**0.85**	**0.80**	**0.78**	**0.75**	**0.74**	**0.73**
Slovenia	2.56	2.54	2.35	2.28	2.33	2.11	2.17	2.12	2.12	2.09	2.03
Slovakia	2.86	2.30	2.20	2.08	1.92	1.80	1.79	1.76	1.79	1.68	1.62
United Kingdom	2.97	2.63	2.48	2.45	2.42	2.20	2.13	2.09	2.05	2.00	

Table A1.14 – *GHG emissions from combustion per unit of primary energy w/o nuclear energy, tCO_2eq/toe.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**3.17**	**3.03**	**2.91**	**2.81**	**2.65**	**2.54**	**2.50**	**2.46**	**2.42**	**2.35**	
EU27	**3.16**	**3.04**	**2.93**	**2.82**	**2.66**	**2.57**	**2.53**	**2.49**	**2.44**	**2.37**	**2.32**
Austria	2.23	2.10	2.01	2.04	1.80	1.66	1.68	1.69	1.70	1.68	1.66
Belgium	**3.00**	**2.87**	**2.65**	**2.68**	**2.37**	**2.19**	**2.22**	**2.19**	**2.13**	**2.24**	**2.14**
Bulgaria	3.10	2.91	3.17	3.19	3.39	3.23	3.10	3.10	2.88	2.86	2.69
Cyprus	2.51	2.69	2.73	2.89	2.83	2.69	2.69	2.62	2.52	2.54	2.85
Czechia	**3.58**	**3.57**	**3.43**	**3.35**	**3.18**	**3.01**	**2.95**	**3.01**	**2.97**	**2.89**	**2.80**
Germany	**3.54**	**3.30**	**3.18**	**2.97**	**2.87**	**2.81**	**2.78**	**2.68**	**2.63**	**2.52**	**2.46**
Denmark	3.04	3.12	2.86	2.68	2.52	2.11	2.14	2.00	2.00	1.86	1.84
Estonia	3.45	3.24	3.31	3.17	3.24	3.31	2.94	3.22	3.18	2.61	2.19
Greece	3.58	3.53	3.56	3.54	3.42	3.04	2.90	2.99	2.93	2.71	2.63
Spain	**3.11**	**3.12**	**2.95**	**2.85**	**2.49**	**2.46**	**2.35**	**2.34**	**2.29**	**2.23**	**2.19**
Finland	2.40	2.39	2.07	1.94	2.01	1.58	1.62	1.49	1.50	1.43	1.37
France	**2.80**	**2.91**	**2.92**	**2.72**	**2.51**	**2.42**	**2.35**	**2.36**	**2.32**	**2.27**	**2.27**
Croatia	2.40	2.26	2.34	2.36	2.22	2.08	2.11	2.08	2.01	2.01	2.00
Hungary	2.91	2.84	2.83	2.52	2.41	2.29	2.30	2.29	2.27	2.26	2.24
Ireland	3.22	3.30	3.10	3.06	2.75	2.63	2.61	2.57	2.51	2.39	2.46
Italy	**3.09**	**2.89**	**2.77**	**2.70**	**2.56**	**2.41**	**2.40**	**2.31**	**2.31**	**2.26**	**2.22**
Lithuania	3.06	2.79	2.50	2.41	2.04	1.85	1.83	1.77	1.77	1.80	1.82
Luxembourg	2.95	2.52	2.25	2.42	2.33	2.15	2.08	2.05	2.04	2.06	1.94
Latvia	2.48	2.09	1.95	1.81	1.87	1.68	1.69	1.62	1.64	1.64	1.59
Malta	3.15	3.10	3.11	2.90	2.80	2.21	1.91	1.88	1.86	1.87	2.12
Netherlands	**2.75**	**2.63**	**2.53**	**2.50**	**2.52**	**2.55**	**2.51**	**2.46**	**2.43**	**2.37**	**2.32**
Poland	**3.86**	**3.83**	**3.79**	**3.77**	**3.54**	**3.54**	**3.47**	**3.45**	**3.27**	**3.19**	**3.14**
Portugal	2.69	2.66	2.61	2.57	2.16	2.17	2.11	2.21	2.08	1.95	1.90
Romania	**2.85**	**2.89**	**2.86**	**2.85**	**2.87**	**2.83**	**2.77**	**2.72**	**2.76**	**2.71**	**2.72**
Sweden	**1.88**	**1.79**	**1.58**	**1.59**	**1.40**	**1.29**	**1.20**	**1.18**	**1.14**	**1.12**	**1.01**
Slovenia	3.23	3.20	2.91	2.89	2.87	2.66	2.73	2.72	2.67	2.64	2.68
Slovakia	3.40	2.79	2.97	2.86	2.50	2.44	2.40	2.34	2.35	2.24	2.20
United Kingdom	3.25	2.95	2.76	2.71	2.60	2.40	2.33	2.28	2.23	2.16	

Table A1.15 – *GHG emissions per unit of gross inland consumption w/o nuclear energy, t CO_2eq/toe.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**3.86**	**3.66**	**3.47**	**3.31**	**3.11**	**3.05**	**3.00**	**2.95**	**2.91**	**2.85**	
EU27	**3.82**	**3.65**	**3.48**	**3.32**	**3.12**	**3.07**	**3.03**	**2.97**	**2.93**	**2.86**	**2.84**
Austria	3.10	2.91	2.74	2.68	2.42	2.33	2.32	2.35	2.31	2.29	2.28
Belgium	**3.86**	**3.53**	**3.17**	**3.10**	**2.72**	**2.51**	**2.56**	**2.54**	**2.46**	**2.56**	**2.47**
Bulgaria	4.03	3.79	4.09	4.08	4.22	4.22	4.21	4.22	4.07	4.09	3.64
Cyprus	3.45	3.54	3.42	3.61	3.43	3.63	3.57	3.50	3.36	3.39	3.88
Czechia	**4.21**	**4.04**	**3.96**	**3.79**	**3.64**	**3.62**	**3.63**	**3.58**	**3.56**	**3.47**	**3.45**
Germany	**3.93**	**3.70**	**3.47**	**3.24**	**3.10**	**3.05**	**3.02**	**2.93**	**2.88**	**2.77**	**2.72**
Denmark	3.98	3.94	3.70	3.43	3.19	2.91	2.94	2.80	2.79	2.67	2.74
Estonia	3.74	3.57	3.71	3.49	3.58	3.72	3.27	3.55	3.52	3.05	2.57
Greece	4.66	4.66	4.54	4.39	4.18	3.96	3.88	3.92	3.87	3.63	3.66
Spain	**3.90**	**3.73**	**3.59**	**3.41**	**3.14**	**3.12**	**3.00**	**2.94**	**2.88**	**2.81**	**2.84**
Finland	3.00	2.95	2.60	2.42	2.42	2.03	2.05	1.91	1.90	1.85	1.80
France	**3.76**	**3.78**	**3.71**	**3.46**	**3.24**	**3.18**	**3.10**	**3.10**	**3.07**	**3.00**	**3.04**
Croatia	3.26	2.85	3.02	3.02	2.95	2.86	2.87	2.87	2.81	2.80	2.86
Hungary	3.70	3.44	3.48	3.08	2.92	2.90	2.90	2.87	2.85	2.86	2.84
Ireland	5.30	5.43	4.76	4.55	4.11	4.25	4.18	4.24	4.19	4.00	4.21
Italy	**3.51**	**3.31**	**3.19**	**3.12**	**2.93**	**2.84**	**2.85**	**2.72**	**2.74**	**2.69**	**2.69**
Lithuania	4.09	3.96	3.87	3.68	2.93	2.83	2.76	2.67	2.57	2.61	2.64
Luxembourg	3.63	3.03	2.64	2.71	2.62	2.47	2.41	2.37	2.35	2.36	2.29
Latvia	3.25	2.69	2.60	2.38	2.55	2.44	2.43	2.36	2.34	2.39	2.40
Malta	3.38	3.39	3.45	3.19	3.14	2.80	2.55	2.45	2.40	2.37	2.79
Netherlands	**3.24**	**3.07**	**2.82**	**2.57**	**2.48**	**2.55**	**2.50**	**2.44**	**2.42**	**2.39**	**2.31**
Poland	**4.60**	**4.48**	**4.45**	**4.38**	**4.06**	**4.06**	**3.98**	**3.94**	**3.76**	**3.68**	**3.65**
Portugal	3.39	3.29	3.21	3.12	2.82	2.86	2.79	2.87	2.79	2.66	2.69
Romania	**3.94**	**3.94**	**3.93**	**3.94**	**3.85**	**3.99**	**3.94**	**3.84**	**3.91**	**3.86**	**3.87**
Sweden	**2.40**	**2.27**	**2.08**	**2.04**	**1.80**	**1.72**	**1.61**	**1.56**	**1.52**	**1.52**	**1.39**
Slovenia	4.10	3.84	3.48	3.38	3.32	3.25	3.29	3.27	3.21	3.19	3.29
Slovakia	4.04	3.56	3.61	3.62	3.29	3.32	3.30	3.18	3.17	3.07	2.98
United Kingdom	4.09	3.73	3.38	3.23	3.06	2.90	2.80	2.76	2.70	2.65	

Table A1.16 – *GHG emissions including bunkers per unit of gross domestic product t CO_2eq/k€ (chain linked volumes, 2015).*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**0.64**	**0.52**	**0.44**	**0.41**	**0.36**	**0.31**	**0.30**	**0.30**	**0.29**	**0.27**	
EU27	**0.65**	**0.53**	**0.46**	**0.43**	**0.38**	**0.33**	**0.33**	**0.32**	**0.31**	**0.29**	**0.28**
Austria	0.38	0.33	0.29	0.31	0.26	0.23	0.23	0.23	0.22	0.22	0.21
Belgium	**0.65**	**0.59**	**0.52**	**0.48**	**0.42**	**0.34**	**0.34**	**0.34**	**0.35**	**0.33**	**0.31**
Bulgaria	2.92	2.41	2.10	1.74	1.40	1.38	1.29	1.33	1.23	1.17	1.01
Cyprus	0.70	0.70	0.70	0.64	0.56	0.55	0.56	0.54	0.51	0.48	0.47
Czechia	**2.06**	**1.50**	**1.32**	**1.08**	**0.90**	**0.76**	**0.75**	**0.72**	**0.69**	**0.64**	**0.62**
Germany	**0.59**	**0.49**	**0.42**	**0.39**	**0.35**	**0.31**	**0.30**	**0.29**	**0.28**	**0.26**	**0.24**
Denmark	0.42	0.42	0.33	0.29	0.27	0.20	0.20	0.19	0.19	0.17	0.16
Estonia	6.00	2.21	1.43	1.10	1.26	0.93	0.97	0.98	0.91	0.63	0.53
Greece	0.90	0.82	0.78	0.68	0.60	0.59	0.57	0.60	0.57	0.53	0.49
Spain	**0.52**	**0.48**	**0.48**	**0.47**	**0.37**	**0.35**	**0.33**	**0.33**	**0.32**	**0.30**	**0.28**
Finland	0.53	0.53	0.41	0.36	0.37	0.27	0.28	0.26	0.26	0.25	0.22
France	**0.38**	**0.35**	**0.31**	**0.29**	**0.26**	**0.22**	**0.22**	**0.22**	**0.21**	**0.20**	**0.19**
Croatia	1.24	0.76	0.73	0.68	0.62	0.55	0.53	0.54	0.50	0.49	0.51
Hungary	1.54	1.09	0.92	0.76	0.65	0.55	0.55	0.54	0.52	0.49	0.50
Ireland	0.96	0.66	0.50	0.40	0.34	0.24	0.25	0.22	0.21	0.19	0.17
Italy	**0.39**	**0.36**	**0.34**	**0.35**	**0.31**	**0.28**	**0.27**	**0.27**	**0.26**	**0.25**	**0.25**
Lithuania	3.77	1.41	0.98	0.80	0.69	0.56	0.55	0.54	0.51	0.49	0.48
Luxembourg	0.63	0.39	0.29	0.34	0.28	0.22	0.20	0.21	0.21	0.21	0.18
Latvia	3.20	1.17	0.71	0.56	0.63	0.48	0.48	0.46	0.44	0.46	0.43
Malta			0.89	0.82	1.03	0.75	0.77	0.82	0.79	0.77	0.79
Netherlands	**0.68**	**0.58**	**0.47**	**0.44**	**0.40**	**0.36**	**0.34**	**0.33**	**0.32**	**0.30**	**0.29**
Poland	**3.15**	**2.29**	**1.57**	**1.38**	**1.12**	**0.91**	**0.91**	**0.90**	**0.85**	**0.77**	**0.76**
Portugal	0.53	0.50	0.49	0.49	0.39	0.40	0.39	0.41	0.38	0.35	0.33
Romania	**2.65**	**1.99**	**1.52**	**1.22**	**0.89**	**0.73**	**0.69**	**0.66**	**0.64**	**0.60**	**0.60**
Sweden	**0.33**	**0.28**	**0.23**	**0.20**	**0.18**	**0.14**	**0.13**	**0.13**	**0.12**	**0.12**	**0.12**
Slovenia	0.96	0.79	0.64	0.59	0.52	0.44	0.45	0.44	0.42	0.39	0.37
Slovakia	2.40	1.45	1.13	0.92	0.65	0.51	0.51	0.51	0.49	0.45	0.43
United Kingdom	0.48	0.45	0.37	0.32	0.27	0.21	0.20	0.19	0.18	0.18	

Table A1.17 – *Gross available energy per unit of gross domestic product toe/M€ (chain linked volumes, 2015).*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**186.3**	**161.7**	**145.0**	**140.6**	**129.7**	**113.2**	**111.8**	**110.8**	**108.0**	**104.3**	
EU27	**193.6**	**167.7**	**151.0**	**149.0**	**138.0**	**121.8**	**120.5**	**119.6**	**116.6**	**112.8**	**110.1**
Austria	121.3	112.8	104.3	112.4	106.7	98.0	97.4	97.0	92.4	93.1	92.5
Belgium	**212.5**	**202.8**	**196.5**	**184.4**	**174.8**	**142.8**	**149.6**	**149.1**	**146.6**	**144.1**	**137.4**
Bulgaria	832.5	775.2	682.4	558.7	420.0	409.7	389.2	392.0	383.1	365.1	361.7
Cyprus	180.2	178.9	186.7	166.2	151.4	142.1	144.5	140.3	136.3	129.5	120.5
Czechia	**521.5**	**400.8**	**362.6**	**330.2**	**291.6**	**248.0**	**239.6**	**237.7**	**231.3**	**220.9**	**219.6**
Germany	**168.9**	**147.4**	**134.9**	**133.0**	**122.5**	**105.9**	**104.4**	**102.1**	**98.6**	**95.4**	**92.4**
Denmark	103.9	106.0	87.7	81.3	82.2	66.0	65.4	63.5	62.6	59.7	55.6
Estonia	1604.3	618.6	383.8	314.2	350.8	249.0	295.7	276.9	256.9	204.1	201.9
Greece	194.9	178.3	173.5	154.4	143.7	146.7	144.6	149.5	144.3	142.0	132.1
Spain	**157.2**	**147.8**	**148.6**	**148.1**	**128.4**	**121.0**	**118.4**	**120.0**	**117.4**	**112.3**	**111.0**
Finland	207.8	214.5	189.2	175.8	175.7	155.9	157.2	154.4	155.4	150.5	145.3
France	**152.9**	**151.7**	**140.3**	**139.6**	**130.3**	**119.1**	**115.7**	**113.2**	**110.6**	**107.3**	**103.4**
Croatia	375.1	262.3	238.8	222.4	208.5	188.3	183.5	183.7	174.7	171.1	175.9
Hungary	471.1	364.5	305.7	278.0	260.9	223.4	221.3	221.7	210.8	201.7	207.2
Ireland	177.1	120.1	101.7	84.1	80.5	54.8	56.5	50.7	47.3	45.2	39.2
Italy	**111.4**	**109.1**	**106.1**	**110.3**	**105.0**	**95.2**	**93.3**	**94.9**	**92.8**	**91.5**	**91.6**
Lithuania	1273.7	556.9	367.3	312.0	232.9	194.4	196.4	197.1	193.5	184.2	180.2
Luxembourg	167.9	120.6	100.5	113.2	95.4	77.2	73.7	75.2	76.7	74.9	66.5
Latvia	975.7	429.8	269.8	228.3	235.5	188.6	187.1	185.1	178.8	178.4	171.1
Malta			242.7	241.5	310.9	229.5	239.6	257.3	250.2	244.7	248.4
Netherlands	**210.5**	**184.8**	**157.4**	**160.0**	**150.4**	**129.1**	**127.7**	**124.9**	**119.5**	**115.5**	**115.0**
Poland	**684.5**	**509.7**	**353.0**	**315.3**	**273.6**	**223.2**	**227.0**	**226.7**	**224.8**	**207.1**	**206.3**
Portugal	152.9	148.7	149.4	153.9	132.5	134.8	132.5	134.0	127.2	124.0	120.3
Romania	**671.5**	**502.9**	**399.6**	**319.7**	**251.7**	**199.3**	**189.8**	**186.5**	**178.8**	**169.7**	**171.1**
Sweden	**207.8**	**186.6**	**149.1**	**142.4**	**128.1**	**107.3**	**109.9**	**110.4**	**108.8**	**104.4**	**99.3**
Slovenia	294.4	255.9	225.4	218.6	191.1	168.9	170.4	167.9	161.0	152.6	148.4
Slovakia	693.6	487.9	409.5	338.0	250.9	203.6	200.7	205.7	195.8	190.6	192.6
United Kingdom	125.3	132.0	115.2	101.6	90.2	73.2	71.0	69.0	68.0	65.8	

Table A1.18 – *Energy GHG emissions including bunkers per unit of gross available energy w/o non-energy consumption, t CO_2eq/toe.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**2.81**	**2.66**	**2.56**	**2.49**	**2.39**	**2.30**	**2.28**	**2.26**	**2.23**	**2.17**	
EU27	**2.77**	**2.65**	**2.55**	**2.47**	**2.36**	**2.29**	**2.28**	**2.26**	**2.22**	**2.16**	**2.08**
Austria	2.27	2.15	2.07	2.10	1.86	1.73	1.75	1.76	1.78	1.77	1.69
Belgium	**2.42**	**2.37**	**2.20**	**2.27**	**2.10**	**2.13**	**2.01**	**2.03**	**2.15**	**2.06**	**2.00**
Bulgaria	2.69	2.37	2.34	2.42	2.67	2.56	2.44	2.48	2.28	2.23	2.05
Cyprus	2.97	3.11	3.10	3.23	3.15	3.04	3.07	3.03	2.95	2.97	3.02
Czechia	**3.36**	**3.30**	**3.14**	**2.87**	**2.66**	**2.52**	**2.54**	**2.52**	**2.46**	**2.38**	**2.25**
Germany	**3.15**	**2.94**	**2.80**	**2.66**	**2.62**	**2.67**	**2.67**	**2.61**	**2.56**	**2.46**	**2.36**
Denmark	3.14	3.22	3.00	2.82	2.66	2.30	2.34	2.20	2.21	2.09	1.94
Estonia	3.46	3.25	3.32	3.20	3.26	3.34	2.97	3.24	3.21	2.67	2.27
Greece	3.65	3.60	3.61	3.60	3.50	3.18	3.06	3.15	3.13	2.93	2.76
Spain	**2.67**	**2.74**	**2.65**	**2.66**	**2.33**	**2.33**	**2.25**	**2.25**	**2.23**	**2.17**	**2.01**
Finland	2.03	2.02	1.75	1.66	1.75	1.38	1.41	1.33	1.34	1.28	1.17
France	**1.80**	**1.71**	**1.69**	**1.59**	**1.50**	**1.38**	**1.42**	**1.43**	**1.38**	**1.37**	**1.33**
Croatia	2.46	2.29	2.37	2.39	2.25	2.13	2.16	2.14	2.08	2.08	2.02
Hungary	2.55	2.44	2.42	2.21	2.06	1.92	1.93	1.94	1.93	1.92	1.87
Ireland	3.33	3.41	3.23	3.22	2.91	2.81	2.79	2.79	2.74	2.62	2.55
Italy	**3.09**	**2.91**	**2.81**	**2.75**	**2.61**	**2.48**	**2.48**	**2.39**	**2.39**	**2.35**	**2.25**
Lithuania	2.18	1.74	1.66	1.64	2.09	1.91	1.91	1.86	1.87	1.89	1.88
Luxembourg	3.07	2.69	2.52	2.69	2.61	2.49	2.45	2.45	2.46	2.46	2.36
Latvia	2.55	2.14	1.98	1.93	2.02	1.85	1.89	1.81	1.75	1.85	1.72
Malta	4.50	5.18	3.48	3.21	3.19	3.07	3.03	3.02	3.03	3.02	3.03
Netherlands	**2.85**	**2.77**	**2.74**	**2.74**	**2.73**	**2.78**	**2.75**	**2.71**	**2.68**	**2.63**	**2.53**
Poland	**3.86**	**3.84**	**3.80**	**3.78**	**3.55**	**3.56**	**3.49**	**3.48**	**3.30**	**3.22**	**3.16**
Portugal	2.77	2.74	2.69	2.67	2.30	2.34	2.29	2.40	2.29	2.19	2.02
Romania	**2.86**	**2.91**	**2.76**	**2.74**	**2.63**	**2.58**	**2.55**	**2.50**	**2.53**	**2.48**	**2.47**
Sweden	**1.22**	**1.20**	**1.19**	**1.12**	**1.12**	**0.99**	**0.95**	**0.94**	**0.89**	**0.90**	**0.89**
Slovenia	2.57	2.55	2.36	2.29	2.34	2.13	2.20	2.16	2.17	2.13	2.05
Slovakia	2.87	2.30	2.20	2.09	1.93	1.81	1.80	1.77	1.80	1.69	1.62
United Kingdom	3.06	2.74	2.63	2.63	2.60	2.40	2.35	2.32	2.29	2.23	

Table A1.19 – *Energy GHG emissions including bunkers per unit of gross available energy w/o non-energy consumption and nuclear energy, t CO_2eq/toe.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**3.22**	**3.10**	**3.00**	**2.91**	**2.76**	**2.67**	**2.64**	**2.60**	**2.56**	**2.50**	
EU27	**3.20**	**3.10**	**3.01**	**2.91**	**2.76**	**2.68**	**2.65**	**2.61**	**2.57**	**2.51**	**2.40**
Austria	2.27	2.15	2.07	2.10	1.86	1.73	1.75	1.76	1.78	1.77	1.69
Belgium	**3.11**	**2.99**	**2.81**	**2.86**	**2.60**	**2.43**	**2.48**	**2.48**	**2.46**	**2.53**	**2.39**
Bulgaria	3.13	2.97	3.18	3.23	3.42	3.27	3.14	3.15	2.93	2.91	2.73
Cyprus	2.97	3.11	3.10	3.23	3.15	3.04	3.07	3.03	2.95	2.97	3.02
Czechia	**3.60**	**3.58**	**3.44**	**3.38**	**3.20**	**3.04**	**2.98**	**3.05**	**3.01**	**2.93**	**2.81**
Germany	**3.57**	**3.35**	**3.25**	**3.06**	**2.96**	**2.90**	**2.88**	**2.79**	**2.74**	**2.63**	**2.52**
Denmark	3.14	3.22	3.00	2.82	2.66	2.30	2.34	2.20	2.21	2.09	1.94
Estonia	3.46	3.25	3.32	3.20	3.26	3.34	2.97	3.24	3.21	2.67	2.27
Greece	3.65	3.60	3.61	3.60	3.50	3.18	3.06	3.15	3.13	2.93	2.76
Spain	**3.19**	**3.20**	**3.05**	**2.96**	**2.66**	**2.64**	**2.56**	**2.55**	**2.51**	**2.46**	**2.33**
Finland	2.47	2.44	2.14	2.01	2.07	1.67	1.70	1.58	1.60	1.55	1.42
France	**2.88**	**3.00**	**3.04**	**2.85**	**2.64**	**2.56**	**2.49**	**2.50**	**2.47**	**2.42**	**2.35**
Croatia	2.46	2.29	2.37	2.39	2.25	2.13	2.16	2.14	2.08	2.08	2.02
Hungary	2.93	2.87	2.87	2.56	2.45	2.32	2.33	2.33	2.31	2.31	2.25
Ireland	3.33	3.41	3.23	3.22	2.91	2.81	2.79	2.79	2.74	2.62	2.55
Italy	**3.09**	**2.91**	**2.81**	**2.75**	**2.61**	**2.48**	**2.48**	**2.39**	**2.39**	**2.35**	**2.25**
Lithuania	3.09	2.83	2.53	2.46	2.09	1.91	1.91	1.86	1.87	1.89	1.88
Luxembourg	3.07	2.69	2.52	2.69	2.61	2.49	2.45	2.45	2.46	2.46	2.36
Latvia	2.55	2.14	1.98	1.93	2.02	1.85	1.89	1.81	1.75	1.85	1.72
Malta	4.50	5.18	3.48	3.21	3.19	3.07	3.03	3.02	3.03	3.02	3.03
Netherlands	**2.89**	**2.81**	**2.78**	**2.77**	**2.76**	**2.82**	**2.78**	**2.74**	**2.71**	**2.66**	**2.56**
Poland	**3.86**	**3.84**	**3.80**	**3.78**	**3.55**	**3.56**	**3.49**	**3.48**	**3.30**	**3.22**	**3.16**
Portugal	2.77	2.74	2.69	2.67	2.30	2.34	2.29	2.40	2.29	2.19	2.02
Romania	**2.86**	**2.91**	**2.88**	**2.86**	**2.88**	**2.86**	**2.81**	**2.75**	**2.77**	**2.72**	**2.72**
Sweden	**1.97**	**1.88**	**1.73**	**1.76**	**1.58**	**1.47**	**1.40**	**1.40**	**1.33**	**1.34**	**1.21**
Slovenia	3.24	3.22	2.93	2.90	2.89	2.69	2.75	2.75	2.71	2.67	2.69
Slovakia	3.41	2.79	2.98	2.87	2.51	2.46	2.41	2.35	2.37	2.26	2.20
United Kingdom	3.33	3.07	2.92	2.90	2.79	2.62	2.56	2.54	2.48	2.41	

Table A1.20 – *Share of renewable energy in gross inland energy consumption, %.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**4.3%**	**5.1%**	**5.7%**	**6.7%**	**10.2%**	**13.4%**	**13.6%**	**13.9%**	**14.6%**	**15.4%**	
EU27	**4.9%**	**5.7%**	**6.4%**	**7.5%**	**11.1%**	**14.1%**	**14.2%**	**14.4%**	**15.2%**	**15.9%**	**17.9%**
Austria	19.9%	21.6%	22.5%	20.9%	27.2%	29.8%	30.2%	29.8%	29.4%	30.0%	32.6%
Belgium	**1.0%**	**1.0%**	**1.1%**	**1.9%**	**4.9%**	**7.0%**	**7.0%**	**7.3%**	**7.8%**	**7.8%**	**9.6%**
Bulgaria	1.1%	1.7%	4.1%	5.5%	8.3%	11.1%	11.1%	10.3%	13.4%	13.1%	14.3%
Cyprus	0.4%	2.3%	1.9%	2.1%	4.0%	6.8%	6.6%	6.9%	9.1%	9.4%	12.3%
Czechia	**2.3%**	**3.4%**	**3.9%**	**4.6%**	**7.0%**	**10.4%**	**10.6%**	**10.4%**	**10.5%**	**11.4%**	**12.7%**
Germany	**1.5%**	**1.8%**	**2.6%**	**5.4%**	**9.2%**	**12.6%**	**12.4%**	**13.2%**	**13.8%**	**14.7%**	**16.5%**
Denmark	6.0%	6.8%	9.6%	14.8%	19.6%	28.8%	29.1%	32.1%	31.9%	34.7%	39.1%
Estonia	1.7%	8.8%	10.9%	10.7%	14.4%	19.2%	16.6%	18.2%	20.2%	24.6%	29.2%
Greece	5.0%	5.5%	5.2%	5.5%	7.7%	11.8%	11.4%	12.0%	13.2%	13.5%	16.4%
Spain	**7.0%**	**5.4%**	**5.5%**	**5.8%**	**11.6%**	**13.8%**	**14.1%**	**12.7%**	**13.9%**	**14.5%**	**17.1%**
Finland	19.2%	21.0%	23.7%	23.2%	25.3%	32.1%	31.4%	34.4%	34.5%	35.7%	37.4%
France	**6.7%**	**7.1%**	**6.1%**	**5.7%**	**8.3%**	**9.3%**	**10.3%**	**10.1%**	**11.0%**	**11.3%**	**12.8%**
Croatia	12.5%	19.6%	18.4%	18.9%	22.0%	23.2%	23.5%	21.5%	25.2%	24.3%	26.4%
Hungary	2.6%	3.3%	3.3%	5.9%	10.4%	12.0%	11.8%	11.2%	10.5%	10.6%	11.3%
Ireland	1.6%	1.4%	1.6%	2.4%	4.5%	7.9%	7.6%	9.2%	9.9%	10.9%	12.9%
Italy	**4.4%**	**4.8%**	**5.8%**	**7.4%**	**12.4%**	**16.9%**	**16.9%**	**18.1%**	**18.7%**	**19.0%**	**20.7%**
Lithuania	2.0%	5.6%	9.2%	9.8%	15.0%	19.8%	19.9%	20.5%	20.3%	20.4%	21.7%
Luxembourg	0.5%	1.0%	1.1%	1.5%	2.8%	5.0%	5.3%	6.1%	6.5%	7.1%	10.0%
Latvia	13.1%	27.1%	30.8%	32.2%	31.0%	35.1%	37.0%	42.5%	38.9%	39.2%	41.5%
Malta	0.0%	0.0%	0.0%	0.1%	0.5%	2.8%	3.4%	4.7%	5.4%	5.4%	7.5%
Netherlands	**1.1%**	**1.2%**	**1.7%**	**2.7%**	**3.8%**	**4.9%**	**4.9%**	**5.3%**	**6.0%**	**7.1%**	**9.4%**
Poland	**1.5%**	**3.9%**	**4.3%**	**4.8%**	**7.2%**	**9.5%**	**8.9%**	**8.6%**	**11.2%**	**12.0%**	**12.6%**
Portugal	19.0%	16.0%	14.8%	12.7%	22.4%	23.6%	26.5%	22.1%	25.4%	25.4%	29.8%
Romania	**2.5%**	**6.0%**	**11.0%**	**12.8%**	**16.7%**	**18.7%**	**19.5%**	**18.0%**	**18.0%**	**18.1%**	**18.6%**
Sweden	**24.3%**	**25.5%**	**30.9%**	**28.4%**	**33.2%**	**43.5%**	**40.3%**	**42.0%**	**39.6%**	**43.1%**	**51.3%**
Slovenia	9.1%	8.9%	13.7%	13.4%	16.0%	17.1%	17.4%	15.9%	16.8%	17.0%	18.6%
Slovakia	1.5%	2.8%	2.8%	4.3%	7.5%	9.7%	9.6%	9.2%	9.3%	12.9%	13.1%
UK	0.5%	0.8%	1.0%	1.7%	3.5%	8.3%	8.8%	9.7%	10.9%	12.0%	

Table A1.21 – *Share of solid fuel energy in gross inland energy consumption, %.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**26.7%**	**21.4%**	**18.2%**	**17.0%**	**15.6%**	**15.8%**	**14.4%**	**13.6%**	**13.1%**	**10.7%**	
EU27	**26.3%**	**21.4%**	**18.6%**	**17.1%**	**15.7%**	**16.2%**	**15.4%**	**14.7%**	**14.2%**	**11.8%**	**10.5%**
Austria	16.2%	12.7%	12.3%	11.8%	9.7%	9.6%	8.8%	8.9%	8.1%	8.3%	7.7%
Belgium	**21.7%**	**16.0%**	**13.5%**	**8.7%**	**6.2%**	**6.4%**	**5.6%**	**5.4%**	**5.6%**	**5.4%**	**4.6%**
Bulgaria	31.0%	32.6%	34.4%	34.4%	38.7%	35.4%	31.2%	32.3%	29.6%	27.9%	24.0%
Cyprus	4.0%	0.7%	1.3%	1.4%	0.6%	0.2%	0.0%	0.1%	0.5%	0.7%	0.6%
Czechia	**62.9%**	**54.2%**	**52.3%**	**44.4%**	**41.5%**	**39.0%**	**39.7%**	**36.4%**	**36.2%**	**33.1%**	**30.3%**
Germany	**36.1%**	**26.8%**	**24.8%**	**23.6%**	**23.4%**	**25.0%**	**24.1%**	**22.1%**	**22.1%**	**18.3%**	**15.7%**
Denmark	33.9%	32.3%	20.4%	18.7%	18.7%	10.5%	11.3%	8.6%	8.7%	5.1%	4.5%
Estonia	2.0%	0.6%	0.9%	0.2%	0.4%	0.3%	0.1%	0.2%	0.3%	0.3%	-0.1%
Greece	36.3%	35.7%	32.4%	28.8%	27.7%	23.3%	18.5%	19.7%	19.1%	13.6%	9.0%
Spain	**21.8%**	**18.5%**	**16.9%**	**14.2%**	**5.6%**	**11.1%**	**8.7%**	**9.9%**	**8.8%**	**4.0%**	**2.8%**
Finland	14.3%	14.7%	11.1%	9.4%	12.5%	8.4%	8.7%	8.3%	7.8%	6.2%	5.7%
France	**8.8%**	**6.6%**	**5.8%**	**5.1%**	**4.4%**	**3.6%**	**3.6%**	**3.9%**	**3.6%**	**2.9%**	**2.4%**
Croatia	8.4%	2.2%	5.1%	7.0%	7.2%	7.1%	7.6%	4.4%	4.2%	4.8%	4.3%
Hungary	21.3%	17.8%	15.3%	10.8%	10.2%	9.4%	8.6%	8.4%	8.0%	6.8%	6.4%
Ireland	20.3%	16.5%	12.6%	12.2%	8.2%	10.3%	9.7%	7.8%	5.3%	2.6%	3.2%
Italy	**9.9%**	**7.6%**	**7.2%**	**8.7%**	**7.7%**	**7.9%**	**7.1%**	**5.9%**	**5.4%**	**4.2%**	**3.6%**
Lithuania	4.8%	2.5%	1.1%	1.9%	2.6%	2.2%	2.2%	2.1%	2.2%	2.2%	1.8%
Luxembourg	31.6%	14.7%	3.0%	1.6%	1.4%	1.2%	1.2%	1.1%	0.9%	1.0%	1.0%
Latvia	7.9%	3.8%	1.9%	1.7%	2.3%	1.1%	0.9%	0.9%	0.9%	0.8%	0.5%
Malta	23.3%	3.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Netherlands	**12.7%**	**11.8%**	**9.9%**	**9.7%**	**8.8%**	**14.5%**	**13.1%**	**11.7%**	**10.7%**	**8.4%**	**5.7%**
Poland	**76.3%**	**70.5%**	**63.1%**	**59.0%**	**54.4%**	**50.5%**	**49.3%**	**47.2%**	**44.8%**	**41.3%**	**39.7%**
Portugal	16.0%	17.4%	15.0%	12.2%	6.8%	13.8%	12.1%	13.1%	11.2%	5.2%	2.6%
Romania	**20.1%**	**23.1%**	**20.3%**	**22.6%**	**19.9%**	**18.5%**	**16.6%**	**16.1%**	**15.0%**	**14.7%**	**10.8%**
Sweden	**5.7%**	**5.1%**	**4.6%**	**4.5%**	**4.2%**	**4.2%**	**3.9%**	**3.8%**	**3.9%**	**3.7%**	**3.2%**
Slovenia	27.4%	22.6%	19.9%	20.3%	20.0%	16.4%	17.1%	16.5%	16.5%	15.9%	16.1%
Slovakia	36.8%	30.3%	24.1%	22.7%	22.0%	20.2%	19.7%	19.6%	19.6%	16.0%	14.0%
UK	29.8%	21.1%	15.6%	16.1%	15.0%	12.9%	6.7%	5.4%	4.4%	3.2%	

Table A1.22 – *Share of energy from oil and petroleum products in gross domestic energy consumption, %.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**38.3%**	**39.5%**	**38.6%**	**37.5%**	**35.0%**	**34.7%**	**34.9%**	**35.1%**	**35.0%**	**35.4%**	
EU27	**38.3%**	**39.7%**	**39.1%**	**37.7%**	**35.0%**	**34.3%**	**34.5%**	**34.6%**	**34.4%**	**34.8%**	**32.9%**
Austria	42.7%	42.0%	42.2%	42.0%	37.4%	35.6%	35.9%	35.3%	36.7%	37.0%	34.5%
Belgium	**38.1%**	**42.4%**	**40.7%**	**41.6%**	**40.4%**	**43.7%**	**40.6%**	**40.4%**	**41.9%**	**39.3%**	**38.2%**
Bulgaria	34.2%	27.0%	22.4%	24.8%	22.4%	23.2%	23.7%	24.0%	24.3%	25.2%	24.2%
Cyprus	95.7%	97.1%	96.8%	96.4%	95.2%	92.5%	92.8%	92.1%	89.6%	88.8%	85.6%
Czechia	**17.9%**	**19.1%**	**19.0%**	**21.9%**	**20.4%**	**21.2%**	**19.9%**	**22.3%**	**22.5%**	**23.0%**	**21.4%**
Germany	**35.5%**	**39.5%**	**38.3%**	**36.0%**	**33.5%**	**34.5%**	**34.6%**	**35.1%**	**34.4%**	**35.7%**	**34.9%**
Denmark	45.6%	44.2%	45.1%	41.7%	38.4%	38.7%	38.5%	39.2%	39.5%	40.1%	36.5%
Estonia	90.5%	81.4%	75.9%	77.0%	80.4%	73.1%	78.3%	77.9%	74.2%	62.5%	55.4%
Greece	57.8%	58.2%	56.0%	57.0%	51.3%	50.0%	51.9%	48.9%	48.0%	50.1%	46.8%
Spain	**49.7%**	**54.1%**	**52.0%**	**49.0%**	**46.8%**	**42.7%**	**43.7%**	**43.9%**	**44.2%**	**44.3%**	**40.9%**
Finland	38.4%	35.1%	33.5%	35.0%	33.5%	30.1%	31.2%	29.5%	29.6%	28.9%	27.6%
France	**38.6%**	**35.6%**	**34.2%**	**33.8%**	**30.7%**	**31.2%**	**30.8%**	**31.0%**	**30.1%**	**30.8%**	**29.0%**
Croatia	50.2%	50.4%	46.8%	46.1%	39.4%	38.2%	37.9%	39.1%	38.6%	37.3%	33.6%
Hungary	30.1%	28.8%	27.2%	26.1%	25.6%	27.9%	27.3%	28.3%	30.2%	30.6%	28.6%
Ireland	59.8%	60.6%	61.8%	61.7%	55.8%	54.5%	54.4%	53.2%	53.7%	54.7%	49.7%
Italy	**57.3%**	**57.8%**	**51.5%**	**44.0%**	**38.7%**	**36.4%**	**35.5%**	**34.7%**	**34.9%**	**34.8%**	**31.7%**
Lithuania	42.1%	34.3%	29.6%	30.1%	36.4%	36.5%	38.9%	38.1%	39.9%	38.9%	38.0%
Luxembourg	45.7%	54.3%	63.5%	65.8%	61.9%	63.1%	62.8%	63.7%	64.8%	64.9%	60.4%
Latvia	45.1%	43.1%	35.1%	32.4%	32.9%	33.9%	33.9%	34.3%	33.2%	33.3%	32.7%
Malta	76.7%	96.1%	100.0%	99.9%	99.5%	85.3%	78.3%	57.0%	53.7%	54.5%	46.0%
Netherlands	**38.7%**	**38.4%**	**39.5%**	**41.4%**	**38.7%**	**39.6%**	**40.5%**	**41.0%**	**40.4%**	**39.6%**	**38.6%**
Poland	**12.8%**	**16.0%**	**22.0%**	**23.7%**	**25.5%**	**25.1%**	**26.4%**	**28.5%**	**28.0%**	**29.5%**	**28.6%**
Portugal	65.0%	66.2%	61.5%	58.8%	50.8%	43.9%	44.1%	43.0%	42.6%	45.2%	41.8%
Romania	**30.5%**	**29.0%**	**27.5%**	**25.3%**	**24.7%**	**27.2%**	**27.8%**	**28.8%**	**29.0%**	**29.8%**	**30.0%**
Sweden	**31.4%**	**32.0%**	**30.3%**	**29.5%**	**29.6%**	**20.5%**	**22.6%**	**21.5%**	**23.1%**	**21.5%**	**18.6%**
Slovenia	30.9%	38.3%	36.8%	34.1%	35.9%	35.2%	35.8%	35.2%	35.9%	35.2%	31.8%
Slovakia	21.0%	19.1%	16.1%	17.5%	19.8%	19.1%	20.3%	21.4%	22.2%	21.1%	21.9%
UK	39.0%	38.0%	35.9%	36.3%	34.9%	37.2%	38.3%	39.4%	39.0%	39.1%	

Table A1.23 – *Share of natural gas energy in gross inland energy consumption, %.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**17.8%**	**20.0%**	**22.9%**	**24.2%**	**25.3%**	**21.8%**	**23.2%**	**23.7%**	**23.6%**	**24.6%**	
EU27	**17.1%**	**18.6%**	**20.6%**	**22.4%**	**23.3%**	**20.4%**	**21.5%**	**22.2%**	**21.9%**	**23.0%**	**24.4%**
Austria	20.7%	23.6%	22.5%	23.5%	23.3%	20.5%	21.2%	22.3%	21.6%	22.1%	22.6%
Belgium	**16.7%**	**19.6%**	**22.5%**	**25.0%**	**27.7%**	**26.1%**	**25.3%**	**25.9%**	**27.5%**	**27.2%**	**29.5%**
Bulgaria	19.1%	19.6%	15.7%	14.0%	12.8%	13.9%	14.7%	14.6%	13.7%	13.0%	14.1%
Cyprus	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Czechia	**10.5%**	**15.6%**	**18.2%**	**16.9%**	**17.7%**	**15.4%**	**16.8%**	**16.6%**	**15.6%**	**16.7%**	**18.1%**
Germany	**15.5%**	**19.7%**	**21.0%**	**22.4%**	**22.4%**	**20.5%**	**22.0%**	**23.4%**	**23.4%**	**24.5%**	**26.2%**
Denmark	10.1%	15.8%	22.8%	22.2%	21.7%	16.5%	16.2%	15.4%	14.9%	14.6%	13.3%
Estonia	11.4%	10.3%	14.1%	14.6%	9.5%	8.0%	7.1%	6.9%	7.2%	7.9%	7.8%
Greece	0.6%	0.2%	6.1%	7.6%	11.4%	11.1%	14.8%	17.2%	17.3%	19.1%	24.1%
Spain	**5.6%**	**7.5%**	**12.3%**	**20.7%**	**23.9%**	**20.0%**	**20.2%**	**20.9%**	**20.8%**	**24.4%**	**25.0%**
Finland	7.6%	9.7%	10.5%	10.4%	10.4%	6.8%	6.1%	5.6%	6.2%	6.2%	6.6%
France	**11.5%**	**12.3%**	**14.0%**	**14.8%**	**15.8%**	**13.5%**	**15.0%**	**15.1%**	**14.5%**	**14.9%**	**15.6%**
Croatia	22.8%	24.5%	26.2%	24.1%	27.8%	24.5%	25.3%	28.1%	26.4%	27.4%	30.4%
Hungary	30.6%	35.2%	38.3%	42.4%	36.9%	29.7%	31.5%	32.0%	31.0%	31.7%	33.5%
Ireland	18.2%	21.6%	23.9%	22.6%	31.2%	26.4%	28.3%	29.5%	30.1%	30.4%	33.2%
Italy	**26.3%**	**27.7%**	**33.2%**	**37.3%**	**38.5%**	**35.5%**	**37.6%**	**38.6%**	**37.9%**	**39.2%**	**41.2%**
Lithuania	28.7%	22.9%	28.1%	27.6%	35.2%	28.8%	25.0%	25.0%	22.7%	23.9%	25.8%
Luxembourg	12.2%	16.8%	18.4%	24.5%	25.8%	18.4%	16.9%	16.0%	15.2%	15.1%	15.7%
Latvia	29.9%	21.8%	28.3%	29.6%	31.6%	25.1%	25.3%	21.8%	24.4%	23.7%	20.9%
Malta	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	29.3%	34.6%	34.0%	41.8%
Netherlands	**44.7%**	**45.5%**	**44.7%**	**42.2%**	**46.5%**	**37.5%**	**38.4%**	**39.3%**	**39.6%**	**42.1%**	**43.7%**
Poland	**8.6%**	**9.0%**	**11.2%**	**13.2%**	**12.6%**	**14.4%**	**14.5%**	**14.7%**	**14.7%**	**15.3%**	**16.9%**
Portugal	0.0%	0.0%	8.0%	13.7%	18.4%	17.2%	18.4%	22.0%	21.0%	22.2%	24.3%
Romania	**45.6%**	**41.1%**	**37.2%**	**36.0%**	**30.8%**	**28.0%**	**28.4%**	**28.9%**	**29.6%**	**27.9%**	**30.1%**
Sweden	**1.2%**	**1.5%**	**1.6%**	**1.6%**	**2.9%**	**1.5%**	**1.7%**	**1.8%**	**2.0%**	**1.9%**	**2.8%**
Slovenia	13.3%	12.2%	12.6%	12.3%	11.9%	10.2%	10.5%	10.7%	10.6%	10.9%	11.6%
Slovakia	23.9%	29.3%	32.6%	31.5%	28.3%	23.9%	23.8%	24.0%	23.9%	24.0%	24.8%
UK	22.3%	29.1%	37.5%	36.4%	39.8%	32.1%	36.6%	36.1%	36.6%	36.6%	

