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REPUBLIC OF POLAND  
MINISTRY OF CLIMATE

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FOURTH BIENNIAL REPORT  
UNDER THE UNITED NATIONS  
FRAMEWORK CONVENTION ON CLIMATE CHANGE



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The photo on the cover depicts a kingfisher, a beautifully coloured bird, most common in the northern parts of Poland. Author: Piotr Kardaś, KOBiZE, IOŚ-PIB



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## List of Abbreviations

AEA	Annual Emission Allocation
ARE	Energy Market Agency S.A.
BULiGL	Bureau for Forest Management and Geodesy
2020 CEP	2020 Climate and Energy Package
Convention	United Nations Framework Convention on Climate Change, the so-called Climate Convention
CTF	Common Tabular Format
EC	European Commission
EDF	European Development Fund
EIA Act	Act of 3 October 2008 on the Provision of Information on the Environment and Its Protection, Public Participation in Environmental Protection and Environmental Impact Assessments (Official Journal of the Laws of 2008, No. 199, Item 1227)
EMS Act	Act of 17 July 2009 on the System to Manage the Emissions of Greenhouse Gases and Other Substances (Official Journal of the Laws of 2009, Item 1447, as amended)
ESD Decision /Sector	Effort Sharing Decision setting out annual emission targets for non-EU ETS sectors. The ESD sector includes GHG emissions which are not covered by the EU ETS system.
ESIF	European Structural and Investment Funds
EU	European Union
EU BR4	Fourth Biennial Report of the EU
EU ETS	EU Emissions Trading System
GHG	Greenhouse gases
HFCs	Hydrofluorocarbons
GUS	Statistics Poland
GWP	Global Warming Potential
IOŚ-PIB	Institute of Environmental Protection – National Research Institute
IPPU	Industrial Processes and Product Use
KOBiZE	National Centre for Emissions Management at the Institute of Environmental Protection – National Research Institute
KP	Kyoto Protocol to the Climate Convention
KPEiK	National Energy and Climate Plan
KPGO 2022	National Waste Management Plan 2022
kt	Kilotonne
LULUCF	Land Use, Land Use Change and Forestry sector
MMR	Regulation (EU) 525/2013 of the European Parliament and of the Council of 21 May 2013 on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change and repealing Decision No 280/2004/EC
NFOŚiGW	National Fund for Environmental Protection and Water Management
NIR	National Inventory Report
QA/QC	Quality Assurance/Quality Control procedures
PEK	Energy and climate policy scenario presented in the draft National Energy and Climate Plan
PEP 2040	Energy Policy of Poland until 2040 – a draft policy prepared by the Ministry of Energy in 2019
QEWER	Quantified Economy-wide Emission Reduction
UNFCCC	United Nations Framework Convention on Climate Change), the so-called Climate Convention
WAM	Scenario with additional measures
WEM	Scenario with existing measures
WFOŚiGW	Voivodeship Fund for Environmental Protection and Water Management
ZliRE	Emission Inventory and Reporting Unit



## 1. Introduction

The Republic of Poland has been a signatory to the United Nations Framework Convention on Climate Change since 1994, to the Kyoto Protocol since 2002, to the Doha Amendment to the Kyoto Protocol since 2018 and to the Paris Agreement since 2016, thus contributing to the efforts undertaken by the international community to mitigate climate change.

Pursuant to Article 4.6 of the United Nations Framework Convention on Climate Change, Poland has recognized the desirability of a flexible approach to the choice of the base year for the evaluation of the commitments under the Climate Convention and adopted the year 1988 instead of 1990, which is obligatory for the Parties to the Convention, as reflected in paragraph 5 of Decision 9/CP.2.

The present Fourth Biennial Report implements the decision of the Conference of the Parties to the United Nations Framework Convention on Climate Change regarding the preparation by developed country Parties, pursuant to Decision 2/CP.17, of a successive biennial report representing an update of data published in the Third Biennial Report, which was submitted at the same time as the Seventh National Communication. The Report presents the following information:

- Greenhouse gas emissions and trends and the national circumstances relevant to the emission inventory;
- Reduction target;
- Progress in the achievement of the reduction target and the relevant measures;
- Projections of greenhouse gas emissions and removals;
- Development cooperation, transfer of technology and capacity building in developing countries.

Poland participates in the implementation of the 2020 greenhouse gas emission reduction target established at the EU level (20% reduction from the 1990 level). In accordance with the provisions of the 2020 climate and energy package, Poland is obliged to participate in reducing the EU greenhouse gas emissions in the period from 2013 to 2020, within the EU ETS system, by 21% compared with their 2005 level and to reduce its national greenhouse gas emissions from non-EU ETS sectors by 14% compared with their 2005 level. Moreover, Poland has undertaken to achieve the following targets by 2020:

- raising the share of electricity generated by RES in the final energy consumption to 15%,
- raising the share of biofuels in the transport fuel market to 10%,
- reducing the primary energy consumption by 13.6 Mtoe.

Poland takes a number of actions to fulfil the above commitments. The key strategic documents which set out the directions of actions include:

- the Strategy for Responsible Development, which proposes a new model for the development of the country in its economic, social and spatial dimensions by 2020,
- the National Reform Programme for the implementation of the Europe 2020 Strategy, which sets out the domestic actions to achieve the EU objectives,
- the 2030 National Environmental Policy, which aims to ensure Poland's environmental safety and a high quality of life for all its citizens.

In addition to those listed above, Poland also implements sectoral policies. The most important of them in terms of their impact on emissions include the *National Energy and Climate Plan for 2021-2030* and the *Energy Policy of Poland until 2030* (PEP2030). The Polish Government is now working on a new energy policy (the *Energy Policy of Poland until 2040*) and the *Strategy for Transition to a Climate-Neutral Economy* under Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action<sup>1</sup>.

The basic institutional and financial mechanism supporting the implementation of the Polish climate policy is the system for financing environmental protection activities, based on funds provided by the National Fund for Environmental Protection and Water Management (NFOŚiGW), the Voivodeship Funds for Environmental Protection and Water Management (WFOŚiGW) and the European funds (the *Operational Programme Infrastructure and Environment 2014-2020*).

Measures to reduce GHG emissions are taken in all the sectors of the economy and some of them are cross-sectoral in nature. The cross-sectoral measures include the EU Emissions Trading System (EU ETS), which covers about 50% of GHG emissions in Poland. At present, its third compliance period (2013-2020) runs. The EU ETS covers the energy generation and industry sectors and part of the aviation sector.

In the energy sector, measures are taken in both energy generation and consumption. The key ones include those related to the development of the use of renewable energy sources, support for the development of cogeneration, the implementation of nuclear energy and the promotion of energy efficiency in construction and industry.

In the transport sector, measures to reduce emissions from road transport play a significant role, including, in particular, the promotion of electromobility and clean transport. Numerous measures also address the urban transport, supporting the development of collective and zero-emission transport, as well as cycling infrastructure. Measures addressing aviation and navigation are also implemented.

In the sector of industrial processes and product use, a key issue is the participation of installations in the EU ETS system. Moreover, measures are carried out to improve energy efficiency in industry and the requirements for the limitation of the use of fluorinated greenhouse gases are implemented.

The measures taken in the agriculture sector, on the one hand, ensure the rational management of agricultural and forest land, and, on the other hand, contribute to the reduction of emissions from agricultural holdings (e.g. the modernisation of agricultural holdings to reduce methane emissions from manure management) and to environment-friendly farming (e.g. organic farming, the protection of waters against pollution with nitrates from agricultural sources and the application of the principle of a good agricultural condition).

The aim of the measures implemented in the waste management sector is to use advanced solutions in both waste management (higher recycling levels, incineration processes, landfill gas processing) and wastewater management (improvements in wastewater management, intensification of the collection and use of methane).

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<sup>1</sup> OJ L 328, 21.12.2018

In forestry, the measures to develop forest areas and improve the viability of forests play a key role, including e.g. support for investments to enhance the resilience of forest ecosystems and their environmental value.

In accordance with Decision 19/CP.18, for the purposes of this report, tables summing up the abovementioned information have been generated from the *Common Tabular Format* (CTF) application in tabular form.



## 2. Information on greenhouse gas emissions and trends

### 2.1 Summary information on emission trends

#### 2.1.1 Greenhouse gas emission trends in Poland by gas

One of the challenges faced by Poland is to reconcile its further economic transition and economic growth with care for the environment, including reductions in the emissions of greenhouse gases and other pollutants. Poland succeeds in achieving these targets, as indicated by a reduction in greenhouse gas emissions by about 28% compared with the base year, while increasing its GDP by about 220%.

The last two decades have seen a steady growth of the Polish economy. The accession to the European Union in 2004 turned out to be particularly important for the country's development, opening new opportunities, sales markets and sources of funding for its development. Poland's membership in the EU structures has contributed to speeding up the modernization processes in the Polish economy. At the same time, Poland's commitments in the field of environmental protection present a big challenge, especially for the Polish energy sector.

In 2017, the national greenhouse gas emissions amounted to 413.78 million tonnes of CO<sub>2</sub> eq., excluding greenhouse gas emissions and removals from category 4. Land use, land-use change and forestry (LULUCF). The emissions fell by 28.3% compared with the base year.

The national greenhouse gas emissions in 2017 were dominated by carbon oxide (CO<sub>2</sub>), the share of which in the total emissions was 81.3%, methane (CH<sub>4</sub>) represented 11.9% and nitrous oxide (N<sub>2</sub>O) 5.0%. Industrial gases represented about 1.7% of aggregated greenhouse gas emissions. Fig. 2.1. shows the percentage shares of greenhouse gases in the total national emissions in 2017, excluding greenhouse gas emissions and removals from category 4.

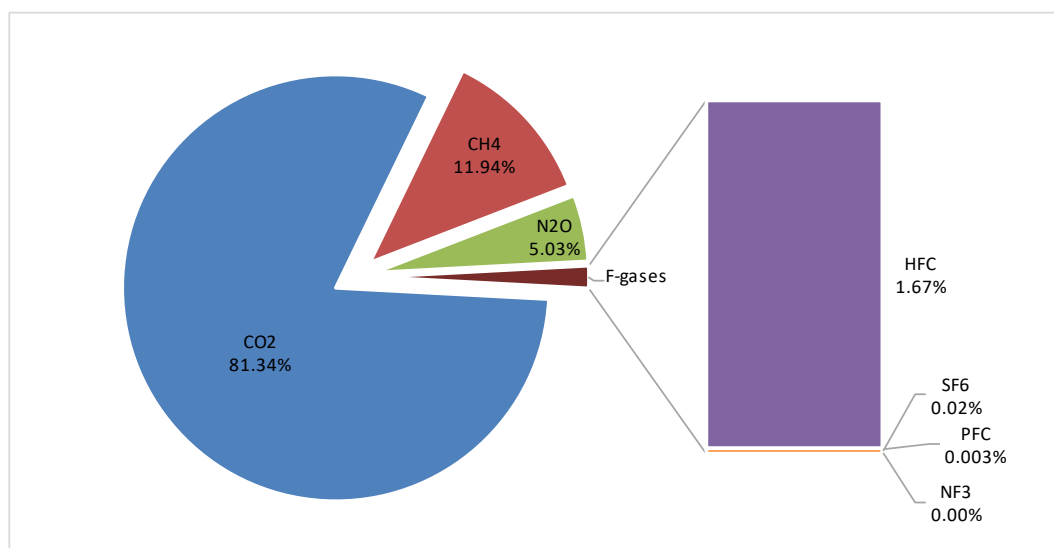


Fig. 2.1. Percentage shares of greenhouse gases in the total national emissions in 2017 (excluding category 4. LULUCF)

Compared with the base year the carbon dioxide emissions fell by 28.7%, those of methane by 34.8% and those of nitrous oxide by 29.2% (Fig. 2.2, Table 2.1). At the same time, the per capita carbon dioxide emissions in Poland fell from 12.5 t CO<sub>2</sub> in 1988 to 8.8 t CO<sub>2</sub> in 2017, while the emissions of all the greenhouse gases decreased, respectively, from 15.2 t CO<sub>2</sub> eq. to 10.8 t CO<sub>2</sub> eq. per capita.

Table 2.1. Greenhouse gas emission trends by gas [kt CO<sub>2</sub> eq.]

Gas	1988	1990	1995	2000	2005	2010	2015	2016	2017	Change 2017 / 1988
CO <sub>2</sub> (without CO <sub>2</sub> emissions from LULUCF)	471 978.71	376 959.60	362 428.12	318 209.19	322 545.79	333 457.41	312 320.56	323 021.90	336 556.77	-28.7%
CO <sub>2</sub> (with CO <sub>2</sub> emissions from LULUCF)	452 009.34	345 109.66	342 138.18	280 849.33	271 331.36	298 727.57	280 636.39	290 441.13	299 116.92	-33.8%
CH <sub>4</sub> (without CH <sub>4</sub> emissions from LULUCF)	75 727.24	69 842.33	58 995.85	53 113.60	53 489.69	51 379.98	50 015.99	49 486.83	49 412.83	-34.8%
CH <sub>4</sub> (with CH <sub>4</sub> emissions from LULUCF)	75 771.37	69 886.38	59 041.76	53 146.15	53 523.18	51 411.63	50 049.94	49 528.88	49 450.36	-34.7%
N <sub>2</sub> O (without N <sub>2</sub> O emissions from LULUCF)	29 404.57	27 406.31	23 173.87	22 583.39	22 618.00	19 772.53	19 030.58	19 792.08	20 824.17	-29.2%
N <sub>2</sub> O (with N <sub>2</sub> O emissions from LULUCF)	33 626.27	32 021.29	23 518.14	27 013.99	27 191.60	24 450.18	20 124.32	26 287.43	24 380.35	-27.5%
HFCs	NO NA	NO NA	164.31	1 366.50	4 556.73	7 006.36	8 987.24	6 730.80	6 893.27	-
PFCs	147.26	141.87	171.97	176.68	187.41	17.07	13.21	12.55	11.92	-91.9%
Unspecified mix of HFCs and PFCs	NA NO	NA NO	NA NO	NA NO	NA NO	NA NO	NA NO	NO NA	NO NA	0.0%
SF <sub>6</sub>	NA NO	NA NO	29.12	23.07	26.8	35.37	77.03	78.38	82.43	-
NF <sub>3</sub>	NA NO	NA NO	NA NO	NA NO	NA NO	NA NO	NA NO	NO NA	NO NA	0.0%
<b>Total (without LULUCF)</b>	<b>577 257.78</b>	<b>474 350.11</b>	<b>444 963.25</b>	<b>395 472.42</b>	<b>403 424.42</b>	<b>411 668.71</b>	<b>390 444.60</b>	<b>399 122.53</b>	<b>413 781.40</b>	<b>-28.3%</b>
<b>Total (with LULUCF)</b>	<b>561 554.23</b>	<b>447 159.20</b>	<b>425 063.49</b>	<b>362 575.71</b>	<b>356 817.09</b>	<b>381 648.18</b>	<b>359 888.13</b>	<b>373 079.17</b>	<b>379 935.26</b>	<b>-32.3%</b>

Source: KOBIZE, IOŚ-PIB

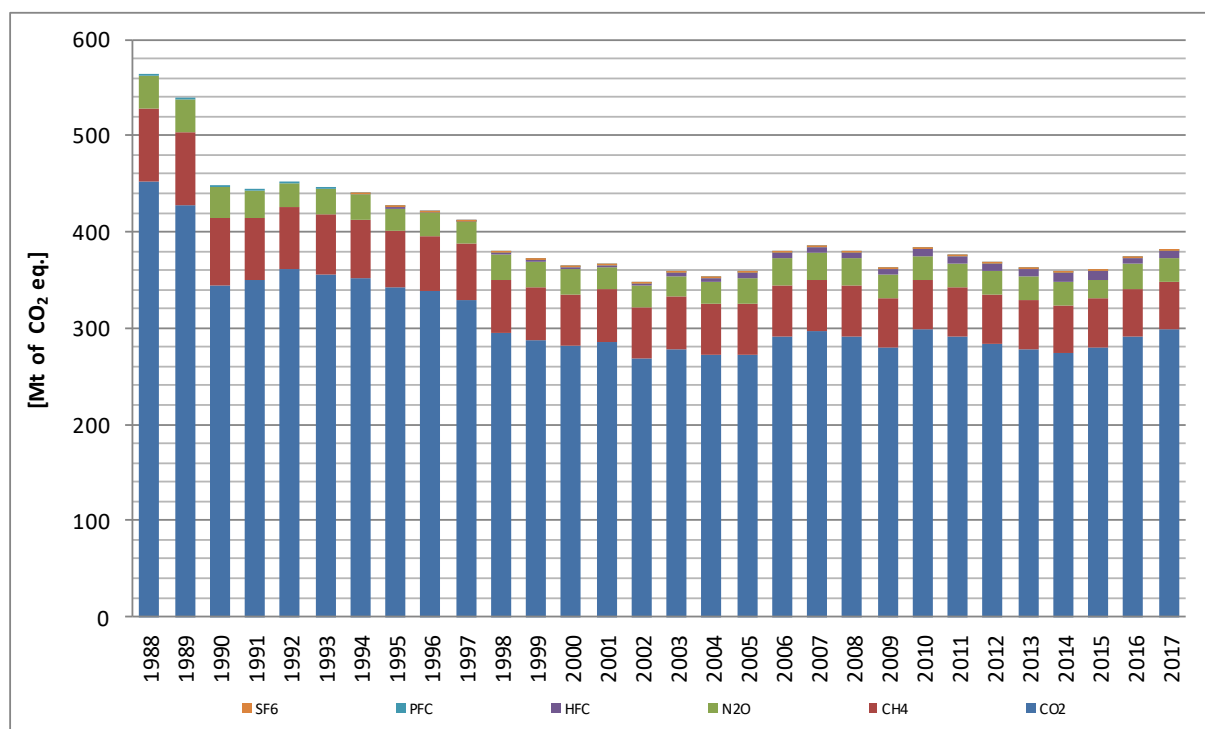


Fig. 2.2. Greenhouse gas emissions in the period from 1988 to 2017 by gas

The evolution of the aggregated greenhouse gas emissions included their significant decrease in the period from 1988 and 1990 which was caused by significant changes in the Polish economy, in particular, in the heavy industry. The situation resulted from the launched political transformation and the transition from a centrally controlled economy to a free market economy. A significant decrease in emissions lasted from the base year to 1991 and, subsequently, the emissions began to slightly grow, to reach their maximum level in 1992, due to economic growth. The successive years were characterised by a slow drop in emissions until 2002, which was accompanied by programmes and measures for energy efficiency, followed by a slight increase in emissions lasting until 2007, which was stimulated by economic growth. In the period from 2008 to 2015, the greenhouse emissions stabilised, except for their substantial drop in 2009 which was caused by the global recession (Fig. 2.2, Table 2.1.). Apart from a good economic situation, the increased fuel consumption in the road transport sector, resulting from the higher transport performance related to the dynamic economic growth, significantly contributed to enhanced greenhouse gas emissions in the period from 2016 to 2017.

### 2.1.2 Greenhouse gas emission trends in Poland by sector

Sector 1. *Energy* had the largest share in the total greenhouse gas emissions (expressed in CO<sub>2</sub> equivalent) - without the LULUCF sector - in Poland in 2017 (about 82.7%) and within this sector so did fuel combustion process (76.8%). Agriculture was responsible for 7.7%, industrial processes for 6.5% and waste for 3.1%. Emission reductions in the period from 1988 to 2017 could be seen in all the sectors, with the largest drop in emissions found in the waste sector (by 41%), in agriculture (by

nearly 34%) and in the energy sector (by 28%). Fig. 2.3 and Table 2.2 show the GHG emission structure by sector.

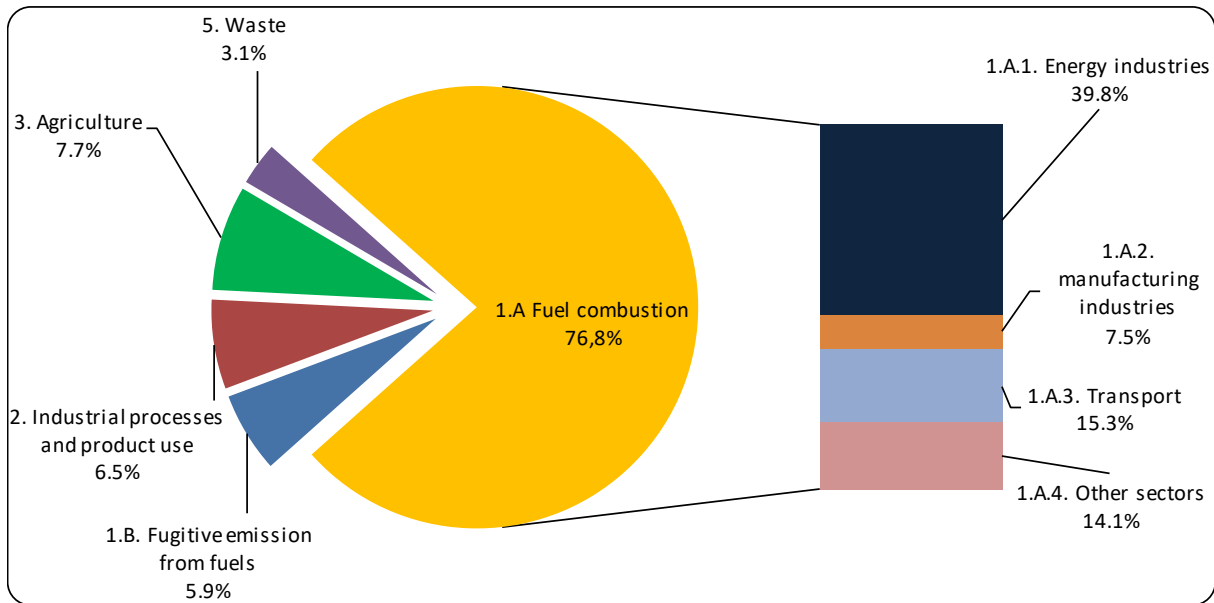


Fig. 2.3. Greenhouse gas emission structure by sector in 2017 (without LULUCF)

The balance of greenhouse gas emissions and removals for carbon dioxide in sector 4. *Land use, land-use change and forestry* in 2017 was estimated at -33.8 million t CO<sub>2</sub> eq., with net CO<sub>2</sub> removals of (mostly by forest land) of -37.4 million t CO<sub>2</sub>. Table 2.2 shows the greenhouse gas emission trends in Poland by sector.

Table 2.2. Greenhouse gas emission trends by sector [kt CO<sub>2</sub> eq.]

Sector	1988	1990	1995	2000	2005	2010	2015	2016	2017	Change 2017 / 1988
1. Energy	476 219.67	382 821.05	367 832.29	322 170.47	331 239.12	340 898.85	318 446.48	328 953.87	342 088.54	-28.17%
2. Industrial processes and product use	31 198.21	22 701.35	22 727.00	23 796.89	25 467.77	25 000.46	28 508.35	26 415.56	26 998.20	-13.46%
3. Agriculture	47 908.81	47 244.30	34 776.64	31 049.14	29 656.05	29 727.52	29 612.74	30 293.26	31 739.73	-33.75%
4. Land use, land use change and forestry (LULUCF)	-15 703.55	-27 190.91	-19 899.76	-32 896.71	-46 607.33	-30 020.54	-30 556.47	-26 043.36	-33 846.14	115.53%
5. Waste	21 931.10	21 583.41	19 627.31	18 455.91	17 061.48	16 041.89	13 877.03	13 459.84	12 954.93	-40.93%
6. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	0%
<b>Total (with LULUCF)</b>	<b>561 554.23</b>	<b>447 159.20</b>	<b>425 063.49</b>	<b>362 575.71</b>	<b>356 817.09</b>	<b>381 648.18</b>	<b>359 888.13</b>	<b>373 079.17</b>	<b>379 935.26</b>	<b>-32.34</b>

Source: KOBIZE, IOŚ-PIB

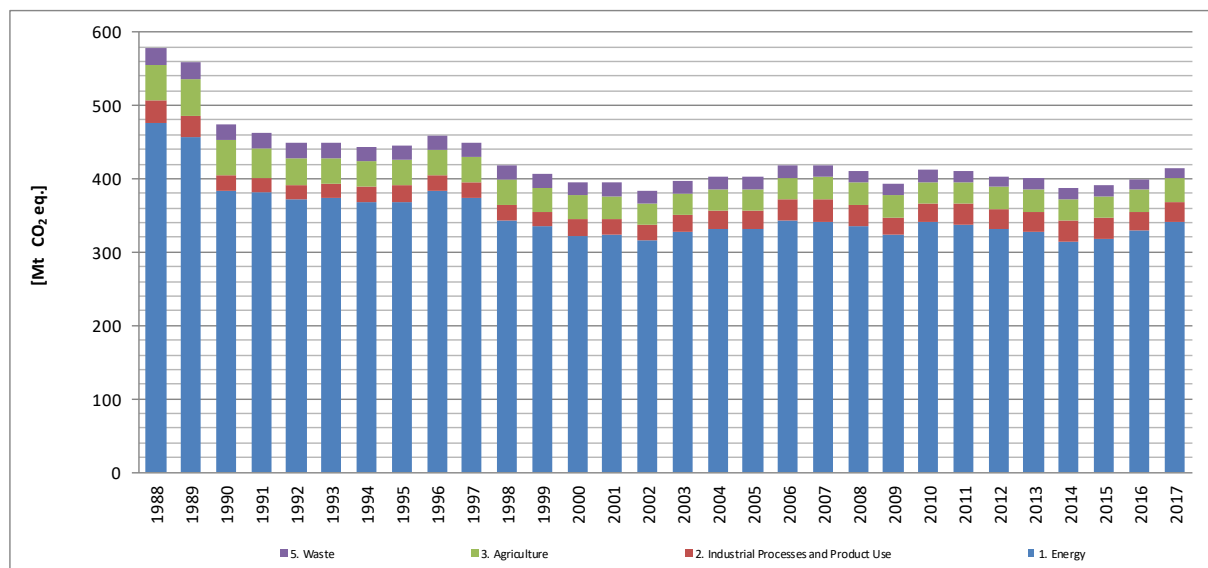


Fig. 2.4. Aggregated GHG emission trends (excluding category 4) for the period from 1988 to 2017 by source category

### Carbon dioxide emissions

The CO<sub>2</sub> emissions (with category 4) in 2017 were estimated at 336.56 million tonnes, i.e. they were lower by 28.7% than the emissions in the base year (1988). The CO<sub>2</sub> emissions (without category 4) represented 81.34% of the total GHG emissions in Poland in 2017 (Fig. 2.1). The main source of CO<sub>2</sub> emissions was category *Fuel combustion* (1.A). The share of this category was 92.5% of the total CO<sub>2</sub> emissions in 2017. The main subcategories of category 1.A were as follows: *Energy industries* – 48.7%, *Manufacturing industries and construction* – 9.2%, *Transport* – 18.6% and *Other sectors* – 16.0%. The share of category *Industrial processes and product use* in the total CO<sub>2</sub> emissions in 2017 was 5.7%. In this category, the main emission source was *Mineral industry*, in particular, *Cement production* (Fig. 2.5). The net balance of CO<sub>2</sub> emissions and removals in Sector 4 in 2017 was estimated at about -37.4 million tonnes, which means that CO<sub>2</sub> removals were significantly higher than the emissions in this sector.

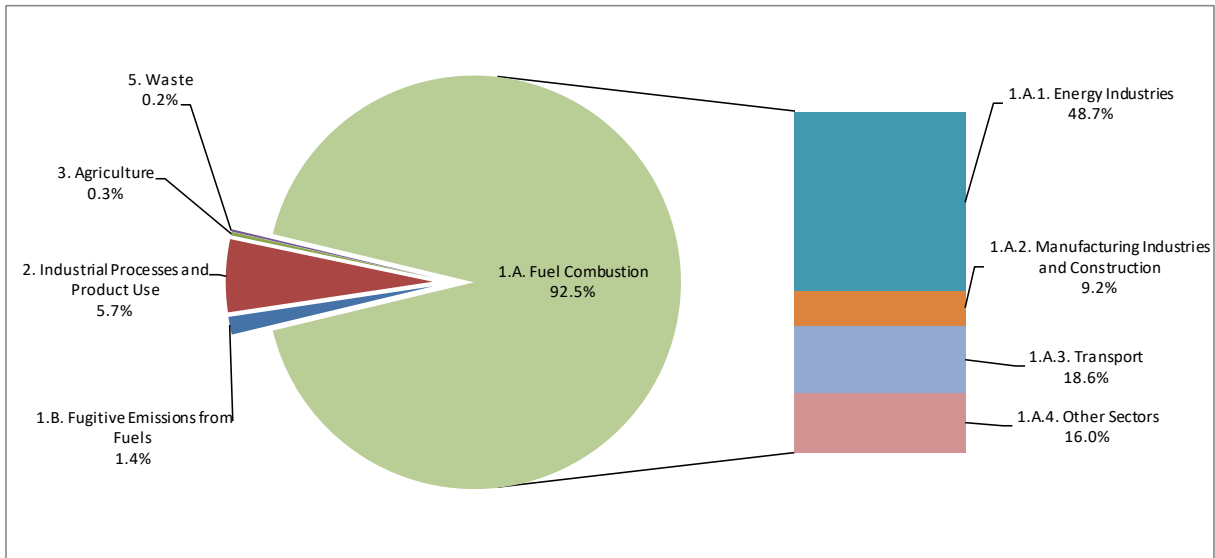


Fig. 2.5. Carbon dioxide emissions (without LULUCF) in 2017 by category

### Methane emissions

The methane emissions (without category 4) in 2017 were 1,976.51 kt, i.e. 49.41 million t CO<sub>2</sub> eq. The emissions in 2017 were lower by 34.7% than in the base year. The share of methane emissions in the total GHG emissions in Poland in 2017 was 11.9% (Fig. 2.1). Three of the main methane emission sources fell within the categories: *Fugitive emissions from fuels*, *Agriculture* and *Waste*. Their shares in the national methane emissions in 2017 were, respectively, 39.7%, 29.3% and 23.2%. The emissions in the first of the listed categories included emissions from coal and lignite mines (34.4% of the total CH<sub>4</sub> emissions) and emissions from oil and natural gas production, processing and distribution (5.4% of the total methane emissions). The emissions in subcategory *Enteric fermentation* (3.A) was the dominant emission source in category *Agriculture*, with its share of about 25.9% in the methane emissions in 2017. The emissions from *Solid waste disposal on land* represented about 17.8% of the national methane emissions, while the emissions from *Wastewater treatment and discharge* constituted 5.1% of the national emissions (Fig. 2.6).



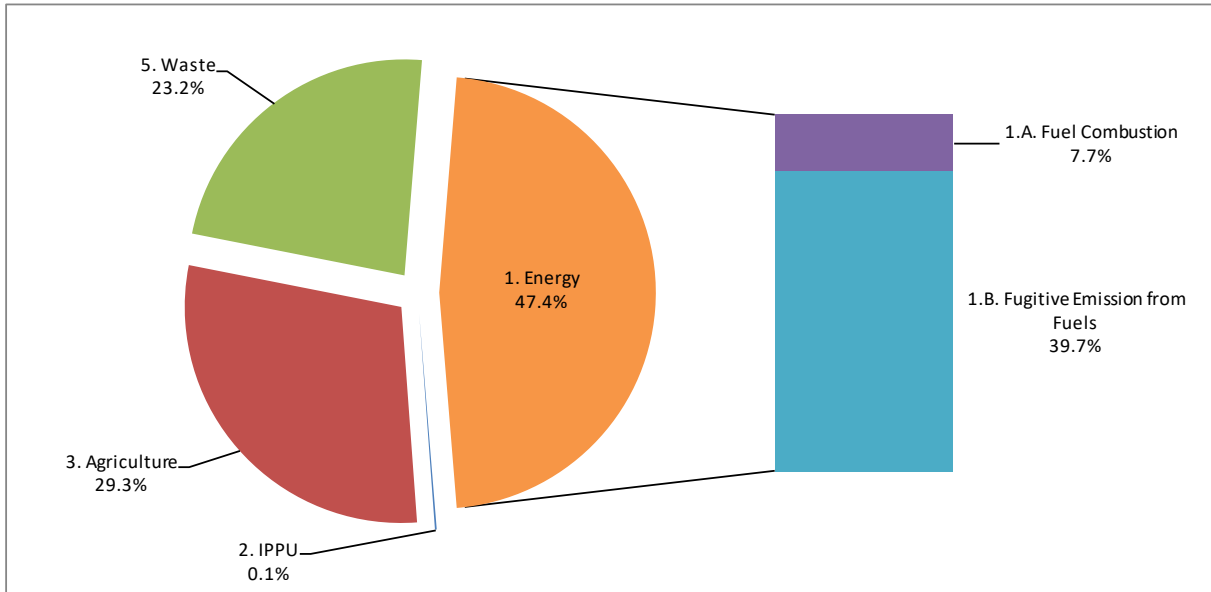


Fig. 2.6. Methane emissions (without LULUCF) in 2017 by category

#### Nitrous oxide emissions

The nitrous oxide emissions (without category 4) in 2017 were 69.88 kt, i.e. 20.82 million t CO<sub>2</sub> eq. The N<sub>2</sub>O emissions were lower by 29.2% than those in the base year (1988). The share of N<sub>2</sub>O emissions in the total GHG emissions in Poland in 2017 was 5.0% (Fig. 2.1). Sector 3. *Agriculture* is the main source of N<sub>2</sub>O emissions in Poland. In 2017, the largest contributors to the total N<sub>2</sub>O emissions from agriculture included the subcategories: *Agricultural soils* – 68,0% and *Manure management* – 10.5%. The other significant N<sub>2</sub>O emission sources included: *Fuel combustion* (in Sector 1. *Energy*) with its share of 13.1%, *Chemical industry* (in Sector 2. *Industrial processes and product use* with its share of 3.4% in the total emissions of this gas and *Waste water treatment and discharge* (in Sector 5. *Waste*) with its share of 3.7%. Fig. 2.7 shows the N<sub>2</sub>O emissions for the main categories.

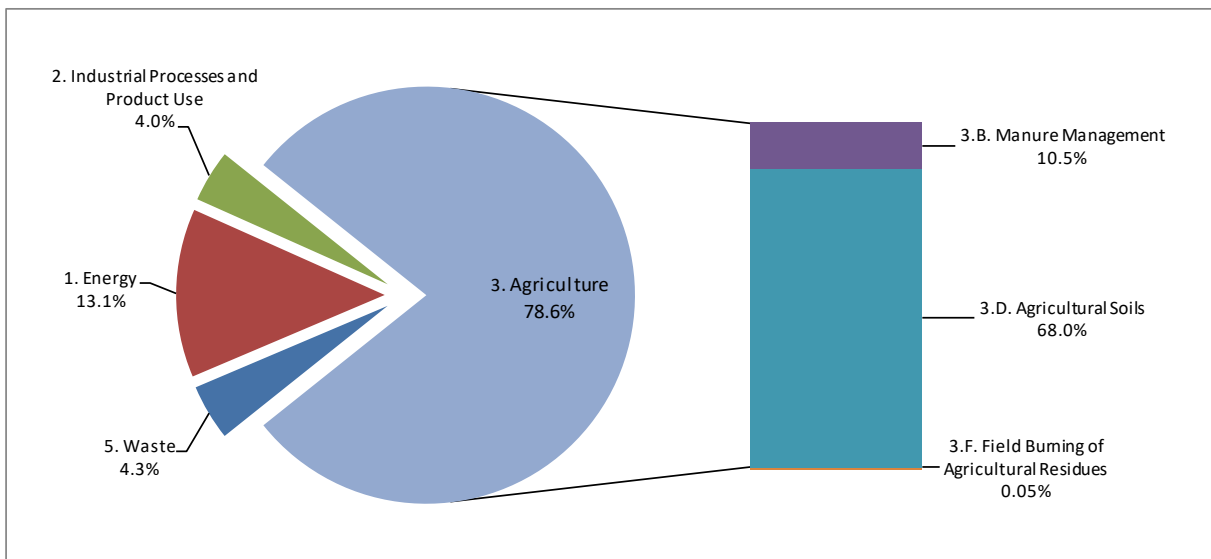


Fig. 2.7. Nitrous oxide emissions (without LULUCF) in 2017 by category

### *Emissions of fluorinated gases*

The total emissions of fluorinated gases (HFCs, PFCs and SF<sub>6</sub>) in 2017 were 6.987.62 kt CO<sub>2</sub> eq., representing 1.7% of the total GHG emissions in 2017 (Fig. 1). The emission of industrial gases were higher by 1,812.3% than those in the base year (1995). Such a significant increase in the emissions was caused by higher emissions from the use of cooling and air-conditioning equipment. The shares of the emissions of HFCs, PFCs and SF<sub>6</sub> in the total greenhouse gas emissions in 2017 were, respectively, 1.67%, 0.003% and 0.020%. No NF<sub>3</sub> emissions were registered.

## **2.2 National circumstances relevant to the preparation of the greenhouse gas emission inventory**

The National Centre for Emissions Management at the Institute of Environmental Protection – National Research Institute (IOŚ – PIB) is the unit responsible for preparing the of greenhouse gas inventory. The Centre was established by the Act of July 17 2009 on the System to Manage the Emissions of Greenhouse Gases and Other Substances (Official Journal of the Laws of 2019, Item 1447, as amended). Pursuant to Article 11 of this Act, the National Centre prepares and submits to the Minister responsible for the environment annual inventories of greenhouse gases and the substances specified in the Convention on Long-Range Transboundary Air Pollution (UNECE CLRTAP). The GHG emission inventories are prepared in accordance with the applicable guidelines.

The tasks of the National Centre also include the compilation of information, including the emission data, for the purpose of public statistics.

Inventories of greenhouse gases emissions, including the calculation of emission values, the selection and development of methodology, the selection of activities which are emission sources and the determination of emission factors are prepared by the Emission Inventory and Reporting Unit (EIRE), set up at the National Centre for Emissions Management (KOBiZE). Both individual experts and institutions, such as: the Statistics Poland (GUS), the Energy Market Agency (ARE SA), the Institute of Transport Engineering (ITS) and the Bureau for Forest Management and Geodesy (BULiGL) cooperate in the preparation of inventories. These institutions are primarily involved in providing activity data for a given sector.

The KOBiZE experts also have access to the data submitted by companies participating in the EU Emissions Trading Scheme (EU ETS). These verified data are used in the inventory of greenhouse gas emissions, in certain sectors (e.g. in subcategories of industrial processes).

The tasks performed by KOBiZE are supervised by the Minister competent for the environment (Fig. 3.6). Prior to its official submission, the national inventory is subject to internal approval. The Minister of the Environment is the body responsible for approving the inventory results.

In addition to emissions inventories, KOBiZE also prepares GHG emission projections. The projections are submitted to the Minister responsible for the environment who subjects them to internal and interministerial consultations. The consultations ensure consistency between the assumptions followed in projections and the sectoral measures implemented and planned by the relevant Ministers. After they are agreed and approved the emission projections are submitted to the EC and UNFCCC.

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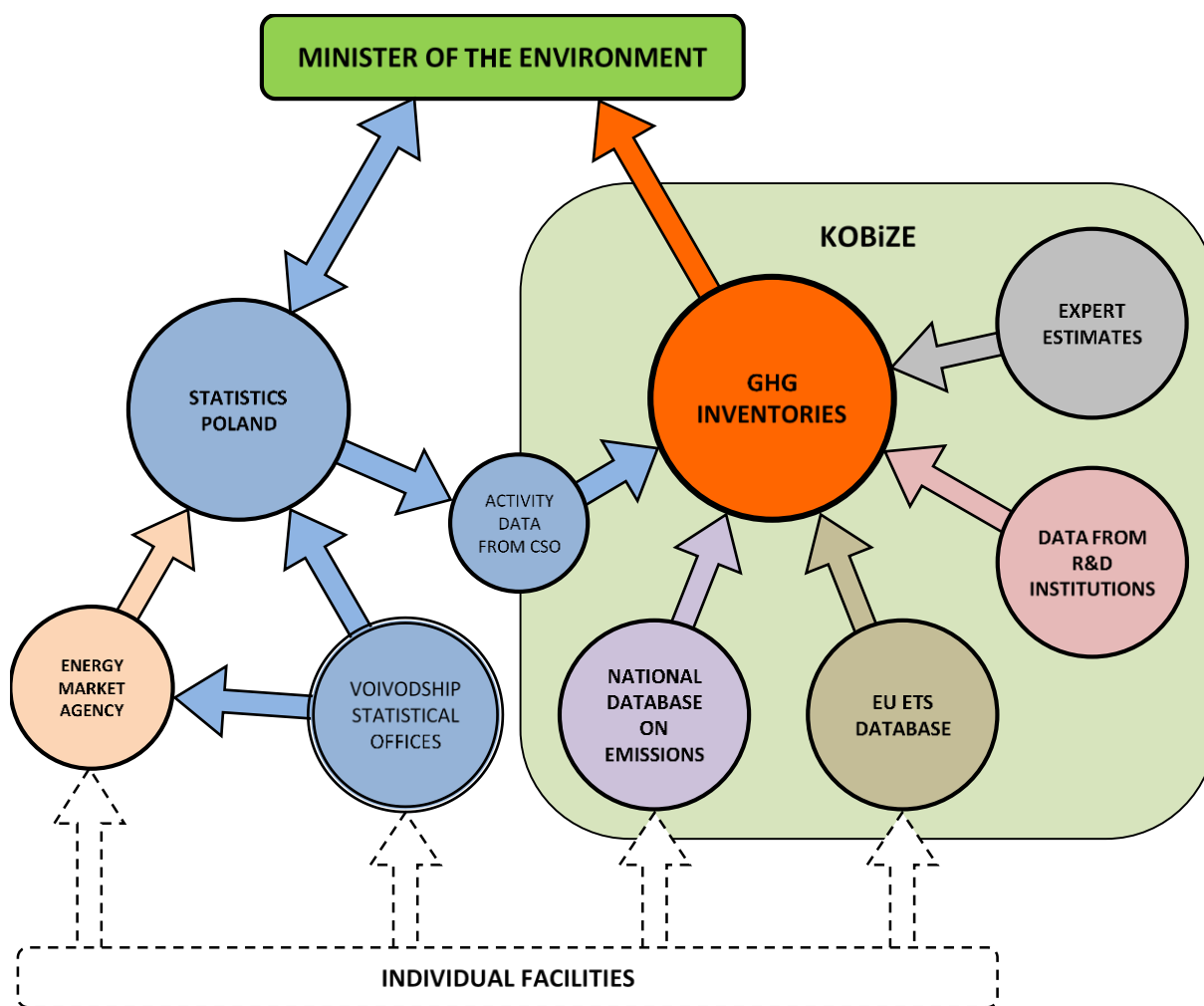


Fig. 2.8. National GHG emission inventory system; *source: KOBiZE*

In order to further assure a high quality of national greenhouse gas emission inventories, the *National Programme for the Quality Assurance/Quality Control of Greenhouse Gas Inventories* was developed. The QA/QC Programme sets out the tasks, the scope of responsibility and the timetable of the implementation of QA/QC procedures and is presented in annual national inventory reports (NIRs). The elements of the national quality assurance and quality control include:

- the institution responsible for the inventory and the coordination of QA/QC activities
- the plan for the quality assurance and quality control (QA/QC) of the inventory
- general quality control procedures (the Tier 1 method)
- detailed source-specific quality control procedures (the Tier 2 method)
- procedures for the review of the quality assurance process
- reporting, documentation and the archiving system

An additional element of the system is also the plan of improvements in the inventories which is updated on an ongoing basis. It covers primarily the methodological aspects, in the scope of both greenhouse gas emissions and air pollutants, resulting from the process of international reviews of the inventories and internal and interministerial consultations. Priority is given to the main

emission sources for which, as far as possible, the national methodologies and emission factors are developed.

KOBiZE is the body responsible for the coordination and implementation of QA/QC procedures in national inventories.

## 3. QUANTIFIED ECONOMY-WIDE EMISSION REDUCTION TARGET (QEWER)

### 3.1 Characteristics of the quantified economy-wide emission reduction target (QEWER)

#### 3.1.1 QEWER at the EU level

As a Party to the Climate Convention, in 2018 the European Union (EU) pledged to unconditionally reduce by 2020 its greenhouse gas (GHG) emissions by 20% compared with the 1990 emissions. In addition, the EU made a conditional declaration to raise this target to 30% if the other Parties to the Convention took on adequate commitments.

Detailed information on the EU reduction commitments under the UNFCCC is given in Table 3.1.

Table 3.1. EU reduction target under the Convention

Target year	2020
Emission reduction target	-20% in 2020 r. compared to 1990
Base year	1990
Gases affected	CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O, HFC, PFC, SF <sub>6</sub>
Sectors covered	All IPCC sources and sectors with the exception of LULUCF (international aviation only in the range covered by EU ETS)
Global warming potential	AR4
Use of international credits (JI and CDM)	Subject to quantitative and qualitative limits
Additional commitments	Conditional target of -30 % if other Parties take on adequate commitments

Full characteristics of the EU emission reduction target are contained in the 3<sup>rd</sup> Biennial Report from the European Union<sup>2</sup>, in its Section 3.1. (pp. 227-228).

Table 3.3 gives additional information on the EU emission reduction commitments.

#### 3.1.2 Poland's contribution to the EU reduction efforts

The EU Member States do not have their individual reduction target under the Climate Convention, but participate in the efforts to achieve the joint EU reduction target (-20% compared with 1990).

The joint fulfilment of its reduction commitments by the European Union for the period from 2013 to 2020 is based on the internal EU legislation, i.e. the climate and energy package (Table 3.2), which

<sup>2</sup> 7th National Communication & 3rd Biennial Report from the European Union under the UN Framework Convention on Climate Change

divides emission sources into two main areas: the EU ETS and the so-called non-ETS (ESD). The greenhouse gas emissions from the part of sources which are covered by the EU ETs (energy generation, district heating and industrial plants) are reported and accounted for directly by the installation operators. The emissions primarily include CO<sub>2</sub> but also N<sub>2</sub>O, mainly from the nitric acid production.

In turn, the emissions from the other, non-EU ETS sectors are reported and accounted for by the particular EU Member States individually, pursuant to *Decision No 406/2009/EC of the European Parliament and of the Council on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020*. Under the ESD Decision, Poland is obliged to limit the growth of its GHG emissions to 14% compared with 2005.

Pursuant to the ESD Decision, the annual emission allocations (AEAs) were set for the Member States for the period from 2013 to 2020 in Commission Decision 2013/162/EU of 26 March 2013 (Annex II) and in 2017 they were adjusted by Commission Decision (EU) 2017/1471 (Annex) in order to apply the 2006 IPPC Guidelines for National Greenhouse Gas Inventories in effect from 2015. Subsequently, these AEAs were adjusted as a result of a change in the scope of the ETS after 2012 and indicated in Commission Implementing Decision 2013/634/EU of 31 October 2013 (Annex II) (Table 3.3). The annual emission allocations for Poland are presented in Table 3.3.

Table 3.2. Annual emission allocations for Poland for the period from 2013 to 2020

2013	2014	2015	2016	2017	2018	2019	2020
193 642 822	194 885 546	196 128 269	197 370 991	199 974 468	201 710 045	203 445 622	205 181 199

In the period from 2013 to 2017, the total emissions from non-EU ETS sectors did not exceed the total allocations set out for Poland for those years. After the 2017 emissions had been accounted for the surplus of the AEAs was 17.4 million AEA units. For more information on the monitoring of the target under the ESD see Section 7.1.

### 3.2 Legal and institutional instruments established at the EU and national levels to achieve the QEWER emission reduction target

#### 3.2.1 2020 climate and energy package

In December 2008, the EU adopted the climate and energy package (hereinafter referred to as the 2020 CEP) in order to achieve, among others, the GHG emission reduction target established under the UNFCCC (QEWER). The package provided that by 2020 the European Union would:

- 1) reduce by 20% its greenhouse gas emissions compared with the 1990 emissions (i.e. by 14% compared with 2005);
- 2) increase to 20% the share of renewable energy in final energy consumption;
- 3) improve energy efficiency by 20% compared with projections for 2020 (a non-mandatory target);
- 4) reduce by at least 10% the share of biofuels in the total transport fuel consumption.

The following main legal acts were included in the 2020 CEP:



- Directive 2009/29/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community (the so-called EU ETS Directive)
- Decision No 406/2009/EC of the European Parliament and of the Council of 23 April 2009 on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020 (the so-called non-ETS Decision)
- Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide and amending Council Directive 85/337/EEC, European Parliament and Council Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC, 2008/1/EC and Regulation (EC) No 1013/2006 (the so-called CCS Directive)
- Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC (the so-called RES Directive)
- 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 (the so-called Energy Efficiency Directive)
- Directive 2009/30/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 98/70/EC as regards the specification of petrol, diesel and gas-oil and introducing a mechanism to monitor and reduce greenhouse gas emissions and amending Council Directive 1999/32/EC as regards the specification of fuel used by inland waterway vessels and repealing Directive 93/12/EEC

As part of the efforts to reform the EU ETS system and to develop the other EU policies (e.g. those on energy efficiency), the legal acts listed above were amended and additional legal acts were also adopted to regulate the areas covered by targets included in the 2020 CEP.

The GHG emission reduction target at the EU level (14% compared with 2005) was divided into two main areas (sectors) of the economy of the EU and its Member States in the following way:

- the target for the EU ETS sector (including domestic and international aviation): a 21% reduction in GHG emissions compared with 2005,
- the target for the ESD sector: a 10% reduction in GHG emissions compared with 2005. The EU target was divided among all the EU Member States. As part of this division, the target for Poland is the limitation of the GHG emission growth by 2020 to +14% compared with 2005.

The market-based reduction mechanism of the EU ETS system is described in Section 4.1.2.

In turn, the emission reduction mechanism in the ESD sector is based on the annual emission allocations (expressed in AEA units) determined for the particular EU Member States in the period from 2013 to 2020. On the basis of their allocations, the Member States shape their sectoral policies so as to ensure that the emissions in particular years do not exceed the annual emission allocations determined for these years (still, minor exceedances may be accounted for by using flexibility mechanisms). Sectoral policies include measures designed to reduce GHG emissions, primarily, in the following categories: fuel combustion in the municipal and housing sector and transport, agriculture and waste. For more on the emission reduction mechanism in the ESD sector see Section 4.1.2.

### 3.2.2 Other Community policies and measures

The European Union also implements other policies and measures (sectoral and cross-cutting ones) which support the achievement of the emission reduction target.

The most important cross-cutting policies include:

- the Horizon 2020 programme – 35% of EUR 80 billion of the programme budget is to be ultimately allocated to research and development work related to climate protection,
- support for the building of a low carbon economy from the European Structural and Investment Funds (ESIF)<sup>3</sup> with a total budget of EUR 114 billion to be spent in the period from 2014 to 2020.

The other EU policies and measures, such as the Covenant of Mayors for Climate, were described in the *Second Biennial Report of the European Union*<sup>4</sup> in its Section 3.2 (pp. 18-19) and in the *3<sup>rd</sup> Biennial Report from the European Union*<sup>5</sup> in its Section 4.2.3 (pp. 239-240).

