



Energy Efficiency trends and policies in Poland

ODYSSEE- MURE 2018

Monitoring EU energy efficiency first principle and policy
implementation

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Executive summary

Energy consumption increased in year 2019 in comparison with year 2000 by 13.8% in case of primary energy and by 25.3 in case of final consumption. The key driver of this growth was the increase in activity, understood as bigger production, more travels, bigger homes etc. Energy saving reflecting energy efficiency improvement were achieved in year 2000-2019 in all sectors being large energy consumers: industry, transport, households. Total energy savings rate amounted in 2019 to 32.1%, making energy efficiency as important in energy economy as other fuels.

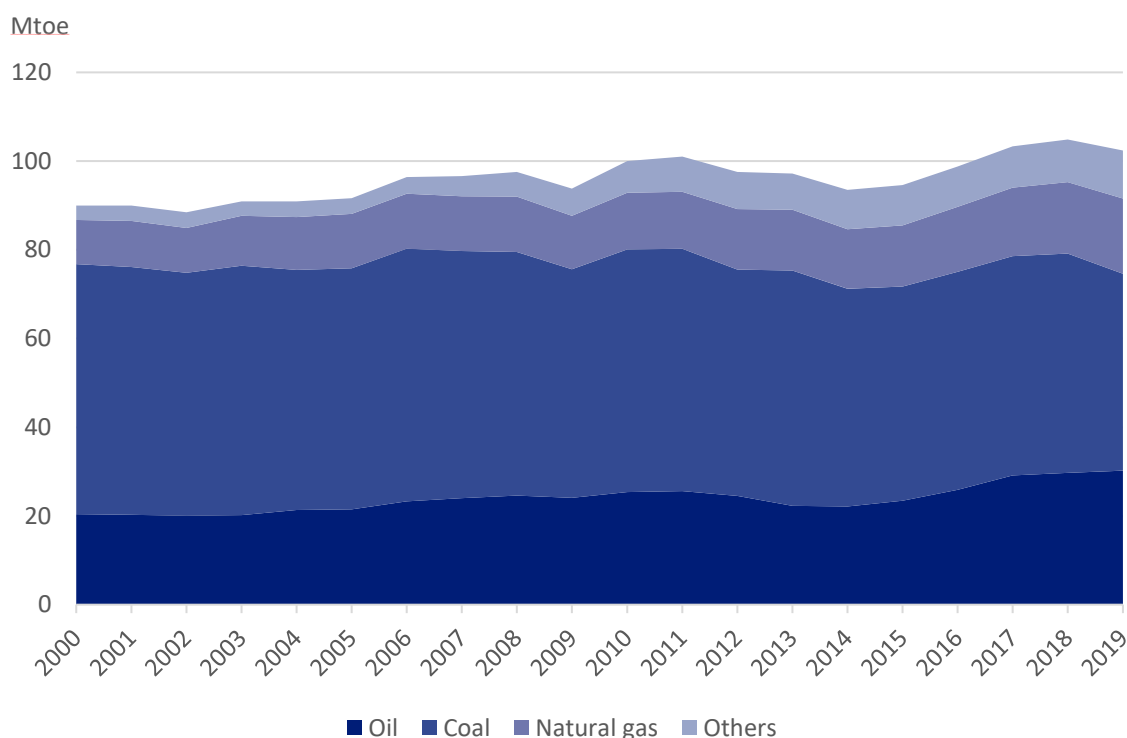
Among the pro-efficiency measures most significant are projects supported by national funds through environmental funds and from the European Union Cohesion Fund within the framework of Regional Operational Programs and the Operational Program Infrastructure and Environment. Stimulating for improvement 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.

1. Energy efficiency indicators

1.1. Energy consumption

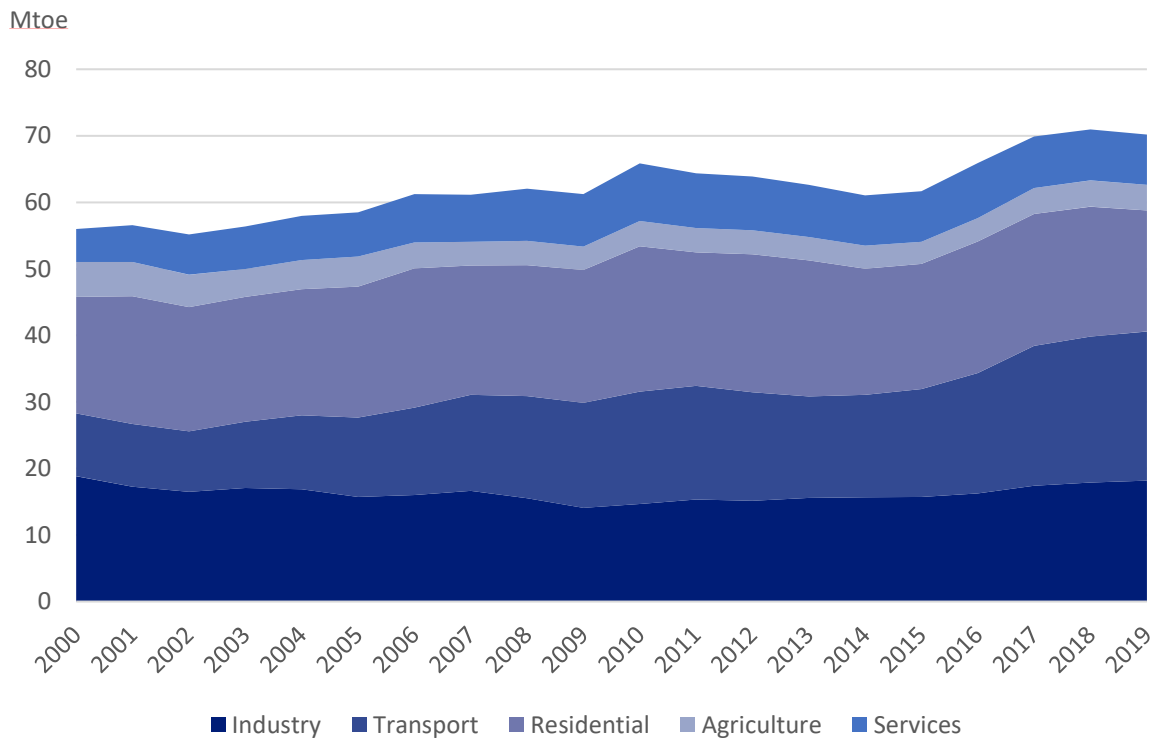
Primary energy consumption in Poland increased in years 2000-2019 from 90.0 Mtoe to 102.4 Mtoe (0.7%/year). The most significant change in scope of energy carriers used concerned coal which share decreased from 62.6% in 2000 to 43.3% in 2019. The share of other energy carriers increased: in case of oil from 22.7% to 29.5%, in case of natural gas from 11.1% to 16.6% and in case of others, mostly renewables from 3.6% to 10.6%.

Figure 1. Primary energy consumption



Final energy consumption increased from 56.0 Mtoe in 2000 to 70.2 Mtoe in 2019 (1.2%/year). The most significant change concerned transport sector which increased its share from 16.9% in 2000 to 31.9% in 2019. Another sector with the same tendency was service sector, which share grew from 8.8% in 2000 to 10.8% in 2019. Consumption of other sector became relatively smaller and the share of residential sector amounted to 25.9% in 2019 (down by 5.4 percentage points), the share of industry amounted to 25.9% (down by 7.7 percentage points) and the share of agriculture amounted to 5.5% (down by 3.9 percentage points).

Figure 2. Final energy consumption by sector

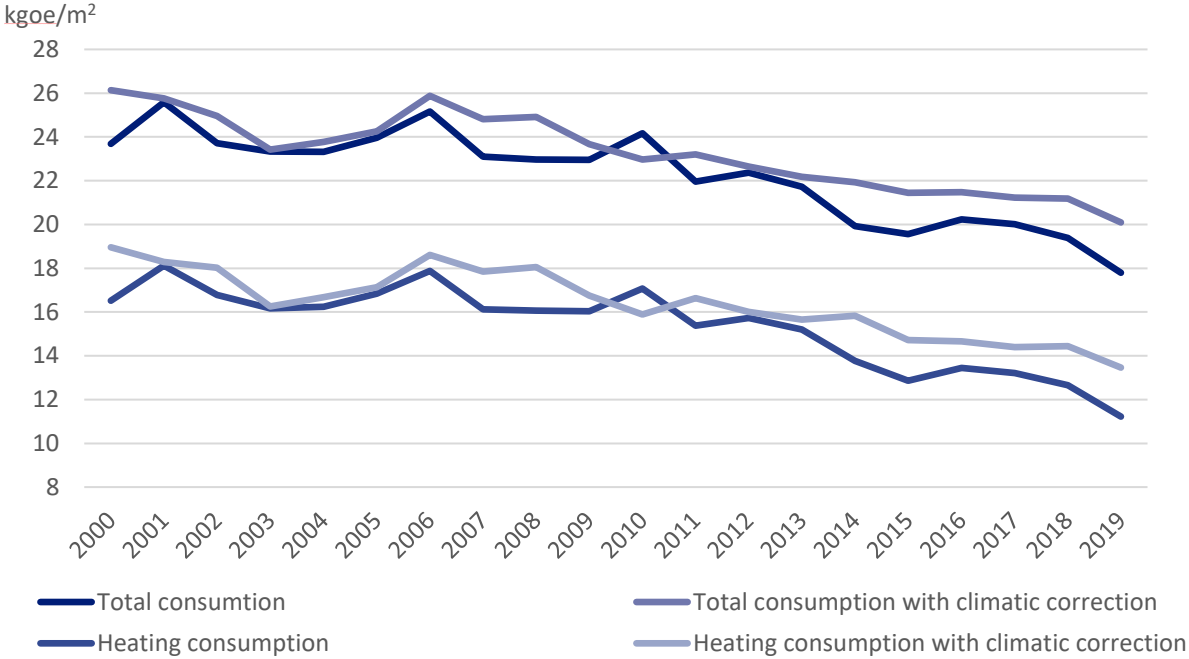


1.2. Residential sector

Energy consumption in households grew from 17.5 Mtoe in 2000 to 18.2 Mtoe in 2019. The most important end-use in household sector was space heating with share of 63.1% in 2019. The share decreased from 70.3% in 2000. The other end-uses increased their shares in years 2000-2019: water heating from 15.1% to 17.1%, cooking from 7.2% to 9.1% and lighting and electrical appliances from 7.5% to 10.8%.

