LITHUANIA'S FIRST BIENNIAL TRANSPARENCY REPORT

under the Paris Agreement

December 2024

Ministry of Environment Republic of Lithuania

Published by the Ministry of Environment of the Republic of Lithuania
Climate Policy Group
A. Jakšto 4, Vilnius LT-01105 Lithuania
E-mail: klimato_kaita@am.lt
Website: https://am.lrv.lt

AUTHORS:

Ministry of Environment: Vakaris Atkočiūnas, Tomas Aukštinaitis, Lina Čeičytė, Skaistė Garlaitė, Irma Kragnytė, Marilė Kosaitė, dr. Judita Liukaitytė-Kukienė, Jolanta Merkelienė, dr. Kamilė Petrauskienė, Emilija Šaulytė, Stasilė Znutienė, Paulius Zvicevičius

Environmental Protection Agency: Vytautas Birgiolas, Eglė Kairienė, Karolina Petniūnienė, Karolis Šulinskas, Inga Žiukelytė

Lithuanian Hydrometeorological Service: Donatas Valiukas

State Forest Service: Marius Balčius

Coordination: Jolanta Merkelienė (Ministry of Environment)

Photo credits: realisbeautifulstock.lt

CONTENT

Executive summary

Introduction

Under the Enhanced Transparency Framework, Parties to the Paris Agreement are required to submit biennial transparency reports every two years. Lithuania's 1st Biennial Transparency Report (BTR) includes information on all required elements according to the modalities, procedures and guidelines (MPGs) for the Enhanced Transparency Framework (annex to decision 18/CMA.1): information on national inventory document (NID), progress towards NDCs, policies and measures, climate change impacts and adaptation, levels of financial, technology development and transfer and capacity-building support and areas of improvement. The Common Tabular Format (CTF) tables as required by decision 5/CMA.3, which are submitted by Lithuania using the UN Reporting Tool, should be considered to be an integral part of this BTR.

National inventory document

Lithuania has decided to submit the National Inventory Document (NID) on its GHG Inventory 1990–2022 in line with 18/CMA.1 Annex para. 12 as a stand-alone report, which is available on UNFCCC website.

In 2022, Lithuania's total greenhouse gas (GHG) emissions amounted to 18,903.7 kt CO_2 eq. excluding LULUCF. Compared to 1990 GHG emissions decreased by 60.6% excl. LULUCF sector and by 70.7% incl. LULUCF sector. Emission levels in the energy sector (33.1 Mt CO_2 eq.) decreased by approximately 65% in the 1990-2022 period (to 11.7 Mt CO_2 eq. in 2022). The total GHG emissions in 2022 from the IPPU (4.3 Mt CO_2 eq.), agriculture (8.9 Mt CO_2 eq.) and waste (1.7 Mt CO_2 eq.) sectors decreased by approximately 47%, 55% and 50% respectively, compared to 1990. The LULUCF sector removals (-6.4 Mt CO_2 eq. in 2022) increased by 19% during the same period.

The most significant source of GHG emissions in Lithuania is energy sector with 62.1% share of the total emissions in 2022. Agriculture is the second most significant source and accounted for 21.5% of the total emissions. Emissions from industrial processes contributed 12.1% of the total GHG emissions, waste sector – 4.3%. LULUCF sector in Lithuania is the only sector with negative emissions – in 2022 LULUCF sector activities removed net -6,355.9 kt CO_2 eq., equal to 33.6% of the Lithuania's annual GHG emissions.

Information necessary to track progress

Under the Paris Agreement, the European Union and its Member States have committed to an ambitious target of reducing net GHG emissions by at least 55% by 2030 compared to 1990. The European Climate Law sets the goal of climate neutrality by 2050 and the intermediate target of reducing net greenhouse gas emissions by at least 55% by 2030 compared to 1990 levels. These targets cover emissions and removals that are regulated in Union law.

The EU NDC is described in the EU submission of 17 October 2023 to the UNFCCC. The EU NDC is an economy-wide net reduction target which includes net removals from the LULUCF sector and emissions from international aviation and maritime transport activities regulated as set out for 2030 in Annex I to the EU ETS Directive. Therefore, the EU NDC includes emissions from international aviation and international maritime transport. This target is to be achieved domestically (i.e. within the EU), without the use of international credits.

For the tracking of progress towards implementing and achieving the NDC of the EU, an indicator is used which has the same unit and metric as the NDC base year and target values. The chosen indicator is "annual total net GHG emissions consistent with the scope of the NDC in CO_2 eq.".

Based on the GHG inventory data and data on international aviation and navigation for 2022, the EU and its Member States reduced net GHG emissions by 31.8% compared to 1990. The EU and its Member States made progress towards implementing and achieving their NDC. The legal and institutional framework is in place to make further progress in the years ahead and to achieve the NDC target by 2030.

