

Energy efficiency trends and policies in Poland

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Notes

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List of abbreviations

pp	Percentage points
Mtoe	Million tonne of oil equivalent
koe	Kilogram of oil equivalent
toe	Tonne of oil equivalent
kWh	Kilowatt-hour
EUR2010	Value of euro expressed in market exchange rate in year 2010
EUR2015	Value of euro expressed in market exchange rate in year 2015
pkm	Passenger-kilometre
tkm	Tonne-kilometre

1 Introduction

Energy consumption in 2023 increased compared to 2000 by 8.8% for primary energy and by 30.5% for final consumption. The key driver of this growth was the increase in activity, including higher production, more travel, larger homes, etc. Energy saving reflecting energy efficiency improvement were achieved between 2000–2023 across all sectors that are major energy consumers: industry, transport, households. Total energy savings rate amounted in 2023 to 31.7%, making energy efficiency as significant in energy economy as other fuels. Among the pro-efficiency measures most significant are projects supported by national environmental funds and from the European Union Cohesion Fund within the framework of Regional Operational Programs and the Operational Program Infrastructure and Environment. A key driver for improving energy efficiency in industry is the modified white certificate system, implemented through the Law on Energy Efficiency. The information and education campaigns of the National Fund for Environmental Protection and Water Management and of the ministry responsible for energy affairs raise awareness and knowledge on energy efficiency improvement options and provide practical help to citizens and institutions and enterprises.

2 Economic and policy context

2.1 Economic context

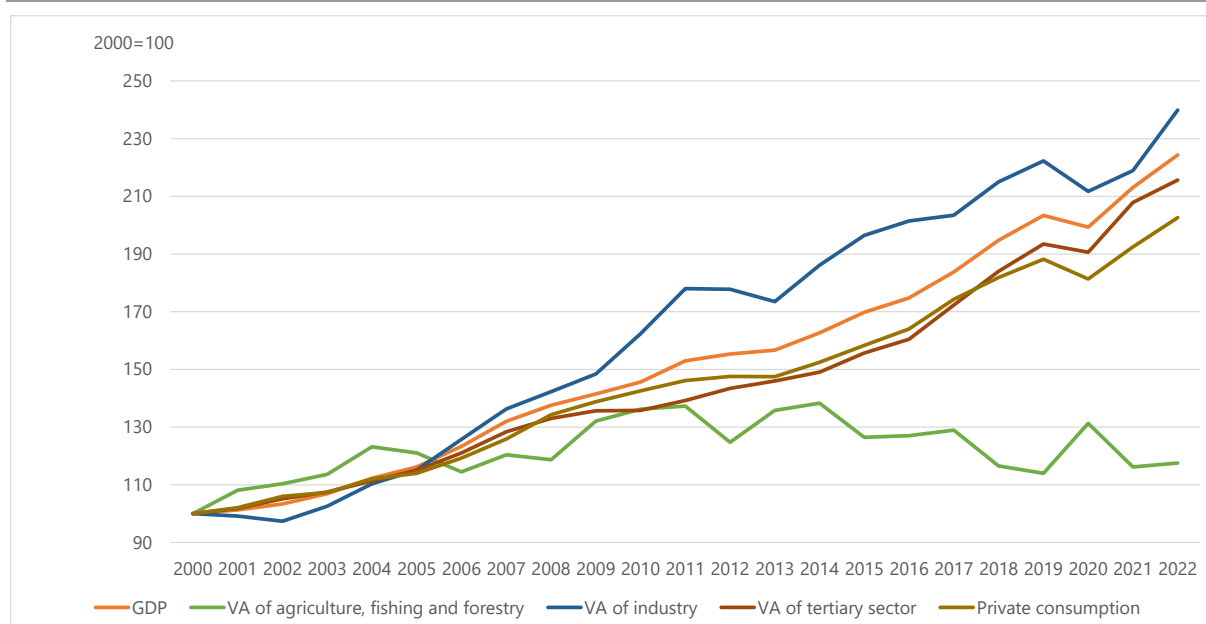
This chapter begins by evaluating the Polish economic context for the period between 2000 (base year) and 2022. This is approached from a global perspective with the Gross Domestic Product (GDP) and from the national production and consumption standpoints, with the industry value added, the private consumption of households, services value added and agriculture value added respectively.

In 2022, the GDP amounted to 0.65 billion € (at constant prices from 2015), an increase of 124.3% compared to 2000. The GDP increased steadily by around 3.7%/year with an exception in 2020, when there was a decrease of 1.2% compared to the previous year.

In 2022, the highest value added at constant 2015 market prices was observed in services, which was equal to 0.33 billion €, an increase of 115.6% compared to 2000. The value added of services is more than twice as high as the value added of industry, which totaled to 0.16 billion € in 2022 (an increase of 139.9% compared to 2000). Value added of agriculture, fishing and forestry was more than fifteen times lower than value added of industry and amounted to 0.01 billion € in 2022 (only an increase of 17.5% compared to 2000). The annual compound growth rates for the period 2000–2023 were 0.7%/year for agriculture, 3.6%/year for services and 4.1%/year for industry.

In 2022, the private consumption of households was almost as high as value added of services, amounting to 0.32 billion €, which marked an increase of 102.61% compared to 2000. In the period 2000–2022 private consumption grew by approximately 3.3%/year.

Figure 1. Macro-economic development in Poland (at constant market prices of 2015)



2.2 Policy background

Poland's energy efficiency policy is shaped by three key strategic documents, which include

- Polish Energy Policy until 2040 - the document sets the framework for the energy transition in Poland. It includes, among other things, strategic arrangements for the selection of technologies necessary to build a low-carbon energy system, adapted to the regulatory conditions of the European Union in relation to the climate and energy targets for 2030,
- National Energy and Climate Plan for 2021–2030 - presents the objectives and assumptions, as well as policies and measures for the implementation of the 5 dimensions of the Energy Union, i.e. energy security, internal energy market, energy efficiency, decarbonisation, and research, innovation and competitiveness,
- Long-term strategy for building renovation - a document presenting a comprehensive plan for the transformation of the building stock in Poland.

Table 1. Energy efficiency targets for 2030 with projected energy consumption in 2030 and 2040

Energy efficiency target	Energy consumption in absolute terms in 2030		Energy consumption in absolute terms in 2040	
	Final energy consumption in absolute terms (Mtoe)	Primary energy consumption in absolute terms (Mtoe)	Final energy consumption in absolute terms (Mtoe)	Primary energy consumption in absolute terms (Mtoe)
Reduction of primary energy consumption in the years 2010–2020 (Mtoe)				
27.3	65.5	90.7	65.1	87.6

Source: National Energy and Climate Plan

An important element in the implementation of energy efficiency are sectoral targets where significant energy efficiency potential has been identified. In the building sector these are

- Increasing the share of insulated dwellings in the total housing stock to 70% in 2030 (compared to 58.8% in 2015).
- Reduce the number of people living in substandard conditions due to overcrowding, poor technical condition or lack of technical installations to 3.3 million in 2030 (from 5.4 million in 2011).

Another area is to support the development of green and efficient heating systems. In 2018, only about 20% of district heating and cooling systems, which are responsible for supplying about 85% of the total amount of system heat, meet the criterion of an energy efficient system. By 2030, at least 8% of district heating or cooling systems above 5 MW should meet this criterion. An important element is also the further development of heat production through cogeneration. Poland has a significant potential to increase CHP heat production by replacing boilers with high efficiency CHP sources. This will help improve the efficiency of primary energy use and reduce the resource intensity of the economy.

3 Overall energy efficiency progress and policies

3.1 Development of energy consumption and energy efficiency trends

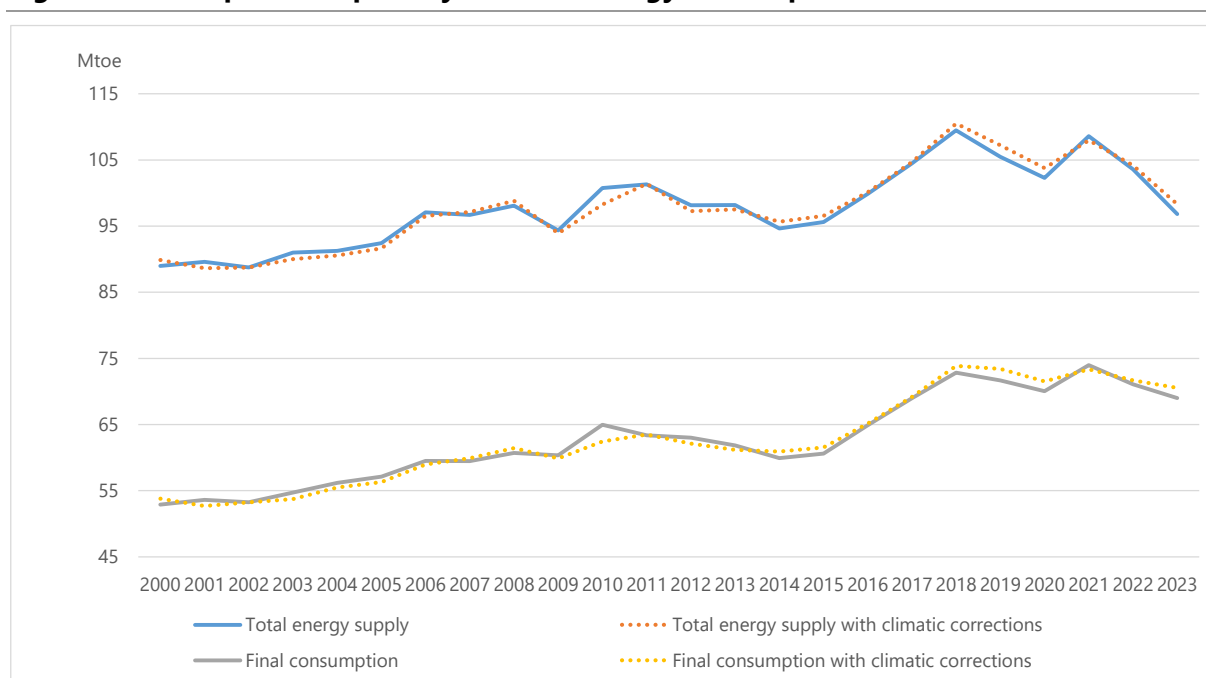
3.1.1 Energy consumption based on ODYSSEE

The primary energy consumption in Poland increased by 8.8% between 2000 and 2023, a rise from approximately 89.0 to 96.8 Mtoe in 2023. Final energy consumption grew significantly by 30.5% over 2000–2023, reaching 69.0 Mtoe in 2023.

According to the “Energy Policy of Poland until 2040” Poland declares a national target for primary energy consumption at the level of 91.3 Mtoe in 2030, while the target for final consumption is at 65.5 Mtoe in 2030. Primary energy consumption in 2023 is still 6.01% above the set target, but the annual compound growth rate of -1.8%/year in the period 2020–2023 indicates that Poland is on track to meet the target by 2030. However, in case of final energy consumption, the current annual growth rate of -0.49%/year for the period 2020–2023 is too low to meet the 2030 target. To meet the final energy consumption target in 2030, an annual growth rate of -0.67%/year would be required.

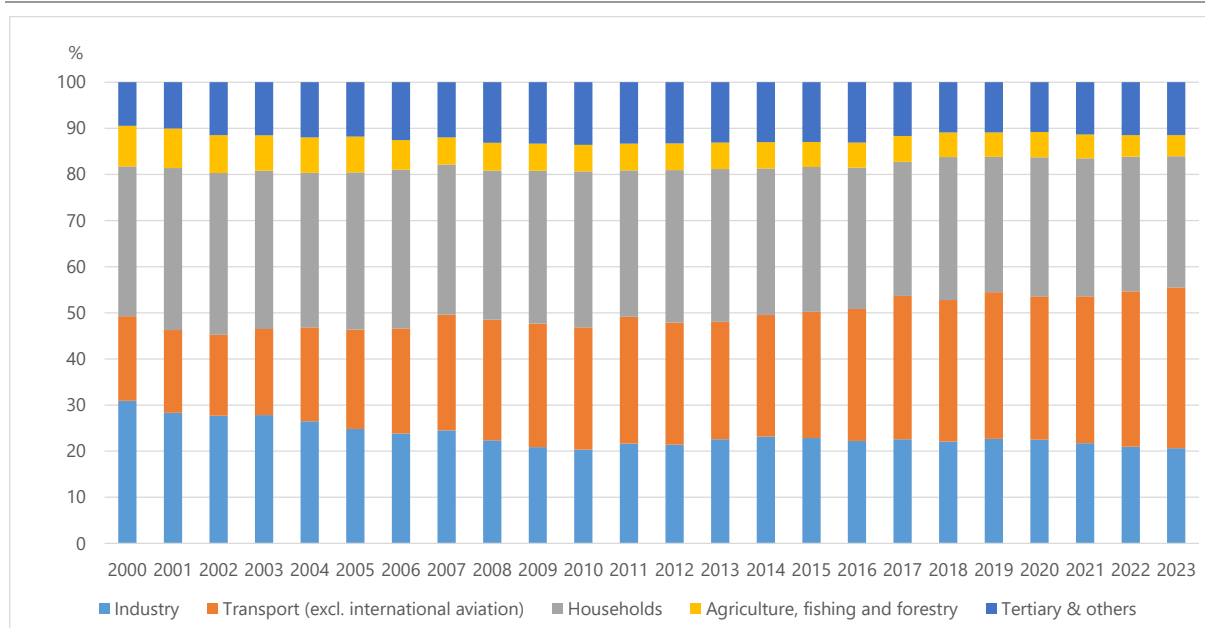
The impact of weather fluctuations on energy consumption is illustrated by the differences between actual and climate-corrected consumption. The climate corrected primary and final energy consumptions are higher than the actual consumption, especially in the second decade of the 21st century, when the average temperatures were significantly higher than in the first decade. This indicates that since 2014 the actual yearly consumption gradually decreases and moves further away from the expected consumption under the experienced weather conditions.