Table A1.24 – *Share of nuclear energy in gross inland energy consumption, %.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**12.3%**	**13.6%**	**14.1%**	**14.0%**	**13.2%**	**13.4%**	**12.9%**	**12.6%**	**12.6%**	**12.8%**	
EU27	**12.9%**	**14.1%**	**14.8%**	**14.8%**	**14.1%**	**14.1%**	**13.5%**	**13.1%**	**13.2%**	**13.5%**	**13.1%**
Austria	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Belgium	**22.6%**	**19.7%**	**20.9%**	**20.7%**	**19.1%**	**11.7%**	**18.7%**	**18.3%**	**12.7%**	**18.9%**	**16.3%**
Bulgaria	13.4%	19.1%	25.3%	24.2%	21.5%	20.9%	21.9%	20.8%	21.9%	22.8%	24.3%
Cyprus	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Czechia	**6.5%**	**7.5%**	**8.5%**	**14.2%**	**15.7%**	**15.9%**	**14.3%**	**16.1%**	**17.1%**	**17.6%**	**18.6%**
Germany	**11.1%**	**11.6%**	**12.8%**	**12.1%**	**10.7%**	**7.4%**	**6.8%**	**6.1%**	**6.2%**	**6.3%**	**5.8%**
Denmark	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Estonia	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Greece	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Spain	**15.8%**	**13.9%**	**12.9%**	**10.3%**	**12.4%**	**12.1%**	**12.3%**	**11.6%**	**11.1%**	**12.0%**	**13.6%**
Finland	17.3%	17.0%	17.7%	17.2%	15.1%	17.2%	16.5%	15.7%	15.6%	16.6%	17.3%
France	**35.8%**	**40.5%**	**41.8%**	**42.0%**	**41.4%**	**43.8%**	**41.1%**	**40.6%**	**42.3%**	**41.4%**	**41.2%**
Croatia	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Hungary	12.2%	13.9%	14.7%	12.7%	14.9%	15.8%	16.0%	15.3%	15.0%	15.4%	15.5%
Ireland	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Italy	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
Lithuania	28.2%	36.5%	31.7%	31.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Luxembourg	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Latvia	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Malta	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Netherlands	**1.3%**	**1.4%**	**1.3%**	**1.2%**	**1.1%**	**1.2%**	**1.2%**	**1.0%**	**1.0%**	**1.2%**	**1.3%**
Poland	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
Portugal	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Romania	**0.0%**	**0.0%**	**3.8%**	**3.7%**	**8.3%**	**9.2%**	**8.8%**	**8.7%**	**8.6%**	**8.6%**	**9.0%**
Sweden	**37.1%**	**35.8%**	**31.0%**	**36.3%**	**28.7%**	**33.0%**	**32.0%**	**32.5%**	**32.8%**	**32.7%**	**26.6%**
Slovenia	20.8%	20.2%	18.7%	20.1%	18.4%	20.5%	20.1%	21.6%	19.9%	20.5%	23.7%
Slovakia	14.6%	16.6%	24.0%	25.3%	21.8%	24.8%	23.8%	23.1%	22.1%	23.8%	24.6%
UK	8.0%	10.3%	9.4%	9.0%	6.5%	8.1%	8.2%	8.1%	7.6%	7.3%	

Table A1.25 – *Share of electricity in gross inland energy consumption, %.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**0.2%**	**0.1%**	**0.1%**	**0.1%**	**0.0%**	**0.1%**	**0.1%**	**0.1%**	**0.1%**	**0.1%**	
EU27	**0.2%**	**0.0%**	**0.1%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.1%**	**0.0%**	**0.1%**
Austria	-0.2%	-0.8%	-0.4%	0.7%	0.6%	2.6%	1.8%	1.6%	2.3%	0.8%	0.6%
Belgium	**-0.7%**	**0.6%**	**0.6%**	**0.9%**	**0.1%**	**3.4%**	**0.9%**	**0.9%**	**2.7%**	**-0.3%**	**-0.1%**
Bulgaria	1.2%	-0.1%	-2.1%	-3.2%	-4.1%	-4.9%	-3.0%	-2.5%	-3.5%	-2.7%	-1.6%
Cyprus	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Czechia	**-0.1%**	**0.1%**	**-2.1%**	**-2.4%**	**-2.8%**	**-2.6%**	**-2.3%**	**-2.6%**	**-2.7%**	**-2.6%**	**-2.2%**
Germany	**0.0%**	**0.1%**	**0.1%**	**-0.1%**	**-0.4%**	**-1.3%**	**-1.4%**	**-1.4%**	**-1.3%**	**-0.9%**	**-0.6%**
Denmark	3.4%	-0.3%	0.3%	0.6%	-0.5%	2.9%	2.4%	2.2%	2.5%	2.9%	3.7%
Estonia	-5.6%	-1.2%	-1.7%	-2.5%	-4.7%	-1.6%	-2.9%	-4.0%	-2.9%	3.9%	7.0%
Greece	0.3%	0.3%	0.0%	1.0%	1.7%	3.4%	3.2%	2.2%	2.3%	3.6%	3.7%
Spain	**0.0%**	**0.4%**	**0.3%**	**-0.1%**	**-0.6%**	**0.0%**	**0.5%**	**0.6%**	**0.7%**	**0.5%**	**0.3%**
Finland	3.2%	2.5%	3.1%	4.2%	2.5%	4.3%	4.8%	5.1%	4.9%	5.0%	4.0%
France	**-1.7%**	**-2.5%**	**-2.3%**	**-1.9%**	**-1.0%**	**-2.1%**	**-1.4%**	**-1.4%**	**-2.1%**	**-2.0%**	**-1.7%**
Croatia	6.1%	3.4%	3.5%	3.9%	3.6%	6.9%	5.5%	6.7%	5.3%	6.0%	4.8%
Hungary	3.3%	0.8%	1.2%	1.9%	1.7%	4.7%	4.3%	4.2%	4.6%	4.1%	3.8%
Ireland	0.0%	0.0%	0.1%	1.1%	0.3%	0.4%	-0.4%	-0.4%	0.0%	0.4%	-0.1%
Italy	**2.0%**	**2.0%**	**2.2%**	**2.2%**	**2.1%**	**2.6%**	**2.1%**	**2.0%**	**2.4%**	**2.1%**	**2.0%**
Lithuania	-6.3%	-2.6%	-1.6%	-2.8%	7.3%	8.6%	9.7%	9.7%	10.6%	10.3%	8.9%
Luxembourg	9.6%	12.9%	13.4%	5.8%	7.5%	11.5%	12.9%	12.3%	11.8%	11.1%	11.9%
Latvia	3.9%	4.2%	4.0%	4.0%	1.6%	3.6%	2.0%	-0.1%	1.6%	2.1%	3.2%
Malta	0.0%	0.0%	0.0%	0.0%	0.0%	12.0%	18.3%	9.0%	6.3%	6.1%	4.7%
Netherlands	**1.2%**	**1.3%**	**2.1%**	**1.9%**	**0.3%**	**1.0%**	**0.5%**	**0.4%**	**0.9%**	**0.1%**	**-0.3%**
Poland	**-0.1%**	**-0.2%**	**-0.6%**	**-1.0%**	**-0.1%**	**0.0%**	**0.2%**	**0.2%**	**0.4%**	**0.9%**	**1.1%**
Portugal	0.0%	0.4%	0.3%	2.1%	0.9%	0.8%	-1.9%	-0.9%	-1.0%	1.2%	0.6%
Romania	**1.3%**	**0.1%**	**-0.2%**	**-0.6%**	**-0.6%**	**-1.8%**	**-1.4%**	**-0.7%**	**-0.7%**	**0.4%**	**0.7%**
Sweden	**-0.3%**	**-0.3%**	**0.8%**	**-1.2%**	**0.4%**	**-4.1%**	**-2.1%**	**-3.2%**	**-2.9%**	**-4.5%**	**-4.8%**
Slovenia	-1.5%	-2.3%	-1.7%	-0.4%	-2.5%	-0.1%	-1.5%	-0.6%	-0.6%	-0.4%	-2.7%
Slovakia	2.1%	0.7%	-1.3%	-1.5%	0.5%	1.3%	1.4%	1.5%	1.9%	0.9%	0.2%
UK	0.5%	0.6%	0.5%	0.3%	0.1%	0.9%	0.8%	0.7%	0.9%	1.0%	

Table A1.26 – *Share of fossil energy in gross inland energy consumption, %.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**83.1%**	**81.2%**	**80.1%**	**79.1%**	**76.5%**	**73.1%**	**73.3%**	**73.4%**	**72.6%**	**71.6%**	
EU27	**82.0%**	**80.2%**	**78.7%**	**77.7%**	**74.7%**	**71.8%**	**72.2%**	**72.4%**	**71.5%**	**70.5%**	**68.9%**
Austria	80.3%	79.2%	77.9%	78.5%	72.2%	67.6%	67.9%	68.5%	68.3%	69.2%	66.8%
Belgium	**77.1%**	**78.7%**	**77.4%**	**76.1%**	**75.5%**	**77.4%**	**72.6%**	**72.9%**	**76.2%**	**73.0%**	**73.6%**
Bulgaria	84.3%	79.2%	72.7%	73.5%	74.0%	72.6%	69.7%	71.1%	68.0%	66.4%	62.7%
Cyprus	99.6%	97.7%	98.1%	97.9%	96.0%	93.2%	93.4%	93.1%	90.9%	90.6%	87.7%
Czechia	**91.3%**	**89.0%**	**89.7%**	**83.6%**	**80.1%**	**76.2%**	**77.3%**	**76.0%**	**75.2%**	**73.6%**	**70.7%**
Germany	**87.3%**	**86.5%**	**84.5%**	**82.6%**	**80.4%**	**81.3%**	**82.1%**	**82.1%**	**81.3%**	**79.9%**	**78.3%**
Denmark	90.6%	93.5%	90.1%	84.6%	80.8%	68.3%	68.4%	65.6%	65.6%	62.4%	57.1%
Estonia	100.0%	92.4%	90.8%	91.8%	90.3%	82.4%	86.3%	85.8%	82.6%	71.6%	63.8%
Greece	94.7%	94.2%	94.8%	93.5%	90.5%	84.8%	85.4%	85.9%	84.6%	82.9%	79.9%
Spain	**77.2%**	**80.3%**	**81.3%**	**84.0%**	**76.6%**	**74.0%**	**73.0%**	**75.1%**	**74.2%**	**73.1%**	**69.1%**
Finland	60.3%	59.6%	55.2%	55.0%	56.8%	46.0%	46.8%	44.3%	44.5%	42.2%	40.9%
France	**59.2%**	**54.9%**	**54.4%**	**54.1%**	**51.3%**	**48.9%**	**50.0%**	**50.6%**	**48.8%**	**49.3%**	**47.7%**
Croatia	81.4%	77.1%	78.1%	77.2%	74.4%	69.9%	70.9%	71.8%	69.5%	69.7%	68.8%
Hungary	82.0%	82.0%	80.9%	79.5%	73.0%	67.5%	68.0%	69.4%	69.9%	70.0%	69.3%
Ireland	98.4%	98.6%	98.3%	96.5%	95.2%	91.6%	92.8%	91.2%	90.1%	88.7%	87.2%
Italy	**93.6%**	**93.2%**	**92.0%**	**90.3%**	**85.5%**	**80.6%**	**81.1%**	**79.9%**	**78.9%**	**78.9%**	**77.3%**
Lithuania	75.6%	59.8%	58.7%	59.6%	74.1%	67.8%	66.7%	65.6%	65.2%	65.5%	66.4%
Luxembourg	89.9%	86.0%	85.5%	92.7%	89.7%	83.5%	81.8%	81.6%	81.7%	81.8%	78.1%
Latvia	83.0%	68.7%	65.2%	63.8%	67.4%	61.3%	61.0%	57.6%	59.5%	58.8%	55.3%
Malta	100.0%	100.0%	100.0%	99.9%	99.5%	85.3%	78.3%	86.3%	88.3%	88.5%	87.8%
Netherlands	**96.4%**	**96.1%**	**94.9%**	**94.2%**	**94.8%**	**92.7%**	**93.1%**	**93.0%**	**91.9%**	**91.3%**	**89.1%**
Poland	**98.6%**	**96.3%**	**96.4%**	**96.2%**	**92.9%**	**90.5%**	**90.9%**	**91.2%**	**88.4%**	**87.1%**	**86.3%**
Portugal	81.0%	83.6%	84.9%	85.2%	76.7%	75.6%	75.4%	78.8%	75.5%	73.4%	69.6%
Romania	**96.2%**	**94.0%**	**85.3%**	**84.2%**	**75.5%**	**73.9%**	**73.0%**	**74.1%**	**74.1%**	**72.9%**	**71.7%**
Sweden	**38.9%**	**39.0%**	**37.3%**	**36.6%**	**37.7%**	**27.6%**	**29.7%**	**28.8%**	**30.6%**	**28.8%**	**26.8%**
Slovenia	71.6%	73.2%	69.3%	66.9%	68.1%	62.4%	64.0%	63.1%	63.8%	63.0%	60.4%
Slovakia	81.8%	79.9%	74.6%	71.9%	70.3%	64.3%	65.1%	66.1%	66.8%	62.4%	62.1%
UK	91.0%	88.3%	89.1%	89.1%	89.9%	82.7%	82.2%	81.5%	80.7%	79.7%	

Table A1.27 – *Share of energy from non-renewable waste from gross inland energy consumption, %.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**0.2%**	**0.3%**	**0.4%**	**0.4%**	**0.6%**	**0.8%**	**0.9%**	**0.9%**	**0.9%**	**0.9%**	
EU27	**0.3%**	**0.4%**	**0.4%**	**0.4%**	**0.7%**	**0.9%**	**0.9%**	**0.9%**	**0.9%**	**1.0%**	**1.1%**
Austria	0.8%	0.8%	0.9%	1.2%	1.8%	2.0%	2.1%	2.0%	1.9%	1.8%	2.1%
Belgium	**0.6%**	**0.8%**	**0.7%**	**0.8%**	**1.2%**	**1.2%**	**1.2%**	**1.1%**	**1.2%**	**1.2%**	**1.3%**
Bulgaria	0.0%	0.0%	0.1%	0.3%	0.0%	0.1%	0.2%	0.2%	0.3%	0.4%	0.4%
Cyprus	0.0%	0.0%	0.0%	0.1%	0.3%	0.5%	0.6%	0.8%	0.9%	1.2%	1.5%
Czechia	**0.0%**	**0.1%**	**0.2%**	**0.4%**	**0.4%**	**0.7%**	**0.7%**	**0.7%**	**0.8%**	**0.8%**	**0.9%**
Germany	**0.3%**	**0.4%**	**0.5%**	**0.5%**	**1.2%**	**1.3%**	**1.4%**	**1.4%**	**1.3%**	**1.4%**	**1.5%**
Denmark	0.9%	1.2%	1.7%	2.0%	2.0%	2.5%	2.4%	2.5%	2.4%	2.6%	2.8%
Estonia	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	0.8%	0.8%	0.9%	0.9%	0.8%
Greece	0.0%	0.2%	0.2%	0.1%	0.1%	0.4%	0.3%	0.0%	0.1%	0.2%	0.0%
Spain	**0.1%**	**0.2%**	**0.2%**	**0.1%**	**0.2%**	**0.3%**	**0.4%**	**0.4%**	**0.4%**	**0.4%**	**0.5%**
Finland	0.0%	0.0%	0.2%	0.3%	0.4%	0.7%	0.8%	0.8%	0.8%	0.9%	0.9%
France	**0.3%**	**0.3%**	**0.4%**	**0.4%**	**0.5%**	**0.6%**	**0.7%**	**0.7%**	**0.7%**	**0.7%**	**0.7%**
Croatia	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%	0.2%	0.3%	0.5%
Hungary	0.0%	0.1%	0.1%	0.2%	0.3%	0.5%	0.6%	0.6%	0.7%	0.8%	0.8%
Ireland	0.0%	0.0%	0.0%	0.0%	0.1%	0.5%	0.4%	0.8%	1.0%	1.0%	1.1%
Italy	**0.1%**	**0.1%**	**0.1%**	**0.4%**	**0.6%**	**0.7%**	**0.8%**	**0.7%**	**0.7%**	**0.8%**	**0.8%**
Lithuania	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.7%	0.4%	0.5%	0.5%	0.8%
Luxembourg	0.3%	0.3%	0.7%	0.7%	0.7%	0.8%	0.8%	0.9%	0.8%	0.8%	1.1%
Latvia	0.0%	0.0%	0.0%	0.1%	0.6%	1.3%	0.8%	0.6%	0.9%	0.9%	1.2%
Malta	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Netherlands	**0.3%**	**0.4%**	**0.7%**	**0.9%**	**0.8%**	**1.0%**	**1.1%**	**1.1%**	**1.1%**	**1.1%**	**1.1%**
Poland	**0.7%**	**0.8%**	**0.1%**	**0.2%**	**0.4%**	**0.5%**	**0.7%**	**0.8%**	**0.9%**	**1.0%**	**1.0%**
Portugal	0.0%	0.0%	0.3%	0.5%	0.7%	0.7%	0.8%	0.8%	0.7%	0.8%	0.9%
Romania	**0.0%**	**0.8%**	**0.3%**	**0.2%**	**0.1%**	**0.2%**	**0.3%**	**0.3%**	**0.5%**	**0.5%**	**0.9%**
Sweden	**0.5%**	**0.5%**	**0.7%**	**0.9%**	**1.0%**	**1.3%**	**1.6%**	**1.6%**	**1.5%**	**1.6%**	**2.2%**
Slovenia	0.0%	0.0%	0.0%	0.1%	0.3%	0.6%	0.6%	0.7%	0.8%	0.9%	0.9%
Slovakia	0.0%	1.2%	1.8%	0.3%	0.2%	1.2%	1.2%	1.2%	1.1%	1.2%	1.4%
UK	0.0%	0.1%	0.1%	0.3%	0.2%	0.5%	0.7%	0.6%	0.7%	0.8%	

Table A1.28 – *Share of electricity consumption in final energy consumption, %.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**18.0%**	**19.0%**	**20.4%**	**21.3%**	**22.1%**	**23.0%**	**22.8%**	**22.7%**	**22.7%**	**22.6%**	
EU27	**17.9%**	**18.9%**	**20.4%**	**21.2%**	**22.2%**	**23.2%**	**23.0%**	**22.9%**	**22.9%**	**22.7%**	**23.2%**
Austria	20.5%	20.4%	20.3%	19.2%	19.9%	20.6%	20.5%	20.5%	21.0%	20.8%	21.2%
Belgium	**17.5%**	**18.8%**	**19.8%**	**20.6%**	**20.7%**	**21.2%**	**21.1%**	**21.4%**	**21.5%**	**21.6%**	**21.9%**
Bulgaria	19.0%	23.0%	24.3%	23.0%	26.8%	25.9%	26.1%	26.4%	26.3%	26.7%	25.9%
Cyprus	18.1%	16.6%	18.8%	22.3%	25.5%	24.7%	25.4%	25.2%	25.4%	25.0%	24.6%
Czechia	**13.3%**	**16.5%**	**17.7%**	**18.5%**	**19.3%**	**20.3%**	**20.3%**	**20.2%**	**20.7%**	**20.7%**	**20.6%**
Germany	**17.9%**	**18.4%**	**20.1%**	**21.7%**	**21.8%**	**22.1%**	**21.9%**	**21.8%**	**21.8%**	**21.3%**	**21.3%**
Denmark	18.9%	18.6%	19.9%	19.5%	18.6%	19.7%	19.4%	19.3%	19.3%	19.6%	20.5%
Estonia	11.0%	15.0%	17.9%	18.5%	20.6%	21.4%	22.5%	22.2%	22.3%	22.3%	22.6%
Greece	17.6%	19.6%	20.7%	21.6%	24.9%	27.7%	28.9%	29.5%	28.1%	28.0%	28.2%
Spain	**19.7%**	**19.8%**	**21.2%**	**22.2%**	**24.6%**	**26.3%**	**25.8%**	**25.8%**	**25.1%**	**24.7%**	**26.1%**
Finland	24.2%	26.3%	28.0%	28.9%	28.7%	29.3%	29.0%	28.3%	28.5%	28.3%	28.5%
France	**20.3%**	**21.9%**	**22.8%**	**24.1%**	**26.1%**	**26.6%**	**26.5%**	**26.5%**	**26.8%**	**26.7%**	**27.6%**
Croatia	18.1%	16.4%	17.1%	17.3%	19.1%	20.3%	20.1%	20.2%	20.8%	20.7%	20.3%
Hungary	14.3%	15.3%	16.2%	15.3%	17.4%	18.5%	18.5%	18.5%	19.0%	19.2%	19.5%
Ireland	14.6%	16.8%	17.1%	17.7%	19.5%	21.1%	20.8%	21.1%	21.1%	21.6%	22.7%
Italy	**17.7%**	**18.5%**	**19.6%**	**19.7%**	**20.9%**	**22.0%**	**22.0%**	**22.1%**	**22.0%**	**22.2%**	**23.0%**
Lithuania	10.8%	12.0%	14.2%	14.8%	15.1%	16.8%	16.8%	16.5%	16.4%	16.6%	16.9%
Luxembourg	13.0%	15.7%	15.6%	13.1%	14.6%	15.1%	15.5%	15.2%	14.9%	14.5%	16.1%
Latvia	11.3%	10.0%	11.9%	12.4%	13.4%	15.1%	15.1%	14.4%	14.2%	14.5%	14.8%
Malta	29.8%	28.5%	42.2%	42.5%	39.1%	39.3%	39.7%	40.5%	39.8%	38.9%	40.5%
Netherlands	**14.3%**	**14.8%**	**17.2%**	**18.3%**	**18.3%**	**20.5%**	**20.3%**	**20.5%**	**20.7%**	**21.2%**	**22.2%**
Poland	**14.4%**	**12.7%**	**15.7%**	**15.7%**	**15.6%**	**18.1%**	**17.5%**	**16.9%**	**16.5%**	**16.8%**	**16.8%**
Portugal	17.8%	18.7%	19.2%	21.8%	24.8%	25.3%	25.5%	25.2%	25.5%	25.2%	26.1%
Romania	**11.0%**	**12.2%**	**13.3%**	**14.2%**	**16.1%**	**17.1%**	**17.0%**	**16.7%**	**16.7%**	**16.5%**	**16.1%**
Sweden	**34.3%**	**31.7%**	**32.9%**	**35.4%**	**34.7%**	**34.1%**	**34.2%**	**34.4%**	**34.6%**	**34.2%**	**33.7%**
Slovenia	21.5%	19.8%	19.9%	21.4%	20.3%	23.3%	22.9%	23.5%	23.8%	24.2%	25.1%
Slovakia	14.5%	18.8%	19.1%	18.9%	20.0%	23.4%	23.3%	22.4%	22.5%	21.1%	21.3%
UK	18.6%	19.2%	20.3%	21.8%	21.7%	21.7%	21.5%	21.3%	21.1%	20.9%	

Table A1.29 – *Share of electricity consumption in final energy consumption of industry, %.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**25.0%**	**27.3%**	**29.9%**	**31.8%**	**32.9%**	**33.8%**	**34.0%**	**34.1%**	**33.8%**	**33.9%**	
EU27	**24.7%**	**27.2%**	**30.0%**	**31.7%**	**32.6%**	**33.6%**	**33.4%**	**33.7%**	**33.5%**	**33.5%**	**32.9%**
Austria	30.3%	31.5%	29.8%	29.2%	29.6%	31.9%	31.8%	31.9%	32.4%	32.0%	32.0%
Belgium	**26.7%**	**30.6%**	**29.6%**	**32.0%**	**31.3%**	**30.9%**	**30.9%**	**31.7%**	**31.3%**	**31.8%**	**31.3%**
Bulgaria	17.9%	18.4%	20.6%	23.2%	26.4%	28.6%	29.4%	30.4%	31.0%	31.6%	30.7%
Cyprus	10.7%	8.6%	8.6%	14.7%	21.1%	18.7%	19.4%	19.0%	20.0%	20.0%	18.7%
Czechia	**14.5%**	**13.8%**	**17.7%**	**22.9%**	**27.2%**	**30.1%**	**30.9%**	**30.5%**	**31.2%**	**31.6%**	**30.2%**
Germany	**28.1%**	**32.3%**	**35.4%**	**36.4%**	**34.7%**	**35.1%**	**35.0%**	**34.9%**	**34.7%**	**34.5%**	**33.5%**
Denmark	26.8%	26.7%	29.2%	30.7%	29.9%	34.1%	33.4%	32.3%	32.0%	31.7%	32.1%
Estonia	10.0%	19.9%	27.2%	26.2%	31.2%	33.1%	40.4%	42.4%	41.6%	39.9%	44.9%
Greece	26.0%	25.8%	26.1%	29.7%	35.0%	34.8%	31.6%	38.2%	39.0%	40.9%	40.4%
Spain	**28.5%**	**26.4%**	**30.1%**	**30.2%**	**30.4%**	**35.0%**	**33.7%**	**34.2%**	**32.7%**	**31.6%**	**31.4%**
Finland	30.6%	32.8%	32.1%	33.3%	32.4%	31.9%	31.4%	31.1%	30.7%	30.2%	29.9%
France	**32.2%**	**33.8%**	**36.0%**	**36.9%**	**36.4%**	**35.7%**	**35.4%**	**36.4%**	**35.7%**	**36.2%**	**35.3%**
Croatia	23.6%	19.8%	18.3%	18.7%	22.5%	27.9%	27.9%	27.0%	27.3%	26.5%	26.2%
Hungary	19.6%	20.7%	23.2%	25.7%	32.3%	34.2%	34.4%	33.6%	33.3%	34.2%	34.0%
Ireland	21.6%	25.1%	26.8%	26.1%	26.3%	27.4%	27.6%	27.0%	26.4%	26.5%	25.7%
Italy	**28.0%**	**30.3%**	**32.5%**	**33.5%**	**37.9%**	**39.0%**	**38.8%**	**39.9%**	**40.5%**	**41.2%**	**42.3%**
Lithuania	14.1%	22.8%	25.3%	23.0%	24.0%	29.0%	29.7%	29.2%	28.6%	29.3%	31.4%
Luxembourg	18.4%	29.4%	37.8%	37.8%	41.4%	41.9%	43.9%	41.0%	42.1%	40.9%	43.1%
Latvia	13.8%	17.5%	21.4%	20.9%	17.7%	18.6%	19.1%	19.1%	17.6%	18.6%	18.4%
Malta		100.0%	100.0%	82.5%	77.4%	64.7%	64.3%	69.0%	73.7%	72.3%	68.0%
Netherlands	**20.3%**	**21.3%**	**22.9%**	**22.8%**	**23.4%**	**22.7%**	**22.5%**	**22.5%**	**23.0%**	**23.3%**	**23.2%**
Poland	**16.0%**	**17.7%**	**20.0%**	**24.1%**	**26.4%**	**30.2%**	**30.1%**	**29.6%**	**29.7%**	**29.5%**	**29.3%**
Portugal	22.6%	23.5%	21.9%	25.5%	27.5%	30.2%	30.7%	30.7%	31.0%	31.1%	30.7%
Romania	**13.6%**	**14.3%**	**19.9%**	**22.6%**	**27.0%**	**27.5%**	**28.6%**	**29.0%**	**28.9%**	**28.3%**	**27.0%**
Sweden	**39.4%**	**33.9%**	**35.8%**	**42.3%**	**40.1%**	**39.2%**	**39.4%**	**40.1%**	**39.6%**	**39.1%**	**35.3%**
Slovenia	33.6%	36.0%	33.3%	37.5%	37.0%	43.4%	43.1%	42.8%	42.4%	42.2%	40.8%
Slovakia	22.3%	21.7%	23.9%	26.4%	29.1%	29.9%	31.4%	30.8%	30.0%	30.4%	28.8%
UK	27.7%	27.5%	28.9%	32.7%	35.2%	34.7%	37.7%	36.7%	37.3%	37.3%	

Table A1.30 – *Share of electricity consumption in final energy consumption of services, %.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**34.5%**	**38.7%**	**44.9%**	**44.1%**	**46.3%**	**48.7%**	**48.0%**	**47.1%**	**47.7%**	**48.0%**	
EU27	**33.9%**	**39.6%**	**44.7%**	**43.6%**	**45.7%**	**49.0%**	**48.8%**	**47.6%**	**48.3%**	**48.5%**	**47.9%**
Austria	46.0%	37.2%	39.0%	35.1%	38.7%	42.9%	41.5%	40.3%	41.9%	40.9%	39.0%
Belgium	**23.3%**	**25.5%**	**30.3%**	**38.1%**	**38.3%**	**39.9%**	**40.0%**	**40.1%**	**40.1%**	**40.3%**	**39.3%**
Bulgaria	21.2%	51.6%	66.8%	62.8%	67.8%	64.4%	63.2%	62.1%	59.2%	59.4%	55.7%
Cyprus	100.0%	100.0%	100.0%	95.6%	78.2%	78.5%	80.3%	78.7%	69.2%	66.3%	64.6%
Czechia	**10.3%**	**32.7%**	**33.4%**	**35.4%**	**39.3%**	**43.0%**	**42.6%**	**42.2%**	**44.1%**	**43.5%**	**44.2%**
Germany	**26.0%**	**34.2%**	**41.8%**	**35.0%**	**35.5%**	**37.5%**	**38.2%**	**37.5%**	**39.7%**	**40.6%**	**40.3%**
Denmark	41.5%	42.9%	46.4%	45.0%	43.8%	45.7%	45.1%	45.2%	44.9%	44.9%	44.1%
Estonia	6.3%	61.3%	41.8%	42.7%	50.9%	52.0%	51.3%	50.0%	51.4%	53.8%	51.9%
Greece	74.0%	76.6%	80.0%	72.5%	79.1%	82.2%	82.1%	75.5%	73.1%	72.1%	70.5%
Spain	**63.1%**	**59.0%**	**64.4%**	**66.0%**	**73.7%**	**66.9%**	**64.1%**	**63.8%**	**62.4%**	**62.2%**	**61.2%**
Finland	100.0%	97.3%	49.1%	51.0%	49.5%	54.8%	52.5%	50.9%	50.8%	51.0%	51.9%
France	**43.6%**	**46.4%**	**49.0%**	**51.3%**	**51.6%**	**54.5%**	**54.4%**	**53.4%**	**54.1%**	**53.6%**	**53.5%**
Croatia	39.8%	39.5%	47.3%	51.8%	57.2%	60.0%	59.0%	59.9%	60.5%	60.9%	58.5%
Hungary	23.5%	23.9%	25.2%	24.4%	32.0%	31.0%	31.6%	33.2%	35.0%	35.9%	34.3%
Ireland	26.4%	31.0%	41.0%	52.2%	58.4%	58.3%	58.6%	59.0%	59.2%	60.2%	60.1%
Italy	**42.1%**	**43.5%**	**42.2%**	**42.2%**	**43.4%**	**51.4%**	**51.1%**	**44.1%**	**42.8%**	**42.2%**	**39.1%**
Lithuania	9.4%	18.5%	34.7%	41.1%	40.6%	46.5%	46.8%	44.9%	45.4%	48.6%	49.3%
Luxembourg	100.0%	100.0%	39.0%	41.0%	40.4%	41.5%	38.4%	42.9%	40.6%	37.9%	36.0%
Latvia	14.7%	18.7%	28.1%	31.0%	34.8%	40.0%	39.7%	39.2%	41.5%	43.1%	40.9%
Malta	100.0%	100.0%	100.0%	76.3%	74.4%	71.2%	72.1%	73.3%	76.0%	73.4%	68.1%
Netherlands	**31.1%**	**30.9%**	**39.7%**	**41.7%**	**40.3%**	**46.3%**	**45.9%**	**45.5%**	**46.1%**	**46.4%**	**47.8%**
Poland	**33.5%**	**36.2%**	**48.1%**	**42.6%**	**42.5%**	**49.8%**	**48.3%**	**50.3%**	**53.6%**	**54.1%**	**54.4%**
Portugal	68.8%	65.6%	69.3%	56.3%	74.8%	62.7%	61.8%	61.2%	60.5%	59.9%	59.9%
Romania	**100.0%**	**33.0%**	**49.9%**	**20.6%**	**34.7%**	**41.0%**	**40.8%**	**39.5%**	**38.1%**	**38.7%**	**40.0%**
Sweden	**52.2%**	**46.1%**	**49.5%**	**54.7%**	**53.9%**	**59.3%**	**58.6%**	**59.4%**	**58.4%**	**58.7%**	**62.7%**
Slovenia	23.9%	36.2%	34.7%	43.8%	49.5%	61.1%	58.8%	63.0%	65.2%	67.0%	64.5%
Slovakia	5.7%	17.2%	20.6%	30.2%	32.7%	45.4%	45.6%	46.2%	47.2%	46.8%	51.8%
UK	47.3%	42.1%	46.1%	50.7%	50.7%	48.1%	44.5%	44.5%	43.5%	42.9%	

Table A1.31 – *Share of electricity consumption in final energy consumption of agriculture, %.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2019
EU28	**12.7%**	**11.1%**	**12.3%**	**13.5%**	**16.4%**	**18.6%**	**18.0%**	**18.0%**	**16.6%**	**16.7%**	
EU27	**12.2%**	**10.4%**	**11.5%**	**12.8%**	**15.9%**	**17.9%**	**17.7%**	**17.8%**	**16.3%**	**16.5%**	**16.0%**
Austria	15.5%	18.4%	13.8%	15.2%	18.7%	18.3%	18.6%	18.5%	19.2%	20.1%	20.1%
Belgium	**0.0%**	**0.0%**	**2.8%**	**8.7%**	**16.7%**	**18.6%**	**18.3%**	**17.3%**	**18.4%**	**17.1%**	**20.0%**
Bulgaria	10.8%	12.0%	4.8%	5.3%	10.5%	10.1%	10.3%	10.6%	12.0%	14.8%	17.0%
Cyprus	100.0%	100.0%	100.0%	26.8%	36.7%	30.9%	34.6%	33.1%	35.2%	30.9%	30.7%
Czechia	**16.3%**	**11.0%**	**15.2%**	**16.0%**	**14.4%**	**13.6%**	**12.6%**	**13.0%**	**13.3%**	**13.2%**	**13.4%**
Germany	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**39.3%**	**32.8%**	**31.3%**	**30.9%**	**13.4%**	**12.2%**	**12.2%**
Denmark	19.7%	20.7%	22.6%	23.9%	22.5%	24.2%	23.8%	25.1%	25.1%	27.0%	27.4%
Estonia	25.4%	37.9%	33.2%	17.5%	16.9%	12.9%	13.9%	15.4%	11.1%	10.2%	10.6%
Greece	13.0%	16.9%	22.4%	21.9%	28.7%	75.6%	76.4%	77.5%	73.9%	73.7%	74.0%
Spain	**18.1%**	**18.9%**	**16.7%**	**14.6%**	**15.9%**	**20.4%**	**20.8%**	**20.3%**	**17.5%**	**17.8%**	**16.3%**
Finland	9.2%	9.0%	18.1%	15.1%	18.4%	18.5%	18.5%	18.4%	18.8%	18.5%	18.1%
France	**5.2%**	**6.2%**	**6.1%**	**15.0%**	**15.9%**	**17.8%**	**18.3%**	**18.7%**	**17.7%**	**17.6%**	**16.3%**
Croatia	3.9%	5.3%	4.2%	5.4%	5.8%	5.8%	5.8%	5.8%	5.9%	5.8%	5.6%
Hungary	14.6%	15.8%	12.3%	14.2%	13.3%	12.7%	11.8%	12.6%	13.0%	12.9%	12.3%
Ireland	14.7%	12.6%	15.5%	16.5%	17.8%	24.0%	23.2%	22.5%	21.5%	21.1%	21.1%
Italy	**12.5%**	**11.4%**	**14.5%**	**15.1%**	**17.5%**	**17.7%**	**17.2%**	**18.1%**	**16.9%**	**18.5%**	**19.2%**
Lithuania	29.1%	22.0%	16.2%	15.6%	13.5%	16.5%	16.6%	15.8%	16.7%	16.4%	14.8%
Luxembourg	55.3%	55.3%	16.5%	12.3%	11.5%	12.6%	10.2%	10.6%	10.2%	11.3%	12.8%
Latvia	24.7%	16.3%	12.4%	10.1%	7.9%	8.7%	8.8%	8.5%	8.5%	7.6%	7.7%
Malta				0.0%	14.3%	47.4%	31.6%	20.0%	23.3%	20.0%	19.4%
Netherlands	**6.0%**	**7.6%**	**8.8%**	**12.7%**	**14.8%**	**21.4%**	**21.1%**	**22.5%**	**23.6%**	**25.3%**	**24.3%**
Poland	**21.5%**	**9.9%**	**8.8%**	**2.9%**	**3.7%**	**3.9%**	**4.0%**	**3.8%**	**4.1%**	**4.1%**	**4.1%**
Portugal	4.9%	8.7%	8.5%	16.3%	24.1%	20.2%	20.0%	22.8%	23.8%	21.7%	21.2%
Romania	**12.1%**	**15.1%**	**13.2%**	**13.2%**	**14.7%**	**17.2%**	**14.1%**	**12.9%**	**11.4%**	**11.6%**	**8.7%**
Sweden	**15.4%**	**15.2%**	**14.3%**	**18.3%**	**16.9%**	**17.6%**	**17.5%**	**15.7%**	**17.0%**	**14.1%**	**15.5%**
Slovenia			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.9%	2.0%	2.2%
Slovakia	14.0%	25.8%	25.6%	20.4%	18.3%	15.0%	14.6%	16.3%	15.6%	20.5%	16.2%
UK	25.7%	25.6%	32.5%	36.7%	31.8%	35.6%	22.7%	21.0%	23.9%	22.4%	

Table A1.32 – *Share of electricity consumption in final energy consumption of households, %.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**19.1%**	**19.8%**	**21.2%**	**22.1%**	**22.5%**	**24.4%**	**24.1%**	**24.2%**	**24.5%**	**24.5%**	
EU27	**18.5%**	**19.1%**	**21.0%**	**21.6%**	**22.5%**	**24.3%**	**24.1%**	**24.2%**	**24.4%**	**24.4%**	**24.7%**
Austria	17.4%	18.5%	20.3%	21.5%	21.5%	22.3%	22.2%	22.2%	23.6%	23.6%	23.2%
Belgium	**19.1%**	**20.4%**	**21.5%**	**17.9%**	**17.8%**	**19.6%**	**19.6%**	**19.5%**	**19.7%**	**20.1%**	**20.2%**
Bulgaria	38.6%	38.5%	40.3%	37.2%	40.5%	41.7%	41.0%	41.3%	42.3%	43.1%	41.0%
Cyprus	36.2%	46.4%	51.6%	38.9%	44.4%	39.9%	40.6%	41.5%	43.1%	42.0%	42.6%
Czechia	**11.3%**	**19.4%**	**18.5%**	**19.0%**	**17.4%**	**18.3%**	**18.1%**	**18.2%**	**18.4%**	**18.8%**	**19.2%**
Germany	**18.7%**	**16.5%**	**17.2%**	**19.1%**	**19.1%**	**20.1%**	**19.4%**	**19.8%**	**19.7%**	**18.8%**	**18.8%**
Denmark	20.6%	19.6%	20.8%	19.9%	17.8%	19.7%	19.3%	18.8%	18.8%	20.1%	21.8%
Estonia	7.5%	8.5%	13.6%	15.7%	16.9%	17.3%	17.7%	17.7%	17.0%	18.7%	18.2%
Greece	25.5%	29.7%	26.8%	26.0%	33.4%	33.8%	39.5%	38.2%	36.8%	36.3%	35.0%
Spain	**28.1%**	**30.7%**	**31.1%**	**35.4%**	**38.4%**	**39.5%**	**41.8%**	**42.7%**	**42.5%**	**43.4%**	**43.2%**
Finland	23.5%	25.7%	33.4%	34.7%	33.9%	36.3%	36.2%	33.6%	34.3%	34.4%	35.8%
France	**21.8%**	**24.0%**	**27.3%**	**27.7%**	**30.6%**	**33.9%**	**33.5%**	**33.7%**	**34.7%**	**34.7%**	**35.9%**
Croatia	19.4%	18.1%	21.5%	19.3%	20.7%	21.9%	21.9%	22.5%	23.2%	23.8%	22.9%
Hungary	11.8%	13.6%	15.0%	13.7%	14.5%	15.6%	15.3%	15.4%	16.8%	17.6%	17.5%
Ireland	15.3%	19.0%	20.5%	19.9%	20.6%	24.3%	23.6%	24.7%	23.7%	24.3%	24.0%
Italy	**17.4%**	**18.7%**	**19.0%**	**17.0%**	**16.9%**	**17.5%**	**17.2%**	**17.1%**	**17.6%**	**18.1%**	**18.6%**
Lithuania	8.2%	8.1%	11.1%	12.3%	14.0%	16.8%	16.6%	16.8%	17.0%	17.3%	18.3%
Luxembourg	9.9%	10.2%	14.6%	13.8%	13.7%	16.7%	16.0%	15.6%	16.0%	16.9%	16.3%
Latvia	7.0%	6.2%	7.7%	9.0%	12.0%	13.7%	13.5%	11.9%	11.7%	11.9%	13.5%
Malta	40.1%	46.8%	62.7%	74.3%	73.1%	70.6%	73.8%	68.7%	70.9%	71.5%	72.0%
Netherlands	**13.0%**	**13.2%**	**15.9%**	**17.5%**	**15.8%**	**20.4%**	**19.7%**	**20.2%**	**20.5%**	**21.3%**	**22.8%**
Poland	**9.7%**	**6.9%**	**10.5%**	**11.2%**	**11.2%**	**12.8%**	**12.5%**	**12.5%**	**11.2%**	**12.0%**	**12.2%**
Portugal	22.1%	26.2%	30.7%	35.4%	42.0%	37.4%	39.6%	38.6%	39.5%	39.3%	39.0%
Romania	**4.4%**	**9.7%**	**7.8%**	**9.9%**	**12.0%**	**14.1%**	**14.0%**	**14.0%**	**14.1%**	**14.4%**	**14.6%**
Sweden	**50.0%**	**47.0%**	**49.5%**	**48.0%**	**47.7%**	**49.9%**	**50.0%**	**50.4%**	**51.7%**	**51.2%**	**50.8%**
Slovenia	20.1%	18.9%	18.0%	17.8%	20.3%	23.6%	23.6%	24.7%	26.7%	27.8%	29.1%
Slovakia	14.1%	21.7%	18.0%	15.9%	16.3%	21.8%	21.6%	20.0%	21.3%	17.7%	18.4%
UK	21.6%	22.3%	22.3%	24.4%	22.5%	24.9%	24.5%	24.6%	23.6%	23.4%	

Table A1.33 – *Share of electricity consumption in final energy consumption of transport, %.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**2.1%**	**2.1%**	**2.0%**	**1.7%**	**1.6%**	**1.7%**	**1.7%**	**1.7%**	**1.7%**	**1.7%**	
EU27	**2.2%**	**2.1%**	**2.0%**	**1.8%**	**1.7%**	**1.8%**	**1.8%**	**1.8%**	**1.8%**	**1.7%**	**1.8%**
Austria	5.1%	5.1%	4.6%	3.5%	3.4%	3.2%	3.2%	3.2%	3.2%	3.2%	3.4%
Belgium	**1.6%**	**1.7%**	**1.5%**	**1.6%**	**1.7%**	**1.6%**	**1.6%**	**1.7%**	**1.7%**	**1.7%**	**1.8%**
Bulgaria	4.9%	4.6%	2.3%	1.6%	1.3%	0.9%	0.9%	1.0%	0.8%	0.9%	1.1%
Cyprus	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Czechia	**10.6%**	**7.7%**	**4.8%**	**2.7%**	**2.4%**	**2.2%**	**2.2%**	**2.2%**	**2.3%**	**2.2%**	**2.2%**
Germany	**2.1%**	**2.4%**	**2.3%**	**2.1%**	**2.0%**	**1.7%**	**1.8%**	**1.8%**	**1.9%**	**1.8%**	**1.9%**
Denmark	0.5%	0.5%	0.7%	0.7%	0.8%	0.8%	0.9%	0.9%	0.9%	0.9%	1.1%
Estonia	3.6%	2.4%	1.4%	1.2%	1.0%	0.5%	0.5%	0.5%	0.4%	0.6%	0.7%
Greece	0.2%	0.2%	0.3%	0.2%	0.2%	0.6%	0.3%	0.3%	0.3%	0.3%	0.3%
Spain	**1.5%**	**1.4%**	**1.2%**	**1.2%**	**0.8%**	**1.2%**	**1.1%**	**1.1%**	**1.1%**	**1.0%**	**1.1%**
Finland	0.9%	1.0%	1.2%	1.3%	1.5%	1.5%	1.5%	1.6%	1.7%	1.8%	1.8%
France	**1.7%**	**1.6%**	**1.8%**	**1.9%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**	**1.9%**	**1.9%**	**1.9%**
Croatia	2.6%	1.2%	1.4%	1.2%	1.2%	1.1%	1.1%	1.0%	1.1%	1.0%	1.1%
Hungary	3.5%	3.5%	2.9%	2.3%	2.3%	2.4%	2.4%	2.3%	2.2%	2.0%	2.3%
Ireland	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.2%	0.2%
Italy	**1.8%**	**1.8%**	**1.8%**	**2.0%**	**2.4%**	**2.6%**	**2.7%**	**2.8%**	**2.8%**	**2.8%**	**3.0%**
Lithuania	1.0%	0.8%	0.6%	0.6%	0.4%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%
Luxembourg	0.5%	0.6%	0.3%	0.3%	0.5%	0.6%	0.6%	0.6%	0.6%	0.6%	0.8%
Latvia	2.1%	2.3%	1.8%	1.3%	1.0%	0.9%	0.9%	0.8%	0.8%	0.8%	0.8%
Malta	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%
Netherlands	**1.2%**	**1.3%**	**1.3%**	**1.2%**	**1.3%**	**1.5%**	**1.5%**	**1.5%**	**1.6%**	**1.7%**	**2.0%**
Poland	**6.6%**	**5.0%**	**4.2%**	**2.8%**	**1.7%**	**1.6%**	**1.5%**	**1.3%**	**1.3%**	**1.3%**	**1.3%**
Portugal	0.8%	0.6%	0.5%	0.6%	0.6%	0.5%	0.7%	0.7%	0.7%	0.7%	0.7%
Romania	**5.4%**	**6.4%**	**4.8%**	**3.3%**	**2.3%**	**1.7%**	**1.6%**	**1.5%**	**1.4%**	**1.4%**	**1.4%**
Sweden	**3.1%**	**3.3%**	**3.7%**	**3.2%**	**2.8%**	**3.1%**	**3.2%**	**2.9%**	**3.1%**	**3.3%**	**3.6%**
Slovenia	2.1%	1.1%	1.9%	1.2%	0.8%	0.7%	0.8%	1.0%	1.0%	1.0%	1.1%
Slovakia	6.9%	8.6%	5.8%	2.1%	1.8%	2.4%	2.1%	1.8%	1.8%	1.6%	1.7%
United Kingdom	1.2%	1.7%	1.8%	0.8%	0.9%	0.9%	1.0%	1.0%	1.0%	1.1%	

Table A1.34 – *Carbon intensity in industry per unit of value added, t CO_2eq / M€ (chain linked volumes, 2015).*