Mitigation policies and measures

Lithuania's climate mitigation policies reflect a robust commitment to addressing GHG emissions and fostering a transition to a sustainable, low-carbon economy. In order to ensure the implementation in the international agreements and the EU legal acts defined targets for Lithuania, in 2021 the Parliament of the Republic of Lithuania approved the **National Climate Change Management Agenda** which lays down the targets and objectives for climate change mitigation and adaptation by 2050. To support the implementation of climate change mitigation targets **Lithuania's National Energy and Climate Action Plan** (NECP) for the period 2021–2030 was adopted in 2019 and updated in October 2024. The NECP sets a number of policies targeting economy-wide emissions reductions. Central to these efforts is the energy sector, where significant investments in renewable energy sources and energy efficiency are transforming the country's energy system. By 2030, Lithuania aims to achieve at least 55% of its energy consumption from renewables and has set ambitious goals for achieving net-zero emissions by 2050. Measures include decoupling from fossil fuels, promoting distributed energy production, and enhancing energy efficiency in residential, industrial, and public sectors. In the energy sector, significant investments in renewables and energy efficiency aim to transition towards a low-carbon economy. Transport policies prioritize electrification, development of sustainable mobility infrastructure, and incentives for adopting electric vehicles, alongside enhanced public transportation and cycling networks. Agricultural measures focus on reducing methane and nitrous oxide emissions through sustainable farming practices, biogas production, and precision soil management. Land-use policies, including afforestation, peatland restoration, and biodiversity-friendly forestry, play a vital role in enhancing carbon sequestration and ecosystem health. Waste management strategies promote recycling, composting, and a circular economy to reduce emissions from the sector. The NECP integrates these measures across all sectors, providing a cohesive framework for achieving Lithuania's interim target of a 30% GHG emissions reduction by 2030 compared to 2005 levels. Lithuania's mitigation policies are implemented within the framework of the European Union's climate commitments, including the Emissions Trading System and Effort Sharing Regulation. These policies not only contribute to achieving climate neutrality by 2050, but also ensure a socially and economically just transition, fostering resilience and sustainable development.

Projections of GHG emissions

Projections of GHG emissions have been calculated by carrying out systematic modelling of economic sectors of Lithuania. The model is based on an integrated approach and relies on statistical data, reflecting the existing situation of base year 2021 and assumptions which affect the long-term development of the economic sectors, with the account of the EU climate change and energy objectives by 2030 and targets by 2040. The same GHG projections were used for the Lithuanian National Energy and Climate Action Plan (NECP) submitted to European Commission in 2024. In this Biennial Transparency Report projections by 2050 are reported. In this report results for ‚with existing measures' (WEM) and ‚with additional measures'

(WAM) scenarios are provided. Projections as well as policies and measures are divided into the following reporting categories: energy, transport, industrial processes, agriculture, LULUCF and waste. The effect of adopted and implemented measures is estimated to reach about 6,767 kt CO_2 eq. in 2030. The highest reduction of GHG emissions is planned in energy, transport and LULUCF sector. The effect of the planned measures in 2030 might reach 1,384 kt CO_2 eq.

The WEM projection scenario estimates that the total GHG emissions (excl. LULUCF) will be 15.9 and 14.2 Mt CO_2 eq. in 2030 and 2040, respectively, which equal to reductions of 67 and 71 per cent compared to 1990. Under the WAM scenario, the total GHG emissions (excl. LULUCF) will be 14.5 and 12.7 Mt CO_2 eq. in 2030 and 2040, respectively, which equal to reductions of 70 and 74 per cent compared to 1990.

Climate change impacts and adaptation

Lithuania's climate is undergoing notable changes, including rising temperatures, shifting precipitation patterns, and increasing frequency of hazardous hydrometeorological events. Projections indicate continued warming, prolonged vegetation periods, and reduced snow cover. These changes pose risks to key sectors, including emergency management, infrastructure, forestry, ecosystems, biodiversity, landscape, transport, urban areas, water resources, public health and agriculture. Municipalities and national institutions address these vulnerabilities through coordinated adaptation policies and robust legal frameworks.

Key adaptation measures include the integration of climate resilience into national and local plans, enhancement of infrastructure resilience, and implementation of ecosystem restoration projects. Implementation actions such as the National Adaptation Plan 2024–2030 and municipal climate change adaptation plans focus on reducing vulnerabilities while fostering sustainable development. Early warning systems, public education, and cross-sector collaboration strengthen national adaptive capacity.

Lithuania actively participates in international cooperation, sharing best practices and leveraging innovative research. Efforts emphasize data-driven decision-making, fostering resilience in critical sectors, and ensuring preparedness for emerging climate challenges. With these adaptive measures, Lithuania aims to protect ecosystems, ensure socio-economic stability, and support its transition to a climate-resilient society.

Support provided and mobilized

Lithuania provides flexible funding to multilateral organizations, including through softly earmarked voluntary contributions to trust funds (e.g., for Ukraine) and bilateral frameworks to support the implementation of the Paris Agreement by developing countries. The lion's share of Lithuania's Official Development Assistance goes to meeting its mandatory commitments to the European Union, World Bank Group and United Nations agencies. As part of the EU, Lithuania's climate finance contributions are often pooled through collective EU mechanisms and funds. At the bilateral level, mostly from the Climate Change Programme Lithuania supports climate-related activities (solar power plants projects) in developing countries, in 2014–2024 period 9.01 mill. EUR by grants were provided to climate mitigation projects in developing countries from Climate Change Programme. Total these project value, including private funds is about 15.08 million EUR.

Detailed information on financial, technology development and transfer and capacity-building support provided and mobilized is provided in Chapter 4 of BTR and relevant CTF tables on support provided.

As an EU country, Lithuania will continue to support actions to address climate change in developing countries by steadily implementing its financial commitment.

Introduction

Under the Enhanced Transparency Framework, Parties to the Paris Agreement are required to submit biennial transparency reports every two years. The Ministry of Environment of the Republic of Lithuania is delighted to present Lithuania's 1st Biennial Transparency Report (BTR), which includes information on all required elements according to the modalities, procedures and guidelines (MPGs) for the Enhanced Transparency Framework (annex to decision 18/CMA.1): information on national inventory document (NID), progress towards NDCs, policies and measures, climate change impacts and adaptation, levels of financial, technology development and transfer and capacity-building support and areas of improvement.