### 3.2.3 Monitoring of progress in achieving the 2020 target

Progress in achieving the 2020 emission reduction target is monitored in Poland pursuant to the provisions of the *Act of 17 July 2009 on the System to Manage the Emissions of Greenhouse Gases and Other Substances* (EMS Act). This Act established a system to inventory, monitor, report and project GHG emissions.

The main element of this system established pursuant to the EMS Act is the National Centre for Emissions Management (KOBiZE) at the Institute of Environmental Protection – National Research Institute (IOŚ-PIB). Every year it prepares emission GHG inventories and projections and also analyses the emission levels and trends with respect to the AEAs determined in the ESD Decision. The results of the analyses are forwarded on an ongoing basis to the Minister of the Environment who is responsible for the implementation of climate policy and the supervision over the performance of tasks by KOBiZE.

The functioning of the system for monitoring and evaluating progress in achieving the emission reduction target is described in greater detail in Section 7.

## 3.3 Other reduction commitments of the European Union and Poland

### *Kyoto Protocol*

In the first commitment period of the Kyoto Protocol, Poland committed to reducing its greenhouse gas emissions in the period from 2008 to 2012 by 6% compared with the emissions in the base year. This target was achieved with a surplus as the emissions were reduced by 28.8%.

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<sup>3</sup> For more on the use of the ESIFs to support measures designed to protect the climate see [here](#)

<sup>4</sup> *Second Biennial Report of the European Union under the UN Framework Convention on Climate Change*

<sup>5</sup> *7th National Communication & 3rd Biennial Report from the European Union under the UN Framework Convention on Climate Change*

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In turn, in the second commitment period established by the Doha Amendment to the Kyoto Protocol in the period from 2013 to 2020, the European Union, its Member States and Iceland concluded an agreement on the joint achievement of the reduction target with respect to the base year. The joint reduction target was expressed as the commitment to achieve mean annual emissions at the level of 80% of the total emissions of all the states in the base years (Table 3.2). Poland chose 1988 as the base year for its emissions of carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O). In turn, 1995 was adopted as the base year for SF<sub>6</sub> and the group of fluorinated gases HFCs and PFCs and 2000 was chosen for NF<sub>3</sub>.

### *Paris Agreement*

In addition to the EU reduction target adopted under the UNFCCC for 2020, Poland, along with the European Union as a whole, committed to reducing by 2030 greenhouse gas emissions by 40% compared with 1990 under the so-called Paris Agreement. This target will be achieved using the three main pillars adopted in the EU legislation (Table 3.3):

- the EU emissions trading scheme – a 43% emission reduction by 2030 compared with 2005 (Directive (EU) 2018/410);
- the non-EU ETS sectors (the Effort Sharing Regulation – ESR) – a 30% emission reduction by 2030 compared with 2005 (Regulation (EU) 2018/842);
- the Member States ensuring that their emissions will not exceed removals in the LULUCF sector (ESR–LULUCF) – the “no debit rule” (Regulation (EU) 2018/841).

These policies are described in greater detail in Section 3.2.1, while full characteristics of the commitments are presented in Table 3.3.

Table 3.3. Overview of other Poland's and European commitments

	International commitments (UNFCCC)			EU legislation				
	Kyoto Protocol		Paris Agreement	Climate and Energy Package		Climate and Energy Framework		
				EU ETS	ESD (non-ETS)	EU ETS	ESR (non-ETS)	LULUCF
	Poland	European Union						
Target year or commitment period	First commitment period (2008–2012) CP1	Second commitment period (2013–2020) CP2	2030	2013–2020	2013–2020	2021–2030		
Emission reduction target	-6%	-20%	At least -40%	-21 % compared to 2005 for ETS emissions	Individual Member States targets. PL - increase in emissions by 14% compared to 2005 according to Annual Emission Allocations	-43% for EU ETS sectors	-30% for ESR sectors (translated into individual binding targets for Member States)	No-debit target based on accounting rules
Further targets	-	-	-	Renewable Energy Directive: 20 % share of renewable energy of gross final energy consumption; Energy Efficiency Directive : Increase energy efficiency by 20%		A binding renewable energy target for the EU for 2030 of at least 32% of final energy consumption, including a review clause by 2023 for an upward revision of the EU level target. A headline target of at least 32.5% for energy efficiency to be achieved collectively by the EU in 2030, with an upward revision clause by 2023		
Base year	1988 for CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O 1995 for HFCs, PFCs, SF <sub>6</sub>	1990, but subject to flexibility rules. 1995 or 2000 may be used as the base year for NF <sub>3</sub> . (PL: 1988 dla CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O; 1995 dla HFCs, PFCs, SF <sub>6</sub> , 2000 dla NF <sub>3</sub> )	1990	1990 for overall emission reduction target; 2005 for renewable energy and energy efficiency target; as well as for targets broken down into ETS and non-ETS emissions		2005		Subject to accounting rules
Aviation	Domestic aviation included. International aviation excluded	Domestic aviation included. International aviation excluded	Aviation in the scope of the EU ETS included (in practice total outgoing flight emissions considered)	Outgoing flights included	Generally excluded (some operations included - below ETS threshold)	Outgoing flights included	Excluded	Not applicable
Use of international credits	Use of KP flexible mechanisms subject to KP rules	Use of KP flexible mechanisms subject to KP rules	No contribution from international credits	Subject to quantitative and qualitative limits	Subject to quantitative and qualitative limits	No contribution from international credits		
Carry-over of units from preceding periods	Not applicable	Subject to KP rules including those agreed in the Doha Amendment	Not applicable	EU ETS allowances can be banked into subsequent ETS trading periods since the second trading period	No carry-over from previous period	Not applicable		
Gases covered	CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O, HFCs, PFCs, SF <sub>6</sub>	CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O, HFCs, PFCs, SF <sub>6</sub> , NF <sub>3</sub>	CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O, HFCs, PFCs, SF <sub>6</sub> , NF <sub>3</sub>	CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O, HFCs, PFCs, SF <sub>6</sub>		CO <sub>2</sub> , N <sub>2</sub> O, CF <sub>4</sub> , C <sub>2</sub> F <sub>6</sub>	CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O, HFCs, PFCs, SF <sub>6</sub>	CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O
Sectors covered	Annex A of KP (Energy, IPPU, agriculture, waste), LULUCF according to KP accounting rules for CP1	Annex A of KP (Energy, IPPU, agriculture, waste), LULUCF according to KP accounting rules for CP2	Energy, IPPU, Agriculture, Waste, LULUCF	Power & heat generation, energy-intensive industry sectors, aviation (Annex 1 of ETS directive)	Transport (except aviation), buildings, non-ETS industry, agriculture (except forestry) and waste	Power & heat generation, industry sectors including: cement, chemical, coke oven plants, refineries, aviation (Annex 1 of ETS directive)	Transport (excluding domestic aviation), buildings, non-ETS industry, agriculture and waste	Land-use, land-use change and forestry
GWP used	IPCC SAR	IPCC AR4	IPCC AR4	IPCC AR4				

Source: KOBiZE

## 4. PROGRESS IN ACHIEVING THE QUANTIFIED ECONOMY-WIDE EMISSION REDUCTION TARGET (QEWER)

### 4.1 Policies and measures to reduce emissions and their effects

#### 4.1.1 Introduction

##### *Context*

The present section of the report presents the most important national policies and measures which contribute to Poland's fulfilment of its commitment to reduce its greenhouse gas emissions by 2020. The following subsections are its descriptive part, while Table 3 in CTF is their integral part as it lists key required information.

As an EU Member State, Poland primarily implements regulations and requirements adopted at the EU level. This is also the case with climate policy and the achievement of its objectives.

The EU GHG emission reduction target by 2020, defined in the so-called 2020 climate and energy package, is 20% compared with the emissions in 1990 (the issues related to the achievement of the reduction target are addressed in Section 3). The efforts to achieve this target have been divided between the sectors covered by the EU ETS system and the sectors outside this system in the following way:

- A 21% emission reduction in the sectors covered by the EU ETS system by 2020 compared with the emissions in 2005 (one EU-wide target),
- A 10% emission reduction in the sectors which are not covered by the EU ETS system by 2020 compared with the emissions in 2005 (this target has been broken down into the national targets, with Poland's target set at +14%).

In light of this, the 2020 targets are implemented pursuant to two key legal acts:

- the ETS Directive (Directive 2003/87/EC, as amended)<sup>6</sup>, which lays down the operating principles of the greenhouse gas emission allowance trading system, and
- the non-ETS Decision (Decision No 406/2009/EC, ESD)<sup>7</sup>, which determines the individual national GHG emission reduction targets in the sectors outside the EU ETS system along with the rules for their achievement.

The 2020 climate and energy package also set targets for the development of RES and the improvement of energy efficiency – both at a level of 20% in 2020 in the EU. Their achievement will also contribute to greenhouse gas emission reductions.

The EU continues its ambitious climate action policy. To date, the EU 2030 climate policy targets have already been adopted (the 2030 climate and energy package), along with a package of relevant

<sup>6</sup> OJ L 275, 25.10.2003, amended by Directive 2008/101/EC and by Directive 2009/29/EC

<sup>7</sup> OJ L 140, 5.6.2009

implementing regulations. The EU has committed to reduce by 2030 its GHG emissions by 40% compared with the emissions in 1990 (the installations covered by the EU ETS system by 43%<sup>8</sup> and the non-ETS sectors by 30% relative to the emissions in 2005<sup>9</sup>). This target will be achieved as an EU commitment under the Paris Agreement. New targets have also been set for RES (32% in 2030) and energy efficiency (32.5% in 2030).

Different sectoral EU regulations are also important for climate protection (they were described in detail in the Biennial Report of the European Union), including e.g.:

- the RES Directive (2009/28/EC and (EU) 2018/2001)
- the Energy Efficiency Directive (2012/27/EU and (EU) 2018/2002)
- the Directive on the energy performance of buildings (2010/31/EU)
- Directive (EU) 2018/844 amending Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency
- the Regulation setting emission performance standards for new passenger cars (Regulation (EC) No 443/2009)
- the Regulation setting emission performance standards for new light commercial vehicles (Regulation (EC) No 510/2011)
- the Ecodesign Directive (2009/125/EC)
- the Regulation on fluorinated greenhouse gases (Regulation (EU) No 517/2014)
- the Directive on alternative fuels (2014/94/EU)
- the Fuel Quality Directive (2009/30/EC)
- the Directive on biofuels (2003/30/EC)
- the Directive on the landfill of waste (1999/31/EC and (EU) 2018/850)
- the Directive on the incineration of waste (2000/76/EC)
- the Directive on waste (2006/12/EC)

Their requirements apply directly in the Member States or need to be implemented into the national legal order. Therefore, they are reflected in the Polish policies and measures to protect the climate which are implemented in Poland, as described below.

#### *Financial mechanisms supporting measures to reduce greenhouse gas emissions*

The basic institutional and financial mechanism supporting the implementation of climate policy, particularly with regard to energy efficiency improvements, renewable energy development and modernization of energy production processes, is the system for financing environmental actions managed by the National Fund for Environmental Protection and Water Management (NFOŚiGW) and the Voivodeship Funds for Environmental Protection and Water Management (WFOŚiGW).

Moreover, the Operational Programme Infrastructure and Environment (POIŚ), under the financial perspectives 2007–2013 and 2014–2020, has implemented projects which have resulted in GHG emission reductions, energy efficiency improvements, the promotion of renewable energy sources, the adaptation to the adverse impacts of climate change, as well as the development of low-emission

<sup>8</sup> Directive (EU) 2018/410, OJ L 76, 19.3.2018

<sup>9</sup> Regulation (EU) 2018/842, OJ L 156, 19.6.2018 (so-called ESR)



transport and road infrastructure for cities. The main source of the financing for the POIŚ 2014-2020 is the Cohesion Fund and, in addition, also the European Regional Development Fund. The total allocated resources will amount to EUR 27.41 billion. More information on both NFOŚiGW and EU resources was presented in the Seventh National Communication (NC7), in its Section 4.3.

Poland also uses non-returnable financial assistance under two instruments called: the EEA Financial Mechanism and the Norwegian Financial Mechanism. The donors are three EFTA countries: Norway, Iceland and Liechtenstein. Both mechanisms apply the same rules and procedures and are subject to one management and implementation system in Poland. Detailed information on them was presented in NC7, in its section 4.4.

#### *Changes in the manner of reporting information in policies and measures with respect to BR3*

The manner of presentation, including the aggregation of policies and measures, in this report is different from the one in the previous report, i.e. the Third Biennial Report (BR3). The modifications which have been made result from amendments to regulations and the use of a verified, different approach to analyses of policies and measures, which has brought further improvements in the scope, comprehensiveness and reliability of information on policies and measures.

The present report does not include several measures which were presented in the NC7/BR3 report, as a result of revisions in the most recent strategic documents. A substantial group of policies and measures which were presented in the NC7/BR3 reports has been replaced by other measures following an update of sectoral plans, programmes and strategies. The documents which have been adopted often represent a continuation of an earlier policy or its extension with new objectives and tasks. The revisions also result from regrouping of the aggregation of policies and measures in order to improve the transparency of the information reported. The present report also describes new measures which have been launched after the submission of the NC7/BR3 report. These key changes are listed below.

Table 4.1. Measures withdrawn from the BR4 report

Name of the measure in the NC7/BR3 report	Clarification
National Green Investment Scheme (GIS)	<p>The GIS is implemented by national policies/measures dedicated to particular sectors; therefore, it has been decided that a separate GIS-related measure would not be formulated in the set of policies so as to avoid double accounting of the reduction effects.</p> <p>In order to ensure greater transparency in the evaluation of the reduction effects of the presented set of policies, it has been recognised that its effects are taken into account in the evaluation of the measures related to energy production and consumption.</p>
Restoring the forest production potential destroyed by disasters and implementing preventive measures	The measure was not included in the Rural Development Programme for 2014-2020.

Source: KOBiZE, IOŚ-PIB

Table 4.2. Measures replaced by other measures

Measure in the NC7/BR3 report	Measure in the BR4 report
Enhancing the use of renewable energy sources, including biofuels	Measure 3: Development of RES
National Energy Efficiency Action Plan for Poland 2014	Measure 8: Improvement of energy efficiency
Town Planning and Construction Code	
Clean Transport Package	Measure 10: Road transport package Measure 11: Urban transport package
Domestic air transport package	Measure 13: Air transport package
International transport package	
Rationalization of the use of fertilizers, including nitrogen fertilizer	Measure 19: Agri-environmental measures
Sustainable management of agricultural land	
Afforestation of agricultural land and afforestation of non-agricultural land	
Restoring the forest production potential destroyed by disasters and implementing preventive measures	Measure 17: Rational management of agricultural and forest land
Counteracting changes in land use	
Support for adaptation and reduction measures in agricultural holdings	Measure 18: Support for adaptation and mitigation measures in agricultural holdings
Improvement of monogastric livestock systems and , reduction of methane emissions from livestock manure	
Elimination of gaseous pollutants emitted from poultry buildings using phytoremediation and solar ventilation	
Rationalization of forest management, incentives and actions supporting afforestation and the protection of ecological stability of forests	Measure 23: Forest land development and improvement of the viability of forests (a group of measures)

Source: KOBiZE, IOŚ-PIB

Table 4.3. Measures with a changed title

Measure in the NC7/BR3 report	Measure in the BR4 report
Implementation of the emissions trading system (EU ETS)	Measure 1: Greenhouse gas emissions trading scheme (EU ETS)
The Effort Sharing Decision (ESD)	Measure 2: Emission reductions in non-ETS sectors
Polish Nuclear Power Programme	Measure 5: Implementation of nuclear energy
Support for the use of methane from hard coal mines to produce electricity and heat	Measure 6: Support for and development of the use of coalbed methane
Use of fluorinated greenhouse gases	Measure 16: Limitation of the use of fluorinated greenhouse gases
National Waste Management Plan	Measure 21: Modern principles of waste management
National Municipal Wastewater Treatment Programme	Measure 22: Modern wastewater management

Source: KOBiZE, IOŚ-PIB

Table 4.4. New measures in the BR4 report

New measures in BR4
Measure 11: Urban transport package
Measure 4: Development of high-efficiency cogeneration
Measure 9: Improvement of air quality
Measure 20: Development of agricultural biogas plants

Source: KOBiZE, IOŚ-PIB

#### 4.1.2 Cross-sectoral policies and measures

##### *Key strategies, plans and programmes*

The table below lists the key strategies, plans and programmes of a cross-sectoral character, related to the protection of the environment and climate.

Table 4.5. Key cross-sectoral strategies, plans and programmes

Title	Description
<b>2020 perspective</b>	
Strategy for Responsible Development, adopted by the Council of Ministers on 14 February 2017	The Strategy defines a new model for the development of the country in its economic, social and spatial dimensions until 2020 and with an outlook until 2030. The specific objectives which it sets out include e.g. support for measures to reduce the emissions of greenhouse gases and air pollutants as well measures related to energy efficiency. More information on this document is available in NC7, Section 4.2.1.
National Reform Programme (KPR) for the implementation of the Europe 2020 Strategy – its update for 2017/2018 was adopted by the Council of Ministers on 25 April 2017	The National Reform Programme (NRP) is the main programme which serves to implement the Europe 2020 Strategy at the level of the EU Member States. Taking into account the social and economic circumstances, the NRP sets out the targets which Poland should achieve in 2020. In their annually updated NRPs, the Member States present, among others: the medium-term macroeconomic scenario, the national plans for the implementation of the objectives of the Europe 2020 Strategy and the planned measures to implement the recommendations of the EU Council for the particular Member States. The NRP should also include the implementation timetable of reforms and an assessment of their impacts on the budget. More information on this document is available in NC7, in its Section 4.2.1.
Energy Security and Environment Strategy - the 2020 Perspective, adopted by the Council of Ministers on 15 April 2014	The Energy Security and Environment Strategy is one of the 9 integrated development strategies, elaborated pursuant to the Act of 6 December 2006 on the Principles of Implementation of Development Policy. The document specifies the provisions of the Medium-Term National Development Strategy 2020 in the fields of energy and the environment and provides guidelines for the Energy Policy of Poland. The main goal of this Strategy is to ensure a high quality of life for the present and future generations, taking environmental protection into account, and to create the conditions for the sustainable development of a modern energy sector capable of ensuring Poland's energy security and a competitive and efficient economy. More information on this document is available in NC7, in its Section 4.2.1.
Operational Programme Infrastructure and Environment 2014-2020	Infrastructure and Environment is the largest programme financed by the European Funds in Poland. The aim of the Programme is to support a resource efficient and environment friendly economy conducive to territorial and social cohesion. Under the financial perspectives 2007–2013 and 2014–2020, the Operational Programme Infrastructure and Environment implements projects which result in greenhouse gas emission reductions, energy efficiency improvements, the promotion of renewable energy or the adaptation to the adverse impacts of climate change. The main source of the financing for the POIŚ 2014-2020 is the Cohesion Fund and, in addition, also the European Regional Development Fund. The total allocated resources will amount to EUR 27.41 billion in a programme including transport, energy, culture, environment and health. EUR 2.8 million will be allocated directly to the energy sector and EUR 3.8 mld EUR to the environment sector. More information on this document is available in NC7, in its Section 4.3.
<b>2030 perspective</b>	

Title	Description
2030 National Environmental Policy adopted by the Council of Ministers on 16 July 2019	<p>The 2030 National Environmental Policy 2030 specifies further and operationalises the provisions of the <i>Strategy for Reasonable Development until 2020 (with an Outlook until 2030)</i>.</p> <p>Its aim is to ensure Poland's environmental safety and a high quality of life for all its citizens. It strengthens the Government's actions to build a innovative economy while complying with the principles of sustainable development. Its specific objectives are set out response to challenges in the field of the environment, in a manner enabling the issues of environmental protection to be coupled with the economic and social needs related to health, economic and climate. The implementation of the environmental objectives is to be supported by horizontal objectives related to environmental education and to the effective functioning of environmental protection instruments.</p> <p>The 2030 National Environmental Policy will provide the basis for investing European funds under the financial perspective 2021–2027. The Strategy also supports the implementation of Poland's international objectives and commitments, including those at the EU and UN levels, particularly, in the context of EU 2030 climate and energy policy objectives and the Sustainable Development Goals set out in the 2030.</p>
National Air Pollution Control Programme (KPOZP), adopted by the Council of Ministers on 29 April 2019	<p>Directive 2016/2284 of 14 December 2016 set out the Member States' commitments to reduce the emissions into the atmosphere of the anthropogenic pollutants: sulphur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), non-methane volatile organic compounds (NMVOC), ammonia (NH<sub>3</sub>) and particulate matter (PM<sub>2.5</sub>), as well the requirements for the preparation, adoption and implementation of national air pollution control programmes.</p> <p>Poland's commitments to reduce its emissions cover two periods: from 2020 to 2029 and from 2030. The reduction commitments were defined with respect to the emissions in the reference year 2005.</p> <p>The elaboration of this document meets the requirements of the Directive mentioned above. The KPOZP indicates the measures and scenarios for Poland's achievement of the emission targets laid down in the Directive.</p>
National Energy and Climate Plan for 2021-2030 (KPEiK), submitted to the European Commission on 30 December 2019	<p>The National Energy and Climate Plan for 2021-2030 (KPEiK) was prepared to meet the obligation under Regulation (EU) 2018/1999. The final version of the KPEiK was elaborated taking into account the comments from interministerial and public consultations, updates of national sectoral strategies, regional consultations and the recommendations of the European Commission published on 18 June 2019.</p> <p>The KPEiK presents the assumptions and objectives as well as policies and measures designed to implement the five dimensions of the Energy Union. i.e. energy security; the internal energy market; energy efficiency; decarbonisation; and research, innovation and competitiveness.</p>

Source: KOBiZE, IOS-PIB

### Key legal acts

The table below lists the key legal acts of a cross-sectoral character, related to the protection of the environment and climate.

Table 4.6. Key cross-sectoral legal acts

Title	Description
Act of 12 June 2015 on the Greenhouse Gas Emission Allowance Trading Scheme (Official Journal of the Laws of 2018, Item 1201, as amended)	The Act now in effect which transposed Directive 2003/87/EC and the changes made by amendments to the Directive into the national regulations.
Act of 17 July 2009 on the System to Manage the Emissions of Greenhouse Gases and Other Substances (Official Journal of the Laws of 2019, Item 1447, as amended)	The Act lays down the tasks of the National Centre for Emissions Management (KOBiZE); the operating rules for the National System of Emissions Management, the rules for management of the emissions of greenhouse gases and other substances; the operating rules for the National Registry of Kyoto units; the rules for trading and management of Kyoto units; the operating rules for the National Green Investment Scheme; the conditions and principles of the realization of Joint Implementation projects in the territory of the Republic of Poland; the conditions and principles of the realization of Joint Implementation and Clean Development Mechanism projects outside the territory of the Republic of Poland.
Act of 27 April 2001 on Environmental Protection Law (Official Journal of the Laws of 2019, Item 1396)	The Act lays down the principles of environmental protection and the conditions for the use of its resources, taking into account the requirements of sustainable development, in particular, the principles of establishing the conditions for the protection of environmental resources, the conditions for releasing substances and energies into the environment, as well as the obligations of administrative authorities, liabilities and penalties.
Act of 20 July 1991 on the Inspectorate for Environmental Protection (Official Journal of the Laws of 2016, Item 1688, as amended)	The Act establishes the State Environmental Monitoring System and the rights and obligations of the State with regard to the monitoring of the state of the environment and the enforcement of the provisions of environmental law pertaining to all the elements of the environment (e.g. air, water, nature, noise, electromagnetic fields and waste).

Source: KOBiZE, IOŚ-PIB

### *Policies and measures*

#### **Measure 1: Greenhouse gas emissions trading scheme (EU ETS)**

Status: implemented

Greenhouse gases affected: CO<sub>2</sub>, N<sub>2</sub>O and PFCs

#### Context

In Poland, a Member State of the European Union, the greenhouse gas emissions trading scheme (EU ETS) operates in accordance with the rules set out by Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 and its amendments. Directive 2003/87/EC was transposed into the national legal order in 2004 by the Act of 12 June 2015 on the Greenhouse Gas

Emission Allowance Trading Scheme which has been amended many time ever since in response to changes in the operating rules of the EU ETS scheme at the level of EU legislation.

#### Aim

The GHG emission reduction in the EU in a cost-effective manner. The GHG emission reduction in the EU compared with 2005: the 2020 target – by 21% and the 2030 target – by 43%.

#### Characteristics

The EU ETS scheme covers energy and industrial installations and aircraft operators, with the scheme covering only flights within the EU and the three European countries from the EEA which have acceded to the scheme, i.e. Iceland, Liechtenstein and Norway. Each installation and aircraft operator must annually account for their greenhouse gas emissions with their emission allowances (EUAs).

The number of installations covered by the EU ETS slightly varies as a result of the inclusion of new installations which meet the criteria for the participation in the EU ETS scheme and the exclusion of installations from the EU ETS system in the case of the cessation of their activities or a drop in the threshold values of production capacity which qualify for their participation in the scheme, or in consequence of a merger or demerger of installations. The number of installations covered by the EU ETS and the total CO<sub>2</sub> eq. emissions in the EU ETS in the period from 2008 to 2018 are shown in the table below.

Table 4.7. Basic data on the EU ETS scheme in Poland

Year	Number of installations	GHG emissions from installations	Number of aircraft operators	GHG emissions from aviation	Total GHG emissions	Change in CO <sub>2</sub> eq. emissions relative to the previous year
	[installation]	[t CO <sub>2</sub> eq.]	[operator]	[t CO <sub>2</sub> eq.]	[t CO <sub>2</sub> eq.]	[%]
2008	832	204 107 419	0	0	204 107 419	-2.63
2009	828	191 174 249	0	0	191 174 249	-6.34
2010	810	199 726 907	0	0	199 726 907	4.47
2011	811	203 026 525	0	0	203 026 525	1.65
2012	764	196 636 280	12	641 424	197 277 704	-2.83
2013	783	205 735 395	7	616 587	206 351 982	4.60
2014	767	197 129 387	7	629 899	197 759 286	-4.16
2015	738	198 700 536	6	591 020	199 291 556	0.77
2016	727	198 051 726	5	749 946	198 801 672	-0.25
2017	710	202 166 696	6	943 715	203 110 411	2.17
2018	700	199 973 130	7	1 142 534	201 115 664	-0.98

Source: KOBiZE, IOŚ-PIB

In the third trading period, i.e. from 2013 to 2020, the total number of emission allowances was reduced, starting in 2013, by 1.74%. The main principle of the allocation of allowances is the sale of allowances at auctions. The allocation of free allowances has been limited to the installations which do not produce electricity and is based on product benchmarks (defined as the average CO<sub>2</sub> eq. emissions for a given product) and the historical outputs of a given installation.

An exception to the above rule is the allocation of emission allowances under Article 10c of Directive 2003/87/EC, the so-called derogation, provided that specific criteria are met (i.e. the dependence of the electricity generation on one type of fossil fuel to an extent exceeding 30% and the GDP level of less than 50% of the average GDP in the EU). Poland meets these requirements and, in consequence, it has been decided that the possibility of the free allocation of allowances to electricity generators will be used. The total number of emission allowances which Poland can allocate under this derogation is about 404.65 million EUAs<sup>10</sup>. The number of such allowances allocated to installations falls from year to year and it is expected to be zero in 2020. The grant of the derogation required the adoption of the national investment plan (NIP) including investment projects with their value balancing the value of the free allocation. These are mostly investment projects to build new power generation units and modernise old ones. Moreover, the aim of the NIP is to limit energy price rises which could emerge in the absence of the derogation.

Emission allowances are sold on the primary market (at auctions) and on the secondary trading market (the most allowances are sold at the EEX and ICE exchanges).

It should be borne in mind that since 2019 the pool of allowances to be sold at auctions has been additionally reduced by the application of the MSR mechanism (the so-called Market Stability Reserve) which consists in:

- adding allowances deducted from the auction pool to the reserve pool if the allowance surplus on the market exceeds 833 million allowances, or
- adding allowances from the reserve to the auction pool, if the allowance surplus on the market is less than 400 million EUAs in a given year.

The fourth trading period will be from 2021 to 2030 and it will be governed by the rules set out in the amendment to the ETS Directive adopted in 2018 (Directive (EU) 2018/410 of 14 March 2018 amending Directive 2003/87/EC to enhance cost-effective emission reductions and low-carbon investments, and Decision (EU) 2015/1814). For the purposes of the allocation of allowances, the period from 2021 to 2030 was divided into two sub-periods: from 2021 to 2025 and from 2026 to 2030, for which the allowances will be allocated. Moreover, the rule was adopted that benchmarks will be updated to reflect technological progress (the values will be calculated on the basis of data collected in applications for the allocation and published in a decision of the Commission). Rules were also changed with regard to sectors vulnerable to carbon leakage (the list of sectors, to be valid for 10 years, was changed and preferences for district heating were added). The total number of emission allowances will be reduced, starting in 2021, by 2.2% per year (the LRF – the linear reduction factor). More flexible rules for the free allocation were developed so as to better adapt the allocation levels to the real production levels.

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<sup>10</sup> As estimated by KOBiZE, the actually used derogation will cover about 270 million EUAs (the remainder is to be auctioned by 2021)

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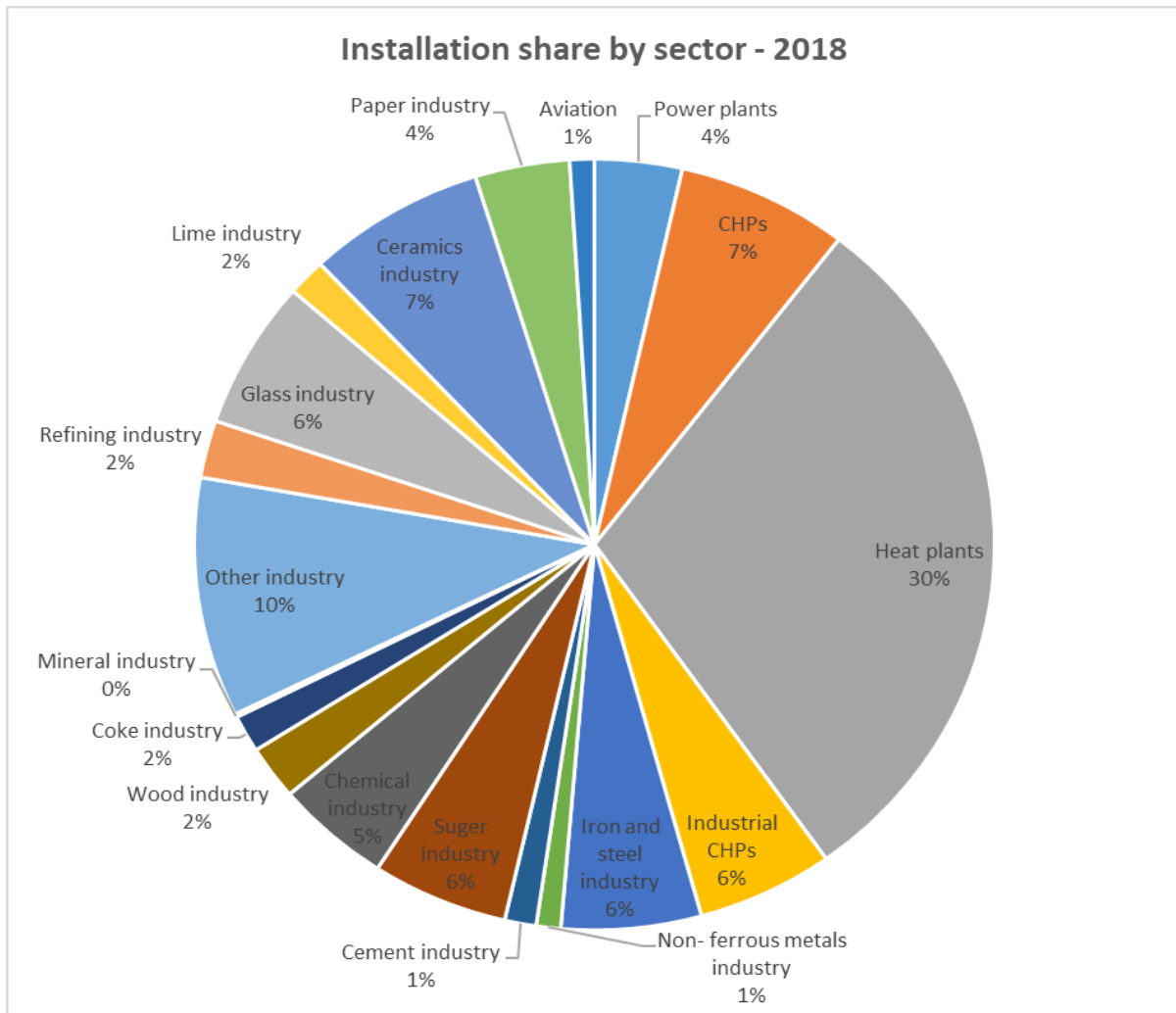


Fig. 4.1. The shares of installations in the EU ETS in Poland by sector in 2018.

Source: KOBiZE, IOŚ-PIB

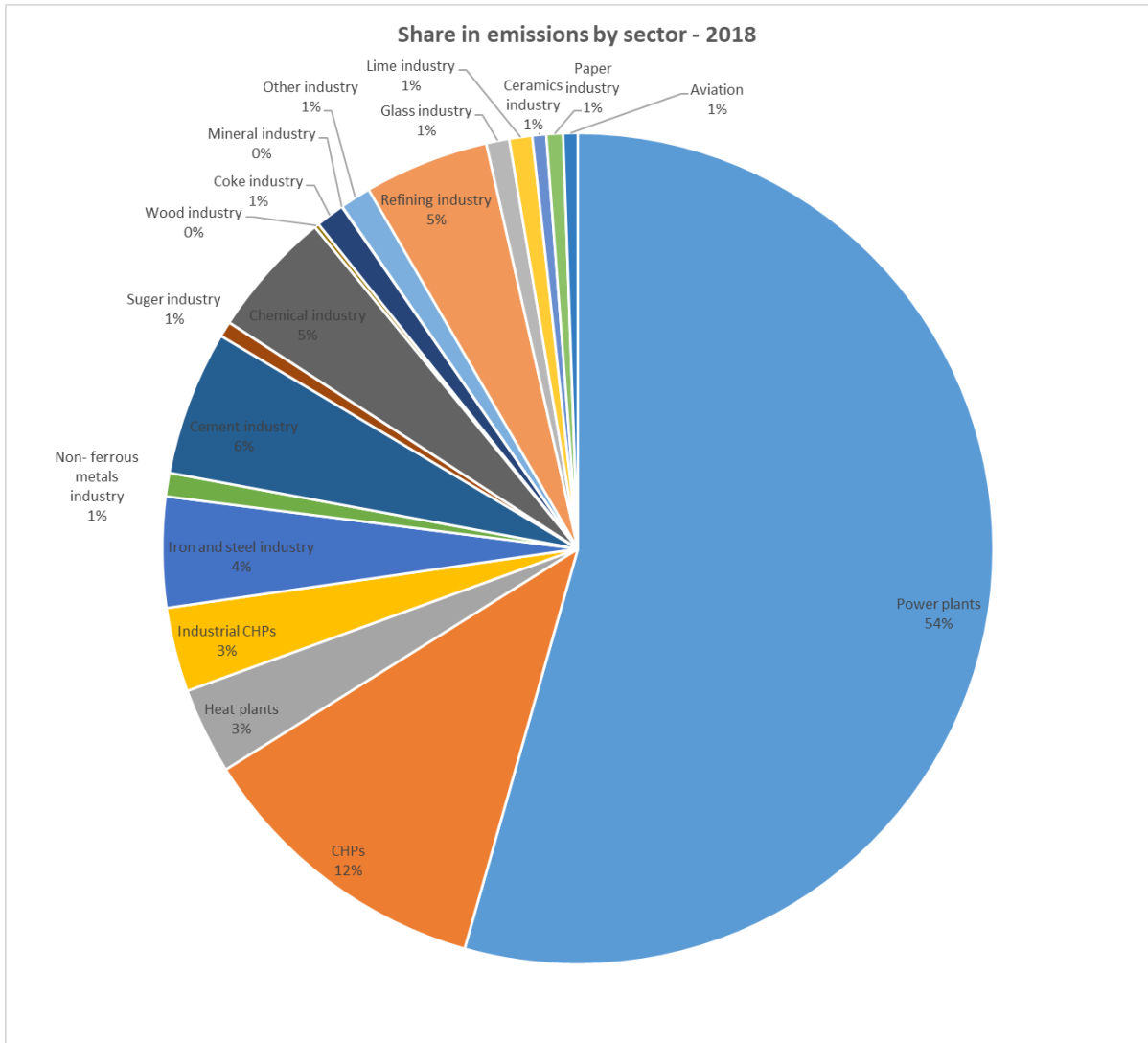


Fig. 4.2. The shares of the particular sectors in Poland's emissions in the EU ETS sectors in 2018.  
Source: KOBiZE, IOŚ-PIB

## **2: Measure 2: Emission reductions in non-ETS sectors (a group of measures)**

Status: implemented

Greenhouse gases affected: CO<sub>2</sub>, N<sub>2</sub>O, CH<sub>4</sub>, PFCs, HFCs and SF<sub>6</sub>

### Context

The non-ETS area includes the sectors of the economy which are outside the emissions trading scheme, i.e. transport, agriculture, waste, buildings, and the industrial sector outside the EU ETS. The EU regulations set out the emission reduction targets in this area for the particular Member States. Decision No 406/2009/EC (the so-called Effort Sharing Decision, ESD) set out percentage-based greenhouse gas emission targets for the period from 2013 to 2020, which were subsequently broken down by Commission Decision 2013/162/EU into annual emission allocations (AEAs). In turn,

Regulation (EU) 2018/842 (the so-called Effort Sharing Regulation, ESR) extended the requirements for emission reductions in the non-ETS sectors to the period from 2021 to 2030. As an EU Member State, Poland is obliged to achieve the reduction targets which have been determined for it.

### Aim

The greenhouse gas emission reduction in the EU from the sectors outside the EU ETS. The EU reduction targets compared with the emissions in 2005 are: 10% by 2020 and 30% by 2030. As part of the achievement of this EU target, Poland's emission reduction targets compared with the emissions in 2005 are: +14% by 2020 and -7% by 2030.

### Characteristics

The annual GHG emissions from the non-ETS area in each Member State are verified and, subsequently, each country accounts for them against its annual emission allocation (AEA). In accounting for the emissions in the non-ETS area, the flexibilities and mechanisms laid down in Decision No 406/2009/EC (ESD) can be used. They include:

- the banking, borrowing and transfer of AEA units – the ESD lays the rules under which the Member States may bank the excess part of their AEAs to successive years of the trading period, borrow part of their AEA from the future years or buy AEA units from other Member States,
- using certain specific types<sup>11</sup> of CERs and ERUs.

To date, Poland has banked its AEA units.

In Poland, the achievement of the target in the non-ETS area is supervised by the Minister responsible for the environment who draws up the strategy for managing the national AEA and agrees it with the members of the Council of Ministers. This strategy is adopted by a resolution of the Council of Ministers. It contains, in particular, the assumptions and guidelines for accounting for and projecting greenhouse gas emissions outside the EU ETS scheme, taking into account:

- 1) the real greenhouse gas emissions which are not covered by the emissions trading scheme in a given year in the Republic of Poland and other Member States of the European Union;
- 2) the national greenhouse gas emissions projected in subsequent years which are not covered by the emissions trading scheme in the Republic of Poland and other Member States of the European Union;
- 3) the prices of Kyoto units, annual emission allocations, temporary certified emission reduction units and long-term certified emission reduction units;

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<sup>11</sup> The types of units allowed for use in non-ETS are listed in Article 5 of Decision No 2009/406/EC:

- certified emission reduction units (CERs) and emission reduction units (ERUs), set out in Directive 2003/87/EC, issued for emission reductions by 31 December 2012 and eligible for use in the Community scheme in the period from 2008 to 2012;
- certified emission reduction units (CERs) and emission reduction units (ERUs) issued for emission reductions from 1 January 2013 as part of projects which were registered before 2013 and eligible for use in the Community scheme in the period from 2008 to 2012;
- certified emission reduction units (CERs) issued for emission reductions achieved in projects which were implemented in least developed countries and eligible for use in the Community scheme in the period from 2008 to 2012, until the ratification of a relevant agreement with the Community by these countries or until 2020, whichever is sooner;
- temporary CER units (tCERs) or long-term CER units (lCERs) from afforestation and reforestation projects – under the condition laid down in Decision No 2009/406/EC (Article 5(1)(d)).

- 4) the geographical distribution of the projects which have produced the units referred to in point 3;
- 5) the levels of demand for and supply of the units on the EU and international markets;
- 6) the tendency for the greenhouse gas emissions covered by the emissions trading scheme to move outside this scheme.

For the 2030 target, a decision defining the annual emission allocations for the period from 2021 to 2030 has not been issued yet. It is known, however, that in accounting for emissions it will be possible to use similar mechanisms as in the period from 2013 to 2020, i.e.:

- the banking, borrowing and transfer of AEA units AEA – just as in the trading period from 2013 to 2020, the Member States may bank the excess part of their AEAs to successive years of the trading period, borrow part of their AEA from the future years or buy AEA units from other Member States,
- the LULUCF flexibility – the possibility of using a certain pool of units from LULUCF removals to account for the emissions from the non-ETS sectors,
- compliance – an additional pool of AEA units – compliance for Poland will involve a certain additional pool of AEA units (7,456,340 t CO<sub>2</sub> eq.) which would increase on a one-off basis the annual emission allocation, to be added in the first year of the trading period,
- the safety reserve – an additional pool of AEA units (105 million t CO<sub>2</sub> eq.) for eligible Member States, which may be awarded to them at the end of the trading period after specific conditions are satisfied.

The regulations on the non-ETS area only set out the national reduction targets and the accounting rules for their achievement. It is only the implementation of policies and measures in specific sectors in the non-ETS that will be translated into the achievement of that reduction target. These sectoral policies and measures are described in subsequent parts of this section. In turn, the issue of accounting for the achievement of the target is addressed in Section 3.

#### 4.1.3 Policies and measures in the energy sector

##### *Key strategies, plans and programmes*

The table below lists the key strategies, plans and programmes in the energy sector which affect its functioning and condition the protection of the environment and climate.

Table 4.8. Key strategies, plans and programmes in the energy sector

Document	Description
Energy Policy of Poland until 2030, adopted by the Council of Ministers on 10 November 2009	The document includes a long-term strategy for development of the energy sector, a projection of fuel and energy demand, and the action plan until 2012. The implementation of the solutions indicated in the document will help to meet the growing energy demand, develop production and transport infrastructures and lessen the dependence on external natural gas and oil supply, as the well as fulfill international environmental commitments. At present, work is underway on the Energy Policy of Poland until 2040.

Document	Description
Polish Nuclear Energy Programme, adopted by the Council of Ministers on 28 January 2014	The Programme diversifies the Polish energy mix by using nuclear energy. Among others, it sets out the timetable for the construction of a nuclear power plant in Poland and the preparation of the regulatory and management structure for the purposes of this investment project.. The document defines the roles and responsibilities of institutions for the implementation of the Programme and the issues related to ensuring nuclear safety and radiological protection. The Programme also contains an economic justification for the implementation of nuclear energy in Poland and addresses the possibilities of its financing and the methods for handling spent nuclear fuel and radioactive waste.
National Action Plan for Energy from Renewable Sources adopted by the Council of Ministers on 7 December 2010	The document sets out the measures to promote the use of RES, including those designed to enable Poland to achieve its 2020 RES target of a 15% share of RES in the final gross energy consumption. It contains projections of the achievement of this target in a sustainable manner, taking many factors into account, including such ones as the resources of RES and raw materials for fuel production, as well as the legal status of the power grid. It assumes that the pillars for enhancing the use of RES will include a greater use of biomass and wind-based electricity.
Fourth National Energy Efficiency Action Plan for Poland, adopted by the Council of Ministers on 23 January 2018	The document lays down the measures to improve energy efficiency in final energy consumption broken down into end-use sectors and the calculations of final energy savings achieved in the period from 2008 to 2015 and planned to be achieved in 2020.
National Plan to Increase the Number of Low-Energy Buildings, adopted by the Council of Ministers on 16 July 2015	The Plan defines low-energy buildings, their specific characteristics and the measures to be taken by the government administration to promote low-energy buildings, also in the scope of their design, construction and reconstruction in a way which ensures energy efficiency, and to increase the share of renewable energy in new and existing buildings.
“Clean Air” Priority Programme launched in September 2018	It is a comprehensive programme with the aim of reducing or avoiding the emissions of particulate matter and other pollutants released into the atmosphere from single-family houses. The programme focuses on the replacement of solid fuel-fired furnaces and boilers and thermal modernisation of buildings in order to effectively manage energy.

Source KOBiZE, IOŚ-PIB

### Key legal acts

The table below lists the key legal acts in the energy sector which affect its functioning and condition the protection of the environment and climate.

Table 4.9. Key legal acts in the energy sector

Title	Description
<b>Energy generation</b>	
Act of 10 April 1997 on Energy Law (Official Journal of the Laws of 2019, Item 755, as amended)	The Act lays down the rules for shaping the national energy policy, the rules and conditions for the supply and use of fuels and energies, including heat, and the operations of energy enterprises, and also specifies the authorities competent for fuel and energy management. Its aim is to create the conditions for the sustainable development of the country, to ensure energy security, the economical and rational use of fuels and energies, the development of competition, to prevent the adverse impacts of natural monopolies, to take into account the requirements of environmental protection and the commitments under international agreements, and to balance the interests of energy enterprises and energy and fuel users.
Act of 20 February 2015 on Renewable Energy Sources (Official Journal of the Laws of 2018, Item 2389, as amended)	The Act lays down the rules and conditions for carrying out operations in the scope of the production of electricity from renewable energy sources and agricultural biogas in RES installations and bioliquids. Moreover, it sets out mechanisms and instruments to support the production of electricity from renewable energy sources, agricultural biogas and heat in RES installations. It also regulates the rules for issuing guarantees of origin for electricity generated from RES, the principles of the implementation of the national action plan for energy from RES and the conditions and procedures for certifying the installers of microinstallations, small installations and RES installations with total installed thermal capacity exceeding 600 kW. It lays down the principles of international cooperation on RES and joint investment projects. The Act contains a number of solutions designed to create a stable environment for enhancing generation in the sector of renewable energy sources. They include: the auction system, transitional solutions for the system of green certificates, net-metering for prosumers and energy clusters.
Act of 20 May 2016 on Investments in Wind Power Plants (Official Journal of the Laws of 2019, Item 654)	The Act lays down the conditions and procedures for the location and construction of wind turbines and the conditions for the location of wind turbines in the vicinity of existing or planned housing.
Act of 14 December of 2018 on the Promotion of Electricity from High-Efficiency Cogeneration (Official Journal of the Laws of 2019, Item 42)	The Act lays down the conditions for the award of support for electricity from high-efficiency cogeneration generated in cogeneration units and for the issue of guarantees of origin for electricity from high-efficiency cogeneration. The Act introduces an action-based system of support for high-efficiency cogeneration. The support is awarded for the maximum period of 15 years, counting from the date of the conclusion of an auction.
Act of 25 August 2006 on Biocomponents and Liquid Biofuels (Official Journal of the Laws of 2019, Item 1155)	The Act lays down the rules for carrying out economic activities in the scope of the production of biocomponents, the import or intra-Community purchase of biocomponents, the farmers' production of liquid

Title	Description
	<p>biofuels for their own use, the performance of economic activities in the scope of the placing on the market of biocomponents and liquid biofuels, the determination and implementation of the National Indicative Target, the confirmation of compliance with the sustainability criteria, the performance of economic activities in the scope of the award of authorisation for the use of a recognised certification and the performance of economic activities in the scope of the issue of certificates. Moreover, it regulates the rules for carrying out inspections, preparing reports and the procedure for submitting reports. It implements the requirements of Directive 2009/28/EC for achieving the target of a 10% share of renewable energy in transport in 2020 and introducing sustainability criteria for biocomponents and liquid biofuels.</p>
<p>Act of 25 August 2006 on the Fuel Quality Monitoring and Control System (Official Journal of the Laws of 2019, Item 660)</p>	<p>The Act lays down the rules for the organisation and operation of a system for monitoring and controlling the quality of fuels intended for use in vehicles, including agricultural tractors, off-road machinery, recreation-related floating vessels, combustion plants and inland navigation vessels, selected fleets and by farmers for their own use. Moreover, it regulates the rules for monitoring and using certain means of reducing GHG emissions in the life cycle of fuels used in transport and electricity used in motor vehicles. The Act also lays down the rules for controlling the quality of solid fuels.</p>
<p>Regulation of the Minister of the Economy of 21 November 2005 on the technical conditions to be met by terminals and stations of liquid fuels, long-distance pipelines for transfer of crude oil and its products, and their location (Official Journal of the Laws of 2014, Item 1853)</p>	<p>The Regulation regulates the issues of the hermetic storage and distribution of liquid fuels with a view to limiting their losses.</p>
<p>Act of 6 December 2008 on the Excise Duty (Official Journal of the Laws of 2018, Item 864, as amended)</p>	<p>The Act lays down, among others, the excise duty rates for excise goods, including motor petrol and diesel oil.</p>
<p><b>Energy consumption and energy efficiency</b></p>	
<p>Act of 20 May 2016 on Energy Efficiency (Official Journal of the Laws of 2019, Item 545)</p>	<p>The Act defines the rules for the development of the national energy efficiency action plan and establishes the rules, among others, for the fulfillment of the obligation to save energy and to carry out the energy audit of an enterprise. The Act also identifies the energy efficiency tasks of public sector entities, introduces changes to the white certificate scheme – energy efficiency certificates which confirm the implementation of measures which have brought specific energy savings. The Act specifies the energy efficiency targets to be achieved by public sector authorities and entities by 2020.</p>

Title	Description
Act of 14 September 2012 on the Obligation to Provide Information on Energy Consumption by Energy-Using Products (Official Journal of the Laws of 2012, Item 1203, as amended)	The Act lays down the obligation to provide information on the consumption of energy and other basic resources by energy-using products the requirements for which concerning the preparation of technical documentation and the use of labels and sheets are set out by acts of the European Commission, or on the impact of these products on energy consumption. It introduces the rules for the organisation and operation of the system for controlling the fulfilment of the obligation to provide information.
Act of 21 November 2008 on Support for Thermal Modernisation and Renovation (Official Journal of the Laws of 2017, Item 130)	The Act lays down the rules for using the resources of the Thermal Modernisation and Renovation Fund to cover part of the costs of thermal modernisation and renovation projects.
Act of 29 2014 on the Energy Performance of Buildings (Official Journal of the Laws of 2018, Item 1984, as amended)	The Act lays down the rules for drawing up energy performance certificates for buildings, the rules for inspections of the heating and air-conditioning systems in buildings and the rules for keeping the central register of energy performance certificates for buildings. It also sets out the manner of preparing the national action plan to enhance the number of low-energy buildings.
Regulation of the Minister of Infrastructure of 12 April 2002 on the technical conditions to be met by buildings and their situation (Official Journal of the Laws of 2019, Item 1065)	This Regulation is the main implementing act for the Act of 7 July 1994 on Construction Law the provisions of which apply to the design, construction, reconstruction and a change in use of buildings and aboveground and underground buildings fulfilling the utility functions of buildings, among others, also addressing the issues of energy efficiency and thermal insulation of buildings in Poland.