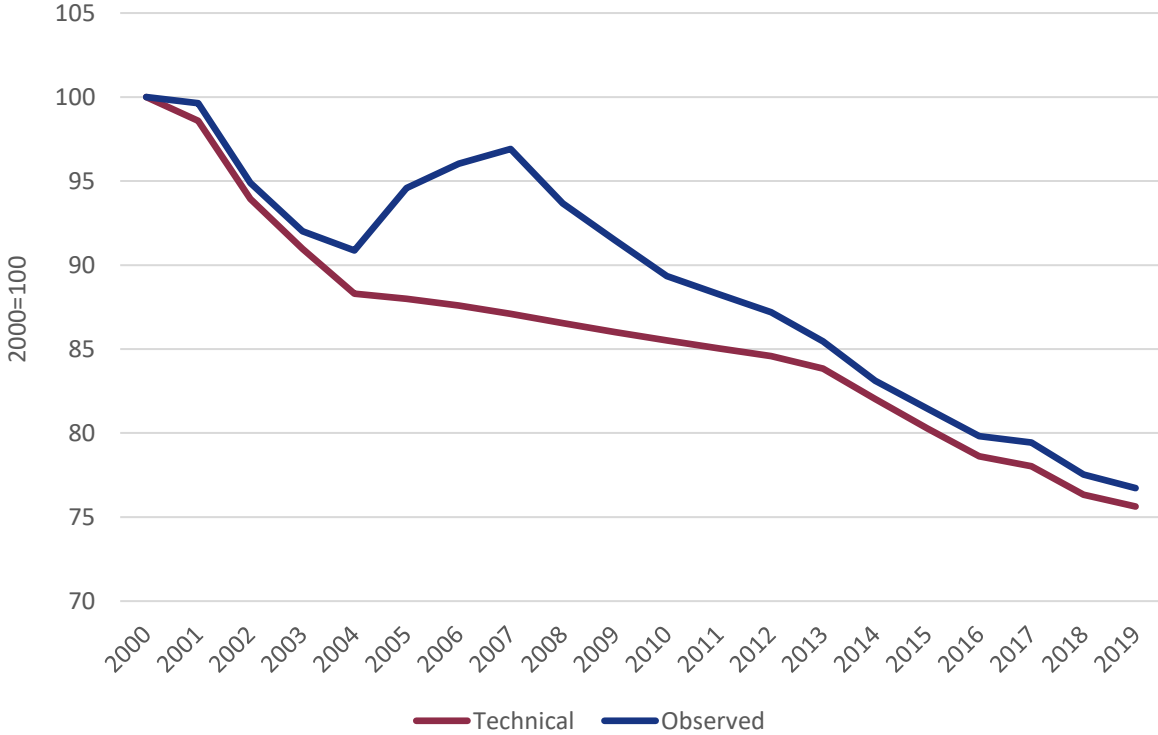
Energy consumption per m² was decreasing by 1.5% annually in years 2000-2019, after taking into account climate correction the rate of improvement amounted to 1.4%/year. In case of space heating, consumption per m² was decreasing by 2.0%/year and by 1.8%/year with climatic correction.

Figure 3. Energy consumption in households



The ODEX indicator amounted to 75.6 points in case of technical ODEX (1.5% improvement per year) and to 76.7 points in case of observed ODEX (1.4% per year).

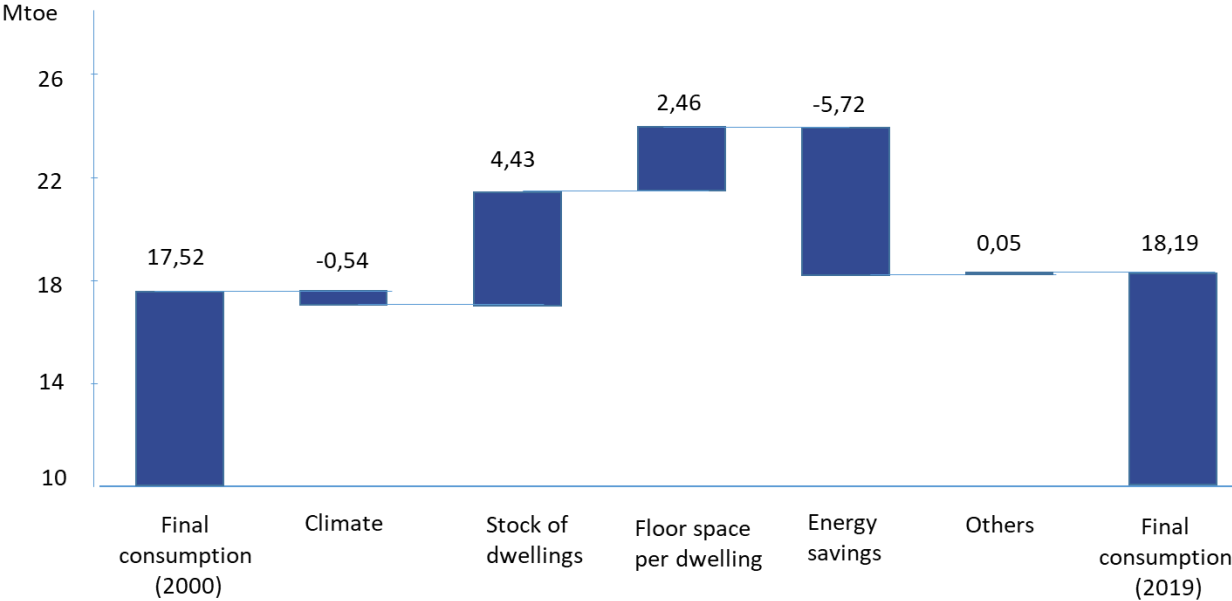
Figure 4. ODEX indicator in households



Two major factors that increase energy consumption in households were stock of dwellings (larger number of homes increased energy demand by 4.4 Mtoe) and floor space per dwelling (bigger average area

increased demand by 2.5 Mtoe) while energy savings lowered consumption by 5.7 Mtoe. Warmer year 2019 in comparison with 2000 decreased energy consumption by 0.5 Mtoe.

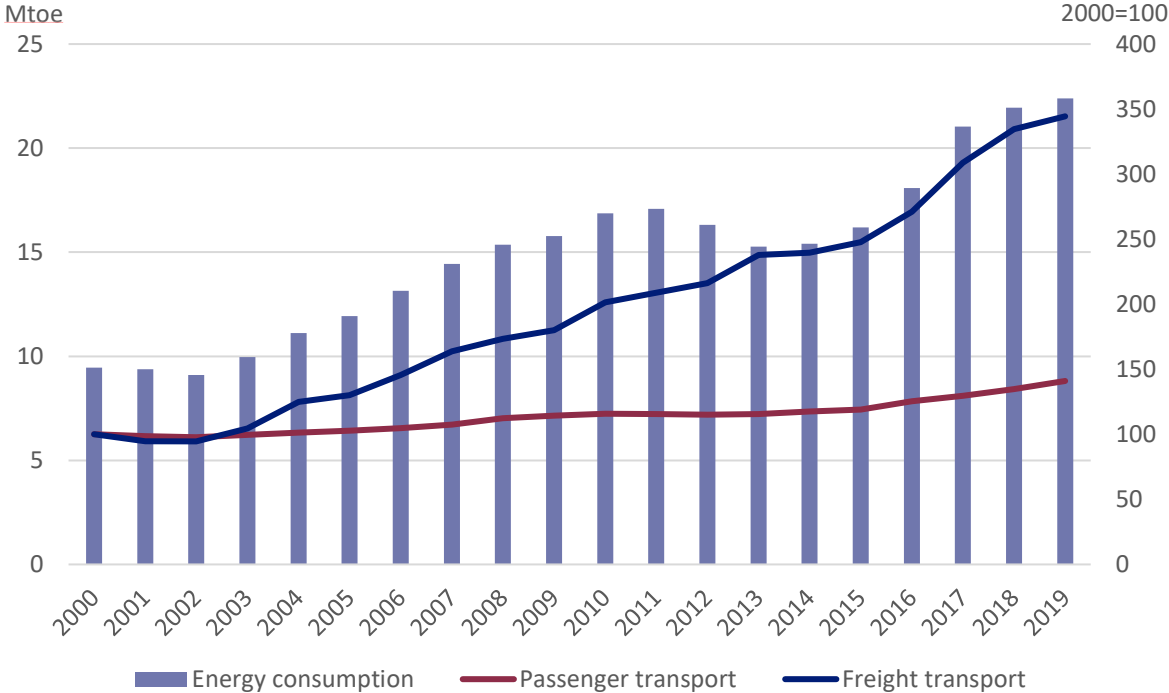
Figure 5. Decomposition of energy consumption in households



1.3. Transport sector

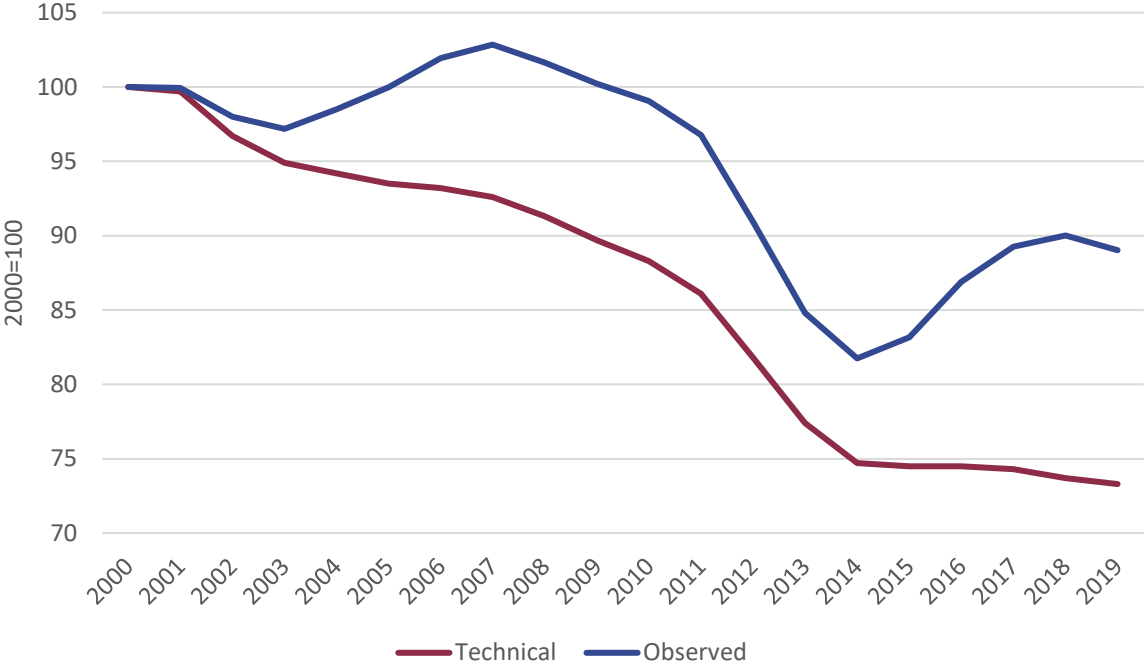
Transport sector was the one where the highest growth of consumption was observed. In years 2000-2019 it increased from 9.5 Mtoe to 22.4 Mtoe (4.5%/year). The biggest share and higher than average rate of consumption growth was observed in road transport (4.9%/year). Passenger transport was increasing by 1.8%/year while freight transport by 6.7%/year.