Figure 2. Development of primary and final energy consumption in Poland



In 2023, industry showed a 20.7% share in final energy consumption, a decrease of 10.3 pp compared to 2000. The highest share in final energy consumption was observed for transport, reaching 34.9% in 2023, an increase of 16.5 pp compared to 2000. Households have the second highest share with 28.4%, a decrease of 4.1 pp compared to 2000. These three sectors account for more than 80% of the final energy consumption. In 2023, the shares of services and agriculture amounted to 11.5% and 4.6% respectively.

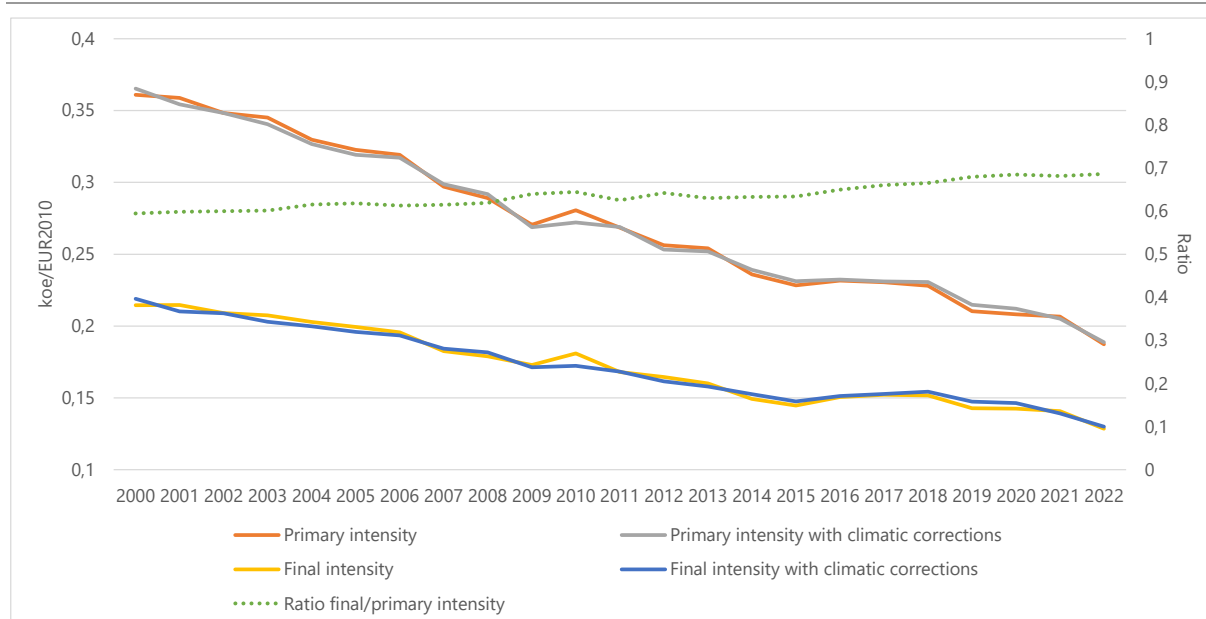
Figure 3. Final energy consumption by sectors in Poland



The overall energy efficiency from an economic perspective is characterized through the primary and final energy intensities, i.e. the ratio between the energy consumption and the GDP. The reverse of this ratio or the "energy productivity" is also a measure of how efficiently energy resources are used. The effects of economic growth from 2000, as measured by GDP, are removed from the indicator to eliminate the impact of inflation. Likewise, the weather fluctuations are accounted for through the temperature-corrected intensities for the residential and service sectors.

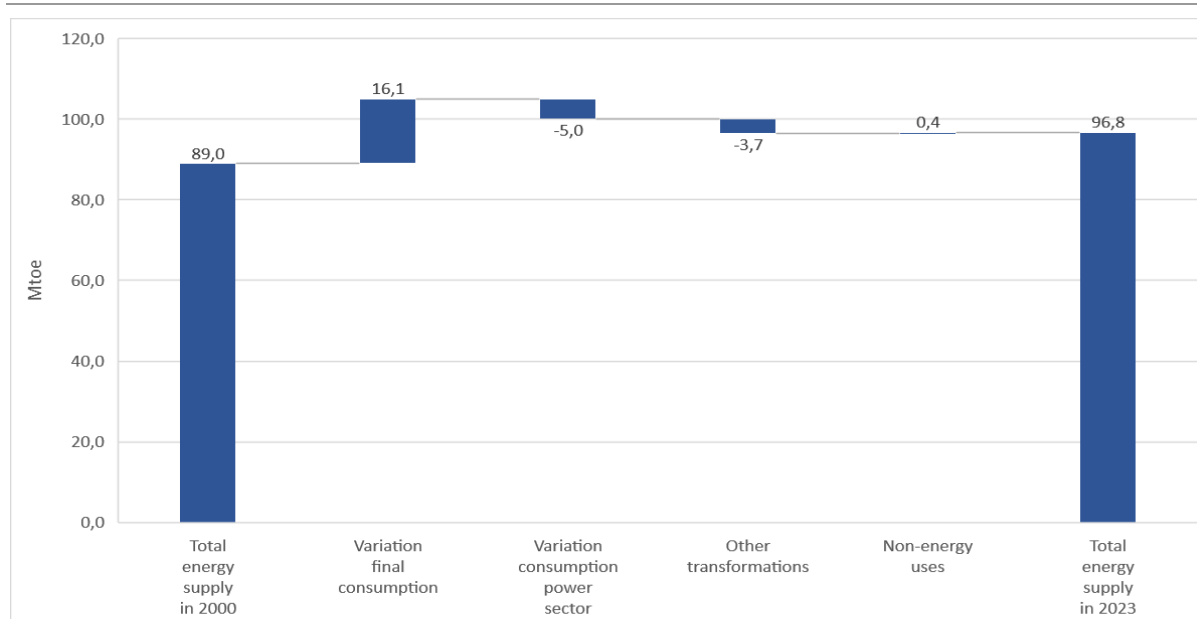
Since 2000, the temperature-corrected primary and final energy intensities have shown a yearly decline of 3.0% and 2.3%, respectively. The economic recession in 2007–2012 did not have a significant impact on Poland. The growths of energy intensities in 2010 was not a result of this recession, because the GDP still grew by almost 3% in that year, but rather due to high increases of primary and final energy consumption by 6.8% and 7.7% respectively.

The ratio between the intensities has shown an upward trend, with an annual growth rate of around 0.7%. In 2022, the ratio reached 0.69, representing an increase of 15.5% compared to 2000.

Figure 4. Development of primary and final energy intensities in Poland

3.1.2 Decomposition of final energy demand

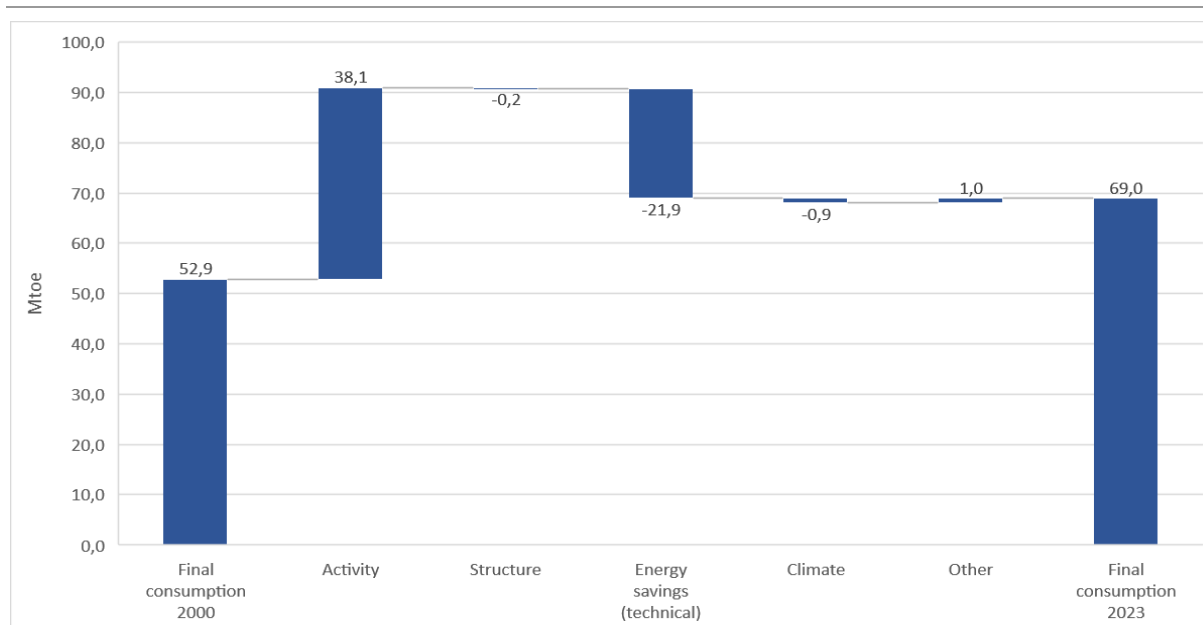
Primary energy consumption increased from 89.0 to 96.8 Mtoe (i.e. 7.8 Mtoe or almost 7.8%) in the time period 2000–2023. The main driver for this increase was the variation of final consumption, which accounted for an increase of 16.1 Mtoe. Additionally, non-energy uses were responsible for a small increase of 0.4 Mtoe. Two factors led to a decrease in primary energy consumption: variations in the power sector's consumption (by 5.0 Mtoe) and other transformations (by 3.7 Mtoe).

Figure 5. Decomposition of total primary energy consumption

During the period 2000–2023, total final energy consumption in Poland increased by 16.1 Mtoe (from 52.9 to 69.0 Mtoe). As was already presented in the chapter about economic context, the GDP and value added of sectors increased significantly in this period. The increase in economic activity

led to an increase in final energy consumption by 38.1 Mtoe. Other effects accounted for an increase in final consumption by 1.0 Mtoe. Energy savings linked to energy efficiency improvements reduced final consumption by 21.9 Mtoe, structure effect — by 0.2 Mtoe, climate effect — by 1.0 Mtoe.

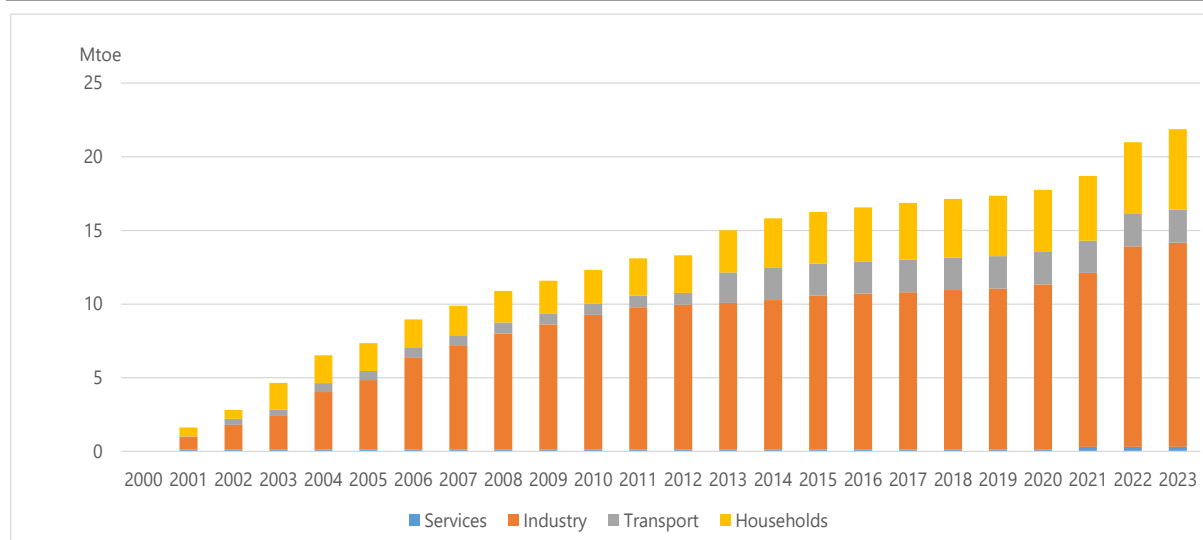
Figure 6. Decomposition of total final energy consumption



3.1.3 Energy Savings

The cumulated energy savings between 2000 and 2023 reached 21.9 Mtoe in Poland. Without these savings, final energy consumption would have been 31.7% higher in 2023 compare to the year 2000. The most energy savings were observed in industry, amounting to 13.8 Mtoe (or 63.3% of energy savings). Households accumulated 5.5 Mtoe (24.9%) of energy savings, transport noted 2.3 Mtoe (10.3%), and services only 0.3 Mtoe (1.5%). The service sector appears to be a challenge in terms of achieving the targeted final consumption of 65.5 Mtoe in 2030, as its energy savings are minimal compared to the significant growth in value added.

Figure 7. Energy savings accumulated since 2000



3.1.4 Comparison with other countries

2024 EU Energy Efficiency Scoreboard¹ has been used to compare how Poland compares with other countries in terms of energy efficiency. The database evaluates energy efficiency in three categories:

- energy efficiency level,
- energy efficiency progress,
- energy efficiency policies.

Taking into account these three criteria, Hungary, Slovakia and Germany are on the podium of energy efficiency. Poland is in 6th place, just behind Romania and the Netherlands.

These statistics look slightly different if we look at energy efficiency at the sectoral level rather than at the general level. Such an analysis was carried out in the following sectors:

- overall,
- industry
- transport,
- households,
- services.

The tables below provide information on efficiency in each of the above sectors. In each case, Poland's position among the 27 members of the European Union is shown, as well as the country that is the leader in a given sector as a benchmark.

The results of the OECD composite indicator² are also presented. The results should be interpreted as follows: a value close to 1 indicates that a country or region is at or near the top of the range for this indicator, while a value close to 0 indicates poor performance.

OVERALL ENERGY EFFICIENCY RESULTS

The combined result puts Poland in a high 5th place, but the level ranking and trend are much worse. The leader in most categories is Luxembourg, and in the case of level, Lithuania. However, it should be borne in mind that these countries are much smaller than Poland, so the scale of energy efficiency implementation is incomparably smaller and to some extent less complex. The results of the ODEC indicator show significant room for improvement, especially in terms of trend.

Table 2. Energy efficiency scoreboard for overall energy efficiency.