Source: KOBiZE, IOŚ-PIB

## *Policies and measures*

### **Energy generation**

#### **Measure 3: Development of RES (a group of measures)**

Greenhouse gases affected: CO<sub>2</sub>, N<sub>2</sub>O, CH<sub>4</sub>

#### Context

The energy generation from renewable sources is an important element of measures to reduce its emission factors, to ensure energy supply diversification and to satisfy the growing demand for energy. It is also an expression of the care for the natural environment and a response to the need to promote sustainable development and to enhance the strength of regions and local communities.

The drawing up of a document laying down measures to develop and support RES (i.e. the National Renewable Energy Action Plan, KPD) has fulfilled the obligation under Directive of the European Parliament and of the Council 2009/28/EC of 23 April 2009 on the promotion of the use of energy from renewable sources (the RES Directive) The KPD defines the path for achieving a 15% share



(Poland's target) of energy from renewable sources in the final energy consumption, broken down into three sectors: electricity, heat and cold, and transport (in the latter, the share of energy from renewable sources should be at least 10%). On its basis, a number of measures with a different character are, therefore, taken (e.g. grants, loans, reliefs, subsidies etc.) to promote a higher share of RES in energy generation and consumption.

#### Aim

Increasing the share of RES in Poland's energy mix and achieving in 2020 a 15% share of RES in the final energy consumption, as determined for Poland under the RES Directive.

#### Characteristics

The development of energy from renewable sources is supported by various instruments and measures. The most important ones include e.g.:

#### ***The system of certificates of origin for RES***

Status: implemented

In 2005, certificates of origin for energy from renewable sources and property rights as tradable instruments were introduced (certificates of origin and the property rights to them are called green certificates). The obligation to register all transactions on green certificates at the Polish Power Exchange in Warsaw was introduced.

The most important elements of the green certificate scheme include:

- a statutory obligation to surrender for cancellation certificates of origin for energy from renewable sources, with their number corresponding to a predetermined percentage share of this energy in the total supply to the end users,
- the award of 1 certificate of origin for 1 MWh of electricity from RES, irrespective of technology,
- the need to pay a substitution fee in case of failure to purchase certificates of origin, with their number corresponding to a predetermined share; the rate of the substitution fee has been set on the basis of the difference in energy prices between the green energy segment and the open market and the reasonable revenues for the cheapest RES (PLN 240/MWh<sup>12</sup>).

After the green certificate scheme had been established the electricity generation from RES began to quickly develop, mostly in wind power plants with investment support and from biomass using the low-outlay co-incineration technology. In 2012, the too fast development of wind farms and co-incineration produced a surplus of supply over demand in the certificates-based support system and a sharp fall in the prices of green certificates. In order to address the arising problems, a decision was taken to reform the RES support system, which led to the adoption of a new Act on RES in 2015 and new support systems.

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<sup>12</sup> The unit substitution fee was established in the Act on Energy Law at rate of PLN 240 PLN per 1 MWh in 2006. This fee was valorised annually on the basis of the mean annual total consumer price index for the calendar year preceding the year for which the substitution fee is calculated.

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***The auction-based RES support system***

Status: implemented

The auction-based support model, adopted under the RES Act in 2015, ensured that investors could use stable support for RES generators and also avoid the adverse consequences related to the previous support system, which had been based on the system of certificates of origin, i.e. the so-called green certificates.

Such an approach ensures fair competition between technologies and equal chances of individual generators by introducing the so-called “technology baskets” at auctions and creates a separate auction basket for electricity from agricultural biogas. The system covers new RES generators and already existing RES generators which have decided to shift from the green certificate scheme to the auction system.

The auction system consists in that the Government orders a specific amount of renewable energy and its generators take part in an auction. The auction is won by those participants who offer the lowest electricity sale price until the amount or value of the electricity to be sold at a given auction is exhausted. The support period is 15 years, counting from the date when the production starts at the RES installation.

The first auction took place in December 2016. Auctions are organised by the President of the Energy Regulatory Office (ERO) at least once a year, with a breakdown into technology baskets, separately for new and existing installations, and with a breakdown based on the capacity of installations, i.e. below and above 1 MW. Every year, the Council of Ministers defines and announces the total amount and value of energy from renewable sources to be offered for sale at auctions. In turn, the Minister responsible for energy sets the reference prices of electricity from renewable energy sources. The reference prices are diversified, depending on the type and capacity of RES installations. The current rates vary<sup>13</sup> from PLN 285/MWh (onshore wind) to PLN 700/MWh (agriculture biogas from CHP plants with capacity of less than <500 kW).

The generators and the support system dedicated to the RES sector can be financed due to the RES fee. The RES fee is a variable fee depending on the electricity consumption by a given end-user, thus ensuring a fair and proportional value of this fee. It is incurred by all electricity users.

***Feed in tariffs and feed in premium***

Status: implemented

The support system in the form of feed-in tariff (FIT) and feed-in premium (FIP) added to the market price also have their legal basis in the RES Act. It is addressed to RES generators with the lowest capacity and serves to manage the energy which has not been used by a small generator.

The FIT system can be used by those who generate electricity from RES in an a small installation or a micro-installation and who sell or will sell unused electricity to a designated energy trading company. In turn, the FIP system is intended for those who generate electricity from RES, with

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<sup>13</sup> The Regulation of the Minister of Energy of 15 May 2019 on the reference price of electricity from renewable energy sources in 2019 and the periods awarded to the generators which have won auctions in 2019 (Official Journal of 2019, Item 1001)

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the total electrical capacity not exceeding 1 MW, and who sell or will sell unused electricity to a chosen entity.

The constant purchase price in the FIT/FIP systems is 90% of the reference price as set for a given calendar year by way of a Regulation of the Minister of Energy, valid as of the date when the FIT/FIP declaration is submitted. The constant purchase price is subject to annual valorisation.

### ***Grants and returnable assistance to support the generation of electricity and heat from RES***

Status: implemented

EUR 142.5 million has been allocated to support the generation of electricity and heat from RES under the Operational Programme Infrastructure and Environment 2014-2020. Under the Regional Operational Programmes (ROPs), an amount of about EUR 890 million has been allocated, including an amount of about EUR 50 million in the form of returnable instruments. Support for the production of biofuels can be awarded under seven ROPs as part of measures dedicated to RES. The resources for these purposes can be spent until 2023. The resources are managed by the NFOŚiGW, WFOŚiGW and local governments of Voivodeships. Several examples of **grants** awarded are given below:

- NFOŚiGW: The “My Power” Programme with a budget of PLN 1 billion is an instrument dedicated to supporting the development of prosumer energy generation; specifically, the segment of photovoltaic (PV) microinstallations. It provides for cofinancing of the purchase and assembly of a PV installation up to an amount of PLN 5,000 and not more than 50% of the costs of an installation with the generation capacity of 2 to 10 kW. The beneficiaries are natural persons generating electricity to meet their own needs who have signed a comprehensive agreement governing the issues related to the feeding of the electricity generated in a microinstallation into the power grid. The first call for applications covered the period from 30.08.2019 to 31.12.2019. This Programme is implemented as part of the Green Investment Scheme (GIS).
- Mazowieckie Voivodeship: Cofinancing can be awarded e.g. for the purchase and assembly of indispensable equipment of the infrastructure designed to generate electricity and heat using wind energy, solar energy (photovoltaics and solar collectors), biomass, biogas, geothermal energy, heat pumps and water. In addition, investment projects may include the construction or reconstruction of an installation already using RES. The applicant may also propose the construction or reconstruction of an external electrical or thermal installation designed to connect an energy generating source to the site to be supplied. It is also possible to connect an installation to a distribution or transmission network. The eligible costs of a project will include expenditures on the metering of a RES installation and the systems for storing the electricity or heat generated – up to, as a maximum, 10% of eligible expenditures. All the earthworks as well surveying, installation, demolition and construction works also fall within the scope of the support offered. The envelope of the resources under the ROPs 2014-2020 is PLN 8.6 million. The minimum amount of cofinancing is PLN 100,000. Depending on its size, an enterprise must provide resources from its own budget to cover the costs of the investment (30-50%).
- Podlaskie Voivodeship: Support is given to investment projects to build new units for electricity generation from RES (biomass, biogas, wind energy, solar energy, water energy

and geothermal energy) or enhance the capacity of existing units, along with the connection to the distribution/transmission network. The capacity of installations may not exceed:

- water energy – 5 MWe,
- wind energy – 5 MWe,
- solar energy – 2 MWe/MWth,
- geothermal energy – 2 MWth,
- biogas energy – 1 MWe,
- biomass energy – 5 MWth/MWe.

Cofinancing is not available for co-incineration of biomass and coal. Projects must contribute to the achievement of the national target of a 15% share of RES in the energy consumption in 2020 and must ensure respect for the environment and landscape protection. Preference is given to microinstallations designed to produce energy from biogas and installations using solar energy. The rate of cofinancing may not exceed 85% or, in the case of farmers, 65%.

Moreover, **loans** are also available:

- E.g., as part of its ROP, in Pomorskie Voivodeship, a RES loan is available for financing of projects which involve installations generating energy from renewable sources, with a reasonable expected environmental effect and cost-effective. Preferential financing can be sought by investors who propose to build in the territory of Pomorskie Voivodeship installations, including microinstallations, generating electricity or heat, also in the cogeneration process, from renewable energy sources, such as biogas, biomass, solar energy, geothermal energy or water energy. Preference is given to projects corresponding with the municipal documents on low-emission economy and energy supply, projects using innovative solutions in their equipment and systems, as well projects ensuring the highest environmental effect relative to their financial outlays. The maximum amount of a loan which can be obtained under an agreement is PLN 15 million. The maximum repayment period is 15 years. The Interest can be from 0.25% per year and a loan can be granted without a commission. The Pomeranian Loan Fund is the financial intermediary which gives such loans.
- Preferential loans for investments in RES are also given by the Bank for Environmental Protection (Bank Ochrony Środowiska, BOŚ). The “Credit with Climate” offered by BOŚ includes financing for investment projects corresponding with the Climate Change Action Programme, as implemented under the European Fund for Strategic Investments (EFIS).

### ***Grants to support the production of biocomponents and biofuels***

Status: implemented

Grants to support the production of biocomponents and biofuels are available under the European Funds, also as part of seven Regional Operational Programmes (ROPs) for 2014-2020 in the area of measures dedicated to RES. These Programmes are managed by the local Voivodeship authorities. Two examples are given below:

- Podlaskie Voivodeship: Cofinancing is available for projects to develop the infrastructure designed to produce biocomponents and biofuels mostly from waste raw materials and

residues from agricultural production and the agri-food industry. The precondition is that the biofuels produced are used to meet the own needs (agricultural production) of agricultural holdings. The infrastructure built must not be used to produce biofuels from food plants. Support is available for the production of biofuels e.g. from oilseeds cultivated in coordination, on the condition that this will not cause competition for the agricultural production space and will significantly contribute to the reduction of greenhouse gas emissions, enhancing energy security and improving the economic conditions in the region. The rate of cofinancing may not exceed 85% of eligible costs. The beneficiaries can include: micro-, small and medium-sized enterprises (in the case of SMEs, the energy generation for sale must dominate the total energy produced by the equipment financed under a project), large enterprises where energy generation is not the core activity, agricultural producers, producer groups, cooperatives, housing associations, social housing companies, non-governmental organisations, churches and religious associations, territorial self-government units, their unions, alliances and associations, organizational units of territorial self-government units having legal personality, public finance sector units having legal personality (not mentioned above), entities operating as part of public and private partnerships and distribution system operators (DSOs). (Status: implemented)

- Świętokrzyskie Voivodeship: Support can be sought for the construction of an installation producing biocomponents and biofuels of the second and third generations. The basic rate of cofinancing for a project is 85% of eligible costs. In the case where the support for a project is state aid, the maximum rate of cofinancing for a project results from the regulations setting out the rules for the award of state aid. The beneficiaries may include: territorial self-government units or entities acting for them, large, medium-sized, small and micro enterprises carrying out their activities in the territory of Świętokrzyskie Voivodeship, including agri-food producers, universities, unions and associations of territorial self-government units, medical entities carrying out medical activities financed from public resources in the territory of Świętokrzyskie Voivodeship and state budget-supported units. (Status: implemented)

Moreover, in 2018, an amendment to the Act on Biocomponents and Liquid Biofuels and Certain Other Acts established the Low-Emission Transport Fund with the task of supporting the expansion of the alternative fuel infrastructure and creating the market of vehicles using alternative fuels. The 10-year budget of the Fund is about PLN 6.7 billion. It has dedicated resources to support, among others, investments projects to produce biocomponents and biofuels. The scope of projects which may be cofinanced is very wide – support may be provided, among others, to both producers of means of transport, local governments which invest in clean public transport, producers of biocomponents and entities wishing to buy new vehicles. The first competitions are expected to be announced in the 3<sup>rd</sup> quarter of 2019.

**Measure 4: Development of high-efficiency cogeneration (a group of measures)**

Greenhouse gases affected: CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub>

**Context**

The electricity generation from high-efficiency cogeneration makes it possible to limit the adverse impact of the energy sector on the environment, while, at the same time, ensuring the security of heat and electricity supply and improving the efficiency of the use energy carriers. However, the development of this technology needs support. The Act on the Promotion of Electricity from High-Efficiency Cogeneration, which entered into force on 25 January 2019, (the CHP Act), established a new country-wide system of support for cogeneration units in the form of a premium paid to generators in addition to the electricity price, replacing the mechanism of certificates of origin from cogeneration which had been applied until then. Moreover, other measures are taken to support the development of this technology.

**Aim**

Ensuring the stability for those who invest in CHPs and, as result of the further development of this technology, reducing the greenhouse gas emissions from the energy sector.

**Characteristics**

The development of high-efficiency cogeneration in Poland is supported primarily with the cogeneration premium system and other legal and financial measures. The major measures are described below:

***Cogeneration premium*****Status: adopted**

The new system of support for high-efficiency cogeneration includes a system of premiums to the electricity generated at CHP plants – awarded under different rules, depending, among others, on the size and type of CHP installations:

- A cogeneration premium for:
  - new and substantially modernised cogeneration units with installed electrical capacity of 1-50 MW which win auctions announced, implemented and resolved by the President of the Energy Regulatory Office (ERO).

Auctions will be held at least once a year. The maximum support period is 15 years (from the first day following the date of the resolution of an auction, the generation, feeding into the grid and sales of electricity, but not longer than until 31.12.2048. The maximum amount of electricity from high-efficiency cogeneration the sales of which may be subject to a cogeneration premium is 6 TWh in 2019 and 24 TWh in 2020, while the maximum budget for these premiums is, respectively, about PLN 1 billion and about PLN 4 billion.

- A guaranteed premium for:
  - existing and modernised cogeneration units with installed electrical capacity of 1-50 MW, and

- new, substantially modernised, existing or modernised small cogeneration units (with installed electrical capacity of less than 1 MW).

The value of the premium is set by the Minister of Energy in a relevant Regulation. The maximum support period is 15 years (from the first generation of electricity), but not longer than until 31.12.2035 (existing CHP plants) or 13.12.2048 (new and substantially modernised CHP plants). Support for modernised units is awarded for a period of 5-7 years, but not longer than until 2036. The unit rate of the premium depends on the type of installation and fuel, and is, as a maximum, about PLN 290/MWh.

- An individual cogeneration premium for:
  - new and substantially modernised cogeneration units with installed electrical capacity of 50 MW and more which win calls for applications announced and implemented by the President of the Energy Regulatory Office (ERO).

The maximum amount of electricity from high-efficiency cogeneration the sales of which may be subject to an individual cogeneration premium in 2019 and 2020 is 36 TWh, while the maximum total value of premiums awarded is about PLN 4 billion in each of these periods. The unit rate of the premium depends on the type of installation and fuel, and is, as a maximum, about PLN 290/MWh.

- A guaranteed individual premium for:
  - existing and modernised cogeneration units with installed electrical capacity of 50 MW and more.

The value of the premium is determined on a case by case basis by a decision of the President of the ERO.

Before they obtain the support, all the cogeneration units will need to be authorised by a decision of the President of the ERO to participate in the relevant scheme (the procedure in this matter will be carried out at the request of an entrepreneur). A CHP unit which seeks support must meet the condition of a unit CO<sub>2</sub> emission factor at a level not exceeding 450 kg per 1 MWh of energy generated. At present, the formal preparations for the actual launch of the scheme are being finalised, including the implementation of the first auctions and calls for applications for guaranteed premiums. This new scheme of support for cogeneration will be financed with a cogeneration fee which will be shifted onto end-users.

### ***Preferences for the generators of electricity from high-efficiency cogeneration***

Status: implemented

The Polish regulations provide for the preferential treatment of the generators of electricity from high-efficiency cogeneration, including the following:

- the power grid operator is obliged to give priority to all entities in the provision of the services involving the transmission or distribution of electricity generated from high-efficiency cogeneration,
- the power grid operator is obliged to use electricity generated from high-efficiency cogeneration at sources located in the territory of the Republic of Poland which are connected directly to the network of that operator,



- the obligation to connect an existing heating network or to equip with an individual renewable heat source, a source of heat from cogeneration or a waste heat source new sites - located in the area where there are the technical conditions for the supply of heat from an energy efficient heating or cooling system - which are not connected to the heating or cooling network or equipped with an individual heat source and where the expected peak thermal capacity of installations and equipment designed to heat that site is 50 kW or more.

### **Grants and loans for high-efficiency cogeneration**

Status: implemented

There is a number of programmes which support investment projects to build new high-efficiency units and to modernise/expand electricity and heating networks. The support offered is awarded on a case by case basis after a relevant application is submitted and the requirements of a given programme are satisfied. The table below lists examples of programmes which provide support in this area.

Table 4.10. Programmes which provide support for improvements in the efficiency of energy generation and supply

Title	Key information on the programme
NFOŚiGW – Support for projects in the scope of a low emission and resource efficient economy – Part 3) Efficient heating and cooling systems	<p><b>Aim:</b> The alignment of existing heating and cooling systems with the requirements arising from the definition of an energy efficient heating and cooling system. As part of this measure, support is provided to projects implemented in an existing enterprise or industrial plant for the construction or reconstruction of generating units, along with their connection to a distribution or transmission network in order to ensure that the heating grid where they operate meets the definition of an <i>energy efficient heating system</i>.</p> <p><b>Budget:</b> PLN 500 million</p> <p><b>Implementation period:</b> 2016-2023</p> <p><b>Form of cofinancing:</b> Loans</p> <p><b>Beneficiaries:</b> Entities carrying out an economic activity in the form of an enterprise within the meaning of Article 55 of the Act of 23 April 1964 on the Civil Code, where the main purpose of that activity is heat generation for municipal and housing purposes (at least 30% of the heat flux generated).</p>
Operational Programme Infrastructure and Environment 2014–2020  Measure 1.5 - Effective distribution of heat and cold  Submeasure 1.7.2 - Effective distribution of heat and cold in Śląskie Voivodeship	<p><b>Aim:</b> Improving air quality by reducing the emissions of pollutants which are particularly harmful to the quality of human life, i.e. reducing the so-called “low emissions” in areas where the allowable PM10 concentrations are exceeded. The investment projects are expected to contribute to reducing non-renewable primary energy consumption, carbon dioxide emissions and particulate matter emissions into the atmosphere. As part of this measure, support is provided to improve the efficiency of heat transmission and distribution to existing users; in particular, through the modernisation and reconstruction of heating networks and the liquidation of collective and individual sources of the so-called low emissions, including those at residential buildings, through their connection to efficient heating and cooling systems.</p> <p><b>Budget:</b> EUR 346.05 million</p> <p><b>Implementation period:</b> 2014-2023</p> <p><b>Form of cofinancing:</b> Grants</p> <p><b>Beneficiaries:</b> Entrepreneurs, territorial self-government units and</p>



Title	Key information on the programme
Operational Programme Infrastructure and Environment 2014–2020 Sub-measure 1.6.1 – High-efficiency cogeneration sources Sub-measure 1.7.3 - Promoting the use of high-efficiency cogeneration of heat and electricity in Śląskie Voivodeship	organisational units acting for them, housing cooperatives, entities providing public services as part of the implementation of the own tasks of territorial self-government units, which are not entrepreneurs. <b>Aim:</b> Achieving savings of the primary energy consumption. Support is provided for the construction of new units generating electricity and heat using the high-efficiency technology in cogeneration units or for enhancing the capacity of existing units (as a result of their expansion or reconstruction). Priority will be given to projects with the highest potential for reductions in carbon dioxide emissions per unit of cofinancing which also enable the largest reduction in particulate matter emissions into the air. <b>Budget:</b> EUR 335.12 million <b>Implementation period:</b> 2014-2023 <b>Form of cofinancing:</b> Grants <b>Beneficiaries:</b> Entrepreneurs, territorial self-government units and organisational units acting for them, entities providing public services as part of the implementation of the own tasks of territorial self-government units, which are not entrepreneurs, housing cooperatives, entities which are energy services providers within the meaning of Directive 2012/27/EO which act in favour of territorial self-government units.

Source: KOBiZE, IOŚ-PIB

### **Measure 5: Implementation of nuclear energy**

Greenhouse gases affected: CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O

Status: implemented

#### Context

The Polish Nuclear Power Programme (PPEJ) was adopted in 2014 as the first comprehensive document to address nuclear energy in Poland. The implementation of nuclear energy in Poland will require the construction of almost all the technical infrastructure necessary for the development of nuclear energy (legal, organisational and related to supporting scientific centres and human resource training). The Programme will be implemented from 2011 to 2030. The costs of its implementation have been estimated until the end of the implementation of the first main stage – the commissioning of the first nuclear power plant. It is expected that the Programme will be updated every 4 years, which will also enable the verification of data on the necessary costs of its implementation.

#### Aim

The implementation of nuclear energy in Poland, which will contribute to ensuring the supply of an adequate quantity of electricity at prices which the economy and the public can accept, while, at the same time complying with the requirements of environmental protection.

### Characteristics

The Polish Nuclear Power Programme (PPEJ) sets out the scope and organisational structure of actions which need to be taken to implement nuclear energy in Poland and to ensure the safe and efficient operation of nuclear power facilities, their closure after their operating period is over and the safe handling of spent nuclear fuel and radioactive waste. They include the following elements:

- the elaboration and update of the legal framework for the development and functioning of nuclear energy,
- ensuring the highest achievable safety level at nuclear power plants,
- the introduction of a rational and efficient system for handling radioactive waste and nuclear fuel, including the construction of a new storage site for medium- and low-activity radioactive waste,
- the development of the institutional support for nuclear energy,
- increasing and maintaining the public support for the development of nuclear energy, among others by raising the level of knowledge of the public in this field,
- strengthening the national system for responding to a radiological emergency from the point of view of the functioning of nuclear energy, including the strengthening the national system of radiological monitoring,
- the recruitment of skilled human resources for the development and functioning of nuclear energy,
- the creation of strong and effective scientific research support for nuclear energy,
- raising the innovativeness and technological quality of the Polish industry,
- ensuring the conditions for stable fuel supply to nuclear power plants,
- the preparation of the National Power System (KSE) for the development of nuclear energy,
- the creation of stable economic and financial conditions for the development of nuclear energy.

It is expected that the introduction of nuclear energy will have a positive effect, among others, on diversification of energy sources and help stabilise energy prices. It will also reduce the emission factor of the Polish energy sector and, thereby, improve the quality of the environment and bring economic benefits. Moreover, it will improve the competitiveness of the Polish economy with respect to the economies of the other EU Member States.

The PPEJ provides for the installation of 4.5 GW of nuclear capacity. The first unit is expected to be commissioned in about 2025-2026, to be followed by subsequent ones by 2030. Most likely, these dates will be delayed, as under the present assumptions laid down in the draft Energy Policy of Poland until 2040<sup>14</sup>, the first unit (of about 1-1,5 GW) is expected to be commissioned in 2033, to be followed in the successive years (until 2043) by the commissioning of successive five such units (with a total capacity of 6-9 GW).

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<sup>14</sup> Draft Energy Policy of Poland until 2040, <https://www.gov.pl/web/energia/polityka-energetyczna-polski-do-2040-r-zapraszamy-do-konsultacji1>

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**Measure 6: Support for and development of the use of coalbed methane**

Greenhouse gases affected: CH<sub>4</sub>

Status: implemented

Context

The Polish mining and energy companies, including Polish Oil and Gas (PGNiG), Polish Mining Group (PGG), Jastrzębie Coal Company (JSW) and Tauron Group have entered into cooperation to use coalbed methane (under the Geo-Metan Programme). As part of the Programme, they cooperate to develop innovative coalbed methane production technologies. The development and improvement of domestic technologies related to mining corresponds with the Strategy for Responsible Development.

Aim

Increasing the extent of coalbed methane production, which will improve safety at mines and contribute to the development of innovative coalbed methane production technologies, coupled with methane removal from mines.

Characteristics

In Polish mines, for many years methane has been removed from coal beds to control the methane hazard and to ensure the safety of miners and mining works. The extracted methane is used as an energy source in heating and cogeneration installations for combined heat and power production in gas engines.

Together with the Polish Geological Institute – National Research Institute (PIG-PIB), Polish Oil and Gas extracts on a trial basis methane from coal deposits in Gilowice in Śląskie Voivodeship. During the trial production since February 2017 almost 900,000 m<sup>3</sup> of natural gas with high methane content has been extracted. As estimated by the PIG-PIB, the extractible methane resources in coal beds in the Upper Silesian Coal Basin amount to about 170 billion m<sup>3</sup>.

Due to the cooperation of Polish mining and energy companies, prospecting and exploration works can be carried out in the mining areas where coal extraction is planned. It is expected that as much as 1-1.5 billion m<sup>3</sup> of gas can be extracted annually. At present, the natural gas extraction in Poland varies between 4 and 4.5 billion m<sup>3</sup>.

**Measure 7: Reduction of methane emissions from fuel production and distribution processes**

Greenhouse gas affected: CH<sub>4</sub>

Status: implemented

Context

The requirements for reducing losses during the storage and transmission of liquid fuels were set by the Regulation of the Minister of the Economy of 21 November 2005 on the technical conditions to be met by terminals and stations of liquid fuels, long-distance pipelines for transfer of crude oil and its products, and their location.

### Aim

Reduction of methane emissions from the storage and transmission of liquid fuels.

### Characteristics

Legal regulations have been issued on the hermetisation of the distribution of liquid fuels, imposing the obligation to equip liquid fuel depots with installations for hermetic storage, filling and emptying Class I petroleum products, to limit the annual losses of these petroleum products at the storage installation of liquid fuel depots to less than 0.01% of their capacity, which means that the issue has been resolved.

## **Energy consumption and energy efficiency**

### ***Measure 8: Improvement of energy efficiency (a group of measures)***

Greenhouse gases affected: CO<sub>2</sub>, N<sub>2</sub>O, CH<sub>4</sub>

### Context

The promotion of the improvement of energy efficiency has its legal basis in EU regulations (Directive 2012/27/EU on energy efficiency) and in national regulations (the Act of 20 May 2016 on Energy Efficiency). On their basis, the National Energy Efficiency Action Plan (KPD) is prepared. To date, four such documents have been issued. They contain information, broken down into sectors, on measures to improve energy efficiency. Therefore, these documents provide the basis for the launch of national measures in this scope. The KPD established the 2020 national energy efficiency target. The target is the achievement a reduction in the primary energy consumption by 13.6 Mtoe in the period from 2010 to 2020, which, in consequence, also means an improvement in the energy efficiency of the national economy.

### Aim

The improvement of energy efficiency in the particular sectors of the economy and the achievement of the established target reduction in the primary energy consumption.

### Characteristics

The improvement of energy efficiency is one of the priorities of the national energy policy. The measures in this scope are intended to diminish the energy intensity of the economy with investment projects in enterprises, the heating sector and the end-use of energy (thermal modernisation in construction, fuel efficiency in transport and the rational use of energy by end-users).

The improvement of energy efficiency is supported and promoted in different areas through multiple measures and programmes in the municipal and housing sector, transport, industry and energy generation. Very important financial instruments supporting the implementation of energy-saving investment projects in Poland include the programmes implemented by the National Fund for Environmental Protection and Water Management (NFOŚiGW) and the Voivodeship Funds for Environmental Protection and Water Management, the resources from the Operational Programme

Infrastructure and Environment (POIŚ), Regional Operational Programmes (ROPs), the Bank for Environmental Protection (BOŚ) and the Thermal Modernisation and Renovation Fund. The most important measures are presented below.

### **White certificate scheme**

Status: implemented

The basic mechanism used in Poland to support energy efficiency is the scheme of energy efficiency certificates, so-called “white certificates”. This scheme was established under the Act on Energy Efficiency<sup>15</sup>.

A statutory obligation to implement a project to improve energy efficiency on the users’ premises or to achieve and surrender for cancellation to the President of the Energy Regulatory Office (ERO) a specific quantity of final energy savings attested by a certificate (a white certificate) has been imposed on energy companies selling electricity, heat or natural gas to end-users.

An allowable manner of fulfilling the obligation is the conditional possibility of paying a substitution fee, while the proceeds from this fee are allocated to the implementation of projects to improve energy efficiency on the users’ premises and the entity which disposes of the proceeds from this fee submits to the Minister of Energy a report on the amount of resources allocated to the implementation of these projects and the final energy savings achieved. Energy efficiency certificates carry tradable property rights which are exchanged commodities and are traded on a commodity exchange or a regulated market.

The white certificate scheme supports the implementation of investment projects, such as e.g. the insulation of industrial installations, the reconstruction or renovation of a building, including technical installations and equipment, the modernisation or replacement of lighting, installations and equipment used in industrial processes, energy, telecommunications or IT processes, local heating networks and local heat sources.

Table 4.11. Energy savings as part of the white certificate scheme

Specification	2014	2015	2016
Cumulative primary energy savings [toe]	354 613	2 892 790	5 692 201
Cumulative final energy savings [toe]	213 184	1 660 662	3 268 126

Source: *The Fourth National Energy Efficiency Action Plan, 2017*

<sup>15</sup> First, the Act of 15 April 2011 on Energy Efficiency (Official Journal of the Laws of 2015, Items 2167 and 2359; and of 2016, Item 266), in accordance with which it functioned from 1 January 2013 to 30 September 2016. In 2016, a new Act was adopted, i.e. the Act of 20 May 2016 on Energy Efficiency (Official Journal of the Laws, Item 831) which extended the functioning of the scheme until 2020.

**Energy audits**

Status: implemented

Large enterprises (those that employ on average more than 250 employees and have a net annual turnover of more than EUR 50 million) are obliged to carry out an energy audit of the enterprise. This obligation was imposed by the Act of 20 May 2016 on Energy Efficiency. Audits should be carried out every four years. It is estimated that in Poland this obligation applies to more than 3,000 enterprises.

The energy audit of an enterprise may be carried out by:

- an entity independent of the enterprise audited which has knowledge and professional experience in carrying out audits of this type,
- an expert of the enterprise audited if he/she is not directly involved in the audited activity of that enterprise.

It constitutes a procedure designed to perform detailed and confirmed calculations concerning the proposed projects to improve energy efficiency and to provide information on potential energy savings.

Such an 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, on the capacity demand,
- contain a detailed review of the energy consumption in buildings or complexes of buildings, in industrial installations and in transport which are responsible as a total for at least 90% of the total energy consumption by that enterprise,
- should be based, if possible, on the cost analysis of the life cycle of a building or a complexes of buildings and industrial installations rather than the period of the recovery of costs, so as to take into account energy savings in a longer term, the residual values of long-term investments and discount rates.

The enterprise itself has the discretion as to the final decision on how the results of an audit are to be used. The performance of an audit should be reported to the President of the ERO. By the end of 2017, the President of the ERO had received information about the performance of more than 3,500 audits indicating the achievable mean annual final energy savings at a level of 973,373.597 toe/year. A fine is imposed for failure to carry out an audit, even up to 5% of revenues in the previous tax year.

**Information and education activities**

Status: implemented

In Poland, there are many organisations, associations or institutions which provide, as part of their tasks, information and advisory services related to the promotion of energy saving issues. In particular, these include: the Polish National Energy Conservation Agency – KAPE S.A., the National Energy Conservation Agency – NAPE, the Polish Foundation for Energy Efficiency – FEWE, the National Association “Respect for Energy and the Environment” - SAPE-POLSKA, regional energy agencies, the Energy Conservation Association, the Pomeranian Thermal Modernisation Centre and other sectoral organisations. Information, education and training activities are also carried out, manuals are published and guides are placed on the websites of the relevant Ministries and the Programme participants concerning the resources available and the rules for using them.

Information campaigns addressed to the public which aim at shaping environment-friendly attitudes and demonstrating how energy can be saved also play an important role in inducing energy efficiency improvements. The campaigns have been implemented by the Ministry of Economy, the Ministry of the Environment, the ERO and other institutions implementing the Programme, including, among others, self-governments and nongovernmental organizations as well as energy generators and distributors.

Since 2016, the Ministry of Energy has been a party to the agreement under which, in cooperation with its partners, the National Fund for Environmental Protection and Water Management (NFOŚiGW) has implemented the programme called the National System of Advisory Support on Energy Efficiency and RES for the Public Sector, the Housing Sector and Enterprises. The Programme is implemented with the Cohesion Fund resources under the Operational Programme Infrastructure and Environment (POIŚ) 2014-2020.

The Programme is an indispensable element of support for building a low-emission economy in Poland, which is related to the so-called low-emission economy plans developed by municipalities (among others, with the resources of the POIŚ 2007-2013). The aim of the initiative is to build a system of advice on a low-emission economy in regions, based on a structure of advisers providing services at the regional and local levels to territorial self-government units, enterprises, natural persons, housing associations and cooperatives. The aim of the Programme is to:

- improve the public awareness in the area of energy efficiency and RES by enabling an exchange of information at the local and regional levels and of good practices in the implementation of the Directive on energy efficiency,
- support at the local level the preparation of low-emission economy plans and the related projects on energy efficiency and RES,
- create an incentive to encourage territorial self-government units to establish the positions of municipal energy officers promoting energy efficiency.

Table 4.12. Examples of information and education campaigns on energy efficiency which have been carried out in Poland.

Campaign	Short description
Time to Save Energy	An information campaign for rational energy use, which was carried out by the Ministry of Energy under the slogan "Time to Save Energy". The aim of the campaign was to present the issues related to the principles and cost-effectiveness of energy-saving measures and to bring closer to the Polish public the issues related to the improvement of energy efficiency in the Polish economy, among others, via TV and radio spots.
The Less the Poles Pay the More Heat They Save and We Turn Off Power and Turn On Savings	The Ministry of the Environment has carried out two information and education campaigns "The Less the Poles Pay the More Heat They Save" and "We Turn Off Power and Turn On Savings" focused on energy efficiency which concerned energy saving at households. As part of the campaigns, the largest Polish TV stations broadcast spots in which popular persons encouraged viewers to take simple, everyday measures which would translate into energy savings and reduce energy bills.

The Guide to Improving the Energy Performance of Buildings	The Ministry of Infrastructure and Construction has published “The Guide to Improving the Energy Performance of Buildings”. The Guide provides information on the energy efficiency of buildings which is useful at the stages of both design, construction and use of buildings or their parts.
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Source: *The Fourth National Energy Efficiency Action Plan, 2017*

### **Renovation and thermal modernisation of buildings**

Status: implemented

The promotion of low-energy buildings involves efforts to achieve the main goal laid down in Article 9(1) of Directive 2010/31/EU, which provides that by 31 December 2020 all new buildings should be nearly zero-energy buildings and that after 31 December 2018 new buildings occupied and owned by public authorities should be nearly zero-energy buildings. Investment projects to improve the energy efficiency of existing buildings are supported, among others, under the Act of 21 November 2008 on Support for Thermal Modernisation and Renovation.

The measures taken as part of the efforts to improve the energy efficiency of buildings consisted, among others, in adopting more stringent technical construction regulations laying down the minimum requirements for energy savings and thermal insulation, along with the path for reaching the level which should be attained in (i.e. new buildings should be nearly zero-energy buildings).

The National Plan to Increase the Number of Low-Energy Buildings defines the concept of such buildings and their specific characteristics. It also sets out the actions taken by the government administration to promote buildings with low energy consumption, including the design, construction and reconstruction of buildings in a manner ensuring their energy efficiency, and to increase the share of energy from renewable sources in new and existing buildings. This also applies to amendments to construction regulations, including gradual amendments to technical construction regulations related to energy savings.

Moreover, as part of the National Housing Programme, a broad range of measures are taken to:

- support the implementation of thermal modernisation and renovation projects, also as one of the aspects of integrated revitalisation projects restoring housing functions in urbanised and socially degraded areas. Support can be provided, among others, to the owners and managers of residential or public buildings who plan thermal modernisation or renovation,
- reform the spatial planning system and improve and expedite the construction investment process.

As a result, measures to improve the energy efficiency of buildings can be given financial support, among others, from the National Fund for Environmental Protection and Water Management and the EU Funds. Various programmes ensuring support for such investment projects are available. The key ones are presented in the table below.



Table 4.13. Programmes supporting the improvement of energy efficiency of buildings and public institutions

Title	Key information on the programme
Thermal Modernisation and Renovation Fund (at the BGK Bank)	<p><b>Aim:</b> Financial assistance for investors implementing thermal modernisation and renovation projects.</p> <p><b>Sources of financing:</b> Resources provided from the state budget in amounts set annually in the Budget Act, interest on bank deposits of the resources of the Fund, revenues from the investments of the Fund in securities, donations and gifts by will, as well as other revenues.</p> <p><b>Implementation period:</b> Since 2009 the regulations have not set the end date of the measure.</p> <p><b>Form of cofinancing:</b> Premium</p> <p>The detailed manner of cofinancing as part of each Premium is set out by the Act of 21 November 2008 on Support for Thermal Modernisation and Renovation. The thermal modernisation premium is given in the case of the implementation of projects aimed at:</p> <ul style="list-style-type: none"> <li>• reducing energy consumption for space heating and heating of domestic hot water in residential buildings, collective dwelling buildings and buildings owned by territorial self-government units which they use to perform their public tasks,</li> <li>• reducing the supply costs of the heat delivered to buildings – as a result of the implementation of a technical connection to a centralised heat source in relation to the liquidation of a local heat source,</li> <li>• reducing primary energy losses in local district heating networks and their local heat sources,</li> <li>• the complete or partial replacement of energy sources by renewable sources or the use of high-efficiency cogeneration.</li> </ul> <p><b>Beneficiaries:</b> The owners or managers of residential buildings, collective dwelling buildings and buildings owned by territorial self-government which they use to perform their public tasks, local district heating networks and local heat sources.</p>
NFOŚiGW - LEMUR Part 4) Energy-efficient public buildings	<p><b>Aim:</b> Reducing energy consumption and, as a result, limiting or avoiding CO<sub>2</sub> emissions due to the design and construction of new energy-efficient public buildings and collective dwelling buildings.</p> <p><b>Budget:</b> PLN 97.4 million</p> <p><b>Implementation period:</b> 2015-2020</p> <p><b>Form of cofinancing:</b> Grants, loans</p> <p><b>Beneficiaries:</b> Public finance sector entities, legal persons of self-government units, commercial-code companies where territorial self-government units have 100% of shares or stock and which are established to perform their own tasks set out in laws, nongovernmental organisations, organisational units of the State Forests National Forest Holding with legal personality, national parks.</p>
NFOŚiGW - KAWKA – Elimination of low emissions to support energy efficiency and development of distributed energy sources	<p><b>Aim of the programme:</b> Reduction of the exposure of the population to air pollutants, in particular, particulate matter PM<sub>10</sub> and PM<sub>2.5</sub> and benzo(a)pyrene which pose a threat to human health and life in the zones with concentrations significantly in excess of the limit and target values for which air protection programmes have been developed.</p> <p><b>Budget:</b> PLN 120 million</p> <p><b>Implementation period:</b> 2015-2018</p> <p><b>Form of cofinancing:</b> Grant</p> <p><b>Beneficiaries:</b> Beneficiaries of the Programme include the Voivodeship</p>

Title	Key information on the programme
	Funds for Environmental and Water Management (WFOŚiGW), while final beneficiaries are the entities relevant to the implementation of projects indicated in air protection programmes. The final users of the cofinancing can include, among others, natural persons, housing associations and developers.
NFOŚiGW – Improvement of energy efficiency Part 2) Subsidies to bank credits taken to build energy-efficient houses	<p><b>Aim of the programme:</b> The preparation of investors, designers, producers of construction materials and contractors for requirements related to “nearly zero-energy buildings”, an incentive encouraging the market to change the manner in which buildings are erected in Poland and an educational impact on the public.</p> <p><b>Budget:</b> PLN 300 million</p> <p><b>Implementation period:</b> 2013-2018</p> <p><b>Form of cofinancing:</b> Grant (partial repayment of the principal of a bank credit)</p> <p><b>Beneficiaries:</b> Natural persons who build a single-family house or purchase a house or apartment from a developer (also including a housing cooperative).</p>
NFOŚiGW – Improvement of air quality Part 2) Reducing energy consumption in the construction sector	<p><b>Aim of the programme:</b> Reducing energy consumption and, in consequence, cutting CO<sub>2</sub> emissions by measures to improve energy efficiency in buildings.</p> <p><b>Budget:</b> PLN 1 billion</p> <p><b>Implementation period:</b> 2016-2022</p> <p><b>Form of cofinancing:</b> Loan or grant</p> <p><b>Beneficiaries:</b> Entities carrying out medical activity by providing stationary and 24-hour medical services, entities managing museums and student dormitories, owners of buildings entered into the Register of Monuments, churches and religious associations.</p>
NFOŚiGW - Improvement of air quality Part ) Public buildings with higher energy efficiency	<p><b>Aim of the programme:</b> Improving air quality by reducing or avoiding CO<sub>2</sub> emissions as a result of the enhanced generation of energy from renewable sources and lower energy consumption in buildings.</p> <p><b>Budget:</b> PLN 50 million</p> <p><b>Implementation period:</b> 2017-2018</p> <p><b>Form of cofinancing:</b> Grant or loan</p> <p><b>Beneficiaries:</b> Public finance sector entities, excluding state budget-supported units, commercial-law companies where territorial self-government units have 100% of shares or stock and which are established to exercise their own tasks indicated in laws, nongovernmental organisations, organisational units of the State Forests National Forest Holding without legal personality, national parks.</p>
Operational Programme Infrastructure and Environment 2014-2020 Measure 1.3 – Promoting energy efficiency in public and residential sectors	<p><b>Aim:</b> Improving energy efficiency in multi-family residential buildings and public buildings. Support for deep, comprehensive energy modernisation of public and residential buildings, including the replacement of equipment in these sites by energy efficient one.</p> <p><b>Budget:</b> EUR 472.34 million (including EUR 431,48 million for public buildings and EUR 40.86 million for residential buildings)</p> <p><b>Implementation period:</b> 2014-2023</p> <p><b>Beneficiaries:</b> Public authorities, including state budget-supported and government administration units, as well as their subordinated authorities and organisational units, housing cooperatives, housing associations etc.</p>
Operational Programme Infrastructure and Environment 2014-2020	<p><b>Aim:</b> Improving energy efficiency in multi-family residential buildings in Śląskie Voivodeship. Support for deep, comprehensive energy modernisation of residential buildings, including the replacement</p>

Title	Key information on the programme
Measure 1.7 Comprehensive elimination of low emissions in Śląskie Voivodeship Sub-measure 1.7.1 Promoting energy efficiency in residential buildings in Śląskie Voivodeship	of equipment in these sites by energy efficient one. <b>Budget:</b> EUR 80.22 million <b>Implementation period:</b> 2014-2023 <b>Beneficiaries:</b> Housing cooperatives and housing associations in Śląskie Voivodeship, territorial self-government units and their unions, organisational units of self-governments and enterprises implementing the own tasks of territorial self-government units.
Regional Operational Programmes	<b>Aim:</b> Improving energy efficiency in multi-family residential and public buildings. Support for deep, comprehensive energy modernisation of public and residential buildings, including the replacement of the furnishings in these buildings by energy efficient ones. <b>Examples of projects eligible for support:</b> - deep, comprehensive energy modernisation of public and multi-family residential buildings, including the replacement of the furnishings in these buildings by energy efficient ones, among others, the insulation of buildings, the replacement of windows, external doors and lighting systems by energy efficient ones, the reconstruction of heating systems (including their replacement and connection to heat sources), ventilation and air-conditioning systems, and RES installations in energy modernised buildings; - installation of energy monitoring and management systems, energy audits as a comprehensive element of projects. <b>Budget:</b> A total amount of EUR 1.684 million has been allocated under 16 ROPs. <b>Implementation period:</b> 2014-2023 <b>Beneficiaries:</b> Territorial self-government units, their unions and associations, organisational units of territorial self-government units, legal entities of territorial self-government units, housing cooperatives and associations, social building societies, nongovernmental organisations and energy services providers.

Source: NFOŚiGW, KOBiZE, IOŚ-PIB

### **Improvement of energy efficiency in industry**

Status: implemented

The promotion of energy efficiency in enterprises and industrial processes is an important element of the policy now pursued. Among others, it includes such measures as:

- the optimisation of energy management and the improvement of energy efficiency, including the use of renewable energy sources,
- the implementation of recommendations based on an energy audit,
- the introduction of smart energy management systems.

This is reflected in the available programmes supporting such measures. The measures to improve energy efficiency in this area are supported, among others, from the Cohesion Fund under the Operational Programme Infrastructure and Environment 2014-2020 and from the resources of NFOŚiGW. Examples of programmes are presented in the table below.

Table 4.14. Programmes supporting the improvement of energy efficiency in industry and the sector of small and medium-sized enterprises (SMEs)

Title	Key information on the programme
<p>Operational Programme Infrastructure and Environment 2014-2020 Measure 1.2 – Promoting energy efficiency and use of renewable energy sources in enterprises</p>	<p><b>Aim:</b> The creation of a production system at enterprises which will take into account the principles of a sustainable use of resources, while the improved energy efficiency will contribute to creating a more effective production system at enterprise and, in consequence, to enhancing the competitiveness of the economy.</p> <p>Support is offered to large enterprises for the use of solutions contributing to optimising energy management and improving energy efficiency, including renewable energy sources.</p> <p>As part of the measure, support is provided to projects resulting from an energy audit of an enterprise and intended to improve energy efficiency and also to technological changes for this purpose in existing facilities, installations and technical equipment.</p> <p><b>Budget:</b> EUR 39.88 million</p> <p><b>Implementation period:</b> 2014-2023</p> <p><b>Form of cofinancing:</b> Returnable assistance</p> <p><b>Beneficiaries:</b> Large enterprises or entities which are energy services providers within the meaning of Directive 2012/27/EE which work for large enterprises.</p>
<p>NFOŚiGW – Support for projects on low-emission and resource efficient economy Part 4) Energy efficiency at enterprises</p>	<p><b>Aim:</b> Reducing the adverse environmental impact with investment measures. The Programme covers projects consistent with “The Announcement of the Minister of Energy of 23 November 2016 of a detailed list of energy efficiency improvement projects” which aim at improving energy efficiency and technological changes for this purpose in existing facilities, installations and technical equipment, e.g.:</p> <ul style="list-style-type: none"> <li>• Technologies for rationalisation of electricity consumption</li> <li>• Upgrades of industrial processes in the scope of energy efficiency</li> <li>• Implementation of systems to manage energy and its quality and the implementation of systems to manage electricity networks at the facilities of enterprises.</li> </ul> <p><b>Budget:</b> PLN 500 million</p> <p><b>Implementation period:</b> 2017-2023</p> <p><b>Form of cofinancing:</b> Loans</p> <p><b>Beneficiaries:</b> Entrepreneurs within the meaning of the Act of 2 July 2004 on the Freedom of Economic Activity (Official Journal of the Laws of 2016, Item 1829, as amended) who carry out their economic activity in the form of an enterprise within the meaning of Article 55 of the Act of 23 April 1964 on the Civil Code.</p>

Source: NFOŚiGW, KOBIZE, IOŚ-PIB

**Measure 9: Improvement of air quality (a group of measures)**

Greenhouse gases affected: CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub>

**Context**

Measures are taken in Poland to improve air quality. These measures correspond with the implementation of the objectives of Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe (the CAFE Directive). The limitation of the emissions of particulate matter and other pollutants will contribute to reducing CO<sub>2</sub> emissions.

**Aim**

Reducing the emissions into the air of harmful substances arising from the heating of single-family houses with poor-quality fuels and using obsolete furnaces.

**Characteristics**

In Poland, two key programmes are implemented to improve air quality and eliminate so-called low emissions. Since February 2019 the STOP SMOG Programme has been implemented, while the Government's "Clean Air" Priority Programme was launched in September 2018 and will be carried out until 2029.

***STOP SMOG Programme***

Status: implemented

The STOP SMOG Programme offers financial support for the replacement or elimination of heat sources and thermal modernisation in single-family residential buildings. It is intended for the energy poor persons who are owners or co-owners of such buildings. The applicant in the Programme is a municipality which receives up to 70% of cofinancing from the state budget in the form of a grant to cover investment project costs. The implementation of the Programme is now planned in the period from 2019 to 2024 and its total budget (the contributions from the state budget and self-governments) is PLN 1.2 billion.

***"Clean Air" Programme***

Status: implemented

The "Clean Air" Programme offers financial support for the following measures:

- the replacement of heat sources in single-family houses by low-emission sources, including, among others, gas-fired sources or solid fuel-fired boilers meeting the requirements of Class V and the Ecodesign, or by connection to the city district-heating system,
- the thermal modernisation of single-family houses (the additional insulation of buildings, the replacement of window and door frames),
- the installation of household-based renewable energy sources (including, among others, solar collectors and photovoltaic microinstallations),
- the assembly of a mechanical ventilation system with heat recovery.

Support can be sought by natural persons who are the owners of single-family houses or the persons who have been granted a permit to start the construction of a single-family house. Grants and loans are awarded via the Voivodship Funds for Environmental Protection and Water Management. Cofinancing is available for projects started not earlier than 12 months before the date of submission of the application for cofinancing. The project implementation period is up to 24 months from the date of conclusion of the cofinancing agreement, but not later than by 30.06.2029. The maximum amount of eligible costs from which the value of the grant is calculated is PLN 53,000, while the minimum value of the eligible costs of project is PLN 7,000. The planned loan repayment period is up to 15 years. The Programme budget is PLN 103 billion.

#### 4.1.4 Policies and measures in the transport sector

##### *Key strategies, plans and programmes*

The table below lists the key strategies, plans and programmes in the transport sector which affect its functioning and condition the protection of the environment and climate.