	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**507.4**	**417.5**	**382.0**	**326.4**	**290.6**	**285.6**	**282.4**	**275.0**	**264.4**	
EU27	**540.0**	**443.8**	**406.1**	**345.6**	**306.8**	**303.5**	**300.6**	**292.5**	**281.0**	**280.2**
Austria	388.6	355.0	359.7	360.8	334.7	325.3	326.6	299.1	310.0	312.8
Belgium	**991.3**	**779.2**	**667.6**	**542.0**	**470.0**	**477.0**	**468.7**	**468.5**	**435.7**	**422.0**
Bulgaria	5978.2	2876.6	2105.1	899.4	1086.2	1148.6	1314.6	1460.3	1471.4	1022.9
Cyprus	820.5	860.8	712.9	642.7	1145.3	1001.9	908.2	738.7	667.3	892.8
Czechia	**1471.2**	**1335.0**	**900.8**	**579.3**	**490.6**	**474.2**	**463.6**	**460.7**	**428.0**	**463.7**
Germany	**391.5**	**323.7**	**295.7**	**274.3**	**243.9**	**241.1**	**241.3**	**227.7**	**222.8**	**225.1**
Denmark	190.0	177.5	155.2	134.2	114.2	113.5	108.3	108.2	96.6	96.2
Estonia	1300.1	681.5	493.1	390.8	275.3	264.7	282.2	258.2	253.0	160.0
Greece	891.4	795.6	678.1	653.7	868.8	917.1	1000.6	898.1	817.1	763.7
Spain	**502.5**	**445.8**	**451.2**	**413.3**	**378.7**	**374.5**	**363.8**	**369.2**	**349.8**	**345.6**
Finland	633.9	437.9	376.4	328.0	278.4	272.8	251.9	259.6	248.9	237.1
France	**497.3**	**398.3**	**365.4**	**319.7**	**292.1**	**291.9**	**283.5**	**276.0**	**256.4**	**264.4**
Croatia	879.1	840.9	777.4	777.9	725.3	665.7	717.5	687.7	680.1	696.7
Hungary	1351.0	706.2	558.1	423.3	409.7	425.0	440.6	439.5	415.8	447.4
Ireland	298.9	220.8	164.8	132.8	76.6	80.8	79.0	71.0	68.0	53.9
Italy	**367.3**	**365.6**	**366.0**	**307.6**	**278.1**	**266.8**	**255.6**	**256.6**	**242.1**	**247.1**
Lithuania	1241.7	1006.4	780.3	498.2	500.9	476.6	484.9	423.8	427.0	388.1
Luxembourg	1121.8	446.1	394.1	388.5	298.3	292.1	323.9	326.6	296.2	285.7
Latvia	965.5	483.3	347.9	526.0	354.1	320.7	322.5	340.6	315.7	306.8
Malta		60.1	62.8	146.9	245.0	250.2	234.1	201.8	178.3	209.6
Netherlands	**548.4**	**431.8**	**370.8**	**325.2**	**298.7**	**305.5**	**306.1**	**291.0**	**279.1**	**286.6**
Poland	**1732.2**	**1286.8**	**892.8**	**568.5**	**458.2**	**460.7**	**473.2**	**448.8**	**431.2**	**437.1**
Portugal	559.5	528.8	541.4	524.6	520.7	474.0	475.1	447.3	457.3	473.3
Romania	**2017.8**	**1446.2**	**1087.2**	**625.7**	**629.0**	**602.8**	**582.0**	**630.1**	**613.2**	**652.2**
Sweden	**363.9**	**259.9**	**216.8**	**192.2**	**159.2**	**163.2**	**152.3**	**145.8**	**153.7**	**136.8**
Slovenia	618.9	445.9	406.2	295.2	275.7	267.5	260.8	261.1	240.6	240.4
Slovakia	3763.2	2422.5	1458.7	966.9	720.7	728.5	748.2	714.1	631.9	701.7
United Kingdom	350.3	284.3	253.5	216.6	197.2	182.6	178.1	172.9		

Table A1.35 – *Carbon intensity in services per unit of value added, t CO_2eq / M€ (chain linked volumes, 2015).*

	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**28.9**	**24.0**	**22.5**	**21.6**	**16.7**	**16.6**	**16.1**	**15.4**	**14.7**	
EU27	**29.3**	**24.5**	**23.9**	**23.5**	**18.1**	**17.9**	**17.4**	**16.5**	**15.7**	**15.4**
Austria	23.1	18.3	20.1	8.8	6.6	6.1	7.0	6.5	6.4	6.6
Belgium	**31.4**	**30.0**	**28.0**	**27.4**	**21.0**	**20.8**	**20.6**	**20.5**	**19.8**	**19.1**
Bulgaria	21.9	25.9	13.5	14.8	14.7	14.4	14.0	12.8	12.3	12.3
Cyprus	16.2	13.7	9.6	9.5	7.2	6.4	8.2	7.7	7.9	6.1
Czechia	**112.8**	**89.4**	**53.4**	**45.7**	**34.1**	**34.1**	**35.1**	**30.2**	**30.8**	**28.9**
Germany	**41.4**	**31.1**	**26.2**	**24.6**	**20.0**	**19.1**	**18.4**	**16.0**	**15.8**	**15.3**
Denmark	18.2	13.6	13.4	11.1	8.4	8.3	8.2	7.9	6.9	6.6
Estonia	20.0	32.6	29.6	18.1	24.9	24.2	21.5	21.6	19.8	20.4
Greece	7.5	7.6	12.5	8.9	6.3	6.2	6.3	6.0	6.4	5.7
Spain	**13.6**	**14.9**	**15.7**	**20.4**	**16.7**	**17.6**	**16.8**	**17.0**	**14.0**	**13.5**
Finland	19.7	16.0	13.6	11.6	9.6	10.0	9.6	9.2	9.0	8.4
France	**24.8**	**22.3**	**21.6**	**21.1**	**15.5**	**15.0**	**15.2**	**14.5**	**13.9**	**13.6**
Croatia	43.7	36.1	35.1	27.8	23.5	23.8	23.9	23.3	22.0	22.3
Hungary	106.6	110.9	109.3	80.2	60.1	57.0	51.1	46.4	42.4	43.8
Ireland	34.8	24.1	18.8	14.8	12.8	12.5	11.3	10.9	10.3	10.5
Italy	**16.8**	**18.4**	**23.8**	**28.1**	**22.6**	**22.9**	**22.6**	**24.1**	**23.4**	**24.4**
Lithuania	144.7	30.3	24.2	24.1	15.7	17.1	17.5	18.4	15.5	13.0
Luxembourg	34.4	20.9	13.7	13.6	11.9	11.9	12.5	12.8	14.5	12.2
Latvia	130.8	66.9	50.8	47.8	33.8	30.2	29.3	28.2	25.5	29.2
Malta		62.3	12.9	14.3	14.6	13.3	10.9	8.3	8.9	11.0
Netherlands	**32.5**	**24.1**	**23.8**	**24.0**	**17.3**	**16.9**	**16.4**	**15.6**	**14.2**	**13.4**
Poland	**77.8**	**41.8**	**50.0**	**55.3**	**36.5**	**37.9**	**31.4**	**28.1**	**24.2**	**22.9**
Portugal	12.8	21.6	29.3	11.7	10.6	10.3	9.9	10.4	9.4	8.5
Romania	**21.0**	**20.5**	**49.1**	**40.6**	**26.7**	**26.8**	**26.1**	**25.7**	**24.0**	**23.0**
Sweden	**11.8**	**9.2**	**5.2**	**4.3**	**2.5**	**2.4**	**2.2**	**2.1**	**2.2**	**2.0**
Slovenia	48.8	61.1	45.7	34.3	20.0	23.0	17.3	15.1	15.3	15.5
Slovakia	100.1	57.6	74.5	63.1	36.6	33.8	36.5	32.8	29.6	25.3
United Kingdom	26.5	21.8	16.1	13.6	11.0	11.0	10.6	10.5		

Table A1.36 – *Carbon intensity in agriculture per unit of value added, t CO_2eq / M€ (chain linked volumes, 2015).*

	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**3085.4**	**2783.2**	**2669.6**	**2479.8**	**2350.0**	**2395.8**	**2353.0**	**2365.4**	**2297.1**	
EU27	**3010.8**	**2725.0**	**2628.5**	**2426.8**	**2313.6**	**2351.4**	**2314.5**	**2325.0**	**2260.8**	**2279.9**
Austria	2740.2	2457.8	2294.3	2193.5	2075.0	2079.9	1947.7	1849.7	1837.3	1890.6
Belgium	**7153.8**	**5689.1**	**5076.3**	**4311.9**	**4104.1**	**4384.0**	**4240.7**	**4687.9**	**4708.3**	**5072.1**
Bulgaria	2586.4	2359.1	2366.9	2992.6	3542.9	3449.8	3169.9	3176.2	3041.0	3111.0
Cyprus	1252.0	1214.5	1162.7	1516.8	1620.9	1442.1	1601.2	1642.0	1574.8	1696.5
Czechia	**3172.5**	**2812.3**	**2124.1**	**2580.7**	**2639.3**	**2496.8**	**2582.5**	**2418.8**	**2260.3**	**2064.5**
Germany	**3746.4**	**3421.2**	**3502.0**	**2938.3**	**3232.8**	**3281.5**	**3040.7**	**3581.0**	**3107.4**	**3026.4**
Denmark	6627.9	5586.9	5585.0	5046.7	5039.7	6017.1	5324.9	5356.2	4448.9	4215.6
Estonia	6488.8	3239.4	3584.0	3022.8	2957.4	3768.4	3630.5	4358.1	3400.5	3610.5
Greece	1625.0	1576.8	1526.4	1633.6	1228.8	1317.3	1173.1	1188.5	1125.5	1223.7
Spain	**2385.3**	**1991.2**	**2113.9**	**1774.2**	**1633.4**	**1567.3**	**1654.6**	**1549.6**	**1586.4**	**1546.6**
Finland	2235.0	2202.0	2209.5	1887.5	1683.4	1662.4	1596.2	1585.9	1533.7	1438.8
France	**3369.0**	**3062.9**	**2902.0**	**2667.3**	**2491.8**	**2778.1**	**2569.1**	**2436.3**	**2460.2**	**2418.4**
Croatia	2248.5	2281.0	2176.0	2076.3	2522.9	2382.2	2493.5	2296.0	2257.9	2199.1
Hungary	2257.3	2389.0	1642.9	1905.2	1900.5	1784.5	1891.0	1828.1	1875.6	2118.6
Ireland	8854.6	9593.9	11018.1	10586.8	8491.9	7920.9	7746.7	8901.4	6801.3	7016.2
Italy	**1530.9**	**1320.4**	**1331.3**	**1202.8**	**1137.7**	**1168.5**	**1201.1**	**1185.7**	**1188.5**	**1313.2**
Lithuania	4556.5	4075.8	4115.8	4338.2	3717.7	3789.6	3765.3	4082.0	3714.9	3544.5
Luxembourg	3500.0	3535.2	5340.2	5088.9	5896.3	6101.5	6602.2	5886.9	6031.4	6432.7
Latvia	4533.9	3712.5	3169.6	3210.8	3011.9	3193.1	3188.5	3196.5	2820.6	2871.3
Malta		1646.6	1015.9	1136.1	1020.1	847.5	1114.4	1001.7	1527.3	1809.8
Netherlands	**3681.9**	**3060.6**	**2658.1**	**2662.2**	**2365.5**	**2316.3**	**2316.4**	**2334.4**	**2275.3**	**2245.3**
Poland	**4263.7**	**5612.1**	**4488.5**	**3843.3**	**4144.0**	**4161.7**	**4361.5**	**4836.4**	**4700.5**	**4278.1**
Portugal	2180.9	2499.4	2311.5	2232.1	2083.2	2117.7	2100.9	2146.8	2104.2	2280.4
Romania	**3187.4**	**3389.5**	**2838.5**	**3164.0**	**2924.2**	**2801.7**	**2490.2**	**2374.5**	**2457.2**	**2816.8**
Sweden	**2021.6**	**1960.0**	**1595.4**	**1449.1**	**1254.9**	**1258.1**	**1208.6**	**1295.2**	**1234.3**	**1232.7**
Slovenia	3044.6	2908.7	2713.3	2619.7	2406.3	2463.9	2549.4	2107.5	2287.2	2200.7
Slovakia	6913.5	6229.0	3952.5	2703.2	1698.3	1647.4	1646.3	1435.3	1753.4	1707.1
United Kingdom	3964.3	3468.7	3108.1	3202.4	2773.7	2940.0	2795.2	2855.7		

Table A1.37 – *Carbon intensity in transport per unit of. GDP, t CO_2eq / M€ (chain linked volumes, 2015).*

	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**80.5**	**76.0**	**73.2**	**67.0**	**61.8**	**61.9**	**61.3**	**60.1**	**59.3**	
EU27	**82.0**	**78.5**	**76.7**	**70.4**	**65.2**	**65.3**	**64.6**	**63.5**	**62.8**	**57.7**
Austria	65.5	67.0	81.5	69.1	66.0	67.2	67.8	66.4	65.6	60.8
Belgium	**80.2**	**75.9**	**73.7**	**68.3**	**64.6**	**63.1**	**60.7**	**60.0**	**58.2**	**51.5**
Bulgaria	141.8	199.8	216.7	186.5	203.2	199.4	196.7	195.9	191.4	188.7
Cyprus	136.8	131.6	125.0	123.1	108.2	108.5	106.1	98.9	95.9	90.5
Czechia	**100.1**	**106.4**	**125.9**	**108.0**	**103.4**	**104.7**	**102.3**	**100.1**	**98.1**	**97.1**
Germany	**76.2**	**71.4**	**61.5**	**55.4**	**53.9**	**53.7**	**53.3**	**51.0**	**50.9**	**47.5**
Denmark	60.1	53.5	54.6	53.3	47.5	47.0	46.4	46.4	44.4	41.6
Estonia	171.7	134.4	121.4	130.7	112.4	111.2	108.8	105.3	98.4	94.3
Greece	109.1	103.7	99.5	104.0	96.9	99.4	97.0	96.7	97.2	91.9
Spain	**98.9**	**98.9**	**100.0**	**85.3**	**77.8**	**78.1**	**78.1**	**77.3**	**76.7**	**69.7**
Finland	82.2	68.3	64.0	60.2	51.3	55.5	51.1	51.4	49.0	46.8
France	**83.5**	**77.1**	**71.5**	**64.6**	**61.4**	**60.8**	**59.6**	**57.4**	**56.4**	**50.9**
Croatia	111.5	127.0	125.7	130.9	131.8	132.1	137.4	128.8	127.9	122.6
Hungary	105.1	110.6	117.9	114.9	108.3	106.3	108.5	109.5	111.0	99.7
Ireland	69.0	75.6	70.9	61.1	45.0	45.9	41.2	38.3	36.5	29.1
Italy	**76.2**	**74.6**	**73.8**	**67.5**	**64.1**	**62.5**	**59.1**	**60.6**	**61.0**	**54.3**
Lithuania	197.0	159.0	143.6	141.5	136.3	143.0	143.0	146.4	144.9	141.7
Luxembourg	121.8	133.9	169.4	133.9	105.4	97.4	98.1	102.6	101.6	78.5
Latvia	189.0	154.2	146.5	158.2	128.2	126.0	127.8	124.0	120.3	116.5
Malta		90.0	78.7	73.5	58.6	56.8	52.7	55.0	55.3	48.1
Netherlands	**65.1**	**56.8**	**57.1**	**52.3**	**44.0**	**43.3**	**43.1**	**42.4**	**40.8**	**36.1**
Poland	**121.1**	**113.1**	**123.0**	**132.8**	**111.6**	**123.3**	**136.0**	**132.9**	**128.8**	**126.3**
Portugal	99.5	113.4	109.7	101.3	91.2	91.9	90.6	88.4	88.6	80.8
Romania	**91.9**	**108.0**	**104.1**	**102.3**	**98.3**	**100.4**	**99.9**	**98.1**	**96.7**	**97.6**
Sweden	**74.9**	**62.2**	**58.0**	**51.6**	**41.3**	**38.9**	**37.1**	**35.4**	**34.3**	**32.0**
Slovenia	167.8	126.6	127.0	139.3	137.9	143.0	139.5	133.1	124.3	105.6
Slovakia	150.8	132.2	139.1	105.2	91.4	92.7	91.7	89.8	91.1	82.8
United Kingdom	73.1	63.8	57.3	51.0	46.1	46.3	45.6	44.4	43.0	

Table A1.38 – *Carbon intensity in households per unit of GDP, t CO_2eq / M€ (chain linked volumes, 2015).*

	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**49.0**	**40.4**	**37.8**	**35.3**	**26.8**	**26.8**	**25.7**	**24.6**	**23.7**	
EU27	**49.4**	**39.9**	**38.3**	**35.2**	**27.2**	**27.3**	**26.2**	**24.7**	**23.8**	**25.4**
Austria	43.2	34.1	30.3	26.2	20.0	20.5	20.0	17.6	17.9	19.3
Belgium	**79.0**	**64.7**	**58.6**	**53.2**	**40.3**	**39.4**	**38.4**	**37.2**	**35.1**	**35.0**
Bulgaria	100.2	47.1	37.2	29.4	22.9	24.0	24.0	19.7	17.7	20.2
Cyprus	36.5	36.2	24.7	19.2	20.1	19.1	17.8	13.8	15.1	15.7
Czechia	**142.8**	**92.4**	**70.2**	**68.4**	**53.2**	**54.3**	**53.4**	**48.3**	**43.0**	**45.7**
Germany	**56.0**	**46.5**	**42.7**	**38.5**	**29.1**	**28.9**	**27.6**	**26.7**	**27.9**	**29.3**
Denmark	26.3	18.7	16.3	14.0	8.7	8.5	7.9	7.5	7.0	6.3
Estonia	55.7	33.6	19.8	20.3	15.0	15.3	14.1	13.4	13.0	13.1
Greece	33.8	43.7	46.6	32.2	30.3	28.2	27.9	23.4	25.6	31.3
Spain	**20.7**	**20.6**	**21.1**	**20.0**	**15.9**	**15.5**	**13.4**	**13.2**	**12.5**	**15.1**
Finland	21.0	15.5	12.7	10.7	7.0	7.1	6.4	5.9	5.5	5.0
France	**37.2**	**33.6**	**33.2**	**28.1**	**21.1**	**21.4**	**20.5**	**18.6**	**17.7**	**18.4**
Croatia	67.0	65.0	64.7	56.7	42.7	41.9	40.7	37.4	34.4	39.2
Hungary	158.9	115.1	111.7	93.4	67.7	70.3	71.5	62.8	57.8	64.5
Ireland	72.1	49.3	44.3	46.5	24.8	25.0	21.7	21.4	19.5	20.1
Italy	**36.7**	**33.8**	**36.2**	**34.6**	**31.2**	**30.9**	**30.4**	**29.0**	**27.9**	**30.2**
Lithuania	57.8	35.4	28.3	31.2	20.5	22.4	23.1	22.8	20.7	20.0
Luxembourg	26.1	29.7	28.6	23.8	20.0	19.7	19.8	17.7	15.7	17.4
Latvia	68.5	35.6	31.7	35.7	22.4	23.2	23.6	23.1	21.1	20.7
Malta		13.2	7.6	5.0	4.7	3.7	3.8	3.4	3.3	3.5
Netherlands	**50.9**	**36.2**	**32.6**	**35.8**	**24.1**	**24.6**	**23.2**	**22.5**	**21.3**	**21.1**
Poland	**233.1**	**114.5**	**126.7**	**120.6**	**84.8**	**87.5**	**84.0**	**76.1**	**63.2**	**67.6**
Portugal	17.3	16.6	15.2	15.3	11.7	11.3	10.8	10.7	10.6	12.1
Romania	**60.7**	**81.6**	**68.3**	**51.0**	**45.5**	**43.8**	**42.6**	**42.0**	**40.6**	**44.4**
Sweden	**22.3**	**14.9**	**6.6**	**2.8**	**1.5**	**1.3**	**1.3**	**1.2**	**1.1**	**1.1**
Slovenia	63.3	56.8	48.1	36.9	22.7	21.9	20.2	17.7	16.7	17.8
Slovakia	125.7	109.7	71.8	52.5	37.3	37.6	40.2	34.8	34.4	36.7
United Kingdom	47.6	42.8	35.9	35.8	24.8	24.9	23.7	24.2	22.9	

Table A1.39 – *Final energy intensity in industry per unit of value added, toe / M€ (chain linked volumes, 2015).*

	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**165.8**	**150.9**	**143.0**	**128.3**	**116.6**	**114.7**	**114.1**	**111.3**	**109.0**	
EU27	**179.1**	**161.2**	**153.1**	**137.5**	**125.1**	**124.0**	**123.2**	**119.9**	**117.5**	**122.1**
Austria	106.2	110.2	116.2	124.4	113.3	113.7	108.1	105.9	108.9	112.5
Belgium	**288.8**	**287.0**	**258.5**	**253.2**	**243.7**	**244.6**	**235.6**	**238.6**	**220.5**	**222.7**
Bulgaria	1756.5	910.3	640.1	345.1	352.8	329.8	332.8	323.3	312.8	334.4
Cyprus	229.6	266.5	145.7	134.8	151.1	140.9	130.7	109.9	100.7	112.7
Czechia	**516.1**	**382.1**	**296.3**	**195.9**	**161.0**	**142.7**	**159.4**	**156.2**	**150.7**	**155.0**
Germany	**124.3**	**118.3**	**121.5**	**114.4**	**99.7**	**97.3**	**96.8**	**93.9**	**93.1**	**97.6**
Denmark	69.6	58.4	58.2	55.9	46.1	44.5	43.9	44.0	40.3	41.5
Estonia	547.3	305.0	254.9	190.2	141.1	110.7	108.4	102.2	97.6	101.7
Greece	171.8	163.1	128.5	159.3	191.0	186.1	193.1	184.4	171.8	167.7
Spain	**151.7**	**148.9**	**149.8**	**126.6**	**121.7**	**129.8**	**125.4**	**127.2**	**124.3**	**132.1**
Finland	391.6	306.4	254.8	241.7	257.9	256.5	245.2	257.4	256.4	244.9
France	**162.7**	**144.6**	**133.4**	**117.0**	**117.3**	**117.7**	**114.4**	**112.3**	**108.7**	**115.9**
Croatia	330.4	273.6	236.0	226.6	205.7	193.7	201.1	189.8	191.9	190.2
Hungary	418.7	268.5	212.0	196.4	211.2	218.7	228.6	224.9	211.5	232.6
Ireland	98.7	67.0	50.0	42.8	22.4	24.0	23.7	22.2	21.5	17.2
Italy	**123.0**	**122.3**	**118.5**	**109.8**	**97.2**	**94.1**	**95.3**	**90.8**	**91.4**	**97.8**
Lithuania	483.6	343.4	248.8	224.9	221.9	214.2	227.2	211.7	208.8	194.7
Luxembourg	266.1	163.3	149.5	157.6	115.2	113.7	117.1	120.8	104.3	100.4
Latvia	322.6	208.2	173.7	235.8	209.7	198.3	192.8	200.5	184.3	189.8
Malta		33.5	59.7	43.4	49.7	50.9	49.9	45.5	44.7	40.0
Netherlands	**253.5**	**232.8**	**246.3**	**233.6**	**214.5**	**219.6**	**216.5**	**203.2**	**192.6**	**205.6**
Poland	**498.7**	**391.2**	**286.0**	**193.5**	**167.2**	**169.2**	**177.4**	**167.1**	**163.5**	**170.5**
Portugal	227.0	227.8	232.2	221.7	191.4	180.0	177.7	157.3	169.2	174.2
Romania	**582.7**	**419.4**	**324.2**	**172.1**	**182.7**	**169.3**	**161.4**	**160.7**	**160.6**	**160.1**
Sweden	**274.7**	**202.2**	**160.0**	**155.1**	**140.7**	**144.7**	**139.5**	**135.2**	**136.9**	**143.4**
Slovenia	216.9	215.0	199.3	146.7	134.6	131.8	128.7	126.8	118.9	116.4
Slovakia	795.9	645.1	373.6	236.9	195.2	190.8	199.2	199.9	184.2	213.7
United Kingdom	101.7	98.3	89.4	76.4	68.2	64.4	63.3	62.0		

Table A1.40 – *Final energy intensity in services per unit of value added, toe / M€ (chain linked volumes, 2015).*

	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**18.9**	**17.1**	**18.2**	**18.3**	**15.9**	**16.0**	**16.0**	**15.5**	**14.7**	
EU27	**18.7**	**17.8**	**19.8**	**20.1**	**17.4**	**17.3**	**17.3**	**16.7**	**15.9**	**15.9**
Austria	17.1	16.6	17.6	13.9	12.5	12.0	12.8	12.2	12.3	12.8
Belgium	**19.4**	**17.4**	**20.9**	**20.2**	**17.3**	**17.1**	**16.8**	**16.5**	**15.9**	**16.4**
Bulgaria	39.3	50.7	48.0	43.6	44.4	46.7	45.0	44.8	43.9	38.2
Cyprus	11.1	12.6	15.5	19.7	16.9	17.1	16.7	18.9	18.8	16.6
Czechia	**47.2**	**53.2**	**47.5**	**44.0**	**35.9**	**36.3**	**35.9**	**33.8**	**33.2**	**32.1**
Germany	**20.1**	**17.6**	**21.9**	**21.5**	**18.4**	**17.8**	**17.4**	**15.6**	**14.6**	**14.7**
Denmark	23.7	20.9	20.4	19.3	16.2	16.3	16.5	16.2	15.5	14.6
Estonia	34.4	43.5	41.6	45.0	43.0	44.6	39.0	39.7	36.3	37.3
Greece	10.5	12.7	15.7	15.2	16.5	18.1	19.3	18.4	18.6	18.4
Spain	**10.8**	**14.0**	**14.3**	**14.8**	**13.9**	**14.0**	**14.0**	**13.8**	**13.5**	**13.9**
Finland	12.4	23.5	23.8	26.4	22.9	23.6	23.6	24.0	23.1	21.9
France	**17.3**	**16.1**	**16.6**	**17.8**	**15.3**	**15.2**	**15.1**	**14.5**	**14.0**	**13.9**
Croatia	32.5	29.2	31.9	32.9	30.5	30.4	30.9	30.6	29.7	29.2
Hungary	73.6	76.8	72.9	62.0	40.2	38.9	36.4	33.4	31.1	31.3
Ireland	17.4	14.5	14.0	13.4	12.0	11.9	10.9	10.6	10.3	10.5
Italy	**11.6**	**12.2**	**15.1**	**16.6**	**15.0**	**14.9**	**17.4**	**18.0**	**17.2**	**16.9**
Lithuania	85.4	42.7	38.1	38.3	31.2	31.7	32.4	31.9	29.7	27.5
Luxembourg	3.5	13.8	12.0	11.5	9.7	9.3	10.3	10.3	11.4	10.8
Latvia	123.3	63.2	54.0	49.6	41.8	41.1	41.4	38.9	36.8	36.9
Malta		12.8	16.0	18.6	17.1	16.1	15.6	13.9	13.8	14.0
Netherlands	**20.5**	**17.3**	**17.9**	**18.4**	**14.9**	**14.7**	**14.6**	**14.3**	**13.7**	**13.5**
Poland	**45.4**	**36.9**	**43.2**	**46.1**	**36.1**	**37.5**	**33.8**	**31.8**	**29.4**	**29.0**
Portugal	11.2	14.5	21.2	16.8	21.4	20.4	19.9	20.1	19.4	19.0
Romania	**13.5**	**16.4**	**32.5**	**31.8**	**23.4**	**23.4**	**22.3**	**22.6**	**20.9**	**20.2**
Sweden	**30.3**	**23.6**	**19.3**	**18.1**	**14.6**	**14.9**	**13.8**	**13.9**	**13.2**	**13.3**
Slovenia	33.2	37.2	28.1	28.0	23.0	24.2	22.8	21.6	20.3	19.2
Slovakia	109.3	80.7	57.7	51.7	31.7	30.4	32.4	29.4	26.8	24.1
United Kingdom	16.1	13.9	11.5	10.6	9.6	10.1	9.9	9.9		

Table A1.41 – *Final energy intensity in agriculture per unit of value added, toe / M€ (chain linked volumes, 2015).*

	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**183.9**	**155.0**	**154.0**	**143.9**	**125.7**	**132.7**	**130.8**	**142.9**	**142.2**	
EU27	**190.6**	**160.9**	**162.7**	**149.3**	**132.0**	**136.1**	**134.3**	**147.6**	**146.7**	**148.1**
Austria	165.8	152.2	150.2	148.6	137.5	137.6	132.4	122.3	120.5	121.9
Belgium	**585.6**	**346.0**	**422.4**	**307.2**	**256.8**	**298.2**	**290.6**	**323.5**	**360.6**	**345.9**
Bulgaria	148.7	124.0	121.7	95.4	99.9	92.7	81.9	88.7	86.3	89.5
Cyprus	11.0	15.0	70.9	98.4	123.2	112.9	125.8	125.4	118.3	124.8
Czechia	**331.8**	**181.8**	**122.9**	**161.4**	**162.1**	**162.5**	**168.7**	**157.2**	**153.8**	**145.0**
Germany	**109.5**	**15.5**	**11.7**	**59.7**	**70.6**	**74.1**	**66.1**	**188.2**	**178.2**	**177.9**
Denmark	411.0	367.6	344.2	327.8	293.5	344.2	288.6	287.3	235.1	216.2
Estonia	362.0	159.1	264.3	198.9	224.7	289.8	276.7	314.1	215.5	223.9
Greece	132.5	145.6	147.6	122.3	40.1	45.7	43.1	40.4	40.2	42.0
Spain	**120.6**	**99.5**	**132.8**	**85.8**	**91.5**	**88.5**	**92.8**	**86.5**	**93.6**	**92.8**
Finland	200.4	203.9	203.7	185.4	156.5	157.0	149.1	145.5	138.3	128.5
France	**158.5**	**144.6**	**155.4**	**138.5**	**130.6**	**144.7**	**132.3**	**129.0**	**130.8**	**135.1**
Croatia	125.2	170.7	134.2	137.9	177.3	168.7	170.8	164.0	162.6	165.2
Hungary	197.3	205.7	124.7	136.5	135.4	135.1	136.3	137.7	146.1	167.1
Ireland	164.6	162.8	232.9	163.6	94.1	88.3	86.7	101.7	79.7	79.3
Italy	**111.7**	**97.4**	**106.7**	**93.2**	**85.4**	**85.9**	**90.6**	**92.0**	**90.1**	**97.0**
Lithuania	193.9	98.3	101.5	110.3	78.4	86.1	89.9	99.4	92.6	86.6
Luxembourg	52.3	83.3	177.0	210.2	206.7	239.6	239.4	212.2	201.1	206.3
Latvia	310.0	238.1	219.0	216.8	189.3	216.1	232.6	234.6	216.7	218.3
Malta			66.3	84.2	44.8	47.0	74.9	77.6	131.0	163.2
Netherlands	**499.3**	**461.7**	**412.1**	**459.4**	**322.2**	**317.7**	**315.0**	**341.7**	**335.7**	**326.5**
Poland	**400.7**	**564.6**	**441.1**	**341.9**	**350.7**	**365.9**	**392.9**	**436.6**	**430.8**	**386.6**
Portugal	145.3	232.2	192.1	135.5	117.5	117.7	121.6	125.6	124.7	138.2
Romania	**128.4**	**71.9**	**48.0**	**68.2**	**71.2**	**66.4**	**63.6**	**66.1**	**67.5**	**75.8**
Sweden	**182.2**	**165.7**	**140.1**	**118.5**	**100.0**	**104.7**	**94.7**	**101.2**	**99.3**	**91.8**
Slovenia	0.0	109.8	134.7	114.9	91.0	91.3	95.6	80.8	85.5	80.8
Slovakia	690.5	531.4	275.6	156.2	110.0	102.7	107.2	90.7	100.8	94.4
United Kingdom	100.3	82.9	66.8	75.8	62.1	94.5	93.4	89.8		

Table A1.42 – *Final energy intensity in transport per unit of GDP, toe / M€ (chain linked volumes, 2015).*

	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**26.3**	**25.2**	**24.4**	**22.9**	**21.2**	**21.3**	**21.1**	**20.8**	**20.6**	
EU27	**26.9**	**26.1**	**25.6**	**24.2**	**22.5**	**22.5**	**22.4**	**22.0**	**21.8**	**20.2**
Austria	22.4	23.1	27.6	25.1	24.6	24.5	24.3	24.0	23.7	22.2
Belgium	**26.7**	**24.9**	**24.2**	**22.9**	**21.4**	**21.4**	**20.7**	**20.4**	**19.8**	**18.5**
Bulgaria	49.3	70.5	75.2	62.8	70.1	69.2	68.5	68.1	66.2	65.3
Cyprus	43.3	41.6	39.7	39.4	34.8	34.6	33.9	32.2	31.0	29.2
Czechia	**26.9**	**38.6**	**42.8**	**38.9**	**37.4**	**37.7**	**37.0**	**36.2**	**35.7**	**35.5**
Germany	**25.1**	**23.6**	**21.0**	**19.2**	**18.3**	**18.4**	**18.1**	**17.4**	**17.4**	**16.6**
Denmark	19.2	17.0	17.5	17.1	15.6	15.3	14.8	14.7	14.1	13.4
Estonia	57.7	44.6	40.4	43.2	36.9	36.6	35.7	35.5	34.1	33.5
Greece	37.6	35.8	33.9	34.8	32.7	33.7	32.9	32.8	33.0	30.8
Spain	**34.3**	**35.2**	**36.3**	**31.9**	**27.5**	**27.7**	**27.9**	**28.0**	**27.8**	**24.7**
Finland	28.1	22.3	21.0	20.4	19.4	19.2	18.7	18.7	18.2	17.4
France	**26.4**	**24.7**	**22.3**	**21.0**	**20.8**	**20.7**	**20.4**	**19.6**	**19.2**	**17.7**
Croatia	37.6	42.2	41.9	43.9	44.6	44.1	45.8	43.5	43.7	41.9
Hungary	34.9	37.1	40.1	40.6	37.5	37.3	37.7	38.1	38.6	35.9
Ireland	22.4	25.3	23.6	20.8	14.9	15.4	14.0	12.9	12.4	9.9
Italy	**24.6**	**24.2**	**24.3**	**22.6**	**22.2**	**21.5**	**20.5**	**20.9**	**20.9**	**18.5**
Lithuania	62.7	52.1	48.4	48.9	47.4	49.2	49.6	50.7	50.1	49.6
Luxembourg	40.3	43.9	55.6	44.8	36.3	33.7	34.3	35.9	35.6	28.1
Latvia	64.1	51.8	48.7	52.9	43.2	42.4	42.4	42.0	40.6	39.9
Malta		25.3	25.0	24.1	20.0	19.4	18.0	19.0	19.0	17.1
Netherlands	**21.1**	**18.4**	**18.5**	**17.6**	**15.2**	**14.9**	**14.7**	**14.8**	**14.4**	**12.9**
Poland	**40.9**	**38.8**	**42.0**	**46.5**	**38.8**	**42.1**	**46.3**	**45.9**	**44.6**	**43.8**
Portugal	31.2	34.6	35.6	34.7	31.1	31.2	30.7	30.1	30.0	27.5
Romania	**31.6**	**36.9**	**34.6**	**36.0**	**33.5**	**34.5**	**34.5**	**33.9**	**33.9**	**34.6**
Sweden	**26.1**	**23.2**	**20.5**	**18.5**	**16.1**	**15.7**	**15.5**	**14.7**	**14.2**	**13.8**
Slovenia	55.4	42.0	42.2	46.7	45.6	47.0	46.0	45.0	42.5	36.5
Slovakia	37.7	33.0	42.6	36.8	27.1	29.8	33.1	31.5	31.2	29.1
United Kingdom	23.6	20.8	18.6	17.0	15.5	15.6	15.3	15.1	14.8	

Table A1.43 – *Final energy intensity in households per unit of. GDP, toe / M€ (chain linked volumes, 2015).*

	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**27.0**	**23.8**	**23.2**	**23.1**	**19.0**	**19.1**	**18.6**	**18.0**	**17.6**	
EU27	**28.2**	**24.4**	**24.0**	**24.0**	**20.1**	**20.1**	**19.6**	**19.1**	**18.6**	**19.8**
Austria	26.1	22.6	21.5	21.6	19.3	19.7	19.4	17.7	17.9	19.2
Belgium	**32.6**	**28.8**	**25.2**	**24.6**	**19.8**	**19.6**	**19.0**	**18.5**	**17.6**	**18.9**
Bulgaria	80.2	76.7	57.8	52.3	47.9	47.7	47.8	44.8	41.7	48.1
Cyprus	12.3	12.5	18.6	17.3	18.3	17.6	17.1	15.8	16.2	17.2
Czechia	**63.0**	**56.5**	**48.3**	**47.7**	**39.9**	**40.8**	**39.4**	**37.3**	**35.8**	**39.0**
Germany	**28.5**	**25.6**	**24.3**	**22.9**	**18.2**	**18.4**	**17.9**	**17.4**	**17.8**	**18.7**
Denmark	22.1	17.8	17.8	19.5	16.3	16.3	15.5	15.1	14.5	14.6
Estonia	117.1	73.9	49.8	58.7	41.6	43.7	41.8	40.1	39.0	39.9
Greece	22.0	25.1	25.4	21.6	25.3	24.8	24.9	21.7	22.4	25.7
Spain	**14.1**	**13.8**	**14.8**	**15.7**	**14.2**	**12.9**	**12.6**	**13.0**	**12.1**	**13.7**
Finland	39.6	25.4	25.0	27.6	23.4	24.6	25.7	25.1	24.5	23.7
France	**24.4**	**22.0**	**21.4**	**21.7**	**18.2**	**18.8**	**18.1**	**17.2**	**16.8**	**17.8**
Croatia	72.5	64.8	63.7	60.9	53.8	51.5	49.5	46.2	43.5	48.1
Hungary	86.8	67.9	68.0	65.2	52.9	53.5	52.4	45.9	42.9	47.3
Ireland	24.6	18.8	17.5	18.9	10.6	10.7	9.5	9.3	8.6	8.8
Italy	**17.6**	**16.6**	**19.5**	**20.7**	**19.6**	**19.2**	**19.3**	**18.5**	**18.0**	**19.5**
Lithuania	101.6	67.4	51.5	51.4	36.4	37.4	36.5	36.4	33.3	33.1
Luxembourg	20.2	12.9	12.4	10.5	9.4	9.2	9.3	8.5	7.6	8.3
Latvia	143.8	92.4	70.8	67.0	45.0	45.5	46.0	45.6	42.9	41.8
Malta		12.7	10.9	9.0	8.0	7.5	7.9	7.9	8.0	8.8
Netherlands	**25.1**	**18.6**	**17.3**	**18.8**	**13.8**	**14.0**	**13.3**	**13.0**	**12.5**	**12.8**
Poland	**115.6**	**67.9**	**66.1**	**59.1**	**44.2**	**44.8**	**43.1**	**46.0**	**40.9**	**42.2**
Portugal	18.1	16.2	17.7	15.8	15.3	15.4	14.8	14.7	14.4	16.4
Romania	**68.1**	**91.5**	**66.0**	**58.2**	**46.1**	**44.2**	**43.0**	**41.4**	**39.6**	**42.5**
Sweden	**28.1**	**22.2**	**20.4**	**20.2**	**16.3**	**16.5**	**16.1**	**15.4**	**14.9**	**15.0**
Slovenia	48.9	42.7	41.2	35.8	30.0	29.6	27.5	24.7	23.3	24.7
Slovakia	54.2	59.7	45.9	32.7	24.9	24.9	25.1	23.6	29.6	32.1
United Kingdom	23.0	21.1	19.0	19.0	14.1	14.1	13.4	13.8	13.6	

Table A1.44 – *Domestic material consumptions per capita (DMC), t/inhabitant.*

	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU27	**15.4**	**16.3**	**14.3**	**13.7**	**13.6**	**13.9**	**14.2**	**14.2**	**13.5**
Austria	20.2	21.0	19.3	18.5	19.3	19.0	19.1	19.0	19.1
Belgium	**15.6**	**15.0**	**14.5**	**13.3**	**13.3**	**13.7**	**13.3**	**13.6**	**13.3**
Bulgaria	12.4	16.5	16.3	21.3	18.9	19.7	20.3	20.6	20.4
Cyprus	24.3	24.9	27.8	14.1	15.6	18.4	18.1	19.2	18.6
Czechia	**17.5**	**18.4**	**16.0**	**15.9**	**15.6**	**15.7**	**15.9**	**16.0**	**14.7**
Germany	**17.3**	**15.3**	**14.9**	**15.1**	**15.2**	**15.3**	**14.8**	**14.3**	**13.3**
Denmark	25.7	27.9	21.2	22.9	23.4	24.1	24.1	24.2	23.9
Estonia	15.5	22.4	24.1	26.0	25.6	30.4	31.6	28.2	28.4
Greece	14.9	17.1	16.8	13.4	12.7	12.5	12.2	11.6	9.3
Spain	**17.0**	**19.9**	**12.6**	**8.8**	**8.6**	**8.8**	**9.5**	**9.3**	**9.0**
Finland	33.7	36.7	34.4	30.5	31.5	33.0	34.6	31.6	33.1
France	**14.6**	**13.6**	**12.1**	**11.1**	**10.9**	**11.7**	**11.4**	**11.5**	**10.3**
Croatia	7.7	12.9	10.5	9.8	10.1	10.1	10.4	10.8	10.7
Hungary	11.7	17.8	9.8	12.7	12.1	13.7	15.7	16.3	14.3
Ireland	33.5	39.0	22.7	20.5	21.7	23.0	24.3	24.6	22.4
Italy	**13.2**	**14.3**	**11.6**	**8.0**	**8.0**	**8.0**	**8.1**	**8.3**	**7.7**
Lithuania	8.3	12.3	12.4	15.0	15.7	17.8	17.7	19.0	20.0
Luxembourg	26.7	25.8	22.4	24.4	24.0	24.9	22.9	23.1	21.6
Latvia	6.5	11.2	9.5	13.0	11.7	13.2	14.5	14.8	14.9
Malta	9.4	8.9	7.2	13.8	13.6	11.4	13.0	11.9	12.6
Netherlands	**12.5**	**11.1**	**11.5**	**11.0**	**9.9**	**9.1**	**9.4**	**8.8**	**8.0**
Poland	**13.6**	**13.9**	**16.3**	**16.3**	**16.8**	**17.8**	**18.5**	**17.7**	**17.0**
Portugal	19.7	18.7	19.2	15.6	15.0	16.5	16.4	16.6	16.3
Romania	**7.7**	**15.7**	**13.7**	**22.5**	**22.9**	**21.3**	**23.1**	**27.6**	**28.9**
Sweden	**20.3**	**22.6**	**22.0**	**23.0**	**23.2**	**24.1**	**24.7**	**25.7**	**24.6**
Slovenia	17.2	18.5	16.0	13.3	12.8	13.1	14.4	13.5	13.1
Slovakia	10.1	14.0	13.3	12.5	12.4	12.8	13.5	12.3	11.9
United Kingdom	12.5	12.1	9.2	8.7	8.5	8.6	8.6	8.5	

Table A1.45 – *Direct material inputs per capita (DMI), t/ab.*

	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU27	**16.4**	**17.6**	**15.7**	**15.3**	**15.2**	**15.6**	**15.9**	**15.9**	**15.1**
Austria	25.3	27.6	26.3	25.7	26.5	26.4	26.5	26.4	26.1
Belgium	**31.9**	**33.3**	**31.6**	**29.7**	**29.8**	**30.5**	**30.6**	**30.2**	**29.2**
Bulgaria	13.8	18.7	19.0	25.0	22.9	23.9	24.3	25.1	24.4
Cyprus	26.2	26.7	29.2	17.9	20.0	22.8	23.0	22.7	22.2
Czechia	**21.5**	**23.4**	**22.0**	**22.6**	**22.4**	**22.4**	**22.9**	**23.1**	**21.9**
Germany	**20.9**	**19.7**	**19.4**	**20.1**	**20.1**	**20.3**	**19.9**	**19.5**	**18.3**
Denmark	34.3	36.9	28.8	30.1	30.6	31.6	31.0	31.4	30.7
Estonia	22.0	30.2	33.5	36.3	36.1	42.6	45.2	41.3	41.3
Greece	17.1	19.1	19.3	17.1	16.8	16.8	16.7	16.0	13.6
Spain	**19.3**	**22.4**	**15.3**	**12.5**	**12.4**	**13.1**	**13.9**	**13.2**	**12.5**
Finland	41.0	44.1	42.2	38.2	39.6	41.3	43.5	40.8	41.4
France	**17.8**	**16.8**	**14.9**	**14.2**	**13.9**	**14.7**	**14.5**	**14.5**	**13.1**
Croatia	10.1	16.3	13.9	13.6	14.2	14.4	14.7	15.1	15.5
Hungary	13.6	20.3	13.0	16.6	16.0	18.3	20.2	20.6	18.8
Ireland	37.0	42.4	25.9	24.4	25.7	26.8	28.0	28.4	26.2
Italy	**15.4**	**16.7**	**14.0**	**10.4**	**10.5**	**10.5**	**10.6**	**10.9**	**10.0**
Lithuania	11.1	18.0	19.2	24.8	25.8	28.6	28.1	30.2	31.2
Luxembourg	48.9	47.1	40.8	38.6	38.2	39.5	37.6	36.7	34.8
Latvia	10.4	17.2	18.1	23.0	22.2	24.3	26.2	27.4	27.9
Malta	10.7	9.4	11.9	16.5	16.0	14.9	15.5	14.6	13.6
Netherlands	**28.3**	**29.1**	**31.3**	**30.8**	**31.4**	**31.1**	**30.8**	**30.3**	**28.2**
Poland	**15.3**	**15.9**	**18.4**	**19.3**	**19.6**	**20.7**	**21.4**	**20.6**	**20.0**
Portugal	21.4	21.2	22.2	19.6	18.9	20.6	20.5	20.7	20.2
Romania	**8.6**	**17.0**	**15.2**	**24.4**	**24.9**	**23.4**	**25.4**	**30.0**	**31.0**
Sweden	28.4	31.7	31.4	32.0	32.5	33.6	33.8	34.4	33.6
Slovenia	21.0	23.2	22.1	21.4	21.2	22.1	23.5	22.6	21.4
Slovakia	13.8	18.5	18.5	18.8	18.9	19.4	20.2	18.8	18.2
United Kingdom	15.9	15.2	11.9	11.1	10.9	11.1	11.0	10.8	

Table A1.46 – *Productivity at purchasing power standard per domestic material consumption (DMC), €/kg.*