Climate change is one of the major threats and challenges of our time. The climate change issues are particularly worrying: Lithuania is already facing increased intensity and frequency of extreme weather events (heat waves, storms, and floods), leading to reduced crop yields, loss of biodiversity, impact on economy and human health. We understand that without urgent ambitious mitigation actions globally, in the future – it will be more difficult and costly. That's the reason why Lithuania is investing in efforts to understand climate change impacts and has already taken significant steps to identify and address climate change mitigation and adaptation. The actions taken are presented in this Biennial Transparency Report.

Lithuania undertook the target to reduce its greenhouse gas (hereinafter – GHG) emissions by 8% below the 1990 level during Kyoto Protocol's first commitment period 2008–2012. This target has been overachieved reducing more than 55% of its GHG emissions over the first commitment period. In 2012 Lithuania together with other EU Member States and Iceland undertook a 20% GHG emissions reduction below 1990 level commitment for the second Kyoto Protocol period from 2013 to 2020. The EU has substantially overachieved its 2020 reduction target in the second Kyoto Protocol period, which means that also its Member States and the United Kingdom have fulfilled their emission reduction obligations. In 2020 Lithuania has reduced GHG emissions by 58% compared to the 1990 level.

Lithuania signed and ratified the Paris Agreement in 2016. Under the Paris Agreement Lithuania jointly with the EU and its Member States took a binding target of at least a 40% domestic reduction in economy wide GHG emissions by 2030 compared to 1990, by implementing the EU legal acts for the EU climate and energy policy targets till 2030, mainly through the EU emission trading system (EU ETS) and Efforts Sharing Regulation, as well as Clean Energy Package legislation amounting to 43% and 30% respectively by 2030 compared to 2005. Based on the European Green Deal strategy and the Commission's Communication of September 2020 on Stepping up Europe's 2030 climate ambition ('2030 Climate Target Plan') the EU has increased the European Union's binding target for 2030 towards at least 55% net emission reduction (compared with 1990 levels). The European Climate Law, adopted in 2021 sets the legally binding EU's climate neutrality target at the latest by 2050, and a binding Union domestic reduction target of at least 55% net emission reduction by 2030 compared to 1990. In order to follow the pathway proposed in the European Climate Law, and deliver this increased level of ambition for 2030, the European Commission has proposed a number of legislative proposals under the "Fit for 55" package laying down obligation to achieve the EU targets of reducing GHG emissions by 62% in the sectors covered by EU ETS and at least 40% in non-ETS sectors by 2030 compared to 2005.

To ensure the implementation in the international agreements and the EU legal acts defined targets for Lithuania, in 2021 the Parliament of the Republic of Lithuania approved the National Climate Change Management Agenda (NCCMA). NCCMA sets a long-term objective of reaching net-zero emissions by 2050, in line with the EU's own targets. It sets interim targets of -85% by 2040 and -70% by 2030 (compared to 1990's levels) and -30% by 2030 (compared to 2005 levels). NCCMA defines sector specific targets for

2030, with the ETS sectors to reduce emissions by 50% and the non-ETS sectors by 25% (compared to 2005 levels), including removals by sinks from the LULUCF sector. It further differentiates sector specific indicative targets for the non-ETS sectors and provides details of short-, medium-, and long-term targets within each sector, for example setting renewable energy and energy efficiency targets for 2030, 2040 and 2050 in each sector.

Lithuania's National Energy and Climate Action Plan (NECP), adopted in 2019 and updated in 2024 under EU's Climate and Energy Framework, constitutes the primary document detailing Lithuania's intended climate policies for the period from 2021–2030. It integrates a number of previous policy documents and was developed in parallel to the National Progress Plan, which sets overarching economic, social, environmental and security priorities, also for the period from 2021–2030. The NECP defines measures for the reduction of GHG emissions and adaptation to climate change in all the sectors of Lithuanian economy, including energy, transport, industry, agriculture, land-use, land-use change and forestry (LULUCF) and waste.

The implementation of the NECP is coordinated by the Ministry of Environment and the Ministry of Energy. Other ministries and relevant institutions participate in the implementation of the measures within their competence and allocating funds for their implementation of the measures. While drawing up sectorial development programmes, action plans or other planning documents for their respective management areas, the ministries shall mainstream the targets and objectives for climate change mitigation and adaptation set out in the NCCMA, to provide for specific measures to implement those targets and objectives and to ensure close interinstitutional cooperation.

The 1st Biennial Transparency Report (BTR) was prepared in accordance with "Modalities, procedures and guidelines for the transparency framework for action and support referred to in Article 13 of the Paris Agreement" (Decision 18/CMA.1). The BTR focuses primarily on activities during the period up to 2022 and updated policies by 2030, including data for National GHG Inventory Document 2024 and, if available, information up to 2023 is provided.

1. National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases

Lithuania has decided to submit the National Inventory Document (NID) on its GHG Inventory 1990–2022 in line with 18/CMA.1 Annex para. 12 as a stand-alone report. Chapter 2.5 of BTR contains a summary of the emissions and sinks, providing an overview of the greenhouse gas emissions.

2. Information necessary to track progress

2.1. National circumstances and institutional arrangements

2.1.1. National circumstances

2.1.1.1. Government structure

The governance of the Republic of Lithuania is performed by the Seimas (Parliament), the President of the Republic and the Government as well as the Judiciary according to the Constitution of the Republic of Lithuania (enacted by citizens of the Republic of Lithuania since 25 October 1992).