Table 4.15. Key strategies, plans and programmes in the transport sector

Title	Description
Transport Development Strategy until 2020 (with an Outlook until 2030), adopted by the Council of Ministers on 22 January 2013 (specified in the Implementing Document, adopted by the Council of Ministers on 13 October 2014), replaced by the Strategy until 2030	The Strategy was a basic planning document for the development of the transport sector in the medium term (2020/2030). The achievement of its main goal required the attainment of five specific objectives in transport modes: creating a modern, coherent transport infrastructure network; improving the organization and management of the transport system; improving the safety of traffic users and goods transported; limiting the negative impact of transport on the environment; and building a rational model for financing infrastructure investments. In order to reduce the negative impact of transport on the environment, it is expected that measures will be taken in relation to organizational and systemic issues, investments, technology and innovation.
Sustainable Transport Development Strategy until 2030, adopted by the Council of Ministers on 24 September 2019	<p>The main aim of the national transport policy presented in the Strategy is to enhance the transport accessibility in the country and to improve the safety of traffic users and the efficiency of the transport sector by creating a coherent, sustainable, innovative and user-friendly transport system at the national, European and global levels. The attainment of this objective will enable the development of suitable conditions conducive to the stable economic growth of the country.</p> <p>The achievement of the main goal in the timeframe until 2030 requires the launch of the following measures:</p> <ul style="list-style-type: none"> <li>• building an integrated and mutually linked transport network serving a competitive economy,</li> <li>• improving the manner of organization and management of the transport system;</li> <li>• changes in individual and collective mobility (among others, to promote collective transport),</li> <li>• improving the safety of traffic users and goods transported;</li> <li>• limiting the negative impact of transport on the environment;</li> <li>• improving the effectiveness of the use of public resources for transport</li> </ul>

Title	Description
	projects.
National Railway Programme until 2023, adopted by the Council of Ministers on 15 September 2015 and last updated on 17 September 2019	<p>The National Railway Programme (KPK) is a multiannual programme which defines the amount and sources of financing (including EU resources and national funds) for investment projects on railway lines managed by PKP PLK S.A. The document implements strategies adopted by the Council of Ministers with a view to improving the technical condition and current parameters of railway infrastructure. The KPK replaced the Multiannual Railway Investment Programme which was in force in the period from 2011 to 2015.</p> <p>The overarching objective of the Programme is to strengthen the role of railway transport in the integrated transport system of the country by creating a coherent and a modern railway network. Among others, this includes the mitigation of negative impacts on the environment.</p>
National Road Construction Programme for 2014–2023 (with an Outlook until 2025), adopted on 8 September 2015 and updated on 24 September 2019	<p>The Road Programme is defined as a medium-term one, establishing a financial framework for planned investment projects. It sets out the directions of actions and investment priorities for the maintenance and safety of traffic in national road networks in Poland. It diagnoses the current condition of the infrastructure in the road sector, lays down both the objectives to be achieved and the key areas constituting so-called bottlenecks in passenger and freight transport, and addresses the obligations and challenges which Poland faces in the nearest future.</p>
National Road Safety Programme 2013–2020, adopted by the National Road Safety Council on 20 June 2013	<p>This is a programme of measures to be undertaken by the government administration with a view to implementing, in the field of road safety, the main goal and specific objectives of “Vision Zero” adopted by Poland, envisaging no road accidents causing fatalities or serious injuries. The Programme is a diagnosis and assessment of road safety in Poland, and takes into account the Polish and European modalities of road safety programming.</p>
Assumptions for the development plans for Inland waterways for 2016–2020, with an outlook until 2030, adopted by the Council of Ministers on 14 June 2016	<p>The document sets the directional objectives of the national inland water policy. It is the basis for the development of plans for modernization or construction of missing sections of the most important waterways in Poland. The document presents an analysis of the current status of the major national inland waterways and focuses on actions to restore their transport and economic functions, i.e. to ensure shipping parameters consistent with at least IV class of navigability and to meet the inland waterway infrastructure requirements for TEN-T network.</p>
National Implementation Plan for the TSI Relating to Control-Command and Signalling of June 2017	<p>The National Implementation Plan for the TSI Relating to Control-Command and Signalling replaced the National Implementation Plan for ERTMS in Poland dated March 2007. The new plan was developed in 2017 on the basis of Article 6(4) of Commission Regulation (EU) 2016/919 of 27 May 2016 on the technical specification for interoperability relating to the ‘control-command and signalling’ subsystems of the rail system in the European Union.</p> <p>The most important element of the plan is the establishment of the deadlines for the implementation of the ERTMS system on individual railway lines in Poland. The cost-benefit analysis of the system is also part of the plan. The information provided in the plan will allow railway undertakings to appropriately plan rolling stock investments with a view to equipping rail vehicles with on-board ERTMS equipment.</p> <p>The National Implementation Plan for the TSI Relating to Control-Command and Signalling was complemented with two supplements. Supplement 1 of October 2018 was elaborated as a “roadmap” to indicate to the participants in the railway market the rules for migration from the VHF150 MHz analog radio communication system to digital GSM-R. Supplement 2 was elaborated in December 2019 on the basis of the provision laid down in paragraph 2 of point 7.4.3 of the Annex of Commission Regulation (EU) 2016/919 and concerns</p>



Title	Description
	the award of temporary exclusion from the obligation to equip 10 rail vehicles owned by the carrier PKP Szybka Kolej Miejska w Trójmieście Sp. z o.o. with on-board ERTMS/ETCS systems.
Programme for the Development of a Network of Airports and Aerial Ground Equipment, adopted by the Council of Ministers on 8 May 2007	This Programme is a basic government document which sets out the directions of the development of airport and navigation infrastructure in Poland. By assumption, it is a directional document indicating, on the basis of projections of air traffic development in Poland, the needs for the development of airports assigned to the TEN-T network and the infrastructure related to communication, navigation and control of air traffic until 2020. At present, work is underway to draw up a programming document which would constitute the guidelines for the development of the air transport market in Poland. Taking into account new projections of air traffic in Poland, this document will indicate the directions of the development of airport and ATM infrastructure in Poland and be an instrument of the national transport policy in the area of civil aviation.
Clean Transport Package, adopted by the Council of Ministers on 16 March 2017	<p>The Clean Energy Package consists of three pillars:</p> <ul style="list-style-type: none"> <li>• the Electromobility Development Plan for Poland</li> <li>• the National Framework for Alternative Fuel Infrastructure Development Policy</li> <li>• the Low-Emission Transport Fund</li> </ul> <p><b>The Electromobility Development Plan</b> lays down the areas and stages of the development of electromobility in Poland, also proposing intervention tools. Its basic assumption is the attainment of 1 million electric vehicles in Poland by 2025. An important issue is the launch of projects related to electrification of public transport which are of key importance for reducing transport emissions and improving the air quality in cities.</p> <p><b>The National Framework for Alternative Fuel Infrastructure Development Policy</b> lays down the objectives and tools of the development of this infrastructure. The obligation to draw up such document results from Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure. The document sets out the objectives and tools of support for the development of the market and infrastructure for electricity and natural gas (CNG and LNG) used in road transport and water transport. The introduction of alternative propulsion systems and the creation of relevant infrastructure will contribute to improving the energy efficiency of transport.</p> <p>The task of the <b>Low-Emission Transport Fund</b> is to finance projects to develop electromobility (electric vehicles, charging infrastructure) and transport based on alternative fuels (CNG, LNG, biofuels and other renewable fuels). In accordance with the Act Amending the Act on Biocomponents and Liquid Biofuels and Certain Other Acts, the revenues of the Fund will consist of a target grant from the state budget in an amount of up to 1.5% of the revenues planned in the previous budget year from the excise duty on motor fuels and the resources provided by the electricity transmission system operator in an amount of 0.1% of the justified return of capital employed in the economic activity carried out in the area of electricity transmission.</p>

Source: KOBIZE, IOŚ-PIB

### Key legal acts

The table below lists the key national legal acts in the transport sector which affect its operation and condition the protection of the environment and climate and which function in parallel to a number of directly applicable regulations laid down at the EU level, primarily Regulations setting CO<sub>2</sub> emission standards for light vehicles (last amended by Regulation 2019/631) and heavy vehicles



(2019/1242) and the pollutant emission standards, so-called Euro standards, for light vehicles (715/2007) and heavy vehicles (582/2011).

Table 4.16. Key legal acts in the transport sector

Title	Description
Act of 11 January 2018 on Electromobility and Alternative Fuels (Official Journal of the Laws of 2019, Item 1124, as amended)	<p>The Act was drawn up on the basis of the Electromobility Development Plan for Poland and the National Framework for Alternative Fuel Infrastructure Development Policy. It was the first regulation to comprehensively lay down the rules for the functioning of the alternative fuel market in transport.</p> <p>The Act sets out the rules for the development and functioning of the infrastructure for the use of alternative fuels, including the technical requirements for this infrastructure, the obligations of public entities in relation to the development of the alternative fuel infrastructure, the information obligations related to alternative fuels, the operating conditions for clean transport zones, the national framework for alternative fuel infrastructure development and the manner of its implementation.</p>
Act of 16 December 2010 on Collective Public Transport (Official Journal of the Laws of 2019, Items 2475 and 2493)	<p>The Act sets out the rules for the organisation and operation of regular passenger carriage in the collective public transport carried out in the territory of Poland and in the transboundary zone, in road transport, railway and other rail transport, cable and funicular transport, maritime shipping and inland navigation. It also lays down the rules for financing of regular passenger carriage in the collective public transport with respect to carriage with the character of a service in the general public interest.</p>
Regulation of the Minister of Infrastructure and Construction of 8 December 2016 amending the Regulation on the sustainable development plan for collective public transport for transport networks of interregional and international passenger carriage in rail transport (Official Journal of the Laws of 2016, Item 1996)	<p>The Plan lays down the basic rules for the functioning and development of interregional and international passenger carriage in railway transport, as carried out as carriage with the character of a service in the general public interest as part of collective public transport on the market subject to the rules governing regulated competition. The Plan is based, among others, on the strategic provisions of government documents programming the development of the country, taking into account the need to minimise its adverse impact on the environment.</p>
Act of 16 March 1995 on the Prevention of Sea Pollution by Ships (Official Journal of the Laws of 2017, Item 2000)	<p>The Act supports the application of the requirements of Regulation (EU) 2015/757 and implements into Polish law the requirements of the MARPOL Convention which relate, among others, to the energy efficiency of ships. Regulation (EU) 2015/757 lays down rules for the monitoring, reporting and verification of carbon dioxide (CO<sub>2</sub>) emissions and of other relevant information from ships arriving at, within or departing from ports under the jurisdiction of a Member State, in order to promote the reduction of CO<sub>2</sub> emissions from maritime transport in a cost effective manner.</p>

Source: KOBiZE, IOŚ-PIB

## *Policies and measures*

### **Measure 10: Road transport package (a group of measures)**

Greenhouse gases affected: CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub>

#### Context

Road transport is one of the sectors where GHG emissions show a growing trend. In light of this, there is a need to take measures to minimise and prevent such a phenomenon. The measures result from the adopted strategic documents, such as the Transport Development Strategy and the Clean Transport Package, as well as the EU regulations imposing emission standards for cars.

#### Aim

Reducing the rate of growth of GHG emissions from road transport, among others, by improving energy and emission efficiency of vehicles, promoting vehicles using alternative fuels and electricity, improving infrastructure and encouraging the use of public transport.

#### Characteristics

In Poland, a number of measures are taken to minimise greenhouse gas emissions from road transport. The measures result from the legal acts in effect and the strategy for the development of this sector. The key ones are presented below.

### ***Improvement of the energy efficiency and emission factors of vehicles***

Status: implemented

The energy efficiency and emission factors of road vehicles are improved by the standards directly applicable in Poland (the so-called Euro standards) for pollutant emissions from light (passenger and light-duty) vehicles and heavy-duty vehicles and by the standards for CO<sub>2</sub> emissions from new light and heavy-duty vehicles registered in the EU. These standards successively become more stringent across the EU.

Moreover, the system for technical inspections of motor vehicles and their trailers also contributes to maintaining the correct energy and emission efficiency of means of transport, eliminating malfunctioning and end-of life vehicles which worsen the energy efficiency and emission factors of this mode of transport. The tolls which are also collected for road use by vehicles with the allowable gross weight exceeding 3.5 tonnes in specific sections of the networks of motorways, expressways and national roads also depend on the category of Euro emission standards. There are also charges for the use of the environment which are diversified depending on the type of vehicle and fuel.

Since 2011 there has been an obligation to apply additional energy and emission criteria for public entities' purchases of road vehicles and operators' purchases of vehicles to provide public passenger transport services, as well as the obligation to provide information on fuel consumption and CO<sub>2</sub> emissions in vehicles offered for sale or lease.

In accordance with the provisions of the Act of 16 December 2010 on Collective Public Transport, when a public contract is awarded for the implementation of collective public transport, the specification of the essential terms of the contract may include, in particular, the quality

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standards and the general access to the services provided, including technical solutions applied in means of transport, especially, to ensure environmental protection and convenient customer service.

### ***Improvement of the condition of the vehicles and infrastructure***

The condition of the passenger road transport vehicles used for carriage services in the general public interest is improved in accordance with the Transport Development Strategy, the Partnership Agreement and the programming documents on support from the European Funds. Old vehicles are successively replaced by new models which take into account the aspects related to pollutant emissions and the needs of the disabled and persons with reduced mobility.

The development of infrastructure is based on the programmes and plans listed in Table 4.15. Its aim is not only to improve the accessibility and coherence of the national and international transport networks, but also to enhance the fluidity and safety of traffic, among others, by reducing the collision-prone character of roads and taking traffic out of strongly urbanised areas.

The development and implementation of Intelligent Transport Systems, including the National Road Traffic Management System, are supported as a tool to implement the objectives of sustainable mobility policy. The National Road Traffic Management System will enable the dynamic management of traffic in the network of national roads, the improvement of the processes of maintaining road infrastructure and the integration with the ITS systems implemented by other road managers, including those in urban areas.

### ***Promotion of electromobility and clean transport***

Status: implemented

The basic assumption of the Electromobility Development Plan for Poland, which is a part of the Clean Transport Package, is to achieve 1 million electric vehicles in Poland by 2025. In addition, the implementation of projects to electrify public transport is considered to be of key importance for reducing pollutant emissions and improving air quality in cities. It is expected that the share of zero-emission buses (including trolleybuses) will grow to at least 5% in 2021 and 20% in 2025. The development of other vehicle types – those powered by natural gas in the form of CNG (54,000 in 2025) and LNG (3,000 in 2025) – is also assumed.

Electric and low-emission vehicles can be successfully promoted as a means of transport, particularly, in cities, by using many solutions which bring benefits to the users of such vehicles, including, among others:

- the introduction of a system of subsidies to purchases of electric vehicles,
- no excise duty on electric cars, those powered by hydrogen and hybrid ones (with the internal-combustion engine capacity of up to 200 cm<sup>3</sup>) and a lower rate of the excise duty on other hybrid vehicles,
- authorisation of access to low-emission zones, use of bus lanes, free parking in public paid parking lots.

It is expected that the infrastructure for charging electric vehicles and refuelling CNG and LNG powered vehicles will develop as a result of:

- cofinancing of the construction of the public infrastructure for charging electric vehicles and refuelling CNG and LNG powered vehicles,

- exempting the electricity charging stations from the obligation to pay a real estate tax,
- support for the production and distribution of biocomponents, liquid biofuels or other renewable fuels.

The instruments adopted in the document called the National Framework for Alternative Fuel Infrastructure Development Policy support the construction of alternative fuel infrastructure and the development of the market of electric and low-emission vehicles (e.g. the subsidy scheme, the system of tax instruments). The Low-Emission Transport Fund has also been established for the purpose of financing projects related to the development of electromobility (electric vehicles) and transport based on alternative fuels (CNG, LNG, biofuels and other renewable fuels). The Fund is financed, among others, from the resources of the state budget, i.e. the proceeds from the excise duty, the revenues from the substitution fee and the resources provided by the electricity transmission system operator.

In parallel to the system of incentives, requirements were introduced for the minimum share of electric vehicles in the fleets used by the supreme and central state administration authorities and territorial self-government units with their number of inhabitants exceeding 50,000. Moreover, the abovementioned self-government units must ensure the minimum shares of electric vehicles in the provision of city transport services and of those powered by natural gas used to carry out the other public tasks.

### ***Shaping of environmentally aware behaviour of drivers and users of transport services***

Status: implemented

Environmentally aware behaviour of drivers and users of transport services is shaped, among others, by disseminating the technique of environmentally friendly driving as part of driving courses and public campaigns, e.g. those carried out on the occasion of the European Mobility Week or Car-Free Day.

Many environmentally friendly projects addressed to drivers and passengers are launched as civic initiatives, e.g. involving offers of ad hoc joint travels under the car-pooling formula (e.g. the initiatives “Bla Bla Car” or “Otodojazd.pl”) or a preferential approach to joint use of a bicycle or a public car (car-sharing).

### ***Measure 11: Urban transport package (a group of measures)***

Greenhouse gases affected: CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub>

#### Context

Urban transport has a direct effect on the state and quality of the environment in cities and urban functional areas. Therefore, it is targeted by many measures to reduce GHG emissions which are taken in the area of road transport. These measures are based on strategic documents, such as the Clean Transport Package, the Sustainable Transport Development Strategy until 2030, the National Urban Policy 2023 and the Act on Electromobility and Alternative Fuels (Official Journal of the Laws of 2019, Item 1124, as amended).

### Aim

Reducing the rate of growth of GHG emissions from road transport by developing and promoting environmentally friendly solutions in urban transport

### Characteristics

Examples of measures taken in cities to reduce GHG emissions and the adverse environmental impact of the transport sector are presented below.

#### ***Promotion of collective transport in cities***

Status: implemented

Sustainable mobility implemented in cities in accordance with the National Urban Policy 2023 primarily consists in making an attractive offer to the inhabitants of a city and its functional area in the scope of public transport in terms of fares and their flexibility, the duration and comfort of travels, the reliability of a means of transport, the completeness and timeliness of passenger information, the convenient character of transfers and linkages between different modes of transport.

In accordance with the Sustainable Transport Development Strategy until 2030, the fundamental aim of transport policy developed at the city level should be to take action to ensure sustainable mobility by creating the conditions for the efficient, effective and safe travels of persons and carriage of goods, while limiting the adverse impact on the natural environment inhabitants' living conditions, and to improve access to transport within the city and the functional area.

The promotion of collective transport includes many measures, including, among others, the widespread traffic preferences in cities in the form of separate bus lanes, financial support for the replacement and modernisation of public transport stock, the integration of connections, travel information and tickets of different public transport operators, as well as the construction of Park&Ride infrastructure.

Rail transport is also promoted in cities – tramway lines and the second line of the Warsaw underground are expanded and the carriage of passengers by commuter railways grows.

The use of Integrated Territorial Investments (ITIs) are of special importance for the development of sustainable and efficient transport connecting a city and its functional area, as a form of cooperation between local governments, translating into optimisation and integration of urban transport and regional passenger transport systems. One example of measures is the development of commuter (regional) railway transport as a convenient form of services in rural areas and travels to cities and airports.

Solutions promoting collective transport are also supported by the development of non-motorised transport (cycling and pedestrian modes), in particular, dynamically expanding cycle traffic. Road traffic regulations have been changed to ones promoting and improving the safety of cyclers (regarding the right of way, the ability to overtake, cycle boxes and counter lanes etc.), and primarily widespread investments are launched in cycle infrastructure (cycle paths, service points and cycle parking lots) and urban bike systems. These investment projects are mainly implemented by territorial self-government units and infrastructure managers as measures to separate cycling and

pedestrian traffic from the motor vehicles and, thus, to improve road traffic safety. High priority is given to investments in cycle infrastructure in suburban areas with a view to “repairing” dysfunctional complexes of dispersed buildings. There are also plans to enhance the presence of water tramways in urban transport.

The measures in the area of the development of collective and non-motorised transport in cities can be financed, among others, from the EU resources under the Operational Programme Infrastructure and Environment and the Regional Operational Programmes.

Table 4.17. Programmes supporting the development of collective transport in cities

Title	Key information on the programme
Operational Programme Infrastructure and Environment 2014-2020 Measure 6.1 – Development of collective public transport in cities	<p><b>Aim:</b> The development and enhanced use of low-emission urban transport to provide services to the inhabitants of the functional areas of cities. Support is available to investments in infrastructure and stock.</p> <p><b>Budget:</b> EUR 2,299.18 million</p> <p><b>Implementation period:</b> 2016-2023</p> <p><b>Form of cofinancing:</b> Grants</p> <p><b>Beneficiaries:</b> Territorial self-government units and their unions – the capitals of Voivodeships and their functional areas, as well as organisational units acting for them and special purpose companies, managers of urban transport infrastructure, operators of collective public transport.</p>

Source: KOBiZE, IOŚ-PIB

### ***Comprehensive measures to change individual and collective mobility in cities and their functional areas***

Status: implemented

In the nearest years, the transport sector will have to face the challenges related to the growing number of inhabitants of urban centres, progressing suburbanisation and the need to economically manage resources. In response to these challenges, in the area of urban policy the Strategy for Responsible Development (SOR) has adopted its aim to create the conditions for the sustainable development of cities and one of its priorities is to work out sustainable urban mobility patterns, including ensuring everyone’s access to the city and improving the quality of public space in order to create a safe urban environment.

Implementing tasks under the SOR and the Sustainable Transport Development Strategy until 2030, efforts are taken to promote the concept of Sustainable Urban Mobility Plan (SUMP). As a strategic plan, the SUMP establishes a set of measures expected to effectively assist in solving transport problems. At present, it is optional for Polish cities to have such a document and only the largest cities are preparing their own plans (e.g. Gdynia, Wrocław, Warsaw and Cracow).

A number of actions are carried out to encourage cities to prepare and implement their SUMPs, including, among others:

- the PROSPERITY project (Prosperity through innovation and promotion of Sustainable Urban Mobility Plan), implemented in the period from 2017 to 2019, financed with the resources of the Horizon 2020 programme to promote and develop SUMPs. In cooperation with the National Focal Point

of PROSPERITY, training activities were delivered and, moreover, a guide to the preparation of the SUMP was prepared, which was aligned with the Polish legal and institutional circumstances,

- the pilot project on the Sustainable Urban Mobility Plans was carried out under the Operational Programme Infrastructure and Environment 2014 – 2020, as part of the preparation for the next financial perspective. It has been implemented since April 2019 and is expected to last 2 years.

The pilot project is addressed to all the interested cities and urban functional areas and its objective is primarily to:

- encourage the city authorities to take comprehensive measures to shape urban mobility, encompassing transport, environmental protection, health care, the social and economic development;
- transfer knowledge and good practices to territorial self-government units (training workshops);
- support cities and functional areas in the preparation or updating of their Sustainable Urban Mobility Plans.

The involvement in the coordination of the European Mobility Week (EMW) campaign at the national level is also important. Due to these measures, the number of Polish cities and municipalities which are interested in participation in this event steadily grows.

The essential objective of the EMW, which takes place on 16 – 22 September, is to encourage local authorities and nongovernmental organisations to introduce and promote sustainable means of transport, particularly, public transport. Finally, on 22 September the World Car-Free Day is held. In the period from 2017 to 2019 a wide EMW information and promotion campaign was carried out. The interest of Polish cities in the participation in the campaign significantly increased. The falling trend to be seen in recent years was reversed. In 2019, the best result in history was achieved – as many as 202 cities and municipalities took part in the EMW campaign and, moreover, other entities registered 51 mobility actions, i.e. measures to promote sustainable mobility. Poland took the fourth place among the European countries participating in the initiative.

### ***Implementation of Intelligent Transport Systems***

Status: implemented

Intelligent Transport Systems (ITS ) implemented in cities and their functional areas assist in the operational management of road traffic, collective (passenger) transport, goods transport and rescue services, and in the solution of transport problems, while, at the same time, making it possible to confer the highest priority to passenger services and collective transport.

For cities, the optimisation of the traffic flows, including their speed, parking policy or support for urban logistics services are of key importance. One of the benefits arising from the promotion of measures in this area is the reduction of energy consumption and car exhaust emissions.

### ***Promotion of zero-emission public transport***

Status: implemented

The Zero-Emission Public Transport Programme is one of the flagship programmes of the National Centre for Research and Development which is expected to result in environmentally friendly public transport for Polish cities. The Programme has been implemented since 2017. It uses a novel formula of innovative partnership where co-employers include the NCBR, 26 cities and the Upper Silesia and

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Zagłębie Metropolis (GZM). In accordance with the adopted technological concept and the model for financing research & development and implementation work, in line with the results achieved, the Programme was divided into two parts:

- the research part, financed by the NCBR from the resources of the European Regional Development Fund, with the aim of developing vehicle prototypes in accordance with the criteria elaborated jointly by the NCBR, the cities participating in the Programme and GZM; and
- the implementation part the launch of which depends on the satisfaction of the requirements set in the procedure for the execution of successive stages of the research part.

Measures to implement zero-emission public transport can also be supported under different programmes, among others, from the resources of NFOŚiGW.

Table 4.18. Programmes supporting energy efficiency in transport

Title	Key information on the programme
NFOŚiGW - GEPARD – Zero-emission public transport	<p><b>Aim:</b> Cofinancing of projects to reduce the consumption of energy and fuels in urban transport. Support is available to projects relating to stock, infrastructure and management, consisting in modernisation or construction of charging stations for collective transport vehicles for adaptation to electric buses.</p> <p><b>Budget:</b> PLN 200 million</p> <p><b>Implementation period:</b> 2017-2022</p> <p><b>Form of cofinancing:</b> Grants and loans</p> <p><b>Beneficiaries:</b> Rural municipalities and urban and rural municipalities, municipal companies which operate to carry out the tasks of urban municipalities related to local collective transport, other entities providing services in the scope of local urban transport under a contract signed with a municipality.</p>

Source: KOBiZE, IOŚ-PIB

### ***The Fund for the Development of Bus Transport As a Service in the Public Interest***

Status: implemented

The aim of the Fund is to eliminate transport exclusion in Poland by cofinancing the restoration of local bus connections. The planned expenditures of the Fund for the Development of Bus Transport As a Service in the Public Interest were set at about PLN 300 million in 2019 and in the subsequent years at about PLN 800 million.

### ***Clean transport zones***

Status: implemented

Pursuant to the Act on Electromobility and Alternative Fuels, in order to prevent a negative impact on human health and the environment caused by pollutant emissions from transport, in an area of compact building with a concentration of public buildings, a clean transport zone can be established with restricted access for vehicles other than electric and hydrogen and natural gas powered ones. Such clean transport zones are established by local authorities (municipalities).

Clean transport zones can be established in municipalities with more than 100,000 inhabitants, in urban areas (i.e. city centres with dense residential building). A charge may be collected for the entry



into such a zone by vehicles other than the three types specified above. Clean transport zones can operate from 9 a.m. to 5 p.m.

Cracow is the first city to have established a clean transport zone in the District of Kazimierz, in operation since January 2019. In addition to local residents' cars, the zone can be entered by taxis, fully electric vehicles and hydrogen or CNG powered vehicles. The establishment of such zones is also considered in other cities, e.g. Warsaw and Wrocław.

### ***Measure 12: Rail transport package (a group of measures)***

Greenhouse gases affected: CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub>

#### Context

Rail transport, primarily including railway transport, is an important mode of transport, especially as regards the sustainable development of the transport sector and the reduction of emissions in this sector. The key measures taken in this sector result from the assumptions adopted in the National Railway Programme and the documents on the development of collective transport in cities.

#### Aim

Reducing GHG emissions by using stock with higher fuel and emission efficiency for carriage purposes, in particular, railway rolling stock.

#### Characteristics

In Poland, a number of measures are carried out to ensure the sustainable development of transport, including the promotion of the development of rail transport, by supporting its modernisation and innovative solutions in collective transport in cities. The key measures are presented below.

### ***Modernisation of railway infrastructure and rolling stock***

Status: implemented

In accordance with the National Railway Programme until 2023, investment projects are carried out on railway lines, among others, to modernise railway infrastructure (lines and junctions, railway stations and stops). The aim of these projects is to improve the technical parameters and adapt the transport network with a view to enhancing the quality of public transport services and also to take into account the needs of persons with reduced mobility.

The modernisation of rolling stock for passenger and freight transport includes support for the purchase of locomotives, including multi-system locomotives, multiple units and light rail vehicles (also for the underground and trams) and carriages. The locomotives and motor coaches are subject to more stringent requirements (level IIIB) setting out the limit values of pollutant emissions, in accordance with the Regulation of the Minister of Economy on the specific requirements for internal-combustion engines for the reduction of the emissions of gaseous pollutants and particulate matter from these engines (Official Journal of the Laws of 2014, Item 588).

The measures to strengthen the integration of transport systems concentrate on:

- supporting the construction or reconstruction of the infrastructure of intermodal terminals, including the terminals located in logistics centres and seaports, along with railway and road infrastructure (improved railway access to Port of Gdańsk in Gdynia, in Szczecin and Świnoujście,
- creating the enabling conditions for shifting carriage from the road to railways or inland navigation, in particular, over distances of more than 300 km,
- supporting the purchase or modernisation of equipment necessary to operate intermodal terminals (lifting and other equipment for reloading shunting locomotives),
- supporting the purchase or modernisation of telematic and satellite systems related to intermodal transport,
- supporting the purchase or modernisation of railway rolling stock, including traction locomotives and specialised carriages used for intermodal transport (flatcars).

### ***Railways Plus Programme to Complement the Local and Regional Railway Infrastructure until 2028***

Status: adopted

The Railways Plus Programme to Complement the Local and Regional Railway Infrastructure until 2028 will contribute to eliminating transport exclusion by enabling the railway network to be complemented with new connections which will first of all ensure that passengers have access to travels between regions.

The main goal of the Railways Plus Programme is to complement the railway network with railway connections (including the preparation of the necessary pre-design and design documentation) between towns with their number of inhabitants exceeding 10,000 which have no access via passenger or freight railways to Voivodeship capitals and to improve the internal transport-related and socio-economic coherence of these regions of Poland with support from public resources. The implementation of the Programme will facilitate access to passenger railways and improve the conditions for carrying out economic activities and road safety (some of freight carriage will be taken over by railway transport).

The Programme is addressed to territorial self-government units. An amount of almost PLN 6.6 billion will be allocated for its implementation in the period from 2020 to 2028, including nearly PLN 5.6 billion as part of recapitalisation of PKP PLK S.A.

### ***Promotion of collective rail transport***

Status: implemented

Collective rail transport is promoted by developing public passenger transport (railways, including commuter and urban railways, tramways and the underground) and by integrating other modalities of passenger transport (connections, Park&Ride and Kiss&Ride). A detailed scope of the plan for the sustainable development of collective public transport in interregional and international travels by railway transport is set out by way of a Regulation of the Minister responsible for transport.

At the same time, the integration of travel information and tickets of different operators (the Common Ticket initiative) is underway and the previously mentioned financial support is granted for the construction and modernisation of infrastructure and the replacement and modernisation of rolling stock for public rail transport (including as part all the operational programmes under both the previous and current, new financial perspectives).

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***Interoperability of railway transport***

Status: implemented

The efforts to achieve a competitive and resource-efficient transport system through its integration, i.e. the creation of a single European transport area, consist in implementing interoperability in the railway services sector. The National Implementation Plan for the TSI Relating to Control-Command and Signalling is one of the tools used to implement harmonised solutions at the EU level in the area of railway traffic control.

The implementation of railway traffic management systems, including the implementation of the European Railway Traffic Management System (ERTMS) on Polish railway lines, will contribute to improving the safety and operational effectiveness of carriage by railways, thus leading to a more sustainable transport system and a lesser negative impact on humans and the environment.

***Common Ticket***

Status: implemented

A single ticket for the whole journey can be purchased from carriers from the PKP Group and the self-government railways. Passengers can use the offer as part of which a single ticket can be bought for the whole journey, irrespective of which trains they use and of the routes they travel. The fares are degressive, which means that a simple rule is applied to calculate the ticket price – the farther you go the less you pay for the successive kilometres of the route travelled. As a result of this, the Common Ticket is a particularly attractive proposal for passengers travelling over longer distances and choosing travels with a change of trains which are delivered by trains of different carriers. The Common Ticket can be bought at ticket counters, via the BILKOM.pl platform and using the smartphone application BILKOM Bilet.

***Measure 13: Air transport package (a group of measures)***

Greenhouse gases affected: CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub>

**Context**

The aviation sector is an important source of GHG emissions not only at the national level but also as a result of flights between countries. Therefore, measures are taken at both the international (the International Civil Aviation Organisation - CAO), EU and national levels to reduce the impact of this sector on the climate.

**Aim**

Improving the efficiency and reducing the impact of aviation on the environment and climate.

**Characteristics**

In the area of air transport, a number of measures are taken to reduce GHG emissions and to improve efficiency. A key instrument of a cross-sectoral character is the emissions trading scheme (EU ETS), described in detail in Section 4.1.2 (Measure 1). For the aviation sector, this scheme includes the flights between airports situated in the territory of the European Economic Area (EEA).

Other measures which are taken in the aviation sector and contribute to reducing GHG emissions are characterised below.

### ***Improvement of operational efficiency***

Status: implemented

The operational efficiency is improved by optimising air corridors and enhancing the capacity of taxiways, thus reducing fuel consumption by up to 15% and, thereby, CO<sub>2</sub> emissions, too.

In order to make it completely possible, it will be necessary to expand and develop the Asynchronous Transfer Mode (ATM) in the radio communication infrastructure, which will improve the safety of air traffic by diminishing errors in information transmitted and decrease the number of voice calls. This purpose is also served by the Airport Collaborative Decision Making Solution (A-CDM) system, which consists in the cooperation of all the airport services and their sharing of information on the current and anticipated situation at the airport.

### ***Introduction of innovative solutions and new technologies***

Status: implemented

An example of investments in advanced technologies is the purchase of Boeing 787 Dreamliners by the Polish LOT Airlines. They are very efficient passenger jets prepared for long-distance flights. Aircraft of this type is used on all the intercontinental flights. The systematic modernisation of the fleet enables fuel savings (even by as much as 20%) and a substantial reduction of CO<sub>2</sub> emissions.

The Polish LOT Airlines have also introduced Continuous Descent Approach (CDA) operational procedures. They consist in the continuous descent of aircraft until the moment when the pilot releases the landing gear and flaps and only then the engine power is enhanced. The CDA procedure makes it possible to diminish the landing time with enhanced engine power which reduces CO<sub>2</sub> emissions.

The Single European Sky ATM Research (SESAR) programme related to the Single European Sky is also gradually implemented. Its most important elements include the creation of Functional Airspace Blocks and the implementation of a technology package related to modern navigation infrastructure. These measures contribute to improving the efficiency and increasing the capacity of the Air Traffic Management (ATM) system, while, at the same time, maintaining a high safety level and reducing costs. By applying modern technologies and procedures, among others, the negative impact on the environment can also be reduced.

### ***Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)***

Status: adopted

In October 2016, the ICAO adopted a resolution to establish a global market-based measure in order to meet the challenges related to the reduction of CO<sub>2</sub> emissions from international aviation. The resolution laid down the main goals, the key assumptions on which this measure is to be based and a work programme for its operationalisation.

The market-based measure set out in the resolution is the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), with the main objective of stabilising CO<sub>2</sub> emissions at their 2020

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level (Carbon Neutral Growth - CNG2020). This is to be achieved by enabling airlines to offset their growing CO<sub>2</sub> emissions after 2020 and is to be a measure additional to technological, operational and fuel changes. All these measures make up a basket expected to make it possible to achieve the CNG2020 objective.

CORSIA provides for three main implementation phases, with the voluntary participation in the first two phases (the pilot phase in 2021-2023 and the first phase in 2024-2026). In turn, the second phase (from 2027) will be obligatory for countries which had an individual share in international aviation activities above 0.5% in 2018.

#### ***Measure 14: Inland navigation package (a group of measures)***

Greenhouse gases affected: CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub>

##### Context

The use of inland navigation in Poland is much lower than the EU average, in the case of the transport of both passengers and goods. In this scope, there is a potential for development. The measures taken in the area of inland navigation mainly result from the assumptions and directions of development as adopted in strategic documents, the Strategy for Reasonable Development until 2020 (with an Outlook until 2030). They are laid down primarily in two strategic projects – the Development of the Inland Navigation Sector and the Construction of the Waterway Linking the Vistula Lagoon and the Gulf of Gdańsk.

##### Aim

Reducing GHG emissions by using inland navigation vessels characterised by higher fuel and emission efficiency for transport.

##### Characteristics

Two key measures implemented in the area of inland navigation are presented below.

#### ***Development of inland waterways of special importance for transport***

Status: implemented

Measures are taken to modernise and build new waterways in international navigability classes. The development in this area will make it possible to transfer goods from road transport to low-emission water transport, thus reducing emissions from road transport. The aim of these measures is also to strengthen the human capital for navigation, to develop the fleet of Polish inland navigation vessels and to more extensively, in economic and social terms, use the arising infrastructure for local development. Measures are also taken to improve the operating parameters of waterways, including their improvement in selected sections of the Odra Waterway, which, as a target, should comply with the international parameters. The linear and point infrastructural investment projects underway include the construction and modernisation of hydro-engineering facilities, the erection of regulation structures and the clearing of the fairway.

The Construction of the Waterway Linking the Vistula Lagoon and the Gulf of Gdańsk is expected to provide access to the Port of Elbląg with a navigation channel through the Vistula Spit.

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The implementation of this investment project will ensure Poland's free access from the Vistula Lagoon to the Baltic, bypassing the Russia-controlled Pilava Strait. Due to this solution, the Elbląg terminal will be able to freely receive lesser cargo, reducing the workload of Tri-City ports. The development of this port will contribute to job creation, improve the tourism values of the localities situated on the Vistula Lagoon and enhance the economic growth of the whole region of north-eastern Poland. The construction of the channel is expected to end in 2022 and its cost will be about PLN 880, to be fully covered from the state budget.

### **Implementation of innovative technologies and solutions**

Status: implemented

The requirements for internal-combustion engines used in inland navigation in the scope of the reduction of the emissions of gaseous pollutants and particulate matter from these engines are set in the Regulation of the Minister of Economy of 30 April 2014 on the detailed requirements for internal-combustion engines in the scope of the reduction of the emissions of gaseous pollutants and particulate matter from these engines (Official Journal of the Laws of 2014, Item 588). Moreover, measures are taken to use water vessels powered by alternative fuels. The number of the vessels in operation will to a large extent depend on financial incentives offered to purchasers of new vessels. The proposed measures also include institutional support for the preparation of the accompanying infrastructure (the equipment of wharves, charging and refuelling stations).

In addition, in the Lower Odra area, the River Information System (RIS) is implemented to improve the safety level of navigation and to raise the effectiveness of the inland water transport, by a quick exchange of information on waterways in sections of inland waterways of international importance. Information provided from the RIS can be used to plan travels and to achieve a steadier travel speed and, thereby, reduce fuel consumption.

Table 4.19. Programmes supporting the development and modernisation of inland navigation

Title	Key information on the programme
Inland Navigation Fund (FZS) at the BGK Bank	<p><b>Aim:</b> Financial assistance for the modernisation of navigation vessels and other projects to restructure the inland navigation sector, including projects to improve environmental protection and navigation safety.</p> <p><b>Source of financing:</b> Grants from the National Fund for Environmental Protection and Water Management, the proceeds from the interest on the resources of the Inland Navigation Fund and the interest on the bank deposits of periodically free resources of the Inland Navigation Fund, the revenues from investments of periodically free resources of the Inland Navigation Fund in securities issued by the State Treasury or the National Bank of Poland, the interest on preferential credits given from the resources of the Inland Navigation Fund, donations and endowments, and a target grant from the state budget.</p> <p><b>Form of cofinancing:</b> Preferential credits, refinancing of the purchase of elements of vessel equipment and loans.</p> <p><b>Beneficiaries:</b> Vessel owners.</p>

Source: KOBiZE, IOŚ-PIB

**Measure 15: Maritime shipping package (a group of measures)**

Greenhouse gases affected: CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub>

**Context**

Given the long distances travelled by ships, the maritime shipping is an important source of fuel consumption and, in consequence, of the emissions of pollutants and greenhouse gases. In light of the transboundary character of this mode of transport, the main measures to limit its impact on the environment results from documents and regulations adopted at the international level (the International Maritime Organization - IMO) and the EU level.

**Aim**

Reducing GHG emissions by using ships characterised by higher fuel and emission efficiency for maritime shipping.

**Characteristics**

Two key measures implemented in the area of maritime shipping are presented below.

***Environmentally friendly standards***

Status: implemented

At present, increasingly stringent standards are adopted for the emissions of pollutants generated by fuel combustion on ships (mainly for SO<sub>x</sub> and NO<sub>x</sub>). These standards are introduced by both the European Union (Directive 2012/33/EU) and the International Maritime Organization (Annex VI to the MARPOL Convention). The emission levels can be achieved in different ways, e.g. by using systems to clean exhaust gases, burning fuels with low sulphur content or purchasing vessels powered by alternative fuels.

In turn, the Act of 7 November 2014 Amending the Act on the Prevention of Sea Pollution by Ships and Certain Other Acts (Official Journal of the Laws of 2014, Item 1554) introduced energy efficiency requirements: the Energy Efficiency Design Index (EEDI) for new ships and the Ship Energy Efficiency Management Plan (SEEMP). The EEDI Index enables the correct selection of equipment and the determination of the energy efficiency of a ship at the stage of its design. The SEEMP plan contains a description of measures to limit energy consumption by equipment installed on ships and recommendations for the implementation of the appropriate strategy for planning sea voyages (to minimise energy consumption) and the promotion of behaviour conducive to energy efficiency among the crew and land-based personnel.

***Implementation of innovative technologies and solutions***

Status: implemented

For the purposes of monitoring vessel traffic, including the management of and supervision over vessel traffic, the National System for Monitoring Vessel Traffic and Transmission of Information was established by the Act of 18 August 2011 on Maritime Safety (Official Journal of the Laws of 2015, Item 611, as amended). The efficient management of vessel traffic enables the optimisation of navigation and, as a result, lesser fuel consumption.

As part of the Programme for the Development of Polish Seaports until 2020 (with an Outlook until 2030), the conditions were created for adapting the infrastructure of selected port terminals for the purposes of handling intermodal transport and for the expansion of the infrastructure for alternative fuels, primarily LNG. In this area, access from land to ports is improved by investments in road, railway, inland water and pipeline connections. At the same time, investment projects are carried out to improve access to ports from the sea.

#### 4.1.5 Policies and measures in the sector of industrial processes and product use

##### *Key strategies, plans and programmes*

The table below lists the key strategies, plans and programmes in the industry sector which affect its functioning and condition the protection of the environment and climate.

Table 4.20. Key strategies, plans and programmes in the industry sector

Title	Description
	The documents concerning the industry sector are described in Section 4.1.2 addressing cross-sectoral measures and in Section 4.1.3 concerning the energy sector.

Source: KOBiZE, IOŚ-PIB

##### *Key legal acts*

The table below lists the key legal acts in the industry sector which affect its functioning and condition the protection of the environment and climate.

Table 4.21. Key legal acts in the industry sector

Title	Description
Act of 15 May 2015 on Substances That Deplete the Ozone Layer and on Certain Fluorinated Greenhouse Gases (Official Journal of the Laws of 2019, Item 2158, as amended)	The Act implements the provisions of Regulation (EU) 517/2014 of the European Parliament and of the Council of 16 April 2014 on fluorinated greenhouse gases and repealing Regulation (EC) No 842/2006 (OJ L 150, 20.05.2014, p. 195, as amended) and Regulation (EC) No 1005/2009 of the European Parliament and of the Council of 16 September 2009 on substances that deplete the ozone layer (OJ L 286, 31.10.2009, p. 1, as amended). Among others, it lays down the obligations of entities carrying out economic activity in the scope of production and services involving the use of on substances that deplete the ozone layer or fluorinated greenhouse gases, the tasks of authorities in this respect and the penalties for a breach of regulations.
	Other legal acts in the industry sector are described in Section 4.1.3 addressing the energy sector (energy consumption, energy efficiency) and Section 4.1.2 presenting cross-sectoral measures (EU ETS).

Source: KOBiZE, IOŚ-PIB



### *Policies and measures*

The greenhouse gas emissions from industrial processes are covered by the European greenhouse gas emissions trading scheme (EU ETS), described as Measure 1 in the section on cross-sectoral policies and measures. It is the fundamental policy on limiting the emissions of these gases in this sector. Moreover, measures are taken to improve the energy efficiency and to enhance the use of energy from renewable sources in industrial processes, as described in the subsection on the energy sector. The measures to limit the emissions of fluorinated greenhouse gases are described here.

#### ***Measure 16: Limitation of the use of fluorinated greenhouse gases***

Status: implemented

Greenhouse gases affected: HFCs, PFCs and SF<sub>6</sub>

#### Context

The issue of the limitation of the use of fluorinated greenhouse gases is regulated at the EU level. In 2006, Regulation (EC) No 842/2006 of 17 May 2006 on certain fluorinated greenhouse gases introduced provisions aimed at the limitation of their use and, thus, also the emissions of these gases. These provisions were replaced by more stringent ones laid down in Regulation (EU) 517/2014 of 16 April 2014 on fluorinated greenhouse gases and repealing Regulation (EC) No 842/2006. Regulation (EU) 517/2014 entered into force on 1 January 2015.

These provisions were implemented into the Polish law by the adoption of the Act of 15 May 2015 on Substances That Deplete the Ozone Layer and on Certain Fluorinated Greenhouse Gases. This Act was amended by the Act of 12 July Amending the Act of 15 May 2015 on Substances That Deplete the Ozone Layer and on Certain Fluorinated Greenhouse Gases. This Act entered into force on 23 September 2017.

#### Aim

Reducing the emissions of fluorinated greenhouse gases by taking measures to limit the accessibility and emissions of refrigerants from the group of fluorinated gases.

#### Characteristics

The measures to reduce the emissions of fluorinated greenhouse gases (so-called F-gases) consist in the phase-out of substances that deplete the ozone layer and also in limiting the accessibility and use of refrigerants exactly from the group of F-gases.

The main elements of these measures include:

- the obligations of entities carrying out economic activity in the scope of production and services involving the use of substances that deplete the ozone layer or fluorinated greenhouse gases,
- the penalties for a breach of regulations on substances that deplete the ozone layer or fluorinated greenhouse gases, products, equipment, fire protection systems and extinguishers, as well as air-conditioning systems in certain vehicles containing these agents,

- the establishment of a certification system for persons performing specific tasks and enterprises carrying out specific activities in the scope of fluorinated greenhouse gases and substances that deplete the ozone layer.

The list of measures taken includes those intended to limit the emissions of refrigerants from the group of fluorinated greenhouse gases by restrictions on the placing on the market of HFCs in bulk or contained in equipment, the obligations to keep records, to recover F-gases and certify personnel and economic operators, the prohibition of using F-gases with GWP of 2,500 or more from 1 January 2020 for servicing or maintenance of refrigeration equipment and, the prohibition of using F-gases for a given application. Moreover, the measures include efforts to reduce the emissions of refrigerants from the group of fluorinated greenhouse gases by restrictions on the placing on the market of passenger vehicles equipped with air-conditioning systems containing F-gases with GWP of 150 or more.

Other measures which affect the greenhouse gas emissions from the industry sector are described in Section 4.1.2 addressing cross-sectoral measures and in the section on the energy sector (Section 4.1.3, the part concerned with energy consumption and energy efficiency).

#### 4.1.6 Policies and measures in the agriculture sector

##### *Key strategies, plans and programmes*

The table below lists the key strategies, plans and programmes in the agriculture sector which affect its functioning and condition the protection of the environment and climate.

Table 4.22. Key strategies, plans and programmes in the agriculture sector

Title	Description
Rural Development Programme (PROW) for 2014–2020, approved by the European Commission on 12 December 2014	The Programme sets out the objectives, priorities and principles of support for the development of rural areas with the resources of the European Agricultural Fund for Rural Development (EAFRD) under Regulation (EU) 1305/ 2013 of the European Parliament and of the Council of 17 December of 2013 on support for rural development by the EAFRD. The most important objective of the Programme is to enhance the competitiveness of agriculture, while taking into account environmental objectives. The PROW for 2014-2020 is based on the implementation of six priorities, two of which directly concern the natural environment and climate protection, i.e. the protection of ecosystems and the sustainable management of natural resources.
Action Programme to Reduce Water Pollution Caused by Nitrates from Agricultural Sources and to Prevent Further Pollution, adopted by the Council of Ministers on 5 June 2018	The most important measures set out in the Programme include the establishment of the conditions for the use of nitrogen fertilisers near watercourses, on steeply sloping ground, on frozen, water-flooded or snow-covered ground, the adoption of the periods when the agricultural use of fertilisers is allowed, the determination of the storage conditions for natural fertilisers and the handling of leachates, the manner of calculating the annual dose of natural fertilisers containing not more than 170 kgN/ha and the introduction of the obligation to prepare a nitrogen fertilisation plan or the use of doses not exceeding the maximum N dose.
Framework Action Plan for Organic Food and Farming for 2014–2020,	The Plan presents the measures which should be taken and implemented by the Ministry Agriculture and Rural Development (MRiRW) and its

Title	Description
adopted by the Minister of Agriculture and Rural Development on 5 June 2018	subordinated and supervised units to develop organic farming and the organic food market.
Programme “Directions of the Development of Agricultural Biogas Plants in Poland in 2010-2020”, adopted by the Council of Ministers on 13 July 2010	The document indicates the optimum conditions for the development of installations generating agricultural biogas to be used to produce electricity and heat. Biogas plants are one of the most important objectives laid down in the Energy Policy of Poland until 2030, which is expected to contribute to Poland’s attainment of the RES target for 2020 (i.e. a 15% share of RES in the final energy consumption and a 10% share in transport).
Strategy for the Sustainable Development of Rural Areas, Agriculture and Fisheries for 2012–2020, adopted by the Council of Ministers on 25 April 2012	The aim of the Strategy is to set out a long-term vision of the development of rural areas and the fisheries sector in Poland and to indicate the measures which will contribute to implementing this vision by 2020. The Strategy also plays the role of a platform coordinating support provided to rural areas under different policies.
Strategy for the Sustainable Development of Rural Areas, Agriculture and Fisheries 2030, adopted by the Council of Ministers on 15 October 2019	The main aim of the strategy is to set out the key directions of the development of rural areas, agriculture and fisheries until 2030. The update of the Strategy is intended to correctly address the scope of public interventions financed from national and EU funds for 2021-2027.

Source: KOBiZE, IOS-PIB

### Key legal acts

The table below lists the key legal acts in the agriculture sector which affect its functioning and condition the protection of the environment and climate.