	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU27	**1.19**	**1.34**	**1.74**	**2.01**	**2.08**	**2.11**	**2.14**	**2.21**	**2.23**
Austria	1.21	1.37	1.65	1.94	1.90	1.96	2.03	2.08	1.95
Belgium	**1.48**	**1.81**	**2.09**	**2.49**	**2.53**	**2.54**	**2.69**	**2.71**	**2.68**
Bulgaria	0.43	0.51	0.69	0.62	0.74	0.75	0.77	0.81	0.80
Cyprus	0.73	0.91	0.91	1.62	1.59	1.43	1.52	1.50	1.42
Czechia	**0.77**	**0.98**	**1.32**	**1.54**	**1.61**	**1.70**	**1.75**	**1.83**	**1.89**
Germany	**1.30**	**1.70**	**1.98**	**2.26**	**2.32**	**2.39**	**2.53**	**2.65**	**2.76**
Denmark	0.93	1.00	1.53	1.54	1.54	1.58	1.62	1.65	1.68
Estonia	0.51	0.61	0.68	0.81	0.85	0.76	0.78	0.91	0.89
Greece	1.09	1.22	1.26	1.44	1.50	1.57	1.65	1.78	2.01
Spain	**1.05**	**1.14**	**1.90**	**2.84**	**3.01**	**3.09**	**2.90**	**3.07**	**2.81**
Finland	0.66	0.72	0.86	1.00	0.99	0.99	0.97	1.08	1.03
France	**1.49**	**1.84**	**2.25**	**2.64**	**2.74**	**2.62**	**2.76**	**2.91**	**3.04**
Croatia	1.15	0.98	1.45	1.71	1.74	1.85	1.88	1.92	1.80
Hungary	0.84	0.79	1.68	1.52	1.60	1.48	1.38	1.40	1.54
Ireland	0.75	0.85	1.44	2.42	2.28	2.33	2.36	2.41	2.78
Italy	**1.70**	**1.72**	**2.30**	**3.34**	**3.47**	**3.59**	**3.62**	**3.63**	**3.64**
Lithuania	0.84	0.97	1.22	1.38	1.37	1.30	1.39	1.38	1.30
Luxembourg	1.72	2.19	3.05	3.18	3.27	3.17	3.46	3.46	3.64
Latvia	1.03	1.02	1.41	1.39	1.58	1.49	1.44	1.47	1.41
Malta	1.63	2.06	3.03	1.95	2.03	2.63	2.38	2.71	2.29
Netherlands	**2.11**	**2.78**	**2.97**	**3.27**	**3.66**	**4.14**	**4.19**	**4.57**	**4.96**
Poland	**0.65**	**0.82**	**0.98**	**1.19**	**1.17**	**1.16**	**1.17**	**1.30**	**1.35**
Portugal	0.80	1.00	1.07	1.36	1.46	1.38	1.44	1.48	1.40
Romania	**0.63**	**0.50**	**0.94**	**0.69**	**0.74**	**0.87**	**0.86**	**0.79**	**0.74**
Sweden	**1.21**	**1.24**	**1.46**	**1.53**	**1.51**	**1.48**	**1.47**	**1.45**	**1.49**
Slovenia	0.87	1.06	1.32	1.71	1.84	1.91	1.84	2.04	2.03
Slovakia	0.94	0.98	1.44	1.73	1.66	1.61	1.57	1.77	1.77
United Kingdom	1.75	2.20	3.01	3.53	3.60	3.64	3.73	3.84	

Table A1.47 *–Productivity at purchasing power standard per direct material inputs (DMI), €/kg.*

	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU27	**1.12**	**1.25**	**1.59**	**1.80**	**1.85**	**1.87**	**1.91**	**1.98**	**1.99**
Austria	0.97	1.04	1.21	1.40	1.38	1.41	1.46	1.50	1.42
Belgium	**0.72**	**0.81**	**0.96**	**1.12**	**1.13**	**1.14**	**1.16**	**1.22**	**1.21**
Bulgaria	0.39	0.45	0.59	0.53	0.61	0.62	0.64	0.66	0.67
Cyprus	0.68	0.85	0.87	1.28	1.24	1.15	1.20	1.27	1.19
Czechia	**0.63**	**0.77**	**0.96**	**1.08**	**1.12**	**1.19**	**1.22**	**1.26**	**1.27**
Germany	**1.08**	**1.32**	**1.52**	**1.70**	**1.75**	**1.79**	**1.88**	**1.94**	**2.00**
Denmark	0.69	0.76	1.13	1.17	1.18	1.20	1.26	1.27	1.31
Estonia	0.36	0.45	0.49	0.58	0.60	0.55	0.54	0.62	0.61
Greece	0.95	1.10	1.09	1.12	1.14	1.17	1.20	1.29	1.37
Spain	**0.93**	**1.01**	**1.56**	**2.00**	**2.08**	**2.07**	**1.98**	**2.15**	**2.01**
Finland	0.54	0.60	0.70	0.80	0.79	0.79	0.77	0.84	0.82
France	**1.22**	**1.49**	**1.83**	**2.07**	**2.15**	**2.09**	**2.18**	**2.30**	**2.40**
Croatia	0.88	0.77	1.08	1.23	1.24	1.29	1.33	1.37	1.24
Hungary	0.73	0.69	1.27	1.16	1.21	1.11	1.07	1.11	1.17
Ireland	0.68	0.78	1.26	2.03	1.93	1.99	2.05	2.10	2.39
Italy	**1.46**	**1.48**	**1.90**	**2.54**	**2.63**	**2.71**	**2.75**	**2.78**	**2.79**
Lithuania	0.63	0.66	0.79	0.84	0.83	0.81	0.88	0.87	0.83
Luxembourg	0.94	1.20	1.68	2.01	2.06	2.00	2.11	2.17	2.27
Latvia	0.64	0.66	0.74	0.78	0.84	0.81	0.80	0.79	0.75
Malta	1.42	1.94	1.83	1.64	1.72	2.01	1.99	2.21	2.13
Netherlands	**0.94**	**1.06**	**1.09**	**1.18**	**1.16**	**1.22**	**1.27**	**1.33**	**1.40**
Poland	**0.58**	**0.72**	**0.87**	**1.00**	**1.00**	**1.00**	**1.01**	**1.12**	**1.14**
Portugal	0.73	0.88	0.93	1.09	1.16	1.10	1.16	1.19	1.13
Romania	**0.57**	**0.46**	**0.85**	**0.64**	**0.68**	**0.80**	**0.78**	**0.72**	**0.69**
Sweden	**0.87**	**0.89**	**1.02**	**1.10**	**1.08**	**1.06**	**1.07**	**1.08**	**1.09**
Slovenia	0.71	0.84	0.95	1.06	1.11	1.14	1.13	1.22	1.24
Slovakia	0.68	0.74	1.04	1.15	1.09	1.06	1.05	1.16	1.15
United Kingdom	1.38	1.76	2.32	2.75	2.81	2.83	2.90	3.00	

ANNEX 2

Table A2.1 – *Fuel energy content for electricity and heat production in thermoelectric plants (Mtoe).*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**388.2**	**371.1**	**381.3**	**427.9**	**410.8**	**356.3**	**353.3**	**355.0**	**337.0**	**313.5**	
EU27	**331.9**	**318.7**	**324.7**	**366.1**	**352.1**	**313.9**	**314.1**	**318.8**	**302.3**	**280.4**	**253.4**
Austria	4.1	4.6	4.1	5.7	5.9	4.7	4.6	5.0	4.7	4.7	4.3
Belgium	**6.5**	**7.2**	**7.0**	**7.8**	**8.5**	**6.4**	**5.9**	**5.9**	**6.0**	**6.1**	**6.2**
Bulgaria	9.6	8.1	5.9	6.5	7.3	6.9	6.2	6.5	6.0	5.8	4.8
Cyprus	0.5	0.6	0.9	1.1	1.2	0.9	1.0	1.0	1.0	1.0	0.9
Czechia	**14.9**	**15.2**	**15.1**	**15.3**	**14.8**	**13.3**	**13.6**	**13.4**	**13.2**	**12.5**	**11.1**
Germany	**99.2**	**88.6**	**84.6**	**91.3**	**91.6**	**90.0**	**91.4**	**86.9**	**83.0**	**72.1**	**64.6**
Denmark	6.0	8.5	7.8	7.1	7.6	4.1	4.6	4.4	4.4	3.8	3.5
Estonia	5.5	2.8	2.4	2.7	3.3	2.6	3.0	3.2	3.1	1.9	1.5
Greece	10.2	10.9	13.2	14.0	12.1	9.2	8.4	9.8	9.4	8.3	6.9
Spain	**16.8**	**20.2**	**26.5**	**35.5**	**25.1**	**25.9**	**22.3**	**26.3**	**23.6**	**20.8**	**16.6**
Finland	5.3	6.8	7.2	7.8	10.2	6.3	6.6	6.4	6.7	6.1	5.1
France	**11.0**	**9.7**	**13.3**	**18.1**	**17.0**	**12.9**	**14.8**	**16.2**	**13.3**	**13.8**	**12.8**
Croatia	1.4	1.1	1.3	1.5	1.3	1.0	1.2	1.2	1.1	1.2	1.3
Hungary	5.3	5.8	6.0	5.6	5.2	3.3	3.5	3.6	3.4	3.4	3.4
Ireland	3.0	3.8	4.8	4.8	4.6	3.8	4.2	4.1	3.8	3.5	3.4
Italy	**37.5**	**40.6**	**45.1**	**54.3**	**48.9**	**41.5**	**42.0**	**43.2**	**40.4**	**40.2**	**37.5**
Lithuania	2.6	1.0	0.9	1.2	1.3	0.7	0.6	0.5	0.5	0.5	0.7
Luxembourg	0.2	0.1	0.1	0.6	0.6	0.2	0.1	0.1	0.2	0.2	0.2
Latvia	0.9	0.6	0.5	0.6	0.8	1.0	1.0	0.8	0.9	0.9	0.7
Malta	0.5	0.5	0.5	0.6	0.6	0.3	0.2	0.3	0.3	0.3	0.3
Netherlands	**14.0**	**16.6**	**17.7**	**19.6**	**21.6**	**19.3**	**19.6**	**19.0**	**17.9**	**18.1**	**16.7**
Poland	**44.3**	**36.9**	**36.4**	**38.8**	**38.3**	**37.1**	**36.7**	**36.8**	**36.7**	**34.2**	**32.1**
Portugal	5.0	6.1	7.4	8.3	7.5	7.8	8.3	8.9	8.4	7.1	6.6
Romania	**22.9**	**16.6**	**10.7**	**10.1**	**8.4**	**7.7**	**7.2**	**7.5**	**7.3**	**6.7**	**5.4**
Sweden	**1.5**	**3.3**	**3.3**	**4.5**	**6.5**	**5.1**	**5.5**	**5.7**	**5.7**	**5.8**	**5.3**
Slovenia	1.5	1.4	1.3	1.5	1.6	1.2	1.3	1.3	1.2	1.2	1.2
Slovakia	3.4	3.3	2.6	2.5	2.4	2.1	2.1	2.2	2.0	2.0	2.0
United Kingdom	56.8	52.7	56.6	62.0	59.0	42.3	39.2	36.2	34.7	33.0	

Table A2.2 – *Fuel energy content for electricity production in thermoelectric plants (Mtoe).*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**314.6**	**312.0**	**326.6**	**358.8**	**340.9**	**295.2**	**290.5**	**292.7**	**277.0**	**254.5**	
EU27	**258.5**	**259.8**	**270.4**	**297.1**	**282.4**	**253.0**	**251.5**	**256.5**	**242.2**	**221.3**	**197.4**
Austria	3.4	3.7	3.2	4.5	4.4	3.2	3.1	3.5	3.2	3.2	2.8
Belgium	**6.2**	**6.9**	**6.6**	**6.8**	**7.4**	**5.4**	**5.0**	**5.1**	**5.2**	**5.3**	**5.4**
Bulgaria	5.8	4.9	4.5	5.2	5.9	5.7	5.1	5.5	5.3	4.9	3.9
Cyprus	0.5	0.6	0.9	1.1	1.2	0.9	1.0	1.0	1.0	1.0	0.9
Czechia	**10.9**	**10.2**	**11.6**	**11.3**	**11.1**	**10.3**	**10.5**	**10.4**	**10.4**	**9.8**	**8.4**
Germany	**87.6**	**80.5**	**76.5**	**80.2**	**80.3**	**79.5**	**80.3**	**75.7**	**72.2**	**61.5**	**54.8**
Denmark	3.9	5.4	4.8	3.7	3.9	1.6	2.0	1.7	1.8	1.3	1.2
Estonia	3.0	2.1	2.0	2.3	3.0	2.3	2.6	2.8	2.6	1.4	1.0
Greece	10.2	10.9	13.1	13.9	12.0	9.0	8.3	9.6	9.3	8.2	6.7
Spain	**16.8**	**20.2**	**26.5**	**35.5**	**25.1**	**25.9**	**22.3**	**26.3**	**23.6**	**20.8**	**16.6**
Finland	3.6	4.7	4.2	4.2	6.1	3.2	3.2	3.0	3.5	3.1	2.5
France	**11.0**	**9.0**	**10.4**	**13.1**	**13.9**	**10.1**	**11.6**	**13.0**	**10.2**	**10.6**	**9.6**
Croatia	1.1	0.7	1.0	1.2	1.0	0.8	0.9	0.8	0.7	0.8	0.9
Hungary	4.0	4.6	4.4	4.4	4.1	2.7	2.8	2.9	2.7	2.7	2.7
Ireland	3.0	3.8	4.8	4.8	4.6	3.8	4.2	4.1	3.8	3.5	3.4
Italy	**37.4**	**40.5**	**44.3**	**47.1**	**40.9**	**33.2**	**33.5**	**34.6**	**31.9**	**31.7**	**29.2**
Lithuania	1.4	0.2	0.3	0.5	0.5	0.3	0.2	0.2	0.1	0.1	0.3
Luxembourg	0.2	0.1	0.1	0.5	0.5	0.2	0.1	0.1	0.1	0.1	0.1
Latvia	0.2	0.1	0.1	0.2	0.3	0.4	0.4	0.3	0.5	0.5	0.3
Malta	0.5	0.5	0.5	0.6	0.6	0.3	0.2	0.3	0.3	0.3	0.3
Netherlands	**12.4**	**12.7**	**13.3**	**15.1**	**16.8**	**15.7**	**16.0**	**15.4**	**14.6**	**14.8**	**13.7**
Poland	**26.8**	**26.2**	**26.9**	**28.7**	**28.7**	**28.5**	**28.0**	**27.9**	**28.0**	**25.8**	**24.1**
Portugal	4.9	6.0	7.1	7.8	6.8	7.1	7.7	8.3	7.8	6.4	6.0
Romania	**6.1**	**7.2**	**5.5**	**6.5**	**5.9**	**5.6**	**5.2**	**5.7**	**5.6**	**5.1**	**4.0**
Sweden	**0.6**	**1.1**	**1.0**	**1.4**	**2.2**	**1.5**	**1.6**	**1.7**	**1.7**	**1.9**	**1.6**
Slovenia	1.1	1.1	1.1	1.2	1.3	0.9	1.0	1.0	1.0	1.0	0.9
Slovakia	2.2	2.1	1.9	1.6	1.2	1.2	1.2	1.2	1.2	1.2	1.2
United Kingdom	56.3	52.2	56.0	62.0	59.0	42.3	39.2	36.2	34.7	33.0	

Table A2.3 – *Fuel energy content for of electricity and heat production in cogeneration plants (Mtoe).*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**139.6**	**126.3**	**121.1**	**158.0**	**167.6**	**148.3**	**152.2**	**154.2**	**148.9**	**146.2**	
EU27	**138.6**	**124.3**	**117.2**	**153.8**	**163.2**	**144.3**	**148.6**	**152.1**	**146.7**	**144.3**	**137.1**
Austria	2.2	2.7	1.6	2.1	2.8	2.5	2.7	2.6	2.5	2.6	2.6
Belgium	**1.8**	**1.7**	**1.1**	**2.1**	**2.8**	**2.7**	**2.7**	**2.6**	**2.7**	**2.6**	**2.7**
Bulgaria	5.9	4.3	2.2	2.3	2.0	1.6	1.5	1.3	1.2	1.6	1.6
Cyprus	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Czechia	**5.4**	**6.7**	**5.6**	**6.5**	**5.8**	**5.1**	**5.2**	**5.0**	**4.8**	**4.7**	**4.7**
Germany	**11.6**	**8.1**	**8.0**	**22.2**	**25.2**	**25.7**	**27.5**	**28.7**	**26.3**	**25.8**	**24.8**
Denmark	5.5	7.6	7.3	7.1	7.6	4.1	4.6	4.4	4.3	3.7	3.5
Estonia	5.5	2.8	0.6	0.5	0.5	0.5	0.5	0.5	0.7	0.7	0.7
Greece	0.2	0.2	0.7	1.8	2.5	2.6	2.6	2.3	2.3	2.3	1.8
Spain	**1.0**	**2.4**	**3.3**	**4.1**	**4.2**	**4.0**	**3.8**	**4.2**	**4.3**	**4.4**	**4.2**
Finland	3.5	4.6	5.6	6.5	7.0	5.4	5.5	5.6	5.5	5.3	4.4
France	**0.2**	**1.0**	**4.4**	**7.9**	**5.7**	**5.3**	**5.8**	**6.0**	**5.7**	**6.1**	**6.0**
Croatia	0.5	0.5	0.5	0.7	0.7	0.5	0.5	0.9	0.8	0.9	1.0
Hungary	1.6	1.4	2.1	2.3	1.9	1.2	1.3	2.7	2.6	2.5	2.5
Ireland	0.0	0.1	0.1	0.1	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Italy	**2.9**	**4.7**	**10.2**	**21.8**	**25.0**	**21.9**	**23.4**	**24.2**	**23.4**	**23.6**	**22.3**
Lithuania	2.6	1.0	0.9	1.2	1.3	0.7	0.6	0.5	0.5	0.5	0.7
Luxembourg	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2
Latvia	0.9	0.6	0.5	0.6	0.8	1.0	1.0	0.8	0.9	0.9	0.7
Malta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Netherlands	**13.9**	**16.1**	**10.7**	**11.7**	**13.2**	**9.2**	**8.8**	**9.0**	**8.7**	**9.6**	**9.6**
Poland	**44.3**	**36.9**	**36.4**	**36.5**	**37.1**	**36.1**	**35.8**	**36.0**	**35.9**	**33.4**	**31.0**
Portugal	0.2	0.7	0.8	1.1	1.4	1.3	1.2	1.3	1.3	1.3	1.3
Romania	**22.9**	**13.3**	**7.5**	**6.0**	**4.3**	**3.2**	**3.1**	**3.1**	**2.8**	**2.7**	**2.4**
Sweden	**1.5**	**3.2**	**3.2**	**4.4**	**6.4**	**5.1**	**5.5**	**5.7**	**5.7**	**5.8**	**5.2**
Slovenia	1.3	1.2	1.2	1.3	1.4	1.2	1.2	1.3	0.4	0.4	0.4
Slovakia	2.5	2.2	1.8	2.3	2.2	2.0	2.0	2.1	1.9	1.7	1.6
United Kingdom	1.5	2.2	3.8	4.7	4.4	4.0	3.7	3.5	3.7	3.9	

Table A2.4 – *Fuel energy content for electricity production in cogeneration plants (Mtoe).*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**66.0**	**67.2**	**66.4**	**89.0**	**97.6**	**87.2**	**89.4**	**91.9**	**88.8**	**87.2**	
EU27	**65.2**	**65.4**	**62.9**	**84.9**	**93.5**	**83.5**	**86.0**	**89.8**	**86.6**	**85.2**	**81.0**
Austria	1.4	1.8	0.7	0.9	1.3	1.0	1.2	1.1	1.1	1.1	1.1
Belgium	**1.5**	**1.4**	**0.7**	**1.1**	**1.7**	**1.8**	**1.9**	**1.8**	**1.9**	**1.8**	**1.9**
Bulgaria	2.1	1.1	0.9	1.0	0.6	0.4	0.4	0.4	0.4	0.7	0.7
Cyprus	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Czechia	**1.4**	**1.8**	**2.1**	**2.5**	**2.1**	**2.1**	**2.1**	**2.0**	**2.0**	**2.0**	**2.0**
Germany	**0.0**	**0.0**	**0.0**	**11.2**	**13.9**	**15.1**	**16.4**	**17.5**	**15.4**	**15.2**	**15.0**
Denmark	3.4	4.5	4.3	3.7	3.9	1.6	2.0	1.7	1.8	1.3	1.2
Estonia	3.0	2.1	0.2	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2
Greece	0.2	0.2	0.7	1.7	2.4	2.5	2.4	2.2	2.2	2.1	1.7
Spain	**1.0**	**2.4**	**3.3**	**4.1**	**4.2**	**4.0**	**3.8**	**4.2**	**4.3**	**4.4**	**4.2**
Finland	1.9	2.5	2.6	2.8	2.9	2.2	2.2	2.2	2.3	2.3	1.9
France	**0.2**	**0.3**	**1.5**	**2.9**	**2.6**	**2.5**	**2.6**	**2.7**	**2.7**	**2.8**	**2.8**
Croatia	0.2	0.2	0.2	0.3	0.4	0.2	0.2	0.5	0.4	0.5	0.6
Hungary	0.3	0.2	0.5	1.0	0.8	0.6	0.6	2.0	1.9	1.8	1.7
Ireland	0.0	0.1	0.1	0.1	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Italy	**2.7**	**4.5**	**9.4**	**14.6**	**17.0**	**13.6**	**14.9**	**15.6**	**15.0**	**15.1**	**14.0**
Lithuania	1.4	0.2	0.3	0.5	0.5	0.3	0.2	0.2	0.1	0.1	0.3
Luxembourg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Latvia	0.2	0.1	0.1	0.2	0.3	0.4	0.4	0.3	0.5	0.5	0.3
Malta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Netherlands	**12.4**	**12.2**	**6.3**	**7.2**	**8.4**	**5.6**	**5.2**	**5.4**	**5.4**	**6.3**	**6.7**
Poland	**26.8**	**26.2**	**26.9**	**26.4**	**27.5**	**27.5**	**27.1**	**27.1**	**27.2**	**25.0**	**22.9**
Portugal	0.2	0.6	0.6	0.6	0.7	0.7	0.6	0.6	0.6	0.7	0.6
Romania	**6.1**	**3.9**	**2.4**	**2.4**	**1.7**	**1.2**	**1.1**	**1.2**	**1.1**	**1.2**	**1.0**
Sweden	**0.5**	**1.0**	**0.9**	**1.2**	**2.1**	**1.5**	**1.6**	**1.7**	**1.7**	**1.9**	**1.6**
Slovenia	1.0	0.9	0.9	1.1	1.1	0.9	1.0	1.0	0.2	0.1	0.1
Slovakia	1.4	1.1	1.1	1.3	1.1	1.1	1.1	1.1	1.1	0.9	0.9
United Kingdom	1.0	1.8	3.2	4.7	4.4	4.0	3.7	3.5	3.7	3.9	

Table A2.5 – *Fuel energy content for electricity production in non-cogeneration plants (Mtoe).*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**248.6**	**244.8**	**260.2**	**269.9**	**243.3**	**208.0**	**201.1**	**200.8**	**188.1**	**167.3**	
EU27	**193.3**	**194.3**	**207.5**	**212.3**	**188.9**	**169.6**	**165.6**	**166.8**	**155.6**	**136.1**	**116.3**
Austria	1.9	1.9	2.4	3.6	3.0	2.2	1.9	2.4	2.1	2.1	1.7
Belgium	**4.7**	**5.5**	**5.9**	**5.8**	**5.7**	**3.6**	**3.2**	**3.3**	**3.3**	**3.5**	**3.5**
Bulgaria	3.7	3.9	3.7	4.2	5.3	5.3	4.7	5.1	4.8	4.2	3.2
Cyprus	0.5	0.6	0.9	1.1	1.2	0.9	1.0	1.0	1.0	1.0	0.9
Czechia	**9.4**	**8.5**	**9.5**	**8.8**	**9.0**	**8.2**	**8.5**	**8.4**	**8.4**	**7.8**	**6.4**
Germany	**87.6**	**80.5**	**76.5**	**69.1**	**66.4**	**64.3**	**63.8**	**58.2**	**56.8**	**46.3**	**39.8**
Denmark	0.5	0.9	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estonia	0.0	0.0	1.9	2.2	2.8	2.1	2.5	2.7	2.4	1.2	0.8
Greece	10.0	10.6	12.4	12.1	9.6	6.5	5.9	7.4	7.1	6.0	5.1
Spain	**15.8**	**17.8**	**23.2**	**31.3**	**20.9**	**21.9**	**18.5**	**22.1**	**19.2**	**16.4**	**12.4**
Finland	1.7	2.2	1.6	1.3	3.2	1.0	1.1	0.8	1.2	0.8	0.6
France	**10.8**	**8.7**	**8.9**	**10.2**	**11.3**	**7.6**	**9.0**	**10.3**	**7.6**	**7.7**	**6.8**
Croatia	0.9	0.5	0.8	0.8	0.6	0.6	0.6	0.3	0.3	0.3	0.3
Hungary	3.7	4.4	3.9	3.4	3.3	2.1	2.2	0.9	0.8	0.9	0.9
Ireland	3.0	3.7	4.7	4.7	4.3	3.5	3.9	3.8	3.5	3.2	3.1
Italy	**34.7**	**36.0**	**34.9**	**32.5**	**23.9**	**19.6**	**18.6**	**19.1**	**17.0**	**16.5**	**15.3**
Lithuania	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Luxembourg	0.2	0.1	0.0	0.5	0.4	0.1	0.0	0.0	0.0	0.0	0.0
Latvia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Malta	0.5	0.5	0.5	0.6	0.6	0.3	0.2	0.3	0.3	0.3	0.3
Netherlands	**0.1**	**0.5**	**7.1**	**7.9**	**8.4**	**10.1**	**10.8**	**10.0**	**9.2**	**8.5**	**7.1**
Poland	**0.0**	**0.0**	**0.0**	**2.3**	**1.2**	**0.9**	**0.9**	**0.8**	**0.8**	**0.8**	**1.1**
Portugal	4.7	5.5	6.6	7.2	6.1	6.5	7.1	7.6	7.1	5.7	5.3
Romania	**0.0**	**3.3**	**3.2**	**4.2**	**4.2**	**4.5**	**4.1**	**4.5**	**4.5**	**4.0**	**3.1**
Sweden	**0.0**	**0.0**	**0.1**	**0.1**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Slovenia	0.2	0.2	0.1	0.2	0.1	0.0	0.0	0.0	0.8	0.8	0.8
Slovakia	0.8	1.0	0.7	0.2	0.1	0.1	0.1	0.1	0.1	0.3	0.3
United Kingdom	55.3	50.5	52.8	57.4	54.6	38.3	35.6	32.7	31.1	29.1	

Table A2.6 – *Gross electricity production w/o pumping (TWh).*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**2,576.3**	**2,722.2**	**3,005.3**	**3,291.2**	**3,336.3**	**3,214.9**	**3,237.5**	**3,268.0**	**3,249.5**	**3,205.2**	
EU27	**2,258.5**	**2,389.7**	**2,631.0**	**2,894.4**	**2,956.1**	**2,879.3**	**2,901.0**	**2,932.8**	**2,916.6**	**2,881.8**	**2,757.8**
Austria	49.3	55.2	59.9	64.5	67.9	61.9	65.3	67.4	65.0	70.9	69.2
Belgium	**70.3**	**73.5**	**82.8**	**84.4**	**93.2**	**68.6**	**84.5**	**85.5**	**74.0**	**92.8**	**88.3**
Bulgaria	41.9	41.6	40.6	43.9	46.0	48.7	44.6	44.9	46.6	43.8	40.3
Cyprus	2.0	2.5	3.4	4.4	5.3	4.5	4.9	5.0	5.1	5.1	4.8
Czechia	**61.7**	**60.1**	**70.7**	**79.3**	**82.5**	**79.9**	**79.5**	**83.4**	**84.6**	**83.8**	**78.6**
Germany	**547.7**	**532.8**	**572.3**	**616.3**	**626.7**	**642.4**	**644.9**	**647.7**	**634.3**	**601.0**	**566.1**
Denmark	26.0	36.8	36.1	36.2	38.9	28.9	30.5	31.0	30.4	29.5	28.7
Estonia	17.2	8.7	8.5	10.2	13.0	10.1	12.2	13.2	12.4	7.6	6.0
Greece	40.5	48.1	60.1	66.3	61.6	55.6	58.2	59.1	57.0	52.3	51.3
Spain	**151.2**	**165.6**	**220.9**	**289.5**	**298.3**	**277.7**	**271.3**	**273.0**	**272.0**	**271.0**	**259.9**
Finland	54.4	64.0	70.0	70.6	80.7	68.6	68.8	67.5	70.3	68.7	68.9
France	**417.2**	**491.2**	**535.2**	**571.2**	**564.5**	**574.5**	**559.2**	**556.8**	**576.4**	**566.3**	**527.3**
Croatia	8.9	9.3	11.3	13.1	14.8	11.2	12.6	11.8	13.5	12.7	13.2
Hungary	28.4	34.0	35.2	35.8	37.4	30.4	31.9	32.9	32.1	34.3	34.9
Ireland	14.2	17.6	23.7	25.6	28.2	28.1	30.2	30.7	30.9	30.7	32.0
Italy	**213.1**	**237.4**	**269.9**	**296.8**	**298.8**	**281.6**	**287.9**	**294.0**	**288.0**	**292.0**	**278.6**
Lithuania	28.4	13.5	11.1	14.4	5.0	4.3	3.7	3.6	3.0	3.4	4.7
Luxembourg	0.6	0.5	0.4	3.3	3.2	1.3	0.8	0.9	1.0	1.1	1.2
Latvia	6.6	4.0	4.1	4.9	6.6	5.5	6.4	7.5	6.7	6.4	5.7
Malta	1.1	1.6	1.9	2.2	2.1	1.3	0.9	1.7	2.0	2.1	2.1
Netherlands	**72.0**	**81.2**	**89.6**	**99.9**	**119.3**	**110.2**	**115.2**	**117.2**	**114.3**	**121.4**	**123.6**
Poland	**134.4**	**137.0**	**143.2**	**155.4**	**157.1**	**164.3**	**166.2**	**170.0**	**169.6**	**163.3**	**157.2**
Portugal	28.3	33.1	43.1	45.9	53.4	51.0	58.8	57.4	58.1	51.5	51.3
Romania	**64.3**	**59.1**	**51.6**	**59.4**	**60.6**	**65.9**	**64.6**	**63.9**	**64.4**	**59.2**	**55.6**
Sweden	**146.0**	**148.3**	**145.2**	**158.4**	**148.4**	**162.0**	**155.9**	**164.2**	**163.4**	**168.4**	**163.8**
Slovenia	12.4	12.9	13.6	15.1	16.3	14.8	16.2	16.1	16.1	15.9	16.9
Slovakia	25.5	26.4	30.8	31.4	27.5	26.6	26.8	27.4	26.7	28.2	28.7
UK	317.8	332.5	374.4	395.4	378.9	335.3	336.3	335.1	330.5	321.7	

Table A2.7 – *Gross electricity production from cogeneration plants (TWh).*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**416.6**	**430.5**	**467.1**	**641.1**	**695.3**	**616.0**	**641.7**	**661.0**	**643.5**	**640.0**	
EU27	**406.8**	**416.0**	**440.3**	**615.3**	**670.4**	**596.9**	**621.5**	**645.9**	**628.0**	**624.8**	**595.9**
Austria	8.7	10.5	5.7	7.7	11.8	9.0	10.6	9.6	9.6	10.0	9.8
Belgium	**7.3**	**8.1**	**5.7**	**8.9**	**15.0**	**14.6**	**15.0**	**15.0**	**15.6**	**15.7**	**16.4**
Bulgaria	11.3	8.4	5.6	5.8	5.1	4.0	3.9	3.8	3.8	5.2	5.3
Cyprus	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Czechia	**10.7**	**12.3**	**17.5**	**17.5**	**13.7**	**14.4**	**14.4**	**14.1**	**13.7**	**13.7**	**14.3**
Germany	**0.0**	**0.0**	**0.0**	**87.7**	**106.1**	**114.8**	**124.5**	**132.3**	**121.9**	**119.3**	**116.5**
Denmark	23.3	31.3	29.3	29.6	30.9	14.2	17.0	15.4	15.5	12.4	11.2
Estonia	17.2	8.7	1.2	1.0	1.3	1.2	1.3	1.5	1.5	1.5	1.7
Greece	1.1	1.2	3.6	8.2	10.9	10.1	9.5	9.6	9.1	8.7	7.1
Spain	**4.4**	**9.2**	**26.1**	**33.7**	**29.1**	**29.5**	**29.8**	**32.0**	**32.9**	**33.7**	**31.1**
Finland	16.9	22.3	25.1	27.3	29.0	21.6	21.6	21.5	22.6	22.3	18.7
France	**1.2**	**2.1**	**15.7**	**24.8**	**17.9**	**18.0**	**19.6**	**20.8**	**20.9**	**22.4**	**21.8**
Croatia	1.1	1.4	1.5	2.4	3.0	1.4	1.8	3.8	3.0	3.5	4.4
Hungary	2.6	2.1	4.8	8.7	7.5	4.6	5.1	10.8	10.6	10.2	10.1
Ireland	0.2	0.2	0.6	0.6	1.9	2.2	2.2	2.2	2.2	2.1	2.1
Italy	**16.6**	**29.2**	**60.1**	**94.4**	**111.5**	**95.9**	**105.1**	**110.1**	**104.9**	**107.3**	**100.5**
Lithuania	10.9	1.3	2.3	3.4	4.0	2.8	1.8	1.3	1.1	1.2	2.6
Luxembourg	0.0	0.1	0.2	0.4	0.4	0.3	0.4	0.3	0.4	0.4	0.6
Latvia	2.2	1.0	1.3	1.5	3.0	3.5	3.8	3.0	4.2	4.2	2.9
Malta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Netherlands	**67.8**	**75.3**	**46.9**	**57.5**	**65.6**	**42.7**	**41.1**	**43.1**	**42.3**	**48.8**	**49.9**
Poland	**133.0**	**135.1**	**141.0**	**142.8**	**147.0**	**147.1**	**147.1**	**148.2**	**150.5**	**141.3**	**132.2**
Portugal	0.9	2.6	3.8	4.5	5.6	5.4	5.3	5.4	5.3	5.5	5.4
Romania	**50.2**	**31.7**	**18.9**	**17.6**	**12.8**	**9.8**	**9.1**	**9.4**	**8.5**	**7.9**	**7.1**
Sweden	**5.2**	**10.0**	**8.6**	**11.8**	**20.5**	**13.9**	**15.1**	**15.5**	**15.5**	**16.4**	**13.6**
Slovenia	4.5	4.3	4.4	5.1	5.5	5.1	5.7	5.6	1.3	1.2	1.2
Slovakia	8.6	6.3	7.2	8.2	7.0	6.5	6.6	7.0	7.0	6.2	5.8
United Kingdom	9.8	14.5	26.8	27.2	25.3	19.1	20.1	20.6	20.9	24.0	

Table A2.8 – *Gross electricity production from non-cogeneration plants (TWh).*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**1,070.1**	**1,070.2**	**1,207.4**	**1,250.4**	**1,163.6**	**974.4**	**976.3**	**982.0**	**912.0**	**835.6**	
EU27	**833.1**	**846.4**	**950.9**	**969.0**	**884.4**	**782.6**	**784.7**	**799.3**	**737.0**	**668.4**	**578.5**
Austria	9.1	7.6	12.2	18.3	15.6	9.9	8.3	11.7	10.3	10.9	8.5
Belgium	**20.0**	**23.7**	**28.4**	**27.1**	**27.8**	**18.5**	**16.5**	**17.6**	**17.6**	**18.8**	**18.9**
Bulgaria	14.3	13.8	14.2	15.1	19.9	20.9	18.2	19.8	18.8	16.3	12.5
Cyprus	2.0	2.5	3.4	4.3	5.2	4.1	4.5	4.6	4.6	4.6	4.3
Czechia	**37.3**	**33.5**	**37.8**	**34.6**	**37.0**	**34.0**	**36.3**	**36.2**	**36.3**	**34.7**	**29.0**
Germany	**377.7**	**356.2**	**371.6**	**314.0**	**306.7**	**295.5**	**295.1**	**272.0**	**263.6**	**214.9**	**184.4**
Denmark	2.1	4.2	2.5	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Estonia	0.0	0.0	7.3	9.1	11.3	8.2	10.3	10.9	10.2	5.4	3.2
Greece	37.6	43.3	52.4	51.8	40.4	30.9	34.1	36.1	32.1	28.0	27.2
Spain	**67.0**	**77.6**	**99.6**	**153.6**	**113.4**	**99.5**	**83.8**	**101.0**	**85.3**	**83.5**	**62.7**
Finland	7.4	9.6	7.4	5.8	15.3	4.4	4.8	3.6	5.3	3.6	2.7
France	**47.6**	**38.3**	**37.4**	**41.9**	**44.2**	**33.2**	**44.3**	**52.1**	**36.7**	**39.7**	**35.2**
Croatia	3.8	2.2	3.3	3.6	2.5	2.6	2.9	1.4	1.5	1.7	1.3
Hungary	11.9	17.7	16.1	13.0	13.4	8.8	9.5	4.6	4.1	5.2	5.2
Ireland	13.3	16.6	22.0	23.3	22.8	18.6	21.2	20.3	19.4	17.7	17.4
Italy	**161.7**	**166.5**	**159.6**	**157.5**	**119.0**	**95.6**	**93.6**	**98.7**	**87.2**	**87.8**	**80.4**
Lithuania	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Luxembourg	0.6	0.3	0.1	2.7	2.6	0.7	0.1	0.1	0.1	0.1	0.0
Latvia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Malta	1.1	1.6	1.9	2.2	2.1	1.2	0.7	1.5	1.8	1.9	1.9
Netherlands	**0.4**	**1.2**	**37.6**	**36.0**	**45.4**	**53.2**	**58.9**	**56.3**	**53.5**	**51.2**	**44.9**
Poland	**0.0**	**0.0**	**0.0**	**10.0**	**5.4**	**4.3**	**4.2**	**4.1**	**4.0**	**4.0**	**5.0**
Portugal	26.9	29.7	38.6	40.4	45.9	44.2	52.3	51.2	51.5	44.6	44.2
Romania	**2.7**	**10.7**	**12.4**	**16.0**	**16.0**	**18.8**	**17.8**	**19.2**	**18.8**	**15.9**	**13.0**
Sweden	**0.1**	**0.2**	**0.3**	**0.4**	**0.3**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Slovenia	0.4	0.6	0.7	0.7	0.6	0.0	0.0	0.0	4.1	4.1	4.0
Slovakia	3.0	3.8	2.5	0.7	0.6	0.5	0.4	0.3	0.6	1.8	2.1
United Kingdom	236.9	223.8	256.5	278.8	277.6	191.8	191.5	177.1	169.4	158.3	

Table A2.9 – *Heat from cogeneration plants (TWh).*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**488.8**	**418.0**	**404.7**	**517.0**	**520.8**	**454.8**	**471.9**	**466.9**	**456.2**	**450.9**	
EU27	**488.8**	**418.0**	**404.7**	**520.1**	**520.7**	**455.2**	**472.0**	**467.3**	**456.5**	**450.5**	**426.4**
Austria	4.8	6.4	8.0	10.8	13.5	13.5	14.1	14.5	13.7	14.3	13.8
Belgium	**2.6**	**2.7**	**6.0**	**8.4**	**9.4**	**7.3**	**7.0**	**6.1**	**6.7**	**5.7**	**5.6**
Bulgaria	29.9	21.7	10.4	10.7	12.3	11.0	10.3	8.9	7.3	8.0	8.0
Cyprus	-	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Czechia	**32.7**	**35.3**	**28.8**	**29.4**	**30.6**	**26.3**	**27.3**	**26.2**	**24.8**	**24.2**	**23.6**
Germany	**123.4**	**93.3**	**75.4**	**99.6**	**100.2**	**90.4**	**93.8**	**93.8**	**97.5**	**96.0**	**88.4**
Denmark	15.1	24.4	27.0	29.4	32.2	23.7	24.8	25.6	24.8	24.9	23.4
Estonia	13.7	3.4	3.1	2.6	2.9	3.1	3.3	3.0	3.8	3.7	3.6
Greece	-	-	0.3	0.6	0.5	0.6	0.6	0.6	0.6	0.6	0.6
Spain	**0.1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Finland	17.1	20.5	30.1	35.7	40.7	32.2	34.2	33.2	31.4	29.5	24.7
France	**-**	**4.5**	**35.9**	**47.0**	**24.4**	**22.3**	**25.6**	**26.5**	**23.9**	**25.5**	**25.3**
Croatia	3.3	2.9	2.4	2.7	2.6	2.5	2.5	3.0	3.0	3.2	3.4
Hungary	11.0	10.0	14.1	11.4	10.3	5.5	6.2	5.5	5.4	5.5	5.7
Ireland	-	-	-	-	-	-	-	-	-	-	-
Italy	**-**	**-**	**-**	**53.6**	**56.3**	**59.2**	**61.0**	**61.1**	**59.6**	**60.2**	**59.3**
Lithuania	9.8	6.7	5.0	6.4	6.3	3.6	3.5	3.6	3.7	3.3	3.4
Luxembourg	-	-	0.1	0.9	0.8	0.6	0.6	0.7	0.8	1.0	1.5
Latvia	6.2	4.4	3.3	4.1	4.7	5.3	6.0	3.8	4.1	3.7	3.3
Malta	-	-	-	-	-	0.0	0.0	-	0.0	0.0	-
Netherlands	**10.5**	**27.4**	**34.9**	**35.9**	**37.4**	**28.8**	**27.8**	**27.2**	**24.9**	**24.6**	**21.1**
Poland	**117.8**	**62.3**	**54.7**	**60.9**	**57.0**	**51.5**	**52.5**	**54.6**	**53.7**	**52.7**	**51.8**
Portugal	0.3	0.4	1.6	3.8	5.9	5.4	5.2	5.3	5.6	5.8	5.7
Romania	**71.7**	**61.1**	**35.3**	**27.8**	**21.9**	**17.6**	**17.5**	**16.0**	**14.3**	**12.3**	**12.2**
Sweden	**10.2**	**22.3**	**22.1**	**29.8**	**40.9**	**36.6**	**39.3**	**38.9**	**39.1**	**38.1**	**34.9**
Slovenia	1.7	1.7	1.8	2.0	2.1	2.0	2.1	2.1	2.2	2.0	2.1
Slovakia	7.0	6.4	4.4	6.6	7.7	6.3	6.7	7.1	5.6	5.5	5.3
United Kingdom	-	-	-	-	-	-	-	-	-	-	

Table A2.10 – *Heat from nuclear plants (TWh).*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**1.9**	**1.0**	**0.9**	**1.8**	**1.4**	**1.1**	**1.1**	**1.2**	**1.1**	**1.1**	
EU27	**1.9**	**1.0**	**0.8**	**1.6**	**1.1**	**1.0**	**1.0**	**0.8**	**0.8**	**0.8**	**0.7**
Austria	-	-	-	-	-	-	-	-	-	-	-
Belgium	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Bulgaria	-	-	-	-	-	-	-	-	-	-	-
Cyprus	-	-	-	-	-	-	-	-	-	-	-
Czechia	**-**	**-**	**-**	**0.3**	**0.3**	**0.2**	**0.2**	**0.3**	**0.2**	**0.2**	**0.2**
Germany	**1.2**	**0.3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Denmark	-	-	-	-	-	-	-	-	-	-	-
Estonia	-	-	-	-	-	-	-	-	-	-	-
Greece	-	-	-	-	-	-	-	-	-	-	-
Spain	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Finland	-	-	-	-	-	-	-	-	-	-	-
France	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Croatia	-	-	-	-	-	-	-	-	-	-	-
Hungary	-	-	0.2	0.2	0.1	0.2	0.2	-	-	-	-
Ireland	-	-	-	-	-	-	-	-	-	-	-
Italy	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Lithuania	0.8	0.7	0.6	0.5	-	-	-	-	-	-	-
Luxembourg	-	-	-	-	-	-	-	-	-	-	-
Latvia	-	-	-	-	-	-	-	-	-	-	-
Malta	-	-	-	-	-	-	-	-	-	-	-
Netherlands	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Poland	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Portugal	-	-	-	-	-	-	-	-	-	-	-
Romania	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Sweden	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Slovenia	-	-	-	-	-	-	-	-	-	-	-
Slovakia	-	-	-	0.6	0.7	0.5	0.5	0.6	0.5	0.5	0.5
United Kingdom	-	-	-	-	-	-	-	-	-	-	

Table A2.11 – *Gross electricity production from nuclear plants (TWh).*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**794.9**	**880.8**	**945.0**	**997.7**	**916.6**	**857.0**	**839.7**	**829.7**	**827.0**	**821.5**	
EU27	**729.1**	**791.9**	**859.9**	**916.1**	**854.5**	**786.7**	**768.0**	**759.4**	**761.9**	**765.3**	**683.5**
Austria	-	-	-	-	-	-	-	-	-	-	-
Belgium	**42.7**	**41.4**	**48.2**	**47.6**	**47.9**	**26.1**	**43.5**	**42.2**	**28.6**	**43.5**	**34.4**
Bulgaria	14.7	17.3	18.2	18.7	15.2	15.4	15.8	15.5	16.1	16.6	16.6
Cyprus	-	-	-	-	-	-	-	-	-	-	-
Czechia	**12.6**	**12.2**	**13.6**	**24.7**	**28.0**	**26.8**	**24.1**	**28.3**	**29.9**	**30.2**	**30.0**
Germany	**152.5**	**153.1**	**169.6**	**163.1**	**140.6**	**91.8**	**84.6**	**76.3**	**76.0**	**75.1**	**64.4**
Denmark	-	-	-	-	-	-	-	-	-	-	-
Estonia	-	-	-	-	-	-	-	-	-	-	-
Greece	-	-	-	-	-	-	-	-	-	-	-
Spain	**54.3**	**55.5**	**62.2**	**57.5**	**62.0**	**57.2**	**58.6**	**58.0**	**55.8**	**58.3**	**58.3**
Finland	19.2	19.2	22.5	23.3	22.8	23.2	23.2	22.5	22.8	23.9	23.3
France	**314.1**	**377.2**	**415.2**	**451.5**	**428.5**	**437.4**	**403.2**	**398.4**	**412.9**	**399.0**	**353.8**
Croatia	-	-	-	-	-	-	-	-	-	-	-
Hungary	13.7	14.0	14.2	13.8	15.8	15.8	16.1	16.1	15.7	16.3	16.1
Ireland	-	-	-	-	-	-	-	-	-	-	-
Italy	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Lithuania	17.0	11.8	8.4	10.3	-	-	-	-	-	-	-
Luxembourg	-	-	-	-	-	-	-	-	-	-	-
Latvia	-	-	-	-	-	-	-	-	-	-	-
Malta	-	-	-	-	-	-	-	-	-	-	-
Netherlands	**3.5**	**4.0**	**3.9**	**4.0**	**4.0**	**4.1**	**4.0**	**3.4**	**3.5**	**3.9**	**4.1**
Poland	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Portugal	-	-	-	-	-	-	-	-	-	-	-
Romania	**-**	**-**	**5.5**	**5.6**	**11.6**	**11.6**	**11.3**	**11.5**	**11.4**	**11.3**	**11.5**
Sweden	**68.2**	**69.9**	**57.3**	**72.4**	**57.8**	**56.3**	**63.1**	**65.7**	**68.5**	**66.1**	**49.2**
Slovenia	4.6	4.8	4.8	5.9	5.7	5.6	5.7	6.3	5.8	5.8	6.4
Slovakia	12.0	11.4	16.5	17.7	14.6	15.1	14.8	15.1	14.8	15.3	15.4
UK	65.7	89.0	85.1	81.6	62.1	70.3	71.7	70.3	65.1	56.2	