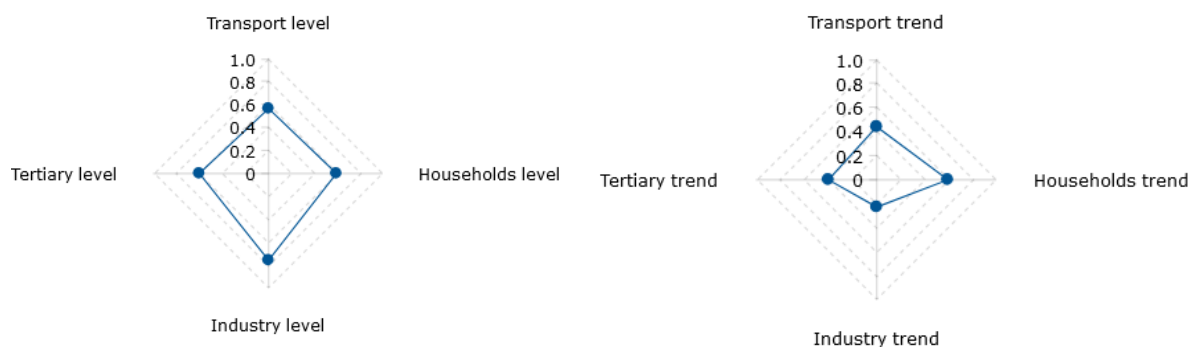
Sector	Level	Trend	Policies	Combined
Overall	19/27	18/27	6/27	5/27
Benchmark	Lithuania	Luxembourg	Luxembourg	Luxembourg

¹ Database is available free of charge at <https://www.odyssee-mure.eu/data-tools/scoring-efficiency-countries.html>

² Methodology behind the indicator is available at <https://www.oecd.org/sdd/42495745.pdf>

Source: 2024 EU ENERGY EFFICIENCY SCOREBOARD.

Figure 8. Results of the OECD composite indicator for overall energy efficiency.



Source: 2024 EU ENERGY EFFICIENCY SCOREBOARD

INDUSTRY ENERGY EFFICIENCY RESULTS

Poland performs well in the industrial sector, ranking second overall, overtaken only by Estonia. In the case of policies, it leads the ranking, although there is room for improvement, especially in terms of trends. This is necessary to maintain a place at the top.

Table 3. Energy efficiency scoreboard for industry energy efficiency.

Sector	Level	Trend	Policies	Combined
Industry	9/25	13/25	1/27	2/25
Benchmark	Cyprus	Estonia	Poland	Estonia

Source: 2024 EU ENERGY EFFICIENCY SCOREBOARD.

TRANSPORT ENERGY EFFICIENCY RESULTS

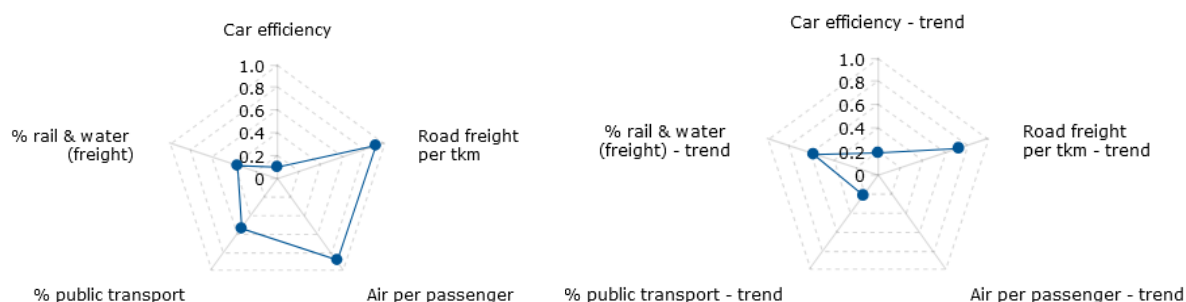
Unfortunately, Poland is at the bottom of the league table in the transport sector. Luxembourg in particular stands out in this sector. There is considerable room for improvement in both levels and trends.

Table 4. Energy efficiency scoreboard for transport energy efficiency.

Sector	Level	Trend	Policies	Combined
Transport	22/26	19/26	7/27	22/26
Benchmark	France	Luxembourg	Cyprus	Luxembourg

Source: 2024 EU ENERGY EFFICIENCY SCOREBOARD.

Figure 9. Results of the OECD composite indicator for transport energy efficiency



Source: 2024 EU ENERGY EFFICIENCY SCOREBOARD.

HOUSEHOLDS ENERGY EFFICIENCY RESULTS

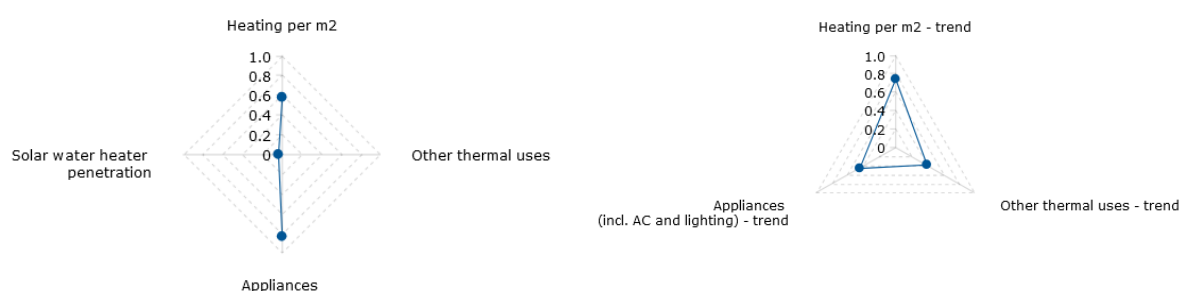
In the household sector, Poland is a respectable eighth. It has a good ranking for policies, but stands out in terms of level and trend. The leader in this category is Ireland.

Table 5. Energy efficiency scoreboard for households energy efficiency.

Sector	Level	Trend	Policies	Combined
Households	21/27	21/27	5/27	8/27
Benchmark	Netherlands	Ireland	Germany	Ireland

Source: 2024 EU ENERGY EFFICIENCY SCOREBOARD.

Figure 10. Results of the OECD composite indicator for households energy efficiency



Source: 2024 EU ENERGY EFFICIENCY SCOREBOARD.

SERVICES ENERGY EFFICIENCY RESULTS

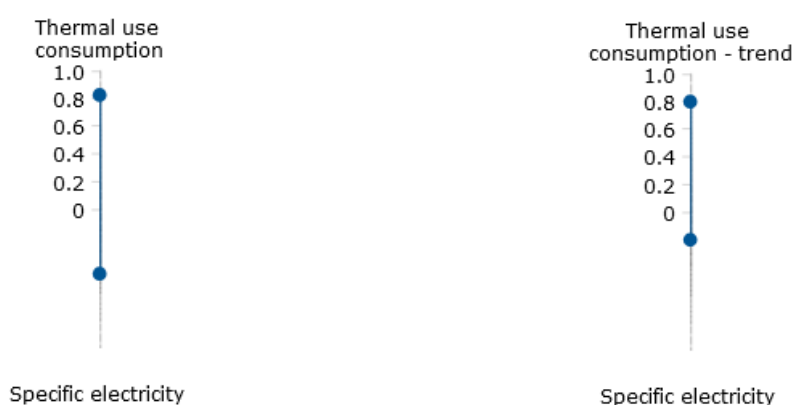
Performance in the services sector is close to overall results. A good result has been achieved in policies, while there is still considerable room for improvement in trend in particular. In this sector, two countries stand out as benchmarks - Hungary and Ireland.

Table 6. Energy efficiency scoreboard for services energy efficiency.

Sector	Level	Trend	Policies	Combined
Services	12/27	16/27	5/27	6/27
Benchmark	Romania	Hungary	Ireland	Hungary

Source: 2024 EU ENERGY EFFICIENCY SCOREBOARD.

Figure 11. Results of the OECD composite indicator for services energy efficiency

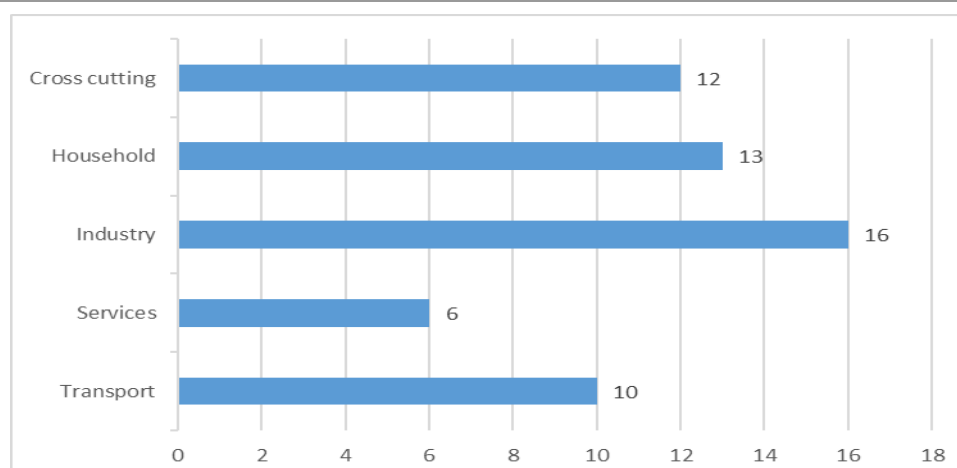


Source: 2024 EU ENERGY EFFICIENCY SCOREBOARD

3.2 Cross cutting energy efficiency policies

In Poland, energy efficiency policies for the industrial sector dominate. In second place are households, followed by cross cutting.

Figure 12. Energy efficiency policies in Poland



Source: MURE database.

The table below shows all available cross-cutting energy policies. Many have been around for decades, and the oldest has been around for over a quarter of a century. These range from thermal modernization measures, support for the development of renewable energy sources, certification schemes and the implementation of energy performance contracts.

Table 7. Cross cutting energy efficiency policies in Poland.

Title	Type	Starting year	Status
Thermomodernisation Fund	Financial	1999	Ongoing
Green certificates for electricity production from renewable energy sources	Market-based instruments	2005	Ongoing
Priority access of renewables to the electricity grid	Mandatory standards	2005	Ongoing
Quota system for the green electricity (concerns the green certificates)	Mandatory standards	2005	Ongoing
System of white certificates - Energy efficiency Act	Market-based instruments	2013	Ongoing
Energy Plus	General programme	2019	Ongoing
District heating - pilot	General programme	2019	Ongoing
New Energy	General programme	2020	Ongoing
European funds - operational programmes in the financial perspective 2021–2027	General programme	2021	Ongoing
Norway and EEA Grants	General programme	2021	Ongoing
Renovation with guaranteed EPC (Energy Performance Contract) Plus savings	General programme	2021	Ongoing
Energy for the countryside	General programme	2022	Ongoing

Source: MURE database.

The Thermomodernisation and Renovation Fund deserves special mention. Modified over the years, it has been in existence since 1997. Its main objective is to provide financial support to investors who carry out thermomodernization and renovation projects and to compensate owners of residential buildings where squatters have been living. Since its establishment, the Fund has provided financial support for thermal modernization and renovation projects in the amount of almost PLN 3,000 million. The Fund offers various forms of support, including the thermal modernization bonus, the renovation bonus and the compensation bonus. Over the past few years, the amount of thermal upgrading premiums paid has been steadily decreasing. This is a positive observation, as it indicates that a significant part of the building stock has already been thermally upgraded.

4 Sectoral energy efficiency progress and policies

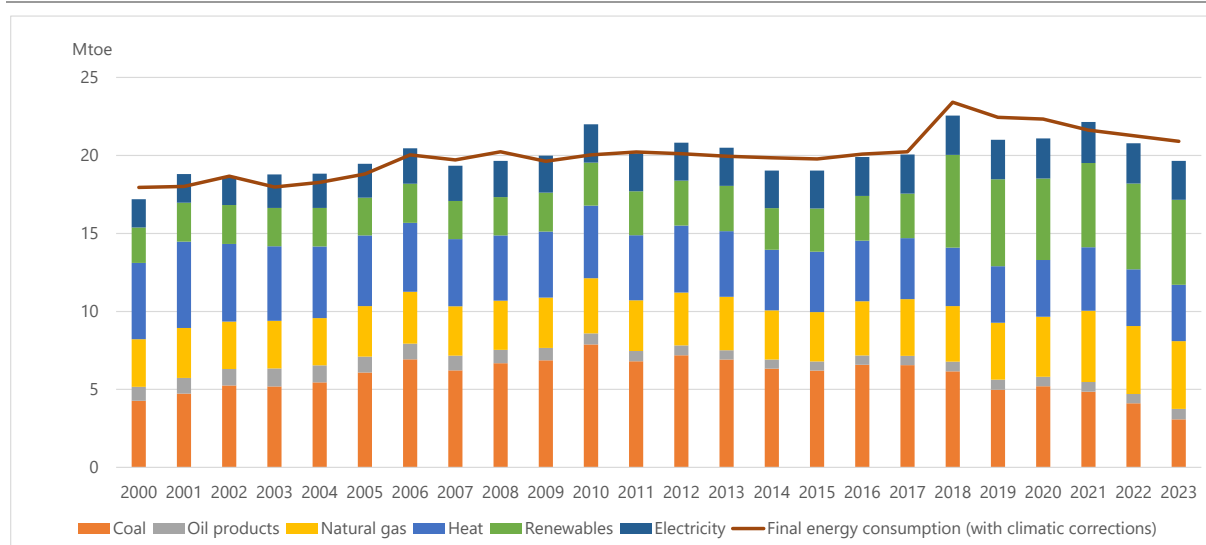
4.1 Residential sector

Between 2000 and 2023, energy consumption in the household sector (not climate-corrected) increased from 17.2 to 19.7 Mtoe, i.e. by around 14.3%. There were some significant annual fluctuations, partly caused by weather variations (e.g. 2010, 2014, 2015, 2019, 2020, 2023).

In 2023, renewable energy sources accounted for 27.7% of energy consumption in households (an increase of 14.5 pp compared to 2000). The second and third highest consumption was noted in case of natural gas (22.1%) and coal (15.7%). The share of coal and heat consumption dropped by 9.2 pp and 10.1 pp respectively.