Table 4.23. Key legal acts in the agriculture sector

Title	Description
Act of 3 February 1995 on the Protection of Agricultural and Forest Land (Official Journal of the Laws of 2015, Item 909)	The Act regulates the principles of the protection of agricultural and forest land, their reclamation and the enhancement of their utility value. It also defines the possible conversion of agricultural and forest land to other uses.
Act of 10 July 2007 on Fertilisers and Fertilisation (Official Journal of the Laws of 2015, Item 625)	The Act regulates, among others, the issues of the placing of fertilisers on the market and their use, the prevention of hazards for humans and livestock which may arise as a result of the transport, storage and application of fertilisers and agrichemical services in agriculture.
Regulation of the Minister of Agriculture and Rural Development of 26 March 2019 on the detailed conditions and procedure for the award of financial assistance under the sub-measure “Support for afforestation and creation of woodland” included in the Rural Development Programme for 2014-2020 (Official Journal of the Laws of 2019, Item 585)	The Regulation lays down the detailed conditions and procedure for the award, payment and return of financial assistance under the sub-measure “Support for afforestation and creation of woodland” included in the Rural Development Programme for 2014-2020.
Regulation of the Council of Ministers of 5 June 2018 on	The Regulation implements Council Directive 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution

Title	Description
the adoption of "The Action Programme to Reduce Water Pollution Caused by Nitrates from Agricultural Sources and to Prevent Further Pollution" (Official Journal of the Laws of 2018, Item 1339)	caused by nitrates from agricultural sources.
Regulation of the Minister of Agriculture and Rural Development of 8 August 2018 on the publication of the consolidated text of the Regulation of the Minister of Agriculture and Rural Development on the detailed conditions and procedure for the award of financial assistance under the sub-measure "Organic farming" included in the Rural Development Programme for 2014-2020 (Official Journal of the Laws of 2018, Item 1784)	The Regulation lays down the detailed conditions and procedure for the award, payment and return of financial assistance under the sub-measure "Organic farming" included in the Rural Development Programme for 2014-2020.
Regulation of the Minister of Agriculture and Rural Development of 21 August 2015 on the detailed conditions and procedure for the award of financial assistance for operations of the type of "Modernisation of agricultural holdings" under the sub-measure "Support for investments in agricultural holdings" included in the Rural Development Programme for 2014-2020 (Official Journal of the Laws of 2015, Item 1371, as amended)	The Regulation lays down the detailed conditions and procedure for the award, payment and return of financial assistance for operations of the type of "Modernisation of agricultural holdings" under the sub-measure "Support for investments in agricultural holdings" included in the Rural Development Programme for 2014-2020.
Regulation of the Minister of Agriculture and Rural Development of 18 March 2015 on the detailed conditions and procedure for the award of financial assistance under the "Agri-environment-climate measure" included in the Rural Development Programme for 2014-2020 (PROW for 2014-2020) (Official Journal of the Laws of 2015, Item 415, as amended)	The Regulation indicates, among others, agricultural practices to be applied at beneficiaries' farm holdings, inter alia, to protect soils against erosion and waters against pollution, and, in consequence, to enable the reduction of greenhouse gas emissions into the atmosphere. In this context, the agricultural holdings of the beneficiaries of the following packages are of special importance: Package 1. Sustainable agriculture, Package 2. Soil and water protection, Package 4. Valuable habitats and endangered bird species on Natura 2000 sites, and Package 5. Valuable habitats outside Natura 2000 sites.
Regulation of the Minister of Agriculture and Rural Development of 13 March 2015 on the detailed conditions and procedure for the award of financial assistance under the measure "Payments to areas facing natural or	An amendment to the Regulation of 1 February introduced a new delimitation of LFAs in Poland from 2019. The aim of this Regulation is to facilitate farmers' continued use of land for agricultural purposes in less favoured areas, thus preventing their abandonment and erosion, and, in consequence, additional greenhouse gas emissions into the atmosphere.

Title	Description
other specific constraints" included in the PROW for 2014-2020 (Official Journal of the Laws of 2015, Item 364, as amended)	
Regulation of the Minister of Agriculture and Rural Development of 23 October 2015 on the detailed conditions and procedure for the award of financial assistance for operations of the type of "Investments to protect waters against pollution by nitrates from agricultural sources" under the sub-measure "Support for investments in agricultural holdings" included in the Rural Development Programme for 2014-2020 (Official Journal of the Laws of 2019, Item 970)	The Regulation lays down the detailed conditions and procedure for the award and payment of financial assistance for operations of the type of "Investments to protect waters against pollution with nitrates from agricultural sources" under the sub-measure "Support for investments in agricultural holdings" included in the Rural Development Programme for 2014–2020.

Source: KOBiZE, IOŚ-PIB

### *Policies and measures*

#### **Measure 17: Rational management of agricultural and forest land (a group of measures)**

Greenhouse gases affected: CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub>

#### Context

Agricultural land and forest land are subject to legal protection, which primarily consists in the prevention of the conversion of soils for purposes other than agriculture and forestry. The measures taken in this scope result from the Act on the Protection of Agricultural Land and Forest Land and the Act on Environmental Protection Law.

#### Aim

Preservation of resources and the correct use of agricultural land and forest land.

#### Characteristics

The protection of agricultural land and forest land consists in limiting their use for other purposes, preventing the processes of degradation and devastation of these types of land and losses in agricultural and forestry production arising as a result of non-agricultural and non-forestry activities, mass earth movements, land reclamation and development, preserving peat bogs and water ponds as natural water reservoirs and limiting changes in the natural relief of the terrain. Examples of measures carried out in this area are described below.

***Protection of agricultural and forest land***

Status: implemented

In order to protect agricultural and forest land, legal constraints have been imposed on their conversion. Only the land which is defined in the land register as uncultivated land may be used for non-agricultural and non-forestry purposes and in their absence so can other lands with the poorest usefulness for production. In the construction of facilities related to industrial activity and also other built structures, solutions which reduce their adverse impact on land should be applied.

Moreover, the use of agricultural and forest land for non-agricultural and non-forestry purposes requires the consent of the competent institutions, i.e.:

- the Minister responsible for rural development in the case of agricultural land in Classes I–III,
- the Minister responsible for the environment and the person authorised by the Minister in the case of forest land which the property of the State Treasury,
- the Voivodeship Marshal after an opinion has been given by the Chamber of Agriculture in the case of the other forest land.

***Support for investments for the restoration of agricultural land and production potential damaged by natural disasters, adverse climatic events and catastrophic events***

Status: implemented

As part of the Rural Development Programme for 2014-2020, farmers whose fixed assets at farm holdings have been damaged as a result of natural disasters, adverse climatic events and catastrophic events may seek financial assistance, among others, for the restoration of hop plantations, orchards or fruit tree plantations of species which effectively bear fruit for a longer period than 5 years, including the purchase of nursery plants intended for the establishment of orchards or fruit tree plantations of species which effectively bear fruit for a longer period than 5 years.

Assistance may be granted for an investment enabling the restoration of an asset of the farm holding which has been destroyed or damaged and the value of the loss has been estimated by the commission evaluating the loss. The loss must be specified in a record prepared by that commission and must represent at least 30% of the annual agricultural production of the farm holding.

***Measure 18: Support for adaptation and mitigation measures in agricultural holdings (a group of measures)***

Greenhouse gases affected: CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub>

**Context**

The agriculture sector can reduce its impact on the climate by changing its animal production, improving its manure management, enhancing its use of energy from renewable sources and also improving the energy efficiency of the buildings of agricultural holdings. Such measures are supported by the PROW for 2014-2020. At the stage of the evaluation of applications for the award of assistance, investments aimed at enhancing the competitiveness of agricultural holdings and

directly and indirectly contributing to environmental protection or mitigating climate change are preferred.

#### Aim

Harmonising the conditions of agricultural production with the requirements of the protection of the environment and climate.

#### Characteristics

Support for adaptation measures and those reducing greenhouse gas emissions from agricultural holdings involves a group of measures with the character of investments (tangible or intangible ones) related to the protection of the environment and climate. Among others, these measures include:

- modernisation of agricultural holdings,
- restructuring of small agricultural holdings.

#### ***Modernisation of agricultural holdings***

Status: implemented

Support is granted for measures which contribute to improving the overall results of agricultural holdings. The improvement of the overall results of agricultural holdings is understood to mean improved competitiveness and enhanced profitability of agricultural holdings. Restructuring means changes in agricultural holdings aimed at improving their competitiveness and enhancing their profitability which are made with consideration given to changes in the business environment and the internal needs of a given environment. Restructuring must be market-oriented.

The measures can concern the production of agricultural products, both food and other than food, as well as the preparation for sales of agricultural products produced at agricultural holdings. The preferred measures include those that:

- build or modernise livestock buildings or feed storage sites,
- contribute to increasing a share in the market or diversifying agricultural production or those related to organic farming,
- are carried out by persons not older than 40 years or persons submitting a joint application,
- aim at environmental protection or climate change mitigation.

A detailed list of investments aimed at protecting the environment or mitigating climate change for which additional points can be given is laid down in the Regulation of the Minister of Agriculture and Rural Development of 21 August 2015.

#### ***Restructuring of small agricultural holdings***

Status: implemented

Restructuring of small agricultural holdings is available for agricultural holdings with the economic size of less than EUR 13,000. The measures supported in this scope are expected to contribute to achieving cross-sectoral environmental objectives and to mitigating climate change.

Restructuring means fundamental changes in agricultural holdings with the aim of enhancing their competitiveness and profitability by increasing their economic size, in particular, as a result

of a change in the profile of their agricultural production. *The* support has the form of a premium in an amount of PLN 60,000, paid out in two installments.

***Premiums for young farmers***

Status: implemented

Support is available for starting and developing the agricultural activity at an agricultural holding as well as for preparing for sales of agricultural products produced at agricultural holdings.

In accordance with the regulations in effect, support can be sought by persons who are not older than 40 years, have the relevant skills and start for the first time the agricultural activity at an agricultural holding as the only head of the agricultural holding. The support has the form of a premium in an amount of PLN 150,000, paid out in two instalments.

As part of ***Restructuring of small agricultural holdings*** and ***Premiums for young farmers***, when establishing the order of the award of assistance, additional points may given to applications for the award of assistance which include the investments specified in the list of investments contributing to environmental protection or climate change mitigation. Among others, these investments include the retrofitting of agricultural holdings with slurry or urine tanks, manure slabs with side walls and a urine tank and ventilation systems with air filters.

***Investments aimed at the protection of waters against pollution by nitrates from agricultural sources***

Status: implemented

The aim of the measure is to protect waters against pollution by nitrates from agricultural sources. As part of the measure, farmers can apply for support for the retrofitting of agricultural holdings engaged in animal production with slabs or tanks for storing natural fertilisers (or silage in the case of young farmers) or the purchase of new machinery and equipment for the application of liquid fertilisers.

Support has the form of the reimbursement of part of the eligible costs of an investment project, i.e. 60% of eligible costs in the case of an investment project carried out by a young farmer and 50% of the costs in the case of the other beneficiaries. The maximum amount of support for one beneficiary and for one agricultural holding may not exceed PLN 100,000.

***Improvement of monogastric livestock systems and the reduction of methane emissions from animal waste***

Status: implemented

Increased demand for poultry meat and the need to reduce the costs of pork production forced feed companies to add to their commercial offers complete industrial feeds based on the complete or partial supplementation with synthetic amino acids. The high digestibility of protein in these feeds caused the reduction of the greenhouse emissions from poultry and pig farming involving the storage of natural fertilisers. In addition, boiler farming generally implemented multiphase nutrition to diminish the production costs and to enhance the competitiveness of national raw material. As the dairy sector develops and its technical equipment improves, to an increasing extent it separates slurry, which results in the reduction of the emissions of methane and nitrogen oxides from the storage of natural fertilisers.

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### **Scientific research on adaptation measures and measures to reduce greenhouse gas emissions from agricultural holdings**

Status: implemented

A number of research projects are implemented in the area of adaptation to climate change and the reduction of greenhouse gas emissions at agricultural holdings. The table below presents several examples of projects carried out as part of the BIOSTRATEG Programme, financed from the state budget.

Table 4.24. Examples of scientific and implementation research as part of the Biostrateg Programme on adaptation measures and measures to reduce emissions at agricultural holdings

Title	Short description
Development of an innovative method for air drying at dryers of cereal grains and seeds with the reduction of pollutant emissions	<p><b>Implemented by:</b> The Wrocław University of Environmental and Life Sciences, the Wrocław University of Technology, the University of Life Sciences in Lublin, Institute of Technology and Life Sciences and the company Expert Solutions</p> <p><b>Aim/Scope:</b> The construction of a dryer of rapeseed and maize grain drying with an air stream directly heated by natural gas so that the natural gas used as a heating medium is as unpolluted as possible and so that the drying process is less energy-intensive.</p>
New environmentally friendly energy production technologies for sustainable rural development and low-emission agricultural production	<p><b>Implemented by:</b> The Institute of Fluid-Flow Machinery, the Warsaw University of Life Sciences (SGGW), the Institute of Soil Science and Plant Cultivation – National Research Institute (IUNG-PIB), the University of Warmia and Mazury and 8 private enterprises.</p> <p><b>Aim/Scope:</b> Development of environmentally friendly technologies enabling the use of natural resources in agricultural and forest land to produce electricity and heat. As part of the project, environmentally friendly energy production technologies will be designed and developed. They will contribute to the sustainable rural development and enable popularisation of low-emission agricultural production.</p>
GUTFEED – innovative nutrition in sustainable poultry production	<p><b>Implemented by:</b> The consortium led by the feed producer called Wytwórnia Pasz PIAST PASZE Sp. z o.o.</p> <p><b>Aim/Scope:</b> The development of comprehensive, innovative feed production technologies and the related technologies for rearing chickens and slaughter turkeys, which will result in diminishing the adverse impact of poultry production on the natural environment by reducing the emissions of nutrients and greenhouse gases into the environment, while, at the same time, maintaining a high level of the effectiveness of production and the quality of the product – poultry meat – and thus improving consumer safety and the competitiveness of domestic producers.</p>

Source: NCBiR, KOBiZE, IOŚ-PIB

### **Measure 19: Agri-environmental measures (a group of measures)**

Greenhouse gases affected: CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub>

#### Context

In the agriculture sector, many measures are taken to protect the environment and climate. Primarily, they result from the Rural Development Programme (PROW) for 2014-2020, which is an instrument of the European Union policy on rural development in Poland.

Aim

Promoting practices contributing to sustainable land management in order to protect soils, waters and climate.

Characteristics

The PROW for 2014-2020 lays down a group of agri-environmental measures. In addition, there are many incentives aimed at promoting the sustainable management system, consisting in the rational use of natural resources which makes it possible to limit the adverse impact of agriculture on the environment and prevents the loss of organic matter in soil. They include e.g. the protection of waters against pollution by nitrates from agricultural sources, the implementation of agricultural production in compliance with the methods of organic farming and a good agricultural condition, and the principle of cross-compliance, as well as afforestation and creation of woodland. Research programmes are also implemented with a view to developing rational and low-emission agricultural production. The key measures in this area are described below.

***Agri-environment-climate measure***

Status: implemented

Under this measure implemented under the PROW for 2014-2020 financial support is available for farmers who, on a voluntary basis, undertake to fulfil 5-year commitments to use practices contributing to environmental protection, mitigating climate change and contributing to adaptation of the agriculture sector to climate change. Payments under the measure compensate for lost incomes and costs incurred as a result of the fulfilment of the commitments. The measures in the scope of sustainable agriculture and the protection of soils and waters make the greatest contribution to the reduction of greenhouse gas emissions.

The budget of the agri-environment-climate measure under the PROW for 2014-2020 is about EUR 1.37 billion. One of the requirements for the award of support is the obligation to have a plan for agri-environmental actions which has been prepared with the participation of an agri-environmental advisor or – in the case of nature packages – to have an expert nature study.

Table 4.25. Key areas of support as part of the agri-environment-climate measure under the PROW for 2014-2020

Area	Description of measures
Sustainable agriculture	The aim of the measure is to promote the sustainable management system and to prevent the loss of organic matter in soil. Support under this package promotes the rational use of natural resources, the limitation of the adverse impact of agriculture on the environment and the prevention of the loss of organic matter in soil. Under the package, each year the farmer is obliged, among others, to cultivate at least 4 crops on arable land. The share of the main crop and cereals as a total may not exceed 65%, while, at the same time, the share of each crop may not be less than 10% of the area of arable land. The beneficiary is obliged to apply appropriate crop rotation, consisting in the use of at least 3 groups of crops in a 5-year commitment period on a parcel of agricultural land. The groups of crops used in crop rotation include plants with similar site-related requirements, i.e. the soil conditions, requirements for preceding crops and agronomic treatments. Under the package, there is also the obligation to prepare and comply with

Area	Description of measures
	a fertilisation plan based a chemical soil analysis. During the 5-year commitment period, the farmer is obliged to use a practice intended to increase the organic matter content in soil twice on each agricultural parcel (intercrop, integration of straw/manure).
Protection of soils and waters	The purpose of the measure is to protect waters from erosion and the loss of organic matter, as well as to protect of waters against pollution by applying catch crops (sowing mixtures of catch crops and leaving them in the period from 15 September to 1 March) or protective belts on slopes with an inclination of more than 20% (grass belts with a width of 6 m or more across the slope).

Source: KOBiZE, IOŚ-PIB

### **Organic farming**

Status: implemented

Organic farming – also called ecological or biological farming – means a management system involving sustainable plant and animal production within an agricultural holding. The production using organic methods ensures high-quality products in the production of which natural methods which do not disturb the natural equilibrium are used to as large an extent as possible. This principle applies to all the types and stages of production – both plant and livestock production, aquaculture products and processing.

The production in an organic agricultural holding is carried out in accordance with the principles of sustainable development, activates biological processes by using natural means of production and ensures the durable fertility of soil and the viability of plants and animals. In particular, this production consists in the application of correct crop rotation and other natural methods to maintain or enhance the biological activity and fertility of soil, as well as the selection of plant species and varieties and animal species and breeds taking into account their natural immunity to diseases.

The aim of this measure, included in the PROW for 2014-2020, is to support the voluntary commitments of farmers to undertake to maintain or shift to the production practices and methods laid down in the of provisions relating to organic farming in the Regulation of the Minister of Agriculture and Rural Development of 15 March 2015. The payment is granted every year if the farmer carries our agricultural production in compliance with the regulations on organic farming for a 5-year organic commitment period. The rates vary between about PLN 400 per ha (grassland) and about PLN 1,900 per ha (horticultural crops).

#### **Principle of cross-compliance, including a good agricultural condition**

Status: implemented

Farmers who apply for direct payments and for certain payments under PROW for 2014-2020 are obliged to meet the requirement for maintaining the land within their agricultural holdings in a good agricultural and environmental condition (GAEC) and the statutory management requirements laid down in Annex to Regulation (EU) No 1306/2013 of the European Parliament and of the Council.

These standards and requirements make up one mechanism called the principle of cross-compliance. This principle means that the amounts of payments to farmers depend on their fulfilment of specific requirements related to the environment, climate change, maintaining land in a good agricultural condition, public health, plant and animal health and animal welfare.

The requirements of a good agricultural condition aim at strengthening the standards for environmental protection and climate change and their purpose is, among others, to ensure the correct soil management by compliance with the standards for the prevention of soil erosion, the limitation of degradation of organic matter, the prevention of changes in the soil structure, the correct management of water resources in agriculture and the protection of water against pollution.

### **Greening**

Status: implemented

Since 2015 all the farmers eligible to receive a single area payment have received payments for agricultural practices favourable for the climate and the environment, i.e. greening. Depending on the area of arable land in their agricultural holdings, the share of permanent grassland and the presence of permanent grassland with natural values, the farmers are obliged to comply with greening practices.

Greening is usually implemented through: crop diversification (in the case of farmers who have at least 10 ha of arable land), as well as the maintenance of existing permanent grassland and the maintenance of ecological focus areas (EFAs) (in the case of farmers who have at least 15 ha of arable land). Crop diversification consists in maintaining an appropriate number and area of crops on arable land in an agricultural holding in a given year. The practice applicable to permanent grassland consists of two elements: the obligation to maintain the permanent grassland with environmental values (ecological focus areas) situated on Natura 2000 sites at the level of an agricultural holding and to maintain the area of permanent grassland at an unchanged level compared its area determined in the reference year (2015) at the scale of the country.

The maintenance of EFAs, including the cultivation of intercrops and green cover plants, such as grasses, legumes and their mixtures, and the maintenance of landscape elements, including, among others, hedges/wooded belts, lines of trees and midfield copses are important as they contribute to weakening advection in the neighbouring arable fields, thus limiting their erosion and, thereby, carbon dioxide emissions from the mineralising organic matter.

### **Afforestation and creation of woodland**

Status: implemented

Afforestation is hugely valuable for the protection of the climate, soils and waters. Forest areas absorb CO<sub>2</sub>, cumulate carbon, contribute to preventing sudden weather events and improve the water regime of the area. Under PROW for 2014-2020, *investments in forest area development and improvement of the viability of forest* were continued. This Programme supports measures which directly contribute to sequestration of CO<sub>2</sub>, i.e. the reduction of its emissions, with the simultaneous adaptation to climate change.

Afforestation support can be granted to farmers, territorial self-government units and the organisational units of municipalities, counties and Voivodeship for land in lower classes or land excluded from agricultural production as an alternative manner of its development.

The aim of the measure is to enlarge forest areas by afforestation and creation of woodland. The support is granted for land defined in the register of land and buildings as agricultural land, constituting arable land or orchards designated for afforestation in the local land use plans and in the studies on the conditions and directions of spatial development.

Support is granted in the form of:

- support for afforestation (on a one-off basis after a forest plantation is established),
- a premium for tending (granted per ha, annually for 5 years),
- a premium for afforestation as a lump sum payment to cover foregone income from agricultural activity, calculated per hectare of land (paid for 12 years).

This measure is dedicated to agricultural land which is characterised by low usefulness for agriculture and constitutes a potential area for establishing forest plantations and also for shaping the landscape structure in rural areas.

### ***Scientific research and projects on rational and low-emission agricultural production***

Status: implemented

A number of research projects are carried out to develop rational and low-emission agricultural production. Examples of the projects are presented in the table below.

Table 4.26. Examples of research projects to develop rational and low-emission agricultural production

Title	Short description
Support for low carbon agriculture able to adapt to observed climate change in the perspective of 2030 and 2050	<p><b>Implemented by:</b> The Institute of Soil Science and Plant Cultivation – National Research in Puławy, the Institute of Agrophysics of the Polish Academy of Sciences, the Institute of Environmental Protection and Grupa Azoty SA in Puławy which co-finances the project.</p> <p><b>Aim/Scope:</b> The provision of new tools to the Centre for Emissions Management (KOBiZE) for assessing the emission factors for Polish agriculture and to Grupy Azoty for assessing the carbon footprint of the use of fertilisers at the production level in agricultural holdings. As part of the project, advanced measuring systems are launched for the assessment of greenhouse gas emissions from soils (for the purposes of modelling the productivity of agriculture and the impact of agriculture on the environment). The assessment covers the conditions of the present climate and the future ones as projected by climate scenarios.</p> <p><b>Implementation period:</b> 2015-2018</p> <p><b>Source of Financing:</b> The National Centre for Research and Development as part of the BIOSTRATEG Programme “Natural Environment, Agriculture and Forestry”</p>
The establishment of an effective model of an interactive system to support agrochemical decisions to optimise the fertilisation and	<p><b>Implemented by:</b> The National Chemical and Agricultural Station in Warsaw (the consortium leader), the Institute of Soil Science and Plant Cultivation – National Research in Puławy, the Institute of Technology and Life Sciences in Falenty</p> <p><b>Aim/Scope:</b> The project includes the following tasks:</p> <ul style="list-style-type: none"> <li>• the establishment of an effective model of an interactive system</li> </ul>

Title	Short description
the protection of waters against agricultural pollutants	<p>to support agrochemical decisions to optimise the fertilisation and the protection of waters against agricultural pollutants in arable land;</p> <ul style="list-style-type: none"> <li>• the establishment of an effective model of an interactive system to support agrochemical decisions to optimise the fertilisation and the protection of waters against agricultural pollutants in grassland;</li> <li>• the implementation of a model of an interactive system to support agrochemical decisions to optimise the fertilisation and the protection of waters against agricultural pollutants in grassland.</li> </ul> <p><b>Implementation period:</b> 02.01.2019 – 31.12.2021  <b>Source of financing:</b> The project co-financed by the National Centre for Research and Development from public resources as part of the Strategic R&amp;D Programme GOSPOSTRATEG – “Poland’s Social and Economic Development in the Conditions of Globalising Markets”</p>
Supporting activities for the conservation and rational use of agricultural production space in Poland and for shaping the quality of plant raw materials in 2016-2020	<p><b>Implemented by:</b> The Institute of Soil Science and Plant Cultivation – National Research Institute in Puławy</p> <p><b>Aim/Scope:</b> The project includes the following tasks:</p> <ul style="list-style-type: none"> <li>• the management and enhancement of the information system on the agricultural space and the preparation of spatial analyses,</li> <li>• the assessment and projection of the production and environmental effects of the CAP ,</li> <li>• the improvement of the plant production technologies to harvest crops of desirable quality in an environmentally safe manner, taking into account the CAP rules and the expected climate change,</li> <li>• the improvement and dissemination of technological progress to enhance the innovativeness and competitiveness of plant (agricultural) production in Poland.</li> </ul> <p><b>Implementation period:</b> 01.01.2016-31.12.2020  <b>Source of financing:</b> The Multiannual Programme of the Ministry of Agriculture and Rural Development</p>
Technological and nature projects for an innovative, effective, and low - emission economy in rural areas	<p><b>Implemented by:</b> The Institute of Technology and Life Sciences in Falenty</p> <p><b>Aim/Scope:</b> The project includes the following tasks:</p> <ul style="list-style-type: none"> <li>• the improvement of the state of knowledge of possibilities of using agricultural biomass for energy generation purposes,</li> <li>• the determination of the technological factors and the economic effects of the reduction of the emissions of greenhouse gases and other harmful gases into the atmosphere from rural areas,</li> <li>• the identification of the effectiveness of measures to protect biodiversity in rural areas (Task 3),</li> <li>• the systematisation and consolidation of the knowledge of small retention sites and amelioration facilities,</li> <li>• the optimisation of the methodology for the implementation of maintenance works on water amelioration facilities,</li> <li>• the enhancement of the possibilities of protecting waters against agricultural pollutants,</li> <li>• the improvement of the state of knowledge of the effectiveness of household-based wastewater treatment plants and their impact on the environment,</li> <li>• the improvement of the design of agricultural roads.</li> </ul> <p><b>Implementation period:</b> 01.01.2016-31.12.2020</p>

Title	Short description
	<b>Source of financing:</b> The Multiannual Programme of the Ministry of Agriculture and Rural Development

Source: NCBR, IUNG, KOBiZE, IOŚ-PIB

### **Measure 20: Development of agricultural biogas plants (a group of measures)**

Greenhouse gases affected: CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub>

#### Context

A biogas plant is an installation which produces at the same time electricity, heat and environmentally friendly fertiliser. Agricultural biogas plants are a specific type of such plants. In their agricultural biogas production they use agricultural raw materials, agricultural side-products, liquid or solid manure, side-products, waste or residues from the processing of products of agricultural origin or forest biomass, or plant biomass collected from areas other than those registered as agricultural or forest land, excluding biogas generated from raw materials coming from wastewater treatment plants and waste landfills.

Energy generation at agricultural biogas plants contributes to alleviating the problem of the storage of agricultural waste and, at the same, reduces the emissions into the atmosphere of high methane concentrations from digestion of freely stored biomass. The processing of organic substances can also be the source of a valuable fertiliser for agriculture.

The Programme “Directions of the Development of Agricultural Biogas Plants in Poland in 2010-2020” was prepared by the Ministry of Economy in cooperation with the Ministry of Agriculture and Rural Development. Its objective is to establish by 2020 in each municipality on average one biogas plant using biomass of agricultural origin, on the assumption that each municipality has the suitable conditions for launching such a project, i.e. a land resource from which biomass can be obtained. At present, in Poland there are more than 80 agricultural biogas producers who own more than 90 agricultural biogas plants.

#### Aim

Increasing the use of energy from renewable sources, enhancing the use of organic agricultural residues for energy generation and the employment in the “green jobs” sector and expanding technical infrastructure in rural areas.

#### Characteristics

The Programme “Directions of the Development of Agricultural Biogas Plants in Poland in 2010-2020” has established a framework for a system promoting and supporting the production of agricultural biogas in order to generate electricity and heat. The Directions do not predetermine the capacity of the equipment installed to produce biogas or the manner of its use (the transfer to the national/local distribution network, electricity/heat generation), which depends on many location factors and local demand.

Key measures include:

- research and education programmes on the construction and operation of agricultural biogas plants,



- support for the construction of agricultural biogas plants.

The implementation of the Programme “Directions of the Development of Agricultural Biogas Plants in Poland in 2010-2020” will make it possible to increase of the share of RES in the generation and use of energy in agriculture and, as a result, improve the energy security of the country by enhancing the supply of domestic raw materials. Since a substantial part of gas, electricity and heat supply will be based on local agricultural biogas plants it will also be possible to shorten supply chains and create new jobs.

### ***Research and education programmes on the construction and operation of agricultural biogas plants***

Status: implemented

The Programme provides for support for science in the execution of research and demonstration projects related to the implementation of new techniques and technologies, educational activities and those that disseminate knowledge via agricultural advice centres and indicates the directions of the work necessary to develop technical and technological processes (from the improvement of methane fermentation and biogas production from different substrates of agricultural origin, the use of post-fermentation products, biogas cleaning, biogas conversion into electricity and heat, through the development of IT techniques, to the optimisation, supervision and stabilisation of the operation of biogas plants) in order to improve the reliability and performance of biogas plants which depend to large extent on the efficiency of microbiological processes unfolding in bioreactors.

Since 2014 the agricultural schools supervised by the Ministry of Agriculture and Rural Development have educated in the profession “technician of renewable energy generation equipment and systems” which is attested by the certificate of an installer of micro- and small renewable energy generating installations.

### ***Support for agricultural biogas plants***

Status: implemented

Financial support for the construction of agricultural biogas plants is available from different sources. The table below lists examples of such plants.

Table 4.27. Examples of sources of financing for agricultural biogas plants

Source of financing	Short characteristics
Programme for projects on RES and high-efficiency cogeneration plants (NFOŚiGW)	<p><b>Scope:</b> Under the Programme, resources are available to support electricity and/or heat generation using biogas.</p> <p><b>Form of support:</b> Interest-bearing loans with the possibility of redemption. The amount of a loan varies between PLN 4 million and PLN 50 million, under the assumption of cofinancing of up to 75% of the eligible costs of a project. The minimum value of a project is PLN 10 million.</p> <p><b>Beneficiaries:</b> Entities launching projects on renewable energy sources and high-efficiency cogeneration</p>
Green Investment Scheme (GIS) – agricultural biogas plants (NFOŚiGW)	<p><b>Scope:</b> As part of the Programme, resources are available for cofinancing of the construction, expansion or re construction of electricity or heat generating plants using agricultural biogas, the construction, expansion or reconstruction of installations producing biogas to be fed into a gas distribution or direct network.</p>



	<p><b>Form of support:</b> Preferential loans (with the possibility of partial redemption) and grants, including subsidies to the loan interest, partial repayments of the credit principal and subsidies to the interest or redemption price of bonds.</p> <p>The minimum total cost of a project is PLN 10 million.</p> <p><b>Beneficiaries:</b> Natural and legal persons, units without legal personality to which the Act confers legal capacity</p>
Support for biogas plants under the Rural Development Programme (PROW)	<p><b>Scope:</b> The support includes, among others, the generation or distribution of energy from renewable sources, in particular, biogas or biomass. This scope includes investment costs, in particular, the purchase of materials and the execution of construction and assembly works, the purchase of necessary equipment.</p> <p><b>Form of support:</b> Grant</p> <p>The amount of support may not exceed 75% of eligible costs, but not more than PLN 3 million for one municipality (for renewable energy sources) in the implementation period of the Programme.</p> <p><b>Beneficiaries:</b> Municipalities or auxiliary units established by municipalities</p>

Source: NFOŚiGW, KOBIZE, IOŚ-PIB

#### 4.1.7 Policies and measures in the waste sector

##### Key strategies, plans and programmes

The table below lists the key strategies, plans and programmes in the waste sector which affect its functioning and condition the protection of the environment and climate.

Table 4.28. Key strategies, plans and programmes in the waste sector

Title	Description
National Waste Management Plan (KPGO) 2014, adopted by the Council of Ministers on 24 December 2010	The Plan covers the full range of tasks necessary to achieve integrated waste management in the country in a manner ensuring environmental protection, taking into account the present and future opportunities and circumstances and the technological level of existing infrastructure. The objectives and tasks presented in the Plan apply to the period from 2011 to 2014 and, as an outlook, to the period from 2015 to 2022.
National Waste Management Plan 2022, adopted by the Council of Ministers on 1 July 2016	The Plan is an update of the KPGO 2014. It sets out the objectives and directions of waste management actions, in accordance with the waste hierarchy and the polluter pays principle. The objectives and tasks presented in the Plan apply to the period from 2017–2022 and, as an outlook, to the period until 2030.
Strategy for the Management of Municipal Sewage Sludge for 2019–2022, issued by the Minister of Environment on 18 November 2018	The aim of the Strategy is to create the conditions and mechanisms conducive to the solution of the growing problem posed by municipal sewage sludge which is waste. The tasks under the Strategy focus on the processes of treatment of municipal sewage sludge as waste.
National Urban Wastewater Treatment Programme, adopted by the Council of Ministers on 16 December 2003, the last (fifth) update, adopted by the Council of Ministers on 31 July 2017	The Programme was drawn up in relation to the need to order wastewater management and prioritise the necessary investments in a manner enabling Poland to meet its commitments made in the Treaty of Accession to the EU. The Programme lists agglomerations which must be equipped with wastewater collection systems and wastewater treatment plans by the deadlines set in the Programme. To date, it has been updated five times: in 2005, 2009, 2010, 2015 and 2017.

Title	Description
Roadmap for Transition to the Circular Economy, adopted by the Council of Ministers on 10 September 2019	<p>The Circular Economy (CE) is an issue which relates to all the stages of the life cycle of products and involves actions within the competence of many Ministries.</p> <p>The Roadmap for Transition to the Circular Economy is one of the strategic projects included in the Strategy for Responsible Development. It is conceived to be a document containing a set of instruments, both legislative and other than legislative ones, which - when implemented by the Polish administration - should contribute to implementing in Poland the economic model which the CE constitutes. The actions proposed in the CE Roadmap primarily include analytical and conceptual works, information, promotion and coordination in the individual areas covered by the Roadmap. Poland's CE priorities are as follows:</p> <ul style="list-style-type: none"> <li>• Innovation, the strengthening of the cooperation between industry and science and, as a result, the implementation of innovative solutions in the Polish economy,</li> <li>• The creation of a European market of recyclables where their flows would be easier,</li> <li>• Ensuring high-quality recyclables which would result from sustainable production and consumption,</li> <li>• The development of the services sector.</li> </ul> <p>This document does not constitute a strategy or a development programme within the meaning of the Act on the Principles of Implementation of Development Policy and is not subject to its requirements.</p>

Source: KOBiZE, IOŚ-PIB

### Key legal acts

The table below lists the key legal acts in the waste sector which affect its functioning and condition the protection of the environment and climate.

Table 4.29. Key legal acts in the waste sector

Title	Description
Act of 14 December 2012 on Waste (Official Journal of the Laws of 2019, Items 701, 730, 1403 and 1579)	The Act sets out the principles of waste management in a manner which ensures the protection of human life and health and the environment in accordance with the principle of sustainable development. The Act establishes the waste hierarchy: 1) prevention; 2) preparing for re-use; 3) recycling; 4) other recovery; 5) disposal.
Act of 13 September 1996 on the Keeping of Cleanliness and Order in Municipalities (Official Journal of the Laws of 2019, Items 730, 1403 and 1579)	The Act sets out the tasks of municipalities and the obligations of property owners related to the keeping of cleanliness and order, the conditions for the performance of operations consisting in the collection of municipal waste from property owners and its management and the conditions for granting permits to providers of services within the scope governed by the Act.
Act of 20 January 2005 on the Recycling of End-of Life Vehicles (Official Journal of the Laws of 2019, Item 1610)	The Act sets out the rules for dealing with end-of life vehicles in a manner which ensures the protection of human life and health and the environment in accordance with the principle of sustainable development.
Act of 11 September 2015 on Waste Electrical and Electronic Equipment (Official Journal of the Laws of 2018,	The main purpose of the Act is to create a waste and electrical waste management system by reducing the quantity and the adverse impact of waste in the form of waste electrical and electronic

Title	Description
Item 1466)	equipment on the environment, as a result of the imposition of an obligation to separately collect and recover it, including recycling.
Act of 24 April 2009 on Batteries and Accumulators (Official Journal of the Laws of 2019, Items 521 and 1403)	The Act establishes the requirements for batteries and accumulators placed on the market and the rules for their placing on the market, as well as the rules for the collection, treatment, recycling and disposal of waste batteries and accumulators.
Act of 10 July 2008 on Extractive Waste (Official Journal of the Laws of 2017, Item 1849)	The Act sets out the rules for management of extractive waste and unpolluted soil, the rules for the operation of an extractive waste facility, the procedures for obtaining permits for the management of extractive waste and the procedures for the prevention of major accidents at category A extractive waste facilities.

Source: KOBiZE, IOS-PIB

### *Policies and measures*

#### **Measure 21: Modern principles of waste management (a group of measures)**

Greenhouse gases affected: CO<sub>2</sub>, N<sub>2</sub>O, CH<sub>4</sub>

#### Context

The waste management principles were set in the Act of 14 December 2012 on Waste, which transposed the EU Directive 2008/98/EC on waste.

The current state of waste management in Poland and the tasks and objectives to be attained are laid down in the National Waste Management Plan 2022 (KPGO), which is an update of the KPGO 2014, corresponding with the strategic documents adopted at the EU and national levels. The tasks and objectives laid down in the KPGO apply to the period from 2016 to 2022 and, as an outlook, to the period until 2030.

The KPGO 2022 sets out a framework for the correct planning of tasks and investment in the area of waste management, in accordance with the waste hierarchy. The National Plan indicates the objectives and directions of measures in the area of waste management, whereas detailed measures to achieve water management goals are laid down, along with investment plans, in updated Voivodeship Waste Management Plans.

#### Aim

Reducing the quantities of waste by intensifying recycling, improving waste treatment technologies and limiting the landfill of waste.

#### Characteristics

Measures in the area of waste management are carried out in accordance with the KPGO. The most important measures to reduce greenhouse gas emissions in the waste sector include:

- increasing the level of recycling of municipal waste,
- reducing the quantities of municipal waste deposited at waste landfills,
- waste incineration processes,
- landfill gas treatment,

- raising the public awareness in relation to waste management.

### ***Increasing the level of recycling***

Status: implemented

The levels of recycling of selected fractions of municipal waste are implemented, among others, by ensuring a uniform system for separate waste collection, the construction and modernisation of waste treatment installations and raising the rates for the landfill of waste. The measures taken in this area are expected to result in:

- the achievement the levels of recycling and preparing for re-use of the fractions of paper, metals, plastics and glass of at least 50% by weight by the end of 2020,
- the achievement of 65% levels of recycling of the fractions mentioned above by the end of 2030.

The measures in the scope of recycling and preparing for re-use include mechanical and biological technologies for the treatment of mixed municipal waste and efforts to maximise the weight of recycled municipal waste, among others, though analysis of recyclability in each Voivodeship primarily of plastics, composite packaging and packaging which has been used to hold dangerous agents, eco-design, the creation of the legal and economic conditions for the construction of installations enabling the treatment of all the separately collected waste or the stimulation of the development of the market of recyclables and products containing recyclables.

Since July 2017 Poland has had a uniform waste segregation system, with a division into the following fractions: paper, glass, metals and plastics, mixed waste and biowaste. In addition, separate collection includes, among other, waste batteries and accumulators, waste electronic equipment or furniture.

### ***Reducing the quantities of municipal waste deposited at waste landfills***

Status: implemented

The quantities of municipal waste deposited at waste landfills are reduced by promoting zero-waste and low-waste technologies, waste treatment using methods which are more environmentally friendly (e.g. recycling) or raising the rates of the landfill charges for municipal waste (including the waste containing the biodegradable fraction). The measures taken in this area are expected to result in:

- reducing the landfill of municipal waste to not more than 10% by 2030,
- reducing the quantities of biodegradable municipal waste deposited at landfills so that in 2020 not more than 35% of the weight of this waste is deposited there (relative to the weight of the waste generated in 1995).

Measures are taken to prevent the generation of municipal waste, including food waste and other biodegradable waste, among others, involving:

- incentives encouraging re-use in the case of municipal waste other than food waste and other biodegradable waste by establishing re-use points enabling an exchange of used objects, establishing repair points for objects and products, and organising exchanges of different objects, in particular, household appliances, clothes and footwear,
  - ecodesign (systematically taking into account the environmental aspects in designing products with a view to improving the characteristics of the environmental impact of a given product at the stage
-

of its manufacture and in its while life cycle, and implementing research projects on ecodesign, as well as such design that extends the service life of a product and enables the re-use of its components,

- the establishment of food banks to collect and distribute food with a short time remaining until its expiry date among those in need,
- the use of food waste which is not suitable for human consumption for other purposes.

### ***Waste incineration processes***

Status: implemented

Waste incineration and landfill gas treatment processes are carried out in a manner which ensures the highest possible environmental protection and efficiency of the processes. Municipal waste incineration processes should be developed in a manner which poses no risk to the set levels of preparing for re-use and recycling.

The capacity of all the installations for the incineration of municipal waste and the waste arising from the treatment of municipal waste in a given Voivodeship should not exceed 30% of the quantity of municipal waste generated in that Voivodeship. Otherwise the achievement of the required levels of recovery and recycling may be at risk. In Poland, eight municipal waste incineration plants are now in operation (Warsaw, Konin, Białystok, Bydgoszcz, Cracow, Poznań, Szczecin and Rzeszów). Another four are planned.

### ***Landfill gas treatment processes***

Status: implemented

Biogas can be generated at a landfill for even 30 years from the moment when waste is deposited. The composition and quantity of gas generated mainly depends on the quantity and quality of the organic fraction deposited at a landfill. Such factors as the deposition height, air temperature and atmospheric pressure are also of large importance. It is assumed that in practice one tone of waste can produce 200-250 m<sup>3</sup> of landfill gas with the methane content of about 45-65%.

Heat and power generation from methane arising in landfill gas aims not only at minimising emissions into the environment but also at replacing the fossil fuel combustion processes. This technology is now used at more than 60 municipal waste landfills in Poland.

### ***Raising the public awareness of the correct management of municipal waste***

Status: implemented

Measures are also taken to raise the public awareness in relation to waste management. Such measures are taken at both national and municipal levels and, among others, aim at:

- raising the public awareness in relation to waste prevention, including biodegradable waste, with particular emphasis on the correct, i.e. rational, planning of purchases of food products so as to prevent food waste,
- the correct waste management, including biodegradable waste, in particular, in the scope of separate collection of municipal waste,
- the promotion of such biowaste treatment technologies which produce a fully valuable and environmentally safe material to be used for fertilisation or reclamation purposes,

- the promotion of the correct waste management and the related benefits (broadly conceived education and information measures addressed to different target groups, in particular, preschoolers, pupils and students, the general public and decision-makers).

Examples include two Internet portals managed by the Ministry of Environment: “Ecobasket” (“Ekoszyk”) on sustainable lifestyle (<http://ekoszyk.mos.gov.pl/>) an “Our Waste” (“Nasze Śmieci”) on the rules for waste segregation ( <http://naszesmieci.mos.gov.pl/>).

### ***Measure 22: Modern wastewater management (a group of measures)***

Status: implemented

Greenhouse gases affected: CH<sub>4</sub>, N<sub>2</sub>O

#### Context

The principles of wastewater management were laid down in the Act on Water Law which, among others, transposed Directive 91/271/EEC concerning urban waste-water treatment. In order to identify the needs in the area of wastewater management and to draw up an action plan, the National Municipal Wastewater Treatment Plan (KPOŚK) was prepared. It is a strategic document aimed at protecting the aquatic environment by reducing discharges of insufficiently treated wastewater. At present the fifth update of KPOŚK of 31 July 2017 (AKPOŚK 2017) is in force, containing a list of tasks planned to be implemented by self-governments in the period from 2016 to 2021.

The AKPOŚK 2017 applies to 1,587 agglomerations with population equivalent of 38.8 million where 1,769 municipal wastewater treatment plants are located.

#### Aim

Improving wastewater management and intensifying the collection and use of methane.

#### Characteristics

The most important measures to reduce greenhouse gas emissions in the wastewater management sector include the construction/modernisation of wastewater treatment infrastructure and the construction/modernisation of installations for the capture of methane and its use which leads to energy self-sufficiency of treatment plants by their maximum use of the biogas generated for the production of electricity and heat. Moreover, important measures include those to minimise the quantity of arising sewage sludge and the need to treat it.

In 2017, there were 1,756 municipal wastewater treatment plants, including 608 plants with enhanced removal of nitrogen compounds and total phosphorus and 1,148 plants ensuring biological treatment. 557 wastewater treatment with enhanced nutrient removal and 1,047 biological treatment plants met the treatment standards.

In 2016 and 2017, within agglomerations 3,983 km of the wastewater collection network, including 3,103 km of the gravity network, were built. As a result of the construction of this network, the number of connected inhabitants grew by 840,989. Moreover, 384 km of the existing network were modernized.

In that period, too, 196 investment projects in the area of municipal wastewater treatment plants were implemented, as part of which:

- 14 wastewater treatment plants were built,
- 73 wastewater treatment plants were modernised,
- 6 wastewater treatment plants were expanded,
- the sludge section was modernised at 61 wastewater treatment plants,
- combined modernisation and expansion investment projects were carried out at 42 plants.

For sludge, the following measures are taken:

- to minimise the quantity of sludge arising,
- to improve the technological lines for sludge treatment by:
  - intensifying the process of anaerobic stabilisation (the application of the disintegration processes, the maximisation of biogas production and use),
  - intensifying the processes of the final dewatering of sludge.

The quantity of sewage sludge generated at wastewater treatment plants is minimised by modifying processes in the sewage sludge treatment systems and using solutions generating smaller quantities of excessive sludge in the main wastewater treatment technological lines.

Therefore, when planning the construction or modernisation of a wastewater treatment plants a decision must be taken to apply the appropriate solutions affecting the quality of municipal sewage sludge, taking to account: the quality of incoming wastewater, the methods for its treatment, as well as the methods for sewage sludge treatment and use. Moreover, the use of municipal sewage sludge must be consistent with the objectives laid down in the update of the National Waste Management Plan 2022 and also take into account the assumptions of Voivodeship Waste Management Plans.

#### 4.1.8 Policies and measures in the forestry sector

##### *Key strategies, plans and programmes*

The table below lists the key strategies, plans and programmes in the forestry sector which affect its functioning and condition the protection of the environment and climate.

Table 4.30. Key strategies, plans and programmes in the forestry sector

Title	Description
National Forestry Policy (PLP), adopted by the Council of Ministers on 22 April 1997	The document sets out the directions of actions in the area of forestry and indicates the linkages of forestry in intersectoral and international systems.
National Programme for the Augmentation of Forest Cover (KPZL), adopted by the Council of Ministers in 1995 and last updated in 2014	The Programme lays down the tasks intended to augment the national forest cover to 30% by 2020 and 33% by 2050. It defines the area of agricultural land designated for afforestation and presents a comprehensive action plan to rationalise the structure of uses of the natural space in the country. New afforestation projects are part of the implementation of the multifunctional and sustainable development of the country.

Source: KOBiZE, IOŚ-PIB

### Key legal acts

The table below lists the key legal acts in the forestry sector which affect its functioning and condition the protection of the environment and climate.

Table 4.31. Key legal acts in the forestry sector

Title	Description
Act of 28 September 1991 on Forests (Official Journal of the Laws of 2015, Item 2100)	The document sets out the principles of the preservation, conservation and augmentation of forest resources and the principles of forest management in relation to other elements of the environment and the national economy. Their purpose is to preserve forests and their favourable effect on the climate, air, water, soil, human living conditions and health and on the natural equilibrium.
Act of 16 April 2004 on Nature Conservation (Official Journal of the Laws of 2015, Item 1651, as amended)	The Act sets out the scope of conservation necessary to effectively protect Natura 2000 sites, fulfilling obligations under Council Directive 92/43/EEC of 21 May 1992 (the so-called Habitats Directive) and Directive 2009/147/EC of 30 November 2009 (the so-called Birds Directive) and achieving to the adequate extent the objective of both Directives – to maintain or restore the favourable state of conservation of the objects of conservation in the Natura 2000 network.

Source: KOBiZE, IOS-PIB

### Policies and measures

#### **Measure 23: Forest land development and improvement of the viability of forests (a group of measures)**

Greenhouse gas affected: CO<sub>2</sub>

#### Context

The implementation of multipurpose, sustained and sustainable forest management makes it possible to maintain an equilibrium between the functions discharged by forests: the nature-related (protective), social and economic. Forests have a large potential to mitigate climate change which can be increased by implementing additional measures in the forestry sector.

As part in the measures envisaged for implementation in Poland under the National Environmental Policy, a system is to be established to increase carbon sequestration by forests. A system of additional measures related to the sustainable forest management pursued provides, among others, for the elaboration of long-term programmes to modify the species composition of forest stands and programmes to shape their multi-storey structure.

The augmentation of forest cover is an important element of Poland's environmental, spatial and economic policies; in addition, it is one of the main objectives of the National Forest Policy. The implementation of this objective is based on the National Programme for the Augmentation of Forest Cover, adopted by the Council of Ministers in 1995 and updated in 2014. Its aim is to ensure the conditions for increasing the forest cover in the country to 30% of the total area of the country by 2020 (and to 33% in 2050), to optimally distribute afforestation projects and to set out the environmental and economic priorities and implementing instruments. The measures to



develop forest area and improve the viability of forests as included in the Rural Development Programme (PROW for 2014 -2020) also contribute to achieving the objective of augmenting the forest cover.

#### Aim

Increasing removals of CO<sub>2</sub> by improving the viability of forests, preventing deforestation, regeneration of forest stands in forest land and afforestation.

#### Characteristics

The measures to maintain and develop forest land and to improve the viability of forests are carried out in several directions. Three key measures are presented below. The 2030 National Environmental Policy refers to the establishment of a system to enhance carbon sequestration by forests. A system of additional measures related to sustainable forest management provides, among others, for the elaboration of programmes to modify the species composition of forest stands and the horizontal structure of forest stands. Scientific research is carried out on the impact of forest management on climate change.

#### ***Support for investments improving the resilience and environmental value of forest ecosystems***

Status: implemented

The aim of the measure carried out as part of PROW for 2014-2020 since 2019 is to support investments improving the resilience and environmental value of forest ecosystems. This measure includes investments contributing to restructuring of an unfavourable structure of a forest stand into one close to a natural or semi-natural one. Due to this support, investments will be carried out in existing forests aged 11 to 60 years, consisting in diversifying the species composition of forest stands, which will significantly enhance biodiversity and have a positive effect on soil conditions by protecting soils against abiotic factors.

The assistance will be paid once to cover the costs incurred in the implementation of individual investments, adapted to the age of forest stands.

The following measures can be financed:

- the reconstruction of the species composition of forest stands by bringing in broadleaved trees in the form of underplanting - introducing the second storey in the stands,
- the reconstruction of the species composition of forest stands by locally reforesting gaps arising as a result of a disease process, including the securing of stumps left from cut trees,
- the diversification of the forest stand structure by introducing the understorey,
- the establishing of clusters of specific tree and shrub species as birds' feeding and nesting site and shelter,
- late cleanings.

This measure is addressed to private forests which need significant outlays to maintain them in a good condition. The aim of the support is to diversify the species composition of forest stands (mostly coniferous monocultures) by introducing broadleaved species under the canopy of a forest stand (the second storey, the understorey and filling in gaps), which significantly enhances biodiversity. At the same time, by protecting the soil against harmful abiotic structures, it has a positive effect on the soil conditions. In addition, it will improve the resilience of forest stands to harmful biotic factors by establishing clusters of specific tree and shrub species as birds' feeding and

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nesting site and shelter (including, among others, fruit shrubs and trees) which grow quite densely, thus increasing the ecological stability of forests. The effective achievement of the objectives listed above is strengthened by the protection of underplanting against damage caused by animals, which will improve the biological resilience of forests.