Table A2.12 – *Gross electricity production from renewable sources w/o pumping (TWh).*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**308.9**	**361.4**	**418.5**	**461.7**	**680.2**	**939.1**	**954.9**	**974.4**	**1052.6**	**1100.4**	
EU27	**303.1**	**354.5**	**408.6**	**444.8**	**654.1**	**856.5**	**871.8**	**875.5**	**940.2**	**978.1**	**1057.9**
Austria	32.6	38.9	43.4	40.9	45.0	47.6	51.1	51.1	50.1	54.6	55.4
Belgium	**0.6**	**0.7**	**1.0**	**2.1**	**6.6**	**14.5**	**14.3**	**15.8**	**17.2**	**19.5**	**23.4**
Bulgaria	1.6	2.2	2.6	4.3	5.8	8.8	7.0	6.1	9.4	7.5	7.5
Cyprus	-	-	-	0.0	0.1	0.4	0.4	0.4	0.5	0.5	0.6
Czechia	**1.2**	**2.4**	**2.3**	**3.1**	**5.9**	**9.4**	**9.4**	**9.6**	**9.4**	**10.1**	**10.3**
Germany	**19.1**	**25.9**	**35.5**	**63.4**	**105.2**	**188.8**	**189.7**	**216.3**	**222.1**	**240.3**	**250.2**
Denmark	0.8	1.9	5.6	9.8	12.4	18.9	18.4	21.8	20.8	23.1	23.5
Estonia	-	0.0	0.0	0.1	1.0	1.6	1.6	1.9	2.0	2.1	2.8
Greece	1.8	3.6	4.1	6.4	10.5	14.9	14.9	13.8	16.1	16.1	17.5
Spain	**26.0**	**24.4**	**34.5**	**42.3**	**97.8**	**97.1**	**104.6**	**87.9**	**103.9**	**101.0**	**113.8**
Finland	16.0	19.5	23.4	23.5	24.2	30.5	30.4	31.5	32.1	31.9	35.6
France	**55.8**	**75.5**	**69.4**	**56.3**	**78.2**	**91.8**	**99.0**	**92.6**	**113.6**	**113.2**	**124.7**
Croatia	3.9	5.7	6.5	7.1	9.3	7.5	8.4	7.1	9.8	8.3	8.6
Hungary	0.2	0.2	0.2	1.9	3.0	3.2	3.3	3.5	3.8	4.7	5.5
Ireland	0.7	0.7	1.2	1.9	3.7	7.9	7.5	8.9	10.2	11.8	13.5
Italy	**34.9**	**41.5**	**50.9**	**48.4**	**77.0**	**108.9**	**108.0**	**103.9**	**114.4**	**115.8**	**116.9**
Lithuania	0.4	0.4	0.3	0.5	0.9	1.7	2.1	2.5	2.2	2.5	2.6
Luxembourg	0.1	0.1	0.2	0.2	0.3	0.4	0.5	0.6	0.7	0.8	1.0
Latvia	4.5	2.9	2.8	3.4	3.6	2.8	3.5	5.5	3.5	3.2	3.6
Malta	-	-	-	-	0.0	0.1	0.1	0.2	0.2	0.2	0.2
Netherlands	**0.8**	**1.4**	**3.0**	**7.4**	**11.2**	**13.7**	**14.8**	**17.4**	**18.9**	**22.8**	**33.0**
Poland	**1.5**	**2.0**	**2.3**	**3.8**	**10.9**	**22.7**	**22.8**	**24.1**	**21.6**	**25.5**	**28.2**
Portugal	18.5	16.9	23.8	13.9	52.3	44.3	60.3	41.1	54.3	50.1	54.8
Romania	**11.4**	**16.7**	**14.8**	**20.2**	**20.3**	**26.2**	**27.0**	**24.3**	**26.2**	**24.6**	**24.6**
Sweden	**74.5**	**70.6**	**83.1**	**81.2**	**82.1**	**102.5**	**89.1**	**95.1**	**91.2**	**98.9**	**112.1**
Slovenia	3.0	3.3	3.9	3.6	4.7	4.4	5.1	4.4	5.2	5.0	5.6
Slovakia	1.9	4.9	4.6	4.7	5.9	6.0	6.6	6.5	5.8	6.6	7.0
UK	5.8	6.9	10.0	16.9	26.2	82.6	83.0	98.9	110.0	120.5	

Table A2.13 – *Share of renewable electricity production on total production, %.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**12.0%**	**13.3%**	**13.9%**	**14.0%**	**20.4%**	**29.2%**	**29.5%**	**29.8%**	**32.4%**	**34.3%**	
EU27	**13.4%**	**14.8%**	**15.5%**	**15.4%**	**22.1%**	**29.7%**	**30.1%**	**29.9%**	**32.2%**	**33.9%**	**38.4%**
Austria	66.2%	70.5%	72.5%	63.4%	66.2%	76.9%	78.3%	75.7%	77.0%	77.1%	80.1%
Belgium	**0.8%**	**0.9%**	**1.3%**	**2.5%**	**7.1%**	**21.1%**	**16.9%**	**18.5%**	**23.2%**	**21.0%**	**26.5%**
Bulgaria	3.9%	5.2%	6.5%	9.8%	12.5%	18.0%	15.8%	13.6%	20.1%	17.1%	18.6%
Cyprus	0.0%	0.0%	0.0%	0.0%	1.4%	8.8%	8.7%	8.7%	9.4%	10.0%	12.3%
Czechia	**1.9%**	**4.0%**	**3.2%**	**4.0%**	**7.2%**	**11.8%**	**11.8%**	**11.5%**	**11.1%**	**12.0%**	**13.2%**
Germany	**3.5%**	**4.9%**	**6.2%**	**10.3%**	**16.8%**	**29.4%**	**29.4%**	**33.4%**	**35.0%**	**40.0%**	**44.2%**
Denmark	3.2%	5.0%	15.5%	27.1%	32.0%	65.4%	60.2%	70.3%	68.4%	78.2%	81.6%
Estonia	0.0%	0.1%	0.2%	1.1%	8.1%	15.4%	13.0%	14.1%	16.1%	28.1%	47.8%
Greece	4.4%	7.4%	6.9%	9.7%	17.1%	26.7%	25.6%	23.4%	28.3%	30.7%	34.1%
Spain	**17.2%**	**14.7%**	**15.6%**	**14.6%**	**32.8%**	**35.0%**	**38.6%**	**32.2%**	**38.2%**	**37.3%**	**43.8%**
Finland	29.5%	30.5%	33.4%	33.2%	30.0%	44.5%	44.2%	46.6%	45.7%	46.4%	51.6%
France	**13.4%**	**15.4%**	**13.0%**	**9.9%**	**13.9%**	**16.0%**	**17.7%**	**16.6%**	**19.7%**	**20.0%**	**23.7%**
Croatia	44.3%	61.4%	57.3%	54.1%	62.8%	66.8%	66.3%	60.4%	72.2%	66.0%	64.6%
Hungary	0.7%	0.6%	0.7%	5.2%	8.1%	10.6%	10.2%	10.6%	11.7%	13.7%	15.8%
Ireland	4.9%	4.1%	5.0%	7.3%	13.2%	28.0%	24.9%	29.0%	33.0%	38.4%	42.1%
Italy	**16.4%**	**17.5%**	**18.8%**	**16.3%**	**25.8%**	**38.7%**	**37.5%**	**35.3%**	**39.7%**	**39.7%**	**42.0%**
Lithuania	1.5%	2.8%	3.1%	3.2%	18.2%	39.4%	57.0%	70.3%	73.9%	73.3%	54.4%
Luxembourg	13.2%	22.1%	40.7%	6.2%	8.3%	32.3%	58.3%	66.8%	71.5%	74.7%	79.3%
Latvia	67.6%	73.8%	68.3%	69.6%	54.9%	50.2%	54.2%	72.5%	52.0%	49.6%	63.7%
Malta	0.0%	0.0%	0.0%	0.0%	0.0%	7.8%	15.9%	10.4%	10.1%	9.8%	11.3%
Netherlands	**1.1%**	**1.7%**	**3.3%**	**7.5%**	**9.4%**	**12.4%**	**12.8%**	**14.9%**	**16.5%**	**18.8%**	**26.7%**
Poland	**1.1%**	**1.4%**	**1.6%**	**2.5%**	**6.9%**	**13.8%**	**13.7%**	**14.2%**	**12.7%**	**15.6%**	**18.0%**
Portugal	65.1%	51.0%	55.2%	30.2%	97.9%	86.8%	102.4%	71.6%	93.4%	97.4%	106.8%
Romania	**17.7%**	**28.3%**	**28.7%**	**34.0%**	**33.5%**	**39.7%**	**41.8%**	**38.0%**	**40.6%**	**41.6%**	**44.2%**
Sweden	**51.0%**	**47.6%**	**57.2%**	**51.3%**	**55.3%**	**63.3%**	**57.2%**	**57.9%**	**55.8%**	**58.7%**	**68.5%**
Slovenia	23.7%	25.2%	28.7%	23.6%	29.2%	29.4%	31.2%	27.7%	32.4%	31.7%	33.0%
Slovakia	7.4%	18.5%	15.0%	14.9%	21.6%	22.7%	24.7%	23.8%	21.8%	23.5%	24.3%
UK	1.8%	2.1%	2.7%	4.3%	6.9%	24.6%	24.7%	29.5%	33.3%	37.5%	

Table A2.14 – *GHG emissions (Mt CO_2eq) for electricity and heat production from thermoelectric plants.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**1,476.3**	**1,375.1**	**1,362.1**	**1,466.2**	**1,336.8**	**1,166.3**	**1,121.3**	**1,111.8**	**1,048.3**	**925.2**	
EU27	**1,257.4**	**1,188.6**	**1,178.6**	**1,266.3**	**1,160.4**	**1,040.5**	**1,021.5**	**1,023.5**	**966.1**	**850.8**	**737.1**
Austria	13.8	14.1	12.9	17.9	17.2	13.4	12.8	14.1	13.0	13.3	11.8
Belgium	**26.2**	**28.3**	**26.1**	**25.9**	**23.9**	**18.1**	**16.9**	**16.8**	**16.9**	**17.4**	**16.5**
Bulgaria	35.7	30.7	23.3	26.1	29.1	27.9	24.5	25.8	23.0	21.5	17.5
Cyprus	1.7	2.1	2.9	3.5	3.9	3.0	3.3	3.3	3.3	3.2	3.0
Czechia	**63.9**	**64.2**	**64.0**	**64.6**	**63.1**	**53.9**	**55.0**	**53.4**	**53.0**	**49.0**	**42.4**
Germany	**393.5**	**350.7**	**333.3**	**341.8**	**328.0**	**318.9**	**318.6**	**298.8**	**283.2**	**235.5**	**201.4**
Denmark	23.3	30.5	25.2	21.5	22.6	10.8	12.3	10.4	10.4	7.8	7.0
Estonia	23.6	12.2	10.5	11.4	13.8	10.2	11.8	12.5	11.6	6.1	3.9
Greece	35.2	36.8	44.7	47.5	41.7	30.7	27.0	30.5	29.4	24.1	18.2
Spain	**66.4**	**77.6**	**98.2**	**117.9**	**71.5**	**84.5**	**70.2**	**82.8**	**73.8**	**56.6**	**42.5**
Finland	17.8	22.9	22.3	23.2	31.7	17.3	18.3	17.5	18.5	15.9	12.6
France	**46.4**	**38.4**	**48.7**	**59.2**	**50.0**	**37.5**	**40.0**	**44.5**	**37.1**	**36.6**	**33.1**
Croatia	4.2	3.2	4.0	4.9	4.0	3.2	3.5	3.1	2.7	3.0	3.0
Hungary	19.3	20.3	21.2	17.0	15.4	10.5	10.9	10.7	10.1	9.9	9.6
Ireland	10.8	13.1	15.6	15.4	13.3	11.9	12.7	11.8	10.5	9.2	8.6
Italy	**123.3**	**130.5**	**137.1**	**160.2**	**137.1**	**110.8**	**110.5**	**110.8**	**102.9**	**98.1**	**89.1**
Lithuania	7.1	2.7	2.3	3.0	3.1	1.5	1.2	1.0	0.9	0.9	1.4
Luxembourg	1.7	0.9	0.2	1.4	1.3	0.5	0.3	0.3	0.3	0.3	0.4
Latvia	2.3	1.8	1.4	1.3	1.8	1.9	2.0	1.3	1.7	1.7	1.2
Malta	1.8	1.6	1.6	2.0	1.9	0.9	0.6	0.7	0.7	0.7	0.8
Netherlands	**45.1**	**52.6**	**53.6**	**57.7**	**61.2**	**61.7**	**60.7**	**57.9**	**53.8**	**50.7**	**43.4**
Poland	**181.5**	**150.3**	**146.7**	**154.6**	**149.6**	**143.3**	**142.2**	**143.7**	**142.1**	**130.2**	**120.1**
Portugal	15.4	19.9	22.2	25.6	15.8	19.9	18.9	22.7	19.4	14.4	11.9
Romania	**73.3**	**56.8**	**37.5**	**36.2**	**31.2**	**27.6**	**25.5**	**26.4**	**25.4**	**23.5**	**18.1**
Sweden	**5.3**	**9.1**	**8.5**	**11.0**	**13.9**	**9.6**	**10.6**	**10.9**	**11.3**	**10.8**	**9.6**
Slovenia	6.1	5.7	5.3	6.2	6.2	4.6	4.9	4.9	4.8	4.6	4.5
Slovakia	12.6	11.7	9.3	9.2	8.2	6.6	6.4	6.7	6.2	5.6	5.4
UK	221.2	187.6	183.5	200.6	177.3	125.3	100.0	88.3	81.9	74.3	

Table A2.15 – *GHG emissions (Mt CO_2eq) for electricity production in thermoelectric plants, after apportioning the energy for the heat production in cogeneration plants.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**1,223.9**	**1,185.2**	**1,197.2**	**1,270.6**	**1,145.6**	**1,006.8**	**958.2**	**951.2**	**895.4**	**778.2**	
EU27	**1,004.5**	**998.8**	**1,015.4**	**1,070.0**	**968.2**	**881.6**	**858.2**	**862.9**	**813.5**	**703.9**	**601.4**
Austria	11.2	11.2	10.4	14.8	13.7	9.8	9.1	10.3	9.5	9.6	8.3
Belgium	**25.3**	**27.3**	**24.9**	**23.5**	**21.4**	**16.0**	**14.8**	**14.9**	**14.9**	**15.5**	**14.8**
Bulgaria	23.7	19.8	18.5	21.5	24.4	23.8	20.9	22.9	20.9	19.2	15.1
Cyprus	1.7	2.1	2.9	3.5	3.9	3.0	3.3	3.3	3.3	3.2	3.0
Czechia	**46.2**	**43.3**	**49.8**	**48.4**	**46.5**	**41.5**	**42.1**	**41.6**	**41.4**	**38.0**	**31.8**
Germany	**350.7**	**322.9**	**306.6**	**308.5**	**293.8**	**288.5**	**287.4**	**267.6**	**254.0**	**207.6**	**176.6**
Denmark	15.1	20.0	16.0	12.0	12.6	4.7	5.9	4.7	5.0	3.0	2.9
Estonia	13.0	9.3	9.0	10.3	12.9	9.4	10.9	11.7	10.6	5.2	3.2
Greece	35.2	36.8	44.4	46.9	41.2	30.1	26.4	29.9	28.8	23.5	17.6
Spain	**66.4**	**77.6**	**98.1**	**117.9**	**71.5**	**84.5**	**70.2**	**82.8**	**73.8**	**56.6**	**42.5**
Finland	11.8	15.6	13.3	12.9	20.2	8.7	9.3	8.4	9.8	7.9	6.3
France	**46.4**	**37.0**	**40.9**	**45.7**	**43.2**	**31.7**	**33.6**	**38.1**	**31.2**	**30.4**	**26.9**
Croatia	3.4	2.3	3.3	4.0	3.2	2.6	2.9	2.3	1.9	2.2	2.2
Hungary	14.8	16.4	15.8	13.4	12.2	8.5	8.8	8.9	8.2	7.9	7.6
Ireland	10.8	13.1	15.6	15.4	13.3	11.9	12.7	11.8	10.5	9.2	8.6
Italy	**122.7**	**129.8**	**134.4**	**141.8**	**116.8**	**91.4**	**89.8**	**90.5**	**83.5**	**78.4**	**70.2**
Lithuania	3.7	0.5	0.8	1.2	1.3	0.7	0.5	0.3	0.2	0.3	0.7
Luxembourg	1.7	0.9	0.2	1.2	1.1	0.4	0.2	0.2	0.2	0.2	0.2
Latvia	0.6	0.3	0.4	0.4	0.7	0.7	0.8	0.6	0.9	1.0	0.6
Malta	1.8	1.6	1.6	2.0	1.9	0.9	0.6	0.7	0.7	0.7	0.8
Netherlands	**40.9**	**42.1**	**42.1**	**45.7**	**48.4**	**53.3**	**52.5**	**49.6**	**46.2**	**43.3**	**36.9**
Poland	**110.6**	**108.0**	**110.0**	**115.3**	**112.5**	**109.5**	**108.2**	**109.0**	**108.5**	**98.2**	**90.2**
Portugal	15.2	19.6	21.5	24.3	14.1	18.4	17.5	21.3	17.9	12.8	10.3
Romania	**16.9**	**25.5**	**20.6**	**24.8**	**23.0**	**21.2**	**19.3**	**20.8**	**20.4**	**19.1**	**14.2**
Sweden	**1.8**	**3.5**	**3.3**	**3.7**	**5.1**	**2.8**	**3.0**	**3.2**	**3.4**	**3.6**	**2.9**
Slovenia	4.6	4.4	4.4	5.1	5.1	3.7	4.0	4.0	3.9	3.8	3.7
Slovakia	8.4	7.8	6.7	6.1	4.3	3.7	3.5	3.6	3.7	3.4	3.2
UK	219.4	186.4	181.8	200.6	177.3	125.3	100.0	88.3	81.9	74.3	

Table A2.16 – *GHG emission factors in the thermoelectric plants for electricity and heat production (g CO_2eq / kWh).*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**747.3**	**716.7**	**655.1**	**608.7**	**561.7**	**570.2**	**536.5**	**526.9**	**521.1**	**480.3**	
EU27	**727.3**	**707.3**	**656.3**	**601.8**	**559.1**	**567.1**	**543.8**	**535.2**	**530.4**	**487.9**	**460.5**
Austria	613.4	577.3	495.6	486.1	420.4	413.6	386.0	394.1	386.1	379.1	366.6
Belgium	**877.9**	**818.9**	**649.2**	**584.2**	**457.1**	**449.0**	**437.3**	**433.8**	**425.4**	**431.7**	**403.2**
Bulgaria	642.8	698.4	770.7	823.8	781.0	777.6	757.9	795.4	766.6	727.6	677.0
Cyprus	858.2	842.0	857.8	807.5	730.1	717.5	722.4	706.6	712.1	691.3	693.6
Czechia	**791.8**	**791.2**	**760.7**	**792.6**	**775.7**	**722.4**	**704.8**	**698.9**	**708.2**	**675.0**	**635.1**
Germany	**785.3**	**780.3**	**745.8**	**681.9**	**639.2**	**636.9**	**620.5**	**600.0**	**586.4**	**547.4**	**517.4**
Denmark	576.8	509.6	429.0	364.8	357.1	283.7	293.3	253.9	258.6	210.3	203.2
Estonia	765.1	1,004.6	904.2	895.9	885.0	814.6	791.8	810.5	749.5	574.6	460.3
Greece	909.0	827.3	793.9	783.4	806.3	739.2	610.1	660.1	703.2	646.8	522.2
Spain	**929.3**	**894.1**	**780.8**	**629.3**	**502.3**	**655.2**	**618.2**	**622.2**	**624.8**	**483.3**	**453.1**
Finland	428.9	436.7	356.3	337.5	372.6	298.0	302.6	300.3	311.8	286.3	272.9
France	**952.2**	**856.6**	**547.4**	**520.1**	**578.9**	**510.1**	**446.7**	**448.2**	**454.7**	**417.3**	**401.4**
Croatia	510.6	496.3	554.9	555.1	491.0	498.2	487.3	386.2	359.9	360.7	334.8
Hungary	755.4	680.6	608.2	513.5	492.1	555.5	522.3	511.6	502.6	471.5	457.7
Ireland	796.9	775.5	689.7	643.2	537.9	573.5	543.1	525.6	485.1	465.6	444.2
Italy	**691.8**	**666.4**	**623.9**	**524.3**	**478.3**	**442.1**	**425.4**	**410.4**	**408.9**	**384.4**	**371.0**
Lithuania	342.8	337.5	320.9	309.4	302.9	242.6	234.7	199.5	193.1	189.3	233.4
Luxembourg	3,128.6	2,280.2	562.4	335.0	332.7	307.1	267.9	255.1	233.2	212.7	187.0
Latvia	274.1	324.0	298.5	237.9	236.7	215.4	203.9	187.4	210.9	213.9	195.6
Malta	1,605.0	977.9	838.6	883.9	884.1	704.1	766.3	477.0	397.2	401.7	431.3
Netherlands	**572.8**	**505.9**	**449.0**	**446.2**	**412.3**	**494.7**	**475.3**	**457.1**	**445.9**	**407.4**	**374.4**
Poland	**723.8**	**761.0**	**749.8**	**724.0**	**714.6**	**705.8**	**697.9**	**694.5**	**683.1**	**657.8**	**635.3**
Portugal	546.4	607.5	504.6	524.5	275.6	361.0	301.6	367.5	311.2	258.0	215.1
Romania	**588.0**	**548.5**	**562.5**	**589.2**	**615.2**	**596.1**	**575.7**	**591.5**	**610.7**	**651.7**	**562.3**
Sweden	**343.0**	**280.8**	**274.8**	**262.6**	**225.0**	**189.7**	**195.2**	**200.2**	**206.9**	**198.0**	**198.7**
Slovenia	933.8	866.5	781.1	794.2	751.3	646.8	629.2	638.6	637.9	627.7	618.1
Slovakia	679.3	708.9	655.1	592.6	532.4	493.2	467.6	462.9	468.9	414.8	405.9
United Kingdom	896.2	787.2	647.8	655.8	585.6	593.9	472.5	446.6	430.2	407.7	

Table A2.17 – *GHG emission factors in the electricity sector for electricity and heat production (g CO_2eq / kWh).*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**481.3**	**437.8**	**399.3**	**384.8**	**346.4**	**317.7**	**302.2**	**297.6**	**282.8**	**253.0**	
EU27	**457.3**	**423.2**	**388.2**	**370.7**	**333.6**	**311.9**	**302.7**	**300.9**	**286.4**	**255.2**	**231.4**
Austria	256.0	229.8	189.5	238.0	211.2	177.9	160.8	172.3	164.9	156.5	142.2
Belgium	**360.0**	**370.9**	**293.5**	**279.5**	**232.7**	**238.9**	**184.3**	**183.3**	**210.0**	**176.2**	**175.5**
Bulgaria	497.0	484.2	456.3	477.5	499.8	466.4	447.2	480.2	425.9	415.2	362.0
Cyprus	858.2	842.0	857.8	807.3	724.9	662.5	667.5	652.6	653.1	630.1	617.1
Czechia	**676.5**	**673.1**	**643.4**	**592.9**	**556.1**	**506.6**	**513.4**	**486.6**	**483.0**	**452.7**	**414.7**
Germany	**585.3**	**559.9**	**514.6**	**477.5**	**451.2**	**435.2**	**431.3**	**403.0**	**387.0**	**337.9**	**307.7**
Denmark	567.9	499.3	399.7	327.9	317.7	204.2	221.5	184.2	188.9	144.0	134.8
Estonia	765.1	1,004.4	903.8	890.6	868.1	769.1	759.1	772.3	717.8	535.1	412.2
Greece	869.2	766.0	739.5	709.8	672.0	546.8	458.5	510.9	510.1	455.3	350.8
Spain	**439.3**	**468.5**	**444.3**	**407.2**	**239.8**	**304.3**	**258.9**	**303.1**	**271.4**	**208.9**	**163.5**
Finland	248.4	270.7	223.1	218.5	261.1	172.0	178.1	173.6	182.0	161.6	134.3
France	**111.3**	**77.5**	**85.3**	**95.7**	**85.0**	**62.8**	**68.4**	**76.3**	**61.8**	**61.8**	**59.8**
Croatia	345.7	265.5	293.6	307.4	229.7	234.6	232.0	213.6	162.2	190.8	182.2
Hungary	488.8	461.3	429.5	359.1	321.1	291.2	283.7	278.4	270.0	248.0	237.1
Ireland	757.9	743.4	657.9	599.4	472.7	422.8	420.3	386.0	338.2	299.7	270.1
Italy	**578.7**	**549.6**	**507.7**	**457.2**	**386.2**	**325.2**	**316.6**	**312.0**	**296.1**	**278.6**	**263.6**
Lithuania	182.2	129.0	139.4	142.6	275.6	196.5	171.9	136.6	138.6	128.3	170.4
Luxembourg	2,777.6	1,868.2	413.8	322.0	317.6	258.6	206.5	185.2	169.9	159.7	145.2
Latvia	178.3	210.2	185.8	148.6	161.9	175.4	160.3	112.8	161.1	166.2	135.0
Malta	1,605.0	977.9	838.6	883.9	883.8	652.9	652.0	430.1	358.7	363.6	383.6
Netherlands	**546.3**	**484.0**	**430.4**	**425.0**	**390.6**	**444.0**	**424.9**	**400.8**	**386.8**	**347.5**	**300.0**
Poland	**719.7**	**753.8**	**741.8**	**715.2**	**699.0**	**663.7**	**650.3**	**639.8**	**636.6**	**602.9**	**574.6**
Portugal	536.3	591.8	497.3	514.3	267.1	352.1	295.5	362.6	304.7	252.0	208.8
Romania	**538.7**	**472.3**	**431.5**	**415.2**	**378.0**	**329.8**	**311.1**	**330.5**	**322.7**	**329.0**	**267.6**
Sweden	**34.0**	**53.5**	**50.9**	**58.7**	**73.2**	**48.3**	**54.4**	**53.7**	**55.8**	**52.2**	**48.5**
Slovenia	432.7	390.9	345.5	359.9	334.9	271.7	268.3	271.3	263.3	256.5	238.2
Slovakia	388.6	356.3	262.7	239.5	227.1	196.0	187.9	190.8	187.7	163.2	155.5
United Kingdom	696.0	564.2	490.2	507.4	468.0	373.5	297.3	263.6	247.8	231.0	

Table A2.18 – *GHG emission factors in the electricity sector for electricity and heat production w/o nuclear energy (g CO_2eq / kWh).*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**650.3**	**608.6**	**552.6**	**521.7**	**454.6**	**414.6**	**390.8**	**382.7**	**364.1**	**326.4**	
EU27	**623.0**	**589.6**	**541.7**	**506.8**	**442.5**	**408.4**	**392.1**	**387.6**	**370.0**	**331.4**	**294.8**
Austria	256.0	229.8	189.5	238.0	211.2	177.9	160.8	172.3	164.9	156.5	142.2
Belgium	**870.0**	**810.8**	**641.6**	**574.0**	**436.8**	**364.1**	**351.5**	**340.2**	**325.3**	**315.9**	**277.0**
Bulgaria	624.5	665.5	709.0	725.2	676.8	628.3	627.6	675.4	607.8	609.8	552.5
Cyprus	858.2	842.0	857.8	807.3	724.9	662.5	667.5	652.6	653.1	630.1	617.1
Czechia	**780.6**	**772.1**	**745.2**	**769.9**	**740.9**	**679.5**	**664.5**	**657.9**	**666.1**	**630.3**	**588.8**
Germany	**758.8**	**741.5**	**697.2**	**618.3**	**559.3**	**497.5**	**487.1**	**449.3**	**431.8**	**378.7**	**341.3**
Denmark	567.9	499.3	399.7	327.9	317.7	204.2	221.5	184.2	188.9	144.0	134.8
Estonia	765.1	1,004.4	903.8	890.6	868.1	769.1	759.1	772.3	717.8	535.1	412.2
Greece	869.2	766.0	739.5	709.8	672.0	546.8	458.5	510.9	510.1	455.3	350.8
Spain	**685.1**	**704.4**	**618.5**	**508.3**	**302.7**	**383.2**	**330.2**	**385.0**	**341.4**	**266.2**	**210.8**
Finland	339.8	350.3	287.7	279.7	321.5	223.6	229.9	223.5	234.6	213.6	178.8
France	**450.2**	**324.3**	**312.5**	**354.9**	**312.1**	**235.1**	**220.3**	**240.8**	**197.9**	**189.8**	**166.3**
Croatia	345.7	265.5	293.6	307.4	229.7	234.6	232.0	213.6	162.2	190.8	182.2
Hungary	750.2	676.9	605.1	510.2	480.9	524.1	492.4	479.3	465.4	419.8	392.1
Ireland	757.9	743.4	657.9	599.4	472.7	422.8	420.3	386.0	338.2	299.7	270.1
Italy	**578.7**	**549.6**	**507.7**	**457.2**	**386.2**	**325.2**	**316.6**	**312.0**	**296.1**	**278.6**	**263.6**
Lithuania	335.5	321.3	302.9	290.2	275.6	196.5	171.9	136.6	138.6	128.3	170.4
Luxembourg	2,777.6	1,868.2	413.8	322.0	317.6	258.6	206.5	185.2	169.9	159.7	145.2
Latvia	178.3	210.2	185.8	148.6	161.9	175.4	160.3	112.8	161.1	166.2	135.0
Malta	1,605.0	977.9	838.6	883.9	883.8	652.9	652.0	430.1	358.7	363.6	383.6
Netherlands	**570.5**	**502.6**	**444.4**	**437.9**	**400.7**	**457.4**	**437.0**	**410.5**	**396.9**	**357.1**	**308.7**
Poland	**719.7**	**753.8**	**741.8**	**715.2**	**699.0**	**663.7**	**650.3**	**639.8**	**636.6**	**602.9**	**574.6**
Portugal	536.3	591.8	497.3	514.3	267.1	352.1	295.5	362.6	304.7	252.0	208.8
Romania	**538.7**	**472.3**	**460.4**	**443.4**	**439.9**	**383.2**	**360.6**	**386.1**	**377.2**	**390.6**	**322.1**
Sweden	**60.4**	**90.6**	**77.4**	**95.4**	**105.4**	**67.4**	**80.5**	**79.4**	**84.4**	**76.8**	**64.5**
Slovenia	643.4	580.5	499.9	548.9	483.8	409.5	390.2	414.9	384.8	379.7	358.1
Slovakia	617.0	547.0	493.8	456.2	395.2	369.0	341.8	344.3	353.3	302.9	289.4
United Kingdom	877.6	770.3	634.3	639.4	559.8	472.7	378.0	333.6	308.5	279.9	

Table A2.19 – *GHG emission factors in the thermoelectric plants for electricity production (g CO_2eq / kWh).*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**823.2**	**789.7**	**715.0**	**671.7**	**616.2**	**633.1**	**592.2**	**578.9**	**575.6**	**527.4**	
EU27	**810.1**	**791.2**	**729.9**	**675.4**	**622.7**	**639.1**	**610.3**	**597.1**	**595.9**	**544.3**	**512.0**
Austria	627.9	619.8	580.9	568.2	500.0	520.2	481.4	481.5	478.2	460.8	449.9
Belgium	**925.2**	**859.2**	**730.6**	**653.3**	**499.2**	**482.4**	**467.7**	**456.9**	**450.1**	**450.1**	**418.6**
Bulgaria	925.8	890.6	932.3	1,025.9	977.2	959.9	946.3	967.1	925.9	887.8	845.8
Cyprus	858.2	842.0	857.8	807.5	730.3	719.9	724.6	708.9	714.4	693.4	695.3
Czechia	**964.3**	**945.2**	**900.6**	**928.8**	**918.4**	**858.6**	**831.9**	**826.3**	**828.8**	**786.5**	**735.6**
Germany	**928.5**	**906.6**	**825.1**	**767.9**	**711.7**	**703.1**	**685.0**	**662.0**	**658.9**	**621.1**	**587.0**
Denmark	594.7	563.0	503.8	405.0	405.8	330.5	347.9	301.2	320.6	243.9	258.5
Estonia	759.5	1,065.3	1,057.1	1,013.1	1,015.2	999.2	948.2	944.8	907.3	757.5	638.0
Greece	908.9	827.3	793.7	782.0	804.3	735.2	604.8	655.8	698.5	640.9	514.7
Spain	**929.4**	**894.0**	**780.6**	**629.3**	**502.3**	**655.2**	**618.2**	**622.2**	**624.8**	**483.3**	**453.1**
Finland	485.3	489.8	409.2	389.1	455.7	335.8	353.4	337.0	350.9	304.2	295.5
France	**952.2**	**918.0**	**771.1**	**684.9**	**696.0**	**620.3**	**525.8**	**522.4**	**541.6**	**489.3**	**471.7**
Croatia	679.1	632.9	681.2	665.1	578.7	652.8	621.9	451.8	437.8	433.2	386.8
Hungary	1,015.7	826.5	757.3	615.8	583.7	636.1	605.3	576.6	559.6	512.2	497.1
Ireland	796.9	775.5	689.7	643.2	537.9	573.5	543.1	525.6	485.1	465.6	444.2
Italy	**688.5**	**663.2**	**611.8**	**562.8**	**506.8**	**477.3**	**452.0**	**433.2**	**434.5**	**402.1**	**388.1**
Lithuania	339.6	374.0	335.4	341.6	320.6	262.3	260.9	222.0	210.9	218.3	261.4
Luxembourg	3,128.6	2,280.2	646.6	363.3	360.2	355.1	329.4	325.6	310.1	293.3	240.7
Latvia	276.5	323.3	289.2	233.6	232.6	212.6	201.8	192.0	226.3	235.3	216.3
Malta	1,605.0	977.9	838.6	883.9	884.1	705.1	767.2	477.0	397.2	401.7	431.3
Netherlands	**600.5**	**550.8**	**497.8**	**488.6**	**435.9**	**555.6**	**524.8**	**499.2**	**481.9**	**432.9**	**389.6**
Poland	**831.2**	**799.3**	**779.7**	**755.2**	**738.2**	**722.9**	**715.2**	**715.9**	**702.9**	**676.1**	**657.0**
Portugal	546.2	605.9	506.2	540.1	274.0	370.2	304.2	376.5	314.7	256.2	208.2
Romania	**319.4**	**601.9**	**657.4**	**736.6**	**797.8**	**739.8**	**720.0**	**724.5**	**747.6**	**803.7**	**706.4**
Sweden	**332.3**	**342.8**	**374.3**	**302.8**	**244.6**	**202.6**	**196.8**	**205.4**	**215.7**	**218.0**	**210.8**
Slovenia	946.0	892.5	872.3	875.7	841.5	732.0	703.8	716.6	728.6	721.2	712.5
Slovakia	728.3	774.6	693.9	680.4	567.8	534.7	495.3	494.6	494.4	422.4	410.3
United Kingdom	889.1	782.3	641.6	655.8	585.6	593.9	472.5	446.6	430.2	407.7	

Table A2.20 – *GHG emission factors in the electricity sector for electricity production (g CO_2eq / kWh).*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**475.1**	**435.4**	**398.4**	**386.1**	**343.4**	**313.2**	**296.0**	**291.1**	**275.5**	**242.8**	
EU27	**444.7**	**417.9**	**386.0**	**369.7**	**327.5**	**306.2**	**295.8**	**294.2**	**278.9**	**244.3**	**218.1**
Austria	226.6	203.4	174.1	229.4	201.7	159.1	139.8	152.1	146.3	135.7	119.4
Belgium	**359.3**	**371.8**	**301.3**	**278.6**	**229.4**	**232.6**	**174.7**	**174.3**	**201.7**	**167.4**	**167.1**
Bulgaria	565.7	475.0	454.5	489.9	531.2	489.3	468.8	508.5	449.6	436.8	374.5
Cyprus	858.2	842.0	857.8	807.3	725.0	664.6	669.4	654.5	655.1	631.8	618.4
Czechia	**749.4**	**721.2**	**705.0**	**610.9**	**564.1**	**519.7**	**530.1**	**498.4**	**489.5**	**454.2**	**405.1**
Germany	**640.3**	**606.1**	**535.7**	**500.5**	**468.8**	**449.1**	**445.7**	**413.2**	**400.4**	**345.4**	**312.0**
Denmark	580.1	544.2	443.5	330.8	324.0	162.0	193.6	150.2	163.7	102.4	100.8
Estonia	759.5	1,065.1	1,056.5	1,005.6	991.4	926.2	898.4	890.0	857.3	679.9	531.2
Greece	869.1	766.0	739.0	707.9	669.2	541.9	453.0	506.1	504.6	449.0	343.7
Spain	**439.1**	**468.5**	**444.2**	**407.2**	**239.8**	**304.3**	**258.9**	**303.1**	**271.4**	**208.9**	**163.5**
Finland	216.9	243.9	190.4	182.5	250.5	127.3	135.7	124.9	139.6	114.9	91.7
France	**111.3**	**75.4**	**76.5**	**80.0**	**76.5**	**55.3**	**60.1**	**68.4**	**54.2**	**53.7**	**51.0**
Croatia	378.9	245.1	290.9	306.2	216.3	232.0	230.9	199.1	143.3	177.5	165.5
Hungary	518.9	481.8	448.3	373.9	326.3	280.7	276.7	269.9	257.0	230.5	218.6
Ireland	757.9	743.4	657.9	599.4	472.7	422.8	420.3	386.0	338.2	299.7	270.1
Italy	**575.9**	**546.9**	**497.8**	**477.7**	**391.0**	**324.6**	**311.9**	**307.7**	**289.9**	**268.6**	**251.9**
Lithuania	130.6	35.9	68.5	81.2	255.5	170.1	124.2	81.5	77.0	78.4	140.7
Luxembourg	2,777.6	1,868.2	417.8	345.6	339.7	274.0	196.3	170.2	158.9	150.6	122.7
Latvia	89.5	84.7	91.8	73.0	107.3	135.5	118.3	76.5	140.3	152.5	111.1
Malta	1,605.0	977.9	838.6	883.9	883.8	653.7	652.7	430.1	358.8	363.6	383.6
Netherlands	**568.7**	**518.8**	**469.2**	**457.1**	**405.6**	**483.7**	**455.7**	**423.5**	**404.1**	**356.4**	**299.0**
Poland	**822.3**	**788.3**	**768.2**	**742.3**	**716.2**	**666.3**	**651.0**	**641.4**	**639.9**	**601.5**	**573.5**
Portugal	536.0	590.1	498.6	528.8	264.6	360.2	297.5	371.0	307.5	249.6	201.5
Romania	**262.8**	**431.8**	**399.4**	**417.2**	**379.1**	**321.0**	**299.5**	**324.9**	**316.8**	**323.0**	**255.1**
Sweden	**12.0**	**23.5**	**22.9**	**23.4**	**34.1**	**17.4**	**19.1**	**19.4**	**20.6**	**21.2**	**17.5**
Slovenia	370.4	337.4	321.9	334.3	314.0	251.0	248.7	250.4	243.6	239.8	220.9
Slovakia	330.8	296.4	218.3	194.5	156.5	140.7	129.6	132.8	139.7	119.0	113.1
United Kingdom	690.5	560.6	485.5	507.4	468.0	373.5	297.3	263.6	247.8	231.0	

Table A2.21 – *GHG emission factors in the electricity sector for electricity production w/o nuclear energy (g CO_2eq / kWh).*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**687.0**	**643.6**	**581.1**	**554.0**	**473.4**	**427.0**	**399.6**	**390.1**	**369.6**	**326.5**	
EU27	**656.8**	**625.1**	**573.4**	**540.8**	**460.7**	**421.3**	**402.3**	**397.0**	**377.5**	**332.6**	**289.9**
Austria	226.6	203.4	174.1	229.4	201.7	159.1	139.8	152.1	146.3	135.7	119.4
Belgium	**916.0**	**849.9**	**720.6**	**639.3**	**472.4**	**375.5**	**360.3**	**344.5**	**328.6**	**315.3**	**273.9**
Bulgaria	870.3	811.2	822.9	851.3	794.7	714.9	725.5	777.3	687.7	701.7	637.8
Cyprus	858.2	842.0	857.8	807.3	725.0	664.6	669.4	654.5	655.1	631.8	618.4
Czechia	**941.5**	**905.6**	**872.8**	**887.9**	**853.9**	**782.4**	**760.9**	**754.9**	**757.3**	**710.9**	**656.0**
Germany	**887.4**	**850.5**	**761.3**	**680.5**	**604.3**	**524.0**	**513.1**	**468.4**	**454.9**	**394.7**	**352.0**
Denmark	580.1	544.2	443.5	330.8	324.0	162.0	193.6	150.2	163.7	102.4	100.8
Estonia	759.5	1,065.1	1,056.5	1,005.6	991.4	926.2	898.4	890.0	857.3	679.9	531.2
Greece	869.1	766.0	739.0	707.9	669.2	541.9	453.0	506.1	504.6	449.0	343.7
Spain	**685.0**	**704.3**	**618.3**	**508.3**	**302.7**	**383.2**	**330.2**	**385.0**	**341.4**	**266.2**	**210.8**
Finland	335.4	348.5	280.6	272.3	349.2	192.5	204.8	187.3	206.7	176.1	138.4
France	**450.2**	**324.9**	**341.1**	**382.0**	**317.7**	**231.6**	**215.5**	**240.2**	**191.0**	**181.8**	**155.1**
Croatia	378.9	245.1	290.9	306.2	216.3	232.0	230.9	199.1	143.3	177.5	165.5
Hungary	1,003.5	819.8	750.8	609.8	564.2	586.6	557.0	528.3	504.5	439.0	404.5
Ireland	757.9	743.4	657.9	599.4	472.7	422.8	420.3	386.0	338.2	299.7	270.1
Italy	**575.9**	**546.9**	**497.8**	**477.7**	**391.0**	**324.6**	**311.9**	**307.7**	**289.9**	**268.6**	**251.9**
Lithuania	326.1	285.5	281.9	286.9	255.5	170.1	124.2	81.5	77.0	78.4	140.7
Luxembourg	2,777.6	1,868.2	417.8	345.6	339.7	274.0	196.3	170.2	158.9	150.6	122.7
Latvia	89.5	84.7	91.8	73.0	107.3	135.5	118.3	76.5	140.3	152.5	111.1
Malta	1,605.0	977.9	838.6	883.9	883.8	653.7	652.7	430.1	358.8	363.6	383.6
Netherlands	**597.8**	**545.8**	**490.7**	**476.2**	**419.6**	**502.3**	**472.0**	**436.1**	**416.9**	**368.3**	**309.2**
Poland	**822.3**	**788.3**	**768.2**	**742.3**	**716.2**	**666.3**	**651.0**	**641.4**	**639.9**	**601.5**	**573.5**
Portugal	536.0	590.1	498.6	528.8	264.6	360.2	297.5	371.0	307.5	249.6	201.5
Romania	**262.8**	**431.8**	**446.6**	**460.2**	**469.0**	**389.9**	**362.9**	**396.2**	**384.7**	**399.0**	**321.4**
Sweden	**22.6**	**44.4**	**37.8**	**43.1**	**55.9**	**26.7**	**32.1**	**32.4**	**35.4**	**34.9**	**25.1**
Slovenia	589.2	535.7	494.9	547.4	481.7	405.7	383.9	411.6	379.5	378.4	353.9
Slovakia	626.6	522.5	470.0	447.5	333.6	326.3	288.5	294.8	314.9	259.7	245.3
United Kingdom	870.7	765.5	628.2	639.4	559.8	472.7	378.0	333.6	308.5	279.9	

Table A2.22 – *Total efficiency of the thermoelectric plants.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**0.438**	**0.445**	**0.469**	**0.484**	**0.498**	**0.494**	**0.509**	**0.511**	**0.513**	**0.528**	
EU27	**0.448**	**0.453**	**0.476**	**0.494**	**0.507**	**0.503**	**0.514**	**0.516**	**0.518**	**0.535**	**0.543**
Austria	0.468	0.461	0.551	0.558	0.601	0.597	0.621	0.611	0.619	0.641	0.641
Belgium	**0.392**	**0.415**	**0.490**	**0.487**	**0.531**	**0.546**	**0.559**	**0.563**	**0.569**	**0.569**	**0.569**
Bulgaria	0.496	0.466	0.440	0.418	0.441	0.446	0.452	0.433	0.426	0.440	0.463
Cyprus	0.326	0.332	0.326	0.346	0.379	0.385	0.382	0.388	0.385	0.397	0.393
Czechia	**0.466**	**0.459**	**0.479**	**0.459**	**0.471**	**0.481**	**0.491**	**0.491**	**0.487**	**0.499**	**0.517**
Germany	**0.435**	**0.436**	**0.454**	**0.472**	**0.481**	**0.478**	**0.483**	**0.493**	**0.500**	**0.513**	**0.518**
Denmark	0.577	0.608	0.644	0.711	0.713	0.795	0.778	0.803	0.796	0.854	0.843
Estonia	0.484	0.371	0.407	0.409	0.406	0.408	0.427	0.415	0.429	0.473	0.495
Greece	0.328	0.352	0.367	0.373	0.368	0.390	0.451	0.407	0.382	0.385	0.436
Spain	**0.365**	**0.369**	**0.408**	**0.454**	**0.487**	**0.428**	**0.438**	**0.435**	**0.431**	**0.483**	**0.487**
Finland	0.676	0.667	0.749	0.757	0.714	0.789	0.795	0.787	0.759	0.783	0.781
France	**0.381**	**0.397**	**0.575**	**0.540**	**0.437**	**0.489**	**0.520**	**0.526**	**0.528**	**0.546**	**0.552**
Croatia	0.506	0.532	0.481	0.497	0.545	0.534	0.530	0.578	0.593	0.587	0.601
Hungary	0.411	0.441	0.499	0.504	0.514	0.488	0.507	0.504	0.510	0.525	0.530
Ireland	0.382	0.385	0.403	0.427	0.461	0.467	0.476	0.476	0.491	0.487	0.489
Italy	**0.408**	**0.414**	**0.419**	**0.484**	**0.504**	**0.520**	**0.531**	**0.537**	**0.536**	**0.546**	**0.550**
Lithuania	0.682	0.725	0.683	0.691	0.675	0.763	0.779	0.821	0.849	0.851	0.757
Luxembourg	0.254	0.255	0.370	0.602	0.602	0.617	0.669	0.677	0.693	0.715	0.759
Latvia	0.809	0.783	0.773	0.838	0.842	0.776	0.809	0.784	0.753	0.743	0.752
Malta	0.188	0.290	0.331	0.315	0.314	0.394	0.362	0.451	0.510	0.507	0.478
Netherlands	**0.484**	**0.537**	**0.578**	**0.568**	**0.591**	**0.556**	**0.562**	**0.572**	**0.580**	**0.592**	**0.597**
Poland	**0.486**	**0.460**	**0.463**	**0.473**	**0.470**	**0.471**	**0.477**	**0.483**	**0.488**	**0.497**	**0.506**
Portugal	0.488	0.459	0.514	0.506	0.659	0.609	0.650	0.600	0.636	0.679	0.719
Romania	**0.469**	**0.537**	**0.537**	**0.523**	**0.517**	**0.519**	**0.527**	**0.509**	**0.492**	**0.466**	**0.511**
Sweden	**0.864**	**0.857**	**0.816**	**0.808**	**0.821**	**0.845**	**0.845**	**0.827**	**0.823**	**0.805**	**0.794**
Slovenia	0.378	0.409	0.450	0.442	0.451	0.518	0.535	0.524	0.525	0.529	0.532
Slovakia	0.475	0.434	0.475	0.533	0.551	0.533	0.554	0.567	0.556	0.586	0.572
United Kingdom	0.374	0.389	0.430	0.424	0.441	0.428	0.464	0.469	0.471	0.475	