The highest annual growth rate was observed for renewables (3.9%/year). Coal, oil and heat consumption decreased by around 1.3%/year.

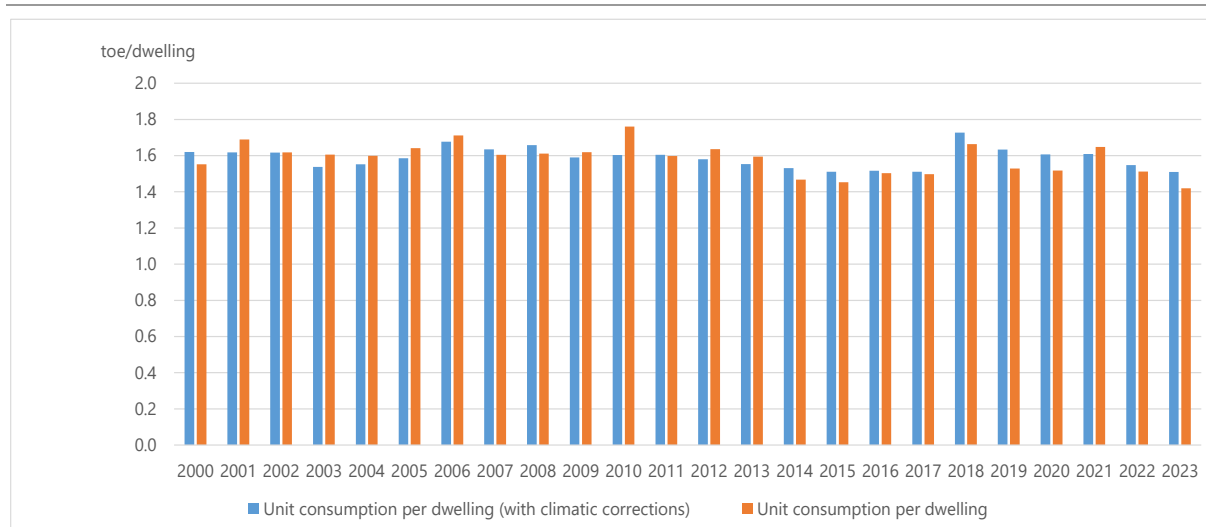
Figure 13. Final energy consumption in households by energy carriers



Unit consumption is calculated both for total energy and electricity consumption of private households. Energy consumption is related to physical factors (number of dwellings or square meter) and the total energy consumption and space heating figures are temperature-corrected, to remove the effect of weather fluctuations.

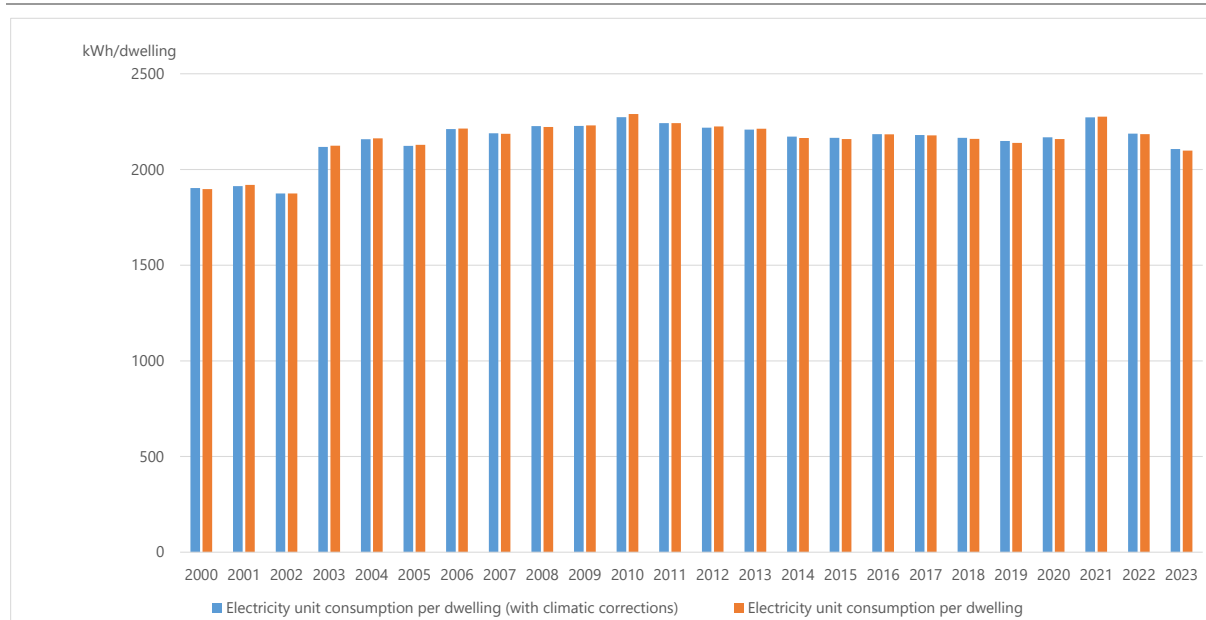
Over the last 23 years, there has been a 6.8% decline in (climate-corrected) energy consumption per dwelling reaching 1.5 toe/dwelling in 2023, which is a decrease of 0.3%/year. The highest consumption per dwelling was observed in 2010, in which the average temperature was substantially below the 30 year average from 1991–2020. Conversely, the consumption per dwelling was at its lowest in 2023. It was a very warm year, with average temperatures more than 1°C above the 30-year average.

Figure 14. Total unit consumption of private households in toe/dwelling (with climatic corrections)



The electricity consumption per dwelling (with climatic corrections) increased by 9.7% in the period 2000–2023 reaching 2107.3 kWh/dwelling in 2023, which marked an annual growth rate of 0.44%/year. The climate only had a small effect on the electricity consumption per dwelling due to a small share of households using electricity for space heating.

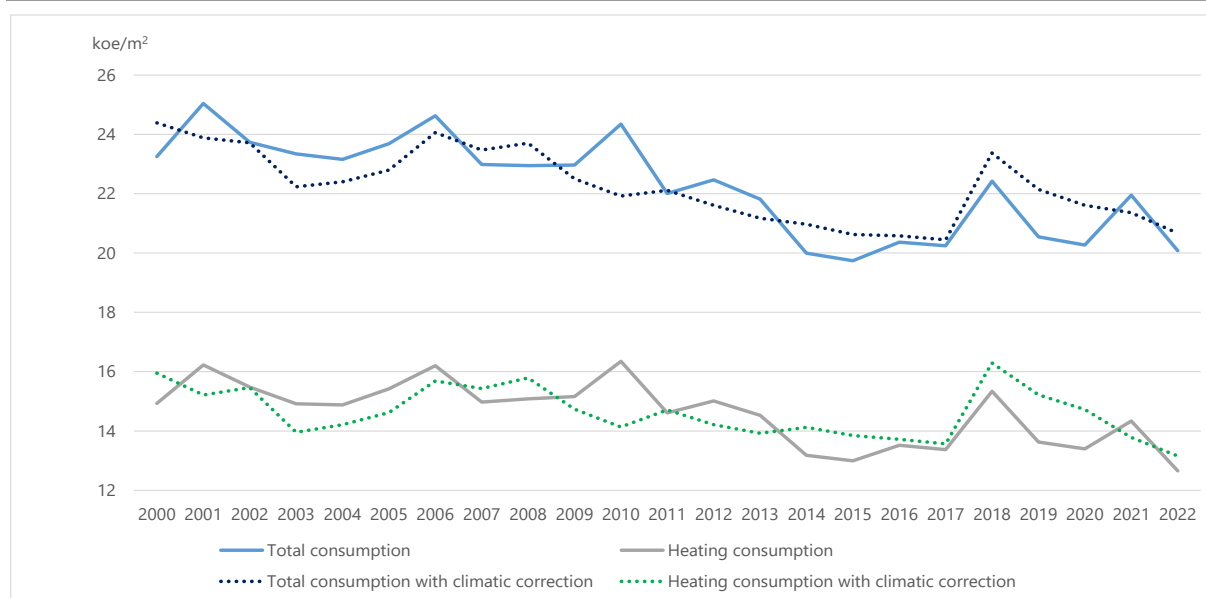
Figure 15. Electricity unit consumption of private households in kWh/dwelling (with climatic corrections)



In 2022, the total energy consumption in households per m² amounted to 20.1 koe, a decrease of 13.6% compared to 2000. Total consumption decreased by 0.66%/year. In case of space heating, the consumption per m² dropped by 15.2% reaching 12.7 koe/m² in 2023. The annual compound decline rate in the period 2000–2022 was 0.75%/year.

The climate had an increasing effect on the consumption in 11 out of the 23 analyzed years. Particularly, the first decade of the 21st century was colder compared to the second decade. On the other hand, the warmer years from 2014 onwards, had a decreasing effect on the households' consumption.

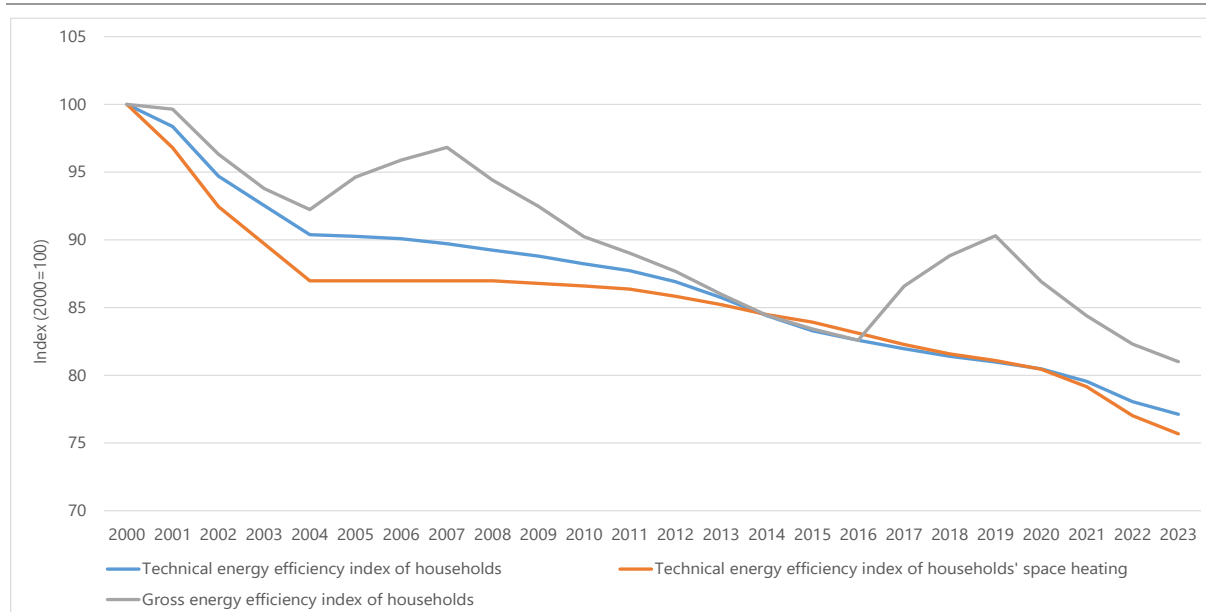
Figure 16. Energy consumption in households per m²



For the residential sector, the bottom-up energy efficiency index (ODEX) is calculated at the sector level and for eight end-uses: heating, water heating, cooking and five large appliances (refrigerators, freezers, washing machines, dishwashers and TV). Figure 12 displays not only their technical improvement in energy efficiency with the technical ODEX, but also the observed energy efficiency performance for the whole sector, which is the one still including the behavioral trends that often compensate energy efficiency gains (as e. g. a higher indoor temperature, increasing use and number of lamps, increasing use of TV, increasing use of hot water).

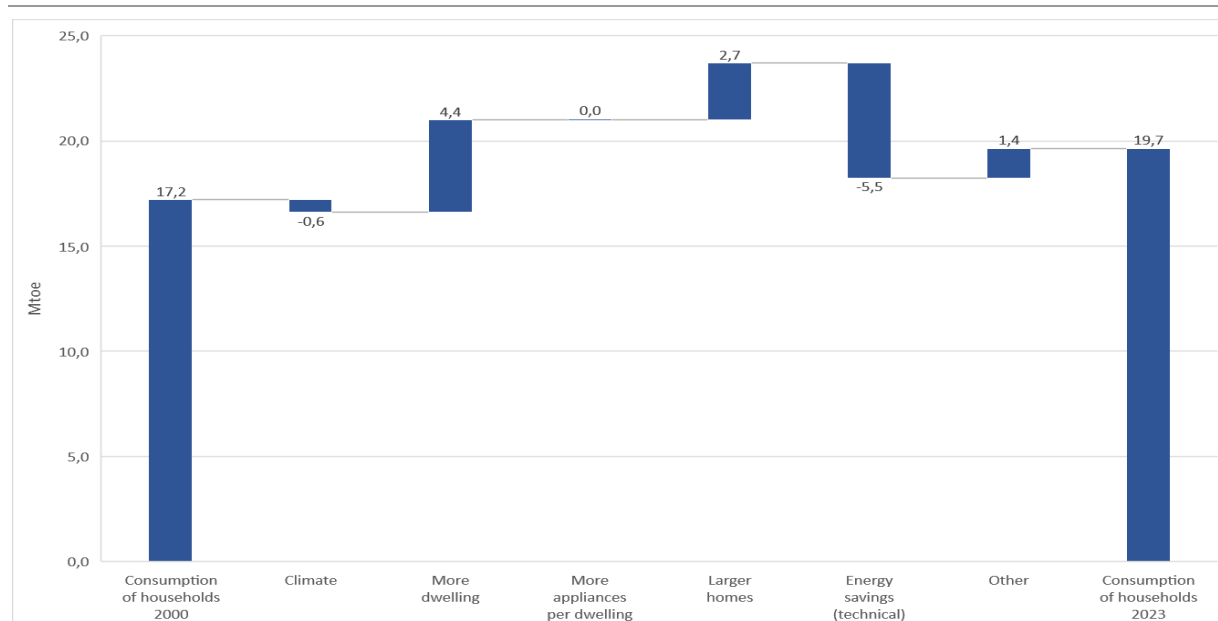
The technical ODEX in the household sector decreased by 22.9 compared to 2000 (as the ODEX is 77.1 for 2023), which represents an average energy efficiency improvement of 1.1% per year. The development of the household ODEX is strongly influenced by the heating sector. Here, the highest annual improvement rate was observed between 2000 and 2004, after which it slowed down. In 2023 the energy efficiency improved by 24.3% compared to 2000, which is an annual improvement rate of 1.2%.