### ***Forest Carbon Farms (LGW)***

Status: implemented

The aim of the measure implemented by State Forests is to demonstrate the role of forest land in mitigating the adverse impacts of climate change and removing atmospheric CO<sub>2</sub>.

The measures related to LGWs are carried out in 26 forest districts. It is expected that they will be continued for 30 years and that their outcome will be monitored. In the selected forest districts, additional measures are taken, consisting in the expansion of the vertical structure of forests by introducing a new generation under the protection of old trees, applying different methods of forest regeneration and tending works to limit carbon emissions from soil and using species with greater natural ability to remove CO<sub>2</sub>. The works are carried out in selected forest sub-compartments and aim at storing additional carbon stocks.

The pilot part covers a 10-year period (2017-2026), while the effects and their durability will be modelled for a period of 30 years. The expected effect of these works is the creation of an original Polish model of carbon balancing in a forest ecosystem. This model will enable an analysis (over a specific time) of changes in accumulated carbon stocks in all the forest layers, including the often ignored layers of undergrowth, understorey, litter or soil, taking different silviculture scenarios into account. The project as a whole is financed by State Forests from the Forest Fund.

### ***Scientific research on the impact of forest management on climate change***

Status: implemented

The table below presents the research carried out by scientific institutions to analyse the impact of forest management on the carbon balance.

Table 4.32. Examples of research and projects implemented by research units to estimate the impact of forest management on climate change

Title	Short description
Modelling carbon balance on local and global levels in the State Forests National Forest Holding and the scientific development of the input parameters and scenarios of economic actions for the territory of Poland	<p><b>Implemented by:</b> The Forest Research Institute and the State Forests National Forest Holding (PGL LP)</p> <p><b>Aim:</b> The implementation of the Canadian software CBM-CFS for carbon balancing and modelling in State Forests</p> <p><b>Financing:</b> The own resources of State Forests</p>
Optimizing forest utilization in view of incomes from timber production and carbon accumulation in forest	<p><b>Implemented by:</b> The Forest Research Institute, the Bureau for Forest Management and Geodesy, the Department of Forest Economics of SGGW, TAXUS SI, experts</p> <p><b>Aim:</b> The development of a model to adjust the size of stock and economic cutting age linking two mutually coupled aspects: timber production and carbon accumulation in raw timber, forest soil and harvested wood products</p>

Title	Short description
REMBIOFOR project - Remote sensing based assessment of woody biomass and carbon storage in forests	<p><b>Financing:</b> The own resources of State Forests</p> <p><b>Implemented by:</b> The Forest Research Institute, State Forests, SGGW, the Poznań University of Life Sciences, the Hugo Kołłątaj University of Agriculture in Cracow, the Institute of Dendrology of the Polish Academy of Sciences in Kórnik, the Wood Technology Institute in Poznan, the Institute of Geodesy and Cartography in Warsaw</p> <p><b>Aim:</b> The development of a complex methodology determining the forest stand descriptions and developing the state-of-the-art aboveground biomass and carbon content retrieval methods based on remote sensed data</p> <p><b>Financing:</b> The project cofinanced by the National Centre for Research and Development, under the BIOSTRATEG Programme "Natural Environment, Agriculture and Forestry"</p>

Source: IBL, KOBiZE, IOŚ-PIB

#### 4.1.9 Policies and measures according to greenhouse gases

The previous subsections described the policies and measures implemented in the specific sectors in Poland to protect the climate and to achieve the QEWER reduction target. The description of each sector also listed the greenhouse gases affected by a given measure (most often several greenhouse gases). In order to ensure better transparency of information in this respect, the table below lists the measures addressed in subsections 4.1.2-4.1.8, arranged according to the greenhouse gases the emissions of which they affect.

Table 4.33. Policies and measures arranged according to the greenhouse gases the emissions of which they affect

Greenhouse gas	Measure
CO <sub>2</sub>	<p><b>Measure 1: Greenhouse gas emissions trading scheme (EU ETS)*</b></p> <p><b>Measure 2: Emission reductions in non-ETS sectors (a group of measures)</b></p> <p><b>Measure 3: Development of RES (a group of measures)</b></p> <p><b>Measure 4: Development of high-efficiency cogeneration (a group of measures)</b></p> <p><b>Measure 5: Implementation of nuclear energy</b></p> <p><b>Measure 8: Improvement of energy efficiency (a group of measures)</b></p> <p><b>Measure 9: Improvement of air quality (a group of measures)</b></p> <p><b>Measure 10: Road transport package (a group of measures)</b></p> <p><b>Measure 11: Urban transport package (a group of measures)</b></p> <p><b>Measure 12: Rail transport package (a group of measures)</b></p> <p><b>Measure 13: Air transport package (a group of measures)</b></p> <p><b>Measure 14: Inland navigation package (a group of measures)</b></p> <p><b>Measure 15: Maritime shipping package (a group of measures)</b></p> <p><b>Measure 17: Rational management of agricultural and forest land (a group of measures)**</b></p> <p><b>Measure 18: Support for adaptation and mitigation measures in agricultural holdings (a</b></p>

Greenhouse gas	Measure
	<p>group of measures)</p> <p>Measure 19: Agri-environmental measures (a group of measures)**</p> <p>Measure 20: Development of agricultural biogas plants (a group of measures)</p> <p>Measure 21: Modern principles of waste management (a group of measures)</p> <p><b>Measure 23: Forest land development and improvement of the viability of forests (a group of measures)**</b></p>
CH <sub>4</sub>	<p>Measure 2: Emission reductions in non-ETS sectors (a group of measures)</p> <p>Measure 3: Development of RES (a group of measures)</p> <p>Measure 4: Development of high-efficiency cogeneration (a group of measures)</p> <p>Measure 5: Implementation of nuclear energy</p> <p><b>Measure 6: Support for and development of the use of coalbed methane</b></p> <p><b>Measure 7: Reduction of methane emissions from fuel production and distribution processes</b></p> <p>Measure 8: Improvement of energy efficiency (a group of measures)</p> <p>Measure 9: Improvement of air quality (a group of measures)</p> <p>Measure 10: Road transport package (a group of measures)</p> <p>Measure 11: Urban transport package (a group of measures)</p> <p>Measure 12: Rail transport package (a group of measures)</p> <p>Measure 13: Air transport package (a group of measures)</p> <p>Measure 14: Inland navigation package (a group of measures)</p> <p>Measure 15: Maritime shipping package (a group of measures)</p> <p>Measure 18: Support for adaptation and mitigation measures in agricultural holdings (a group of measures)</p> <p>Measure 19: Agri-environmental measures (a group of measures)**</p> <p><b>Measure 20: Development of agricultural biogas plants (a group of measures)</b></p> <p><b>Measure 21: Modern principles of waste management (a group of measures)</b></p> <p><b>Measure 22: Modern wastewater management (a group of measures)</b></p>
N <sub>2</sub> O	<p>Measure 1: Greenhouse gas emissions trading scheme (EU ETS)</p> <p>Measure 2: Emission reductions in non-ETS sectors (a group of measures)</p> <p>Measure 3: Development of RES (a group of measures)</p> <p>Measure 4: Development of high-efficiency cogeneration (a group of measures)</p> <p>Measure 5: Implementation of nuclear energy</p> <p>Measure 8: Improvement of energy efficiency (a group of measures)</p> <p>Measure 9: Improvement of air quality (a group of measures)</p> <p>Measure 10: Road transport package (a group of measures)</p> <p>Measure 11: Urban transport package (a group of measures)</p> <p>Measure 12: Rail transport package (a group of measures)</p> <p>Measure 13: Air transport package (a group of measures)</p> <p>Measure 14: Inland navigation package (a group of measures)</p> <p>Measure 15: Maritime shipping package (a group of measures)</p> <p><b>Measure 18: Support for adaptation and mitigation measures in agricultural holdings (a group of measures)</b></p> <p><b>Measure 19: Agri-environmental measures (a group of measures)**</b></p> <p>Measure 20: Development of agricultural biogas plants (a group of measures)</p> <p>Measure 21: Modern principles of waste management (a group of measures)</p> <p>Measure 22: Modern wastewater management (a group of measures)</p>

Greenhouse gas	Measure
HCFs	Measure 2: Emission reductions in non-ETS sectors (a group of measures) <b>Measure 16: Limitation of the use of fluorinated greenhouse gases</b>
PFCs	Measure 1: Greenhouse gas emissions trading scheme (EU ETS) Measure 2: Emission reductions in non-ETS sectors (a group of measures) <b>Measure 16: Limitation of the use of fluorinated greenhouse gases</b>
SF <sub>6</sub>	Measure 2: Emission reductions in non-ETS sectors (a group of measures) <b>Measure 16: Limitation of the use of fluorinated greenhouse gases</b>
NF <sub>3</sub>	No measures***

\* Bold print indicates the measures which have a key effect on the reduction of the emissions of a given greenhouse gas.

\*\* Measures 17, 19 (the part concerning afforestation and creation of woodland) and 23 do not affect the achievement of the QEWER reduction target because they address the emissions from the LULUCF sector.

\*\*\* This gas is not covered by QEWER. Moreover, in Poland there are no emission sources of this gas.

Source: KOBiZE, IOŚ-PIB

## 4.2 Changes in the national institutional system for the evaluation of progress in achieving the emission reduction target

### 4.2.1 Changes in the EU system

Progress in achieving the emission reduction target is monitored pursuant to *Regulation (EU) No 525/2013 of the European Parliament and of the Council of 21 May 2013 on a mechanism for monitoring and reporting greenhouse gas emissions* (JMMR). This Regulation introduced mechanisms enabling the monitoring of the achievement of the emission reduction targets at the levels of Member States and the EU as a whole. The MMR imposed on the EU Member States the obligation to report to the EC on:

- historical GHG emissions
- GHG emission projections
- policies and measures to reduce GHG emissions
- low-carbon development strategies
- assistance provided to developing countries
- use of the proceeds from the sales of emission allowances under the EU ETS system
- adaptation to climate change

Moreover, the EU has adopted a number of regulations on the monitoring, reporting and verification of emissions by aircraft operators and stationary installations covered by the EU ETS system. Pursuant to their provisions, each EU Member State adopted regulations implementing the EU legislation in their territories.

The system for monitoring EU emissions has been described in greater detail in Section 2.2.2 of the *Second Biennial Report of the European Union* (pp. 11-13).

Compared with the previous reporting period there have been no changes in the EU institutional system for monitoring the achievement of the emission reduction target.

#### 4.2.2 Changes in the national system

Compared with the information provided in BR3 there have been no changes in the national institutional system for the evaluation of progress in achieving the emission reduction target. This system is described in Section 7.

#### 4.3 Assessment of the adverse economic and social effects of measures to reduce greenhouse gas emissions

In accordance with the provisions of the *Act of 3 October 2008 on the Provision of Information on the Environment and its Protection, Public Participation in Environmental Protection and Environmental Impact Assessments (EIA Act)*, specific types of documents drawn up or approved by public administration bodies or other competent authorities are subject to a strategic environmental impact assessment. The documents subject to this obligation include policies, strategies, plans and programmes in all the sectors of the economy the implementation of which may have a significant impact on the environment.

The strategic assessment process includes the preparation of a prognosis of the environmental impact of a given policy or programme. The scope of the prognosis is regulated in great detail in the EIA Act and must contain, among others, information on the possible transboundary environmental impact. The preparation of an analysis of international environmental impacts of implemented policies is required under the UNECE Espoo Convention. The environmental impact prognosis is disclosed to the public and the countries concerned may express their opinions and possible concerns related to the proposed actions. When taking a decision to implement a policy, the competent authority must take into account the results of consultation. When implementing a policy or programme, the competent authority must monitor their impact on the environment (also abroad) and disclose the monitoring results to the public.

The regulations mentioned above ensure that potentially negative environmental and social transboundary impacts of the implementation of policies must be identified and taken into account already at the stage of their planning.

In addition, it should be pointed out that all the major policies, programmes and measures designed to mitigate climate change in the Member States of the European Union directly or indirectly result from policies adopted at the EU level (in the form of documents and legal acts). When it was working on the 2020 climate and energy package the European Commission (EC) carried out extensive analyses of the impacts of the policies and measures included in the package. As part of its assessments, the EC also carried out analyses on the impacts on third parties with a view to minimising the adverse effects of the proposed policies. Among others, on the basis of these impact analyses, all the EU Member States decide whether they adopt or do not adopt a given policy or programme. Thus, the EU decision-making process enables all the EU Member States, including Poland, to assess the potentially negative impacts on third parties already at the planning stage. The information on the analyses of the impacts of policies and measures implemented in the EU on

third parties is included in the *EU National Inventory Reports*<sup>16</sup> and *EU Biennial Reports*<sup>17</sup> available on the UNFCCC website.

In addition to the impact analyses carried out for each policy, the EU analyses the negative impacts of its climate policy pursued as part of bilateral and regional cooperation. The EU measures in this area were addressed in BR3 of the European Union (Section 4.4, pp. 254-255).

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<sup>16</sup> <https://unfccc.int/process-and-meetings/transparency-and-reporting/reporting-and-review-under-the-convention/greenhouse-gas-inventories-annex-i-parties/national-inventory-submissions-2019>

<sup>17</sup> <https://unfccc.int/process-and-meetings/transparency-and-reporting/reporting-and-review-under-the-convention/national-communications-and-biennial-reports-annex-i-parties/third-biennial-reports-annex-i>

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## 5. PROJECTIONS OF GREENHOUSE GAS EMISSIONS AND REMOVALS

### 5.1 Introduction

This report presents the national projections of greenhouse gas emissions and removals in two variants: the so-called scenario “with existing measures” (WEM), which includes the projected levels of greenhouse gas emissions and removals taking into account the adopted and already implemented policies and measures to reduce GGH emissions, and the so-called scenario “with additional measures” (WAM), which additionally includes planned measures.

The main differences between the scenarios result from the assumptions made in sector 1. *Energy*. The WEM takes into account the implementation of current regulations on: the improvement of energy efficiency, the improvement of the security of fuel and energy supply, the diversification of the fuel structure in the energy sector, the enhancement of the use of renewable energy sources, the development of competitive fuel and energy markets and the limitation of the impact of the energy sector on the environment.

In turn, the WAM scenario assumes that Poland will take additional measures to fulfil its commitments under EU legislation and international agreements to reduce GHG emissions and air pollutants. They also include other specific objectives, i.e. those consisting in enhancing the share of renewable energy sources (RES), improving energy efficiency and the security of energy supply and the construction of a single energy market. The measures laid down for the area of energy in the *Strategy for Responsible Development until 2020 (with an Outlook until 2030)* will be implemented to improve energy security and energy efficiency, to develop technologies and to restructure the hard coal mining sector [PEP 2040, 2019, Annex 2]. These measures primarily aim at achieving the 2020 and 2030 GHG emission reduction targets.

The projections in both scenarios cover the following greenhouse gases: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), HFCs (hydrofluorocarbons), PFCs (perfluorocarbons) and sulphur hexafluoride (SF<sub>6</sub>). To date, no NF<sub>3</sub> emissions have been reported in Poland; therefore, the projections assume that there will be no NF<sub>3</sub> emissions in the subsequent years, either. The projections took into account the following sectors in accordance with the IPC source classification: *Energy (including Transport)*, *Industrial processes and product use (IPPU)*, *Agriculture, Land use, land-use change and forestry (LULUCF)* and *Waste*.

### 5.2 Greenhouse gas emissions and removals in the scenario “with existing measures” (WEM)

#### 5.2.1 Results of emission projections in the scenario “with existing measures” (WEM)

According to the scenario “with existing measures”, the greenhouse gas emissions in Poland by 2040 will fall by 42% compared with 1988 and by 30% compared with 1990 (Fig. 5.1), with the largest reduction expected after 2030. In turn, for 2020 and 2030 the expected greenhouse gas emission reduction levels will be 31.1% in 2020 and 29.9% in 2030 compared with 1988. CO<sub>2</sub> has the largest



share in the national greenhouse gas emissions. Its share will fall from 81.8% in 1988 to 79.8% in 2040. In turn, the share of methane will not change, to remain at the level of 13.1%, while that of nitrous oxide will grow, respectively, from 5.1% in 1988 to 6.2% in 2040. Fluorinated gases will represent less than 1% of emissions. To date, no NF<sub>3</sub> emissions have been reported and this assumption is upheld.

Sector *Energy* has the greatest effect on changes in the future emissions and its share in the total emissions will decrease from 83% in 2017 to 79% in 2040. It is projected that by 2025–2030 the emissions in this sector will stabilise at a level of about 330 million t CO<sub>2</sub> eq., to fall later to 266 million t CO<sub>2</sub> eq. in 2040. In turn, the emissions from *Industrial processes and product use* show slight fluctuations in the projected years, staying at a level of 23–24 million t CO<sub>2</sub> eq. The future greenhouse gas emissions in *Agriculture* show a slight growing trend, from less than 32 to more than 33 million t CO<sub>2</sub> eq., while after their increase in 2020, the emissions in sector *Waste* will systematically decrease in the projected years. The LULUCF sector is characterised by a systematic decrease in the projected net CO<sub>2</sub> removals from less than -34 million t CO<sub>2</sub> eq. at present to about -14 million t CO<sub>2</sub> eq. in 2040.

Table 5.1. Aggregated results of GHG projections by gas for the years: 2020-2040 (WEM scenario) compared to emissions in the years 1988, 1990 and 2017

GHG*	Emissions by year [kt CO <sub>2</sub> eq.]							
	1988	1990	2017	2020	2025	2030	2035	2040
CO <sub>2</sub>	471 979	376 960	336 557	323 024	329 857	331 695	300 643	266 408
CH <sub>4</sub>	75 727	69 842	49 413	50 495	49 840	49 171	45 999	43 757
N <sub>2</sub> O	29 405	27 406	20 824	20 180	20 507	20 834	20 975	20 805
HFCs	NO	NO	6 893	4 004	3 298	2 882	2 678	2 696
PFCs	147	142	12	10	8	6	5	4
SF <sub>6</sub>	0	0	82	97	125	151	176	199
NF <sub>3</sub>	–	–	–	–	–	–	–	–
<b>Total</b>	<b>577 258</b>	<b>474 350</b>	<b>413 781</b>	<b>397 811</b>	<b>403 635</b>	<b>404 740</b>	<b>370 476</b>	<b>333 870</b>

\* emissions and removals from IPCC sector 4.LULUCF are not included

Source: IOŚ-PIB, KOBiZE

The total projected emissions from international aviation and marine navigation in the period from 1988 to 2040 will grow compared with the 1988 emissions by about 43%, with aviation bunker emissions tripled in that period.

A comparison of the projected data on the total greenhouse gas emissions in the period from 2020 to 2040 with the data from the base year 1988 shows a decrease in the total emissions from all the sectors, respectively, by 31.1% in 2020, by 29.9% in 2030 and by 42.2% in 2040. The largest projected reductions in the period from 1988 to 2040 occur in sectors: *Waste* (48%), *Energy* (44%) and *Agriculture* (31%). In turn, the projected emissions from *Industrial processes and product use* are lower in 2040 than in the base year by about 22% (Tables 5.2 and 5.6, Figs. 5.1 and 5.2).

Table 5.2. Aggregated results of GHG projections by source category for the years: 2020-2040 (WEM scenario) compared to emissions in the years 1988, 1990 and 2017

Source categories	Emissions by sector [kt CO <sub>2</sub> eq.]							
	1988	1990	2017	2020	2025	2030	2035	2040
1. Energy	476 220	382 821	342 089	328 559	334 754	336 042	301 769	265 071
2. Industrial processes and product use	31 198	22 701	26 998	24 420	24 040	23 942	23 985	24 246
3. Agriculture	47 909	47 244	31 740	31 752	32 452	32 881	33 170	33 249
4. Land use, land-use change and forestry	-15 704	-27 191	-33 846	-31 778	-27 338	-21 693	-17 743	-14 021
5. Waste	21 931	21 583	12 955	13 079	12 389	11 875	11 552	11 304
<b>Total**</b>	<b>577 258</b>	<b>474 350</b>	<b>413 781</b>	<b>397 811</b>	<b>403 635</b>	<b>404 740</b>	<b>370 476</b>	<b>333 870</b>
International fuel bunker	2 787	1 896	3 361	2 812	3 135	3 404	3 723	3 989
Aviation	1 018	627	2 517	2 176	2 439	2 671	2 865	3 028
Navigation	1 769	1 269	844	636	696	734	858	960

\*\* emissions and removals from IPCC sector 4.LULUCF and international fuel bunker are not included in the national total

Source: IOŚ-PIB, KOBiZE

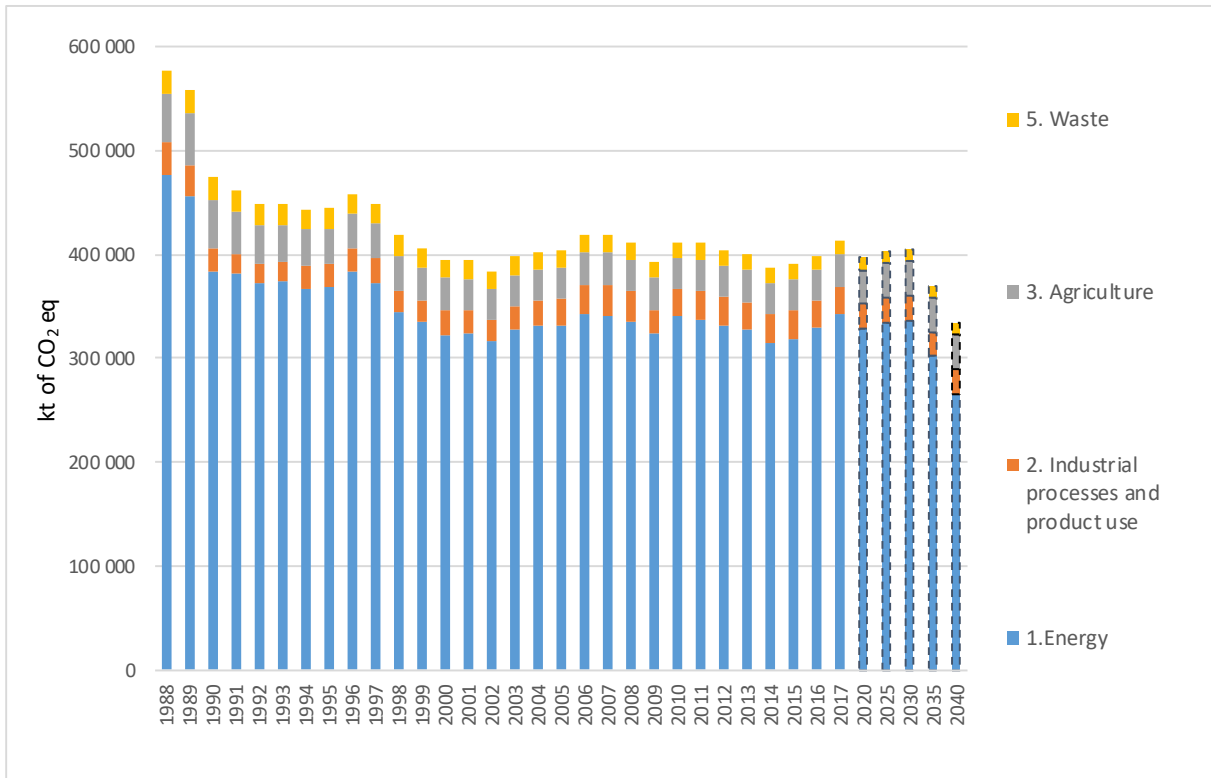


Fig. 5.1. Historical (1988–2017) and projected (2020-2040 by the WEM scenario) GHG emissions, in kt CO<sub>2</sub> equivalent.

Source: IOŚ-PIB, KOBiZE

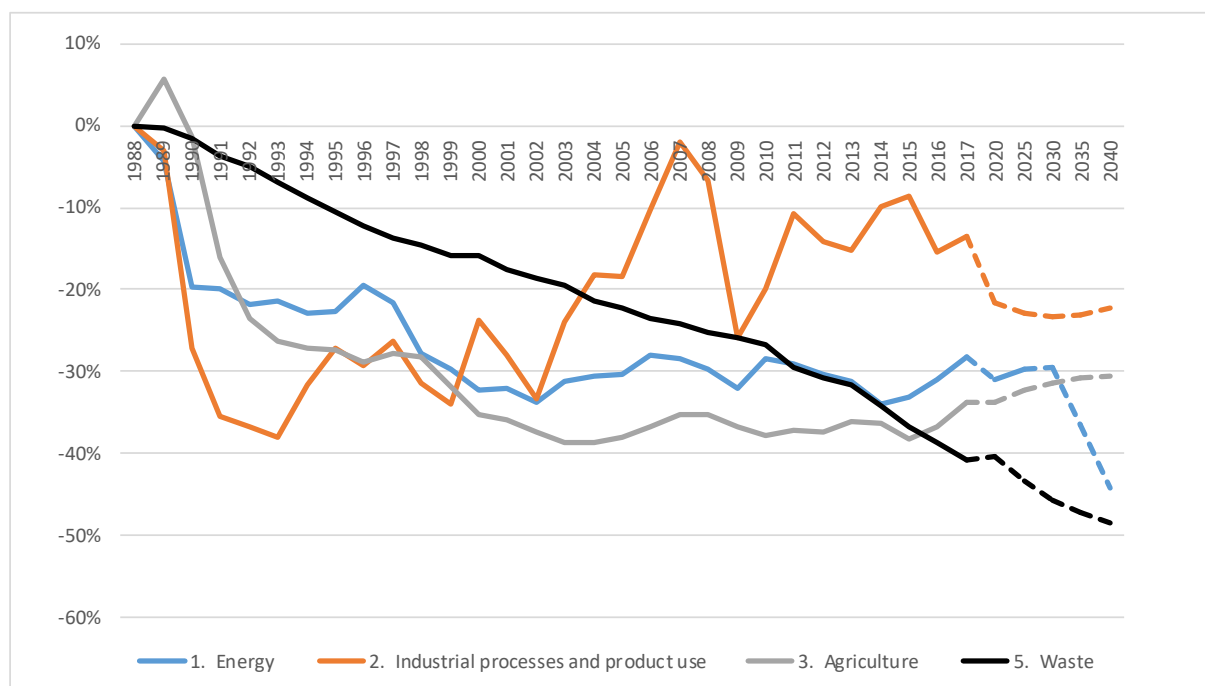


Fig. 5.2. Changes in greenhouse gases emissions compared to 1988 by sector (WEM scenario);

Source: IOŚ-PIB, KOBIZE

Table 5.3 presents detailed results of the projections of carbon dioxide emissions by IPCC category source. It follows from these data that the total CO<sub>2</sub> emission reduction in Poland in 2040 can reach 44% compared with 1988 and 29% compared with 1990. In turn, the CO<sub>2</sub> emissions in sector *Energy*, responsible for 94% of the emissions of that gas in Poland, will peak in the period from 2025 to 2030, to fall later until 2040, reaching a level of about 310 million tonnes in 2030 and about 244 million tonnes in 2040. This trend is related to the projected changes in the fuel consumption structure and level. In the other sectors, the CO<sub>2</sub> emissions will slightly change, depending on the activities projected.

Table 5.3. CO<sub>2</sub> emissions [kt] in 1988, 1990 and 2017 and projected for 2020–2040 (WEM scenario) by source category

Source categories	1988	1990	2017	2020	2025	2030	2035	2040
<b>1. Energy</b>	<b>443 000.70</b>	<b>355 175.89</b>	<b>315 932.52</b>	<b>301 943.44</b>	<b>308 444.81</b>	<b>309 973.68</b>	<b>278 673.55</b>	<b>244 175.71</b>
A. Fuel combustion	438 930.39	351 827.03	311 277.44	298 386.88	304 993.44	306 613.53	275 393.05	240 965.75
1. Energy industries	256 935.44	235 067.27	164 034.89	153 952.81	158 627.24	160 216.23	131 813.73	100 712.41
2. Manufacturing industries and construction	54 962.60	42 769.78	30 838.48	28 866.51	28 026.75	27 134.12	26 233.60	25 352.32
3. Transport	24 008.07	20 379.13	62 503.09	63 413.79	66 934.68	68 895.78	68 278.93	67 323.04
4. Other sectors	103 024.27	53 610.84	53 900.98	52 153.77	51 404.77	50 367.41	49 066.80	47 577.97
B. Fugitive emissions from fuels	4 070.31	3 348.86	4 655.08	3 556.56	3 451.38	3 360.15	3 280.50	3 209.97
1. Solid fuels	4 026.75	3 303.28	2 740.38	1 812.22	1 707.03	1 615.81	1 536.16	1 465.62
2. Oil and natural gas	43.55	45.58	1 914.71	1 744.34	1 744.34	1 744.34	1 744.34	1 744.34
<b>2. Industrial processes and product use</b>	<b>26 061.44</b>	<b>18 840.28</b>	<b>19 105.89</b>	<b>19 327.17</b>	<b>19 622.99</b>	<b>19 909.94</b>	<b>20 129.36</b>	<b>20 344.52</b>
A. Mineral industry	11 605.22	8 855.06	10 932.91	10 873.13	11 124.74	11 349.32	11 531.04	11 700.97
B. Chemical industry	5 757.60	3 801.80	5 175.61	5 303.40	5 375.28	5 446.71	5 503.64	5 560.75
C. Metal industry	7 729.51	5 766.77	2 272.47	2 442.32	2 414.66	2 405.60	2 386.37	2 374.48
D. Non-energy products and fuel use	969.11	416.65	724.90	708.31	708.31	708.31	708.31	708.31

Source categories	1988	1990	2017	2020	2025	2030	2035	2040
<b>3. Agriculture</b>	<b>2 468.52</b>	<b>2 593.38</b>	<b>919.97</b>	<b>1 013.16</b>	<b>1 041.93</b>	<b>1 064.27</b>	<b>1 092.06</b>	<b>1 140.15</b>
G. Liming	1 950.86	2 099.38	504.35	448.91	489.45	527.19	569.70	631.60
H. Urea application	517.66	494.00	415.61	564.25	552.48	537.08	522.36	508.55
<b>4. Land use, land-use change and forestry</b>	<b>-19 969.38</b>	<b>-31 849.94</b>	<b>-37 439.85</b>	<b>-33 694.70</b>	<b>-29 307.18</b>	<b>-23 604.33</b>	<b>-19 663.26</b>	<b>-15 815.90</b>
A. Forest land	-21 628.10	-34 140.71	-36 893.95	-33 228.99	-28 846.65	-22 599.97	-18 293.83	-13 359.87
B. Cropland	859.94	923.73	848.95	1 516.11	1 471.33	1 382.35	1 346.76	1 259.84
C. Grassland	698.59	719.64	-566.82	-385.85	-161.55	-4.00	253.21	258.22
D. Wetlands	596.80	601.56	1 502.87	1 429.60	1 429.60	1 429.60	1 429.60	1 429.60
E. Settlements	710.97	502.32	2 392.30	2 307.49	2 307.49	2 307.49	2 307.49	1 859.13
G. Harvested wood products	-1 207.58	-456.49	-4 723.20	-5 333.05	-5 507.40	-6 119.79	-6 706.49	-7 262.81
<b>5. Waste</b>	<b>448.05</b>	<b>350.06</b>	<b>598.39</b>	<b>739.83</b>	<b>747.54</b>	<b>747.54</b>	<b>747.54</b>	<b>747.54</b>
C. Incineration and open burning of waste	448.05	350.06	598.39	739.83	747.54	747.54	747.54	747.54
<b>Total CO<sub>2</sub> emissions without LULUCF</b>	<b>471 978.71</b>	<b>376 959.60</b>	<b>336 556.77</b>	<b>323 023.60</b>	<b>329 857.28</b>	<b>331 695.43</b>	<b>300 642.52</b>	<b>266 407.93</b>
Total CO <sub>2</sub> emissions with LULUCF	452 009.34	345 109.66	299 116.92	289 328.90	300 550.09	308 091.11	280 979.26	250 592.03

Source: IOŚ-PIB, KOBiZE

From 2020, the projected methane emissions will gradually decrease from about 2 million tonnes in 2020 to 1.7 million tonnes of CH<sub>4</sub> in 2040 (Table 5.4). There are slight fluctuations of the future changes in CH<sub>4</sub> emissions – their decrease is projected mainly in sectors *Waste* and *Energy* (primarily in fugitive emissions from fuels (from the extraction and processing fossil fuels). The methane emissions in the agriculture sector are mainly enhanced by the growing share of bedding-free cattle and pig rearing systems. In general, it is projected that the CH<sub>4</sub> emissions in 2040 will fall by about 42% compared with 1988 and by about 37% compared with 1990.

Table 5.5 show the results of the projections of nitrous oxide emissions where the N<sub>2</sub>O emissions can be seen to further stabilise at a level of about 70,000 tonnes. The projections envisage a further decrease in these emissions in 2040 compared with the base year 1988 by about 29% and by about 24% compared with 1990. The largest N<sub>2</sub>O emission reduction in the period from 1988 to 2040 was reported in sector *Industrial processes and product use* (mainly in the chemical industry) – by 81%, and in sector *Agriculture* – by 18%. In sector *Waste*, the N<sub>2</sub>O emissions grow by 20% as a result of the development of biological treatment and incineration of waste (5.B and 5.C) due to the adoption of more stringent legal regulations on the disposal of waste at landfills.

Table 5.4. CH<sub>4</sub> emissions [kt] in 1988, 1990 and 2017 and projected for 2020–2040 (WEM scenario) by source category

Source categories	1988	1990	2017	2020	2025	2030	2035	2040
<b>1. Energy</b>	<b>1 225.43</b>	<b>1 017.34</b>	<b>937.32</b>	<b>988.84</b>	<b>975.10</b>	<b>964.05</b>	<b>851.22</b>	<b>769.18</b>
A. Fuel combustion	222.08	127.27	151.82	149.63	145.83	142.30	139.05	136.16
1. Energy industries	3.61	3.29	3.71	4.81	4.74	5.22	5.40	5.60
2. Manufacturing industries and construction	4.04	4.14	5.03	4.29	4.28	4.24	4.20	4.18
3. Transport	7.73	7.39	5.53	5.07	5.39	5.68	5.93	6.09
4. Other sectors	206.70	112.45	137.55	135.46	131.43	127.16	123.52	120.30
5. Other	NO.IE	NO.IE	NO.IE	NO.IE	NO.IE	NO.IE	NO.IE	NO.IE
B. Fugitive emissions from fuels	1 003.35	890.07	785.51	839.21	829.28	821.75	712.17	633.01
1. Solid fuels	952.94	846.70	679.58	741.37	731.44	723.91	614.33	535.17
2. Oil and natural gas	50.41	43.37	105.93	97.84	97.84	97.84	97.84	97.84
<b>2. Industrial processes and product use</b>	<b>2.81</b>	<b>2.51</b>	<b>2.58</b>	<b>2.97</b>	<b>3.04</b>	<b>3.10</b>	<b>3.15</b>	<b>3.20</b>
B. Chemical industry	1.74	1.60	2.02	2.40	2.47	2.53	2.58	2.63
C. Metal industry	1.07	0.91	0.56	0.57	0.57	0.57	0.57	0.57
<b>3. Agriculture</b>	<b>972.49</b>	<b>954.08</b>	<b>578.44</b>	<b>573.15</b>	<b>588.70</b>	<b>593.03</b>	<b>591.34</b>	<b>592.96</b>
A. Enteric fermentation	878.10	862.16	511.78	499.76	496.21	491.88	488.27	489.71
B. Manure management	93.58	91.12	65.73	72.41	91.47	100.11	101.99	102.13
F. Field burning of agricultural residues	0.82	0.80	0.93	0.99	1.01	1.04	1.07	1.11
<b>4. Land use, land-use change and forestry</b>	<b>1.77</b>	<b>1.76</b>	<b>1.50</b>	<b>1.13</b>	<b>1.18</b>	<b>1.18</b>	<b>1.18</b>	<b>1.18</b>
A. Forest land	1.35	1.35	1.45	1.08	1.13	1.13	1.13	1.13
C. Grassland	0.41	0.41	0.05	0.05	0.05	0.05	0.05	0.05
<b>5. Waste</b>	<b>828.36</b>	<b>819.76</b>	<b>458.17</b>	<b>454.84</b>	<b>426.77</b>	<b>406.65</b>	<b>394.25</b>	<b>384.96</b>
A. Solid waste disposal	564.50	566.66	352.63	354.89	328.87	310.84	298.13	288.85
B. Biological treatment of solid waste	0.65	0.51	3.75	7.73	8.34	8.34	8.34	8.34
C. Incineration and open burning of waste	NO.NA	NO.NA	0.00	0.00	0.00	0.00	0.00	0.00
D. Waste water treatment and discharge	263.21	252.59	101.78	92.21	89.56	87.47	87.78	87.77
<b>Total CH<sub>4</sub> emissions without LULUCF</b>	<b>3 029.09</b>	<b>2 793.69</b>	<b>1 976.51</b>	<b>2 019.80</b>	<b>1 993.62</b>	<b>1 966.84</b>	<b>1 839.96</b>	<b>1 750.29</b>
<b>Total CH<sub>4</sub> emissions with LULUCF</b>	<b>3 030.85</b>	<b>2 795.46</b>	<b>1 978.01</b>	<b>2 020.93</b>	<b>1 994.80</b>	<b>1 968.02</b>	<b>1 841.14</b>	<b>1 751.48</b>

Source: IOŚ-PIB, KOBiZE

Table 5.5. N<sub>2</sub>O emissions [kt] in 1988, 1990, 2017 and projected for 2020–2040 (WEM scenario) by source category

Source categories	1988	1990	2017	2020	2025	2030	2035	2040
<b>1. Energy</b>	<b>8.67</b>	<b>7.42</b>	<b>9.14</b>	<b>6.36</b>	<b>6.48</b>	<b>6.60</b>	<b>6.09</b>	<b>5.59</b>
A. Fuel combustion	8.67	7.42	9.14	6.36	6.48	6.60	6.09	5.59
1. Energy industries	3.71	3.43	2.47	2.48	2.50	2.59	2.13	1.69
2. Manufacturing industries and construction	0.59	0.60	0.70	0.59	0.59	0.58	0.57	0.57
3. Transport	1.37	1.12	2.39	2.14	2.25	2.31	2.27	2.22
4. Other sectors	3.00	2.27	3.58	1.15	1.14	1.13	1.12	1.11
5. Other	NO.IE	NO.IE	NO.IE	NO.IE	NO.IE	NO.IE	NO.IE	NO.IE
B. fugitive emissions from fuels	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2. Oil and natural gas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>2. Industrial processes and product use</b>	<b>16.51</b>	<b>12.27</b>	<b>2.82</b>	<b>3.04</b>	<b>3.05</b>	<b>3.07</b>	<b>3.08</b>	<b>3.09</b>
B. Chemical industry	16.11	11.87	2.37	2.60	2.61	2.62	2.64	2.65
G. Other product manufacture and use	0.40	0.40	0.45	0.44	0.44	0.44	0.44	0.44
<b>3. Agriculture</b>	<b>70.90</b>	<b>69.79</b>	<b>54.90</b>	<b>55.07</b>	<b>56.02</b>	<b>57.02</b>	<b>58.03</b>	<b>58.00</b>
B. Manure management	10.60	10.52	7.34	7.74	7.98	8.26	8.54	8.69
D. Agricultural soils	60.26	59.24	47.52	47.29	47.99	48.72	49.45	49.27
F. Field burning of agricultural residues	0.04	0.04	0.03	0.04	0.04	0.04	0.04	0.04
<b>4. Land use, land use change and forestry</b>	<b>14.17</b>	<b>15.49</b>	<b>11.93</b>	<b>6.34</b>	<b>6.51</b>	<b>6.31</b>	<b>6.35</b>	<b>5.92</b>
A. Forest land	0.03	0.03	0.00	0.01	0.01	0.01	0.01	0.01
B. Cropland	NA.NO	1.28	7.74	2.10	2.06	1.92	1.89	1.76
C. Grassland	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
D. Wetlands	13.60	13.60	NO.NA	NO.NA	NO.NA	NO.NA	NO.NA	NO.NA
E. Settlements	0.53	0.57	4.18	4.23	4.44	4.38	4.45	4.15
<b>5. Waste</b>	<b>2.60</b>	<b>2.48</b>	<b>3.03</b>	<b>3.25</b>	<b>3.26</b>	<b>3.23</b>	<b>3.18</b>	<b>3.13</b>
B. Biological treatment of solid waste	0.04	0.03	0.23	0.46	0.50	0.50	0.50	0.50
C. Incineration and open burning of waste	0.03	0.03	0.25	0.25	0.25	0.25	0.25	0.25
D. Waste water treatment and discharge	2.53	2.43	2.55	2.53	2.51	2.47	2.43	2.37
<b>Total N<sub>2</sub>O emissions without LULUCF</b>	<b>98.67</b>	<b>91.97</b>	<b>69.88</b>	<b>67.72</b>	<b>68.81</b>	<b>69.91</b>	<b>70.39</b>	<b>69.82</b>
<b>Total N<sub>2</sub>O emissions with LULUCF</b>	<b>112.84</b>	<b>107.45</b>	<b>81.81</b>	<b>74.06</b>	<b>75.32</b>	<b>76.23</b>	<b>76.73</b>	<b>75.74</b>

Source: IOŚ-PIB, KOBiZE

Table 5.6 shows the projections of greenhouse emissions expressed in CO<sub>2</sub> equivalent. The reduction of total emissions by 2040 mainly results from a significant decrease in the emissions in category 1.A.1. *Fuel combustion in energy industries*.

Table 5.6. Total GHG emissions [kt CO<sub>2</sub> eq.] in 1988, 1990 i 2017 and projected for 2020–2040 (WEM scenario) by source category

Source categories	1988	1990	2017	2020	2025	2030	2035	2040
<b>1. Energy</b>	<b>476 219.67</b>	<b>382 821.05</b>	<b>342 088.54</b>	<b>328 559.44</b>	<b>334 754.34</b>	<b>336 041.69</b>	<b>301 769.43</b>	<b>265 070.74</b>
A. Fuel combustion	447 065.35	357 220.22	317 795.22	304 022.16	310 570.56	312 137.18	280 684.26	246 034.98
1. Energy industries	258 132.22	236 171.41	164 863.57	154 811.17	159 491.64	161 117.52	132 584.30	101 355.65
2. Manufacturing industries and construction	55 239.37	43 053.37	31 171.90	29 149.77	28 308.22	27 412.20	26 508.91	25 625.51
3. Transport	24 608.35	20 898.10	63 353.04	64 178.37	67 740.48	69 725.03	69 103.24	68 137.74
4. Other sectors	109 085.41	57 097.35	58 406.71	55 882.85	55 030.22	53 882.42	52 487.81	50 916.07
5. Other	NO.IE	NO.IE	NO.IE	NO.IE	NO.IE	NO.IE	NO.IE	NO.IE
B. fugitive emission from fuels	29 154.32	25 600.83	24 293.32	24 537.28	24 183.78	23 904.51	21 085.16	19 035.77
1. Solid fuels	27 850.33	24 470.66	19 729.87	20 346.46	19 992.95	19 713.68	16 894.33	14 844.94
2. Oil and natural gas	1 303.99	1 130.16	4 563.45	4 190.83	4 190.83	4 190.83	4 190.83	4 190.83
<b>2. Industrial processes and product use</b>	<b>31 198.21</b>	<b>22 701.35</b>	<b>26 998.20</b>	<b>24 419.97</b>	<b>24 039.81</b>	<b>23 941.76</b>	<b>23 985.41</b>	<b>24 245.59</b>
A. Mineral industry	11 605.22	8 855.06	10 932.91	10 873.13	11 124.74	11 349.32	11 531.04	11 700.97
B. Chemical industry	10 601.17	7 377.73	5 933.48	6 137.70	6 214.63	6 292.21	6 353.80	6 416.16
C. Metal industry	7 903.51	5 931.47	2 290.50	2 456.61	2 428.94	2 419.91	2 400.66	2 388.74
D. Non-energy products and fuel use	969.11	416.65	724.90	708.31	708.31	708.31	708.31	708.31
F. Product uses as ODS substitutes	NO	NO	6 905.19	4 014.45	3 306.17	2 888.44	2 683.01	2 699.61
G. Other product manufacture and use	119.20	120.45	211.23	229.77	257.02	283.59	308.59	331.79
<b>3. Agriculture</b>	<b>47 908.81</b>	<b>47 244.30</b>	<b>31 739.73</b>	<b>31 751.72</b>	<b>32 452.22</b>	<b>32 880.91</b>	<b>33 169.74</b>	<b>33 249.44</b>
A. Enteric fermentation	21 952.45	21 554.10	12 794.48	12 493.93	12 405.29	12 296.92	12 206.79	12 242.81
B. Manure management	5 499.66	5 413.10	3 831.58	4 115.51	4 665.87	4 963.42	5 096.16	5 142.18
D. Agricultural soils	17 956.64	17 653.09	14 160.07	14 092.78	14 302.05	14 518.45	14 735.64	14 683.73
F. Field burning of agricultural residues	31.54	30.63	33.64	36.33	37.09	37.85	39.10	40.57
G. Liminig	1 950.86	2 099.38	504.35	448.91	489.45	527.19	569.70	631.60
H. Urea application	517.66	494.00	415.61	564.25	552.48	537.08	522.36	508.55
<b>4. Land use, land use change and forestry</b>	<b>-15 703.55</b>	<b>-27 190.91</b>	<b>-33 846.14</b>	<b>-31 777.68</b>	<b>-27 337.63</b>	<b>-21 692.93</b>	<b>-17 742.64</b>	<b>-14 021.28</b>
A. Forest land	-21 586.44	-34 099.09	-36 856.30	-33 199.18	-28 815.38	-22 568.70	-18 262.56	-13 328.60
B. Cropland	859.94	1 306.01	3 156.72	2 141.49	2 085.96	1 955.71	1 909.37	1 784.51
C. Grassland	710.85	731.90	-565.36	-384.39	-160.09	-2.55	254.67	259.68
D. Wetlands	4 649.60	4 654.36	1 502.87	1 429.60	1 429.60	1 429.60	1 429.60	1 429.60
E. Settlement	870.08	672.40	3 639.13	3 567.86	3 629.68	3 612.79	3 632.76	3 096.34
G. Harvested wood product	-1 207.58	-456.49	-4 723.20	-5 333.05	-5 507.40	-6 119.79	-6 706.49	-7 262.81
<b>5. Waste</b>	<b>21 931.10</b>	<b>21 583.41</b>	<b>12 954.93</b>	<b>13 079.37</b>	<b>12 388.85</b>	<b>11 875.23</b>	<b>11 551.66</b>	<b>11 303.98</b>
A. Solid waste disposal	14 112.45	14 166.42	8 815.76	8 872.30	8 221.83	7 771.01	7 453.23	7 221.37
B. Biological treatment of solid waste	27.93	21.79	161.00	331.66	357.61	357.61	357.61	357.61
C. Incineration and open burning of waste	457.71	357.53	673.19	815.44	823.20	823.20	823.20	823.20
D. Waste water treatment and discharge	7 333.01	7 037.66	3 304.98	3 059.97	2 986.21	2 923.41	2 917.62	2 901.81
<b>Total CO<sub>2</sub> eq. emission without LULUCF</b>	<b>577 257.78</b>	<b>474 350.11</b>	<b>413 781.40</b>	<b>397 810.50</b>	<b>403 635.22</b>	<b>404 739.60</b>	<b>370 476.24</b>	<b>333 869.76</b>
<b>Total CO<sub>2</sub> eq. emission with LULUCF</b>	<b>561 554.23</b>	<b>447 159.20</b>	<b>379 935.26</b>	<b>366 032.83</b>	<b>376 297.59</b>	<b>383 046.67</b>	<b>352 733.59</b>	<b>319 848.48</b>

Source: IOŚ-PIB, KOBIZE

Table 5.7 presents the expected trends of changes in greenhouse gas emissions for the WEM scenario, broken down into ETS and non-ETS (so-called ESD<sup>18</sup>). The main part of the emissions in the non-ETS sectors comes from the following 5 categories of emission sources:

- 1.A.3. Fuel combustion in transport (mainly road transportation)
- 1.A.4. Fuel combustion in other (small) sources (households, commerce, services, agriculture, forestry)
- 1.B. Fugitive emissions from fuels (from extraction, transport and processing of fossil fuels)
3. Agriculture (plant and animal production)
5. Waste (including wastewater treatment and discharge).

The emissions in both ETS and non-ETS sectors are projected to stabilise in the period from 2025 to 2030 and to fall afterwards; however, the largest emission reduction is expected in the sectors covered by the ETS system.