Figure 6. Energy consumption and traffic in transport sector



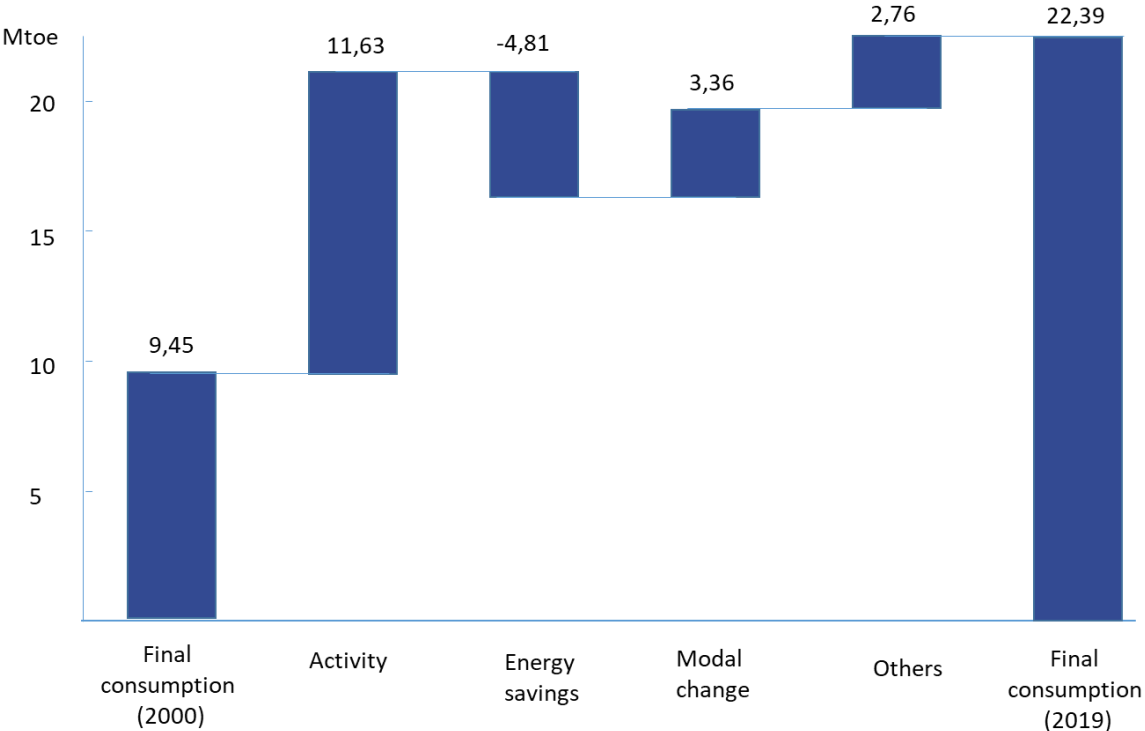
Technical ODEX has decreased by 1.6%/year and amounted to 73.3 in 2019. Observed ODEX performed worse and amounted to 89.0 in 2019 (0.6%/year improvement). The results in years 2013-2016 could be little distorted due to possible grow of not registered fuels turnover in this period.

Figure 7. ODEX indicator in transport sector



The highest impact on fuel consumption growth had activity (11.6 Mtoe), as well as modal shift from rail to road transport and from public to individual transport. Also other factors played important role and increased demand by 2.8 Mtoe. Energy savings decreased consumption by 4.8 Mtoe.

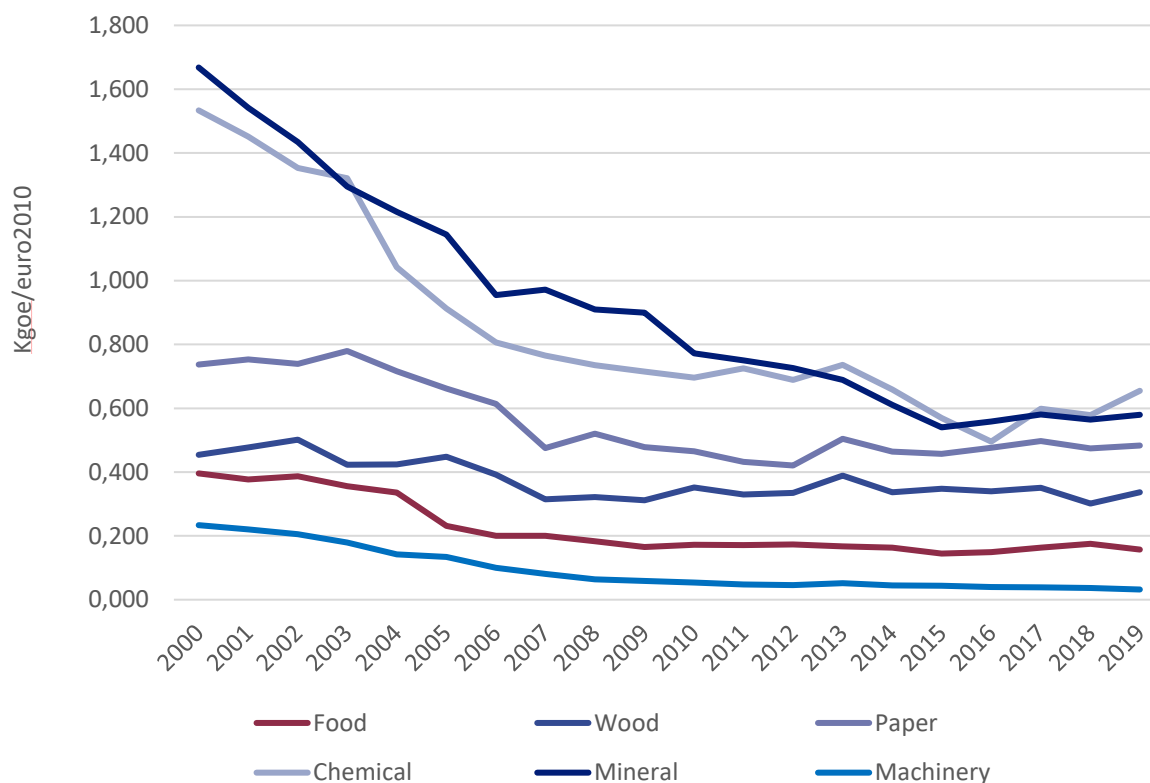
Figure 8. Decomposition of energy consumption in transport



1.4. Industry sector

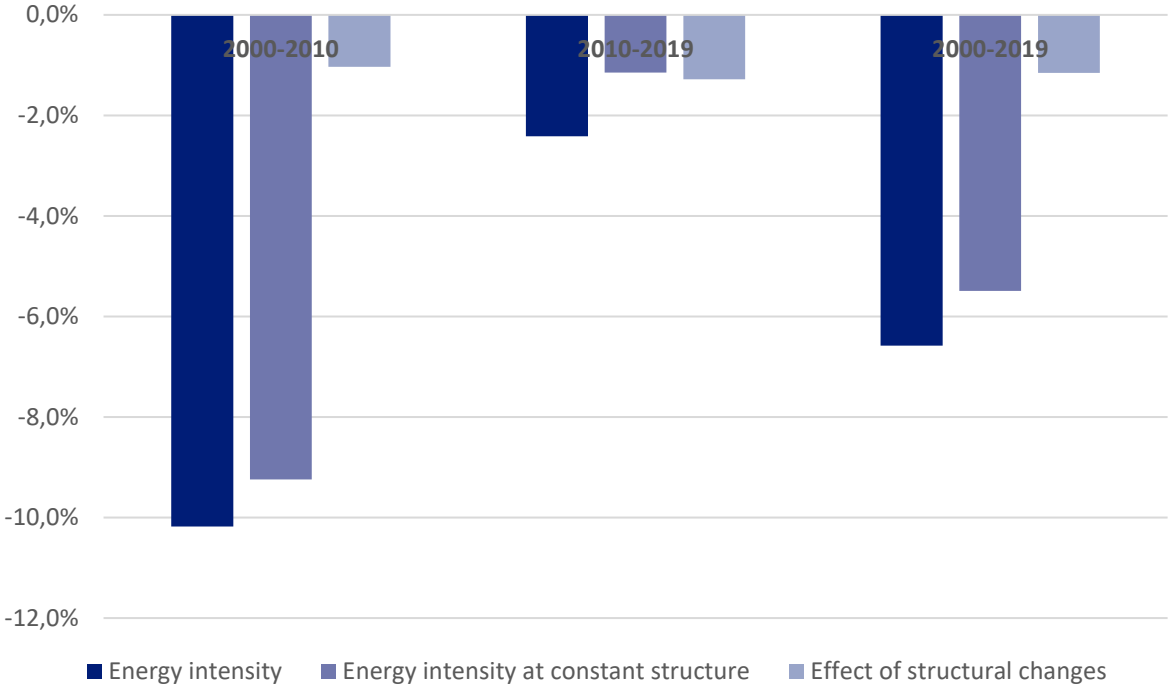
Industry sector was the one with highest rate of energy efficiency improvement. All branches recorded decrease of energy intensity and the best (machinery) achieved annual average 9.9% improvement during the 2000-2019 period. Around 30% of final energy consumption in manufacturing was consumed to produce steel, cement and paper. The energy intensity per tonne of product decreased by 2.2%/year in case of steel, by 1.0%/year in case of cement and by 0.5%/year in case of paper.