Figure 17. ODEX indicator in households



Over the period 2000–2023, the residential sector recorded an increase of around 2.5 Mtoe in the total energy consumption (from 17.2 to 19.7 Mtoe). This variation was due to larger number of dwellings (4.4 Mtoe), larger area of houses (2.7 Mtoe) and other effects (1.4 Mtoe). On the other hand, two factors have a decreasing effect on the consumption of households: climate (by 0.6 Mtoe) and energy efficiency improvement (by 5.5 Mtoe).

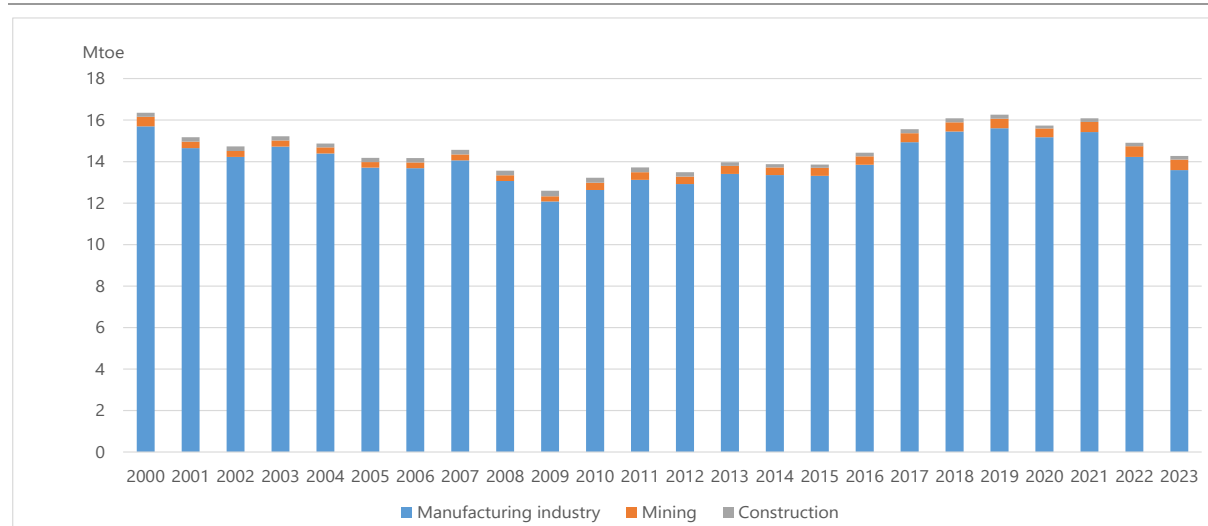
Figure 18. Decomposition of energy consumption in households



4.2 Industry sector

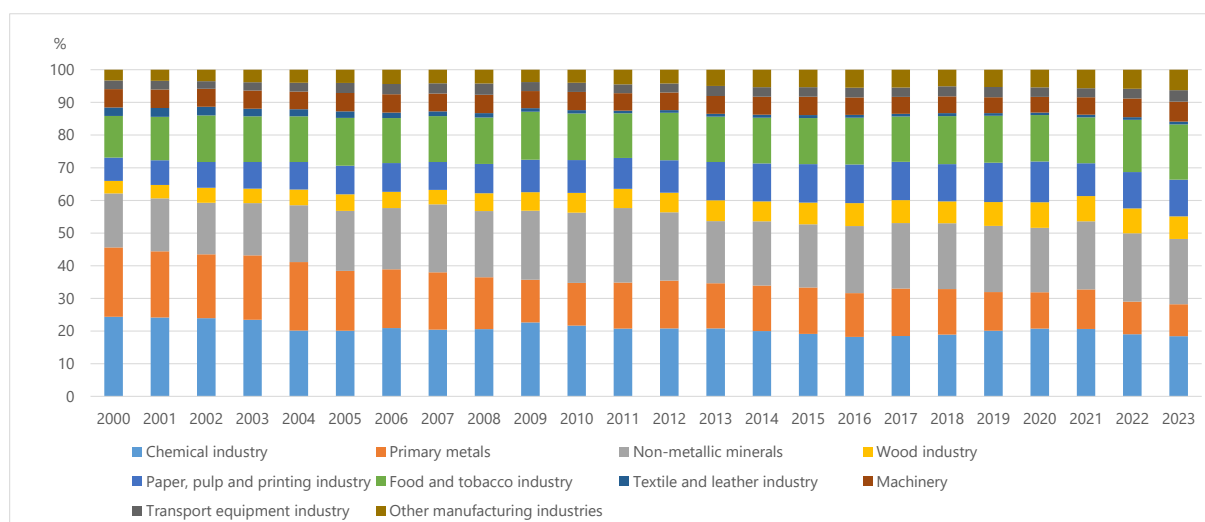
In 2023, total final energy consumption of industry (consisting of manufacturing, construction and mining) amounted to 14.7 Mtoe, which is 12.7% lower than the consumption of 16.4 Mtoe in 2000. This consumption level was reached by an average yearly decrease of 0.59%. This downward trend is principally shaped by the manufacturing industry, which contributes about 95.2% of total final consumption in industry amounted to 13.6 Mtoe in 2023. The lower-consuming branches: construction and mining industries reached a consumption level of 0.18 Mtoe and 0.50 Mtoe, respectively, in 2023.

Figure 19. Final energy consumption in industry



In 2023, non-metallic minerals is the branch with the highest share in manufacturing consumption (20.0%). Three other branches have a share of over 10%: chemical industry (18.4%), food and tobacco industry (17.0%), paper, pulp and printing industry (11.2%). Primary metals branch faces serious problems in Poland, its share decreased by 11.4 pp compared to 2000. This branch experiences a decline in production. The other branches show a fairly stable share in manufacturing consumption. Four branches noted an increase in the share by around 3–4 pp: non-metallic minerals, wood industry, paper, pulp and printing industry, and food and tobacco industry.

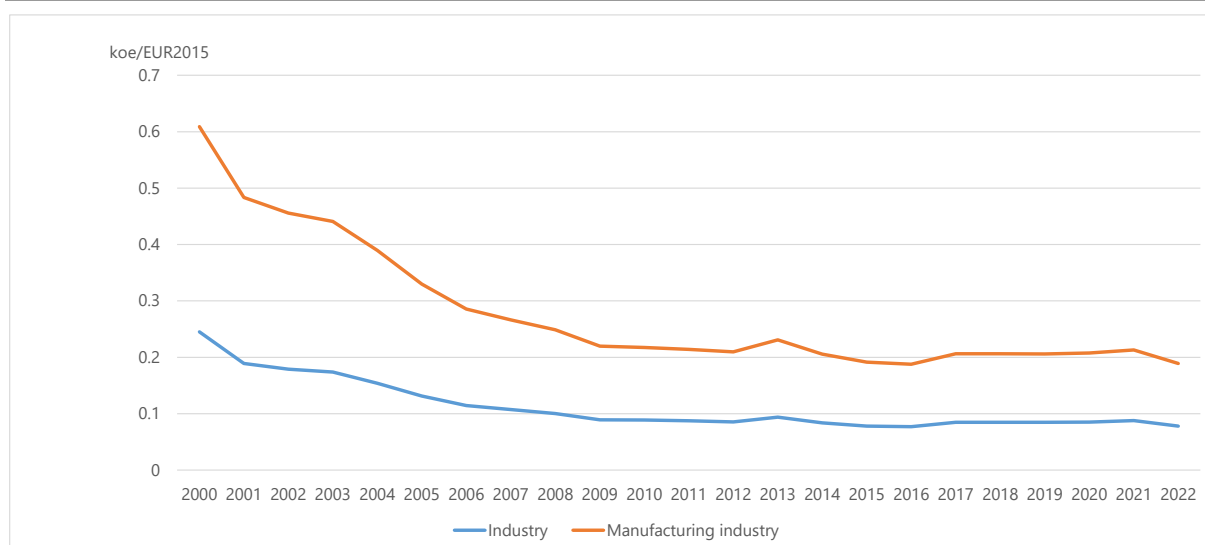
Figure 20. Final energy consumption in the manufacturing sector by branches



Energy efficiency in industry is described by the aggregate indicator of energy consumption compared to value added per branch (i.e. energy intensity).

In the period 2000–2022, industry and manufacturing showed a very high drop in energy intensity by 68.2% and 68.9% respectively. Although, the biggest drop was noted between 2000 and 2008 (almost a 60% drop). After 2008 energy intensity decreased only by around 1.8%/year.

Figure 21. Development of energy intensity in industry and manufacturing

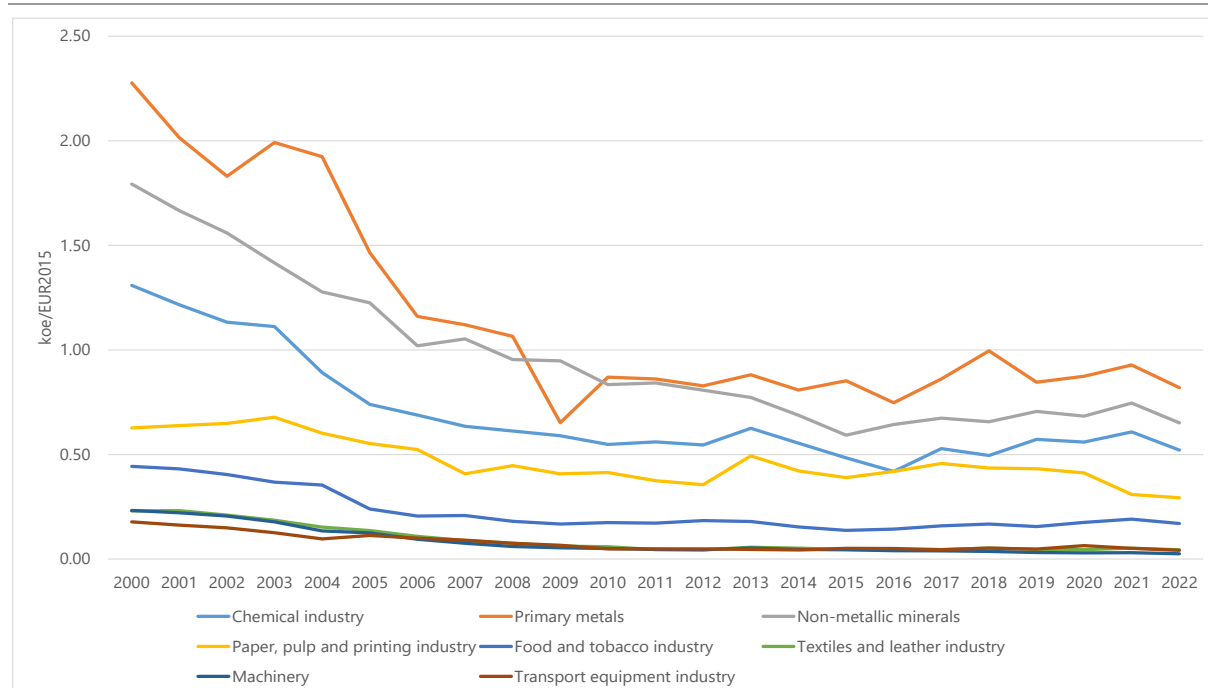


Between 2000 and 2022, energy intensity of industry decreased across all manufacturing industries. The largest decline (by 89.2%) occurred in the machinery industry, while the smallest decrease (53.3%) was observed in the paper, pulp, and printing industries. Compared to 2021, the greatest

decrease was recorded in the transport equipment industry (by 18.4%), while the smallest reduction was in the paper, pulp, and printing industries (by 5.2%).

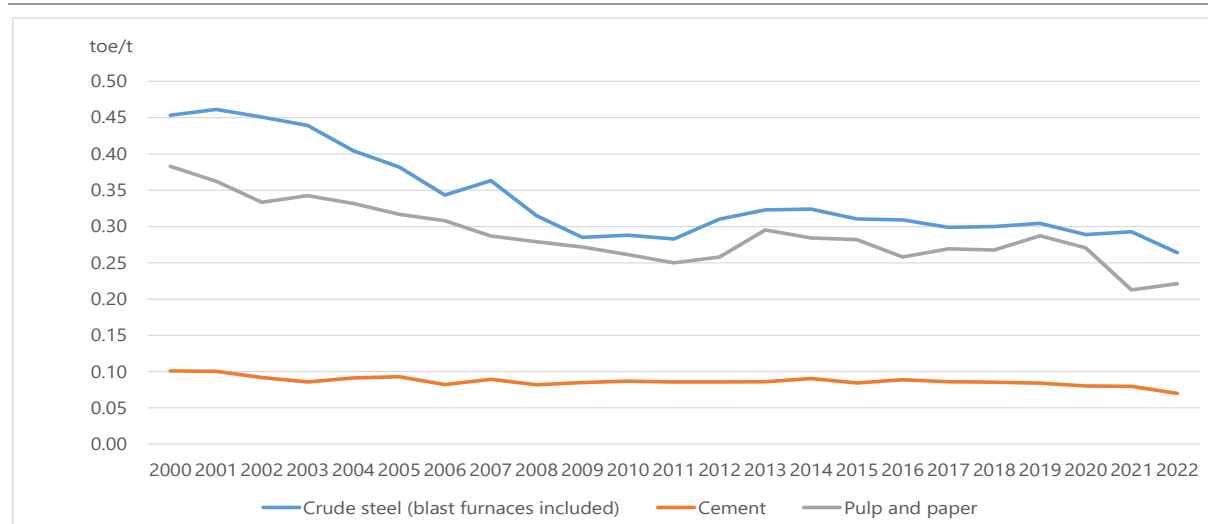
Analyzing the data presented in Figure 17, it can be observed that the most significant improvement in energy intensity for most of the industries took place between 2000 and 2009. In the case of the food and tobacco industries, the decrease in energy intensity was 62.1%, while from 2010 to 2022 it was only 2.4%. A different trend can be observed in the machinery industry, where the decrease in energy intensity was 76.7% between 2000 and 2009, while from 2010 to 2022 it was 50.4%.