The Constitution of the Republic of Lithuania lays down that the Seimas of the Republic of Lithuania consist of 141 representatives of the Nation, who are elected for a four-year term. The Seimas debates, adopts and passes laws, gives or does not give its assent to the candidate proposed by the President of the Republic for the post of the Prime Minister (head of the Government), supervises the activities of the Government, approves the State Budget and supervises its execution, establishes state taxes, calls elections to municipal councils, and ratifies international treaties of the Republic of Lithuania. The Seimas forms committees for consideration of draft laws and standing and other ad hoc commissions for resolving issues of narrower scope.

The Government consists of the Prime Minister and ministers. The Government represents the executive power in Lithuania. It resolves public issues by taking the majority-vote decisions in its sittings. The Government has the right to a legislative initiative at the Parliament (Seimas). The Government adopts resolutions on Seimas draft laws and other proposals submitted to the Seimas. The Government, among the other responsibilities, executes laws and resolutions of the Seimas concerning the implementation of laws as well as decrees of the President; coordinates ministries and other governmental agencies; drafts a public budget and submits it to the Seimas; executes the public budget.

There were 14 ministries in the Republic of Lithuania in 2024. The ministries are set up to formulate public policy, as well as to organize, coordinate and monitor its implementation in areas assigned for the minister's competence.

The Ministry of Environment is the main institution forming the country's state policy of environmental protection, forestry, utilization of natural resources, geology and hydrometeorology, territorial planning, construction, provision of residents with housing, utilities and housing, as well as coordinating its implementation, has made a significant contribution to climate change regulation. Having assessed the data of environmental observations, taken into consideration the conclusions of scientific institutions and

public opinion and following the existing strategic documents and preparing the legal bases, the goals of the Ministry of Environment and its subordinate institutions are as follows:

- To implement the principle of sustainable development;
- To promote and preserve biodiversity and distinctive landscape;
- To set preconditions for rational utilization, protection and restoration of natural resources;
- Implement climate change policies to change consumption patterns, increase energy efficiency and promote the use of renewable energy sources and technologies;
- To ensure provision of information about the state of environment and its forecasts to the public;
- To create conditions for the development of construction business and the provision of residents with housing;
- To implement the state regulation of territorial planning, construction and housing development processes, use of buildings and their maintenance in accordance with the principles of sustainable development;
- To ensure a proper environmental quality, taking into account the norms and standards of the European Union.

After the Seimas ratified the UNFCCC (1995) and the Kyoto Protocol (2002), most of the obligations of international agreements implementation and the related policy-making responsibilities laid down on the Ministry of Environment and a number of other ministries and institutions supervised by relevant ministries are involved in the implementation of this policy. The Ministry of the Environment is the national focal point of the UNFCCC. More information about the institutional framework of Lithuania's climate policy is presented in Section 2.4.

2.1.1.2. Population profile

Generally, changes in the population are one of the factors that influence energy consumption and the dynamics of GHG emissions accordingly.

During the period from 2005 to 2022, the population of Lithuania showed a declining trend, but it has started to grow since 2023. From 2005 to 2024 the resident population declined by 469.3 thousand, or 14.0%. At the beginning of 2024, the estimated resident population of Lithuania amounted to 2,885.9 thousand, i.e. 79.9 thousand (2.8%) more than at the beginning of 2022. The increase of the resident population in recent years is mainly caused by immigration.

In 2005–2022, due to negative net international migration, the population declined by 345.5 thousand (61.2% of the total decline), due to the natural decrease – of 218.8 thousand (38.8% of the total decline). The highest negative net international migration was recorded in 2010. During the last few years, the increase in the number of emigrants was influenced by geopolitical tension in Europe. Increased immigration from Ukraine and Belarus caused positive impact in Lithuania's population growth.

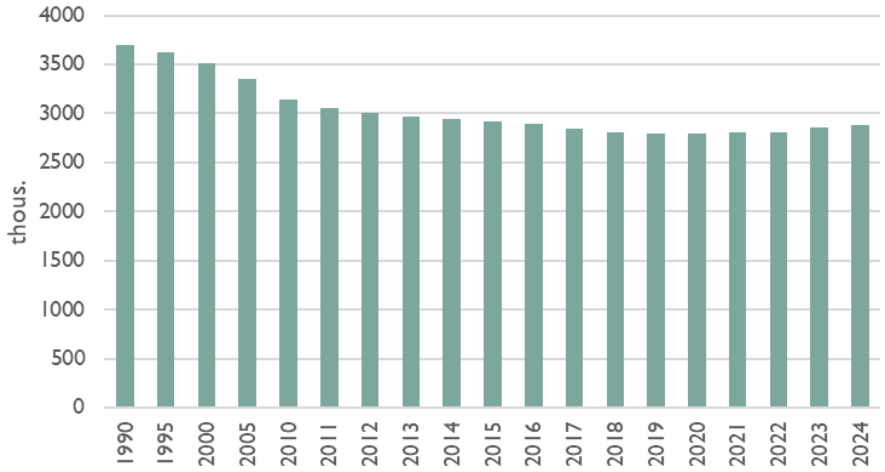


Figure 2-1. Number of population in Lithuania in 1990–2024, thous.

At the beginning of 2024, 1,977.7 thousand (68.5%) residents of Lithuania lived in cities and towns, 908.2 thousand (31.5%) – in rural areas. Vilnius is the most populated city in Lithuania, its population in 2023 reached 581 thousand.

At the beginning of 2022, the population density in Lithuania was 43.0 persons per square kilometre (at the beginning of 2005 – 51.4 persons).