Figure 9. Energy intensity of selected industrial branch



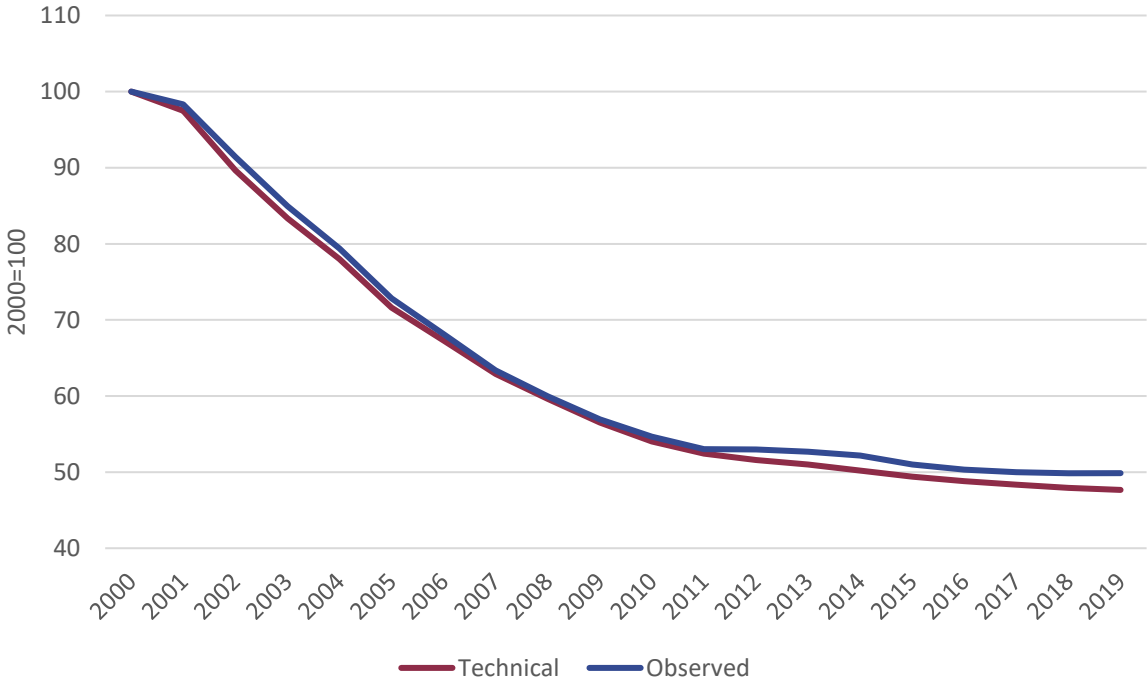
The rate of improvement in manufacturing was especially high in years 2000-2010 when it amounted to 10.2%/year. Most of the improvement (9.2%/year) stem from energy efficiency improvement on the level of branches, while structural changes decreased energy intensity by 1.0%/year. After 2010 situation changed significant and energy intensity at constant structure was decreasing by 1.1%/year while structural changes were lowering energy intensity of manufacturing by 1.3%/year.

Figure 10. Energy intensity in manufacturing – role of structural changes



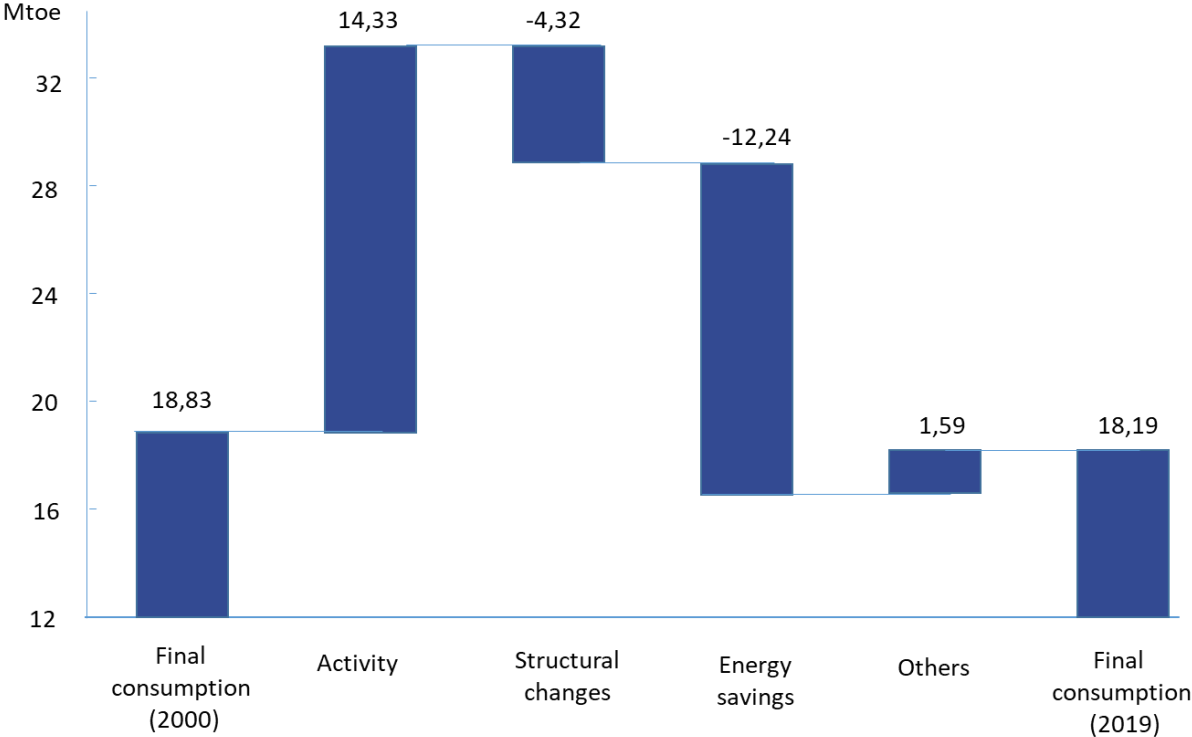
Similar effect can be seen on ODEX indicator which amounted to 49.9 in 2019 in case of observed ODEX (decrease by 3.6%/year) and 47.7 in case of technical ODEX (decrease by 3.8%/year). However the rate of improvement after 2010 amounted to 1.4%/year in case of technical ODEX and 1.0%/year in case of observed ODEX. Also the difference between technical and observed ODEX was in 2019 the highest, showing decreasing number of branches improving their energy efficiency.

Figure 11. ODEX indicator in industry sector



The growth of activity was the major factor increasing demand for energy and its impact can be estimated at 14.3 Mtoe. Structural changes decreased demand for energy by 4.3 Mtoe while energy savings by 12.2 Mtoe.

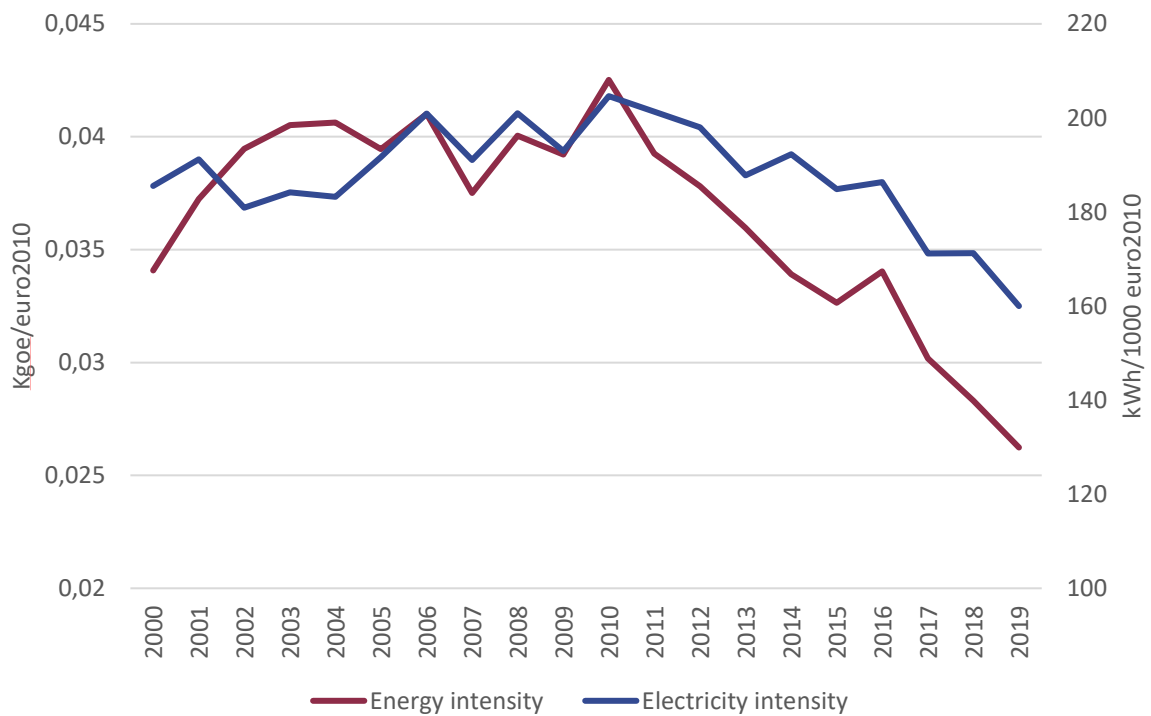
Figure 12. Decomposition of energy consumption in industry