Figure 22. Development of energy intensity in manufacturing branches



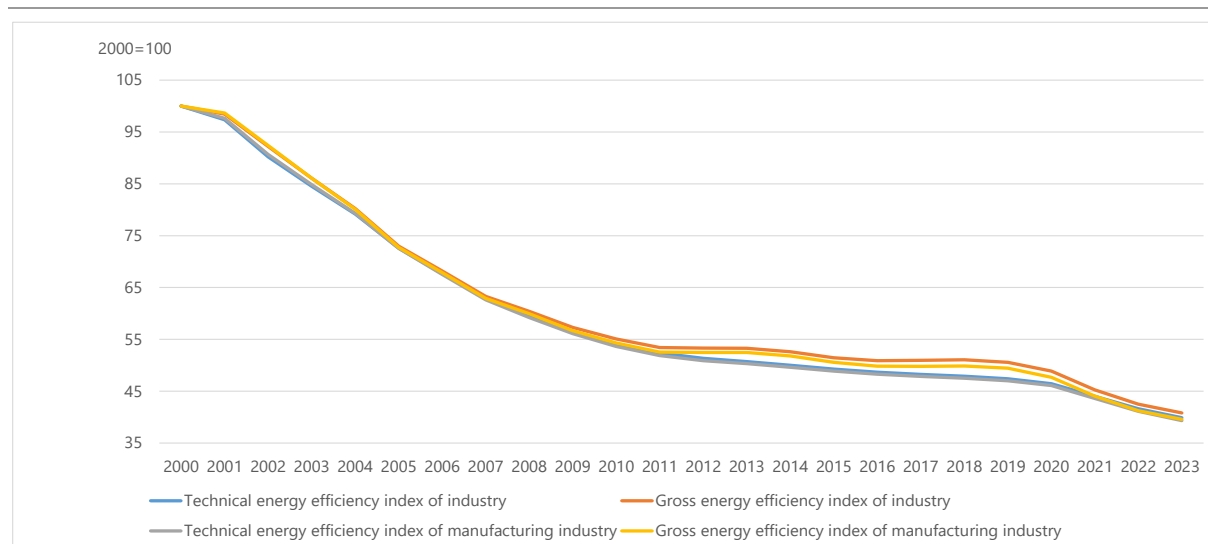
In 2000–2022, the unit consumption of energy carriers for selected energy-intensive products (raw steel, pulp and paper, cement) improved significantly. The largest decrease (by 42.2%) was observed in the production of pulp and paper, followed by raw steel production (by 41.8%) and cement (by 30.8%). Compared to 2021, the largest decrease occurred in cement production (by 12.2%), while an increase of 4% was observed in the production of pulp and paper.

Figure 23. Unit consumption of energy-intensive products



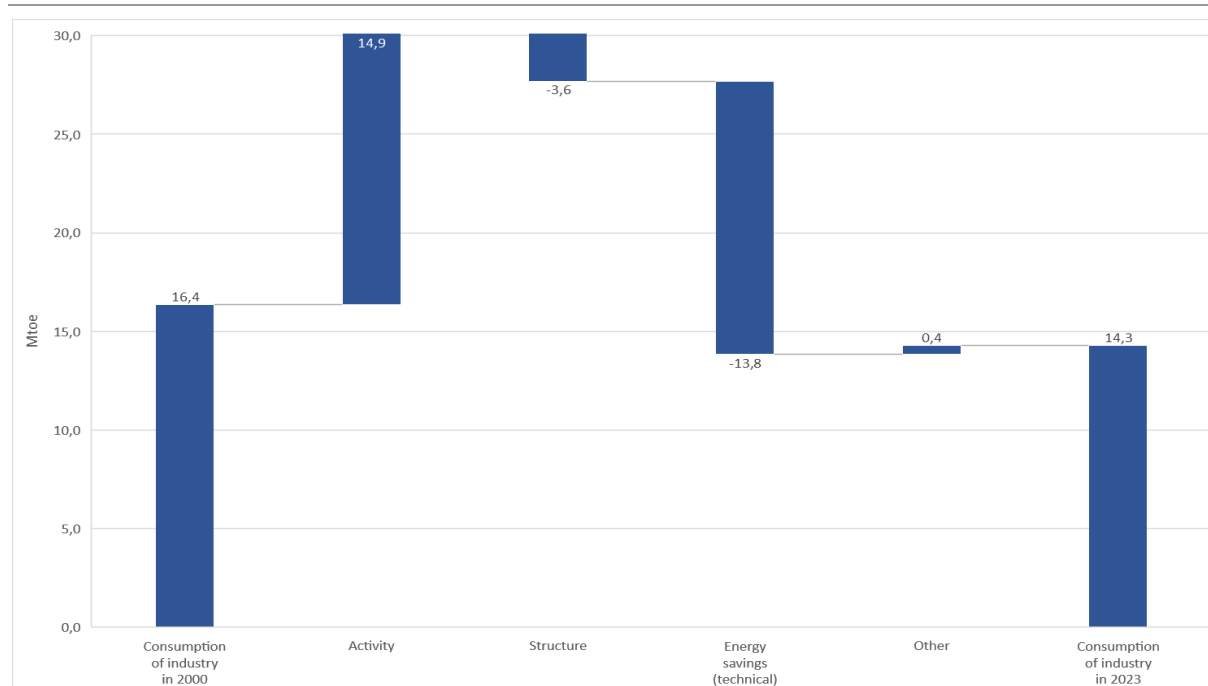
Energy efficiency indicators (ODEX) for the industry sector demonstrated significant improvement from 2000 to 2023, with the ODEX value reaching approximately 40 in 2023. This value indicates a 60% improvement in energy efficiency since the base year. The smallest decline in dynamics, particularly for gross energy efficiency indicators, was observed between 2011 and 2020.

Figure 24. Development of the energy efficiency index (ODEX) in industry and manufacturing



In 2023, energy consumption in industry amounted to 14.3 Mtoe, a decrease of 12.7% compared to 2000. Between 2000 and 2023, the largest impact on the reduction of energy consumption in industry came from savings (resulting from the introduction of new production technologies), which accounted for a reduction of 13.8 Mtoe. The next factors were structural changes (a decrease of 3.6 Mtoe) and variation in consumption (a decrease of 2.1 Mtoe). On the other hand, the main factor contributing to the increase in energy consumption was the increased activity of producers, which led to an increase of 14.9 Mtoe, while other factors caused a further increase of 0.4 Mtoe.

Figure 25. Decomposition of final energy consumption in industry

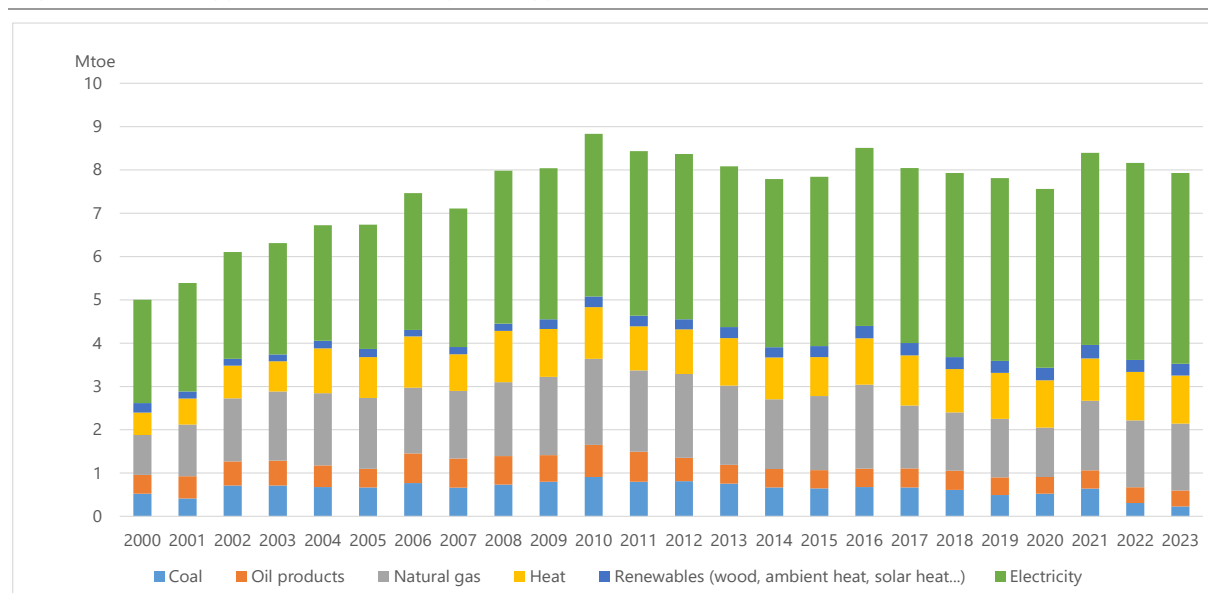


4.3 Service sector

Between 2000 and 2023, total energy consumption in the services sector ranged from 5 to 9 Mtoe (without climate correction). During this period, the largest increase in energy consumption was observed for heat (by 115.2%), followed by electricity (by 84.5%) and natural gas (by 67.7%). The use of renewable energy increased by 22.1%. On the other hand, consumption decreased for coal (by 56.2%) and oil products (by 15%).

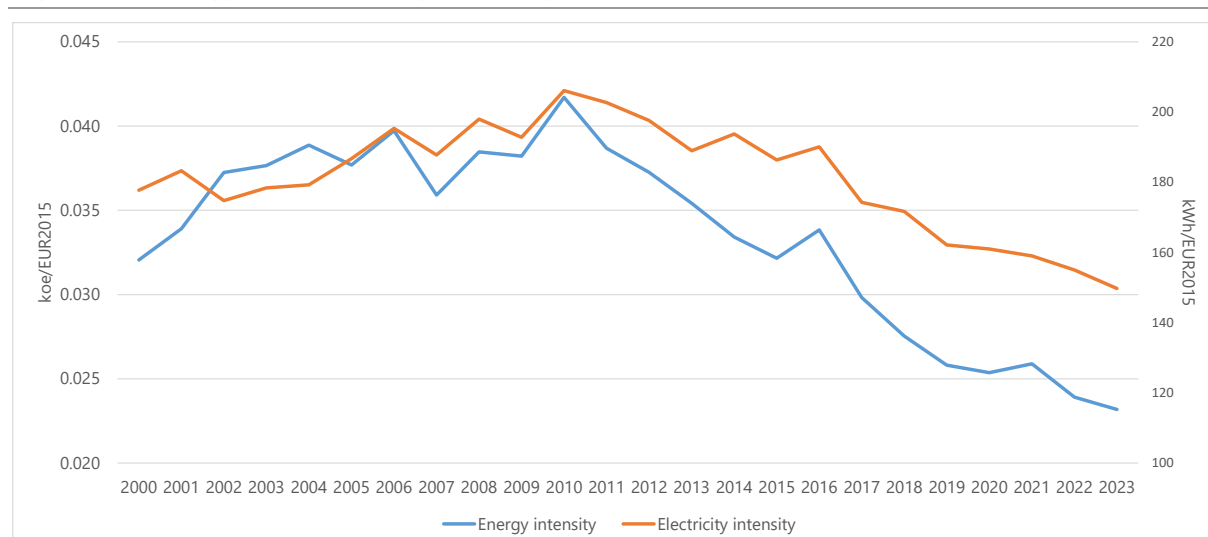
When comparing 2023 with the previous year, an increase in consumption was observed only for oil products (by 1.2%). In all other cases, a decrease was recorded, with the largest drop in coal consumption (by 25.2%).

Figure 26. Energy consumption by energy carrier in the service sector



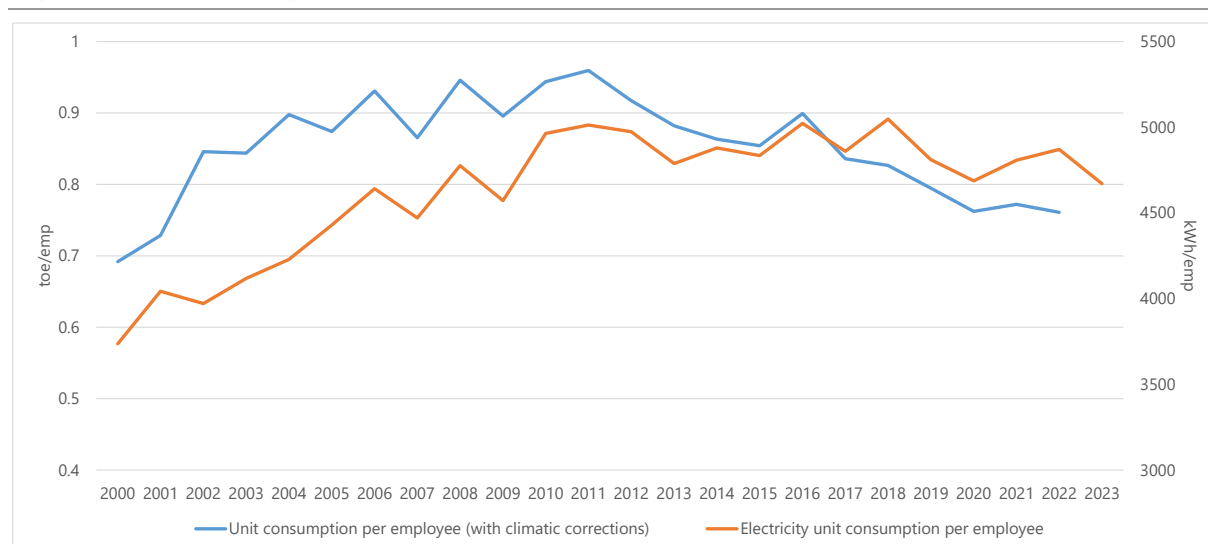
In 2023, energy and electricity intensity in the services sector decreased by 27.7% and 15.8% respectively, compared to 2000. Between 2000 and 2010, energy and electricity intensity in services showed an upward trend, while after 2010, a downward trend was observed. In 2023, compared to 2010, energy and electricity intensity in services decreased by 44.4% and 27.4%, respectively.