Table 5.7. GHG emissions (excluding LULUCF) in historical years and projected for 2020-2040 broken down into ETS and ESD according to the WEM scenario

GHG emissions	2005	2015	2016	2017	2020	2025	2030	2035	2040
	kt CO <sub>2</sub> eq.								
ETS	223 441	198 696	198 052	202 167	199 686	203 891	204 972	176 238	144 823
ESD	179 984*	191 748	201 071	211 615	198 125	199 744	199 767	194 238	189 047
<b>Total</b>	<b>403 424</b>	<b>390 445</b>	<b>399 123</b>	<b>413 781</b>	<b>397 811</b>	<b>403 635</b>	<b>404 740</b>	<b>370 476</b>	<b>333 870</b>

\* Emissions corrected for a change in the ETS scope after 2005

Source: IOŚ-PIB KOBIZE/KPEiK

## 5.2.2 Methodology and assumptions for projections in the scenario “with existing measures” (WEM)

### Energy

The source of data on the projected greenhouse gas emissions in category 1. *Energy* was the study by the Ministry of Energy entitled “The National Energy and Climate Plan for 2021-2030” (Annex 1). The GHG emissions were calculated using a methodology consistent with one applied in the national greenhouse gas inventories since 2015, in accordance with the 2006 IPCC Guidelines<sup>19</sup> in effect. The input data for projections in this category are presented in Tables 5.8–5.10:

<sup>18</sup> The so-called *Effort Sharing Decision* – i.e. Decision No 406/2009/EC of the European Parliament and of the Council of 23 April 2009 on the effort of Member States to reduce their greenhouse gas emissions to meet the Community’s greenhouse gas emission reduction commitments up to 2020 (OJ L 140, 5.6.2009, p. 136)

<sup>19</sup> 2006 IPCC Guidelines for National Greenhouse Gas Inventories (<http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>)



Table 5.8. Projected transformation input for electricity and heat production [ktoe] for 2020-2040 according to the WEM scenario

Specification	2020	2025	2030	2035	2040
<b>Power plants</b>					
Coal	5 096	6 248	6 201	6 201	5 684
Oil products	2	2	2	2	1
Gas	0	0	0	0	0
RES, waste	438	436	397	397	289
<b>CHP plants</b>					
Coal	25 232	24 926	25 347	17 197	9 418
Oil products	139	147	142	112	87
Gas	2 666	3 241	3 462	6 484	8 624
RES, waste	2 275	2 296	2 817	3 208	3 745
Nuclear energy	0	0	0	2668	8003
<b>Heat plants</b>					
Coal	2 196	2 045	1 960	1 788	1 875
Oil products	19	17	15	13	12
Gas	185	174	171	160	188
RES, waste	47	56	72	81	92

Source: Ministry of Energy: "The current situation and projections with existing policies and measures (as of the end of 2017) – Draft – ver. 3.0 of 27.12.2018, Annex 1 to the National Energy and Climate Plan for 2021-2030

Table 5.9. Projected final energy consumption in particular sectors (excluding non-energy use) [ktoe] for 2020-2040 according to the WEM scenario

Sector	2020	2025	2030	2035	2040
Industry	16 088	16 271	16 462	16 645	16 831
Transport	23 495	24 897	25 790	25 744	25 434
Households	20 267	20 989	21 615	22 071	22 415
Services	8 811	9 431	9 936	10 286	10 518
Agriculture	3 457	3 491	3 523	3 555	3 585
<b>TOTAL</b>	<b>72 117</b>	<b>75 078</b>	<b>77 327</b>	<b>78 300</b>	<b>78 784</b>

Source: Ministry of Energy: "The current situation and projections with existing policies and measures (as of the end of 2017) – Draft – ver. 3.0 of 27.12.2018, Annex 1 to the National Energy and Climate Plan for 2021-2030

Table 5.10. Projected structure of final energy consumption [ktoe] for 2020-2040 according to the WEM scenario

Structure	2020	2025	2030	2035	2040
Electricity	12 241	13 247	14 255	15 151	16 019
Heat	5 759	6 013	6 202	6 376	6 558
Coal	11 936	11 081	10 291	9 591	8 969
Oil products	24 621	25 656	26 178	25 890	25 407
Natural gas	9 877	10 819	11 583	12 053	12 293
Biogas	90	104	121	142	170
Solid biomass	5 146	5 324	5 469	5 610	5 744
Biofuels	1 579	1 681	1 739	1 715	1 673
Municipal and industrial waste	666	704	714	725	738
Solar panels, heat pumps, geothermal	203	450	777	1 047	1 213
<b>TOTAL</b>	<b>72 117</b>	<b>75 078</b>	<b>77 327</b>	<b>78 300</b>	<b>78 784</b>

Source: Ministry of Energy: "The current situation and projections with existing policies and measures (as of the end of 2017) – Draft – ver. 3.0 of 27.12.2018, Annex 1 to the National Energy and Climate Plan for 2021-2030

*Industrial processes and product use*

The input data for the projections of emissions from sector 2. *Industrial processes and product use* are presented in Table 5.11. The projected product manufacture levels are consistent with the data used in the *National Energy and Climate Plan for 2021-2030*.

Table 5.11. Primary projected activity data for category 2. *IPPU* according to the WEM scenario

Industrial processes	Industrial production [kt]				
	2020	2025	2030	2035	2040
<b>2.A. Mineral industry</b>					
Cement clinker production	12 792	13 238	13 628	13 945	14 237
Lime production	2 041	2 027	2 020	2 013	2 010
<b>2.B. Chemical industry</b>					
Ammonia production	2781	2805	2831	2851	2873
Nitric acid production	2410	2427	2446	2461	2477
Black carbon production	39	40	41	42	44
Styrene production	153	157	161	164	167
Ethylene production	577	597	614	629	642
Caprolactam production	167	166	167	167	167
<b>2.C. Metal industry</b>					
Sinter production	7091	7091	7091	7091	7091
Pig iron production	4854	4890	4927	4964	5001
Basic oxygen furnaces steel	5349	5120	5005	4890	4833
Electric steel production	4198	4293	4380	4451	4519
Ferroalloys production	75	75	76	75	74
Lead production	86	91	90	86	78
Zinc production	109	105	101	98	95

*F-gases*

The data on the projected emissions were based on the analysis entitled “The preparation of inventories and analysis of data on the projected emissions of substances: HFCs, PFCs, SF<sub>6</sub> and NF<sub>3</sub> in the years 2020, 2025, 2030, 2035 and 2040 in Poland. The estimation of the effects of policies and measures intended to limit the use of fluorinated greenhouse gases or resulting in such limitation”, carried out in 2019 on commission of KOBiZE IOŚ-PIB. That analysis included the estimation of the effects of policies and measures intended to limit the use of fluorinated greenhouse gases or resulting in such limitation.

In light of the commitments under the Climate Convention, in the scope of work covering the period from 1995 to 2040, all the estimates were derived using the methodology described in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC 2006 GL).

On the basis of that analysis, an emission scenario was prepared, including the implemented and approved policies and measures, called the scenario with existing measures (WEM). The timetable for the reduction of the quantities of fluorinated gases of the HFC group to be placed on the market in specific years plays a significant role in the projected emissions, as presented in Table 5.12.

Table 5.12. Percentage reduction schedule for HFC amounts introduced into the national market compared to the year 2015 (under the WEM scenario)

Years	Reduction schedule for HFCs introduced into the national market compared to the year 2015
2015	100%
2016–2017	93%
2018–2020	63%
2021–2023	45%
2024–2026	31%
2027–2029	24%
2030	21%

### Agriculture

The estimation of the projected emissions in the agriculture sector applied the methodology used in the national emission inventories for the same category of emission sources and gases: 3.A. *Enteric fermentation (CH<sub>4</sub>)*, 3.B. *Manure management (CH<sub>4</sub>, N<sub>2</sub>O)*, 3.D. *Agricultural soils (N<sub>2</sub>O)*, 3.F. *Field burning of agricultural residues (CH<sub>4</sub>, N<sub>2</sub>O)*, 3.G. *Liming (CO<sub>2</sub>)* and 3.H. *Urea application (CO<sub>2</sub>)*.

The main data on the expected rate of changes in activities in sector 3. *Agriculture* were elaborated with the participation of scientific institutes supervised by the Ministry of Agriculture and Rural Development, specifically: the Institute of Agricultural and Food Economics – National Research Institute (IERiGŻ – PIB), the Plant Breeding and Acclimatisation Institute – National Research Institute (IHAR-PIB), the Institute of Technology and Life Sciences (ITP), the Institute of Soil Science and Plant Cultivation – National Research Institute (IUNG-PIB) and the National Research Institute of Animal Production (IZ-PIB) (Table 5.13). It should be pointed out that it is very difficult to carry out precise projections for the agriculture sector and that it is particularly complex in the scope characterised by dynamically unfolding multidirectional changes on the agricultural markets, related to their operation as part of the EU market since 2004.

The area of agricultural land will be characterised by a further falling trend until 2040. To the greatest extent this will result from the expected decrease in the area of particular crops (potatoes and sugar beets) and the conversion of agricultural land to non-agricultural uses. A slight decrease in the area of cereals is also expected, mostly as a result of the diminished cultivation of cereal mixed. Changes in the structure of agricultural holdings may contribute to halting the decrease in the area used for agricultural purposes. The decrease in the area of agricultural land will lead to the enhancement of the concentration and intensity of agricultural production, which will contribute to further improving the effectiveness of the use of the practices implemented, including new technologies and, in consequence, also to emissions reductions.

In the timeframe from 2020 to 2040, the cattle population will remain at a similar level, slightly exceeding 6 million head. The further concentration of production is and will be a distinct process in the rearing of milk cows. It is expected that the simultaneous growing trend in the milk yield from cows will be accompanied by a drop in their population. The mean yield per cow in 2040 can come close to 7,800 kg/year. The growing milk yield from cows results from large progress in the genetic improvement of the animals, reproduction biotechnology, the use of modern technologies for

the preparation and distribution of feeds and the higher specialisation and concentration of agricultural holdings. To some extent, milk production can be replaced by meat production; therefore, in a longer term, the total cattle population will not diminish. It is also expected that the digestibility of feeds for the cattle will improve further. Similarly, in the case of pigs, their rearing will remain at a level similar to the present one, but will concentrate in increasingly large herds of pigs, resulting from the progressing consolidation of the processing sector and the more stringent qualitative and quantitative requirements set for suppliers by livestock purchasers and also more demanding sanitary standards (biosecurity) related to the African swine fever (ASF). In turn, a further increase in poultry rearing (the broiler population) is expected. The factors which affect the projected poultry population will continue to be the price relations between pork, feeds and poultry, changes in consumer preferences or expectations concerning the environmentally friendly keeping of these birds and trends of changes unfolding on the world markets. In the case of sheep and horses, their populations are projected to further diminish.

As regards the systems of keeping particular livestock groups, the greatest changes towards increasing the share of bedding-free systems are projected for dairy cattle (to about 70%) and pigs (to about 75%). This will be caused by the further concentration of animal production. In the case of meat cattle, this share will remain at a level of about 4%. It is also assumed that slurry tanks will be closed in compliance with the regulations adopted.

The quantities of used mineral fertilisers will continue to slightly grow until 2040, given the projected growth of yields in the future, along with a decrease in the area of crops. Similarly, in the case of lime fertilisers, their consumption in Poland is projected to grow because of the condition of soils and the need to prevent their acidification.

The production levels of the main agricultural and horticultural crops in the timeframe until 2040 will be determined by changes in the area of their cultivation and the future yields. Given improvements in efficiency and profitability of farming and the need to balance the domestic demand for basic plant products, higher crop yields and some growth of plant production can be expected until 2040, except for root crops. In light of the increasingly large possibilities offered by the so-called non-fertiliser factors of the growth of plant production (crop yields), the productivity of particular crops can grow faster, but a significant unknown is still the strength of impacts of increasing often occurring extreme weather events.

Table 5.13. Primary projected activity data for category 3. *Agriculture* according to the WEM scenario

Activity	Unit	2020	2025	2030	2035	2040
Cattle population	thous.	6 140	6 208	6 200	6 173	6 203
including dairy cattle	thous.	2 333	2 257	2 168	2 123	2 090
Average annual milk yield per cow	litres/yr	5 950	6 275	6 755	7 235	7 765
Sheep and goat population	thous.	259	227	195	167	147
Horse population	thous.	162	152	143	128	117
Pig population	thous.	11 452	11 467	11 542	11 400	11 217
Poultry population	million	250	271	291	321	351
including chickens	million	230	250	270	300	330
Area of cultivated organic soils	thous. ha	675	670	665	660	654
Nitrogen fertilizer use (in pure ingredient)	thous. tonnes	1 153	1 198	1 230	1 258	1 286
Lime fertilizer use (in pure ingredient)	thous. tonnes	682	743	804	866	961
Cereal production	thous. tonnes	30 033	30 063	29 779	30 695	31 505

Legume production	thous. tonnes	655	820	987	1 000	1 113
Oil bearing plants production	thous. tonnes	2 731	2 979	3 206	3 421	3 588
Root crop production	thous. tonnes	17 958	17 316	16 629	16 344	16 021
Fruit production	thous. tonnes	3 900	4 050	4 150	4 263	4 489
Vegetable production	thous. tonnes	4 670	4 900	5 525	5 767	6 028

Source: Ministry of Agriculture and Rural Development, with the participation of the institutes: IERiGŻ – PIB, IHAR-PIB, ITP, IUNG-PIB and IZ-PIB

## Waste

The estimation of the greenhouse gas emissions in the waste sector for subsectors 5.A. *Solid waste disposal*, 5.B. *Biological treatment of solid waste* and 5.C. *Waste incineration and open burning of waste* is based on information contained in the *National Waste Management Plan 2022* (KPGO 2022) and the *Voivodeship Waste Management Plans*, which published the projected quantities of:

- the municipal solid waste generated (in 2025 and 2030),
- the municipal solid waste disposed of at waste landfills (in 2020 and 2022),
- the green waste and other biowaste treated by composting and digestion methods in 2020 and 2022),
- the municipal waste incinerated (in 2020 and 2025),
- the medical waste incinerated (in 2020, 2025 and 2030).

The above projections result from the targets adopted in the KPGO 2022, specifically:

- achieving the levels of recycling and preparing for re-use of paper, metals, plastics and glass from the municipal waste stream representing at least 50% of their weight by 2020;
- achieving the levels of municipal waste recycling of 60% in 2025 and 65% in 2030;
- reducing the quantity of biodegradable municipal waste deposited at waste landfills so that in 2020 not more than 35% of the weight of this waste generated in 1995 will be deposited;
- efforts to reduce the quantity of waste landfilled;
- achieving adequate levels of recovery and recycling of post-use waste, including, among others, packaging waste, used tires and waste oils;
- establishing the standards for separate municipal waste collection throughout the country;
- establishing the systems for the separate collection of green waste and other biowaste in all the municipalities by the end of 2021;
- limiting the methods for incineration of municipal waste and waste originating from the treatment of municipal waste to not more than 30% at the national and Voivodeship levels.

In the case of subsector 5.D. *Wastewater treatment and discharge*, the information on the projected activities was drawn from Annex 2 to the fifth update of the National Municipal Wastewater Treatment Programme (AKPOŚK 2017) and the GUS study *The population projection for 2014-2050*, containing data on:

- the dry weight of sludge generated at municipal wastewater treatment plants (in 2021),
- the populations of cities and rural areas and the population of the country (in 2020, 2025, 2030, 2035 and 2040).

The projected dry weight of sludge generated at municipal wastewater treatment plants is based on the assumption that in 2021 Poland will meet the requirements for municipal wastewater collection systems and treatment plants under Directive 91/271/EEC.

In the absence of data projected for milestone years, the emission projections were estimated using the methods of interpolation and extrapolation. In the cases where the use of extrapolation was not substantively justified, the value equal to a known value projected for the most distant perspective was adopted.

#### *Land use, land-use change and forestry*

The data on the projected dynamics of changes in activities in sector *Land use, land-use change and forestry* are presented in Table 5.14. Land use in Poland is dominated by the impacts of agriculture and forestry. In this area, significant changes could be seen over recent years, which was taken into account in the preparation of projections. For this purpose, on the basis of available statistical data, a dynamic analysis of changes in the directions of land use in the period from 1988 to 2017 was carried out. In the period in question, the area of agricultural land was found to have a steady tendency to decrease in favour of other forms of land uses, mainly forest, infrastructure etc. The changes observed in the area of permanent crops indicate that after accession to the EU the structural transformations in agriculture were to an increasing extent influenced by the Common Agricultural Policy (CAP) and the related financial instruments implemented. These measures include, among others, financial support available for farmers who, on a voluntary basis, use practices contributing to environmental protection, mitigating climate change and contributing to adaptation of the agriculture sector to climate change. The measures in the scope of sustainable agriculture and the protection of soils and waters make the greatest contribution to the reduction of greenhouse gas emissions. Moreover, all the farmers eligible since 1 January 2015 to receive a single area payment are obliged to implement greening. Greening is implemented through: crop diversification (in the case of farmers who have at least 10 ha of arable land), as well as the maintenance of existing permanent grassland. Crop diversification consists in maintaining an appropriate number and area of crops on arable land in an agricultural holding in a given year. The practice applicable to permanent grassland consists of two elements: the obligation to maintain the permanent grassland with environmental values (ecological focus areas) situated on Natura 2000 sites at the level of an agricultural holding and to maintain the area of permanent grassland at an unchanged level compared with its area determined in the reference year at the scale of the country.

Moreover, the analysis indicates that the intensity of agricultural production significantly affects the dynamics and direction of land-use change. In this context, the changes in the use of agricultural space seem to result from economic growth, investments, agricultural policy and law-conditioned measures to protect the landscape. An important factor is also a change in the consumption needs and style which is an expression of the greater affluence of society.

These processes are driven by a number of social and economic factors. Coupled with the waning economic significance of agriculture, the strength of their influence results in a diminishing production potential of that sector. It should be emphasised, however, that this process can also be conducive to the restructuring of agriculture and is a consequence of the dynamic economic growth of the whole country. This is particularly important in the conditions of the process of economic, social and political transformation in recent years which exerted a significant effect on the land use structure. The progressing process of population concentration, the unfolding development of urban agglomerations and the diminishing importance of industry in the national economy unquestionably affected the structural transformations in agriculture. All these processes were accompanied by

changes in the land use structure and the competition for space among different functions, subject to specific rules governing the principles of spatial development and environmental protection.

Table 5.14. Area of specific land use change

Land use, land-use change and forestry (LULUCF)	Area [kha]				
	2020	2025	2030	2035	2040
4.A. Forest land	9507	9642	9778	9913	10048
4.B. Cropland	13881	13761	13641	13520	13400
4.C. Grassland	4144	4103	4062	4022	3981
4.D. Wetlands	1374	1374	1374	1374	1374
4.E. Settlements	2281	2306	2332	2357	2383
4 F. Other land	83	83	83	83	83

Source: Own estimates of IOŚ-PIB, KOBIZE

One of the basic sources of data describing the direction and dynamics of the evolution of the quantity and structure of forest resources in Poland is the projection of the predicted volume structure of growing stock. This projection in the timeframe until 2030 was prepared as part of the interinstitutional cooperation within the *Team for the Elaboration of National Plans Related to Accounting for Greenhouse Gas Emissions and Removals Resulting from Forestry Activities*, consisting of the representatives of the Ministry of the Environment, the Directorate General of the State Forests National Forest Holding, the National Centre for Emissions Management, the Forest Research Institute and the Bureau for Forest Management and Geodesy. The Team was set up by the *Order of the Minister of the Environment of 20 July 2018 establishing Team for the Elaboration of National Plans Related to Accounting for Greenhouse Gas Emissions and Removals Resulting from Forestry Activities*, in relation to Poland's implementation of Regulation (EU) 2018/841 of the European Parliament and of the Council of 30 May 2018 on the inclusion of greenhouse gas emissions and removals from land use, land use change and forestry in the 2030 climate and energy framework, and amending Regulation (EU) No 525/2013 and Decision No 529/2013/EU.

In addition, the sectoral projections of greenhouse gas balances take into account data elaborated by abovementioned Team for the prognostic data on greenhouse gas emissions and removals from forest land until 2040. The representatives of Ministry of the Environment, the Directorate General of the State Forests National Forest Holding, the National Centre for Emissions Management, the Forest Research Institute, the Bureau for Forest Management and Geodesy and the Wood Technology Institute participated in the work of that Team.

The main factor which affects the level of the greenhouse gas balance is the dynamics of annual changes in wood resources and its possible changes. The indicated dynamics of the development of wood resources (Table 5.15) is significantly affected by the overriding principles of the implementation of a multifunctional forest holding as adopted in the *National Forest Policy* which are strongly linked to climate protection measures carried out in the area of forestry, mainly by the State Forests National Forest Holding, National Parks and the managers of forests under the other ownership forms. In practice, strong and direct dependencies can be discerned between the current age structure of forests and the condition of their resources as well as the related intensity of final felling.



Table 5.15. Predicted structure of forest growing stock

Tree species	Volume [million m <sup>3</sup> ]				
	2020	2025	2030	2035	2040
Pine	1 634,64	1 637,23	1 637,23	1 697,97	1 723,53
Spruce	167,79	163,45	163,45	166,08	163,59
Fir	110,96	114,42	114,42	125,99	131,46
Other conifers	29,77	32,69	32,69	34,36	67,19
<b>Total softwood</b>	<b>1 943,16</b>	<b>1 947,79</b>	<b>1 947,79</b>	<b>2 024,40</b>	<b>2 056,55</b>
Beech	184,03	185,24	185,24	194,71	198,64
Oak	175,91	179,80	179,80	194,71	201,57
Hornbeam	40,60	43,59	43,59	51,54	55,50
Birch	132,61	133,48	133,48	140,30	143,14
Alder	148,85	152,55	152,55	166,08	172,35
Poplar	2,71	2,72	2,72	2,86	2,92
Aspen	18,94	21,79	21,79	22,91	26,29
Other broadleaved	56,83	59,93	59,93	62,99	67,19
<b>Total hardwood</b>	<b>763,19</b>	<b>776,39</b>	<b>776,39</b>	<b>838,97</b>	<b>864,69</b>
Total	2 706,35	2 724,18	2 724,18	2 863,36	2 921,24

Source: Forestry Department; Ministry of the Environment

The methodology for the projections of greenhouse gas emissions and removals for IPCC category IPCC 4.A (Forest land) within the LULUCF sector is based on the use of the constant values of the quantified effects of management practices (in the form of the intensity indicators of final felling and pre-final cuts) determined until 2017. Moreover, as part of prognostic simulations carried out using the Carbon Budget Model of the Canadian Forestry Sector (CBM-CFS), no account was taken of changes in the climatic conditions observed for the historical period, i.e. it was assumed that the climatic conditions would be constant over time. The modelling process itself was based on the following elements:

- using area units represented by homogeneous (uniform) age and species groups of forest stands, taking into account the nature and forest regions;
- using the three main groups of disturbances of the development dynamics of wood resources, i.e. pre-final cuts, final felling and fires;
- using data quantifying specific disturbances in the form of volume-based wood harvest data, broken down into years, the individual species and age groups and the nature and forest regions.

It should be added that in light of the construction of the CBM-CFS3 model itself, the emissions related to forest fires were modelled as a separate process the results of which were taken into account in the final calculations of the balance for the related land use category. Moreover, in the case of an assessment of the carbon substitution effect in harvested wood products, the sectoral projections of greenhouse gas balances take into account the forecasts of the development of the market of wood and harvested wood products (production, export and import), prepared by the Wood Technology Institute, as part of the work of the Team for the prognostic data on greenhouse gas emissions and removals resulting from forestry activities. These projections take into account the verified historical data on sawn wood production covered by the FAO reporting mechanism under FAO code FAO 1872. In the case of the projections of greenhouse emissions and



removals for the other IPCC categories within the LULUCF sector, the methodology follows the estimation models applied in greenhouse inventories as described in the *National Inventory Report 2019* (NIR 2019). In the absence of prognostic data necessary to update the emission factors, the values extrapolated from the database containing data available from 1990-2017 were used. A similar approach was applied in the case of missing activity data.

### 5.3 Greenhouse gas emissions and removals in the scenario “with additional measures” (WAM)

#### 5.3.1 Results of emission projections in the scenario “with additional measures” (WAM)

The scenario “with additional measures” planned in the energy sector provides for the achievement of the 2030 reduction target in the non-ETS sectors as set for Poland under the climate and energy framework at a level of –7% compared with 2005. According to the WAM scenario, it is projected that the greenhouse gas emissions in Poland by 2040 will fall by almost 53% compared with 1988 and by 43% compared with 1990 (Fig. 5.16). In this scenario, too, CO<sub>2</sub> has the largest share in the national greenhouse gas emissions. The share of this gas will fall from 81.8% in 1988 to 77.1% in 2040. In turn, the shares of methane and nitrous oxide will grow, respectively, from 13.1% and 5.1% to 14.8 and 7.6% in 2040 r. Fluorinated gases will represent less than 0.5%. This scenario does not assume NF<sub>3</sub> emissions.

Sector *Energy* will have the largest effect on the future emissions in both projection variants and in the WAM scenario the share of this sector in the total emissions will fall from 83% in 2017 to 75% in w 2040, to reach 204 million t CO<sub>2</sub> eq. in 2040. In turn, the emissions from *Industrial processes and product use* are different between the two scenarios only for fluorinated gases (sectors 2.F-G), where account was taken of the potential additional measures contributing to emission reductions. In both projection scenarios, the projected emissions in sectors *Agriculture, Waste and Land use, land-use change and forestry* are the same (Table 5.17).

Table 5.16. Aggregated results of GHG projections by gas for years: 2020-2040 (WAM scenario) compared to emissions in the years 1988, 1990 and 2017

GHG*	Emission by year [kt CO <sub>2</sub> eq.]							
	1988	1990	2017	2020	2025	2030	2035	2040
CO <sub>2</sub>	471 979	376 960	336 557	311 227	292 568	268 601	230 561	208 894
CH <sub>4</sub>	75 727	69 842	49 413	48 734	47 047	44 295	41 697	40 119
N <sub>2</sub> O	29 405	27 406	20 824	20 174	20 425	20 654	20 773	20 651
HFCs	NO	NO	6 893	4 004	3 298	2 605	1 893	1 368
PFCs	147	142	12	10	8	6	5	4
SF <sub>6</sub>	0	0	82	97	125	91	83	75
NF <sub>3</sub>	–	–	–	–	–	–	–	–
<b>Total</b>	<b>577 258</b>	<b>474 350</b>	<b>413 781</b>	<b>384 247</b>	<b>363 471</b>	<b>336 253</b>	<b>295 012</b>	<b>271 110</b>

\* Emissions and removals from IPCC sector 4.LULUCF are not included.

The total projected emissions related to international aviation and marine navigation in the period from 1988 to 2040 will grow by about 66% compared with 1988, with the emissions from international fuel bunker in aviation tripling in that period (Table 5.17).

Table 5.17. Aggregated results of GHG projections by source category for the years: 2020-2040 (WAM scenario) compared to emissions in the years 1988, 1990 and 2017

Source categories	Emission by sector [kt CO <sub>2</sub> eq.]							
	1988	1990	2017	2020	2025	2030	2035	2040
1. Energy	476 220	382 821	342 089	314 996	294 590	267 891	227 184	203 764
2. Industrial processes and product use	31 198	22 701	26 998	24 420	24 040	23 605	23 106	22 793
3. Agriculture	47 909	47 244	31 740	31 752	32 452	32 881	33 170	33 249
4. Land use, land use change and forestry	-15 704	-27 191	-33 846	-31 778	-27 338	-21 693	-17 743	-14 021
5. Waste	21 931	21 583	12 955	13 079	12 389	11 875	11 552	11 304
<b>Total*</b>	<b>577 258</b>	<b>474 350</b>	<b>413 781</b>	<b>384 247</b>	<b>363 471</b>	<b>336 253</b>	<b>295 012</b>	<b>271 110</b>
International fuel bunker	2 787	1 896	3 361	2 920	3 343	3 738	4 198	4 617
Aviation	1 018	627	2 517	2 284	2 648	3 005	3 340	3 656
Navigation	1 769	1 269	844	636	696	734	858	960

\* emissions and removals from IPCC sector 4.LULUCF and international fuel bunker are not included in the national total

Source: *IOŚ-PIB, KOBIZE*

A comparison of the projected emission data on 2020–2040 with those on the base year 1988 shows that the total emissions from all the sectors fall, respectively, by 33.4% in 2020, by 41.7% in 2030 and by 53,0% in 2040, i.e. to a significantly larger extent than in the WEM scenario. The largest projected reduction in the period from 1988 to 2040 can be seen in sector *Energy* – by 57%. In turn, the projected emissions from *Industrial processes and products use* will be lower in 2040 than in the base year by about 27% (Table 5.16, Fig. 5.3) and lower than in the WEM scenario due to the account taken of additional measures affecting the emissions of fluorinated gases after 2030.

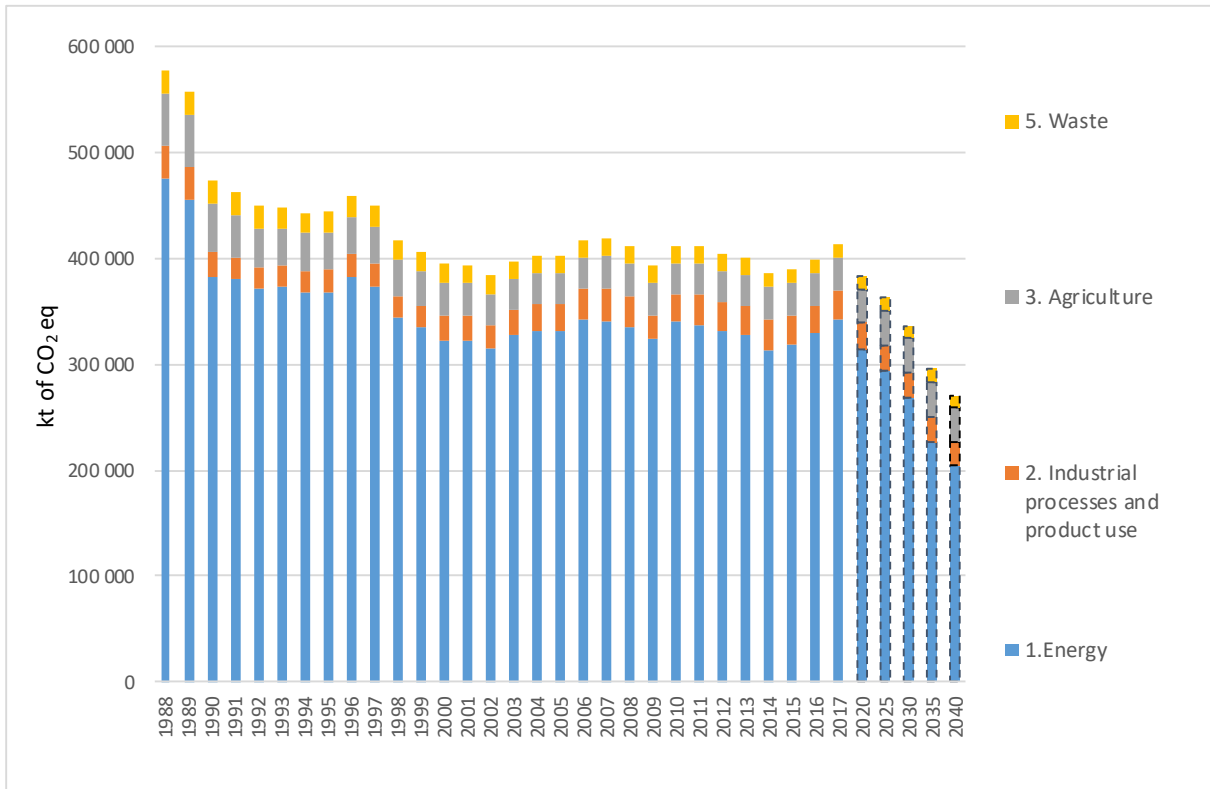


Fig. 5.3. Historical (1988–2017) and projected (2020-2040 WAM scenario) greenhouse gases in kt CO<sub>2</sub> equivalent, *Source: IOŚ-PIB, KOBiZE*

Tables 5.18–5.21 present the detailed results of the projections of the emissions of carbon dioxide, methane, nitrous oxide and the total emissions of all the greenhouse gases by IPCC source category for the scenario “with additional measures”. The differences between the projected emissions in the abovementioned tables and those in Tables 5.3–5.6 (the WEM scenario) can only be seen in sector *Energy* (as a result of different assumptions for energy generation and the fuel mix and consumption) and those in Table 5.20 in sectors 2.G-H (fluorinated gases), too.

Table 5.18. CO<sub>2</sub> emissions [kt] in 1988, 1990, 2017 and projected for 2020–2040 (WAM scenario) by source category

Source categories	1988	1990	2017	2020	2025	2030	2035	2040
<b>1. Energy</b>	<b>443 000.70</b>	<b>355 175.89</b>	<b>315 932.52</b>	<b>290 147.24</b>	<b>271 155.63</b>	<b>246 879.43</b>	<b>208 592.08</b>	<b>186 661.77</b>
A. Fuel combustion	438 930.39	351 827.03	311 277.44	285 598.27	266 993.84	242 923.81	204 975.28	183 415.11
1. Energy industries	256 935.44	235 067.27	164 034.89	146 578.98	142 112.87	132 233.28	101 830.10	87 259.45
2. Manufacturing industries and construction	54 962.60	42 769.78	30 838.48	25 437.57	22 234.82	19 355.89	17 432.54	15 639.33
3. Transport	24 008.07	20 379.13	62 503.09	62 849.34	60 362.78	56 327.76	54 598.87	52 365.71
4. Other sectors	103 024.27	53 610.84	53 900.98	50 732.37	42 283.37	35 006.87	31 113.77	28 150.62
B. Fugitive emission from fuels	4 070.31	3 348.86	4 655.08	4 548.97	4 161.80	3 955.62	3 616.79	3 246.65
1. Solid fuels	4 026.75	3 303.28	2 740.38	2 521.42	2 133.60	1 926.90	1 587.64	1 217.12
2. Oil and natural gas	43.55	45.58	1 914.71	2 027.55	2 028.20	2 028.72	2 029.16	2 029.53
<b>2. Industrial processes and product use</b>	<b>26 061.44</b>	<b>18 840.28</b>	<b>19 105.89</b>	<b>19 327.17</b>	<b>19 622.99</b>	<b>19 909.94</b>	<b>20 129.36</b>	<b>20 344.52</b>
A. Mineral industry	11 605.22	8 855.06	10 932.91	10 873.13	11 124.74	11 349.32	11 531.04	11 700.97
B. Chemical industry	5 757.60	3 801.80	5 175.61	5 303.40	5 375.28	5 446.71	5 503.64	5 560.75
C. Metal industry	7 729.51	5 766.77	2 272.47	2 442.32	2 414.66	2 405.60	2 386.37	2 374.48
D. Non-energy products and fuel use	969.11	416.65	724.90	708.31	708.31	708.31	708.31	708.31
<b>3. Agriculture</b>	<b>2 468.52</b>	<b>2 593.38</b>	<b>919.97</b>	<b>1 013.16</b>	<b>1 041.93</b>	<b>1 064.27</b>	<b>1 092.06</b>	<b>1 140.15</b>
G. Liminig	1 950.86	2 099.38	504.35	448.91	489.45	527.19	569.70	631.60
H. Urea application	517.66	494.00	415.61	564.25	552.48	537.08	522.36	508.55
<b>4. Land use, land use change and forestry</b>	<b>-19 969.38</b>	<b>-31 849.94</b>	<b>-37 439.85</b>	<b>-33 694.70</b>	<b>-29 307.18</b>	<b>-23 604.33</b>	<b>-19 663.26</b>	<b>-15 815.90</b>
A. Forest land	-21 628.10	-34 140.71	-36 893.95	-33 228.99	-28 846.65	-22 599.97	-18 293.83	-13 359.87
B. Cropland	859.94	923.73	848.95	1 516.11	1 471.33	1 382.35	1 346.76	1 259.84
C. Grassland	698.59	719.64	-566.82	-385.85	-161.55	-4.00	253.21	258.22
D. Wetlands	596.80	601.56	1 502.87	1 429.60	1 429.60	1 429.60	1 429.60	1 429.60
E. Settlement	710.97	502.32	2 392.30	2 307.49	2 307.49	2 307.49	2 307.49	1 859.13
G. Harvested wood product	-1 207.58	-456.49	-4 723.20	-5 333.05	-5 507.40	-6 119.79	-6 706.49	-7 262.81
<b>5. Waste</b>	<b>448.05</b>	<b>350.06</b>	<b>598.39</b>	<b>739.83</b>	<b>747.54</b>	<b>747.54</b>	<b>747.54</b>	<b>747.54</b>
C. Incineration and open burning of waste	448.05	350.06	598.39	739.83	747.54	747.54	747.54	747.54
<b>Total CO<sub>2</sub> emissions without LULUCF</b>	<b>471 978.71</b>	<b>376 959.60</b>	<b>336 556.77</b>	<b>311 227.40</b>	<b>292 568.10</b>	<b>268 601.18</b>	<b>230 561.04</b>	<b>208 893.98</b>
Total CO <sub>2</sub> emissions with LULUCF	452 009.34	345 109.66	299 116.92	277 532.70	263 260.92	244 996.85	210 897.79	193 078.08

Source: IOŚ-PIB, KOBIZE

A comparison of CO<sub>2</sub> emissions in the WAM (Table 5.18) and WEM (Table 5.3) scenarios shows that the largest reduction will occur in sector *Fuel combustion*, particularly, in the area of *Energy industries*. A significant difference can also be found for *Other* sectors, including, among others, households and services, and also *Transport*. The lower final energy consumption in the individual sectors as indicated for the WAM scenario in Table 5.24 than in the WEM scenario (Table 5.9) translates into the reduction of CO<sub>2</sub> emissions mentioned above.

Table 5.19. CH<sub>4</sub> emissions [kt] in 1988, 1990, 2017 and projected for 2020–2040 (WAM scenario) by source category

Source categories	1988	1990	2017	2020	2025	2030	2035	2040
<b>1. Energy</b>	<b>1 225.43</b>	<b>1 017.34</b>	<b>937.32</b>	<b>918.39</b>	<b>863.37</b>	<b>769.00</b>	<b>679.15</b>	<b>623.63</b>
A. Fuel combustion	222.08	127.27	151.82	144.40	124.22	108.60	100.99	96.30
1. Energy industries	3.61	3.29	3.71	5.25	6.01	7.23	7.09	6.90
2. Manufacturing industries and construction	4.04	4.14	5.03	4.44	4.68	4.89	4.88	4.95
3. Transport	7.73	7.39	5.53	5.13	5.18	5.21	5.56	5.71
4. Other sectors	206.70	112.45	137.55	129.58	108.36	91.27	83.46	78.73
5. Other	NO.IE	NO.IE	NO.IE	NO.IE	NO.IE	NO.IE	NO.IE	NO.IE
B. fugitive emission from fuels	1 003.35	890.07	785.51	773.99	739.15	660.40	578.16	527.33
1. Solid fuels	952.94	846.70	679.58	663.39	626.98	546.63	461.25	408.41
2. Oil and natural gas	50.41	43.37	105.93	110.59	112.17	113.77	116.91	118.92
<b>2. Industrial processes and product use</b>	<b>2.81</b>	<b>2.51</b>	<b>2.58</b>	<b>2.97</b>	<b>3.04</b>	<b>3.10</b>	<b>3.15</b>	<b>3.20</b>
B. Chemical industry	1.74	1.60	2.02	2.40	2.47	2.53	2.58	2.63
C. Metal industry	1.07	0.91	0.56	0.57	0.57	0.57	0.57	0.57
<b>3. Agriculture</b>	<b>972.49</b>	<b>954.08</b>	<b>578.44</b>	<b>573.15</b>	<b>588.70</b>	<b>593.03</b>	<b>591.34</b>	<b>592.96</b>
A. Enteric fermentation	878.10	862.16	511.78	499.76	496.21	491.88	488.27	489.71
B. Manure management	93.58	91.12	65.73	72.41	91.47	100.11	101.99	102.13
F. Field burning of agricultural residues	0.82	0.80	0.93	0.99	1.01	1.04	1.07	1.11
<b>4. Land use, land use change and forestry</b>	<b>1.77</b>	<b>1.76</b>	<b>1.50</b>	<b>1.13</b>	<b>1.18</b>	<b>1.18</b>	<b>1.18</b>	<b>1.18</b>
A. Forest land	1.35	1.35	1.45	1.08	1.13	1.13	1.13	1.13
C. Grassland	0.41	0.41	0.05	0.05	0.05	0.05	0.05	0.05
<b>5. Waste</b>	<b>828.36</b>	<b>819.76</b>	<b>458.17</b>	<b>454.84</b>	<b>426.77</b>	<b>406.65</b>	<b>394.25</b>	<b>384.96</b>
A. Solid waste disposal	564.50	566.66	352.63	354.89	328.87	310.84	298.13	288.85
B. Biological treatment of solid waste	0.65	0.51	3.75	7.73	8.34	8.34	8.34	8.34
C. Incineration and open burning of waste	NO.NA	NO.NA	0.00	0.00	0.00	0.00	0.00	0.00
D. Waste water treatment and discharge	263.21	252.59	101.78	92.21	89.56	87.47	87.78	87.77
<b>Total CH<sub>4</sub> emissions without LULUCF</b>	<b>3 029.09</b>	<b>2 793.69</b>	<b>1 976.51</b>	<b>1 949.35</b>	<b>1 881.88</b>	<b>1 771.79</b>	<b>1 667.90</b>	<b>1 604.75</b>
<b>Total CH<sub>4</sub> emissions with LULUCF</b>	<b>3 030.85</b>	<b>2 795.46</b>	<b>1 978.01</b>	<b>1 950.48</b>	<b>1 883.07</b>	<b>1 772.97</b>	<b>1 669.08</b>	<b>1 605.93</b>

Source: IOŚ-PIB, KOBiZE

Table 5.20. N<sub>2</sub>O emissions [kt] in 1988, 1990, 2017 and projected for 2020–2040 (WEM scenario) by source category

Source categories	1988	1990	2017	2020	2025	2030	2035	2040
<b>1. Energy</b>	<b>8.67</b>	<b>7.42</b>	<b>9.14</b>	<b>6.34</b>	<b>6.21</b>	<b>6.00</b>	<b>5.41</b>	<b>5.07</b>
A. Fuel combustion	8.67	7.42	9.14	6.34	6.21	5.99	5.41	5.07
1. Energy industries	3.71	3.43	2.47	2.45	2.47	2.47	2.00	1.75
2. Manufacturing industries and construction	0.59	0.60	0.70	0.60	0.63	0.66	0.65	0.66
3. Transport	1.37	1.12	2.39	2.17	2.08	1.91	1.83	1.74
4. Other sectors	3.00	2.27	3.58	1.11	1.03	0.95	0.93	0.92
5. Other	NO.IE	NO.IE	NO.IE	NO.IE	NO.IE	NO.IE	NO.IE	NO.IE
B. Fugitive emission from fuels	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2. Oil and natural gas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>2. Industrial processes and product use</b>	<b>16.51</b>	<b>12.27</b>	<b>2.82</b>	<b>3.04</b>	<b>3.05</b>	<b>3.07</b>	<b>3.08</b>	<b>3.09</b>
B. Chemical industry	16.11	11.87	2.37	2.60	2.61	2.62	2.64	2.65
G. Other product manufacture and use	0.40	0.40	0.45	0.44	0.44	0.44	0.44	0.44
<b>3. Agriculture</b>	<b>70.90</b>	<b>69.79</b>	<b>54.90</b>	<b>55.07</b>	<b>56.02</b>	<b>57.02</b>	<b>58.03</b>	<b>58.00</b>
B. Manure management	10.60	10.52	7.34	7.74	7.98	8.26	8.54	8.69
D. Agricultural soils	60.26	59.24	47.52	47.29	47.99	48.72	49.45	49.27
F. Field burning of agricultural residues	0.04	0.04	0.03	0.04	0.04	0.04	0.04	0.04
<b>4. Land use, land use change and forestry</b>	<b>14.17</b>	<b>15.49</b>	<b>11.93</b>	<b>6.34</b>	<b>6.51</b>	<b>6.31</b>	<b>6.35</b>	<b>5.92</b>
A. Forest land	0.03	0.03	0.00	0.01	0.01	0.01	0.01	0.01
B. Cropland	NA.NO	1.28	7.74	2.10	2.06	1.92	1.89	1.76
C. Grassland	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
D. Wetlands	13.60	13.60	NO.NA	NO.NA	NO.NA	NO.NA	NO.NA	NO.NA
E. Settlement	0.53	0.57	4.18	4.23	4.44	4.38	4.45	4.15
<b>5. Waste</b>	<b>2.60</b>	<b>2.48</b>	<b>3.03</b>	<b>3.25</b>	<b>3.26</b>	<b>3.23</b>	<b>3.18</b>	<b>3.13</b>
B. Biological treatment of solid waste	0.04	0.03	0.23	0.46	0.50	0.50	0.50	0.50
C. Incineration and open burning of waste	0.03	0.03	0.25	0.25	0.25	0.25	0.25	0.25
D. Waste water treatment and discharge	2.53	2.43	2.55	2.53	2.51	2.47	2.43	2.37
<b>Total N<sub>2</sub>O emissions without LULUCF</b>	<b>98.67</b>	<b>91.97</b>	<b>69.88</b>	<b>67.70</b>	<b>68.54</b>	<b>69.31</b>	<b>69.71</b>	<b>69.30</b>
<b>Total N<sub>2</sub>O emissions with LULUCF</b>	<b>112.84</b>	<b>107.45</b>	<b>81.81</b>	<b>74.04</b>	<b>75.05</b>	<b>75.62</b>	<b>76.05</b>	<b>75.22</b>

Source: IOŚ-PIB, KOBiZE

Table 5.21. Total GHG emissions [kt CO<sub>2</sub> eq.] in 1988, 1990 and 2017 and projected for 2020–2040 (WAM scenario) by source category

Source categories	1988	1990	2017	2020	2025	2030	2035	2040
<b>1. Energy</b>	<b>476 219.67</b>	<b>382 821.05</b>	<b>342 088.54</b>	<b>314 996.08</b>	<b>294 590.13</b>	<b>267 891.48</b>	<b>227 183.91</b>	<b>203 763.73</b>
A. Fuel combustion	447 065.35	357 220.22	317 795.22	291 096.93	271 949.07	247 425.26	209 112.61	187 333.21
1. Energy industries	258 132.22	236 171.41	164 863.57	147 439.51	142 998.62	133 149.95	102 604.16	87 953.55
2. Manufacturing industries and construction	55 239.37	43 053.37	31 171.90	25 728.45	22 539.69	19 673.58	17 749.15	15 960.16
3. Transport	24 608.35	20 898.10	63 353.04	63 625.30	61 111.79	57 028.66	55 282.98	53 025.70
4. Other sectors	109 085.41	57 097.35	58 406.71	54 303.68	45 298.97	37 573.08	33 476.32	30 393.80
5. Other	NO.IE	NO.IE	NO.IE	NO.IE	NO.IE	NO.IE	NO.IE	NO.IE
B. Fugitive emission from fuels	29 154.32	25 600.83	24 293.32	23 899.15	22 641.06	20 466.21	18 071.31	16 430.52
1. Solid fuels	27 850.33	24 470.66	19 729.87	19 106.25	17 808.21	15 592.73	13 118.91	11 427.41
2. Oil and natural gas	1 303.99	1 130.16	4 563.45	4 792.90	4 832.86	4 873.49	4 952.40	5 003.11
<b>2. Industrial processes and product use</b>	<b>31 198.21</b>	<b>22 701.35</b>	<b>26 998.20</b>	<b>24 419.97</b>	<b>24 039.81</b>	<b>23 605.13</b>	<b>23 106.20</b>	<b>22 792.66</b>
A. Mineral industry	11 605.22	8 855.06	10 932.91	10 873.13	11 124.74	11 349.32	11 531.04	11 700.97
B. Chemical industry	10 601.17	7 377.73	5 933.48	6 137.70	6 214.63	6 292.21	6 353.80	6 416.16
C. Metal industry	7 903.51	5 931.47	2 290.50	2 456.61	2 428.94	2 419.91	2 400.66	2 388.74
D. Non-energy products and fuel use	969.11	416.65	724.90	708.31	708.31	708.31	708.31	708.31
F. Product uses as ODS substitutes	NO	NO	6 905.19	4 014.45	3 306.17	2 611.59	1 897.38	1 371.39
G. Other product manufacture and use	119.20	120.45	211.23	229.77	257.02	223.80	215.01	207.07
<b>3. Agriculture</b>	<b>47 908.81</b>	<b>47 244.30</b>	<b>31 739.73</b>	<b>31 751.72</b>	<b>32 452.22</b>	<b>32 880.91</b>	<b>33 169.74</b>	<b>33 249.44</b>
A. Enteric fermentation	21 952.45	21 554.10	12 794.48	12 493.93	12 405.29	12 296.92	12 206.79	12 242.81
B. Manure management	5 499.66	5 413.10	3 831.58	4 115.51	4 665.87	4 963.42	5 096.16	5 142.18
D. Agricultural soils	17 956.64	17 653.09	14 160.07	14 092.78	14 302.05	14 518.45	14 735.64	14 683.73
F. Field burning of agricultural residues	31.54	30.63	33.64	36.33	37.09	37.85	39.10	40.57
G. Liming	1 950.86	2 099.38	504.35	448.91	489.45	527.19	569.70	631.60
H. Urea application	517.66	494.00	415.61	564.25	552.48	537.08	522.36	508.55
<b>4. Land use, land use change and forestry</b>	<b>-15 703.55</b>	<b>-27 190.91</b>	<b>-33 846.14</b>	<b>-31 777.68</b>	<b>-27 337.63</b>	<b>-21 692.93</b>	<b>-17 742.64</b>	<b>-14 021.28</b>
A. Forest land	-21 586.44	-34 099.09	-36 856.30	-33 199.18	-28 815.38	-22 568.70	-18 262.56	-13 328.60
B. Cropland	859.94	1 306.01	3 156.72	2 141.49	2 085.96	1 955.71	1 909.37	1 784.51
C. Grassland	710.85	731.90	-565.36	-384.39	-160.09	-2.55	254.67	259.68
D. Wetlands	4 649.60	4 654.36	1 502.87	1 429.60	1 429.60	1 429.60	1 429.60	1 429.60
E. Settlement	870.08	672.40	3 639.13	3 567.86	3 629.68	3 612.79	3 632.76	3 096.34
G. Harvested wood product	-1 207.58	-456.49	-4 723.20	-5 333.05	-5 507.40	-6 119.79	-6 706.49	-7 262.81
<b>5. Waste</b>	<b>21 931.10</b>	<b>21 583.41</b>	<b>12 954.93</b>	<b>13 079.37</b>	<b>12 388.85</b>	<b>11 875.23</b>	<b>11 551.66</b>	<b>11 303.98</b>
A. Solid waste disposal	14 112.45	14 166.42	8 815.76	8 872.30	8 221.83	7 771.01	7 453.23	7 221.37
B. Biological treatment of solid waste	27.93	21.79	161.00	331.66	357.61	357.61	357.61	357.61
C. Incineration and open burning of waste	457.71	357.53	673.19	815.44	823.20	823.20	823.20	823.20
D. Waste water treatment and discharge	7 333.01	7 037.66	3 304.98	3 059.97	2 986.21	2 923.41	2 917.62	2 901.81
<b>Total CO<sub>2</sub> eq. emissions without LULUCF</b>	<b>577 257.78</b>	<b>474 350.11</b>	<b>413 781.40</b>	<b>384 247.14</b>	<b>363 471.01</b>	<b>336 252.75</b>	<b>295 011.52</b>	<b>271 109.81</b>
<b>Total CO<sub>2</sub> eq. emissions with LULUCF</b>	<b>561 554.23</b>	<b>447 159.20</b>	<b>379 935.26</b>	<b>352 469.47</b>	<b>336 133.38</b>	<b>314 559.82</b>	<b>277 268.88</b>	<b>257 088.53</b>

Source: IOŚ-PIB, KOBiZE

Table 5.22 presents the historical and projected greenhouse emissions in the WAM scenario broken down into ETS and non-ETS (so-called ESD<sup>20</sup>) sectors. Both in the ETS and non-ETS sectors, a gradual reduction of emissions is predicted after 2020. In the WAM scenario, the reduction of emissions in the non-ETS sectors in 2030 can be –7.4% compared with 2005.

Table 5.22. GHG emissions (excluding LULUCF) in historical years and projected for 2020-2040 broken down into ETS and ESD according to the WAM scenario

GHG emission	2005	2015	2016	2017	2020	2025	2030	2035	2040
	kt CO <sub>2</sub> eq.								
ETS	223 441	198 696	198 052	202 167	188 921	181 772	169 525	137 797	121 847
ESD	179 984*	191 748	201 071	211 615	195 326	181 699	166 728	157 214	149 263
<b>Total</b>	<b>403 424</b>	<b>390 445</b>	<b>399 123</b>	<b>413 781</b>	<b>384 247</b>	<b>363 471</b>	<b>336 253</b>	<b>295 012</b>	<b>271 110</b>

\* Emissions corrected for a change in the ETS scope after 2005

Source: IOŚ-PIB KOBIZE/KPEiK

### 5.3.2 Methodology and assumptions for the projections in the scenario “with additional measures” (WAM)

#### Energy

The source of data on the projected greenhouse gas emissions in the WAM scenario in category 1. *Energy* was the *National Energy and Climate Plan for 2021-2030* (KPEiK) under the Energy and Climate Scenario (PEK) scenario prepared by the Ministry of Energy and updated in December 2019. The assumptions followed in the WAM scenario correspond with the assumptions of the draft Energy Policy of Poland until 2040 [PEP 2040, draft version 2.1 – 08.11.2019].