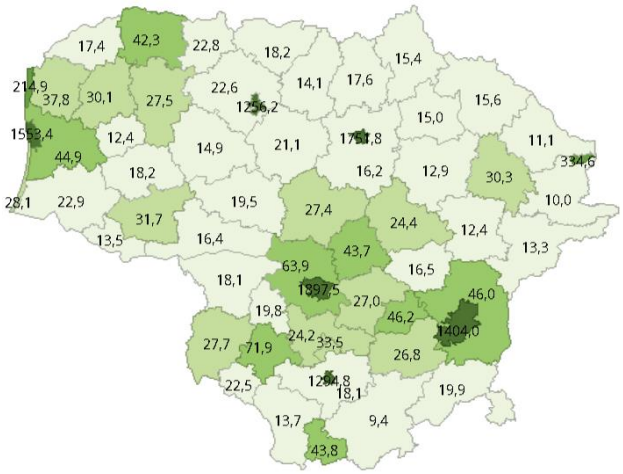


Figure 2-2. Map of population density in Lithuania in 2022, inh./km²

The number of women in Lithuania was 154 thousand higher than that of men (1,520.1 thousand and 1,365 thousand, respectively) at the beginning of 2024. As a result, women accounted for 52.7% of the total resident population, men 47.3%.

In 2023, life expectancy at birth for men was 72.9 years, and for women – 81.7 years (in 2015, 69.1 and 79.6 years, respectively). In 2023, the difference between life expectancy at birth for men and women was 8.9 years.

2.1.1.3. Geographical profile

Lithuania is a Central European country on the eastern coast of the Baltic Sea. The size of the territory is 65,302 km².

The current coordinates of the borders of Lithuania's territory are between 53°54' and 56°27' Northern latitude and between 20°56' and 26°51' Eastern longitude. From East to West, the territory of Lithuania goes up to 373 km, from North to South – 276 km. Our country has borders with five neighbouring countries. In the North, Lithuania has a 588 km long border with Latvia, in the East and South – a 660 km long border with Belarus. The neighbouring countries in the south-west are Poland (the length of border is 103 km) and the Russian Federation (273 km). More than three quarters of the Lithuanian borders stretch along rivers and lakes. Lithuanian economic zone in the Baltic Sea (6,400 km³) meets the Swedish waters. The length of the Lithuanian coast is 90.6 km.

Lithuania is the region of plains. The highest hill is 293.8 m above sea level. The country's territory consists of clayey plains (55.2% of the country territory), sandy plains (17.8%), hilly moraine uplands (21.2%), coastal plains (2.2%) and river valleys (3.6% of the territory).

More than half of the Lithuanian land is suitable for agriculture, i.e. the land area used for agricultural production. Changes in land use since 1990 are shown in Table 2-1. The areas of forest land, grassland and settlements have increased, while the areas of cropland, wetlands and other land have decreased.

Table 2-1. Land uses (based on the 2006 IPCC Guidelines land uses classification) in 1990 and 2022, ha

Land use	1990	2022	Change
Forest land	2,054.15	2,241.0	9.09%
Cropland	2,414.75	2,087,3	-13.56%
Grassland	1,286.64	1,446.8	12.45%
Wetlands	3,813.76	358,6	-6.07%
Settlements	347.42	385.8	11.05%
Other land	43.92	9.2	-78.98%
Total	65,300	65,300	-

According to the State Forest Service records, in 2023, the forested areas accounted for 33.8% of the total area. Currently, there are about 240 thousand private forest owners in Lithuania, owning about 928 thousand ha of forest. Private forests make up 42% of all forests. The average area of forest land managed by a forest owner is 2.7 ha.

After the restoration of independence, the area of protected areas of Lithuania has been rapidly increasing; from 1990 to 2024, it increased from 327.1 to 1,206.5 thousand ha and reached 18.5% of the country's territory. At present, the system of protected areas in Lithuania consists of 3 strict state nature reserves, one state biosphere reserve and 2 strict cultural reserves. Lithuania has five national parks, 30 regional parks, 403 state reserves and 108 municipal reserves.

Rivers in Lithuania occupy yan area of 332 km^2, 0.5% area of the country. Lithuania has 22.2 thousand rivers and streams (waterways), with the total length of 76.8 thousand km. The longest river is Nemunas (its length in the country is 475 km), Neris (235 km), Šešupė (209 km).

Lithuania has 2,585 lakes and 1,039 reservoirs (ponds) with an area exceeding 0.5 ha. The total area of lakes amounts to 886.9 km^2. The deepest Lithuanian lake is Tauragnas, with a maximum depth of 62.5 m.

Small (up to 50 ha) swamps are predominant. Among the vestigial are mostly wetland mires (71%) and wetland bogs important from the geo-ecological approach (22%).

The country has sought and examined 17 types of mineral resources. In 2024 the following valuable mineral resources were registered in Lithuania: oil, shale, peat, limestone, dolomite, opoka, sapropel, anhydrite, gypsum, chalk marl, travertine, rock salt, iron ore, amber, clay, sand and gravel.

2.1.1.4. Economic profile

Since transitioning to a market-oriented system in the early 1990s, heavy industries in Lithuania declined, leading to a significant decrease in emissions initially. This transition contributed to a decoupling of economic growth from emissions growth. In the period 1990–2022 GDP increased by 136% and GHG emissions were reduced by 61%. Joining the European Union in 2004 led to further restructuring and modernization, with a focus on service sectors and integration into the EU market. This generally supported a trend of lower emissions intensity. Currently Lithuania is a small open economy with robust growth performance and significant integration into the global economy. As a Eurozone member, Lithuania benefits from a stable currency and access to the single market, facilitating trade and attracting foreign investment.