1.5. Service sector

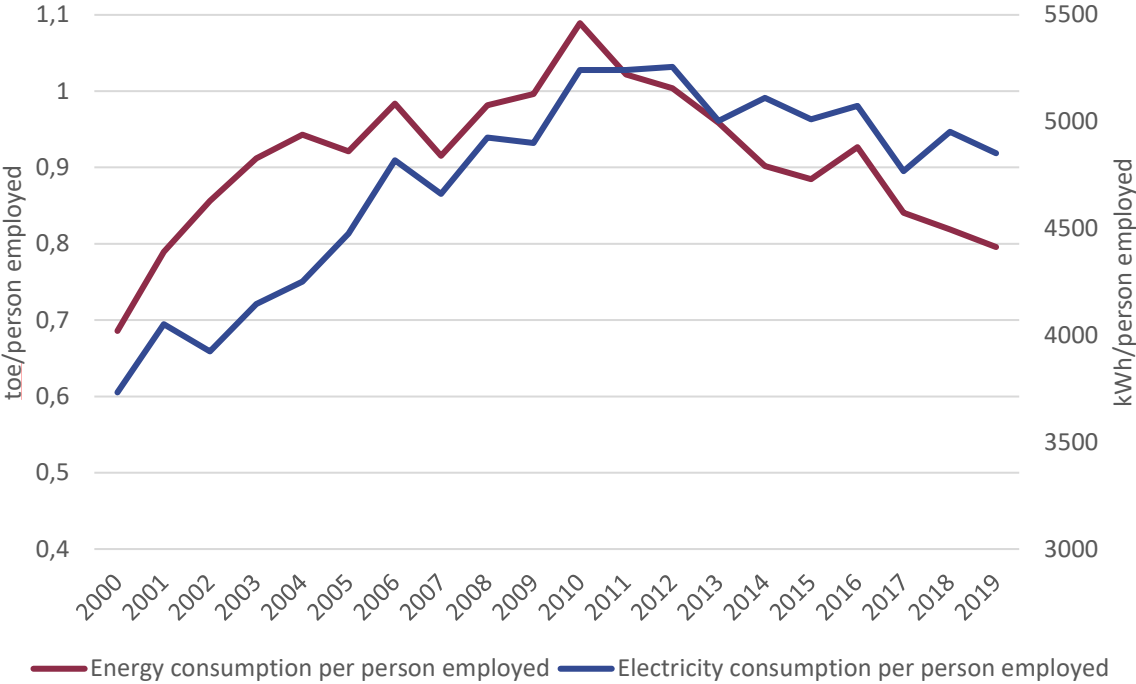
Energy efficiency in service sector measured by financial indicators started to improve after year 2010, earlier both energy and electricity intensity of value added were increasing. The rate of improvement during whole 2000-2019 period amounted to 0.8%/year in case of electricity intensity and to 1.4%/year in case of energy intensity. The rate of improvement after year 2010 amounted to 2.7%/year for electricity intensity and 5.2%/year for energy intensity.

Figure13. Energy and electricity intensity of value added



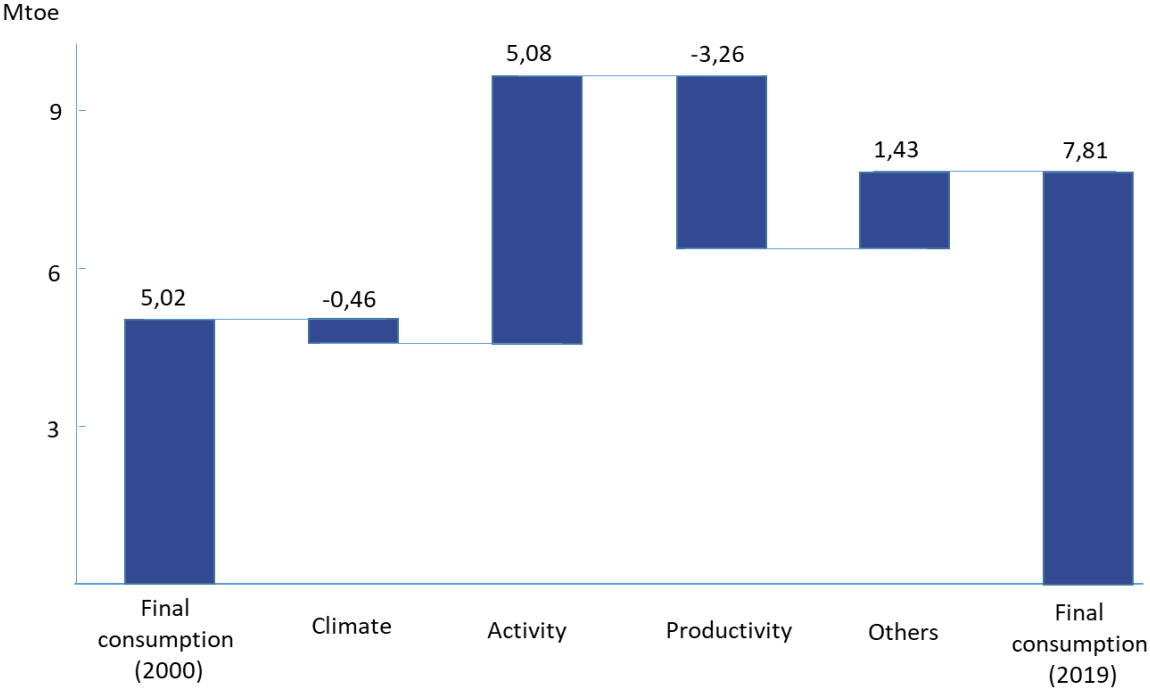
In case of technical indicators, trends of indicators look similar – decrease in energy efficiency until year 2010 and improvement after 2010. In this case however, in year 2019 both energy and electricity consumption per person employed was higher than in 2000. Decrease in energy consumption per person employed amounted in years 2010-2019 to 3.4%/year, while in case of electricity to 0.9%/year. In comparison with year 2000 electricity consumption per person employed was higher by 30.0% in year 2019 (growth by 1.4%/year), while energy consumption was by 16.0% higher (growth by 0.8%/year).

Figure 14. Energy and electricity consumption per person employed



Growth in activity of service sector created demand for energy at the level of 5.1 Mtoe. Decrease in energy efficiency measured by technical indicators resulted in no achieved energy savings. Growth of productivity (higher value added per person employed) decreased energy consumption by 3.3 Mtoe. Other factors increased consumption by 1.4 Mtoe.

Figure 15. Decomposition of energy consumption in services



2 Energy efficiency policy and actions towards energy efficiency improvement

2.1 Introduction. Energy efficiency policy of the European Union

Until 2020, the European Union implemented the climate and energy package, published in January 2008, according to which Member States were obliged to:

- 20% reduction of CO₂ emissions in 2020 compared to 1990;
- an increase of energy from renewable sources utilisation in the EU to 20% in 2020, for Polish 15% has been set;
- increase energy efficiency in 2020 by 20% compared to 2005.

The European Union has set post-2020 targets for climate protection, energy efficiency improvements and the use of renewable energy sources, which were proposed in the so-called "winter package" in 2016 and then revised in 2018 and 2020.

As part of the European Green Deal, in September 2020, the Commission has proposed to increase the greenhouse gas emission reduction target, including emissions and removals, to at least 55% by 2030 compared to 1990 level. After analysing the actions required in all sectors, e.g. in energy efficiency and the use of renewable energy, the Commission has launched a legislative proposal process that will last until June 2021 to effectively meet its targets. They will enable the EU's transition to a climate-neutral economy and fulfil its commitments under the Paris Agreement by updating the commitments of EU constituent countries. The 2030 climate and energy policy framework, based on the legal acts adopted in 2018 and 2019, contains the following EU-wide energy objectives and targets for the period 2021-2030:

- A reduction of at least 40% in greenhouse gas emissions (compared to 1990 levels). The reduction target for Polish greenhouse gas emissions in non-ETS sectors was set at -7% in 2030 compared to 2005;
- Increasing the share of renewable energy in the EU's total gross energy consumption to at least 32%. As part of the EU-wide 2030 target Poland declares to achieve by 2030 a 21-23%¹ share of RES in gross final energy consumption (total consumption in electricity, heating and cooling, as well as for transport purposes).
- An increase of at least 32.5% in energy efficiency. For Polish, the national energy efficiency target for 2030 is set at 23% for primary energy consumption according to the PRIMES 2007 forecast, corresponding to primary energy consumption of 91.3 Mtoe in 2030.

The 40% reduction in greenhouse gas emissions is achieved through the EU Emissions Trading System, the Effort Sharing Regulation with Member States' reduction targets and the Regulation on Land Use, Land Use Change and Forestry. In this way, all sectors will contribute to achieving the 40% CO₂ reduction target by reducing emissions and increasing the absorption of greenhouse gases.

All three key climate legislation will be updated to meet the target of reducing net greenhouse gas emissions by at least 55%. The Commission is expected to prepare and present appropriate legislative proposals in 2021.

Long-term strategic vision of European Union

On 28 November 2018, the European Commission presented a Communication entitled "A Clean Planet for All European", a long-term strategic vision for a prosperous, modern, competitive and climate-neutral economy by 2050.

The strategy shows how Europe can lead the way towards climate neutrality by investing in realistic technological solutions, empowering citizens and aligning policies in important areas such as industrial policy, finance and research. In such a transformation process, it is also important to guarantee social justice.

¹ The 23% target will be achievable if Poland is granted additional EU funds, including those intended for a just transition.

As requested by the European Parliament and the European Council, the Commission's vision for a climate-neutral future covers almost all EU policies and is in line with the Paris Agreement's objective of keeping the temperature increase well below 2°C and trying to reduce this increase to 1.5°C.

Regulation of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action (EU/2018/1999), requires Member States to develop long-term national strategies and to ensure coherence between those strategies and their national energy and climate plans for the period 2021-2030. Strategies should be developed every 10 years with a perspective until 2050 and updated every 5 years as needed.

The European Commission will assess whether the national long-term strategies are adequate for the EU to jointly achieve the objectives and targets set out in the Regulation on the Governance of the Energy Union and provide information on any remaining gaps in the collective targets set.

National Energy and Climate Plans

Under the agreements presented as part of the Clean Energy for All Europeans package, adopted in 2019, EU countries were obliged to develop National Energy and Climate Plans (NECPs) by the end of 2019.

On 17 September 2020 The Commission has published a detailed EU-wide assessment of the final national energy and climate plans. As part of its follow-up and the 2020 Energy Union Report, the Commission has published individual assessments of each national plan as a guide for their further implementation.

Each country must submit a report every two years on the progress made in the implementation of the NECP. The Commission will monitor the progress of the EU as a whole towards the objectives set.

However, under Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC, Article 3(1) of Directive 2012/27/EU, each Member State has set an indicative national energy efficiency target based on its primary or final energy consumption, primary or final energy savings or energy intensity. The target values also had to be expressed in terms of the absolute level of primary and final energy consumption in 2020.

Article 7 of Directive 2012/27/EU also requires each Member State to establish an energy efficiency obligation scheme. That system should ensure that energy distributors or retail energy sales companies that have been designated as obliged parties and that are operating in the territory of the Member State concerned achieve their aggregate final energy savings target by 31 December 2020. That target shall be at least equivalent to the achievement by all energy distributors or all retail energy sales companies of new energy savings each year from 1 January 2014 to 31 December 2020 of 1.5 % of the annual volume of energy sales to final customers averaged over the last three-year period before 1 January 2013. The volume of sales of energy consumed in transport may be partially or completely excluded from this calculation. The priority for increasing energy efficiency is expressed in Directive (EU) 2018/2002 of the European Parliament and of the Council of 11 December 2018 amending Directive 2012/27/EU on energy efficiency (revised EED Directive), which entered into force on 24 December 2018.