Figure 27. Energy and electricity intensity in services



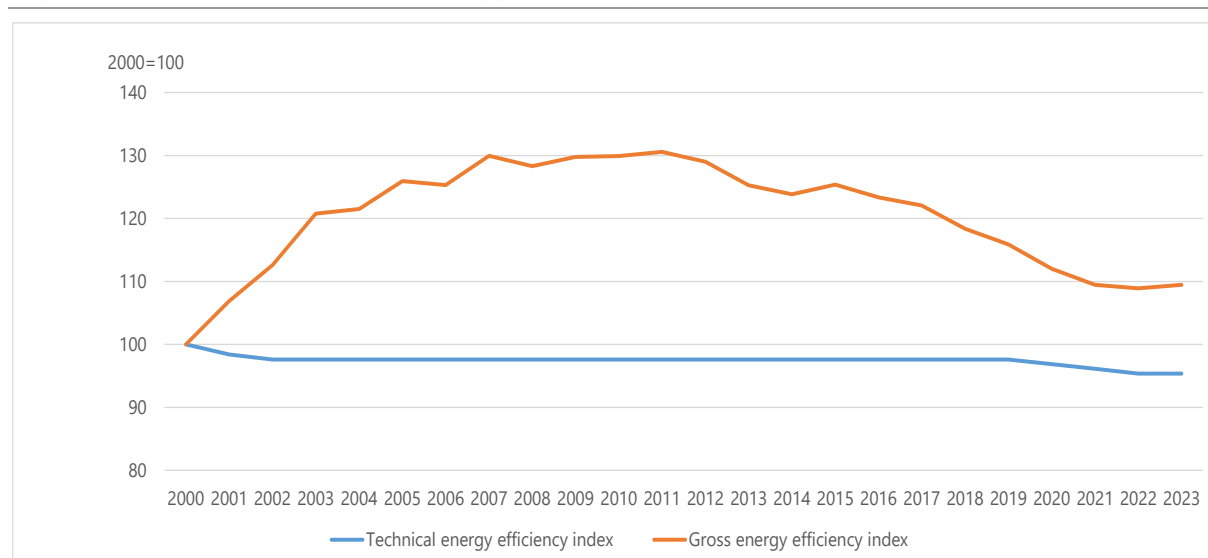
In 2022, total energy consumption and electricity consumption per employee in the services sector increased by 10.0% and 30.4% respectively, compared to 2000. It is important to note that increases were observed between 2000 and 2011, while decreases in energy carrier consumption per employee occurred after 2011.

Figure 28. Total energy and electricity consumption per employee in services

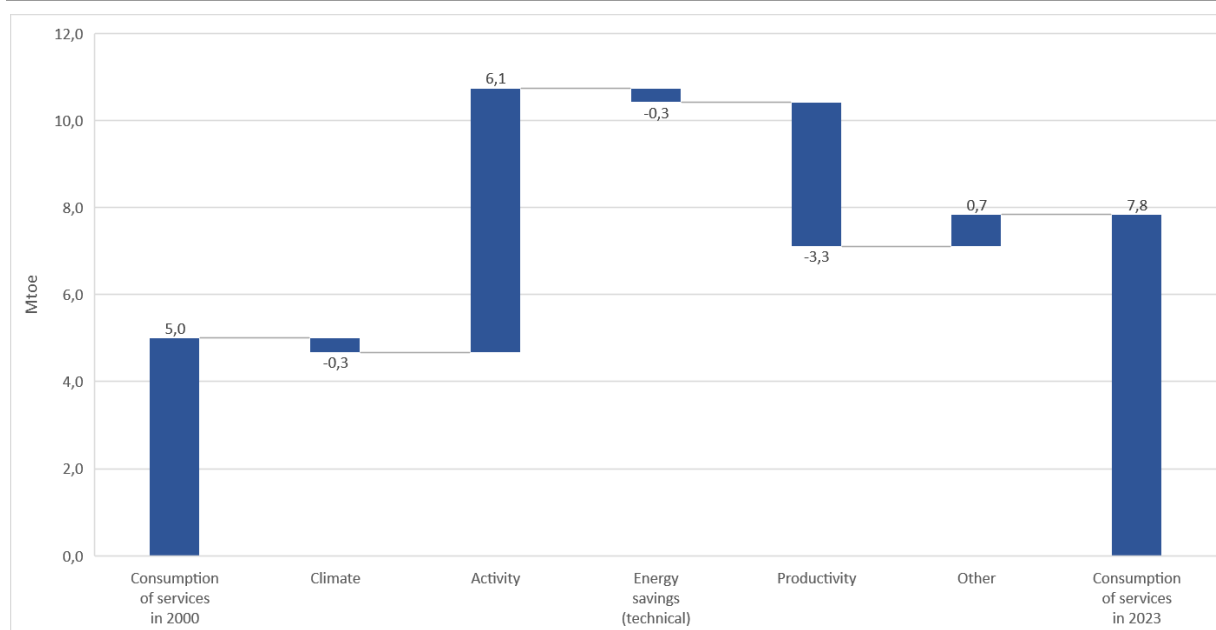


From 2000 to 2023, there was a slight improvement of 4.6% in the value of the technical energy efficiency indicator ODEX for the services sector. Meanwhile, the gross energy efficiency indicator increased by 9.5% over the studied period. It is worth noting that the growth in the gross indicator mainly occurred between 2000 and 2011, followed by a visible decline starting from 2011 and lasting until 2022.

Figure 29. Development of the energy efficiency index (ODEX) in services

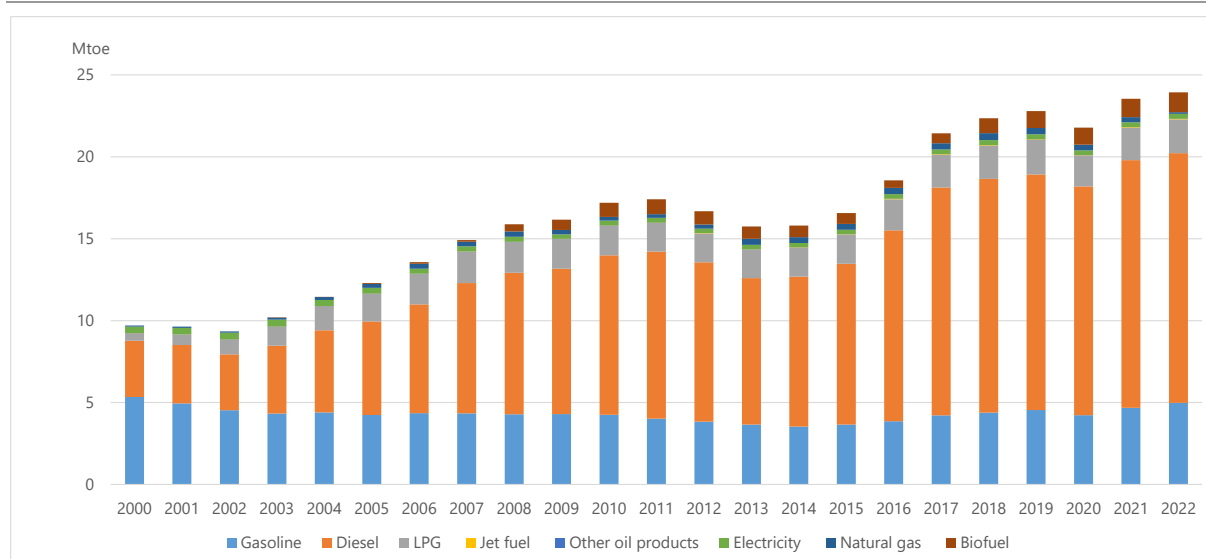


In 2023, energy consumption in the services sector amounted 7.8 Mtoe, an increase of 56.6% compared to 2000. During the period from 2000 to 2023, the following factors contributed to the reduction in energy consumption in services: energy savings (a decrease of 0.3 Mtoe), climate changes (a decrease of 0.3 Mtoe), and productivity growth (a decrease of 3.3 Mtoe). On the other hand, the factors contributing to the increase in energy consumption were: variation in consumption (an increase of 2.8 Mtoe), activity of entities (an increase of 6.1 Mtoe), and other factors (an increase of 0.7 Mtoe).

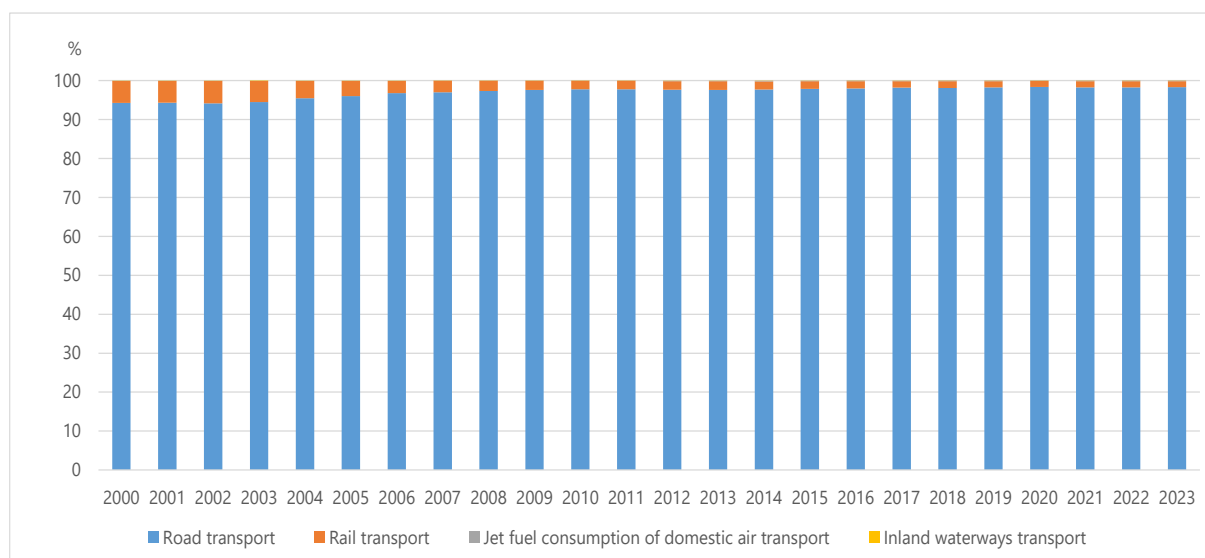
Figure 30. Decomposition of final energy consumption in services

4.4 Transport sector

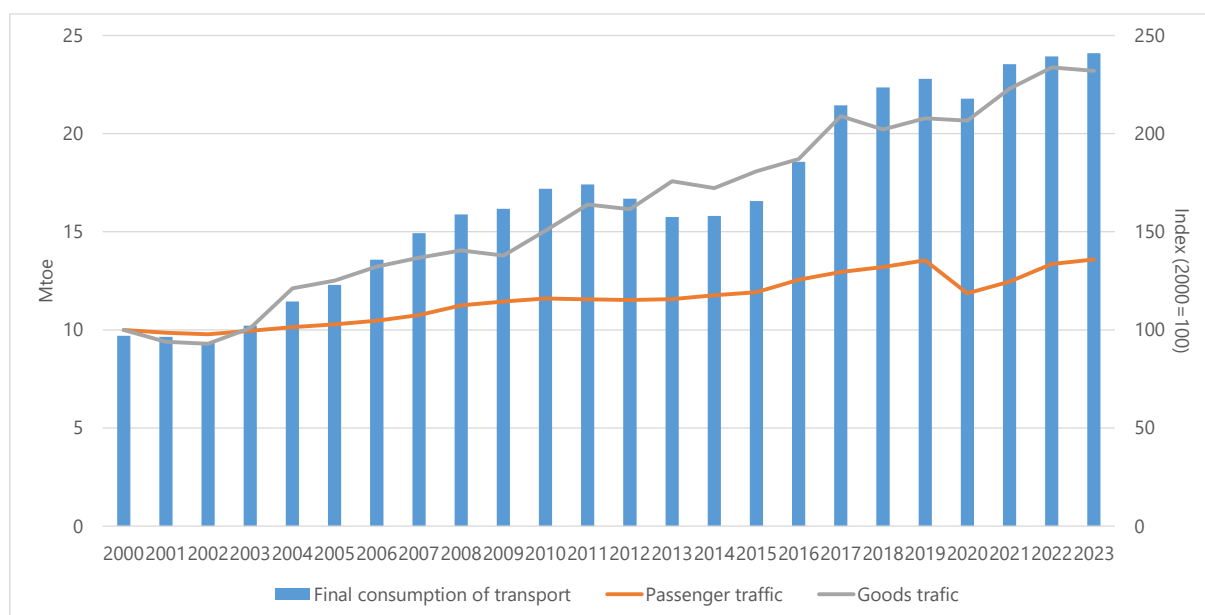
In 2022, total energy consumption in transport amounted to 24.1 Mtoe, which represents an increase of 146.7% compared to 2000. The largest increases (over 9.5-fold) were recorded for the consumption of jet fuel in domestic air transport. Significant increases (over 4.4-fold) were also observed for the consumption of diesel and LPG. Decreases in consumption were noted for three types of fuels. The largest decrease occurred for other oil products (by 81.5%) and electricity (by 24.7 %). Meanwhile, the use of biofuels in transport showed a more than 42.7-fold increase in 2023 compared to 2003.