The nation exhibits a strong service sector, with particular emphasis on FinTech and ICT. Lithuania also maintains a competitive manufacturing sector, specializing in areas such as food processing and laser technology. The country demonstrates a commitment to innovation and digitalization, fostering a thriving start-up ecosystem and investing in research and development. Lithuania's skilled workforce, fuelled by a strong education system, further enhances its economic competitiveness.

Lithuania’s economy had been recovering well from the COVID-19 crisis, experiencing steady growth thanks to increased exports and strong global connections. However, the ongoing war in Ukraine has brought significant challenges, with inflation soaring to some of the highest levels in the euro area due to increased energy and food costs. Lithuania made the decision to completely stop importing energy from Russia, finding new suppliers for these essential resources. Despite these difficulties, the government is actively supporting Ukrainian refugees and providing assistance to households and businesses struggling with the energy crisis.

The main challenges for Lithuania’s economy in terms of GHG emissions, lie in non-ETS sectors, namely transport, buildings, agriculture. Lithuania’s aging building stock requires large-scale renovations to improve energy efficiency. In 2020, 82.5% of buildings in terms of floor area, had D or lower energy performance ratings or did not have energy performance ratings evaluated (generally equivalent to low energy performance rating). The transport sector, contributing 8.1% of total Gross value added (GVA) in 2022, is heavily reliant on fossil fuels. This reliance on fossil fuels creates vulnerability to price fluctuations and geopolitical instability. Additionally, substantial public and private investments are needed to measurably decarbonize the transport sector. The agricultural sector, while constituting a smaller portion of the economy (3% of GVA in 2023), contributes disproportionally to GHG emissions. Furthermore, the sector is not included in EU-ETS, modernizes slowly and rely on subsidies for advancement in terms of GHG emission reduction.

In Figure 2-3 below GDP and GHG emission index alteration is shown from 1990 to 2022.

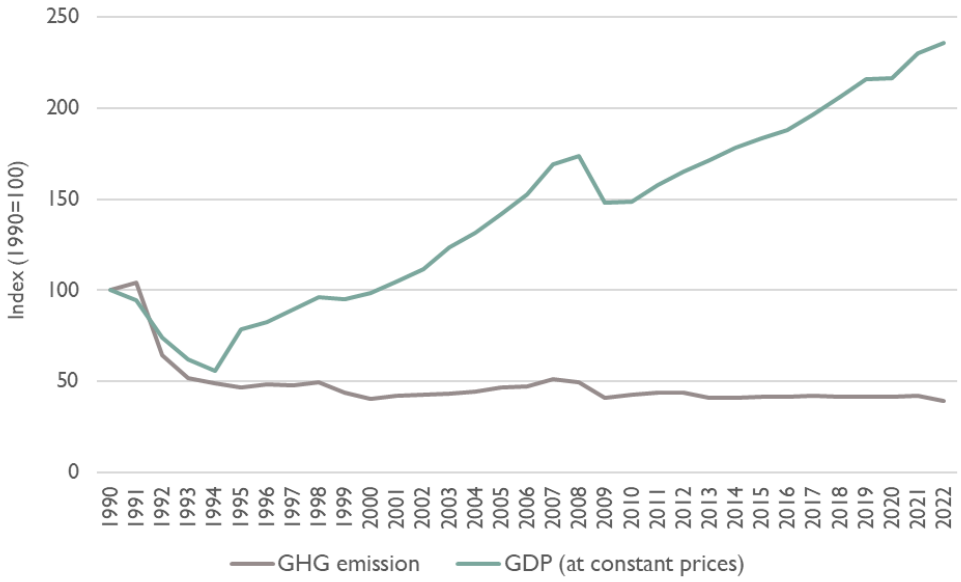


Figure 2-3. GDP and GHG emission index of Lithuania in 1990–2022

2.1.1.5. Climate profile

The Lithuanian climate is formed and affected by global factors and local geographical circumstances. Key features of the climate depend on the geographical location of the territory. Lithuania is located in the northern part of the temperate climate zone. The second global factor is the prevailing westerly airflow. Lithuanian territory, as the whole European region, lies in the area of influence of the Atlantic Ocean and westerly airflow, with air temperature, precipitation and runoff patterns, sea level and other parameters being largely determined by the North Atlantic Oscillation.

Climate is also influenced by the local landscape. Uplands, lowlands, plateaus and hills in Lithuania are positioned in parallel or sub-parallel to north-south meridians. Important local geographical factor is a fact that South-Eastern part of the Baltic Sea does not freeze, and the sea warms Lithuanian coastal region.

In accordance with Boris P. Alisov climate classification, most of Lithuania's territory is assigned to the southwestern sub-region of the continental forest region of the middle latitudes of the Atlantic Ocean. Only the Baltic Sea coastal region is closer to the climate of Western Europe and the climate can be attributed to individual Southern Baltic climate regions.

Temperature

In 2021 new climate norms describing average climate conditions have started to be used in Lithuania. Statistics have been calculated based on weather observations from the 1991–2020. The mean temperature of Lithuania in the new normal period is 7.4°C which is 0.5 degrees warmer than in the previous one (1981–2010). Compared with the 1961–1990 period the average temperature has already risen by about 1.2 degrees, which shows climate warming. The smallest change has been observed in October and the greatest has been in January and February. In Lithuania mean annual air temperature in 2018–2023 compared to 1991–2020 period was 0.9°C higher. The year 2020 with the average annual air temperature of 9.2°C was the warmest, 2019 with the average annual air temperature of 8.8°C was the

second and 2023 with the 8.7 °C average annual air temperature third warmest year since 1961. In Figure 2-4 average annual air temperature is presented.