The revised EED Directive sets as a target to increase energy efficiency by at least 32.5% in 2030, while assuming that in 2030 primary energy consumption in EU countries will not be greater than 1,273 Mtoe, which is about 53.3 million TJ.

Article 7 on the energy saving obligation, supplemented by the revised EED, indicates that Member States must achieve cumulative end-use energy savings in each year from 1 January 2014 to 31 December 2020 of at least 1.5% of the volume of energy sales to final customers. In addition, in the period 01.01.2021 – 31.12.2030, they must achieve new savings of 0.8% of annual final energy consumption every year (averaged over 2016-2018). In addition, Member States still have to implement new annual savings after 2030 for the next 10 years, unless the EC review in 2027 shows that this is not necessary. Article 7 also sets out how to calculate the required amount of energy savings.

The package of EU regulations adopted in 2018 also includes Directive (EU) 2018/844 of the European Parliament and of the Council of 30 May 2018 amending Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency. Its important provisions concern the long-term strategy for the renovation of buildings and are as follows:

1. Each Member State shall establish a long-term renovation strategy (LTRS) to support the renovation of the national stock of residential and non-residential buildings, both public and private, in order to ensure high energy efficiency and the decarbonisation of the building stock by 2050, enabling the cost-effective conversion of existing buildings into nearly zero-energy buildings. Each LTRS shall be submitted in accordance with the applicable planning and reporting obligations and shall include:
 - a) an overview of the national building stock based, where appropriate, on statistical samples and the expected share of renovated buildings in 2020;
 - b) the identification of cost-effective renovation approaches specific to the building type and climate zone, taking into account, where appropriate, possible appropriate activation points in the life cycle of the building;
 - c) policies and actions to stimulate cost-effective major renovations of buildings, e.g. through the introduction of an optional building renovation passport scheme;
 - d) an overview of policies and actions targeting those segments of the national building stock with the worst energy performance;
 - e) policies and actions targeting all public buildings;
 - f) an overview of national initiatives to support smart technologies, and
 - g) fact-based estimates of expected energy savings and wider benefits, such as health, safety and air quality.
2. In its long-term renovation strategies, each Member State shall establish an action plan containing actions and measurable progress indicators identified at national level to achieve the 2050 long-term goal of reducing greenhouse gas emissions in the Union by 80-95% compared to 1990, in order to ensure high energy efficiency and decarbonisation of the national building stock and to enable cost-effective transforming existing buildings into nearly zero-energy buildings. The Action Plan shall contain indicative milestones for 2030, 2040 and 2050 and shall set out how they contribute to the achievement of the Union's energy efficiency targets in accordance with Directive 2012/27/EU.
3. In order to support the mobilisation of investments in renovations necessary to achieve the objectives referred to in paragraph 1, Member States shall facilitate access to appropriate mechanisms:
 - a) the aggregation of projects, including by investment platforms or groups and through consortia of small and medium-sized enterprises, in order to facilitate investor access and provide packaged solutions to potential clients,
 - b) reducing the perceived risks to energy efficiency measures for investors and the private sector;
 - c) the use of public funds to leverage additional investment in the private sector and to address specific market failures;
 - d) promote investment in the stock of energy-efficient public buildings, in accordance with Eurostat guidelines, and
 - e) easily accessible and transparent advisory tools, such as one-stop shops for consumers or energy advisory services, on appropriate energy efficiency renovations and financing instruments.

The deadline for transposition of the above-mentioned directive was 10 March 2020.

2.2 Energy efficiency policy in Poland until 2020

The most important documents defining energy efficiency policy until 2020 were:

- Poland Energy Policy until 2030;
- National Energy Efficiency Action Plans (NEEAPs: 1, 2, 3, 4 from 2007, 2012, 2014, 2017 respectively), which were required to be developed by Directives 2006/32/EC and 2012/27/EU.

The Fourth Energy Efficiency Action Plan (4 KPD), adopted in 2018 and prepared in 2017, takes stock of the energy efficiency improvement targets achieved, presents the targets for 2020 and updates the actions and measures taken and planned to achieve them.

With regard to legal regulations, the Energy Efficiency Act was adopted in 2011 (Journal of Laws of 2011 No. 94, item 551), the aim of which was to develop mechanisms stimulating the improvement of energy efficiency. First of all, the Act introduced the obligation to obtain an appropriate number of energy efficiency certificates, the so-called white certificates, by energy companies selling electricity, heat or natural gas to final customers connected to the grid on the territory of the Republic of Poland. The Act of 2011 was replaced by the new Energy Efficiency Act of 20th May 2016 (Journal of Laws of 2016, item 831), aimed at further improving the energy efficiency of the Polish economy and ensuring the implementation of the national energy efficiency target.

The Act introduced a regulation according to which a public sector entity may implement and finance projects on the basis of an energy efficiency improvement contract. All Polish public authorities are obliged to purchase energy-efficient products and services. They must buy or rent energy-efficient buildings and comply with energy efficiency recommendations in state-owned and retrofitted buildings.

National energy saving targets for 2020 and energy savings achieved

The setting of the national energy efficiency target for 2020 implemented Article 3(1) of Directive 2012/27/EU. Table 1 shows the energy efficiency target for Polish set in accordance with Directive 2012/27/EU. This goal is understood as achieving in the years 2010-2020 a reduction in primary energy consumption by 13.6 Mtoe, which in the conditions of economic growth also means an improvement in the energy efficiency of the economy. The target, also expressed in terms of the absolute level of primary and final energy consumption in 2020, was set on the basis of data developed as part of analyses and forecasts carried out for the needs of the government document "Poland Energy Policy until 2030".

Table 1. Energy efficiency targets for 2020, pursuant to Directive 2012/27/EU

Energy efficiency target	Energy consumption in absolute terms in 2020	
Reduction of primary energy consumption in the years 2010–2020 (Mtoe)	Final energy consumption in absolute terms (Mtoe)	Primary energy consumption in absolute terms (Mtoe)
13.6	71.6	96.42

2.3 Energy efficiency policy in Poland after 2020

The state's energy policy in the longer term is presented in strategic framework documents. These include:

- The Poland Energy Policy 2040, adopted by the Council of Ministers on 2 February 2021. 12 years after the establishment of the previous policy, a new strategy paper has been adopted, setting out the directions for the development of this sector.
- National Energy and Climate Plan for the years 2021-2030, which Poland was obliged to develop by the provisions of the Regulation of the European Parliament and of the Council. The document was adopted by the European Affairs Committee at its meeting on 18 December 2019.
- Long-Term Renovation Strategy.

The Poland Energy Policy until 2040 (PEP2040) sets the framework for the energy transition in Poland. It contains strategic arrangements for the selection of technologies for the construction of a low-carbon energy system. PEP2040 contributes to the implementation of the Paris Agreement concluded in December 2015 at the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change (COP21), taking into account the need to carry out the transition in a fair and solidarity-based manner. PEP2040 determines the national share in the implementation of the EU's climate and energy policy, whose ambition and dynamics have increased significantly in recent times. Poland Energy Policy takes into

2 for Polish contained in the forecast made for the European Commission (PRIMES – Baseline 2007), primary energy consumption is forecast at 110 Mtoe in 2020, so taking into account the reduction in energy consumption by 13.6 Mtoe, the following were obtained: 110 Mtoe – 13.6 Mtoe = 96.4 Mtoe

account the scale of the challenges of adapting the national economy to the EU regulatory conditions related to the 2030 climate and energy targets, the European Green Deal, the post-COVID economic recovery plan and the pursuit of climate neutrality in line with national capabilities, as a contribution to the implementation of the Paris Agreement.

PEP2040 is one of nine integrated sectoral strategies resulting from the Strategy for Responsible Development until 2020, with a perspective until 2030, adopted in 2017. PEP2040 is consistent with the National Energy and Climate Plan 2021-2030.

Three pillars of the PEP are identified, on which eight specific objectives are based, among which are the improvement of energy efficiency:

- I pillar – Just Transition;
- II Pillar – Zero-emission energy system;
- III pillar – Good air quality.

Poland sets a national target for improving energy efficiency by 2030 at 23% for primary energy consumption in 2020 according to the PRIMES 2007 forecast, which is in line with the target adopted in the NECP for the years 2021-2030.

According to the forecasts for the Energy Poland Energy Policy 2040, primary energy consumption in 2030 will be at the level of approx. 90.7 Mtoe, and therefore in natural values the target will translate into a reduction in primary energy consumption by approx. 27.9 Mtoe compared to PRIMES 2007 forecasts (predicting primary energy consumption at the level of approx. 118.6 Mtoe for this year).

The projected final energy consumption by 2030 will be around 65.5 Mtoe, so the planned measures to improve energy efficiency will lead to a reduction in final energy consumption of around 20 Mtoe compared to PRIMES 2007 forecasts. The decrease in primary energy consumption to 90.7 Mtoe in 2030 is close to the target (91.3 Mtoe) indicated in PEP2040 and NECP – i.e. a 23% reduction in primary energy consumption compared to PRIMES 2007 forecasts for that year.

Table 2. Energy efficiency targets for 2030 and energy consumption forecast for years 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)	65.5	90.7 ^[3]	65.1	87.6
27.3				

The total cumulative final energy savings in the years 2021-2030 calculated in accordance with the guidelines of the revised Energy Efficiency Directive, using forecasts for the average annual final energy consumption from 2016-2018, are expected to be 30,635 ktoe.

On 30 December 2019, Poland submitted to the European Commission the National Energy and Climate Plan for 2021-2030, thus fulfilling the obligation imposed on Poland by the provisions of the Regulation of the European Parliament and of the Council. The document was adopted by the Polish European Affairs Committee at its meeting on 18 December 2019.

The National Climate Action Plan 2021-2030 sets out the objectives and objectives as well as the policies and actions to achieve the 5 dimensions of the Energy Union:

1. Energy security;
2. Internal energy market;
3. Energy efficiency;
4. Decarbonisation;
5. Research, innovation and competitiveness.