Figure 31. Energy consumption by fuel in transport

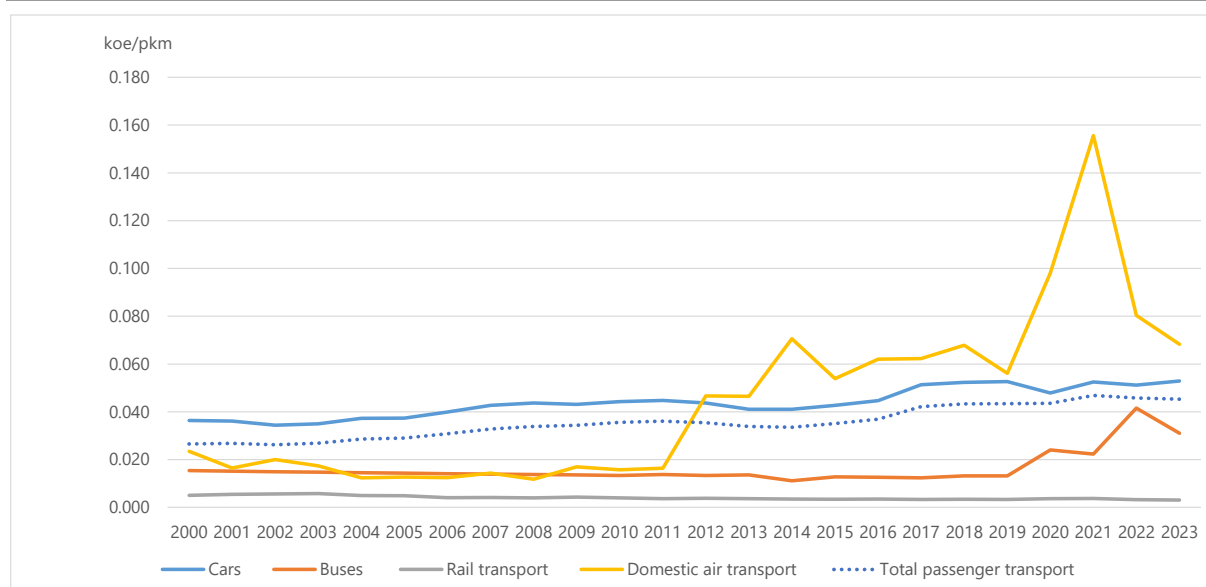
In the years 2000–2023, road transport played a dominant role in energy consumption in the transport sector, accounting for over 98.34% of the total energy use in 2023. The second place is held by rail transport, with a share of 1.53%. Meanwhile, domestic air transport and inland waterway transport together accounted for 0.13%.

Figure 32. Development of transport energy consumption by mode

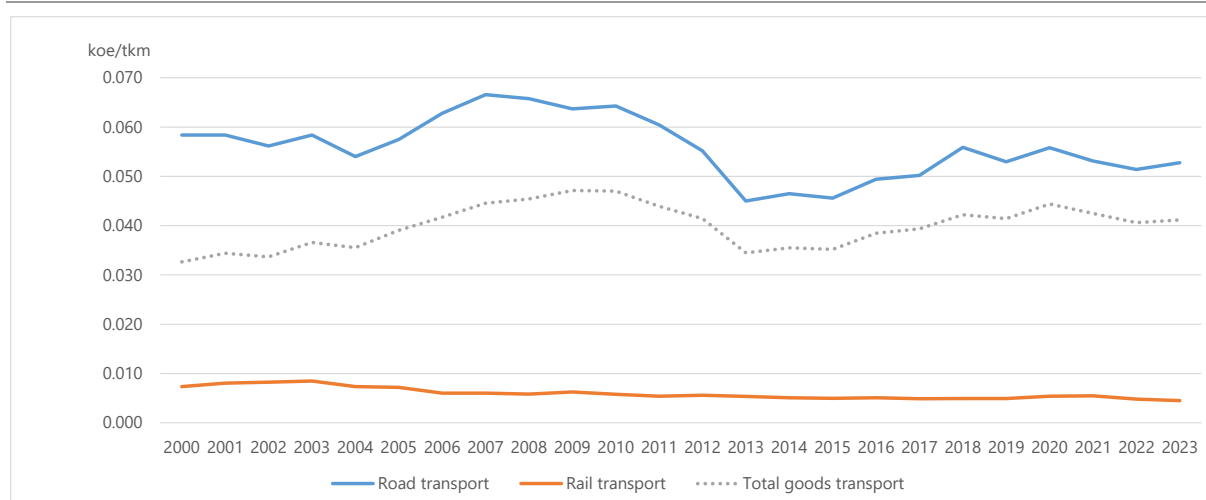
Energy consumption in both goods and passenger transport increased between 2000 and 2023. Energy consumption in transport increased by 148.4% in the period under review, reaching 24.1 Mtoe in 2023. Passenger traffic increased by 35.9%, and goods traffic by 132%.

Figure 33. Energy consumption in transport and passenger and goods traffic

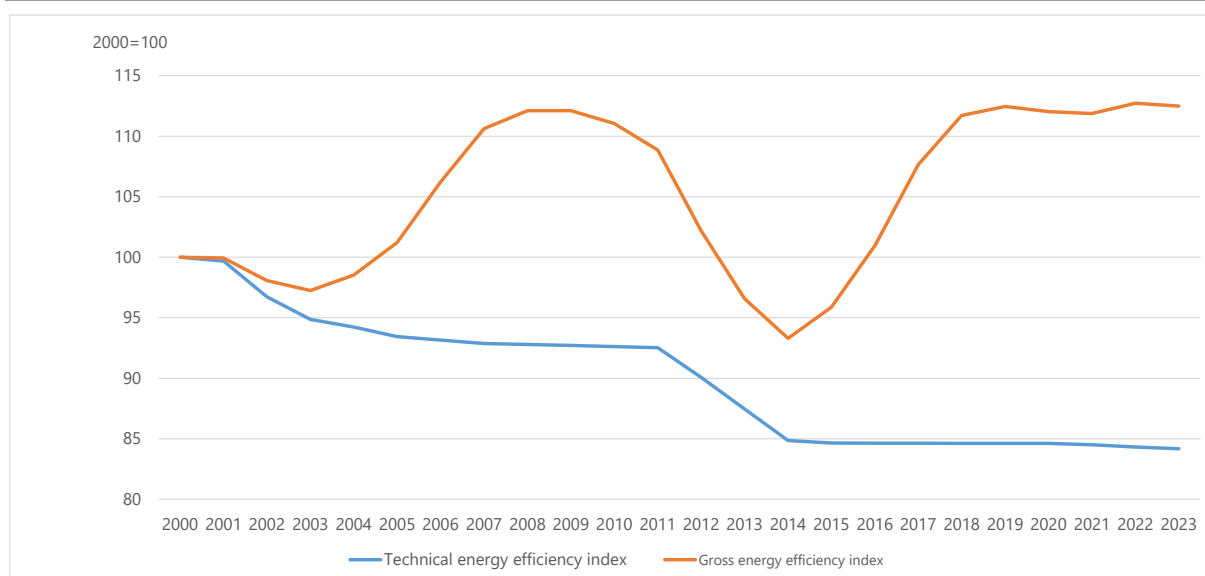
In the period 2000–2023, unit energy consumption per passenger-kilometer decreased for rail transport by 38.7%. In the remaining cases, an increase was recorded. The largest increase occurred in air transport and amounted to 191.5%. Next, there is bus and road transport with an increase of 101.7% and 45.4%, respectively.

Figure 34. Energy consumption in transport per passenger-kilometre

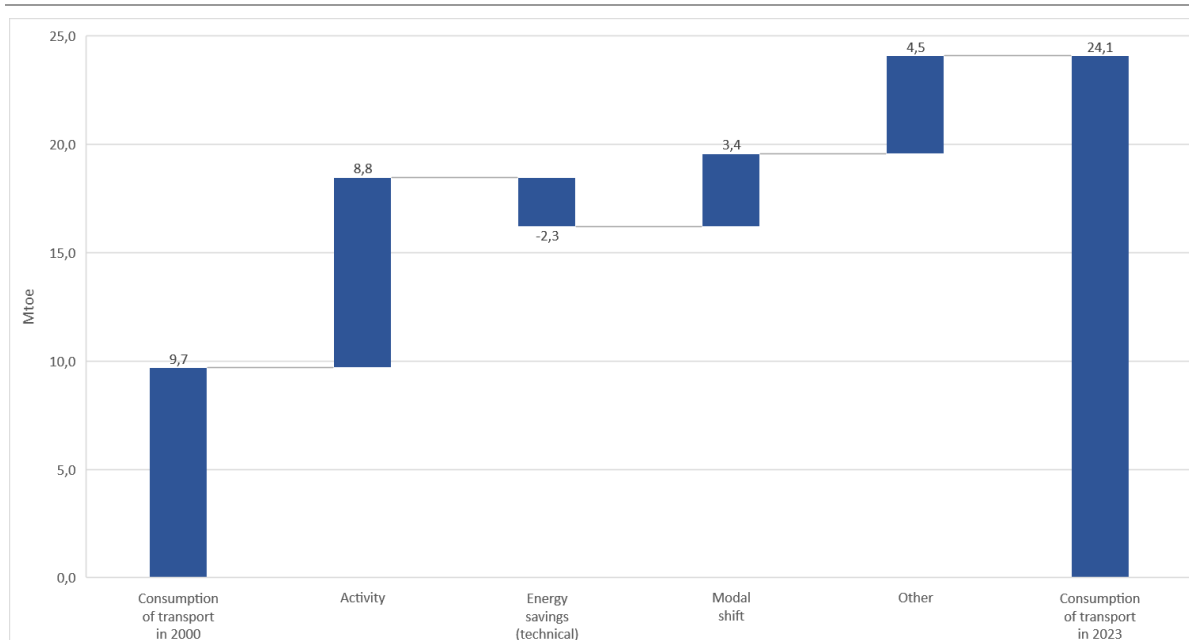
Energy consumption per tonne-kilometre in the period 2000–2023 decreased for both road and rail transport, respectively by 9.6% and 38.7%. Comparing 2023 to 2022, in the case of road transport, an increase in energy consumption was recorded by 2.6%.

Figure 35. Energy consumption in transport per tonne-kilometre

During the period under review, the technical ODEX indicator decreased by 15.8, reaching 84.2 in 2023. The gross energy efficiency index for transport from 2000 to 2023 showed periods of growth and decline, with the largest increase of 19.1 recorded between 2014 and 2023. The value of this index remained stable above 111 until 2018.

Figure 36. ODEX indicator in transport sector

In 2023 energy consumption in transport amounted to 24.1 Mtoe, this is an increase by 148.4% compared with 2000. In the period under review 2000–2023, energy savings reduced energy consumption in transport by 2.3 Mtoe. The factors influencing the increase in energy consumption were: expansion of activity (increase by 8.8 Mtoe), change of means of transport (increase by 3.4 Mtoe) and other factors (increase by 4.5 Mtoe).

Figure 37. Decomposition of energy consumption in transport

5 Special focus: Energy poverty policies

Energy poverty in Poland in 2025 remains a serious social problem affecting a significant proportion of the population. It is estimated that around 11% of households struggle to meet their basic energy needs, meaning that millions of Poles may not be able to afford adequate heating or access to electricity. Rising energy prices and the high cost of operating old heating systems exacerbate this phenomenon. The government is planning new support measures to protect the poorest from rising energy costs, but experts say more decisive action is needed to effectively reduce energy poverty and improve people's quality of life. However, there is just one policy directly related to energy poverty.

The "Stop Smog" program is a key government initiative in Poland to combat air pollution by providing financial assistance to households to replace old, inefficient heat sources with low-emission technologies. The program aims to reduce the emission of harmful substances into the atmosphere, thereby contributing to the improvement of air quality in Poland. The program is primarily targeted at low-income households, giving them access to modern and environmentally friendly heating systems. Households can receive funding to replace heat sources, thermo-modernise buildings and connect to a district heating or gas network. In some cases, up to 100% of the investment costs can be covered.

Table 8. Energy efficiency policies aiming at energy poverty.

Sector	Title	Type	Starting year	Status
Household	STOP SMOG Programme	Financial	6/27	Finished in 2024

Source: MURE database.

A new version of the program will be launched in 2025. The Ministry of Climate and Environment plans to make changes to increase funding for low-carbon projects and reduce municipal contributions.

6 Discussion and conclusion

Increasing the energy efficiency of the processes of generation, transmission and use of energy is a pillar of a sustainable energy policy. This is reflected in legislation and actions undertaken by national and European Union institutions. At the European Union level, the priority of increasing energy efficiency is expressed in the EED (Energy Efficiency Directive), which entered into force on 25 October 2012. The amended directive published on 20 September 2023 establishes as a primary objective the reduction of final energy consumption in 2030 by 11.7% in 2030 in relation to the forecasts of the so-called PRIMES2020 reference scenario developed by the European Commission. Moreover, Member States are jointly responsible for ensuring that the final energy consumption in the EU does not exceed 763 Mtoe in 2030 and 992.5 Mtoe in case of primary energy consumption. Therefore, each EU Member State should set out an estimated contribution to this target, along with an indicative trajectory. In terms of improving energy efficiency, Poland aims to achieve a 12.8% reduction in final energy consumption (equivalent to 8.6 Mtoe) in 2030, compared to PRIMES2020 forecasts. Between 2000 and 2023, total primary energy consumption in Poland increased at a rate of 0.4%/year, reaching a value of 96.8 Mtoe in 2023. The transport sector remained the largest energy consumer, with its share in 2023 amounting to 34.9% (increased by 16.5 pp compared to 2000). Households account for the second-largest share, amounting to 28.4%. In this sector, in 2023 the use of solid fossil fuels decreased by 1.2 Mtoe compared to 2000, primarily due to a 3.2 Mtoe increase in the use of energy from renewable sources. Energy consumption by the third largest consumer - industry, decreased by over 2.1 Mtoe and accounted for 20.7% of final energy consumption in 2023. Energy efficiency in Poland improved between 2000 and 2023. Primary energy intensity of GDP decreased by 48.1%, while the final energy intensity of GDP decreased by 40.1%. With regards to sectors, the fastest rate of energy efficiency improvement measured by the technical ODEX indicator was recorded in industry, where the aggregate energy efficiency index decreased at a rate of 3.9%/year; in the case of households it was 1.1%/year and for transport 0.7%/year. In 2023, energy savings totalled 0.9 Mtoe. From 2020 onwards, the largest energy savings took place in industry (1.8 Mtoe in 2022) and was largely determined by the increase in the price of energy carriers for industrial consumers.

Among the pro-efficiency measures most significant are projects supported by national funds through environmental funds and from the European Union Cohesion Fund within the framework of Regional Operational Programs and the Operational Program Infrastructure and Environment. Stimulating for improvement of energy efficiency in industry is a modified white certificate system implemented by the law on energy efficiency. The information and education campaigns of the National Fund for Environmental Protection and Water Management and of the ministry responsible for energy affairs raise awareness and knowledge on energy efficiency improvement options and serve practical help to citizens and institutions and enterprises.

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