The projections in that scenario take into account political decisions which constitute the boundary values as the analytical assumptions, e.g. including the imposition of the requirement for the fulfilment of the EU commitments regarding the share of RES in the energy balance. The model applied for the projections selected generation sources by cost-effectiveness, but also took into account the security conditions for the operation of the grid. This means that even if one of RES technologies (dependent on the weather conditions) were significantly cheaper than the other available ones, the model would not choose these sources as the only ones, given the uncertainty related to their use. In such a situation, a source which would be a backup for RES sources was selected. Moreover, in light of technical conditions, the rate at which the sources using individual technologies would be connected to the power grid was limited [PEP 2040, Annex 2].

The input data for the projections in category *Energy* are presented in Tables 5.23–5.25.

<sup>20</sup> The so-called *Effort Sharing Decision* - Decision No 406/2009/EC of the European Parliament and of the Council of 23 April 2009 on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020 (OJ L 140, 5.6.2009, p. 136)



The GHG emission projections were calculated using the methodology consistent with that applied since 2015 the national greenhouse gas inventories, in accordance with the 2006 IPCC Guidelines now in effect 2006<sup>21</sup>.

Table 5.23. Projected transformation input for electricity and heat production [ktoe] for 2020-2040 according to the WAM scenario

Specification	2020	2025	2030	2035	2040
<b>Power plants</b>					
Coal	4 722	5 925	5 990	6 047	4 796
Oil products	6	5	5	6	3
Gas	0	188	571	1 587	2 019
RES, waste	450	447	416	416	0
<b>CHP plants</b>					
Coal	24 369	22 282	19 746	12 223	9 681
Oil products	337	334	324	301	289
Gas	2 259	2 562	3 018	3 582	4 277
RES, waste	2 696	3 473	4 592	4 909	5 414
Nuclear energy	0	0	0	4 624	6 936
<b>Heat plants</b>					
Coal	1 864	1 278	856	565	394
Oil products	23	21	20	21	24
Gas	154	127	111	105	109
RES, waste	82	193	404	423	448

Source: Ministry of Energy, draft *National Energy and Climate Plan for 2021-2030* (November 2019)

Table 5.24. Projected final energy consumption in particular sectors (excluding non-energy use) [ktoe] for 2020-2040 according to the WAM scenario

Sector	2020	2025	2030	2035	2040
Industry	15 316	14 902	14 763	14 664	14 596
Transport	22 546	22 075	21 049	20 827	20 492
Households	19 772	18 506	17 513	17 505	17 657
Services	8 343	8 586	8 700	8 853	9 079
Agriculture	3 743	3 613	3 485	3 379	3 287
<b>TOTAL</b>	<b>69 720</b>	<b>67 682</b>	<b>65 509</b>	<b>65 229</b>	<b>65 112</b>

Source: Ministry of Energy, draft *National Energy and Climate Plan for 2021-2030* (November)

A comparison of the assumptions adopted for the WAM and WEM scenarios shows a fairly significant difference in the assumed heat consumption (Table 5.25 and 5.10). The lower energy consumption in the WAM scenario results, among others, from the assumption of higher energy efficiency of buildings and the *Clean Air Programme*. Table 5.26 shows a comparison of the projected primary and final energy consumption in the economy according to the two scenarios.

<sup>21</sup> 2006 IPCC Guidelines for National Greenhouse Gas Inventories (<http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>)

Table 5.25. Projected structure of final energy consumption [ktoe] for 2020-2040 according to the WAM scenario

Structure	2020	2025	2030	2035	2040
Electricity	12 152	13 041	14 202	15 349	16 520
Heat	5 748	5 436	5 090	5 080	5 132
Coal	9 917	7 117	4 899	3 735	2 842
Oil products	23 822	22 602	20 911	20 063	19 124
Natural gas	10 144	10 353	10 327	10 277	10 108
Biogas	97	131	165	201	237
Solid biomass	5 295	5 916	6 439	6 681	7 036
Biofuels	1490	1531	1413	1364	1317
Municipal and industrial waste	785	871	891	905	919
Solar panels, heat pumps, geothermal	270	685	1 172	1 574	1 876
<b>TOTAL</b>	<b>69 720</b>	<b>67 682</b>	<b>65 509</b>	<b>65 229</b>	<b>65 112</b>

Source: Ministry of Energy, draft *National Energy and Climate Plan for 2021-2030* (November 2019)

Table 5.26. Comparison of projected primary and final energy consumption (excluding non-energy use) according to the WEM and WAM scenarios [ktoe] for 2020-2040

Specification	2020	2025	2030	2035	2040
Primary energy consumption (WAM)	96 400	94 396	91 317	88 963	87 736
Primary energy consumption (WEM)	98 943	102 217	104 778	103 199	102 680
Primary energy savings (WAM-WEM)	-2 543	-7 821	-13 462	-14 235	-14 944
Final energy consumption (WAM)	69 720	67 682	65 509	65 229	65 112
Final energy consumption (WEM)	72 117	75 078	77 327	78 300	78 784
Final energy savings (WAM-WEM)	-2 397	-7 396	-11 818	-13 071	-13 672

Source: Ministry of Energy, *National Energy and Climate Plan for 2021-2030* (November 2019)

### *Industrial processes and product use*

The input data for the projections of emissions from sector 2. *Industrial processes* are the same as those presented in Table 5.10 in Section 5.2.2. In turn, the emission scenario which was prepared for fluorinated greenhouse gases also included – in addition to the implemented and approved policies and measures – additional measures (planned, but not approved yet) for the purposes of the scenario with additional measures (WAM). The adopted assumptions take into account the effect of the following measures:

- The prohibition of the placing on the market from 1 January 2026 of electric switchboards which contain sulphur hexafluoride or the operation of which depends on sulphur hexafluoride;
- The prohibition of the placing on the market from 1 January 2028 of refrigeration units of refrigerated trucks and their trailers which contain HFCs of GWP of not less than 150 or the operation of which depends on HFCs;
- The prohibition of the placing on the market from 1 January 2030 of stationary refrigeration equipment which contains HFCs of GWP of not less than 1500 or the operation of which depends on HFCs;
- The prohibition of the placing on the market from 1 January 2030 of stationary air-conditioning equipment which contains HFCs of GWP of not less than 750 or the operation of which depends on HFCs;
- The prohibition of the placing on the market from 1 January 2028 of fire protection equipment which contains HFC-236fa or the operation of which depends on HFC-236fa.

The effects of the future unimplemented policies and measures were estimated in the scope and form consistent with the reporting requirements for policies and measures as set in:

- Regulation (EU) No 525/2013 of the European Parliament and of the Council (Article 13);
- Commission Implementing Regulation (EU) No 749/2014 (Articles 20 and 22 and Annex XI, Tables 1 and 2).

#### 5.4 Comparison of the results of the present emission projections with those included in the Third Biennial Report

In Fig. 5.4 and Tables 5.27 and 5.28, the results of the present greenhouse gas emission projections are compared with the data provided in the *Third Biennial Report* for 2020, 2030 and 2040.

A comparison of the scenarios “with existing measures” shows that the total greenhouse gas emissions for all the years analysed in this report are higher than those in the *3<sup>rd</sup> Biennial Report*. In 2020, this difference is almost 9.8 million t CO<sub>2</sub> eq., in 2030 more than 43.8 million t CO<sub>2</sub> eq. and in 2040 6.5 million t CO<sub>2</sub> eq. Thus, the now projected emissions grow by, respectively, 2.5%, 12.1% and 20% in 2020, 2030 and 2040 compared with the emissions presented in the *3<sup>rd</sup> Biennial Report*. The greatest differences between the projected emissions and those presented in the *3<sup>rd</sup> Biennial Report* occur for CO<sub>2</sub>, CH<sub>4</sub> and fluorinated gases. In contrast, the projected emissions in the scenario “with additional measures” presented in this report are lower for all the years than those in the previous *Biennial Report*.

The greatest changes in the projected greenhouse gas emission levels between the successive biennial reports were caused by the update of the energy assumptions prepared by the Ministry of Energy for the purposes of the *National Energy and Climate Plan for 2021-2030* (KPEiK). The input data and circumstances were also updated for the other sectors; however, in their case the differences are slight (except for fluorinated gases).

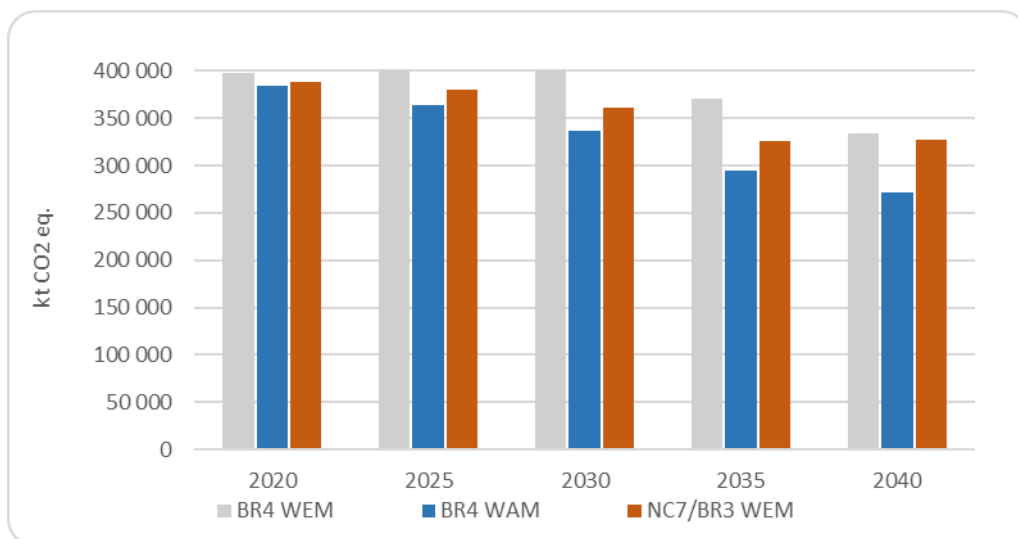


Fig. 5.4. Comparison of projected GHG emissions published in BR3 and BR4

Table 5.27. Comparison of the present projections with the results published in the 3<sup>rd</sup> Biennial Report by gas

Greenhouse gas	7th National Communication and 3rd Biennial Report - with existing measures (WEM)			4th Biennial Report - with additional measures (WAM) - with existing measures (WEM)		
	2020	2030	2040	2020	2030	2040
	kt of CO <sub>2</sub> eq.					
CO <sub>2</sub>	314 091.83	286 338.15	253 072.98	311 227.40	268 601.18	208 893.98
				323 023.60	331 695.43	266 407.93
CH <sub>4</sub>	45 427.52	44 641.04	44 219.10	48 733.76	44 294.69	40 118.74
				50 495.09	49 170.97	43 757.37
N <sub>2</sub> O	20 319.87	20 928.79	20 428.46	20 174.15	20 653.88	20 651.01
				20 179.98	20 833.56	20 805.45
HFCs	8 095.06	8 962.32	9 607.75	4 004.23	2 605.47	1 367.73
				4 004.23	2 882.32	2 695.95
PFCs	11.53	10.10	9.08	10.22	6.12	3.66
				10.22	6.12	3.66
SF <sub>6</sub>	47.44	52.63	56.55	97.38	91.40	74.68
				97.38	151.19	199.40
NF <sub>3</sub>	-	-	-	-	-	-
National total excluding category 4. LULUCF	387 993.26	360 933.03	327 393.91	384 247.14	336 252.75	271 109.81
				397 810.50	404 739.60	333 869.76

Source: IOŚ-PIB, KOBIZE

Table 5.28. Comparison of the present projections with the results published in the 3<sup>rd</sup> Biennial Report by source category

Source category	7th National Communication and 3rd Biennial Report - with existing measures (WEM)			4th Biennial Report - with additional measures (WAM) - with existing measures (WEM)		
	2020	2030	2040	2020	2030	2040
	kt of CO <sub>2</sub> eq.					
1. Energy	315 861.06	284 906.63	250 268.44	314 996.08	267 891.48	203 763.73
				328 559.44	336 041.69	265 070.74
2. Industrial processes and product use	29 180.59	31 903.33	33 360.15	24 419.97	23 605.13	22 792.66
				24 419.97	23 941.76	24 245.59
3. Agriculture	31 029.39	32 320.47	32 158.36	31 751.72	32 880.91	33 249.44
				31 751.72	32 880.91	33 249.44
4. Land use, land use change and forestry	-21 820.22	-13 796.38	-9 500.20	-31 777.68	-21 692.93	-14 021.28
				-31 777.68	-21 692.93	-14 021.28
5. Waste	11 922.22	11 802.59	11 606.97	13 079.37	11 875.23	11 303.98
				13 079.37	11 875.23	11 303.98
National total excluding category 4. LULUCF	387 993.26	360 933.03	327 393.91	384 247.14	336 252.75	271 109.81
				397 810.50	404 739.60	333 869.76

Source: IOŚ-PIB, KOBIZE

## 5.5 Description of the models applied in the activity projections in the energy sector

### Forecasting method and tools

The STEAM-PL and MESSAGE models were used to prepare a forecast of the national energy demand and its results were then used to estimate the greenhouse gas emissions from the energy sector. The block diagram presenting the forecasting method, along with the models used to determine

the electricity and district heat demand in the country and the optimum manner of its satisfaction, is shown in Fig. 5.5.

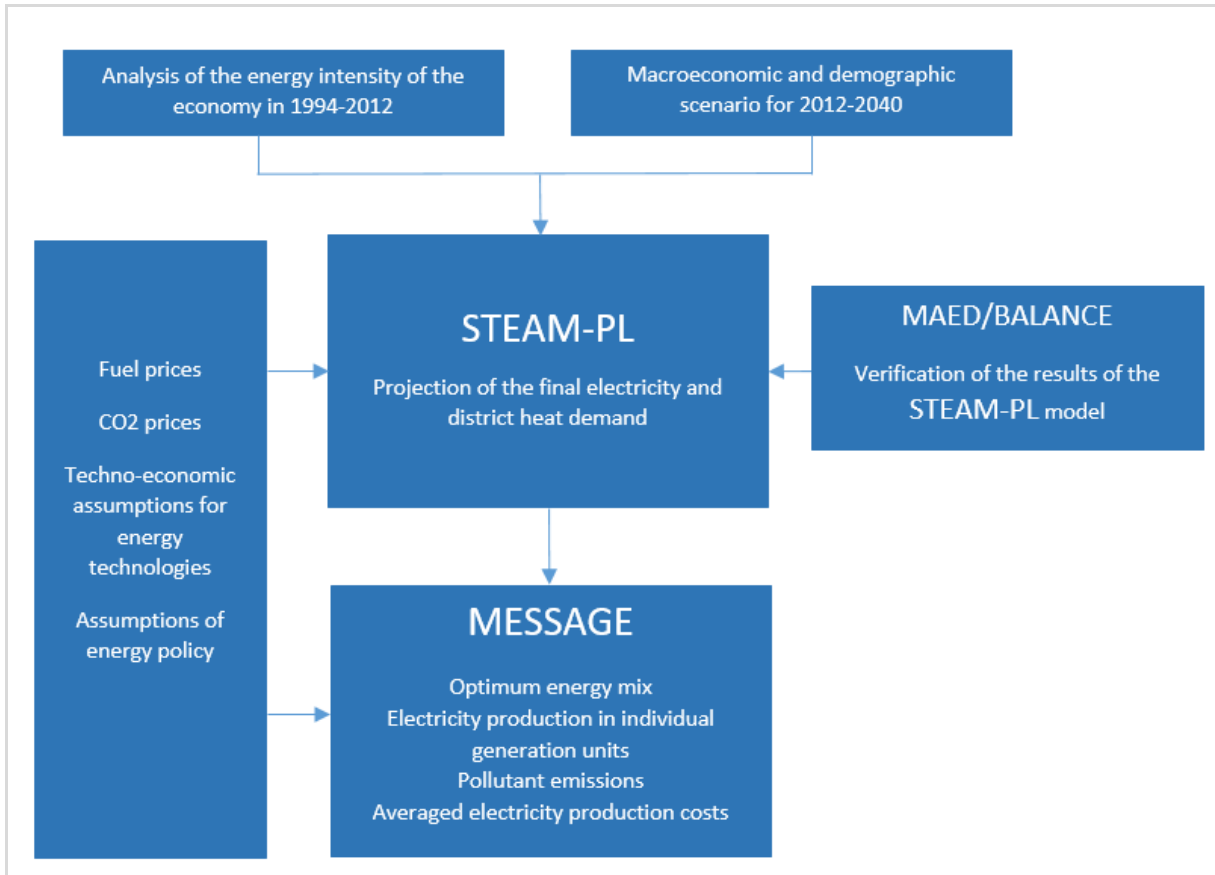


Fig. 5.5. Block diagram of the calculation procedure of the model.

In accordance with the method applied, the main factors were adopted as ones affecting the development of energy demand in the country: economic growth (GDP and values added in the individual sectors of the national economy) described by the following macroeconomic indicators:

- demographic processes,
- changes in the lifestyles of society,
- technological progress,
- processes to improve energy efficiency.

The electricity demand projections were prepared using the STEAM-PL model (Set of Tools for Energy Demand Analysis and Modelling), a tool which was developed in ARE S.A. in 2012-2016, which fully aligns the relationships contained in it with the changing operating conditions of energy markets, including the foreseeable technological progress. The projections generated using this model were built on the basis of a single consistent scenario, including macroeconomic and demographic assumptions and the assumptions for the foreseeable technological progress and the related rate of energy efficiency improvement. The base year in this model is 2012.

The outputs of the STEAM-PL model were inputs to the MESSAGE model (Model for Energy Supply Strategy Alternatives and their General Environmental Impacts), where on the basis of the identified electricity and district heat demand, the optimum structure of the generation sector and the demand-driven production by individual generation units were determined. The selection of the optimum - from the point of view of the economy – generation structure (energy mix) in the MESSAGE model is based on the minimisation of the total discounted systemic costs over the entire time interval considered.

#### *STEAM-PL model*

STEAM-PL is an “end-use” consumption model dedicated to the national fuel and energy system, reflecting in detail the technical aspects related to energy use in the particular sectors of the economy. It is an integrated hybrid model which makes it possible at the same time to determine the future energy demand for useful energy (using the classical “bottom-up” approach) and the ways of meeting the demand (using the “top-down” approach). The model is based on a calculation algorithm which is used to simulate the behaviour of energy consumer reacting to changes in the price relations between fuels and technologies, enabling an analysis of the substitution of energy generation technologies and energy carriers on the basis of costs related to the provision of specific energy services. To this end, the model uses the econometric modelling of the shares in the market in the form of a logit function (the market share algorithm – the mathematical approach applied in the BALANCE and WEM models).

STEAM-PL has a modular structure, which means that a relevant module is dedicated to a sector of the national economy defined in it, with its calculation algorithms taking into account a number of characteristics distinguishing a given sector (Fig. 5.6).

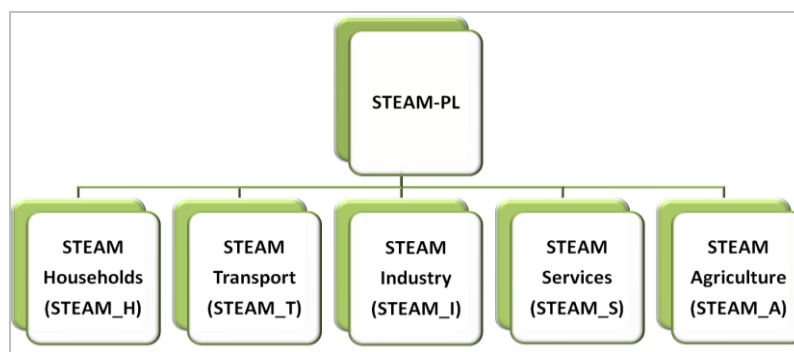


Fig. 5.6. Division of the structure of the STEAM-PL model into modules

The model uses the division of the sectors of the national economy into subsectors, thus making it possible to capture the specific operating characteristics of the individual economic areas (Table 5.29). Energy uses are defined for each sector and subsector (Table 5.30).

Table 5.29. The division of the sectors of the national economy into subsectors as used in the model

Sector	Subsector
Households	Urban households
	Rural households
Transport	Passenger transport
	Freight transport
Industry	Manufacture and casting of metals
	Manufacture of non-ferrous metals
	Manufacture of chemical and petrochemical products
	Manufacture of non-metallic mineral products
	Manufacture of paper and paper products, printing and manufacture of wood
	Manufacture of food products, beverages and tobacco products
	Manufacture of other industrial products (manufacture of textile products, garments, hides and leather, manufacture of machinery and equipment, manufacture of motor vehicles, trailers and semi-trailers, manufacture of other transport equipment, metal ore mining, other mining and quarrying, construction, other manufacture of products)
Services	Non-commercial services
	Commercial services

Table 5.30. Energy uses identified for each sector and subsector

Sector	Use
Households	Electrical equipment
	Lighting
	Air-conditioning and ventilation
	Preparation of meals
	Room heating
	Preparation of domestic hot water
Transport	Transport performance (passenger transport)
	Transport performance (freight transport)
Industry	Electric drives
	Lighting
	Room heating and ventilation

Sector	Use
	Furnace heat
	Process steam
Services	Room lighting
	Street lighting
	Ventilation
	Air-conditioning
	Room heating
	Preparation of domestic hot water
	Electric drives
	Technological equipment
	Electrical office equipment
	Refrigeration equipment
Preparation of meals	
Agriculture	Motor fuels
	Other fuels
	Electrical loads

The calculation procedure applied in the model can be characterised as follows: in the first step the model determines the usable energy demand based on the assumed rate of the national economic growth and social, technological and regulatory factors taken into account as drivers.<sup>22</sup>

In the next step, the set of technology and equipment enabling the meeting of the demand for individual energy services and the intensity of their use are determined. The following was used e.g. to identify the initial state: the results of a cyclical (every three years) survey of energy and fuel consumption carried out by the GUS among households<sup>23</sup>, the results of the statistical survey on "Fuel and energy balances"<sup>24</sup> and the results of analyses performed by recognised research centres

22 The identified factors which condition to the largest extent the scope and pace of changes in energy demand.

23 "Energy consumption in households" – Statistics Poland (GUS), Warsaw, 2002, 2009, 2012 and 2015.

24 Annual Statistical Survey Programmes of Public Statistics, the project "Fuel and energy balances".



and sectoral institutions<sup>25</sup>. The final energy consumption is calculated on the basis of the projected number of items of equipment, their techno-economic characteristics and the foreseen intensity of their use. The improvement of the energy efficiency of electrical equipment is taken into account through the assumptions for technological equipment (the energy efficiency class). The pace of the replacement of existing equipment by new one in a higher energy efficiency class is adopted on the basis of an analysis of historical trends as the result of a prediction developed in relevant econometric models and on the basis of sales data acquired from manufacturers for each item of equipment separately. The division into energy efficiency classes is applied to all the items of electrical equipment defined in the model (e.g. the module dedicated to households defines 72 different types of electrical equipment for everyday use and 6 types of air-conditioning and ventilation equipment). For such energy uses as heating and the preparation of domestic hot water, the market share algorithm mentioned earlier is used to determine the manner of satisfying the energy needs.

In the manufacturing sector, the model applies a slightly different approach than the one for services and households. In the first step, output projections are developed for energy-intensive industrial products and then, on the basis of historical data, the energy intensity indicators are determined for given product groups. These indicators are extrapolated as an element reflecting the course of the processes of improving energy efficiency. The energy demand thus determined is divided into the individual uses within which, using the market share algorithm, the ways of meeting this demand are simulated for the particular groups of dedicated technologies, described by a number of techno-economic parameters (with preset limitations).

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25 Including e.g. Leonardo Energy, KAPE, FEWE and NTUA.

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Fig. 5.7 presents the structure of the model and the individual elements defined in the STEAM-PL model.

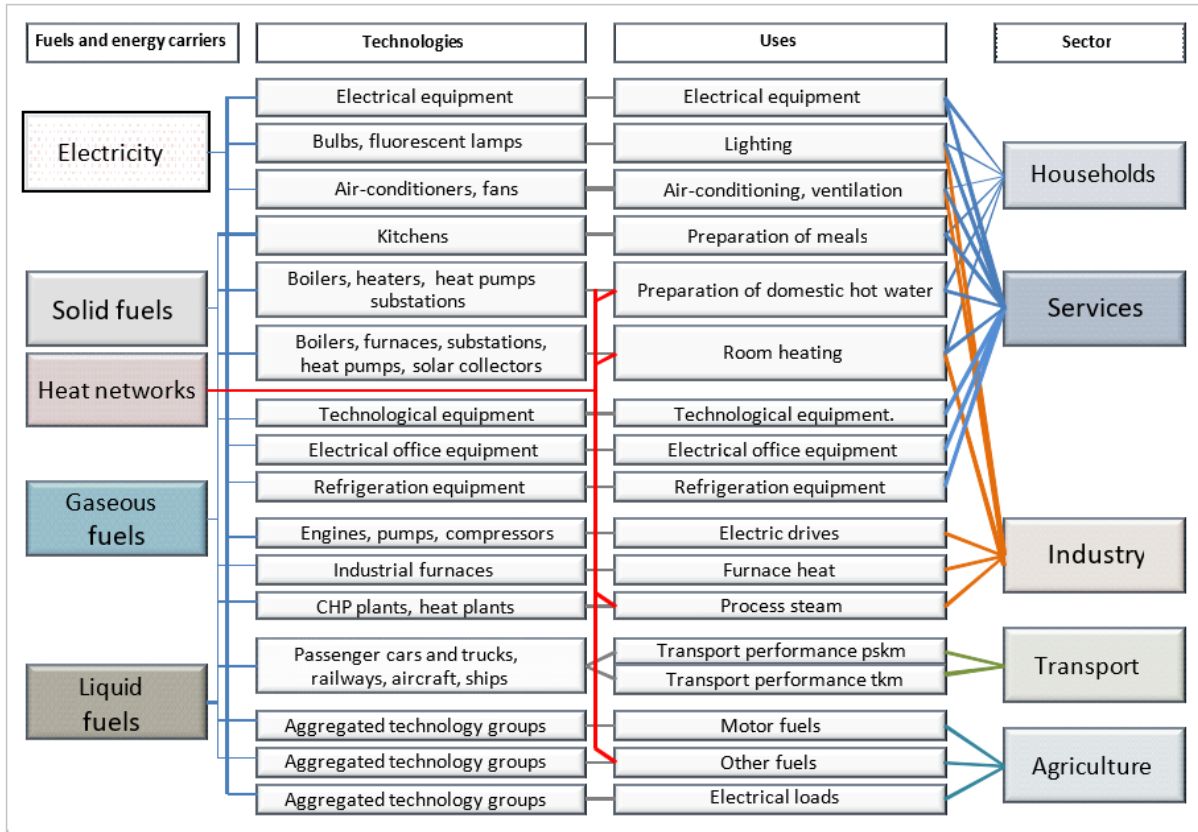


Fig. 5.7. Structure of the STEAM-PL model.

### MESSAGE-PL model

On the basis of the identified electricity and district heat demand, in the next step, the optimum structure of the generation sector and the demand-driven production by individual generation units in the MESSAGE-PL model was determined. The operating principle of the MESSAGE<sup>26</sup> model is based on the minimisation of the total discounted systemic costs over the entire time interval considered, using linear programming methods or, integer programming for certain tasks (e.g. the selection of generators with specified capacity – large coal-fired and nuclear units).

MESSAGE operates on a predefined energy flow network, starting from the extraction or supply of primary energy, though conversion (e.g. electricity and heat generation), transmission and distribution, up to end-users (Fig. 5.8).

<sup>26</sup> MESSAGE - Model for Energy Supply Strategy Alternatives and the General Environmental Impacts, User Manual, IAEA, 2007.

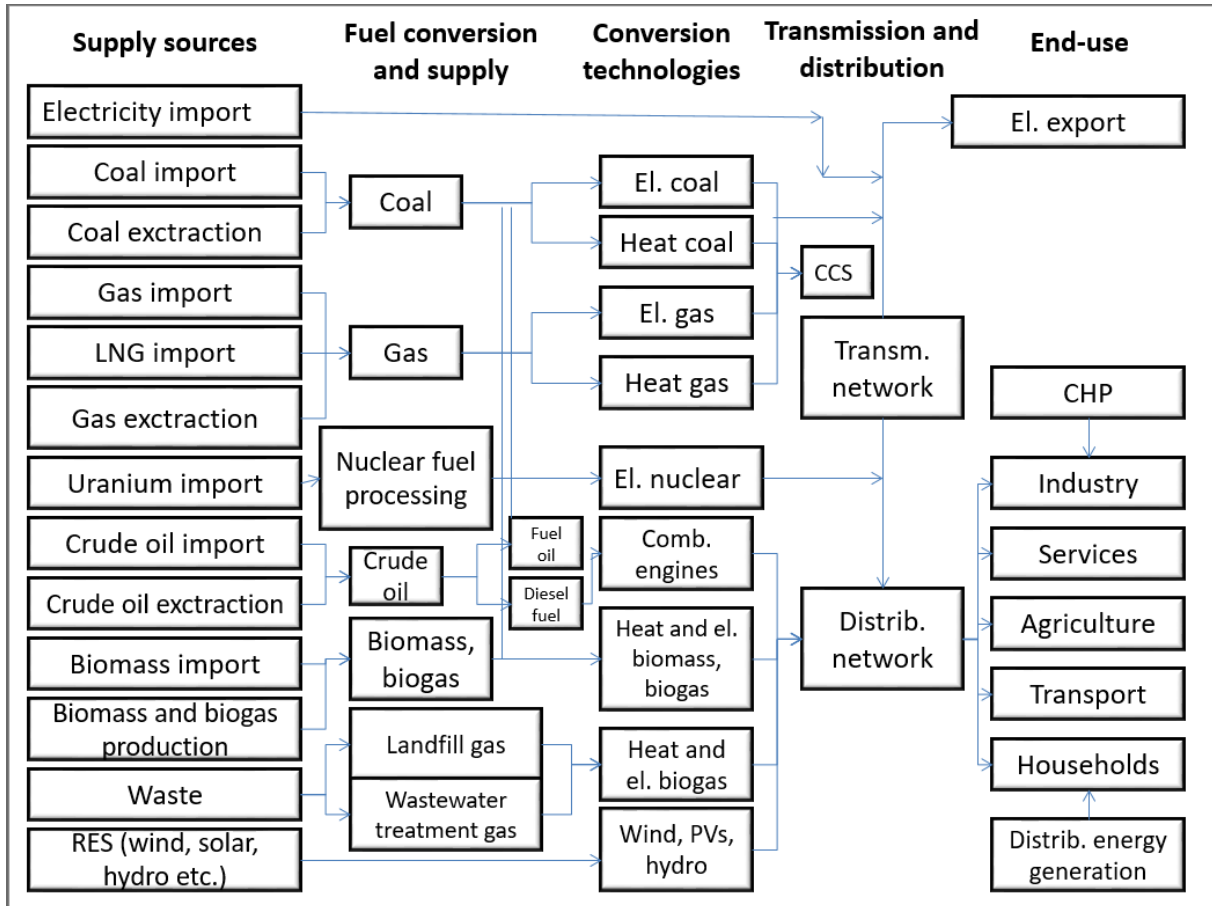


Fig. 5.8. Simplified block diagram of the energy system in the MESSAGE model.

Both existing technologies and new generation units are part of the network. At present, the model contains more than 80 existing generation units and new types of technologies (among others, high-efficiency coal and gas technologies without and with CO<sub>2</sub> capture, technologies using renewable sources, nuclear power plants, CHP technologies). The model takes into account the long-term objectives of the emissions of air pollutants and CO<sub>2</sub> emissions (including constraints on emission allowances under the EU ETS regulations) and the national policy instruments promoting RES and combined heat and power generation.

An important advantage of the MESSAGE model is the possibility of differentiating the level of demand for a given energy carrier depending on the season of the year, the type of day and the time of day. This information provides the basis for determining the technology mix and the operating mode of installed units (the operation under base, near peak and peak load). The equivalent load curve used in the MESSAGE model for KSE (the Polish Power System) (Fig. 5.9) is plotted on the basis of the data from the transmission system operator on the load levels in the historical periods and projected changes in this curve.

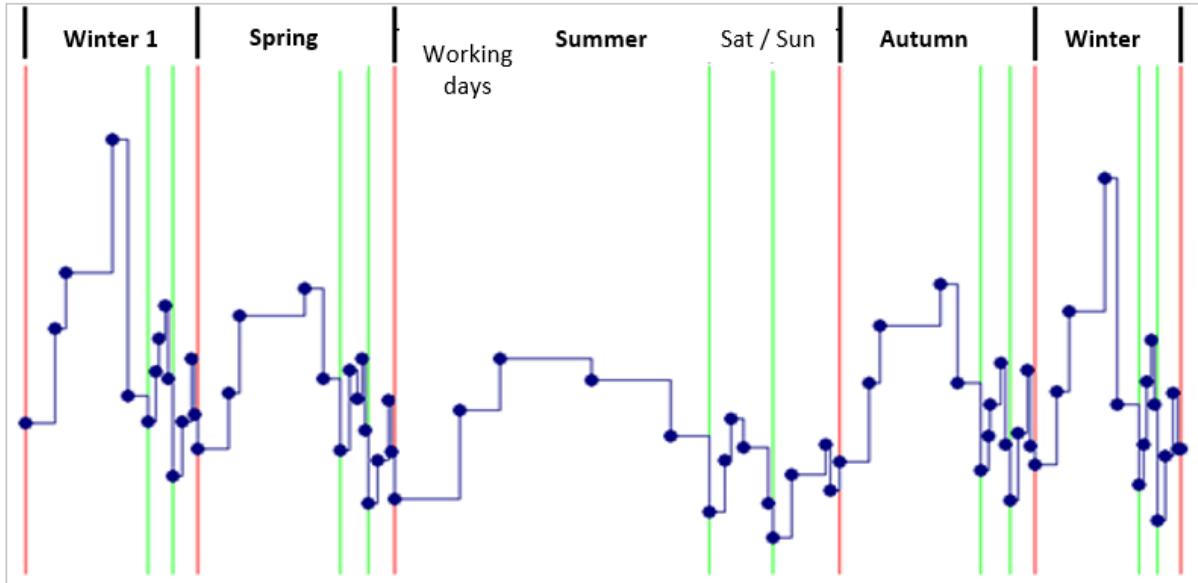


Fig. 5.9. Equivalent load curve applied in the MESSAGE model.

The MESSAGE model generator has been created and is now developed at the International Institute for Applied Systems Analysis in (IIASA) in Laxenburg (Austria). Under a special agreement between the IIASA and the International Atomic Energy Agency (IAEA), it can be used by the IAEA and its member states. At ARE S.A. it has been adapted to the Polish conditions.

On the basis of the optimum structure of the generation sector (and the demand-driven production by individual generation units) identified using the MESSAGE model, the averaged unit electricity generation costs in Poland were determined in the timeframe considered.

## 6. PROVISION OF FINANCIAL, TECHNOLOGICAL AND CAPACITY BUILDING ASSISTANCE TO DEVELOPING AND EASTERN PARTNERSHIP COUNTRIES

### 6.1 Legal basis

Article 4.3 of the Convention provides that the developed country Parties and other developed Parties included in Annex II are obliged to provide financial resources to meet the agreed full costs incurred by developing country Parties in complying with their obligations under Article 12, paragraph 1. In the implementation of these commitments, account must be taken of the need for adequacy and predictability in the flow of funds and the importance of appropriate burden sharing among the developed country Parties.

Moreover, Article 4.4 obliges developed country Parties and other developed Parties included in Annex II to assist the developing country Parties that are particularly vulnerable to the adverse effects of climate change in meeting costs of adaptation to those adverse effects.

Pursuant to Article 4.5 developed country Parties and other developed Parties included in Annex II are obliged to take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies and know-how to other Parties, particularly developing country Parties, to enable them to implement the provisions of the Convention. In this process, the developed country Parties are obliged to support the development and enhancement of endogenous capacities and technologies of developing country Parties. Other Parties and organizations in a position to do so may also assist in facilitating the transfer of such technologies.

The Republic of Poland is not one of the Parties listed in Annex II to the Climate Convention; therefore, it is not obliged to fulfil the commitments under Articles 4.3, 4.4 and 4.5 of the Convention. Still, Poland implements a large number assistance programmes and actions.

### 6.2 Financial assistance

Poland grants financial assistance to developing countries through bilateral and multilateral channels as part of its Official Development Assistance (ODA). This assistance is granted pursuant to the Act of 16 September 2011 on Development Assistance<sup>27</sup> and on the basis of the framework laid down in the Government document entitled “The Multiannual Development Cooperation Programme for 2016-2020”. It includes development and humanitarian assistance with its thematic scope and geographical coverage defined each time for a given programming period<sup>28</sup>.

Multilateral assistance was granted mainly through contributions to the assistance budget of the European Union. Poland’s total contribution (not only for climate objectives) to the EU

<sup>27</sup> Official Journal of the Laws of 2017, Item 2098, and of 2018, Items 650 and 1699.

<sup>28</sup> The current programme for 2016-2020 is a continuation of the Multiannual Development Cooperation Programme for 2012-2015.

financing of development assistance was almost EUR 277 million in 2017 and more than EUR 303 million in 2018. These amounts are part of the annual contribution (of about 3%) paid annually to the general EU budget in the part of the EU budget allocated to official development assistance.

In addition to the EU, United Nations Funds and Programmes and the World Bank Group are important intermediaries in the transfer of Poland's multilateral assistance.

One of the objectives of this assistance is environmental protection, including the mitigation of climate change and its effects. Poland provides financial support to organisations taking action to protect the climate, such as the UNFCCC, UNEP, UNECE-LRTAP, IUCN, UNCCD, IAEA-TCF, EPPO, WMO, World Bank and AIIB.

The amounts expended by Poland on climate-related official development assistance are presented in Fig. 6.1 and Table 6.1.

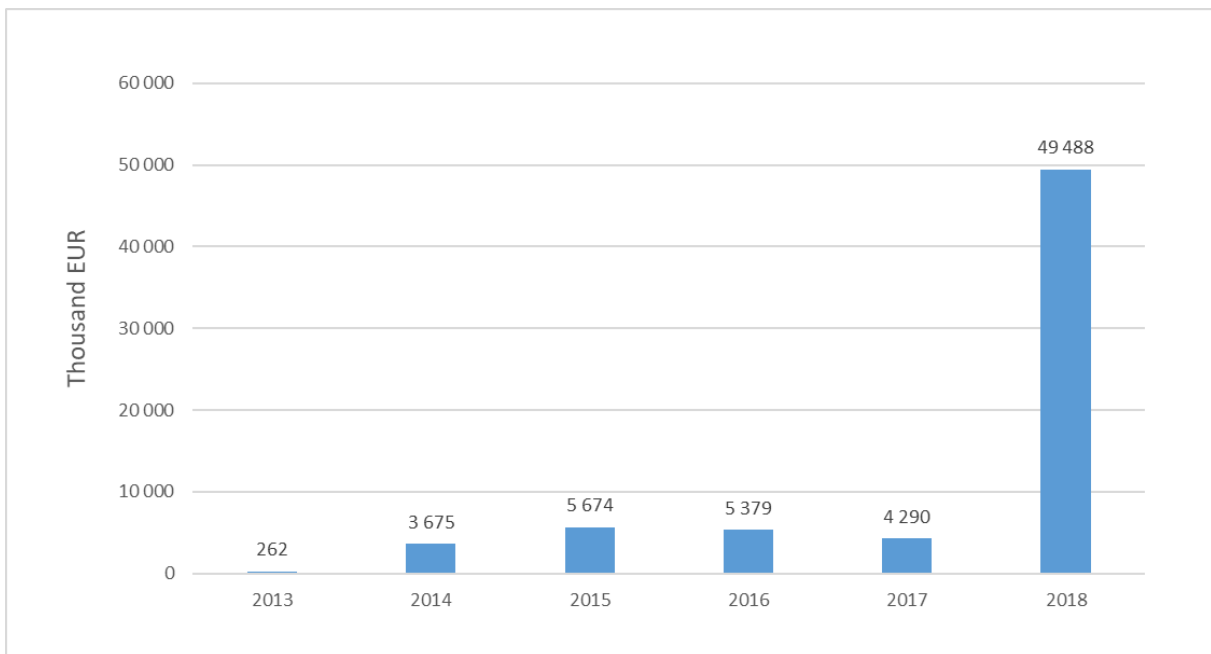


Fig. 6.1. Amounts expended by Poland on climate-related official development assistance

Source: Poland's reports submitted to the EU under Article 16 of MMR and EIONET

The climate-related bilateral assistance is granted primarily to the Eastern Partnership and African countries. The main beneficiaries of this assistance in 2017 included Ukraine, Ethiopia, Tanzania, Moldova, Palestine, Kenya, Georgia, Togo, Kyrgyzstan and Pakistan. In 2018, the largest amounts of assistance were granted to Ukraine, Belarus, Georgia, Iraq, Jordan, Kenya, Myanmar, Palestine, Senegal and Tanzania.

Table 6.1. Poland's climate-related assistance in 2013-2018

Year	Climate-related assistance		including	PLN	EUR
	PLN	EUR			
2013	1 099 023	261 990	Multilateral	15 719	3 747
			Bilateral	1 083 304	258 243
2014	15 380 394	3 675 036	Multilateral	9 139 128	2 183 730
			Bilateral	6 241 266	1 491 306
2015	23 739 163	5 673 932	Multilateral	12 653 896	3 024 426
			Bilateral	11 085 267	2 649 506
2016	23 465 950	5 379 014	Multilateral	14 217 145	3 258 944
			Bilateral	9 248 805	2 120 070
2017	18 219 685	4 289 762	Multilateral	10 352 982	2 441 481
			Bilateral	7 866 703	1 848 280
2018	210 926 077	49 487 607	Multilateral	12 848 910	3 014 619
			Bilateral	198 077 166	46 472 987

Source: Poland's reports submitted to the EU under Article 16 of MMR and EIONET

In 2017, the climate-related assistance granted by Poland amounted to EUR 4.3 million (grants), while in 2018 it was EUR 49.5 million (including EUR 6.9 million in the form of grants and EUR 42.6 million in the form of preferential loans).

### 6.3 Development and transfer of technology

Since 2013 has provided funds for transfer of technology as part of the GreenEvo – Green Technologies Accelerator Programme. Its aim is to create favourable conditions for the dissemination of environmental protection technologies proposed by Polish entrepreneurs in Poland and abroad. GreenEvo supports the identification of the technological needs of developing countries and assesses the ability of these suppliers to meet these needs. In 2013–2016, 54 technological projects were implemented to promote the rational use of energy and renewable energy sources in developing countries. 40% of the projects were addressed to developing countries.

In 2017 and 2018, the GreenEvo Programme was suspended. In 2019, the Programme was resumed. Its effects related to transfer of technology will be presented in the next Biennial Report (BR5).

Just as in the case of financial assistance, Poland participates in the financing of EU projects and programmes intended to support the development and transfer of technology with payments into its assistance budget. Examples of Project include: support for the *Climate Technology Centre & Network (CTCN)* as well as *Switch Asia* and *Switch Africa Green*. For more information on the programmes implemented by the European Union to support the development and transfer of technology, see Chapter 6 of the EU BR4 Report.

#### 6.4 Support for capacity building

Poland grants financial assistance for capacity building projects in developing countries via its contribution to the European Development Fund (EDF) and its contribution to the EU assistance budget, referred to in Section 6.2.

In 2017, the Polish contribution to the EDF was more than EUR 72 million and in 2018 it was EUR 92 million.

The EU grants financial assistance, among others, for following capacity building projects:

- *Technical Cooperation and Capacity Building Facility (2018-2022)*
- *Strengthening financial resilience and accelerating risk reduction in Central Asia (2014-2020)*

For more information on the EU capacity building actions, Chapter 6 of the EU BR4 Report.



## 7. OTHER REPORTING

### 7.1 The national institutional system established to monitor and evaluate progress in achieving the emission reduction target

Progress in achieving the 2020 emission reduction target is monitored in Poland pursuant to the provisions of the *Act of 17 July 2009 on the System to Manage the Emissions of Greenhouse Gases and Other Substances* (EMS Act). This Act established a system to inventory, monitor, report and project GHG emissions.

The EMS Act established a legal basis for managing the ceilings of the emissions of greenhouse gases and other substances in a manner ensuring the ability of the Republic of Poland to fulfil its international and EU commitments and to optimise the emission reduction costs. The scope of tasks set out in the Act includes, among others:

- carrying out the activities relating to the operation of the National System for Emissions Management and Projections, including the keeping of the National Database on Emissions of Greenhouse Gases and Other Substances;
- developing the methodology for determining the emission levels for particular types of installations or activities and the methodology for determining the emission factors;
- drawing up reports and projections of the emission levels;
- keeping the National Registry of the Kyoto Units;
- keeping the list of the Joint Implementation projects carried out in the territory of the Republic of Poland for which the Letters of Endorsement or the Letters of Approval have been issued;
- carrying out the tasks of the National Administrator of the Greenhouse Gas Emission Allowance Trading Scheme (EU ETS);
- managing the national GHG emission allocation in the non-ETS area.

The national inventory system described in Section 2.2 is also an element of the monitoring system.

#### *Monitoring emissions with respect to the allocation (reduction target)*

In addition to the preparation of emission inventories and projections, KOBiZE draws up draft reports, including the National Communications (NCs) and Biennial Reports (BRs) and analyses emission levels and trends with respect to the allocations imposed.

Since the EU Member States, including Poland, have their individual reduction targets only in the non-ETS area, progress in achieving the emission reduction target is monitored and evaluated exactly for the target laid down for the non-ETS sectors. This target is expressed in AEA units defined in the ESD Decision.

The characteristics of the target are described in Sections 3.1.2 and 4.1.2.

The architecture of the EU reduction targets and the mechanisms for their attainment by the EU and its Member States was described in detail in the 3<sup>rd</sup> Biennial Report of the EU (BR3)<sup>29</sup>, which is available on the UNFCCC website (Section 3.2, p. 229).

The non-ETS area includes all the emissions which are not covered by the EU emissions trading scheme (EU ETS). Thus, the non-ETS area includes the emissions of all the GHGs from the following sectors:

- transport (excluding aviation, which is partly covered by the EU ETS scheme),
- agriculture,
- waste,
- municipal and housing sector (fuel combustion for heating purposes),
- industry (in the case of sources which do not qualify for inclusion in the EU ETS scheme).

Moreover, the non-ETS area includes the emissions of GHGs other than CO<sub>2</sub> in industry and energy generation (with some minor exceptions of certain sources of N<sub>2</sub>O and F-gases).

In Poland, non-ETS covers approximately half the GHG emissions (in 2017, its share was 51% of the total emissions).

Under the provisions of the EMS Act, the system for managing the national GHG emission allocation was established in Poland. Its main element is the strategy for managing the national GHG emission allocation which is prepared by the Minister responsible for the environment and approved by the Council of Ministers. Among others, this Strategy includes the assumptions and guidelines for accounting for and projecting GHG emissions in the non-ETS sectors. On its basis, the Minister of the Environment decides how to account for annual emissions, including borrowing, purchasing AEA units or using CER/ERU units for accounting purposes.

In the process of accounting for non-ETS emissions, the EU Member States use a four-month flexibility period<sup>30</sup> when they can apply flexibility mechanisms to balance the national emissions.

If it follows from the annual report that the result of the accounting for emissions is a negative one (and the surplus from the previous years is insufficient), the Minister of the Environment may decide to:

- borrow part of the national allocation awarded for the subsequent year in an amount not exceeding 5% of the national allocation envisaged for the year covered by the report, or
- purchase AEA units from another Member State.

If it follows from the annual report that the result of the accounting for emissions is a positive one:

- the AEA surplus is banked to the subsequent year, or

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<sup>29</sup> [https://unfccc.int/sites/default/files/resource/459381\\_European%20Union-NC7-BR3-1-NC7%20BR3%20combined%20version.pdf](https://unfccc.int/sites/default/files/resource/459381_European%20Union-NC7-BR3-1-NC7%20BR3%20combined%20version.pdf)

<sup>30</sup> The four-month flexibility period begins after the EC issues its Implementing Decision defining the emission level of the Member State for a given year.

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- the Minister of the Environment may decide to sell the surplus or a part of it to another EU Member State.

Moreover, CER/ERU units can be used to account for non-ETS emissions.

The categories of units allowed to be used to account for non-ETS emissions include:

- CER/ERU units issued for emission reductions by the end of 2012,
- CER/ERU units issued for emission reductions achieved since 2013, as part of projects registered before 2013,
- CER units issued for emission reductions achieved in so-called Least Developed Countries (LDCs), until their ratification of an agreement with the European Union or until 2020, whichever is sooner,
- temporary CER units (tCERs) or long-term CER units (ICERs) from afforestation and reforestation projects, on the condition that the State undertakes to further replace these units before their expiry date.

All the above-mentioned categories of CER/ERU units should come from projects eligible for use in EU ETS in the period from 2008 to 2012.

The annual number of CER/ERU units used for accounting may not exceed 3% of the greenhouse gas emissions which were not covered by the EU ETS scheme in 2005. The part of the allocation which is not used in a given year can be banked to the subsequent years of the trading period. In addition, each Member State may transfer its unused part of the allocation (not more than 3%) to another Member State.

## **7.2 National system for preventing the risk of failing to achieve the emission reduction target**

The system in place in Poland in which the Council of Ministers adopts policies, strategies and other planning and development documents ensures that implemented sectoral policies are consistent with one another and that they achieve the objectives which Poland has adopted under national, EU and international agreements. Each Government policy undergoes the process of interministerial consultations. The consultations make it possible to take into account – when the draft policy is prepared – the comments and suggestions of the Ministers responsible for the different areas of the Government administration. Such a system eliminates the risk that a given sectoral policy may fail to consider the need to fulfil the commitments for which another Minister in the Polish Government is responsible.

In addition, with respect to the emission reduction target of the in non-ETS, the Polish law provides for a corrective mechanism, which is set in operation when the adopted policies are insufficient to achieve this target.

The EMS Act provides for a mechanism for developing and implementing additional reduction measures in case the allocation for a given year is not complied with despite the application of the flexible mechanisms described above. In such a case, the Minister responsible for the environment orders the KOBIZE to prepare a plan of corrective measures. The EMS Act provides

that the Minister of the environment issues a Regulation on this matter within 7 days of the end of the four-month flexibility period.

This plan sets out:

- 1) the measures to be implemented in order to comply with the national allocation;
- 2) the timetable for the implementation of these measures.

KOBiZE prepares a draft plan of corrective measures within 3 months of the date of the order mentioned above and submits it to the Minister responsible for the environment. The plan is subject to approval by the Council of Ministers. Poland submits the plan of corrective measures approved by the Council of Ministers to the European Commission.

The aim of the mechanism described above, which has been established pursuant to EU and national regulations, is to ensure that Poland achieves the emission reduction target in non-ETS.