The area of energy efficiency is an important element of the Energy Union. Currently, the most important legal act in this area in Poland is the Energy Efficiency Act, under which entities are obliged to implement projects increasing energy efficiency (or in a limited part purchase of white certificates). The act covers both the private sector and the public sector, imposing savings obligations on all entities. It lists the energy efficiency improvement measures that public sector entities can use, including the solution of concluding an energy efficiency contract. According to the provisions of the above Act, the private sector, and within it large enterprises, are burdened with the obligation to perform energy audits at four-year intervals. This system introduces into the Polish legal system legislative provisions adopted at the EU level. Its main task is to achieve the objective of increasing energy efficiency by 20% in 2020 for the EU as a whole. The amendment to the Act in 2020 will enable the implementation into the national legal order of the provisions of Directive (EU) 2018/2002 of 11 December 2018 amending Directive 2012/27/EU on energy efficiency. The National Energy Efficiency Action Plan is replaced from 2019 by this National Energy and Climate *Plan*.

The National Energy and Climate Plan takes into account the conclusions of the inter-ministerial agreements and public consultations, as well as the conclusions of the regional consultation and the European Commission's Recommendation C(2019) 4421 of 18 June 2019. The document was prepared on the basis of national development strategies approved at the government level (e.g. Strategy for sustainable development of transport until 2030, Ecological Policy of the State 2030, and Strategy for sustainable development of villages, agriculture and fisheries 2030) and taking into account the draft Poland Energy Policy until 2040. It sets the following climate and energy targets for 2030:

- 7% reduction in greenhouse gas emissions in sectors not covered by the ETS compared to the level in 2005,
 - 21-23% share of RES in gross final energy consumption (the 23% target will be achievable if Poland is granted additional EU funds, including those intended for a just transition), taking into account:
 - 14% share of RES in the transport.
 - annual increase in the share of RES in heating and cooling by 1.1% on average per year.
- increase in energy efficiency by 23% compared to PRIMES 2007 forecasts, reduction to 56-60% of the share of coal in electricity production.

The study presents guidelines on the shape of the policy in the area of building renovation and three scenarios for the thermal modernization of the building stock in the perspective until 2050. The preparation and updating of the Long-Term Renovation Strategy fulfils the obligation under Article 2a of Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings. According to the recommended scenario, by 2050 66% of buildings will be brought to the passive standard, and 21% to the energy-saving standard. The remaining 13% of buildings, which for technical or economic reasons cannot be so deeply modernized, will go to the efficiency range defined by the values of primary energy demand of 90-150 kWh/(m²·year).

The scenario forecasts an average annual renovation rate of around 4%, with the rate of deep thermal upgrade to the highest standard not significantly exceeding 3%, and this level is only reached after 2035. Until then, it is planned to build appropriate competences and potential among suppliers of necessary technological solutions. Overall, economically viable thermal modernization potentially allows for final energy savings in residential buildings of up to 147 TWh, which is about 75% of the current level of their final energy demand. Overall, economically viable thermo-modernisation potentially allows to achieve a reduction in CO₂ emissions by over 37 million tons per year, which is about 10% of the total annual greenhouse gas emissions in Poland.

Sectoral objectives related to the energy efficiency dimension

Construction

According to the NECP, the expected energy savings target for the years 2021-2030, related to taking measures to improve the energy performance of buildings, should amount to 43 440.1 MWh.

The objectives for the long-term renovation of the national housing stock have been set out in the National Housing Programme:

- the share of insulated residential buildings in the total housing stock will be 70% in 2030 (compared to 58.8% in 2015),
- reducing the number of people living in sub-standard conditions due to overcrowding, poor technical condition or lack of technical installations to 3,300,000 in 2030 (from 5,360,000 in 2011).

The Long-Term Renovation Strategy presented plans for the thermal modernization of the stock of residential and non-residential buildings, both public and private, which will aim to ensure the improvement of energy efficiency and low-carbon building stock, by enabling a cost-effective transformation of existing buildings into nearly zero-energy buildings.

Development of ecological and efficient district heating systems

In 2018, only about 20% of district heating or cooling systems, which provided about 85% of the total volume of system heat in the country, met the criterion of an energy-efficient system. In 2030, at least 85% of district heating or cooling systems with a procured capacity exceeding 5 MW are expected to meet the criteria of an energy-efficient district heating system. The following activities will serve this purpose:

- development of cogeneration;
- heating of power plants;
- increasing the use of RES and natural gas in district heating;
- increasing the use of waste for energy purposes;
- modernization and expansion of the heat and cold distribution system;
- popularization of heat storage and smart grids; ensuring conditions for increasing the use of system heat, in particular by:
 - simplification of procedures in the area of investment in district heating network infrastructure;
 - change in the heat market model and tariff policy.

In 2015, 61% of households were connected to the district heating network in urban areas – the aim is to gradually increase this indicator.

The target is to reach 70% of households connected to the district heating network in urban municipalities in 2030. The 2040 target is that the thermal needs of all households should be covered by district heating and by zero- or low-emission heat sources.

Covering the thermal needs should be carried out primarily through the use of district heating. This ensures high efficiency in the use of raw material, improves the comfort of life of citizens and reduces the problem of low emissions. If connection to the district heating network is not possible, individual sources with the lowest possible emission should be sought.

Development of heat production in cogeneration

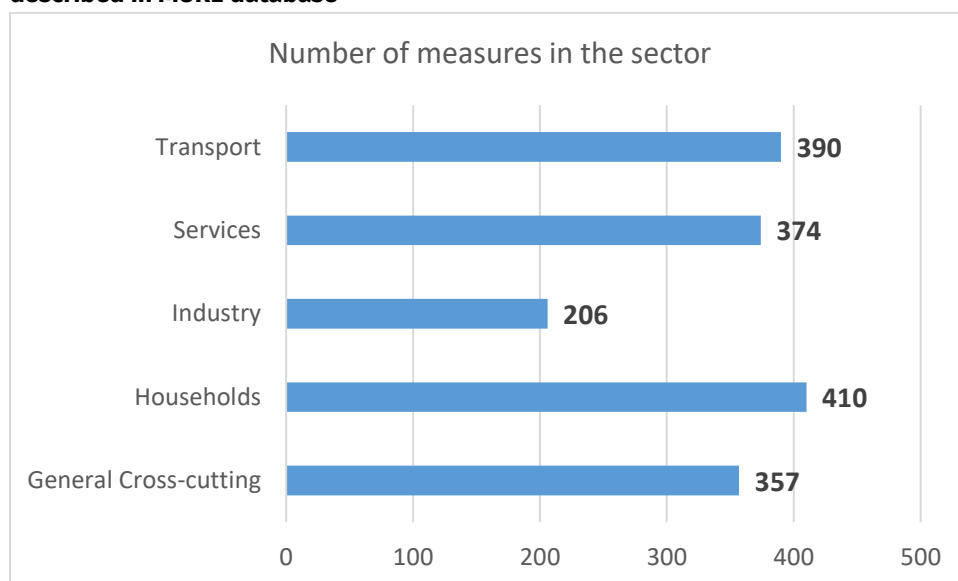
Poland has the potential to significantly increase heat production in cogeneration by replacing heating boilers with cogeneration sources. Increasing the use of the potential of high-efficiency cogeneration will contribute to further improving the efficiency of the use of primary energy carriers, reducing CO₂ emissions and reducing the raw material intensity of the domestic economy. Support for electricity generated in high-efficiency cogeneration will be maintained. The system will be active as long as the market requires intervention. In the longer term, system heat should be generated primarily in CHP.

2.4. Actions to improve energy efficiency in the EU 2.4. Activities for improving energy efficiency in the EU Actions taken or planned to improve energy efficiency are presented in the MURE (Mesures d'Utilisation Rationnelle de l'Energie) database – <https://www.measures.odyssee-mure.eu/>. MURE describes the implemented, planned or already completed energy efficiency improvement activities together with their qualitative and quantitative assessment. The involvement of all European Union countries guarantees a continuous update of the database, which also contains a general presentation of energy efficiency issues in individual countries. The database consists of five sections classifying information on efficiency

improvement programmes for 4 basic sectors of the economy: industry, households, transport, services and for horizontal activities (concerning the whole economy).

The database is maintained as part of the European Commission's ODYSSEE-MURE projects. In the period June 2019 – November 2021, the "ODYSSEE-MURE 2018" project is being implemented. It significantly modified and updated the database on energy efficiency measures. The number of energy efficiency improvement measures presented in the MURE database for all EU-29 European countries is illustrated below (as of 16.06.2021).

Figure 16. Number of energy efficiency measures introduced or planned in the European countries described in MURE database



2.4 Activities for improving energy efficiency in Poland

The National Energy and Climate Action Plan presents the most important tools and measures in the area of energy efficiency. In the years 2021-2030.

Poland will continue the system obliging to energy efficiency in the form of white certificates.

Planned policies, measures and programmes to achieve the indicative national energy efficiency target for 2030, as well as other objectives set out and presented earlier in the text, taking into account planned measures and instruments (including financial ones) to support the energy performance of buildings, in particular with regard to the following aspects:

Energy efficiency obligation scheme referred to in Article 7a of Directive 2012/27/EU

Article 7a of Directive 2012/27/EU provides that Member States may decide to fulfil their obligations to achieve the amount of energy savings required under Article 7(1) of the Directive by means of an energy efficiency obligation scheme. Under the energy efficiency obligation scheme, Member States shall ensure that obliged entities, i.e. energy distributors or retail energy sales companies operating in their territory, comply with the requirement to achieve end-use energy savings.

The scheme is foreseen to run until 2030 and, if necessary, to extend or specify another support scheme. The amount of cumulative final energy savings by 2030 will be around 24 500 ktoe, which is 80% of the total amount of energy savings required, which is 30,635 ktoe.

In Poland, the energy efficiency obligation system was introduced by the statutory imposition of an obligation on obliged entities starting from 1 January 2013. Currently, this system operates on the basis of the Act of 20 May 2016 on energy efficiency.

The Energy Efficiency Act imposes the obligation to obtain and present for redemption to the President of the Energy Regulatory Office (ERO) energy efficiency certificates, called white certificates, on the following groups of entrepreneurs:

- energy companies performing business activity in the field of generation or trading in electricity, heat or natural gas and selling electricity, heat or natural gas to final customers connected to the grid,
- end users connected to the network, who are members of the stock exchange within the meaning of the Act of 26 October 2000 on commodity exchanges or a member of a regulated market, in relation to transactions concluded in their own name on a commodity exchange or on a regulated market,
- commodity brokerage houses or brokerage houses, in relation to transactions carried out on a commodity exchange or on a regulated market, on behalf of final customers connected to the network.