Table A2.23 – *Electrical efficiency of the thermoelectric plants.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**0.329**	**0.348**	**0.378**	**0.380**	**0.389**	**0.384**	**0.394**	**0.398**	**0.397**	**0.405**	
EU27	**0.321**	**0.341**	**0.368**	**0.372**	**0.380**	**0.378**	**0.385**	**0.390**	**0.388**	**0.397**	**0.398**
Austria	0.369	0.340	0.381	0.394	0.402	0.348	0.356	0.363	0.366	0.381	0.366
Belgium	**0.358**	**0.382**	**0.417**	**0.395**	**0.435**	**0.447**	**0.457**	**0.474**	**0.474**	**0.488**	**0.490**
Bulgaria	0.229	0.235	0.289	0.277	0.296	0.309	0.308	0.315	0.322	0.320	0.320
Cyprus	0.326	0.332	0.326	0.346	0.379	0.384	0.380	0.387	0.384	0.395	0.392
Czechia	**0.277**	**0.259**	**0.315**	**0.294**	**0.294**	**0.312**	**0.319**	**0.323**	**0.325**	**0.333**	**0.335**
Germany	**0.328**	**0.346**	**0.378**	**0.378**	**0.387**	**0.392**	**0.395**	**0.400**	**0.399**	**0.399**	**0.400**
Denmark	0.362	0.361	0.348	0.357	0.350	0.297	0.316	0.302	0.306	0.284	0.273
Estonia	0.269	0.266	0.299	0.324	0.329	0.307	0.332	0.333	0.324	0.306	0.288
Greece	0.328	0.352	0.365	0.369	0.364	0.384	0.445	0.401	0.376	0.379	0.428
Spain	**0.365**	**0.369**	**0.408**	**0.454**	**0.487**	**0.428**	**0.438**	**0.435**	**0.431**	**0.483**	**0.487**
Finland	0.397	0.406	0.389	0.365	0.372	0.352	0.346	0.338	0.358	0.367	0.363
France	**0.381**	**0.357**	**0.343**	**0.317**	**0.314**	**0.341**	**0.372**	**0.386**	**0.373**	**0.387**	**0.382**
Croatia	0.305	0.292	0.319	0.342	0.370	0.331	0.344	0.368	0.351	0.363	0.376
Hungary	0.234	0.293	0.298	0.331	0.343	0.347	0.355	0.371	0.373	0.387	0.387
Ireland	0.382	0.385	0.403	0.427	0.461	0.467	0.476	0.476	0.491	0.487	0.489
Italy	**0.408**	**0.414**	**0.419**	**0.399**	**0.405**	**0.397**	**0.406**	**0.415**	**0.409**	**0.417**	**0.414**
Lithuania	0.360	0.117	0.214	0.240	0.262	0.330	0.258	0.219	0.192	0.227	0.327
Luxembourg	0.254	0.255	0.243	0.475	0.474	0.391	0.293	0.280	0.271	0.251	0.227
Latvia	0.208	0.150	0.218	0.229	0.333	0.311	0.311	0.344	0.380	0.393	0.356
Malta	0.188	0.290	0.331	0.315	0.314	0.394	0.362	0.451	0.510	0.507	0.478
Netherlands	**0.419**	**0.395**	**0.409**	**0.410**	**0.442**	**0.427**	**0.440**	**0.449**	**0.460**	**0.475**	**0.489**
Poland	**0.258**	**0.315**	**0.334**	**0.338**	**0.342**	**0.351**	**0.354**	**0.356**	**0.362**	**0.365**	**0.367**
Portugal	0.482	0.453	0.496	0.466	0.592	0.549	0.596	0.548	0.579	0.609	0.645
Romania	**0.199**	**0.220**	**0.252**	**0.286**	**0.294**	**0.321**	**0.319**	**0.327**	**0.323**	**0.307**	**0.318**
Sweden	**0.295**	**0.268**	**0.234**	**0.235**	**0.276**	**0.233**	**0.235**	**0.236**	**0.235**	**0.242**	**0.223**
Slovenia	0.282	0.303	0.332	0.329	0.334	0.373	0.393	0.382	0.376	0.381	0.381
Slovakia	0.296	0.266	0.326	0.306	0.272	0.280	0.284	0.288	0.319	0.345	0.342
United Kingdom	0.374	0.389	0.430	0.424	0.441	0.428	0.464	0.469	0.471	0.475	

Table A2.24 – *Electrical efficiency after apportioning the energy for heat-production in thermoelectric plants.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**0.406**	**0.414**	**0.441**	**0.453**	**0.469**	**0.463**	**0.479**	**0.483**	**0.483**	**0.499**	
EU27	**0.412**	**0.418**	**0.442**	**0.458**	**0.473**	**0.469**	**0.481**	**0.484**	**0.485**	**0.503**	**0.512**
Austria	0.453	0.424	0.487	0.497	0.537	0.508	0.531	0.528	0.535	0.563	0.558
Belgium	**0.376**	**0.399**	**0.447**	**0.452**	**0.499**	**0.525**	**0.539**	**0.548**	**0.553**	**0.559**	**0.559**
Bulgaria	0.381	0.389	0.378	0.346	0.364	0.372	0.373	0.366	0.368	0.382	0.395
Cyprus	0.326	0.332	0.326	0.346	0.379	0.384	0.381	0.388	0.385	0.396	0.393
Czechia	**0.380**	**0.385**	**0.409**	**0.398**	**0.394**	**0.402**	**0.413**	**0.414**	**0.414**	**0.426**	**0.442**
Germany	**0.371**	**0.381**	**0.417**	**0.430**	**0.442**	**0.444**	**0.449**	**0.459**	**0.459**	**0.467**	**0.472**
Denmark	0.563	0.565	0.572	0.681	0.681	0.756	0.738	0.761	0.739	0.812	0.779
Estonia	0.501	0.359	0.357	0.372	0.365	0.356	0.381	0.375	0.383	0.410	0.414
Greece	0.328	0.352	0.367	0.373	0.368	0.390	0.453	0.407	0.382	0.386	0.437
Spain	**0.365**	**0.369**	**0.408**	**0.454**	**0.487**	**0.428**	**0.438**	**0.435**	**0.431**	**0.483**	**0.487**
Finland	0.575	0.586	0.674	0.685	0.620	0.710	0.708	0.716	0.685	0.722	0.724
France	**0.381**	**0.384**	**0.439**	**0.439**	**0.384**	**0.437**	**0.474**	**0.483**	**0.485**	**0.506**	**0.512**
Croatia	0.394	0.415	0.410	0.435	0.493	0.448	0.457	0.535	0.548	0.547	0.570
Hungary	0.316	0.368	0.404	0.429	0.438	0.434	0.450	0.463	0.469	0.489	0.496
Ireland	0.382	0.385	0.403	0.427	0.461	0.467	0.476	0.476	0.491	0.487	0.489
Italy	**0.410**	**0.416**	**0.426**	**0.460**	**0.484**	**0.495**	**0.511**	**0.519**	**0.517**	**0.529**	**0.532**
Lithuania	0.683	0.713	0.675	0.646	0.663	0.741	0.720	0.738	0.736	0.731	0.709
Luxembourg	0.254	0.255	0.324	0.555	0.556	0.546	0.550	0.549	0.557	0.574	0.654
Latvia	0.805	0.783	0.776	0.837	0.844	0.781	0.819	0.798	0.752	0.732	0.744
Malta	0.188	0.290	0.331	0.315	0.314	0.394	0.362	0.451	0.510	0.507	0.478
Netherlands	**0.471**	**0.518**	**0.545**	**0.532**	**0.567**	**0.526**	**0.538**	**0.554**	**0.564**	**0.582**	**0.593**
Poland	**0.426**	**0.443**	**0.450**	**0.458**	**0.457**	**0.457**	**0.465**	**0.469**	**0.474**	**0.484**	**0.491**
Portugal	0.488	0.460	0.513	0.494	0.652	0.597	0.642	0.589	0.627	0.673	0.717
Romania	**0.749**	**0.508**	**0.488**	**0.443**	**0.423**	**0.436**	**0.444**	**0.435**	**0.420**	**0.398**	**0.431**
Sweden	**0.826**	**0.820**	**0.774**	**0.775**	**0.807**	**0.790**	**0.799**	**0.776**	**0.770**	**0.741**	**0.719**
Slovenia	0.373	0.398	0.407	0.404	0.411	0.471	0.492	0.481	0.474	0.477	0.479
Slovakia	0.453	0.407	0.448	0.488	0.528	0.498	0.521	0.537	0.537	0.564	0.560
United Kingdom	0.377	0.392	0.435	0.424	0.441	0.428	0.464	0.469	0.471	0.475	

Table A2.25 – *Total efficiency of cogeneration plants.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**0.558**	**0.578**	**0.619**	**0.630**	**0.624**	**0.621**	**0.629**	**0.629**	**0.635**	**0.641**	
EU27	**0.556**	**0.577**	**0.620**	**0.635**	**0.628**	**0.627**	**0.633**	**0.629**	**0.636**	**0.641**	**0.641**
Austria	0.525	0.545	0.727	0.758	0.775	0.781	0.793	0.787	0.794	0.795	0.785
Belgium	**0.464**	**0.550**	**0.881**	**0.723**	**0.757**	**0.687**	**0.690**	**0.696**	**0.699**	**0.704**	**0.699**
Bulgaria	0.598	0.608	0.616	0.623	0.759	0.800	0.813	0.823	0.806	0.712	0.722
Cyprus				0.416	0.514	0.762	0.760	0.712	0.735	0.754	0.757
Czechia	**0.688**	**0.608**	**0.715**	**0.622**	**0.654**	**0.686**	**0.695**	**0.693**	**0.688**	**0.691**	**0.691**
Germany	**0.915**	**0.989**	**0.806**	**0.726**	**0.703**	**0.688**	**0.682**	**0.677**	**0.718**	**0.718**	**0.710**
Denmark	0.596	0.630	0.660	0.712	0.715	0.796	0.779	0.804	0.797	0.855	0.844
Estonia	0.484	0.371	0.669	0.673	0.775	0.745	0.751	0.733	0.686	0.659	0.689
Greece	0.443	0.440	0.454	0.408	0.386	0.346	0.338	0.373	0.361	0.350	0.365
Spain	**0.372**	**0.328**	**0.680**	**0.704**	**0.596**	**0.636**	**0.671**	**0.661**	**0.654**	**0.655**	**0.644**
Finland	0.825	0.802	0.848	0.838	0.856	0.863	0.872	0.847	0.839	0.846	0.840
France	**0.589**	**0.554**	**1.005**	**0.779**	**0.634**	**0.647**	**0.669**	**0.680**	**0.675**	**0.679**	**0.675**
Croatia	0.753	0.690	0.636	0.656	0.674	0.727	0.703	0.655	0.660	0.654	0.652
Hungary	0.712	0.753	0.777	0.759	0.792	0.705	0.719	0.517	0.524	0.544	0.552
Ireland	0.337	0.355	0.404	0.464	0.579	0.608	0.630	0.624	0.633	0.646	0.605
Italy	**0.496**	**0.537**	**0.505**	**0.583**	**0.578**	**0.610**	**0.609**	**0.609**	**0.604**	**0.609**	**0.617**
Lithuania	0.682	0.725	0.683	0.691	0.675	0.763	0.779	0.821	0.849	0.851	0.757
Luxembourg		0.352	0.458	0.886	0.870	0.798	0.810	0.813	0.820	0.822	0.759
Latvia	0.809	0.783	0.773	0.839	0.844	0.776	0.809	0.784	0.753	0.743	0.752
Malta						0.650	0.784	0.762	0.757	0.783	0.769
Netherlands	**0.484**	**0.547**	**0.659**	**0.686**	**0.672**	**0.667**	**0.674**	**0.672**	**0.668**	**0.659**	**0.635**
Poland	**0.486**	**0.460**	**0.463**	**0.479**	**0.472**	**0.473**	**0.479**	**0.485**	**0.489**	**0.500**	**0.511**
Portugal	0.454	0.382	0.578	0.672	0.719	0.724	0.731	0.731	0.724	0.730	0.728
Romania	**0.459**	**0.600**	**0.622**	**0.656**	**0.698**	**0.739**	**0.727**	**0.716**	**0.706**	**0.642**	**0.698**
Sweden	**0.872**	**0.863**	**0.829**	**0.820**	**0.826**	**0.846**	**0.845**	**0.827**	**0.824**	**0.805**	**0.794**
Slovenia	0.395	0.427	0.459	0.452	0.455	0.519	0.536	0.525	0.723	0.727	0.731
Slovakia	0.532	0.489	0.545	0.561	0.564	0.541	0.562	0.574	0.564	0.605	0.581
United Kingdom	0.555	0.570	0.602	0.501	0.495	0.411	0.472	0.501	0.493	0.529	

Table A2.26 – *Electrical efficiency of cogeneration plants.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**0.257**	**0.293**	**0.332**	**0.349**	**0.357**	**0.357**	**0.362**	**0.369**	**0.372**	**0.376**	
EU27	**0.252**	**0.288**	**0.323**	**0.344**	**0.353**	**0.356**	**0.360**	**0.365**	**0.368**	**0.372**	**0.374**
Austria	0.338	0.339	0.303	0.314	0.361	0.312	0.341	0.313	0.327	0.326	0.326
Belgium	**0.343**	**0.413**	**0.429**	**0.372**	**0.466**	**0.457**	**0.470**	**0.495**	**0.489**	**0.516**	**0.520**
Bulgaria	0.164	0.169	0.217	0.220	0.222	0.212	0.223	0.247	0.277	0.280	0.290
Cyprus				0.416	0.504	0.597	0.600	0.561	0.584	0.605	0.647
Czechia	**0.169**	**0.158**	**0.270**	**0.232**	**0.201**	**0.243**	**0.239**	**0.243**	**0.244**	**0.249**	**0.261**
Germany	**0.000**	**0.000**	**0.000**	**0.340**	**0.361**	**0.385**	**0.389**	**0.396**	**0.399**	**0.398**	**0.404**
Denmark	0.361	0.354	0.344	0.357	0.350	0.297	0.316	0.303	0.306	0.284	0.273
Estonia	0.269	0.266	0.188	0.190	0.242	0.212	0.208	0.240	0.195	0.186	0.223
Greece	0.443	0.440	0.416	0.382	0.368	0.327	0.318	0.351	0.338	0.327	0.336
Spain	**0.368**	**0.328**	**0.680**	**0.704**	**0.596**	**0.636**	**0.671**	**0.661**	**0.654**	**0.655**	**0.644**
Finland	0.410	0.418	0.386	0.363	0.356	0.346	0.338	0.332	0.351	0.365	0.362
France	**0.589**	**0.174**	**0.306**	**0.269**	**0.268**	**0.289**	**0.291**	**0.299**	**0.315**	**0.318**	**0.312**
Croatia	0.196	0.226	0.245	0.306	0.362	0.264	0.291	0.368	0.325	0.343	0.368
Hungary	0.138	0.130	0.197	0.329	0.332	0.323	0.323	0.343	0.347	0.353	0.354
Ireland	0.337	0.355	0.404	0.464	0.579	0.608	0.630	0.624	0.633	0.646	0.605
Italy	**0.496**	**0.537**	**0.505**	**0.372**	**0.384**	**0.377**	**0.385**	**0.392**	**0.385**	**0.390**	**0.388**
Lithuania	0.360	0.117	0.214	0.240	0.262	0.330	0.258	0.219	0.192	0.227	0.327
Luxembourg		0.352	0.278	0.304	0.302	0.295	0.302	0.278	0.266	0.241	0.227
Latvia	0.208	0.150	0.218	0.229	0.333	0.311	0.311	0.344	0.380	0.393	0.356
Malta						0.520	0.712	0.762	0.747	0.754	0.769
Netherlands	**0.419**	**0.401**	**0.378**	**0.422**	**0.428**	**0.399**	**0.402**	**0.412**	**0.421**	**0.438**	**0.447**
Poland	**0.258**	**0.315**	**0.334**	**0.336**	**0.340**	**0.350**	**0.353**	**0.354**	**0.361**	**0.364**	**0.367**
Portugal	0.333	0.328	0.411	0.365	0.351	0.362	0.366	0.367	0.353	0.355	0.354
Romania	**0.189**	**0.205**	**0.217**	**0.254**	**0.258**	**0.263**	**0.248**	**0.266**	**0.263**	**0.252**	**0.258**
Sweden	**0.294**	**0.266**	**0.232**	**0.233**	**0.276**	**0.233**	**0.235**	**0.236**	**0.235**	**0.242**	**0.223**
Slovenia	0.288	0.305	0.326	0.326	0.328	0.374	0.394	0.382	0.274	0.273	0.274
Slovakia	0.293	0.242	0.338	0.311	0.267	0.275	0.279	0.285	0.313	0.319	0.303
United Kingdom	0.555	0.570	0.602	0.501	0.495	0.411	0.472	0.501	0.493	0.529	

Table A2.27 – *Electrical efficiency after apportioning the energy for heat-production in cogeneration plants.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**0.542**	**0.551**	**0.605**	**0.620**	**0.613**	**0.608**	**0.617**	**0.619**	**0.623**	**0.631**	
EU27	**0.536**	**0.547**	**0.602**	**0.624**	**0.617**	**0.615**	**0.622**	**0.619**	**0.623**	**0.631**	**0.632**
Austria	0.521	0.511	0.661	0.719	0.758	0.765	0.782	0.777	0.784	0.782	0.767
Belgium	**0.413**	**0.502**	**0.730**	**0.722**	**0.761**	**0.696**	**0.699**	**0.713**	**0.714**	**0.733**	**0.723**
Bulgaria	0.464	0.685	0.570	0.514	0.725	0.779	0.787	0.790	0.762	0.670	0.680
Cyprus				0.416	0.510	0.757	0.759	0.705	0.735	0.754	0.769
Czechia	**0.648**	**0.595**	**0.715**	**0.609**	**0.572**	**0.588**	**0.601**	**0.592**	**0.589**	**0.592**	**0.610**
Germany				**0.676**	**0.657**	**0.652**	**0.651**	**0.650**	**0.678**	**0.675**	**0.670**
Denmark	0.590	0.593	0.591	0.682	0.684	0.757	0.739	0.764	0.740	0.815	0.781
Estonia	0.501	0.359	0.682	0.702	0.775	0.765	0.779	0.748	0.698	0.665	0.706
Greece	0.447	0.440	0.455	0.410	0.387	0.345	0.336	0.373	0.361	0.349	0.364
Spain	**0.373**	**0.329**	**0.682**	**0.704**	**0.596**	**0.636**	**0.671**	**0.661**	**0.654**	**0.655**	**0.644**
Finland	0.760	0.765	0.843	0.835	0.856	0.858	0.863	0.842	0.836	0.845	0.842
France	**0.589**	**0.543**	**0.893**	**0.743**	**0.588**	**0.613**	**0.650**	**0.663**	**0.676**	**0.683**	**0.681**
Croatia	0.529	0.530	0.527	0.594	0.650	0.655	0.644	0.642	0.648	0.646	0.647
Hungary	0.877	0.951	0.813	0.759	0.797	0.704	0.720	0.464	0.473	0.496	0.508
Ireland	0.337	0.355	0.404	0.464	0.579	0.608	0.630	0.624	0.633	0.646	0.605
Italy	**0.522**	**0.556**	**0.548**	**0.555**	**0.564**	**0.604**	**0.608**	**0.609**	**0.603**	**0.609**	**0.619**
Lithuania	0.683	0.713	0.675	0.646	0.663	0.741	0.720	0.738	0.736	0.731	0.709
Luxembourg		0.352	0.430	0.897	0.877	0.805	0.818	0.816	0.817	0.815	0.654
Latvia	0.805	0.783	0.776	0.839	0.848	0.781	0.819	0.798	0.752	0.732	0.744
Malta						0.650	0.784	0.762	0.757	0.783	0.769
Netherlands	**0.472**	**0.530**	**0.645**	**0.683**	**0.669**	**0.658**	**0.677**	**0.687**	**0.679**	**0.670**	**0.644**
Poland	**0.426**	**0.443**	**0.450**	**0.465**	**0.459**	**0.460**	**0.467**	**0.471**	**0.476**	**0.487**	**0.496**
Portugal	0.439	0.383	0.582	0.660	0.707	0.711	0.717	0.717	0.711	0.719	0.716
Romania	**0.711**	**0.703**	**0.692**	**0.639**	**0.647**	**0.714**	**0.701**	**0.692**	**0.667**	**0.572**	**0.643**
Sweden	**0.846**	**0.837**	**0.815**	**0.815**	**0.822**	**0.792**	**0.801**	**0.777**	**0.772**	**0.742**	**0.722**
Slovenia	0.395	0.420	0.411	0.411	0.412	0.472	0.493	0.482	0.728	0.716	0.712
Slovakia	0.547	0.494	0.544	0.528	0.552	0.509	0.534	0.548	0.549	0.593	0.571
United Kingdom	0.855	0.710	0.712	0.501	0.495	0.411	0.472	0.501	0.493	0.529	

Table A2.28 – *Electrical efficiency of non-cogeneration plants.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**0.370**	**0.376**	**0.399**	**0.398**	**0.411**	**0.403**	**0.417**	**0.420**	**0.417**	**0.430**	
EU27	**0.371**	**0.374**	**0.394**	**0.392**	**0.403**	**0.397**	**0.408**	**0.412**	**0.407**	**0.422**	**0.427**
Austria	0.404	0.342	0.433	0.441	0.440	0.389	0.378	0.418	0.412	0.448	0.425
Belgium	**0.365**	**0.373**	**0.415**	**0.403**	**0.420**	**0.439**	**0.446**	**0.458**	**0.461**	**0.467**	**0.467**
Bulgaria	0.333	0.308	0.333	0.307	0.323	0.338	0.336	0.332	0.333	0.336	0.335
Cyprus	0.326	0.332	0.326	0.346	0.378	0.382	0.379	0.386	0.382	0.394	0.390
Czechia	**0.339**	**0.340**	**0.341**	**0.339**	**0.353**	**0.355**	**0.368**	**0.371**	**0.372**	**0.383**	**0.389**
Germany	**0.371**	**0.381**	**0.417**	**0.391**	**0.397**	**0.395**	**0.397**	**0.402**	**0.399**	**0.399**	**0.398**
Denmark	0.370	0.417	0.417	0.305	0.296	0.235	0.259	0.272	0.265	0.278	0.269
Estonia			0.331	0.353	0.344	0.329	0.358	0.351	0.360	0.371	0.340
Greece	0.325	0.350	0.362	0.367	0.363	0.408	0.501	0.417	0.389	0.398	0.461
Spain	**0.365**	**0.374**	**0.369**	**0.421**	**0.466**	**0.390**	**0.390**	**0.393**	**0.381**	**0.437**	**0.434**
Finland	0.371	0.380	0.401	0.371	0.408	0.386	0.391	0.377	0.388	0.378	0.365
France	**0.378**	**0.378**	**0.362**	**0.354**	**0.337**	**0.378**	**0.424**	**0.436**	**0.417**	**0.442**	**0.443**
Croatia	0.366	0.363	0.371	0.370	0.381	0.383	0.387	0.368	0.418	0.414	0.405
Hungary	0.277	0.344	0.351	0.332	0.350	0.361	0.375	0.462	0.460	0.475	0.473
Ireland	0.383	0.385	0.403	0.426	0.454	0.455	0.464	0.464	0.479	0.473	0.478
Italy	**0.401**	**0.398**	**0.393**	**0.417**	**0.428**	**0.419**	**0.433**	**0.445**	**0.442**	**0.456**	**0.453**
Lithuania					1.000				0.000		
Luxembourg	0.254	0.233	0.158	0.522	0.524	0.469	0.270	0.287	0.287	0.287	
Latvia		1.000		0.126	0.322			1.000		1.000	
Malta	0.188	0.290	0.331	0.315	0.314	0.393	0.360	0.450	0.509	0.507	0.478
Netherlands	**0.427**	**0.205**	**0.457**	**0.393**	**0.465**	**0.453**	**0.470**	**0.483**	**0.497**	**0.517**	**0.546**
Poland		**0.400**	**0.282**	**0.375**	**0.395**	**0.394**	**0.407**	**0.413**	**0.414**	**0.412**	**0.382**
Portugal	0.489	0.468	0.507	0.481	0.646	0.586	0.636	0.578	0.620	0.668	0.717
Romania		**0.279**	**0.336**	**0.332**	**0.331**	**0.363**	**0.374**	**0.368**	**0.360**	**0.345**	**0.365**
Sweden	**0.314**	**0.396**	**0.301**	**0.325**	**0.326**	**0.331**	**0.331**	**0.235**	**0.313**	**0.214**	**0.159**
Slovenia	0.230	0.287	0.380	0.355	0.405	0.259	0.266	0.259	0.426	0.433	0.434
Slovakia	0.303	0.317	0.296	0.262	0.350	0.380	0.385	0.370	0.420	0.482	0.529
United Kingdom	0.369	0.381	0.418	0.418	0.437	0.430	0.463	0.466	0.469	0.467	

Table A2.29 – *Total efficiency of the electricity generation sector.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	0.424	0.428	0.443	0.453	0.476	0.487	0.499	0.501	0.508	0.517	
EU27	0.432	0.435	0.448	0.459	0.480	0.490	0.500	0.502	0.508	0.518	0.535
Austria	0.678	0.682	0.762	0.720	0.750	0.775	0.797	0.783	0.792	0.813	0.822
Belgium	0.356	0.367	0.391	0.396	0.435	0.487	0.455	0.461	0.496	0.473	0.501
Bulgaria	0.456	0.427	0.406	0.401	0.434	0.446	0.441	0.427	0.428	0.424	0.433
Cyprus	0.326	0.332	0.326	0.346	0.381	0.404	0.400	0.407	0.406	0.419	0.421
Czechia	0.446	0.443	0.456	0.427	0.437	0.448	0.460	0.454	0.448	0.454	0.462
Germany	0.412	0.414	0.425	0.448	0.467	0.502	0.507	0.527	0.536	0.555	0.571
Denmark	0.581	0.613	0.661	0.733	0.737	0.843	0.823	0.849	0.842	0.895	0.890
Estonia	0.484	0.371	0.407	0.411	0.410	0.422	0.438	0.427	0.440	0.491	0.523
Greece	0.337	0.370	0.384	0.396	0.411	0.463	0.523	0.469	0.460	0.471	0.535
Spain	0.394	0.389	0.419	0.463	0.518	0.474	0.488	0.467	0.488	0.507	0.526
Finland	0.551	0.567	0.603	0.609	0.616	0.638	0.643	0.644	0.632	0.632	0.635
France	0.371	0.376	0.389	0.382	0.375	0.382	0.393	0.393	0.397	0.401	0.413
Croatia	0.602	0.680	0.636	0.641	0.719	0.708	0.703	0.712	0.763	0.717	0.718
Hungary	0.381	0.400	0.437	0.439	0.445	0.418	0.428	0.428	0.430	0.443	0.451
Ireland	0.394	0.395	0.414	0.444	0.494	0.543	0.540	0.553	0.581	0.596	0.612
Italy	0.426	0.436	0.438	0.484	0.519	0.543	0.550	0.552	0.561	0.570	0.575
Lithuania	0.463	0.427	0.439	0.452	0.707	0.821	0.855	0.897	0.915	0.921	0.828
Luxembourg	0.277	0.294	0.444	0.611	0.613	0.657	0.724	0.743	0.756	0.770	0.802
Latvia	0.867	0.848	0.845	0.892	0.887	0.810	0.843	0.858	0.800	0.788	0.814
Malta	0.188	0.290	0.331	0.315	0.314	0.412	0.401	0.477	0.536	0.532	0.508
Netherlands	0.476	0.528	0.568	0.562	0.589	0.569	0.576	0.594	0.600	0.614	0.631
Poland	0.488	0.463	0.465	0.477	0.476	0.486	0.495	0.504	0.506	0.519	0.531
Portugal	0.482	0.460	0.509	0.503	0.643	0.579	0.618	0.567	0.603	0.632	0.658
Romania	0.491	0.573	0.560	0.565	0.542	0.561	0.573	0.550	0.548	0.531	0.561
Sweden	0.529	0.540	0.579	0.549	0.604	0.598	0.601	0.599	0.595	0.603	0.658
Slovenia	0.414	0.434	0.463	0.442	0.481	0.506	0.522	0.502	0.520	0.518	0.520
Slovakia	0.421	0.425	0.420	0.434	0.461	0.439	0.454	0.458	0.459	0.457	0.457
United Kingdom	0.368	0.376	0.407	0.406	0.439	0.462	0.488	0.504	0.514	0.518	

Table A2.30 – *Electrical efficiency of the electricity generation sector.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**0.359**	**0.374**	**0.394**	**0.394**	**0.414**	**0.430**	**0.438**	**0.442**	**0.448**	**0.456**	
EU27	**0.357**	**0.373**	**0.392**	**0.392**	**0.411**	**0.426**	**0.433**	**0.436**	**0.442**	**0.451**	**0.467**
Austria	0.631	0.623	0.688	0.639	0.654	0.672	0.686	0.681	0.689	0.708	0.718
Belgium	**0.347**	**0.358**	**0.370**	**0.364**	**0.400**	**0.444**	**0.423**	**0.433**	**0.458**	**0.448**	**0.474**
Bulgaria	0.268	0.282	0.325	0.326	0.347	0.368	0.363	0.362	0.372	0.361	0.365
Cyprus	0.326	0.332	0.326	0.346	0.381	0.403	0.399	0.406	0.405	0.418	0.421
Czechia	**0.293**	**0.280**	**0.327**	**0.313**	**0.320**	**0.342**	**0.346**	**0.349**	**0.349**	**0.356**	**0.360**
Germany	**0.337**	**0.355**	**0.378**	**0.388**	**0.405**	**0.442**	**0.445**	**0.464**	**0.468**	**0.482**	**0.499**
Denmark	0.368	0.368	0.378	0.405	0.403	0.463	0.454	0.465	0.464	0.486	0.491
Estonia	0.269	0.266	0.299	0.326	0.335	0.323	0.344	0.346	0.337	0.329	0.326
Greece	0.339	0.372	0.384	0.396	0.407	0.459	0.518	0.465	0.455	0.466	0.530
Spain	**0.396**	**0.393**	**0.425**	**0.463**	**0.523**	**0.479**	**0.494**	**0.472**	**0.492**	**0.510**	**0.532**
Finland	0.419	0.429	0.421	0.403	0.408	0.432	0.428	0.429	0.435	0.440	0.466
France	**0.374**	**0.375**	**0.368**	**0.356**	**0.363**	**0.371**	**0.379**	**0.378**	**0.384**	**0.387**	**0.397**
Croatia	0.441	0.516	0.524	0.534	0.616	0.590	0.595	0.579	0.627	0.577	0.578
Hungary	0.275	0.309	0.311	0.331	0.347	0.352	0.355	0.366	0.366	0.381	0.387
Ireland	0.402	0.401	0.420	0.450	0.497	0.549	0.545	0.557	0.585	0.600	0.617
Italy	**0.433**	**0.443**	**0.448**	**0.418**	**0.440**	**0.450**	**0.456**	**0.459**	**0.466**	**0.474**	**0.476**
Lithuania	0.337	0.283	0.298	0.308	0.345	0.486	0.474	0.487	0.447	0.515	0.543
Luxembourg	0.611	0.743	0.923	0.601	0.694	0.940	1.150	1.062	0.968	0.706	0.664
Latvia	0.448	0.403	0.468	0.487	0.520	0.415	0.435	0.568	0.497	0.500	0.519
Malta	0.188	0.290	0.331	0.315	0.314	0.412	0.400	0.477	0.536	0.532	0.508
Netherlands	**0.414**	**0.393**	**0.408**	**0.412**	**0.448**	**0.445**	**0.459**	**0.476**	**0.490**	**0.508**	**0.537**
Poland	0.264	0.323	0.342	0.345	0.350	0.371	0.377	0.382	0.385	0.394	0.402
Portugal	0.480	0.456	0.496	0.468	0.584	0.535	0.579	0.535	0.561	0.584	0.610
Romania	**0.232**	**0.282**	**0.332**	**0.385**	**0.401**	**0.445**	**0.454**	**0.442**	**0.451**	**0.443**	**0.463**
Sweden	**0.497**	**0.470**	**0.503**	**0.462**	**0.474**	**0.488**	**0.481**	**0.484**	**0.480**	**0.492**	**0.543**
Slovenia	0.365	0.383	0.410	0.391	0.430	0.455	0.471	0.451	0.464	0.465	0.472
Slovakia	0.339	0.347	0.372	0.353	0.357	0.352	0.360	0.359	0.375	0.378	0.383
United Kingdom	0.370	0.378	0.410	0.409	0.443	0.465	0.493	0.509	0.518	0.521	

Table A2.31 – *Fuel energy content in the thermoelectric plants in the main European countries (ktoe).*

Fuel	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28											
Anthracite, BKB	1,332	539	611	4,996	3,363	3,494	1,897	1,654	1,536	682	-
Coal and other solid fuels	164,446	148,276	136,444	137,938	112,636	105,116	89,297	82,223	73,509	51,516	-
Lignite	98,229	85,756	81,791	83,043	76,345	74,777	70,552	71,264	68,827	57,135	-
Coke oven coke	289	-	-	-	1	3	-	-	0	-	-
Oil and petroleum products	55,228	54,156	41,184	35,205	22,741	16,549	16,363	15,503	14,025	13,174	-
Peat and peat products/Oil shale and oil sands	5,818	4,575	3,952	4,381	5,344	3,908	3,973	4,028	4,105	2,572	-
Natural gas	49,138	60,959	94,327	126,582	140,720	88,893	106,240	114,361	108,232	119,733	-
Manufactured gases	8,006	6,964	8,420	8,911	8,535	8,566	8,337	8,509	8,299	8,031	-
Primary solid biofuels/Charcoal	2,172	3,648	5,456	12,451	19,558	24,546	24,647	25,417	26,661	28,221	-
Liquid biofuels	-	-	-	419	908	1,057	1,005	959	960	1,043	-
Biogases	334	795	1,744	3,333	6,931	12,256	12,546	12,651	12,534	12,581	-
Renewable waste	1,245	2,069	3,021	4,917	6,535	8,199	8,602	8,750	8,709	8,875	-
Non-renewable waste	1,952	3,339	4,353	5,680	7,215	8,910	9,880	9,723	9,652	9,949	-
Total	**388,189**	**371,075**	**381,302**	**427,857**	**410,832**	**356,272**	**353,338**	**355,041**	**337,049**	**313,512**	**-**

EU27											
Anthracite, BKB	1,332	539	611	4,996	3,363	3,494	1,897	1,654	1,536	677	617
Coal and other solid fuels	116,765	112,310	108,434	106,914	88,209	87,703	82,141	76,945	69,507	49,687	37,631
Lignite	98,229	85,756	81,791	83,043	76,345	74,777	70,552	71,264	68,827	57,135	46,469
Coke oven coke	289	-	-	-	1	3	-	-	0	-	-
Oil and petroleum products	47,976	50,146	39,896	34,034	21,683	15,987	15,564	15,000	13,622	12,762	11,725
Peat and peat products/Oil shale and oil sands	6,323	4,796	3,959	4,443	5,547	3,701	3,972	4,027	3,997	2,554	1,523
Natural gas	48,024	49,325	69,210	101,106	111,572	72,450	83,230	92,356	87,092	98,819	96,762
Manufactured gases	7,452	6,584	7,540	7,965	7,873	7,932	7,876	8,020	7,890	7,547	6,538
Primary solid biofuels/Charcoal	2,172	3,536	5,295	11,502	18,436	21,044	21,150	21,636	22,293	23,435	24,240
Liquid biofuels	-	-	-	419	908	1,057	1,005	959	960	1,043	1,021
Biogases	200	508	989	1,926	5,145	10,144	10,283	10,375	10,343	10,411	10,575
Renewable waste	1,197	1,951	2,776	4,616	6,109	7,555	7,805	7,913	7,742	7,789	7,847
Non-renewable waste	1,923	3,236	4,209	5,141	6,876	8,037	8,667	8,676	8,489	8,551	8,491
Total	**331,882**	**318,687**	**324,710**	**366,106**	**352,067**	**313,882**	**314,142**	**318,824**	**302,299**	**280,410**	**253,440**

Belgium											
Anthracite, BKB	-	-	-	-	-	-	-	-	-	-	-
Coal and other solid fuels	3,942	3,745	2,593	1,801	911	480	79	9	9	9	8
Lignite	-	-	-	-	-	-	-	-	-	-	-
Coke oven coke	-	-	-	-	-	-	-	-	-	-	-
Oil and petroleum products	255	222	161	411	85	36	35	35	30	11	16
Peat and peat products/Oil shale and oil sands	-	-	-	-	-	-	-	-	-	-	-
Natural gas	1,319	2,022	3,143	4,248	5,510	3,658	3,620	3,607	3,795	3,891	4,087
Manufactured gases	664	700	647	554	379	420	456	472	459	488	364
Primary solid biofuels/Charcoal	15	14	18	194	615	752	740	788	723	666	707
Liquid biofuels	-	-	-	17	47	23	4	6	18	20	6
Biogases	3	4	26	68	98	138	138	131	133	134	145
Renewable waste	109	128	135	178	303	363	361	370	367	370	371
Non-renewable waste	241	319	312	365	515	495	503	497	487	487	482
Total	**6,548**	**7,153**	**7,036**	**7,834**	**8,465**	**6,365**	**5,936**	**5,915**	**6,021**	**6,076**	**6,184**

Table A2.31 - *following*

Fuel	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
Czechia											
Anthracite, BKB	-	-	-	-	2	-	-	-	-	-	-
Coal and other solid fuels	2,042	2,524	1,898	1,776	2,131	1,862	1,885	1,569	1,282	898	804
Lignite	12,290	11,894	12,055	12,373	11,636	9,661	9,747	9,770	9,910	9,227	7,689
Coke oven coke	-	-	-	-	-	-	-	-	-	-	-
Oil and petroleum products	329	317	206	154	71	44	35	45	38	45	32
Peat and peat products/Oil shale and oil sands	-	-	-	-	-	-	-	-	-	-	-
Natural gas	204	344	694	675	430	607	824	781	785	1,080	1,280
Manufactured gases	266	228	542	617	732	681	681	649	634	567	482
Primary solid biofuels/Charcoal	-	79	182	147	369	585	600	648	618	689	736
Liquid biofuels	-	-	-	-	-	-	-	-	-	-	-
Biogases	-	34	32	35	122	473	436	449	451	432	440
Renewable waste	-	-	23	24	42	57	64	70	65	69	75
Non-renewable waste	-	-	15	17	29	46	49	55	51	53	58
Total	**15,131**	**15,421**	**15,647**	**15,819**	**15,565**	**14,016**	**14,322**	**14,035**	**13,834**	**13,061**	**11,597**

Germany											
Anthracite, BKB	1,092	465	404	2,005	1,940	2,055	782	747	1,060	463	391
Coal and other solid fuels	33,504	35,184	32,549	29,006	25,514	24,446	24,585	19,748	17,386	13,052	9,662
Lignite	46,057	35,907	34,157	34,688	32,310	34,404	33,274	32,812	32,124	25,041	20,273
Coke oven coke	289	-	-	-	-	-	-	-	-	-	-
Oil and petroleum products	3,342	2,369	1,421	2,449	1,677	1,265	1,212	1,190	1,034	966	998
Peat and peat products/Oil shale and oil sands	-	-	-	-	-	-	-	-	-	-	-
Natural gas	10,614	10,273	11,095	15,886	17,700	11,940	15,210	16,116	15,495	16,778	17,539
Manufactured gases	2,430	1,742	1,796	2,024	2,272	2,314	2,449	2,486	2,409	2,323	2,125
Primary solid biofuels/Charcoal	111	386	330	1,769	2,648	3,040	2,902	2,853	2,983	3,005	3,088
Liquid biofuels	-	-	-	19	196	74	70	72	77	91	91
Biogases	152	255	439	673	3,116	5,631	5,699	5,691	5,693	5,659	5,776
Renewable waste	562	588	709	1,371	1,821	2,147	2,318	2,341	2,222	2,178	2,203
Non-renewable waste	1,000	1,437	1,681	1,371	2,434	2,663	2,865	2,848	2,543	2,543	2,467
Total	**99,151**	**88,606**	**84,581**	**91,262**	**91,629**	**89,980**	**91,365**	**86,905**	**83,027**	**72,098**	**64,613**

Spain											
Anthracite, BKB	153	-	-	1,770	89	1,078	693	532	218	18	14
Coal and other solid fuels	10,733	13,360	16,751	14,678	5,483	10,790	8,031	10,298	9,127	3,249	1,446
Lignite	3,103	1,833	1,480	1,178	-	-	-	-	-	-	-
Coke oven coke	-	-	-	-	-	-	-	-	-	-	-
Oil and petroleum products	2,207	3,692	4,497	5,302	3,506	3,562	3,420	3,240	2,977	2,615	2,159
Peat and peat products/Oil shale and oil sands	-	-	-	-	-	-	-	-	-	-	-
Natural gas	273	753	2,685	10,798	14,621	8,260	8,086	9,929	8,979	12,760	10,663
Manufactured gases	216	234	391	342	218	300	237	283	284	262	148
Primary solid biofuels/Charcoal	56	93	284	732	648	1,203	1,190	1,282	1,210	1,174	1,354
Liquid biofuels	-	-	-	-	-	-	-	-	3	3	3
Biogases	-	54	106	277	204	202	193	201	203	198	194
Renewable waste	40	93	115	189	174	250	230	253	250	251	231
Non-renewable waste	48	135	190	189	174	250	230	253	321	309	346
Total	**16,828**	**20,246**	**26,497**	**35,456**	**25,118**	**25,893**	**22,310**	**26,270**	**23,570**	**20,837**	**16,559**

Table A2.31 - *following*

Fuel	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
France											
Anthracite, BKB	-	-	-	-	-	-	-	-	-	-	-
Coal and other solid fuels	6,942	5,569	6,473	6,404	4,444	2,771	2,440	3,015	1,975	952	823
Lignite	759	529	108	-	-	-	-	-	-	-	-
Coke oven coke	-	-	-	-	-	-	-	-	-	-	-
Oil and petroleum products	1,641	1,236	1,246	2,897	1,652	1,590	1,687	1,692	1,201	1,215	1,164
Peat and peat products/Oil shale and oil sands	-	-	-	-	-	-	-	-	-	-	-
Natural gas	437	551	3,000	5,463	6,712	3,835	5,814	6,632	5,096	6,542	5,874
Manufactured gases	923	706	1,002	835	656	733	564	610	615	616	516
Primary solid biofuels/Charcoal	162	219	168	637	1,279	1,244	1,488	1,481	1,520	1,561	1,569
Liquid biofuels	-	-	-	-	-	1	1	0	0	0	1
Biogases	17	19	68	192	375	560	578	581	618	660	712
Renewable waste	63	445	620	848	927	1,038	1,070	1,078	1,090	1,084	1,051
Non-renewable waste	63	445	620	848	952	1,137	1,162	1,157	1,168	1,172	1,129
Total	**11,008**	**9,719**	**13,305**	**18,124**	**16,997**	**12,909**	**14,804**	**16,246**	**13,283**	**13,803**	**12,838**

Italy											
Anthracite, BKB	-	-	-	-	-	-	-	-	-	-	-
Coal and other solid fuels	6,737	5,244	6,044	10,399	9,035	9,801	7,960	7,253	6,404	4,335	3,360
Lignite	264	43	1	-	-	-	-	-	-	-	-
Coke oven coke	-	-	-	-	-	-	-	-	-	-	-
Oil and petroleum products	21,531	25,009	18,954	12,079	7,365	4,522	4,315	4,164	4,103	3,705	3,499
Peat and peat products/Oil shale and oil sands	-	-	-	-	-	-	-	-	-	-	-
Natural gas	8,075	9,375	18,689	28,283	27,855	20,362	22,735	24,986	23,111	25,180	23,954
Manufactured gases	896	859	979	1,302	1,112	608	767	655	652	642	439
Primary solid biofuels/Charcoal	2	8	106	780	852	1,673	1,747	1,728	1,722	1,703	1,755
Liquid biofuels	-	-	-	-	572	940	905	861	835	910	906
Biogases	1	23	131	324	506	1,827	1,831	1,849	1,827	1,936	1,899
Renewable waste	11	28	86	556	778	846	871	853	847	873	843
Non-renewable waste	25	45	115	611	818	881	907	889	881	899	878
Total	**37,542**	**40,633**	**45,105**	**54,333**	**48,892**	**41,460**	**42,036**	**43,239**	**40,382**	**40,181**	**37,534**

Netherlands											
Anthracite, BKB	-	-	-	-	-	-	-	-	-	-	-
Coal and other solid fuels	5,544	5,798	4,998	4,958	4,669	8,040	7,277	6,126	5,304	3,502	1,525
Lignite	-	-	-	-	-	-	-	-	-	-	-
Coke oven coke	-	-	-	-	-	-	-	-	-	-	-
Oil and petroleum products	601	891	664	545	386	317	310	265	339	398	324
Peat and peat products/Oil shale and oil sands	-	-	-	-	-	-	-	-	-	-	-
Natural gas	6,798	8,663	10,373	11,471	13,567	7,976	8,931	9,600	9,340	11,019	11,094
Manufactured gases	483	554	562	643	615	631	582	616	589	565	542
Primary solid biofuels/Charcoal	11	12	122	485	974	494	515	516	506	815	1,444
Liquid biofuels	-	-	-	328	11	-	-	-	-	-	-
Biogases	15	51	56	57	188	159	149	139	129	129	119
Renewable waste	306	353	497	515	620	930	970	930	881	875	884
Non-renewable waste	223	302	472	581	550	761	826	824	813	776	753
Total	**13,981**	**16,624**	**17,744**	**19,584**	**21,581**	**19,309**	**19,559**	**19,016**	**17,901**	**18,079**	**16,685**