Figure 2-4. The average annual air temperature in 1991–2020 years, °C

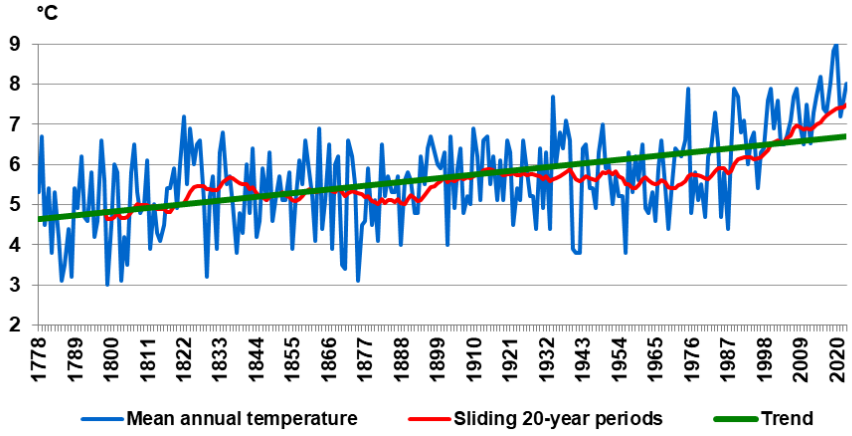


Figure 2-5. The average annual air temperature in Vilnius 1778–2023, °C

The average annual air temperature in Vilnius in 1778–2023 is presented in Figure 2-5. Air temperature rising trend is greatest from the second part of 20th century.

The hottest month in Lithuania is July; the coldest is January. In the period from 1991 to 2020, the average temperature in July was about 18.3°C and in January – about -3.2°C. In the period from 2018 to 2023 the average temperature in July was about 18.6°C, in January – about -1.0°C (Figure 2-6).

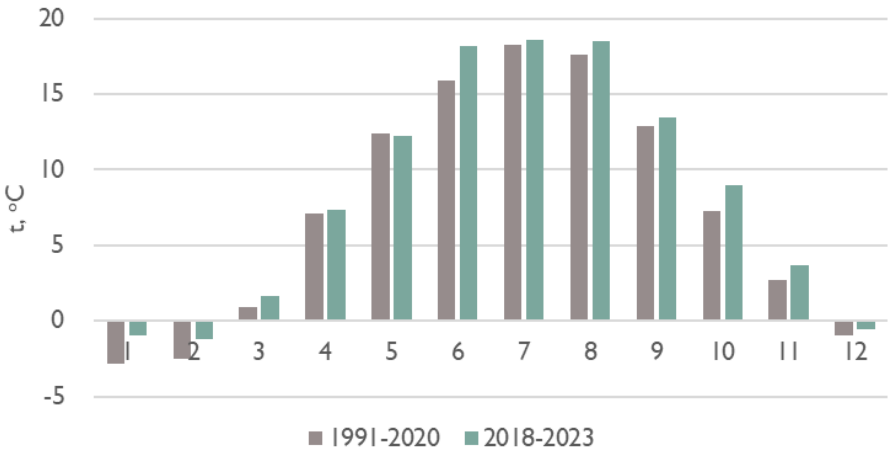


Figure 2-6. Average monthly temperature in Lithuania in 1991–2020 and 2018–2023, °C

At the end of the 20th century the number of extremely hot days with the daily maximum air temperature equal to or above 30°C has increased. In 1991–2020 on average about 4-5 days per year maximum temperature was equal of higher than 30°C. Compared to 1961–1990 the number of hot days has increased more than 3 times. The number of extremely hot days in 2018–2023 compared to 1991–2020 has increased and was about 7 days per year. The highest probability is in southern and south-western Lithuania.

Meanwhile, frosty days when the daily minimum air temperature drops to -20°C and below have decreased significantly. In the period of 1991–2020 on average 3 cold days occurred during winter (from 1 day in the seaside to 5 days in the Eastern Lithuania). Compared to the 1961–1990 period, the number of cold days decreased approximately 2 times. The number of cold days in 2018–2023 compared to 1991–2020 period has decreased and was on average less than 2 days per year. It was found out that the change in the probability of extremely hot and cold days originated mainly due to higher rates of recurrence of anticyclone processes during the summer and less frequent in winter.

Precipitation

The 1991–2020 climatic normal precipitated rainfall is 695 mm. More precipitation drops in west side (Figure 2-7). Compared with the 1961–1990 period climate normal amount of annual precipitation increased approximately by 3%. The most humid was warm period of the year.

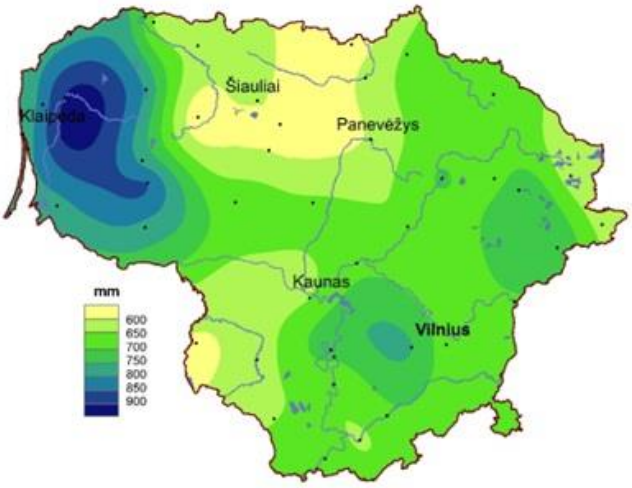


Figure 2-7. The average annual precipitation in 1991–2020, mm

The year 2017 was particularly rainy – 904 mm which is 130% of climatic normal. In 2017 the autumn rainfall significantly exceeded the average multi-annual rainfall: fell 343 mm – 182% of climatic normal. Meanwhile 2018 was particularly dry – 565 mm which is 81% of climatic normal. The amount of precipitation in 2019, 2020, 2022 was a little bit less and in 2021, 2023 a little bit more than climatic normal.