Pursuant to Article 30(1) of the Energy Efficiency Act, the energy efficiency certificate provides for transferable property rights, which are a commodity within the meaning of the Act of 26 October 2000 on commodity exchanges. In the case of entities which, in accordance with the Act, are subject to the obligation to obtain energy efficiency certificates, and will not obtain them and will not redeem or implement projects aimed at improving energy efficiency at the final customer documented by an energy audit, they must pay a substitute fee in the appropriate amount specified by the Act. Under the energy efficiency obligation scheme, obliged entities have statutory amounts of final energy, which they are obliged to obtain and submit for redemption for each subsequent year. Energy efficiency certificates can be obtained only for projects the types of which are specified in Article 19(1) of the Act.

An energy efficiency certificate may be obtained for an activity as a result of which the annual final energy savings are not less than 10 tonnes of oil equivalent (toe) or for a group of activities of the same type whose total effect exceeds 10 toe. The system of white certificates supports the implementation of investment projects m.in such as: insulation of industrial installations; reconstruction or renovation of the building together with installations and technical devices; modernization or replacement of lighting, equipment and installations used in industrial processes or in energy, telecommunications or IT processes, local heating networks and local heat sources. The condition for obtaining the certificate is, m.in, the preparation of an energy efficiency audit for a given project. This audit is submitted to the President of the Energy Regulatory Office by the entity notifying the project aimed at improving energy efficiency.

Mandatory energy audit

An important change in the regulations that came into force with the amendment to the Energy Efficiency Act (i.e. 01.10.2016) is the obligation to perform energy audits for large enterprises covering a minimum of 90% of energy consumption (all carriers), including transport. Thanks to the energy audit, the company gains information about the possibilities of energy savings. The results of the audit are used for analysis and control. The report on the energy audit may be subject to the control of the President of the Energy Regulatory Office. According to Directive 2012/27/EU – "Minimum criteria for energy audits, including audits carried out as part of energy management systems" and Article 37 of the Energy Efficiency Act of 20 May 2016 – energy audits are based on the following guidelines:

- the audit should be carried out on the basis of up-to-date, representative, measured and identifiable data on energy consumption and, in the case of electricity, power demand,
- the audit includes a detailed overview of energy consumption in buildings or complexes of buildings, industrial installations and transport, accounting for at least 90% of the total energy consumption of this company,
- should be based, where possible, on a life-cycle cost analysis of a building or complex of buildings and industrial installations and not on a payback period, so as to take into account energy savings over a longer period, the residual values of long-term investments and discount rates.

For the period from 2021 to 2030, the following alternative policy measures referred to in Articles 7b and 20(6) of Directive 2012/27/EU are envisaged:

- the Thermal Modernisation and Renovation Fund;
- tax relief for expenses incurred for the thermo-modernization of single-family residential buildings;
- development of public transport in cities.

Thermo-modernisation and Renovation Fund

The overriding objective of the Thermo-modernisation and Renovation Fund is financial support for investors implementing thermo-modernization and renovation activities and payment of compensation to the owners of residential buildings in which there were accommodation units. The legal basis of the Fund is the Act of 21 November 2008 on supporting thermal modernization and renovations. From the beginning of its existence until 31.12.2020, the Thermo-modernisation and Renovation Fund provided financial assistance for thermo-modernization and renovation projects in the amount of PLN 2697 million.

Forms of support

- thermo-modernization bonus,
- renovation bonus,
- compensatory bonus.

Allocation of funds The thermo-modernization bonus is a form of state aid for an investor carrying out a thermo-modernization project. It is granted only to investors using the loan and is a partial repayment of the liability incurred. The right to thermo-modernization relief does not have investors implementing a thermo-modernization project from their own funds. The amount of co-financing Bonus granted by National Economy Bank in the amount of:

- 16% of the costs of the thermo-modernization project,
- 21% of the costs of the project – if the thermo-modernization activity is accompanied by the installation of a micro-installation of a renewable energy source with an installed capacity of at least:
 - 1 kW for a single-family residential building,
 - 6 kW for other buildings.

Additional support in the amount of 50% of the project costs is granted to the entity implementing thermo-modernization activities in the case of an additional connection of the texture layer with the structural layer of external walls in large-panel buildings.

Beneficiaries of the thermo-modernization bonus

Owners and managers:

- residential buildings;
- buildings of collective residence (m.in social care homes, dormitories, rectory and monasteries);
- buildings owned by local government units;
- district heating networks and heat sources.

In addition, the thermo-modernization bonus is addressed to a wide range of investors regardless of legal status, excluding budgetary units and local government budget establishments, i.e.:

- natural persons,
- commercial law companies,
- local government units,
- housing communities and cooperatives.

The basic condition for applying for a thermo-modernization bonus is to present an energy audit. Such a study defines the scope and technical and economic parameters of the thermo-modernization project, with an indication of the optimal solution, and additionally constitutes assumptions for the construction project of the implemented project. The scope of support is presented below.

Table 3. Activity of Thermo-modernisation and Renovation Fund

Specification	2009	2010	2011	2012	2013	2014
Number of new applications	3 363	3 168	3 007	3 328	944	2 697
Number of granted premiums	3 267	2 823	3 412	2 859	869	2 472
Amount of granted premiums (thousand PLN)	193 584	133 384	162 663	139 419	47 929	131 240
Number of paid premiums	3 086	3 302	2 969	2 975	2 333	1 381
Amount of paid premiums (thousand PLN)	178 281	170 402	160 773	174 511	160 433	107 672
Specification	2015	2016	2017	2018	2019	I quarter 2020
Number of new applications	2 106	1 739	1 595	1 288	1 007	776
Number of granted premiums	2 271	1 697	1 632	1 233	1 022	707
Amount of granted premiums (thousand PLN)	117 708	88 319	88 257	62 315	61 671	50 931
Number of paid premiums	2 030	1 980	1 611	1 443	1 274	911
Amount of paid premiums (thousand PLN)	100 138	95 664	85 282	75 289	69 843	55 794

Tax relief

From 1 January 2019, another financial support instrument is the thermo-modernization relief allowing for the deduction of expenses related to the implementation of thermo-modernization projects from income. The solution encourages owners of single-family houses to carry out thermal modernization, e.g. wall insulation, replacement of woodwork or modernization of the heating system. The list of building materials, equipment and services covered by the thermo-modernization relief was published in the Regulation of the Minister of Investment and Development of 21 December 2018.

Therefore, the so-called thermo-modernization relief can be used, provided that the conditions provided for in the Act are met, by taxpayers of personal income tax who make settlements according to the tax scale of 18% and 32%, flat tax and paying a lump sum on recorded revenues. As part of this new tax relief, you can deduct from your income, for three years, up to PLN 53,000.

Clean Air Programme

In September 2018, the government's priority program Clean Air was launched, which will last until 2029, and its budget amounts to PLN 103 billion. The most important goal is to improve air quality and reduce greenhouse gas emissions by replacing heat sources and improving the energy efficiency of single-family residential buildings. The program offers support in the form of grants or loans for projects involving the replacement of old and inefficient heat sources for solid fuel with modern heat sources that meet the highest standards. The material scope concerns a substation, heat pump, condensing gas boiler, condensing oil boiler, electric heating, solid fuel boiler (coal, biomass), as well as carrying out the necessary thermo-modernization works of the building. One of the main reasons for the problem of smog in Poland is the so-called low emission, i.e. the release of harmful substances into the atmosphere.

The addressees of the program are the owners or co-owners of a single-family residential building, or a single-family residential unit with a separate land and mortgage register and persons who have obtained permission to start the construction of a single-family residential building and the building has not yet been handed over or reported for use. The maximum grant level for the project can be up to PLN 30,000 for the basic level of co-financing and PLN 37,000 for the increased level of co-financing.

STOP SMOG

The program has been operating since February 2019, and supports the replacement or liquidation of heat sources and thermo-modernization in single-family residential buildings of energy-poor people. The applicant in the program is the municipality, which can obtain up to 70% of the co-financing of the costs

of the thermo-modernization project. The program is intended for energy-poor people who are owners or co-owners of single-family residential buildings and municipalities implementing low-emission projects in single-family buildings included in the commune's housing stock. As part of the planned project, the municipality may include these two groups of buildings.

The implementation of projects in single-family residential buildings consists in:

- replacement or liquidation of high-emission heat sources for low-emission ones;
- thermal modernization;
- connections to the district heating or gas network;
- providing buildings with access to energy from RES installations;
- reducing the demand of single-family residential buildings for energy supplied for heating and domestic water heating.

In the context of the Clean Air and Stop Smog programs, it is worth mentioning important elements of the latest amendment to the Act amending the Act on supporting thermal modernization and renovation and some other acts (Journal of Laws of 2020, item 2127), the provisions of which entered into force on January 1, 2021.

According to the Act, it is envisaged to create a Central Register of Emissivity of Buildings, which is to help identify sources of emissions from buildings. The database will collect information on heat sources in buildings or premises, as well as on building inspections carried out in the field of heating systems. The register will include data on the thermo-modernization bonus paid, renovation bonus, tax relief or other form of support granted from public funds. Collected and unified data on buildings and emission sources on a national scale will serve as a tool to fight smog.

The Act also aims to improve the functioning of the Clean Air program and increase interest in the Stop Smog program. The key solutions to encourage municipalities to participate in the programme are as follows:

- reduced minimum number of single-family buildings to apply to the programme (from 2 to 1% or 20 buildings);
- one-off abolition of the above-mentioned limit, in a situation where the municipality has previously concluded at least one agreement;
- reducing the required reduction of heating heat demand from 50 to 30%, calculated collectively for all low-emission projects implemented by the municipality under one agreement;
- shortening from 10 to 5 years the period after the end of the agreement for the obligations of the municipality and the beneficiary. The obligation relates to the return of a certain part of the value of the project in the case of the sale of the building and to the durability period of the project.

Development of public transport in cities

The main objective of the Programme, implemented in the years 2021-2030, will be the development and greater use of low-emission urban transport in serving residents of functional areas of cities. The action means support for low-emission public transport in cities from the EU Cohesion Fund, which will be continued under the Operational Programme Infrastructure and Environment in the period 2021-2027.

The support is addressed to entities, which are:

- local government units and their associations – voivodship cities and their functional areas, as well as organizational units and special purpose vehicles acting on their behalf;
- urban transport infrastructure managers;
- public transport operators.