Table A2.31 - *following*

Fuel	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
Poland											
Anthracite, BKB	-	-	-	-	-	-	-	-	-	-	-
Coal and other solid fuels	28,852	23,256	22,935	23,535	22,984	19,880	20,246	20,224	20,295	18,957	17,098
Lignite	13,185	12,622	12,054	12,747	11,397	12,125	11,573	11,861	11,124	9,428	8,699
Coke oven coke	-	-	-	-	-	-	-	-	0	-	-
Oil and petroleum products	1,248	409	436	565	562	405	432	393	377	354	378
Peat and peat products/Oil shale and oil sands	-	-	-	-	-	-	-	-	-	-	-
Natural gas	71	63	299	1,070	973	1,235	1,482	1,798	2,209	2,527	2,918
Manufactured gases	602	425	540	488	792	990	968	913	926	857	714
Primary solid biofuels/Charcoal	249	22	70	372	1,510	2,249	1,711	1,282	1,314	1,605	1,762
Liquid biofuels	-	-	-	-	0	2	1	1	1	1	1
Biogases	-	3	9	13	66	150	173	196	205	206	229
Renewable waste	-	-	-	-	-	-	8	34	37	49	85
Non-renewable waste	124	89	21	13	17	32	96	133	196	234	230
Total	**44,330**	**36,888**	**36,365**	**38,803**	**38,302**	**37,066**	**36,689**	**36,834**	**36,683**	**34,216**	**32,116**
Romania											
Anthracite, BKB	-	-	-	-	-	-	-	-	-	-	-
Coal and other solid fuels	1,809	392	189	197	222	115	92	133	126	148	91
Lignite	5,781	6,959	5,247	5,785	5,617	4,832	4,260	4,346	4,114	3,885	2,632
Coke oven coke	-	-	-	-	-	-	-	-	-	-	-
Oil and petroleum products	6,264	3,025	1,728	782	302	184	244	203	209	227	147
Peat and peat products/Oil shale and oil sands	-	-	-	-	-	-	-	-	-	-	-
Natural gas	8,984	5,994	3,393	3,287	2,243	2,350	2,451	2,673	2,631	2,205	2,351
Manufactured gases	-	183	114	56	21	30	32	24	34	36	40
Primary solid biofuels/Charcoal	13	12	1	2	19	129	144	155	149	153	158
Liquid biofuels	-	-	-	-	-	-	-	-	-	-	-
Biogases	-	-	-	-	0	14	11	11	11	9	11
Renewable waste	-	-	-	-	-	-	-	-	-	-	-
Non-renewable waste	-	25	3	1	-	0	0	0	0	0	0
Total	**22,852**	**16,588**	**10,675**	**10,109**	**8,424**	**7,654**	**7,235**	**7,545**	**7,273**	**6,663**	**5,429**
Sweden											
Anthracite, BKB	-	-	-	-	-	-	-	-	-	-	-
Coal and other solid fuels	537	535	334	282	292	191	123	149	157	98	1
Lignite	-	-	-	-	-	-	-	-	-	-	-
Coke oven coke	-	-	-	-	-	-	-	-	-	-	-
Oil and petroleum products	274	761	281	320	435	70	119	75	93	64	42
Peat and peat products/Oil shale and oil sands	52	162	128	226	305	109	120	114	178	118	56
Natural gas	130	272	215	198	700	174	246	73	146	107	32
Manufactured gases	123	134	225	292	230	185	191	226	229	189	206
Primary solid biofuels/Charcoal	294	1,107	1,696	2,509	3,344	2,972	3,227	3,434	3,407	3,675	3,210
Liquid biofuels	-	-	-	28	67	10	19	15	22	15	10
Biogases	-	15	20	23	13	5	5	5	5	8	6
Renewable waste	53	110	137	225	628	844	767	809	756	796	874
Non-renewable waste	80	165	231	372	439	580	726	765	716	753	820
Total	**1,543**	**3,261**	**3,266**	**4,476**	**6,452**	**5,140**	**5,543**	**5,664**	**5,707**	**5,823**	**5,256**

Table A2.31 - *following*

Fuel	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
Other Countries											
Anthracite, BKB	87	74	207	1,221	1,332	361	422	375	258	196	212
Coal and other solid fuels	21,874	20,840	16,452	15,875	13,656	9,922	9,594	8,563	7,578	4,644	2,911
Lignite	22,571	22,927	21,936	22,057	21,003	18,587	15,958	16,821	15,669	13,440	9,808
Coke oven coke	-	-	-	-	1	3	-	-	-	-	-
Oil and petroleum products	16,804	15,464	12,190	9,723	6,029	4,212	4,034	3,935	3,460	3,400	3,128
Peat and peat products/Oil shale and oil sands	6,271	4,634	3,831	4,217	5,242	3,592	3,852	3,913	3,819	2,435	1,467
Natural gas	21,421	19,030	22,161	27,262	29,014	18,062	19,902	22,440	21,932	22,826	23,408
Manufactured gases	1,514	1,703	1,504	1,420	1,246	1,489	1,438	1,583	1,551	1,528	1,366
Primary solid biofuels/Charcoal	1,288	1,610	2,338	4,070	6,811	7,584	7,771	8,413	9,013	9,209	9,323
Liquid biofuels	-	-	-	44	60	30	8	10	23	24	9
Biogases	15	55	129	333	554	1,137	1,218	1,264	1,212	1,185	1,200
Renewable waste	162	334	589	888	1,119	1,443	1,508	1,546	1,596	1,613	1,601
Non-renewable waste	360	618	863	1,139	1,462	1,687	1,807	1,752	1,801	1,812	1,810
Total	**92,367**	**87,289**	**82,200**	**88,249**	**87,530**	**68,108**	**67,512**	**70,614**	**67,911**	**62,312**	**56,243**

Table A2.32 – *Gross electricity production in the thermoelectric plants in the main European countries (TWh). Total production includes electricity from pumping.*

Fuel	1990	1995	2000	2005	2010	2015	2016	2017	2018	2020
EU28										
Anthracite, BKB	1.5	0.8	0.9	20.9	13.0	14.9	7.5	6.4	6.1	2.5
Coal and other solid fuels	659.4	608.5	575.3	581.5	482.4	452.4	382.8	353.0	314.6	214.1
Lignite	337.8	320.5	344.1	341.2	313.4	313.7	299.4	301.9	291.6	241.3
Coke oven coke	0.8	-	-	-	0.0	0.0	-	-	0.0	-
Oil and petroleum products	224.2	230.3	181.3	142.8	86.9	65.3	63.9	60.3	56.1	53.4
Peat and peat products/Oil shale and oil sands	19.8	16.1	13.6	16.8	20.4	13.7	15.1	15.2	15.3	9.5
Natural gas	192.6	268.4	479.6	668.2	765.8	496.2	609.7	662.0	622.1	699.9
Manufactured gases	30.9	26.0	33.6	35.8	34.4	33.3	32.7	33.5	32.5	31.0
Primary solid biofuels/Charcoal	10.9	15.2	20.3	44.0	69.7	91.5	91.9	94.9	100.1	106.7
Liquid biofuels	-	-	-	1.8	4.9	5.5	5.3	5.0	4.9	5.2
Biogases	0.9	2.5	6.4	12.8	32.3	60.3	62.9	63.5	62.7	62.5
Renewable waste	2.5	3.8	7.3	11.6	17.0	20.7	21.2	22.2	22.9	22.9
Non-renewable waste	5.3	8.7	12.1	14.4	18.8	23.0	25.7	25.2	26.4	26.8
Total	**1,486.7**	**1,500.7**	**1,674.5**	**1,891.6**	**1,858.9**	**1,590.4**	**1,618.0**	**1,643.1**	**1,555.4**	**1,475.6**

EU27										
Anthracite, BKB	1.5	0.8	0.9	20.9	13.0	14.9	7.5	6.4	6.1	2.5
Coal and other solid fuels	454.8	454.7	455.3	446.8	374.8	376.5	352.1	330.5	297.7	207.2
Lignite	337.8	320.5	344.1	341.2	313.4	313.7	299.4	301.9	291.6	241.3
Coke oven coke	0.8	-	-	-	0.0	0.0	-	-	0.0	-
Oil and petroleum products	189.5	213.0	172.9	137.4	82.1	63.3	62.0	58.7	54.5	52.0
Peat and peat products/Oil shale and oil sands	19.8	16.1	13.6	16.8	20.4	13.7	15.1	15.2	15.3	9.5
Natural gas	187.6	204.6	331.5	514.2	588.8	396.4	466.4	525.3	490.8	569.4
Manufactured gases	29.1	24.7	31.2	34.1	33.3	32.3	31.9	32.7	31.7	30.3
Primary solid biofuels/Charcoal	10.9	15.0	19.8	40.6	65.0	72.0	72.4	74.3	76.3	80.6
Liquid biofuels	-	-	-	1.8	4.9	5.5	5.3	5.0	4.8	5.1
Biogases	0.5	1.5	3.9	8.1	26.2	53.8	55.0	55.6	55.1	55.0
Renewable waste	2.4	3.3	6.5	10.6	15.5	18.0	18.4	18.7	19.3	19.0
Non-renewable waste	5.2	8.3	11.6	11.8	17.4	19.4	20.7	20.8	21.6	21.4
Total	**1,239.9**	**1,262.4**	**1,391.2**	**1,584.3**	**1,554.8**	**1,379.5**	**1,406.3**	**1,445.2**	**1,365.0**	**1,293.2**

Belgium										
Anthracite, BKB	-	-	-	-	-	-	-	-	-	-
Coal and other solid fuels	17.1	16.5	12.9	8.2	4.2	2.1	0.4	0.1	0.1	0.1
Lignite	-	-	-	-	-	-	-	-	-	-
Coke oven coke	-	-	-	-	-	-	-	-	-	-
Oil and petroleum products	1.3	1.3	0.8	1.7	0.4	0.2	0.2	0.2	0.2	0.1
Peat and peat products/Oil shale and oil sands	-	-	-	-	-	-	-	-	-	-
Natural gas	5.4	10.2	16.0	21.5	30.8	22.0	22.1	23.0	24.0	25.5
Manufactured gases	2.8	2.8	3.1	2.3	1.8	2.0	2.2	2.3	2.3	2.4
Primary solid biofuels/Charcoal	0.1	0.1	0.2	1.0	3.0	3.6	3.5	3.8	3.5	3.3
Liquid biofuels	-	-	-	0.1	0.3	0.1	0.0	0.0	0.1	0.1
Biogases	0.0	0.0	0.1	0.2	0.6	1.0	1.0	0.9	0.9	0.9
Renewable waste	0.1	0.2	0.3	0.3	0.7	0.9	0.9	0.9	0.9	0.9
Non-renewable waste	0.4	0.7	0.8	0.7	1.2	1.2	1.3	1.3	1.3	1.2
Total	**27.3**	**31.8**	**34.1**	**36.0**	**42.9**	**33.1**	**31.6**	**32.6**	**33.2**	**34.5**

Table A2.32 - *following*

Fuel	1990	1995	2000	2005	2010	2015	2016	2017	2018	2020
Czechia										
Anthracite, BKB	-	-	-	-	0.0	-	-	-	-	-
Coal and other solid fuels	5.7	7.0	5.5	5.6	6.1	5.7	5.7	4.5	3.5	2.2
Lignite	41.3	37.4	47.2	44.0	40.8	35.5	36.2	37.0	37.7	35.2
Coke oven coke	-	-	-	-	-	-	-	-	-	-
Oil and petroleum products	0.5	0.6	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.1
Peat and peat products/Oil shale and oil sands	-	-	-	-	-	-	-	-	-	-
Natural gas	0.4	0.5	1.7	1.5	1.4	2.3	3.7	3.7	3.8	5.8
Manufactured gases	0.6	0.5	2.2	2.7	2.8	2.7	2.7	2.5	2.4	2.1
Primary solid biofuels/Charcoal	-	0.3	0.4	0.6	1.5	2.1	2.1	2.2	2.1	2.4
Liquid biofuels	-	-	-	-	-	-	-	-	-	-
Biogases	-	0.1	0.1	0.2	0.6	2.6	2.6	2.6	2.6	2.5
Renewable waste	-	-	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Non-renewable waste	-	-	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Total	**48.5**	**46.3**	**57.6**	**54.8**	**53.5**	**51.1**	**53.3**	**52.8**	**52.3**	**50.5**

Germany										
Anthracite, BKB	1.0	0.6	0.3	8.6	7.8	9.1	3.3	3.2	4.6	1.9
Coal and other solid fuels	141.0	147.1	143.2	126.9	110.6	110.4	110.6	91.1	79.6	57.0
Lignite	168.0	141.4	153.2	152.6	144.5	152.7	147.9	146.9	144.0	112.6
Coke oven coke	0.8	-	-	-	-	-	-	-	-	-
Oil and petroleum products	10.4	9.0	4.8	12.0	8.7	6.2	5.8	5.6	5.2	4.8
Peat and peat products/Oil shale and oil sands	-	-	-	-	-	-	-	-	-	-
Natural gas	40.5	43.2	52.5	74.0	90.4	63.0	82.3	87.7	83.4	90.8
Manufactured gases	10.8	7.2	7.5	9.6	10.6	11.5	11.5	11.6	10.8	10.4
Primary solid biofuels/Charcoal	0.1	0.5	0.8	7.5	10.4	11.0	10.8	10.6	11.1	11.0
Liquid biofuels	-	-	-	0.1	1.3	0.4	0.5	0.4	0.4	0.3
Biogases	0.2	0.6	1.7	3.9	17.5	33.1	33.7	33.9	33.2	33.0
Renewable waste	1.2	1.3	1.8	3.3	4.7	5.8	5.9	6.0	6.2	5.8
Non-renewable waste	3.6	5.3	5.8	3.3	6.4	7.1	7.3	7.3	7.1	6.8
Total	**377.7**	**356.2**	**371.6**	**401.7**	**412.8**	**410.3**	**419.6**	**404.3**	**385.4**	**334.2**

Spain										
Anthracite, BKB	0.3	-	-	8.3	0.3	4.8	3.1	2.2	0.9	0.1
Coal and other solid fuels	47.7	58.2	72.9	65.3	25.0	46.5	33.3	42.9	36.5	12.8
Lignite	11.8	7.7	6.2	5.4	-	-	-	-	-	-
Coke oven coke	-	-	-	-	-	-	-	-	-	-
Oil and petroleum products	8.6	14.6	22.6	24.4	16.6	17.2	16.9	15.8	14.5	12.9
Peat and peat products/Oil shale and oil sands	-	-	-	-	-	-	-	-	-	-
Natural gas	1.5	3.8	20.2	79.0	94.9	52.5	52.8	64.0	58.0	83.7
Manufactured gases	0.9	1.2	1.8	1.7	1.0	1.3	1.0	1.2	1.4	1.1
Primary solid biofuels/Charcoal	0.5	0.7	0.8	1.6	2.5	4.0	4.0	4.4	4.2	3.9
Liquid biofuels	-	-	-	-	-	-	-	-	0.0	0.0
Biogases	-	0.1	0.3	0.6	0.8	1.0	0.9	0.9	0.9	0.9
Renewable waste	0.1	0.2	0.3	0.5	0.7	0.8	0.7	0.8	0.8	0.8
Non-renewable waste	0.1	0.3	0.6	0.5	0.7	0.8	0.7	0.8	1.0	1.0
Total	**71.4**	**86.8**	**125.7**	**187.3**	**142.4**	**128.9**	**113.6**	**133.0**	**118.1**	**117.1**

Table A2.32 - *following*

Fuel	1990	1995	2000	2005	2010	2015	2016	2017	2018	2020
France										
Anthracite, BKB	-	-	-	-	-	-	-	-	-	-
Coal and other solid fuels	29.1	22.1	26.6	27.5	23.4	11.9	10.2	12.8	8.3	3.6
Lignite	2.4	2.0	0.4	-	-	-	-	-	-	-
Coke oven coke	-	-	-	-	-	-	-	-	-	-
Oil and petroleum products	8.7	7.7	7.2	7.9	5.5	6.7	6.9	7.0	5.7	5.9
Peat and peat products/Oil shale and oil sands	-	-	-	-	-	-	-	-	-	-
Natural gas	3.0	3.8	11.5	23.1	23.8	21.1	35.0	40.5	30.6	39.3
Manufactured gases	4.0	2.4	3.9	3.2	3.0	2.7	2.0	2.4	2.2	2.2
Primary solid biofuels/Charcoal	1.1	1.4	1.1	1.3	1.5	2.7	3.4	3.5	3.8	3.9
Liquid biofuels	-	-	-	-	-	0.0	0.0	0.0	0.0	0.0
Biogases	0.1	0.1	0.3	0.5	1.0	1.8	2.0	2.1	2.4	2.6
Renewable waste	0.2	0.4	1.1	1.7	2.0	2.0	2.1	2.2	2.2	2.2
Non-renewable waste	0.2	0.4	1.1	1.7	2.0	2.3	2.4	2.4	2.4	2.4
Total	**48.7**	**40.3**	**53.1**	**66.7**	**62.1**	**51.2**	**64.0**	**72.9**	**57.6**	**62.1**

Italy										
Anthracite, BKB	-	-	-	-	-	-	-	-	-	-
Coal and other solid fuels	30.9	24.0	26.3	43.6	39.7	43.2	35.6	32.6	28.5	18.8
Lignite	1.2	0.2	0.0	-	-	-	-	-	-	-
Coke oven coke	-	-	-	-	-	-	-	-	-	-
Oil and petroleum products	102.7	120.8	85.9	47.1	21.7	13.4	12.1	11.5	11.0	10.2
Peat and peat products/Oil shale and oil sands	-	-	-	-	-	-	-	-	-	-
Natural gas	39.7	47.0	101.4	149.3	152.7	110.9	126.1	140.3	128.5	141.7
Manufactured gases	3.7	3.4	4.3	5.8	4.7	2.2	2.8	2.5	2.5	2.4
Primary solid biofuels/Charcoal	0.0	0.0	0.4	2.2	2.3	3.9	4.1	4.2	4.2	4.2
Liquid biofuels	-	-	-	-	3.1	4.9	4.7	4.5	4.3	4.7
Biogases	0.0	0.1	0.6	1.2	2.1	8.2	8.3	8.3	8.3	8.3
Renewable waste	0.0	0.1	0.4	1.3	2.0	2.3	2.4	2.4	2.4	2.4
Non-renewable waste	0.1	0.2	0.5	1.5	2.1	2.4	2.5	2.5	2.5	2.4
Total	**178.3**	**195.8**	**219.7**	**252.0**	**230.5**	**191.5**	**198.7**	**208.8**	**192.1**	**195.1**

Netherlands										
Anthracite, BKB	-	-	-	-	-	-	-	-	-	-
Coal and other solid fuels	25.0	27.4	24.3	23.5	22.6	39.4	36.7	31.3	27.5	17.7
Lignite	-	-	-	-	-	-	-	-	-	-
Coke oven coke	-	-	-	-	-	-	-	-	-	-
Oil and petroleum products	3.1	2.8	2.6	2.3	1.3	1.3	1.3	1.2	1.3	1.4
Peat and peat products/Oil shale and oil sands	-	-	-	-	-	-	-	-	-	-
Natural gas	36.5	42.0	51.5	57.6	75.3	45.9	52.6	57.9	57.7	70.8
Manufactured gases	2.5	2.6	2.8	3.4	3.2	2.9	2.7	2.8	2.8	2.4
Primary solid biofuels/Charcoal	0.0	0.0	0.4	2.2	4.2	1.9	1.9	1.8	1.5	2.8
Liquid biofuels	-	-	-	1.4	0.1	-	-	-	-	-
Biogases	0.1	0.3	0.3	0.3	1.0	1.0	1.0	0.9	0.9	0.9
Renewable waste	0.5	0.7	1.3	1.3	1.8	2.0	2.0	1.9	2.2	2.1
Non-renewable waste	0.4	0.6	1.2	1.4	1.6	1.6	1.7	1.7	2.0	1.8
Total	**68.2**	**76.4**	**84.5**	**93.5**	**111.0**	**96.0**	**100.0**	**99.4**	**95.8**	**99.9**

Table A2.32 - *following*

Fuel	1990	1995	2000	2005	2010	2015	2016	2017	2018	2020
Poland										
Anthracite, BKB	-	-	-	-	-	-	-	-	-	-
Coal and other solid fuels	75.8	77.5	82.4	87.1	87.9	77.7	79.4	79.0	81.2	76.0
Lignite	54.6	54.3	53.5	54.8	48.7	52.8	50.9	52.2	49.3	42.2
Coke oven coke	-	-	-	-	-	-	-	-	0.0	-
Oil and petroleum products	1.6	1.5	1.9	2.8	2.9	2.1	2.3	2.0	1.8	1.8
Peat and peat products/Oil shale and oil sands	-	-	-	-	-	-	-	-	-	-
Natural gas	0.1	0.3	0.9	5.2	4.8	6.4	7.8	10.0	12.6	14.8
Manufactured gases	0.7	1.2	2.0	1.4	1.9	2.4	2.6	2.3	2.4	2.3
Primary solid biofuels/Charcoal	0.1	0.1	0.2	1.4	5.9	9.0	6.9	5.3	5.3	6.4
Liquid biofuels	-	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0
Biogases	-	0.0	0.0	0.1	0.4	0.9	1.0	1.1	1.1	1.1
Renewable waste	-	-	-	-	-	-	0.0	0.1	0.1	0.1
Non-renewable waste	0.2	0.3	0.1	0.0	0.0	0.1	0.2	0.3	0.4	0.6
Total	**133.0**	**135.2**	**141.1**	**152.7**	**152.4**	**151.5**	**151.2**	**152.3**	**154.4**	**145.3**

Romania										
Anthracite, BKB	-	-	-	-	-	-	-	-	-	-
Coal and other solid fuels	18.5	1.5	0.4	0.5	0.8	0.2	0.1	0.2	0.2	0.3
Lignite	-	19.1	18.5	21.5	19.9	17.9	15.7	16.6	15.4	13.3
Coke oven coke	-	-	-	-	-	-	-	-	-	-
Oil and petroleum products	11.8	5.8	3.4	1.9	0.7	0.5	0.7	0.6	0.6	0.6
Peat and peat products/Oil shale and oil sands	-	-	-	-	-	-	-	-	-	-
Natural gas	22.6	16.0	9.0	9.6	7.3	9.4	9.7	10.7	10.5	9.0
Manufactured gases	-	-	-	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Primary solid biofuels/Charcoal	-	-	-	0.0	0.1	0.5	0.5	0.5	0.4	0.5
Liquid biofuels	-	-	-	-	-	-	-	-	-	-
Biogases	-	-	-	-	0.0	0.1	0.1	0.1	0.1	0.1
Renewable waste	-	-	-	-	-	-	-	-	-	-
Non-renewable waste	-	0.0	-	0.0	-	0.0	0.0	-	-	-
Total	**52.9**	**42.4**	**31.3**	**33.7**	**28.8**	**28.6**	**26.9**	**28.7**	**27.3**	**23.8**

Sweden										
Anthracite, BKB	-	-	-	-	-	-	-	-	-	-
Coal and other solid fuels	1.1	2.3	1.6	0.6	1.0	0.4	0.3	0.3	0.3	0.2
Lignite	-	-	-	-	-	-	-	-	-	-
Coke oven coke	-	-	-	-	-	-	-	-	-	-
Oil and petroleum products	1.3	3.9	1.5	1.4	1.8	0.3	0.4	0.3	0.3	0.2
Peat and peat products/Oil shale and oil sands	0.1	0.2	0.1	0.5	0.7	0.2	0.2	0.2	0.3	0.2
Natural gas	0.4	0.7	0.5	0.6	2.9	0.4	0.6	0.3	0.4	0.3
Manufactured gases	0.5	0.7	0.8	0.8	0.9	0.7	0.6	0.7	0.8	0.8
Primary solid biofuels/Charcoal	1.9	2.3	4.0	6.8	10.3	9.0	9.7	10.3	10.2	11.2
Liquid biofuels	-	-	-	0.1	0.2	0.0	0.0	0.0	0.1	0.0
Biogases	-	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Renewable waste	0.0	0.0	0.1	0.5	1.7	1.7	1.7	1.8	1.7	1.8
Non-renewable waste	0.1	0.1	0.2	0.9	1.2	1.2	1.6	1.7	1.6	1.7
Total	**5.3**	**10.2**	**8.9**	**12.2**	**20.7**	**13.9**	**15.2**	**15.5**	**15.6**	**16.4**

Table A2.32 - *following*

Fuel	1990	1995	2000	2005	2010	2015	2016	2017	2018	2020
Other Countries										
Anthracite, BKB	0.2	0.2	0.6	3.9	4.9	0.9	1.1	1.0	0.7	0.6
Coal and other solid fuels	98.6	89.1	72.6	66.6	58.5	41.3	40.3	35.9	32.4	18.9
Lignite	58.5	77.5	83.5	84.4	79.4	72.7	64.4	65.9	60.5	51.3
Coke oven coke	-	-	-	-	0.0	0.0	-	-	-	-
Oil and petroleum products	52.7	52.0	46.0	39.2	23.4	16.0	16.2	15.2	14.6	14.7
Peat and peat products/Oil shale and oil sands	19.8	15.9	13.5	16.3	19.6	13.5	14.9	15.0	15.0	9.3
Natural gas	65.4	63.4	91.3	124.1	142.7	93.9	105.3	120.9	115.8	122.3
Manufactured gases	5.5	5.4	6.0	5.5	5.2	5.9	6.0	6.9	6.4	6.6
Primary solid biofuels/Charcoal	7.2	9.7	11.6	17.1	26.5	28.4	29.4	32.0	33.8	34.6
Liquid biofuels	-	-	-	0.1	0.3	0.1	0.0	0.1	0.1	0.1
Biogases	0.0	0.2	0.5	1.3	2.7	5.1	5.6	5.7	5.7	5.7
Renewable waste	0.2	0.6	1.5	2.1	2.6	3.3	3.4	3.5	3.8	3.8
Non-renewable waste	0.6	1.2	2.1	2.7	3.4	3.9	4.2	4.1	4.6	4.7
Total	**308.8**	**315.2**	**329.2**	**363.3**	**369.4**	**285.2**	**290.7**	**306.2**	**293.5**	**272.5**

Table A2.33 – *Gross of electricity production from renewable sources w/o pumping in the main European countries (TWh).*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28											
Hydro	290.0	331.9	356.9	313.3	376.9	342.3	351.0	300.2	349.3	325.8	-
Geothermal	3.2	3.5	4.8	5.4	5.6	6.6	6.7	6.7	6.7	6.7	-
Wind	0.8	4.1	22.2	71.0	150.1	303.5	304.0	361.9	377.4	431.5	-
Solar thermal	-	-	-	-	0.8	5.6	5.6	5.9	4.9	5.7	-
Solar photovoltaic	0.0	0.0	0.1	1.5	22.5	102.8	105.9	113.5	123.2	133.0	-
Tide, wave, ocean	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	-
Bioenergy	14.3	21.4	34.1	70.1	123.8	177.9	181.2	185.6	190.6	197.2	-
Total	**308.9**	**361.4**	**418.5**	**461.7**	**680.2**	**939.1**	**954.9**	**974.4**	**1,052.6**	**1,100.4**	**-**
EU27											
Hydro	284.8	327.0	351.8	308.4	373.3	336.0	345.6	294.3	343.9	320.2	346.3
Geothermal	3.2	3.5	4.8	5.4	5.6	6.6	6.7	6.7	6.7	6.7	6.7
Wind	0.8	3.7	21.3	68.1	139.8	263.2	266.8	312.3	320.6	367.2	397.4
Solar thermal	-	-	-	-	0.8	5.6	5.6	5.9	4.9	5.7	5.0
Solar photovoltaic	0.0	0.0	0.1	1.5	22.5	95.3	95.5	102.0	108.2	118.1	139.2
Tide, wave, ocean	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Bioenergy	13.7	19.8	30.1	61.0	111.6	149.4	151.1	153.6	155.5	159.7	162.7
Total	**303.1**	**354.5**	**408.6**	**444.8**	**654.1**	**856.5**	**871.8**	**875.5**	**940.2**	**978.1**	**1,057.9**
Belgium											
Hydro	0.3	0.3	0.5	0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.3
Geothermal	-	-	-	-	-	-	-	-	-	-	-
Wind	0.0	0.0	0.0	0.2	1.3	5.6	5.4	6.5	7.6	9.8	12.8
Solar thermal	-	-	-	-	-	-	-	-	-	-	-
Solar photovoltaic	-	-	-	0.0	0.6	3.1	3.1	3.3	3.9	4.3	5.1
Tide, wave, ocean	-	-	-	-	-	-	-	-	-	-	-
Bioenergy	0.3	0.3	0.6	1.6	4.5	5.5	5.4	5.7	5.4	5.2	5.3
Total	**0.6**	**0.7**	**1.0**	**2.1**	**6.6**	**14.5**	**14.3**	**15.8**	**17.2**	**19.5**	**23.4**
Czechia											
Hydro	1.2	2.0	1.8	2.4	2.8	1.8	2.0	1.9	1.6	2.0	2.1
Geothermal	-	-	-	-	-	-	-	-	-	-	-
Wind	-	-	0.0	0.0	0.3	0.6	0.5	0.6	0.6	0.7	0.7
Solar thermal	-	-	-	-	-	-	-	-	-	-	-
Solar photovoltaic	-	-	0.0	0.0	0.6	2.3	2.1	2.2	2.4	2.3	2.3
Tide, wave, ocean	-	-	-	-	-	-	-	-	-	-	-
Bioenergy	-	0.4	0.5	0.7	2.2	4.8	4.8	5.0	4.8	5.0	5.2
Total	**1.2**	**2.4**	**2.3**	**3.1**	**5.9**	**9.4**	**9.4**	**9.6**	**9.4**	**10.1**	**10.3**
Germany											
Hydro	17.4	21.8	21.7	19.6	21.0	19.0	20.5	20.1	17.7	19.7	18.3
Geothermal	-	-	-	-	0.0	0.1	0.2	0.2	0.2	0.2	0.2
Wind	0.1	1.7	9.4	27.8	38.5	80.6	79.9	105.7	110.0	125.9	132.1
Solar thermal	-	-	-	-	-	-	-	-	-	-	-
Solar photovoltaic	0.0	0.0	0.1	1.3	11.7	38.7	38.1	39.4	43.5	44.4	48.6
Tide, wave, ocean	-	-	-	-	-	-	-	-	-	-	-
Bioenergy	1.6	2.4	4.3	14.7	33.9	50.3	50.9	50.9	50.8	50.1	50.9
Total	**19.1**	**25.9**	**35.5**	**63.4**	**105.2**	**188.8**	**189.7**	**216.3**	**222.1**	**240.3**	**250.2**

Table A2.33 – *following*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
Spain											
Hydro	25.5	23.1	28.3	18.4	42.3	28.1	36.4	18.3	34.3	24.6	30.5
Geothermal	-	-	-	-	-	-	-	-	-	-	-
Wind	0.0	0.3	4.7	21.2	44.3	49.3	48.9	49.1	50.9	55.6	56.4
Solar thermal	-	-	-	-	0.8	5.6	5.6	5.9	4.9	5.7	5.0
Solar photovoltaic	0.0	0.0	0.0	0.0	6.4	8.3	8.1	8.5	7.9	9.4	15.7
Tide, wave, ocean	-	-	-	-	-	-	-	-	-	0.0	0.0
Bioenergy	0.5	1.0	1.5	2.7	4.0	5.8	5.7	6.1	5.9	5.6	6.1
Total	**26.0**	**24.4**	**34.5**	**42.3**	**97.8**	**97.1**	**104.6**	**87.9**	**103.9**	**101.0**	**113.8**
France											
Hydro	53.9	73.1	66.4	51.5	62.7	55.6	60.8	50.0	65.1	56.9	62.1
Geothermal	-	-	-	-	-	0.1	0.1	0.1	0.1	0.1	0.1
Wind	0.0	0.0	0.0	1.0	9.9	21.4	21.4	24.6	28.6	34.8	39.8
Solar thermal	-	-	-	-	-	-	-	-	-	-	-
Solar photovoltaic	-	0.0	0.0	0.0	0.6	7.8	8.7	9.6	10.9	12.2	13.4
Tide, wave, ocean	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Bioenergy	1.4	1.8	2.5	3.4	4.4	6.5	7.5	7.8	8.4	8.6	8.8
Total	**55.8**	**75.5**	**69.4**	**56.3**	**78.2**	**91.8**	**99.0**	**92.6**	**113.6**	**113.2**	**124.7**
Italy											
Hydro	31.6	37.8	44.2	36.1	51.1	45.5	42.4	36.2	48.8	46.3	47.6
Geothermal	3.2	3.4	4.7	5.3	5.4	6.2	6.3	6.2	6.1	6.1	6.0
Wind	0.0	0.0	0.6	2.3	9.1	14.8	17.7	17.7	17.7	20.2	18.8
Solar thermal	-	-	-	-	-	-	-	-	-	-	-
Solar photovoltaic	0.0	0.0	0.0	0.0	1.9	22.9	22.1	24.4	22.7	23.7	24.9
Tide, wave, ocean	-	-	-	-	-	-	-	-	-	-	-
Bioenergy	0.1	0.2	1.4	4.7	9.4	19.4	19.5	19.4	19.2	19.6	19.6
Total	**34.9**	**41.5**	**50.9**	**48.4**	**77.0**	**108.9**	**108.0**	**103.9**	**114.4**	**115.8**	**116.9**
Netherlands											
Hydro	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0
Geothermal	-	-	-	-	-	-	-	-	-	-	-
Wind	0.1	0.3	0.8	2.1	4.0	7.5	8.2	10.6	10.5	11.5	15.3
Solar thermal	-	-	-	-	-	-	-	-	-	-	-
Solar photovoltaic	0.0	0.0	0.0	0.0	0.1	1.1	1.6	2.2	3.7	5.4	8.8
Tide, wave, ocean	-	-	-	-	-	-	-	-	-	-	-
Bioenergy	0.7	1.0	2.0	5.3	7.0	4.9	4.9	4.6	4.6	5.8	8.8
Total	**0.8**	**1.4**	**3.0**	**7.4**	**11.2**	**13.7**	**14.8**	**17.4**	**18.9**	**22.8**	**33.0**
Poland											
Hydro	1.4	1.9	2.1	2.2	2.9	1.8	2.1	2.6	2.0	2.0	2.1
Geothermal	-	-	-	-	-	-	-	-	-	-	-
Wind	-	0.0	0.0	0.1	1.7	10.9	12.6	14.9	12.8	15.1	15.8
Solar thermal	-	-	-	-	-	-	-	-	-	-	-
Solar photovoltaic	-	-	-	-	-	0.1	0.1	0.2	0.3	0.7	2.0
Tide, wave, ocean	-	-	-	-	-	-	-	-	-	-	-
Bioenergy	0.1	0.1	0.2	1.5	6.3	9.9	8.0	6.5	6.5	7.7	8.4
Total	**1.5**	**2.0**	**2.3**	**3.8**	**10.9**	**22.7**	**22.8**	**24.1**	**21.6**	**25.5**	**28.2**

Table A2.33 – *following*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
Romania											
Hydro	11.4	16.7	14.8	20.2	19.9	16.6	18.0	14.5	17.7	15.6	15.4
Geothermal	-	-	-	-	-	0.0	0.0	-	-	-	-
Wind	-	-	-	0.0	0.3	7.1	6.6	7.4	6.3	6.8	6.9
Solar thermal	-	-	-	-	-	-	-	-	-	-	-
Solar photovoltaic	-	-	-	-	0.0	2.0	1.8	1.9	1.8	1.8	1.7
Tide, wave, ocean	-	-	-	-	-	-	-	-	-	-	-
Bioenergy	-	-	-	0.0	0.1	0.5	0.5	0.5	0.4	0.5	0.5
Total	**11.4**	**16.7**	**14.8**	**20.2**	**20.3**	**26.2**	**27.0**	**24.3**	**26.2**	**24.6**	**24.6**
Sweden											
Hydro	72.5	68.1	78.6	72.8	66.4	75.3	62.0	65.1	62.2	65.4	72.4
Geothermal	-	-	-	-	-	-	-	-	-	-	-
Wind	0.0	0.1	0.5	0.9	3.5	16.3	15.5	17.6	16.6	19.8	27.5
Solar thermal	-	-	-	-	-	-	-	-	-	-	-
Solar photovoltaic	-	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.4	0.7	1.1
Tide, wave, ocean	-	-	-	-	-	-	-	-	-	-	-
Bioenergy	1.9	2.4	4.1	7.5	12.2	10.8	11.5	12.1	11.9	13.0	11.2
Total	**74.5**	**70.6**	**83.1**	**81.2**	**82.1**	**102.5**	**89.1**	**95.1**	**91.2**	**98.9**	**112.1**
Other countries											
Hydro	69.5	82.1	93.4	84.8	103.8	91.8	100.7	85.3	94.1	87.3	95.5
Geothermal	0.0	0.0	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.3
Wind	0.6	1.3	5.3	12.5	26.9	49.1	50.2	57.5	59.0	67.0	71.2
Solar thermal	-	-	-	-	-	-	-	-	-	-	-
Solar photovoltaic	0.0	0.0	0.0	0.0	0.5	9.0	9.6	10.2	10.8	13.2	15.7
Tide, wave, ocean	-	-	-	-	-	0.0	0.0	0.0	-	-	-
Bioenergy	7.2	10.2	13.0	19.0	27.5	30.9	32.5	35.1	37.6	38.6	37.8
Total	**77.4**	**93.6**	**111.8**	**116.4**	**158.9**	**181.0**	**193.1**	**188.4**	**201.7**	**206.4**	**220.6**

Table A2.34 – *Other parameters of electricity production and distribution for the main European countries (TWh).*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28											
Net import	46	21	23	16	8	14	18	10	28	24	
Gross electricity production	2,595	2,743	3,035	3,326	3,367	3,245	3,268	3,299	3,278	3,232	
Energy own consumption	162	159	162	173	169	156	160	161	154	143	
Electricity for pumped storage	28	29	41	48	43	41	41	43	40	37	
Distribution losses	176	201	217	220	212	208	206	205	208	205	
Gross inland consumption	2,641	2,764	3,058	3,342	3,375	3,259	3,286	3,309	3,306	3,256	
Final consumption	2,161	2,257	2,528	2,783	2,839	2,754	2,786	2,806	2,811	2,780	
Industry	*994*	*961*	*1,060*	*1,131*	*1,030*	*1,007*	*1,019*	*1,035*	*1,040*	*1,026*	
Agriculture and forestry/Fishing	*49*	*40*	*40*	*44*	*52*	*56*	*56*	*57*	*57*	*58*	
Commercial and public services	*444*	*519*	*635*	*740*	*841*	*828*	*833*	*837*	*835*	*819*	
Households	*609*	*657*	*718*	*802*	*849*	*800*	*813*	*812*	*813*	*810*	
Transport	*62*	*67*	*70*	*64*	*60*	*61*	*62*	*63*	*64*	*64*	
Not elsewhere specified	*4*	*13*	*5*	*3*	*7*	*3*	*3*	*2*	*2*	*3*	

EU27											
Net import	34	4	9	7	5	-7	1	-5	9	3	14
Gross electricity production	2,275	2,409	2,658	2,927	2,984	2,907	2,928	2,961	2,943	2,907	2,786
Energy own consumption	143	141	146	155	153	146	144	146	141	131	122
Electricity for pumped storage	25	27	38	45	38	38	37	39	36	35	39
Distribution losses	151	174	186	192	185	179	180	178	183	179	174
Gross inland consumption	2,309	2,414	2,667	2,934	2,989	2,900	2,929	2,956	2,952	2,910	2,800
Final consumption	1,887	1,963	2,198	2,436	2,511	2,450	2,482	2,506	2,507	2,480	2,385
Industry	*893*	*860*	*946*	*1,015*	*925*	*913*	*926*	*942*	*946*	*933*	*885*
Agriculture and forestry/Fishing	*45*	*36*	*36*	*40*	*47*	*52*	*52*	*53*	*53*	*54*	*53*
Commercial and public services	*373*	*439*	*544*	*649*	*745*	*733*	*740*	*741*	*740*	*726*	*677*
Households	*515*	*555*	*606*	*669*	*730*	*692*	*704*	*709*	*707*	*706*	*714*
Transport	*57*	*59*	*61*	*60*	*56*	*56*	*57*	*58*	*59*	*58*	*53*
Not elsewhere specified	*4*	*13*	*5*	*3*	*7*	*3*	*3*	*3*	*2*	*3*	*3*

Table A2.34 – *following*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
Belgium											
Net import	-3.7	4.1	4.3	6.3	0.6	21.0	6.2	6.0	17.3	-1.9	-0.3
Gross electricity production	70.9	74.4	84.0	85.7	94.6	69.7	85.6	86.6	75.0	93.6	89.4
Energy own consumption	3.7	3.8	3.7	3.4	3.6	2.3	3.2	3.5	3.0	3.7	3.3
Electricity for pumped storage	0.8	1.2	1.6	1.8	1.8	1.5	1.5	1.5	1.3	1.2	1.4
Distribution losses	3.6	3.7	3.8	3.9	4.1	3.8	3.9	3.8	3.8	3.6	3.5
Gross inland consumption	67.2	78.5	88.3	92.0	95.1	90.7	91.8	92.6	92.4	91.8	89.1
Final consumption	58.0	68.4	77.5	81.9	85.4	81.6	82.2	82.2	82.8	81.8	79.1
Industry	*30.5*	*34.6*	*39.9*	*39.4*	*39.9*	*38.1*	*38.4*	*38.6*	*39.0*	*38.3*	*36.5*
Agriculture and forestry/Fishing	*0.0*	*0.0*	*0.3*	*1.0*	*1.6*	*1.6*	*1.7*	*1.6*	*1.7*	*1.8*	*1.9*
Commercial and public services	*7.8*	*10.3*	*12.2*	*20.8*	*22.3*	*21.4*	*21.6*	*21.7*	*21.8*	*21.6*	*20.4*
Households	*18.4*	*22.1*	*23.7*	*19.0*	*19.9*	*18.8*	*18.8*	*18.5*	*18.5*	*18.4*	*18.6*
Transport	*1.2*	*1.5*	*1.4*	*1.7*	*1.8*	*1.6*	*1.7*	*1.7*	*1.7*	*1.7*	*1.6*
Not elsewhere specified	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*

Czechia											
Net import	-0.7	0.4	-10.0	-12.6	-14.9	-12.5	-11.0	-13.0	-13.9	-13.1	-10.2
Gross electricity production	62.6	60.8	73.5	82.6	85.9	83.9	83.3	87.1	88.0	87.0	81.5
Energy own consumption	4.4	4.0	5.5	6.4	7.6	7.0	6.9	7.2	7.2	6.9	6.4
Electricity for pumped storage	0.4	0.4	0.7	0.9	0.8	1.7	1.6	1.5	1.4	1.5	1.7
Distribution losses	4.0	4.8	5.0	5.0	4.5	4.1	4.1	4.4	4.3	4.3	4.1
Gross inland consumption	61.9	61.3	63.4	69.9	71.0	71.4	72.3	74.0	74.1	73.9	71.4
Final consumption	48.2	48.1	49.4	53.6	54.2	54.5	55.9	57.4	58.1	58.4	57.0
Industry	*26.9*	*18.4*	*18.9*	*23.1*	*21.8*	*22.6*	*23.0*	*23.9*	*24.3*	*24.3*	*23.1*
Agriculture and forestry/Fishing	*2.9*	*1.6*	*1.2*	*1.0*	*0.9*	*1.0*	*0.9*	*1.0*	*1.0*	*1.0*	*1.0*
Commercial and public services	*3.6*	*9.2*	*11.6*	*12.9*	*14.9*	*14.9*	*15.3*	*15.6*	*16.0*	*16.1*	*15.4*
Households	*9.6*	*14.8*	*13.8*	*14.7*	*15.0*	*14.4*	*14.9*	*15.2*	*15.0*	*15.3*	*16.0*
Transport	*3.2*	*2.4*	*2.3*	*1.8*	*1.6*	*1.6*	*1.6*	*1.7*	*1.8*	*1.8*	*1.6*
Not elsewhere specified	*1.9*	*1.7*	*1.5*	-	-	-	-	-	-	-	-

Germany											
Net import	0.9	4.8	3.1	-4.6	-15.0	-48.3	-50.5	-52.5	-48.7	-32.7	-19.0
Gross electricity production	550.0	537.3	576.5	623.1	633.1	648.3	650.4	653.7	640.5	606.9	572.7
Energy own consumption	41.4	38.4	38.1	40.2	38.7	38.0	36.1	34.7	34.8	31.1	27.8
Electricity for pumped storage	5.0	5.9	6.0	9.5	8.6	8.1	7.5	8.3	8.4	8.2	8.9
Distribution losses	23.5	25.3	34.1	29.3	24.0	25.6	25.8	27.0	26.7	27.5	26.9
Gross inland consumption	550.9	542.1	579.6	618.5	618.2	600.0	599.9	601.3	591.7	574.3	553.6
Final consumption	455.1	451.2	483.5	522.4	532.0	514.9	517.6	519.0	509.4	496.5	479.8
Industry	*216.5*	*204.7*	*211.6*	*230.6*	*228.5*	*228.8*	*230.6*	*232.2*	*230.7*	*223.3*	*211.1*
Agriculture and forestry/Fishing	-	-	-	-	*5.9*	*5.5*	*5.5*	*5.1*	*5.2*	*5.1*	*5.2*
Commercial and public services	*87.9*	*103.1*	*125.5*	*137.4*	*143.9*	*140.7*	*141.6*	*138.8*	*133.5*	*130.0*	*125.4*
Households	*137.1*	*127.2*	*130.5*	*141.3*	*141.7*	*128.7*	*128.2*	*130.9*	*127.9*	*126.5*	*127.0*
Transport	*13.7*	*16.2*	*15.9*	*13.1*	*12.1*	*11.1*	*11.7*	*12.0*	*12.1*	*11.6*	*11.1*
Not elsewhere specified	-	-	-	-	-	-	-	-	-	-	-

Spain											
Net import	-0.4	4.5	4.4	-1.3	-8.3	-0.1	7.7	9.2	11.1	6.9	3.3
Gross electricity production	151.9	167.1	224.5	294.1	301.5	280.9	274.8	275.7	274.5	273.3	263.4
Energy own consumption	7.3	8.0	10.0	11.9	10.6	11.2	10.4	10.8	10.6	9.5	8.8
Electricity for pumped storage	1.0	2.1	4.9	6.4	4.5	4.5	4.8	3.6	3.2	3.0	4.6
Distribution losses	14.0	16.0	19.3	26.0	27.4	26.5	26.7	23.8	25.6	24.8	25.6
Gross inland consumption	151.5	171.6	228.9	292.7	293.2	280.8	282.4	284.9	285.6	280.1	266.7
Final consumption	125.8	140.9	188.5	242.2	244.8	232.0	232.5	239.1	238.5	234.5	219.7
Industry	*63.3*	*60.6*	*85.6*	*105.0*	*73.5*	*76.1*	*77.9*	*81.0*	*78.7*	*75.9*	*68.9*
Agriculture and forestry/Fishing	*3.5*	*4.9*	*5.0*	*5.3*	*4.1*	*5.8*	*6.0*	*5.9*	*5.0*	*5.5*	*5.3*
Commercial and public services	*25.1*	*29.6*	*50.0*	*63.8*	*83.9*	*74.1*	*73.4*	*75.3*	*74.5*	*74.6*	*67.2*
Households	*30.2*	*36.0*	*43.6*	*62.6*	*75.7*	*70.1*	*69.6*	*71.4*	*75.0*	*73.0*	*73.2*
Transport	*3.7*	*3.9*	*4.2*	*5.4*	*3.2*	*4.0*	*3.9*	*4.0*	*4.0*	*3.9*	*3.3*
Not elsewhere specified	-	*5.9*	-	*0.1*	*4.4*	*2.0*	*1.7*	*1.5*	*1.2*	*1.6*	*1.7*

Table A2.34 – *following*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
France											
Net import	-45.4	-69.8	-69.5	-60.3	-30.7	-64.1	-41.5	-40.1	-63.0	-57.7	-45.0
Gross electricity production	420.8	494.3	540.0	576.1	569.3	579.5	564.1	562.0	581.8	570.9	531.8
Energy own consumption	19.6	21.7	23.8	26.0	25.0	24.3	23.7	24.1	24.0	23.9	22.5
Electricity for pumped storage	4.9	4.2	6.6	6.6	6.6	6.9	6.7	7.1	7.4	6.4	6.2
Distribution losses	27.7	30.1	30.4	32.2	35.4	36.1	37.5	38.6	38.6	38.1	35.9
Gross inland consumption	375.3	424.4	470.5	515.7	538.6	515.4	522.6	521.8	518.8	513.2	486.7
Final consumption	302.2	342.9	384.9	422.8	444.1	435.0	442.7	439.4	437.1	431.7	411.4
Industry	*114.7*	*123.6*	*134.7*	*139.5*	*117.4*	*115.9*	*117.7*	*116.7*	*116.9*	*115.7*	*105.8*
Agriculture and forestry/Fishing	*2.1*	*2.6*	*2.7*	*7.4*	*7.7*	*8.9*	*8.9*	*8.9*	*8.6*	*8.5*	*8.1*
Commercial and public services	*80.8*	*95.0*	*106.3*	*125.2*	*144.7*	*141.4*	*141.9*	*141.4*	*140.5*	*136.6*	*126.5*
Households	*96.9*	*108.8*	*128.7*	*138.5*	*161.5*	*157.3*	*163.1*	*161.1*	*160.2*	*159.7*	*161.5*
Transport	*7.5*	*7.7*	*9.4*	*9.9*	*10.0*	*10.7*	*10.5*	*10.6*	*10.1*	*10.1*	*8.3*
Not elsewhere specified	*0.3*	*5.0*	*3.1*	*2.3*	*2.7*	*0.9*	*0.6*	*0.6*	*0.7*	*1.2*	*1.2*
Italy	0.2	0.2	0.2	0.2	0.1	0.2	0.1	0.1	0.2	0.1	0.1
Net import	34.7	37.4	44.3	49.2	44.2	46.4	37.0	37.8	43.9	38.1	32.2
Gross electricity production	216.6	241.5	276.6	303.7	302.1	283.0	289.8	295.8	289.7	293.9	280.5
Energy own consumption	11.5	12.3	13.3	13.1	11.3	10.6	10.1	10.6	9.9	9.9	8.9
Electricity for pumped storage	4.8	5.6	9.1	9.3	4.5	1.9	2.5	2.5	2.3	2.5	2.7
Distribution losses	16.2	17.6	19.2	20.6	20.6	19.7	18.8	18.7	18.0	17.8	17.4
Gross inland consumption	251.3	278.9	321.0	352.9	346.2	329.4	326.8	333.6	333.6	332.0	312.7
Final consumption	214.6	238.3	273.0	300.9	299.3	287.5	286.0	292.0	293.1	291.9	275.2
Industry	*110.9*	*119.6*	*141.8*	*144.8*	*127.9*	*112.7*	*113.3*	*115.6*	*116.1*	*119.5*	*117.3*
Agriculture and forestry/Fishing	*4.2*	*4.0*	*4.9*	*5.4*	*5.6*	*5.7*	*5.6*	*6.0*	*5.8*	*6.1*	*6.3*
Commercial and public services	*40.0*	*49.7*	*56.6*	*73.9*	*85.6*	*92.1*	*91.7*	*93.5*	*94.5*	*89.2*	*75.3*
Households	*52.7*	*57.2*	*61.1*	*67.0*	*69.6*	*66.2*	*64.3*	*65.5*	*65.1*	*65.6*	*66.2*
Transport	*6.7*	*7.8*	*8.5*	*9.9*	*10.7*	*10.9*	*11.2*	*11.4*	*11.5*	*11.5*	*10.1*
Not elsewhere specified	-	-	-	-	-	-	-	-	-	-	-
Netherlands											
Net import	9.2	11.4	18.9	18.3	2.8	8.7	4.9	3.5	8.0	0.9	-2.7
Gross electricity production	72.0	81.2	89.6	99.9	119.3	110.2	115.2	117.2	114.3	121.4	123.6
Energy own consumption	2.5	3.4	3.6	4.3	4.4	4.5	4.2	3.8	3.4	3.5	3.4
Electricity for pumped storage	-	-	-	-	-	-	-	-	-	-	-
Distribution losses	3.7	4.1	4.9	5.4	5.6	5.3	5.4	5.4	5.3	5.1	4.7
Gross inland consumption	81.2	92.5	108.5	118.2	122.0	119.0	120.1	120.7	122.2	122.2	120.9
Final consumption	71.5	80.4	95.1	104.4	107.7	103.8	105.1	106.3	108.9	109.2	109.1
Industry	*33.4*	*36.4*	*40.4*	*41.5*	*39.2*	*34.1*	*35.4*	*35.6*	*36.0*	*35.4*	*35.4*
Agriculture and forestry/Fishing	*2.6*	*3.7*	*4.2*	*5.8*	*6.9*	*9.0*	*8.9*	*9.6*	*10.8*	*11.6*	*10.8*
Commercial and public services	*18.5*	*20.7*	*28.8*	*33.7*	*36.8*	*36.3*	*36.2*	*36.7*	*37.0*	*36.6*	*35.9*
Households	*15.7*	*18.1*	*20.0*	*21.8*	*23.0*	*22.6*	*22.6*	*22.6*	*23.0*	*23.4*	*24.6*
Transport	*1.3*	*1.5*	*1.6*	*1.6*	*1.8*	*1.8*	*1.8*	*1.8*	*2.0*	*2.2*	*2.2*
Not elsewhere specified	-	-	-	-	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*
Poland											
Net import	-1.0	-2.8	-6.4	-11.2	-1.4	-0.3	2.0	2.3	5.7	10.6	13.3
Gross electricity production	136.3	139.0	145.2	156.9	157.7	164.9	166.6	170.5	170.0	164.0	158.0
Energy own consumption	12.9	11.6	13.0	13.3	14.2	14.2	14.6	15.6	14.8	12.6	11.9
Electricity for pumped storage	2.6	2.8	2.8	2.2	0.8	0.9	0.7	0.7	0.7	1.0	1.2
Distribution losses	10.6	18.1	14.2	14.6	11.9	10.5	9.5	10.0	8.9	9.0	10.0
Gross inland consumption	135.3	136.2	138.8	145.7	156.3	164.6	168.6	172.8	175.7	174.6	171.3
Final consumption	96.2	89.7	98.1	105.0	118.7	127.8	132.8	135.8	140.5	140.4	137.3
Industry	*42.7*	*44.0*	*39.9*	*40.9*	*41.5*	*49.5*	*51.2*	*54.5*	*56.4*	*56.7*	*54.3*
Agriculture and forestry/Fishing	*8.5*	*5.5*	*4.7*	*1.5*	*1.6*	*1.5*	*1.6*	*1.7*	*1.9*	*1.8*	*1.8*
Commercial and public services	*19.3*	*17.4*	*27.8*	*33.4*	*43.7*	*45.4*	*47.8*	*47.0*	*49.4*	*49.1*	*48.0*
Households	*20.2*	*18.1*	*21.0*	*25.3*	*28.6*	*28.3*	*28.9*	*29.2*	*29.3*	*29.4*	*30.0*
Transport	*5.5*	*4.7*	*4.7*	*4.0*	*3.3*	*3.1*	*3.3*	*3.3*	*3.5*	*3.4*	*3.2*
Not elsewhere specified	-	-	-	-	-	-	-	-	-	-	-

Table A2.34 – *following*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
Romania											
Net import	9.5	0.3	-0.7	-2.9	-2.3	-6.7	-5.0	-2.9	-2.5	1.5	2.8
Gross electricity production	64.3	59.1	51.6	59.4	61.0	66.3	65.1	64.3	64.9	59.6	55.9
Energy own consumption	7.6	6.4	3.3	3.9	5.1	5.0	4.8	4.9	4.7	4.4	4.0
Electricity for pumped storage	-	-	-	-	0.5	0.5	0.7	0.5	0.6	0.6	0.4
Distribution losses	5.9	6.7	6.6	6.1	7.1	7.2	7.1	7.0	7.1	6.5	6.2
Gross inland consumption	73.8	59.4	50.9	56.5	58.7	59.6	60.1	61.4	62.3	61.1	58.7
Final consumption	54.2	36.4	33.9	38.9	41.3	43.0	43.3	44.7	45.6	45.6	44.0
Industry	*38.6*	*23.3*	*19.9*	*23.7*	*20.4*	*20.5*	*20.8*	*21.7*	*22.2*	*21.9*	*20.2*
Agriculture and forestry/Fishing	*3.2*	*1.8*	*0.6*	*0.3*	*0.7*	*0.9*	*0.7*	*0.7*	*0.8*	*0.8*	*0.5*
Commercial and public services	*4.5*	*2.0*	*3.9*	*4.0*	*7.6*	*8.4*	*8.6*	*8.5*	*8.8*	*8.8*	*8.5*
Households	*5.4*	*7.1*	*7.7*	*9.2*	*11.3*	*12.1*	*12.1*	*12.6*	*12.8*	*13.0*	*13.6*
Transport	*2.6*	*2.2*	*1.9*	*1.6*	*1.4*	*1.1*	*1.0*	*1.1*	*1.1*	*1.1*	*1.1*
Not elsewhere specified	-	-	-	-	-	-	-	-	-	-	-

Sweden											
Net import	-1.8	-1.7	4.7	-7.4	2.1	-22.6	-11.7	-19.0	-17.2	-26.2	-25.0
Gross electricity production	146.5	148.4	145.3	158.4	148.5	162.1	156.0	164.3	163.4	168.4	163.8
Energy own consumption	4.0	4.1	3.7	3.8	3.3	3.1	3.5	3.7	3.7	2.8	2.9
Electricity for pumped storage	0.8	0.1	0.0	0.1	0.1	0.2	0.2	0.0	0.1	0.0	0.1
Distribution losses	9.2	10.1	10.8	11.7	10.6	7.0	8.6	9.5	10.5	10.8	8.6
Gross inland consumption	144.7	146.7	149.9	151.0	150.6	139.5	144.3	145.3	146.2	142.3	138.8
Final consumption	120.3	124.6	128.7	130.7	131.2	124.9	127.5	127.3	127.6	124.6	123.1
Industry	*54.0*	*52.0*	*56.9*	*57.6*	*54.4*	*50.3*	*50.3*	*50.9*	*50.7*	*49.5*	*47.5*
Agriculture and forestry/Fishing	*1.5*	*1.4*	*1.2*	*1.5*	*1.3*	*1.3*	*1.3*	*1.1*	*1.2*	*1.0*	*1.1*
Commercial and public services	*24.4*	*26.1*	*25.4*	*26.1*	*27.2*	*27.7*	*28.7*	*27.6*	*28.0*	*27.5*	*29.2*
Households	*38.1*	*42.4*	*42.0*	*42.7*	*46.0*	*43.0*	*44.5*	*45.1*	*45.1*	*43.9*	*42.6*
Transport	*2.5*	*2.7*	*3.2*	*2.8*	*2.4*	*2.6*	*2.7*	*2.5*	*2.6*	*2.7*	*2.8*
Not elsewhere specified	-	-	-	-	-	-	-	-	-	-	-

Other Countries											
Net import	38.3	20.1	19.3	37.4	26.2	86.1	63.8	67.3	83.0	76.1	67.0
Gross electricity production	518.6	539.9	587.1	631.8	666.7	593.7	628.0	634.7	620.9	621.4	610.8
Energy own consumption	39.2	38.2	35.1	35.5	37.4	32.8	34.6	35.6	32.3	31.1	29.2
Electricity for pumped storage	5.8	5.8	7.6	9.6	12.5	13.6	13.2	14.9	12.8	12.4	13.5
Distribution losses	42.1	47.7	48.0	47.1	45.5	44.5	43.7	40.7	44.8	41.6	41.1
Gross inland consumption	556.9	559.9	606.4	669.2	692.8	679.9	691.7	702.0	703.9	697.5	677.8
Final consumption	453.0	446.6	497.1	553.8	578.7	569.7	581.5	590.1	594.0	593.0	572.3
Industry	*230.6*	*201.1*	*215.9*	*231.7*	*220.9*	*223.5*	*226.3*	*231.6*	*235.7*	*232.9*	*221.4*
Agriculture and forestry/Fishing	*20.0*	*12.6*	*12.0*	*12.4*	*13.4*	*12.9*	*13.1*	*13.5*	*13.3*	*13.6*	*13.4*
Commercial and public services	*73.7*	*88.5*	*112.6*	*142.4*	*164.0*	*160.7*	*162.9*	*165.3*	*166.7*	*166.2*	*153.9*
Households	*114.3*	*132.2*	*144.9*	*155.4*	*169.1*	*161.8*	*168.2*	*168.3*	*166.8*	*168.9*	*172.6*
Transport	*12.8*	*12.1*	*11.6*	*11.5*	*11.1*	*10.6*	*10.7*	*11.0*	*11.1*	*11.1*	*10.8*
Not elsewhere specified	*1.6*	*0.2*	*0.1*	*0.3*	*0.2*	*0.2*	*0.3*	*0.3*	*0.4*	*0.2*	*0.2*

Table A2.35 – *Total electricity production per capita (MWh/inhabitant).*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**5.42**	**5.65**	**6.17**	**6.65**	**6.63**	**6.32**	**6.35**	**6.39**	**6.34**	**6.25**	
EU27	**5.40**	**5.64**	**6.14**	**6.66**	**6.71**	**6.49**	**6.52**	**6.58**	**6.54**	**6.45**	**6.17**
Austria	6.45	6.95	7.48	7.86	8.13	7.21	7.50	7.69	7.37	8.00	7.78
Belgium	**7.07**	**7.26**	**8.08**	**8.08**	**8.60**	**6.11**	**7.47**	**7.53**	**6.49**	**8.10**	**7.67**
Bulgaria	4.78	4.94	4.96	5.71	6.20	6.77	6.23	6.33	6.60	6.26	5.79
Cyprus	3.45	3.87	4.88	5.97	6.50	5.35	5.76	5.85	5.86	5.87	5.46
Czechia	**5.95**	**5.81**	**6.88**	**7.77**	**7.88**	**7.58**	**7.53**	**7.88**	**7.98**	**7.87**	**7.35**
Germany	**6.92**	**6.53**	**6.97**	**7.47**	**7.66**	**7.91**	**7.85**	**7.85**	**7.66**	**7.24**	**6.81**
Denmark	5.06	7.05	6.76	6.70	7.02	5.11	5.35	5.40	5.25	5.08	4.93
Estonia	10.94	6.00	6.08	7.51	9.72	7.72	9.25	10.00	9.37	5.75	4.48
Greece	4.00	4.57	5.58	6.05	5.54	5.12	5.40	5.49	5.31	4.88	4.79
Spain	**3.89**	**4.18**	**5.46**	**6.69**	**6.42**	**5.98**	**5.84**	**5.87**	**5.83**	**5.77**	**5.49**
Finland	10.93	12.56	13.53	13.48	15.07	12.54	12.53	12.27	12.74	12.44	12.48
France	**7.18**	**8.28**	**8.84**	**9.10**	**8.73**	**8.64**	**8.39**	**8.33**	**8.60**	**8.43**	**7.83**
Croatia	1.86	1.99	2.50	3.03	3.44	2.66	3.01	2.84	3.30	3.10	3.26
Hungary	2.74	3.29	3.44	3.54	3.73	3.08	3.25	3.36	3.28	3.51	3.58
Ireland	4.06	4.89	6.27	6.23	6.19	6.01	6.39	6.41	6.40	6.26	6.45
Italy	**3.76**	**4.18**	**4.74**	**5.13**	**5.05**	**4.63**	**4.75**	**4.85**	**4.76**	**4.88**	**4.67**
Lithuania	7.69	3.71	3.17	4.30	1.59	1.46	1.27	1.27	1.06	1.21	1.70
Luxembourg	1.65	1.20	0.97	7.25	6.44	2.37	1.36	1.52	1.59	1.74	1.97
Latvia	2.49	1.59	1.74	2.18	3.13	2.79	3.26	3.86	3.48	3.35	3.00
Malta	3.12	4.34	4.93	5.56	5.11	2.97	1.90	3.59	4.13	4.17	4.16
Netherlands	**4.83**	**5.26**	**5.65**	**6.13**	**7.20**	**6.52**	**6.78**	**6.86**	**6.65**	**7.02**	**7.10**
Poland	**3.53**	**3.55**	**3.74**	**4.07**	**4.13**	**4.32**	**4.38**	**4.48**	**4.47**	**4.30**	**4.14**
Portugal	2.84	3.31	4.21	4.37	5.05	4.91	5.69	5.57	5.65	5.01	4.98
Romania	**2.77**	**2.60**	**2.30**	**2.78**	**2.99**	**3.32**	**3.27**	**3.25**	**3.30**	**3.05**	**2.88**
Sweden	**17.12**	**16.82**	**16.39**	**17.57**	**15.89**	**16.62**	**15.82**	**16.43**	**16.14**	**16.46**	**15.86**
Slovenia	6.23	6.49	6.85	7.57	7.94	7.18	7.86	7.77	7.81	7.64	8.06
Slovakia	4.82	4.93	5.70	5.84	5.09	4.91	4.94	5.05	4.90	5.18	5.25
United Kingdom	5.56	5.74	6.37	6.57	6.06	5.17	5.14	5.09	4.99	4.83	

Table A2.36 – *Renewable electricity production per capita (MWh/inhabitant).*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**0.65**	**0.75**	**0.86**	**0.93**	**1.35**	**1.85**	**1.87**	**1.91**	**2.05**	**2.14**	
EU27	**0.72**	**0.84**	**0.95**	**1.02**	**1.48**	**1.93**	**1.96**	**1.96**	**2.11**	**2.19**	**2.36**
Austria	4.27	4.90	5.43	4.99	5.39	5.54	5.87	5.82	5.67	6.17	6.23
Belgium	**0.06**	**0.07**	**0.10**	**0.20**	**0.61**	**1.29**	**1.26**	**1.39**	**1.51**	**1.70**	**2.03**
Bulgaria	0.19	0.26	0.32	0.56	0.78	1.22	0.98	0.86	1.33	1.07	1.08
Cyprus	0.00	0.00	0.00	0.00	0.09	0.47	0.50	0.51	0.55	0.59	0.67
Czechia	**0.11**	**0.23**	**0.22**	**0.31**	**0.56**	**0.89**	**0.89**	**0.91**	**0.89**	**0.94**	**0.97**
Germany	**0.24**	**0.32**	**0.43**	**0.77**	**1.29**	**2.33**	**2.31**	**2.62**	**2.68**	**2.89**	**3.01**
Denmark	0.16	0.36	1.05	1.81	2.25	3.35	3.22	3.79	3.59	3.98	4.03
Estonia	0.00	0.01	0.01	0.08	0.78	1.19	1.21	1.41	1.51	1.62	2.14
Greece	0.17	0.34	0.38	0.58	0.95	1.37	1.38	1.28	1.50	1.50	1.63
Spain	**0.67**	**0.62**	**0.85**	**0.98**	**2.10**	**2.09**	**2.25**	**1.89**	**2.23**	**2.15**	**2.40**
Finland	3.22	3.83	4.52	4.48	4.52	5.58	5.54	5.72	5.83	5.78	6.44
France	**0.96**	**1.27**	**1.15**	**0.90**	**1.21**	**1.38**	**1.49**	**1.39**	**1.69**	**1.68**	**1.85**
Croatia	0.82	1.22	1.43	1.64	2.16	1.78	2.00	1.71	2.38	2.05	2.11
Hungary	0.02	0.02	0.02	0.19	0.30	0.33	0.33	0.36	0.39	0.48	0.57
Ireland	0.20	0.20	0.31	0.46	0.82	1.68	1.59	1.86	2.11	2.41	2.72
Italy	**0.62**	**0.73**	**0.89**	**0.84**	**1.30**	**1.79**	**1.78**	**1.71**	**1.89**	**1.94**	**1.96**
Lithuania	0.11	0.10	0.10	0.14	0.29	0.57	0.73	0.89	0.78	0.88	0.92
Luxembourg	0.22	0.26	0.39	0.45	0.53	0.77	0.79	1.02	1.13	1.30	1.56
Latvia	1.69	1.17	1.19	1.52	1.71	1.40	1.77	2.80	1.81	1.66	1.91
Malta	0.00	0.00	0.00	0.00	0.00	0.23	0.30	0.37	0.42	0.41	0.47
Netherlands	**0.05**	**0.09**	**0.19**	**0.46**	**0.68**	**0.81**	**0.87**	**1.02**	**1.10**	**1.32**	**1.90**
Poland	**0.04**	**0.05**	**0.06**	**0.10**	**0.29**	**0.60**	**0.60**	**0.64**	**0.57**	**0.67**	**0.74**
Portugal	1.85	1.69	2.32	1.32	4.94	4.27	5.83	3.99	5.28	4.88	5.32
Romania	**0.49**	**0.73**	**0.66**	**0.95**	**1.00**	**1.32**	**1.36**	**1.24**	**1.34**	**1.27**	**1.27**
Sweden	**8.73**	**8.00**	**9.38**	**9.01**	**8.79**	**10.52**	**9.05**	**9.51**	**9.01**	**9.67**	**10.86**
Slovenia	1.48	1.63	1.96	1.79	2.32	2.11	2.45	2.15	2.53	2.42	2.66
Slovakia	0.36	0.91	0.85	0.87	1.10	1.11	1.22	1.20	1.07	1.22	1.27
United Kingdom	0.10	0.12	0.17	0.28	0.42	1.27	1.27	1.50	1.66	1.81	

Table A2.37 – *Electricity consumption per capita (MWh/inhabitant).*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**4.55**	**4.68**	**5.19**	**5.63**	**5.64**	**5.42**	**5.46**	**5.49**	**5.48**	**5.42**	
EU27	**4.51**	**4.63**	**5.13**	**5.61**	**5.70**	**5.52**	**5.58**	**5.63**	**5.62**	**5.56**	**5.33**
Austria	5.59	5.88	6.44	7.01	7.18	7.12	7.14	7.19	7.19	7.17	6.88
Belgium	**5.83**	**6.76**	**7.57**	**7.84**	**7.88**	**7.26**	**7.27**	**7.24**	**7.26**	**7.14**	**6.86**
Bulgaria	4.02	3.40	2.96	3.34	3.65	3.93	4.04	4.21	4.24	4.30	4.11
Cyprus	3.13	3.44	4.34	5.40	5.96	4.83	5.19	5.31	5.40	5.39	4.93
Czechia	**4.65**	**4.65**	**4.80**	**5.26**	**5.18**	**5.17**	**5.29**	**5.43**	**5.48**	**5.49**	**5.33**
Germany	**5.75**	**5.53**	**5.88**	**6.33**	**6.50**	**6.34**	**6.30**	**6.29**	**6.15**	**5.98**	**5.77**
Denmark	5.52	5.92	6.09	6.18	5.79	5.44	5.45	5.41	5.35	5.31	5.36
Estonia	4.33	3.15	3.58	4.44	5.18	5.21	5.55	5.50	5.68	5.52	5.40
Greece	2.81	3.24	4.00	4.64	4.78	4.68	4.95	5.01	4.61	4.68	4.43
Spain	**3.24**	**3.55**	**4.66**	**5.59**	**5.27**	**5.00**	**5.01**	**5.14**	**5.11**	**5.00**	**4.64**
Finland	11.85	12.79	14.64	15.42	15.60	14.35	14.75	14.73	15.01	14.74	13.92
France	**5.20**	**5.78**	**6.36**	**6.73**	**6.87**	**6.55**	**6.64**	**6.58**	**6.52**	**6.43**	**6.11**
Croatia	2.79	2.13	2.63	3.34	3.69	3.63	3.65	3.85	3.94	3.96	3.75
Hungary	3.05	2.68	2.88	3.20	3.42	3.68	3.78	3.93	4.03	4.12	4.09
Ireland	3.38	4.13	5.37	5.92	5.58	5.51	5.58	5.57	5.77	5.80	5.77
Italy	**3.79**	**4.19**	**4.80**	**5.20**	**5.06**	**4.73**	**4.71**	**4.82**	**4.85**	**4.88**	**4.61**
Lithuania	3.25	1.74	1.76	2.38	2.65	3.20	3.38	3.53	3.70	3.77	3.71
Luxembourg	10.94	12.32	13.32	13.34	13.13	11.06	11.05	10.82	10.73	10.42	9.77
Latvia	3.12	1.79	1.88	2.55	2.93	3.25	3.29	3.33	3.44	3.46	3.42
Malta	2.58	3.34	4.03	4.61	4.41	4.81	4.70	5.03	4.99	4.99	4.58
Netherlands	**4.80**	**5.22**	**5.99**	**6.40**	**6.50**	**6.14**	**6.19**	**6.23**	**6.34**	**6.32**	**6.27**
Poland	**2.53**	**2.32**	**2.56**	**2.75**	**3.12**	**3.36**	**3.50**	**3.58**	**3.70**	**3.70**	**3.62**
Portugal	2.36	2.88	3.74	4.41	4.72	4.42	4.49	4.52	4.66	4.66	4.49
Romania	**2.34**	**1.60**	**1.51**	**1.82**	**2.04**	**2.17**	**2.19**	**2.28**	**2.33**	**2.35**	**2.28**
Sweden	**14.11**	**14.13**	**14.53**	**14.50**	**14.05**	**12.81**	**12.94**	**12.73**	**12.60**	**12.18**	**11.92**
Slovenia	4.63	4.70	5.29	6.38	5.84	6.20	6.31	6.55	6.63	6.57	6.18
Slovakia	4.43	4.06	4.08	4.25	4.48	4.50	4.60	4.75	4.76	4.62	4.36
United Kingdom	4.80	5.09	5.60	5.79	5.26	4.68	4.65	4.55	4.54	4.43	

Table A2.38 – *GHG emissions per capita from electricity and heat production (t CO_2eq/inhabitant).*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**3.11**	**2.85**	**2.80**	**2.96**	**2.66**	**2.29**	**2.20**	**2.17**	**2.05**	**1.80**	
EU27	**3.01**	**2.80**	**2.75**	**2.91**	**2.63**	**2.35**	**2.30**	**2.30**	**2.17**	**1.91**	**1.65**
Austria	1.81	1.78	1.61	2.19	2.06	1.56	1.47	1.61	1.47	1.50	1.33
Belgium	**2.64**	**2.79**	**2.54**	**2.48**	**2.20**	**1.61**	**1.49**	**1.48**	**1.49**	**1.51**	**1.43**
Bulgaria	4.07	3.64	2.84	3.39	3.93	3.87	3.43	3.64	3.26	3.08	2.51
Cyprus	2.96	3.26	4.19	4.82	4.71	3.56	3.86	3.83	3.84	3.71	3.38
Czechia	**6.16**	**6.21**	**6.23**	**6.33**	**6.03**	**5.12**	**5.21**	**5.05**	**4.99**	**4.60**	**3.97**
Germany	**4.97**	**4.30**	**4.06**	**4.14**	**4.01**	**3.93**	**3.88**	**3.62**	**3.42**	**2.84**	**2.42**
Denmark	4.54	5.85	4.73	3.98	4.08	1.90	2.15	1.81	1.80	1.35	1.21
Estonia	15.05	8.41	7.48	8.42	10.35	7.76	8.93	9.52	8.79	4.58	2.96
Greece	3.48	3.50	4.15	4.33	3.75	2.83	2.50	2.83	2.74	2.25	1.70
Spain	**1.71**	**1.96**	**2.43**	**2.72**	**1.54**	**1.82**	**1.51**	**1.78**	**1.58**	**1.21**	**0.90**
Finland	3.57	4.49	4.32	4.43	5.92	3.17	3.34	3.18	3.36	2.87	2.28
France	**0.80**	**0.65**	**0.80**	**0.94**	**0.77**	**0.56**	**0.60**	**0.67**	**0.55**	**0.54**	**0.49**
Croatia	0.88	0.70	0.89	1.13	0.93	0.76	0.84	0.76	0.66	0.74	0.75
Hungary	1.86	1.97	2.08	1.68	1.53	1.06	1.10	1.09	1.03	1.01	0.99
Ireland	3.08	3.64	4.12	3.74	2.93	2.54	2.69	2.47	2.16	1.88	1.74
Italy	**2.18**	**2.30**	**2.41**	**2.77**	**2.32**	**1.82**	**1.82**	**1.83**	**1.70**	**1.64**	**1.49**
Lithuania	1.92	0.74	0.66	0.91	0.99	0.53	0.43	0.35	0.33	0.31	0.49
Luxembourg	4.57	2.24	0.54	2.93	2.57	0.89	0.50	0.49	0.49	0.54	0.63
Latvia	0.86	0.70	0.58	0.59	0.86	0.95	1.01	0.66	0.90	0.88	0.64
Malta	5.01	4.24	4.14	4.92	4.51	1.94	1.24	1.54	1.48	1.52	1.60
Netherlands	**3.03**	**3.41**	**3.38**	**3.54**	**3.69**	**3.65**	**3.58**	**3.39**	**3.13**	**2.93**	**2.49**
Poland	**4.77**	**3.90**	**3.84**	**4.05**	**3.94**	**3.77**	**3.74**	**3.78**	**3.74**	**3.43**	**3.16**
Portugal	1.54	1.98	2.17	2.44	1.50	1.91	1.83	2.21	1.89	1.40	1.16
Romania	**3.16**	**2.50**	**1.67**	**1.69**	**1.54**	**1.39**	**1.29**	**1.34**	**1.30**	**1.21**	**0.94**
Sweden	**0.62**	**1.04**	**0.96**	**1.23**	**1.48**	**0.98**	**1.08**	**1.09**	**1.12**	**1.05**	**0.93**
Slovenia	3.06	2.88	2.68	3.08	3.01	2.21	2.38	2.38	2.33	2.21	2.16
Slovakia	2.39	2.18	1.71	1.72	1.51	1.21	1.18	1.23	1.13	1.03	0.98
United Kingdom	3.87	3.24	3.12	3.33	2.84	1.93	1.53	1.34	1.24	1.12	

ANNEX 3

Table A3.1 – *Fuel energy content for heat generation in heat only producer plants (ktoe).*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**25,704**	**20,795**	**19,276**	**19,759**	**21,807**	**19,163**	**19,961**	**20,110**	**19,221**	**18,705**	
EU27	**25,704**	**20,793**	**16,073**	**17,578**	**19,490**	**16,790**	**17,511**	**17,775**	**16,897**	**16,425**	**16,271**
Austria	335	423	547	602	870	952	983	1,032	953	885	943
Belgium	**9**	**6**	**39**	**20**	**9**	**8**	**6**	**5**	**6**	**5**	**5**
Bulgaria	2,803	1,419	324	368	304	225	235	255	231	180	192
Cyprus	-	-	-	-	-	-	-	-	-	-	-
Czechia	**1,186**	**1,379**	**956**	**898**	**940**	**652**	**713**	**721**	**706**	**715**	**687**
Germany	**-**	**1,985**	**1,198**	**3,747**	**4,324**	**3,576**	**3,535**	**3,533**	**2,867**	**2,787**	**2,635**
Denmark	832	626	416	476	763	958	989	908	954	866	859
Estonia	1,552	499	449	489	443	292	391	420	358	278	266
Greece	-	-	-	-	-	-	-	-	-	-	-
Spain	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Finland	662	567	1,070	1,268	1,585	1,406	1,681	1,479	1,567	1,628	1,650
France	**510**	**199**	**156**	**308**	**1,670**	**1,745**	**1,912**	**1,932**	**1,920**	**1,925**	**1,889**
Croatia	78	72	84	104	98	68	67	52	50	47	48
Hungary	1,158	785	471	624	467	783	741	767	719	682	694
Ireland	-	-	-	-	-	-	-	-	-	-	-
Italy	**-**	**-**	**-**	**-**	**110**	**128**	**137**	**386**	**423**	**413**	**438**
Lithuania	1,818	1,074	652	518	498	557	572	608	591	549	516
Luxembourg	-	-	1	3	4	6	8	11	11	12	11
Latvia	2,560	891	570	476	356	203	228	448	426	425	419
Malta	-	-	-	-	-	-	-	-	-	-	-
Netherlands	**274**	**958**	**1,343**	**1,331**	**603**	**552**	**521**	**447**	**316**	**444**	**501**
Poland	**10,560**	**5,997**	**4,167**	**3,450**	**3,722**	**2,670**	**2,853**	**2,794**	**2,762**	**2,661**	**2,708**
Portugal	-	-	-	-	-	-	-	-	-	-	-
Romania	**-**	**1,834**	**1,740**	**826**	**688**	**477**	**373**	**470**	**551**	**476**	**430**
Sweden	**1,039**	**1,169**	**1,136**	**1,268**	**1,483**	**1,166**	**1,212**	**1,167**	**1,178**	**1,138**	**1,065**
Slovenia	65	76	80	89	57	44	41	51	47	50	49
Slovakia	265	835	675	715	496	325	312	287	262	260	267
UK	-	-	3,201	2,181	2,314	2,380	2,459	2,338	2,332	2,325	

Table A3.2 – *Heat generation in heat only producer plants (TWh).*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**227.2**	**200.0**	**185.0**	**183.4**	**203.4**	**179.3**	**189.4**	**193.1**	**187.7**	**181.6**	
EU27	**227.2**	**200.0**	**156.7**	**167.5**	**187.6**	**163.2**	**172.5**	**175.8**	**170.2**	**165.0**	**163.5**
Austria	3.1	4.4	5.1	5.4	8.0	9.3	9.4	9.9	9.4	8.8	9.4
Belgium	**0.1**	**0.0**	**0.4**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Bulgaria	28.4	15.3	3.6	3.6	3.3	2.4	2.4	2.7	2.5	1.9	2.0
Cyprus	-	-	-	-	-	-	-	-	-	-	-
Czechia	**10.3**	**13.5**	**9.7**	**8.7**	**9.9**	**6.7**	**7.3**	**7.4**	**7.3**	**7.4**	**7.1**
Germany	**-**	**22.2**	**12.4**	**34.1**	**38.8**	**31.0**	**31.3**	**31.3**	**27.8**	**26.3**	**25.3**
Denmark	8.7	6.7	4.2	5.1	8.4	10.8	11.1	10.3	10.9	9.9	9.8
Estonia	15.1	5.1	4.4	4.8	4.2	2.7	3.4	3.7	3.1	2.4	2.3
Greece	-	-	-	-	-	-	-	-	-	-	-
Spain	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Finland	6.9	6.5	10.7	12.9	16.3	14.4	17.1	14.8	15.8	16.2	16.3
France	**2.8**	**0.9**	**0.9**	**1.7**	**16.6**	**17.0**	**18.5**	**18.8**	**18.7**	**18.9**	**18.2**
Croatia	0.7	0.7	0.8	1.0	0.9	0.6	0.6	0.5	0.5	0.5	0.5
Hungary	9.5	7.0	5.0	6.1	4.2	8.3	7.9	7.9	7.3	6.9	6.9
Ireland	-	-	-	-	-	-	-	-	-	-	-
Italy	**-**	**-**	**-**	**-**	**0.8**	**1.0**	**1.1**	**3.8**	**4.1**	**4.0**	**4.3**
Lithuania	16.6	10.4	6.3	4.9	4.8	5.2	5.8	6.1	5.9	5.5	4.9
Luxembourg	-	-	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1
Latvia	21.0	8.4	5.5	4.6	3.3	1.8	2.0	4.5	4.2	4.2	4.2
Malta	-	-	-	-	-	-	-	-	-	-	-
Netherlands	**2.8**	**8.7**	**12.3**	**13.0**	**6.0**	**4.6**	**4.7**	**4.6**	**3.2**	**4.5**	**5.1**
Poland	**87.6**	**54.5**	**40.0**	**32.3**	**36.1**	**26.3**	**28.7**	**28.4**	**28.0**	**26.8**	**27.5**
Portugal	-	-	-	-	-	-	-	-	-	-	-
Romania	**-**	**17.4**	**17.3**	**7.7**	**5.7**	**3.7**	**3.8**	**4.7**	**5.6**	**4.8**	**4.2**
Sweden	**10.6**	**12.2**	**11.6**	**13.2**	**14.7**	**13.5**	**13.5**	**12.9**	**12.8**	**12.7**	**11.9**
Slovenia	0.6	0.8	0.8	0.8	0.6	0.4	0.4	0.5	0.4	0.5	0.5
Slovakia	2.3	5.3	5.8	7.3	5.0	3.3	3.2	2.8	2.5	2.6	2.7
United Kingdom	-	-	28.4	15.9	15.8	17.4	18.0	18.3	18.3	18.0	

Table A3.3 – *GHG emissions for heat generation in heat only producer plants (Mt CO_2eq.).*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**87.1**	**64.1**	**55.1**	**53.0**	**59.0**	**46.9**	**48.3**	**48.1**	**45.3**	**43.6**	
EU27	**87.1**	**64.1**	**46.0**	**47.2**	**52.8**	**41.4**	**42.6**	**42.7**	**39.9**	**38.3**	**37.6**
Austria	0.9	1.0	1.2	1.2	1.5	1.6	1.7	1.7	1.6	1.4	1.5
Belgium	**0.0**	**0.0**	**0.1**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Bulgaria	8.6	4.0	0.8	0.9	0.8	0.5	0.5	0.6	0.6	0.4	0.5
Cyprus	-	-	-	-	-	-	-	-	-	-	-
Czechia	**3.9**	**4.4**	**2.8**	**2.5**	**2.4**	**1.6**	**1.8**	**1.8**	**1.7**	**1.7**	**1.7**
Germany	**-**	**4.8**	**2.8**	**9.6**	**12.2**	**9.8**	**9.5**	**9.5**	**7.6**	**7.4**	**6.8**
Denmark	2.3	1.5	0.9	0.9	1.4	1.7	1.8	1.6	1.6	1.4	1.3
Estonia	4.8	1.4	1.1	1.1	1.0	0.6	0.7	0.8	0.7	0.5	0.5
Greece	-	-	-	-	-	-	-	-	-	-	-
Spain	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Finland	2.1	1.7	2.9	3.4	4.2	3.4	4.1	3.3	3.5	3.6	3.6
France	**2.0**	**0.8**	**0.6**	**0.5**	**4.3**	**3.7**	**3.9**	**3.7**	**3.5**	**3.4**	**3.3**
Croatia	0.2	0.2	0.2	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1
Hungary	3.7	2.3	1.1	1.9	1.5	2.1	1.8	2.1	1.9	1.7	1.8
Ireland	-	-	-	-	-	-	-	-	-	-	-
Italy	**-**	**-**	**-**	**-**	**0.1**	**0.1**	**0.1**	**0.7**	**0.8**	**0.8**	**0.8**
Lithuania	5.0	3.0	1.7	1.1	1.0	0.9	0.9	0.9	0.9	0.8	0.7
Luxembourg	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Latvia	7.6	2.4	1.3	1.0	0.7	0.3	0.4	0.8	0.8	0.7	0.7
Malta	-	-	-	-	-	-	-	-	-	-	-
Netherlands	**0.6**	**2.3**	**3.3**	**3.3**	**1.6**	**1.3**	**1.2**	**1.0**	**0.7**	**1.0**	**1.1**
Poland	**41.2**	**23.7**	**16.1**	**13.1**	**14.2**	**10.2**	**10.8**	**10.6**	**10.4**	**10.0**	**10.1**
Portugal	-	-	-	-	-	-	-	-	-	-	-
Romania	**-**	**5.1**	**4.4**	**2.0**	**1.7**	**1.1**	**0.9**	**1.1**	**1.3**	**1.1**	**1.0**
Sweden	**3.4**	**2.8**	**2.4**	**2.4**	**2.5**	**1.5**	**1.7**	**1.6**	**1.5**	**1.4**	**1.4**
Slovenia	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Slovakia	0.7	2.7	2.0	1.7	1.1	0.7	0.7	0.6	0.5	0.5	0.6
United Kingdom	-	-	9.2	5.8	6.2	5.5	5.7	5.5	5.4	5.4	

Table A3.4 – *GHG emission factors for heat generation in heat only producer plants (g CO_2eq / kWh).*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**383.4**	**320.5**	**297.8**	**289.2**	**290.0**	**261.7**	**254.8**	**249.3**	**241.3**	**239.8**	
EU27	**383.4**	**320.5**	**293.4**	**281.8**	**281.3**	**253.9**	**246.8**	**242.8**	**234.6**	**232.0**	**230.1**
Austria	281.2	227.6	226.8	228.2	187.2	175.7	177.8	176.6	166.7	159.6	155.1
Belgium	**387.2**	**279.7**	**257.9**	**950.8**	**493.9**	**637.3**	**179.0**	**173.2**	**166.7**	**135.2**	**122.8**
Bulgaria	302.2	263.8	224.3	247.7	231.3	223.5	225.0	223.8	220.3	223.0	226.3
Cyprus											
Czechia	**374.5**	**324.1**	**290.8**	**285.5**	**246.5**	**243.8**	**242.1**	**241.1**	**239.1**	**234.1**	**233.0**
Germany		**214.2**	**229.6**	**280.1**	**315.4**	**314.2**	**302.3**	**303.7**	**273.7**	**282.3**	**269.2**
Denmark	261.2	225.0	220.5	173.5	168.4	159.5	158.0	150.1	147.7	138.7	134.2
Estonia	314.0	267.5	254.1	236.5	247.9	229.4	207.3	210.1	226.7	227.4	227.2
Greece											
Spain											
Finland	297.5	264.0	270.0	260.5	260.8	234.5	238.7	222.6	222.1	223.2	222.5
France	**719.3**	**823.8**	**713.8**	**314.3**	**260.4**	**216.4**	**209.3**	**196.7**	**187.3**	**177.6**	**178.6**
Croatia	294.7	280.0	307.8	293.1	294.8	262.8	255.0	260.8	253.4	248.2	245.6
Hungary	383.0	322.9	223.7	310.1	360.9	254.3	223.9	260.3	264.8	253.2	265.1
Ireland											
Italy					**131.5**	**110.8**	**110.6**	**189.7**	**190.1**	**188.6**	**187.5**
Lithuania	303.1	285.6	269.3	226.2	202.8	163.7	150.5	152.4	156.3	148.0	151.2
Luxembourg			292.7	222.6	198.3	166.3	186.2	208.3	202.7	207.6	193.2
Latvia	362.8	287.3	238.3	221.6	211.6	186.0	178.3	188.0	189.3	176.7	176.2
Malta											
Netherlands	**227.0**	**265.3**	**269.5**	**256.0**	**269.8**	**280.0**	**259.3**	**224.3**	**222.3**	**217.0**	**207.3**
Poland	**470.7**	**433.7**	**402.2**	**404.9**	**393.3**	**386.0**	**377.8**	**372.2**	**371.3**	**372.8**	**366.9**
Portugal											
Romania		**293.2**	**252.3**	**262.6**	**298.3**	**312.0**	**242.5**	**235.0**	**234.5**	**236.8**	**245.2**
Sweden	**317.0**	**225.3**	**202.8**	**179.4**	**170.3**	**110.5**	**124.0**	**122.1**	**116.5**	**112.9**	**117.0**
Slovenia	296.4	244.6	223.6	248.2	214.3	232.4	208.0	214.7	226.4	209.4	210.8
Slovakia	326.1	517.2	350.7	231.7	218.7	209.0	207.4	216.7	213.1	207.0	205.1
United Kingdom			322.7	367.5	392.7	318.0	317.3	297.7	294.9	298.8	

Table A3.5 – *Efficiency of heat only producer plants.*

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020
EU28	**0.760**	**0.827**	**0.825**	**0.798**	**0.802**	**0.805**	**0.816**	**0.825**	**0.839**	**0.835**	
EU27	**0.760**	**0.827**	**0.838**	**0.819**	**0.828**	**0.836**	**0.847**	**0.850**	**0.866**	**0.864**	**0.864**
Austria	0.787	0.887	0.804	0.777	0.795	0.841	0.822	0.824	0.850	0.856	0.858
Belgium	**0.782**	**0.718**	**0.831**	**0.287**	**0.382**	**0.320**	**0.624**	**0.651**	**0.698**	**0.638**	**0.624**
Bulgaria	0.871	0.925	0.948	0.849	0.929	0.907	0.872	0.916	0.933	0.928	0.917
Cyprus											
Czechia	**0.747**	**0.839**	**0.868**	**0.837**	**0.904**	**0.879**	**0.884**	**0.878**	**0.884**	**0.895**	**0.890**
Germany		**0.962**	**0.889**	**0.783**	**0.771**	**0.746**	**0.762**	**0.762**	**0.834**	**0.811**	**0.826**
Denmark	0.903	0.917	0.863	0.913	0.949	0.967	0.965	0.978	0.980	0.985	0.981
Estonia	0.838	0.876	0.845	0.844	0.808	0.790	0.744	0.757	0.751	0.735	0.754
Greece											
Spain											
Finland	0.897	0.991	0.864	0.878	0.883	0.881	0.873	0.858	0.866	0.853	0.851
France	**0.469**	**0.409**	**0.472**	**0.488**	**0.854**	**0.838**	**0.832**	**0.837**	**0.836**	**0.843**	**0.831**
Croatia	0.807	0.875	0.774	0.799	0.757	0.801	0.825	0.809	0.827	0.839	0.837
Hungary	0.709	0.769	0.906	0.839	0.779	0.912	0.916	0.888	0.872	0.870	0.856
Ireland											
Italy					**0.619**	**0.698**	**0.710**	**0.837**	**0.842**	**0.838**	**0.842**
Lithuania	0.784	0.832	0.825	0.820	0.836	0.806	0.877	0.859	0.856	0.859	0.817
Luxembourg			0.732	0.780	0.791	0.817	0.805	0.784	0.805	0.782	0.814
Latvia	0.705	0.813	0.831	0.826	0.795	0.763	0.763	0.860	0.839	0.858	0.872
Malta											
Netherlands	**0.890**	**0.778**	**0.790**	**0.840**	**0.855**	**0.720**	**0.769**	**0.887**	**0.873**	**0.874**	**0.882**
Poland	**0.714**	**0.782**	**0.825**	**0.806**	**0.834**	**0.848**	**0.865**	**0.875**	**0.873**	**0.867**	**0.872**
Portugal											
Romania		**0.814**	**0.857**	**0.798**	**0.708**	**0.661**	**0.887**	**0.868**	**0.868**	**0.860**	**0.848**
Sweden	**0.879**	**0.899**	**0.878**	**0.899**	**0.852**	**0.993**	**0.960**	**0.954**	**0.937**	**0.961**	**0.964**
Slovenia	0.815	0.853	0.885	0.802	0.884	0.869	0.910	0.880	0.797	0.844	0.841
Slovakia	0.744	0.547	0.737	0.876	0.871	0.879	0.875	0.828	0.830	0.857	0.868
United Kingdom			0.762	0.626	0.587	0.628	0.629	0.674	0.675	0.666	

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