Lithuania is an excess irrigation area with increasing recurrence of warm season drought (years 1992, 1994, 2002, 2006, 2018, 2019). Due to the climate change, precipitation patterns in Lithuanian territory are changing differently – in some places it is increasing, elsewhere decreasing (however, these changes are not very large). But there is the tendency that precipitation is increasing in Lithuania during the cold season and decline in the warm season. The share of liquid precipitation in the cold period is increasing. In Figure 2-8 is presented the average annual rainfall in Vilnius (1887–2023).

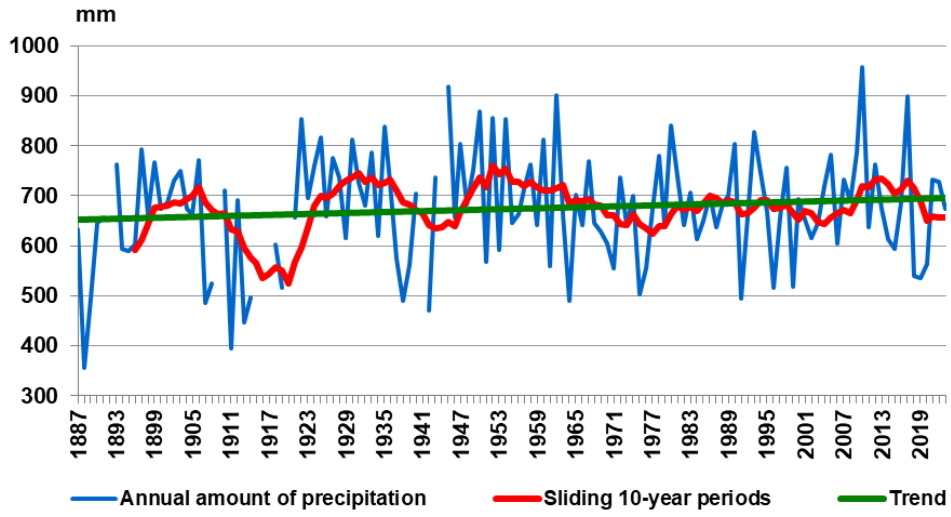


Figure 2-8. The average annual rainfall in Vilnius in 1887–2023, mm

Solar radiation

The average annual duration of sunshine in Lithuania is 1917 hours (based on data of 1991–2020 climatic normal). The longest sunshine duration occurs in the Curonian Spit and at the seaside part of Lithuania, ranging between 1,997 and 2,076 hours (Figure 2-9). Towards to the east, the duration of the sunshine

time decreases. The shortest duration of sunshine is in the southeastern part of Lithuania – 1,769 hours. The annual duration of sunshine differs by about 300 hours between the western and eastern regions. The longest duration of sunshine in Lithuania is in May and July (283 hours) and the shortest in December (29 hours).

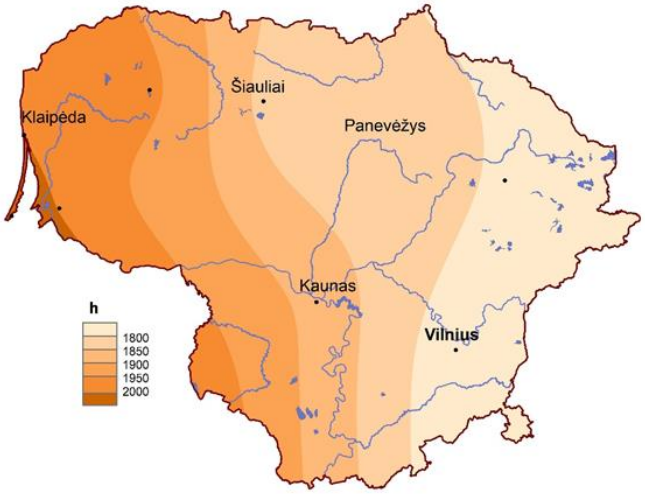


Figure 2-9. Duration of sunny hours in 1991–2020 years

Over the last five years, the duration of sunshine in Lithuania has been increasing. The number of sunny hours over the period 2018–2023 has increased by 3.1% compared to the 1991–2020 climate normal. During this period the average duration of sunshine was about 1,977 hours – 60 hours longer than climate normal. The increased number of hours of sunshine also can be seen by comparing the climate normal for 1981–2010 and 1991–2020: in the former case, the climate normal is 1,871 hours, and in the latter case 1,917 hours (increased by 2.5%).

In Lithuania the average general solar radiation to the horizontal surface during the year is about 3,750 MJ/m^2 (half less than the equatorial areas). However, the quantity per year is distributed very unevenly: in June solar radiation amounts to 17% and in December it makes just 1% of the annual volume. Annual global solar radiation is the highest in Curonian Spit and south-western Lithuania, while the lowest is in south-eastern, middle Lithuania and Venta middle-course plains. Solar radiation in the coastal area is higher in spring and autumn. In winter spatial differences in global solar radiation in Lithuania are not high. The total solar radiation measured at the Kaunas and Šilutė actinometric observation stations in the 2018–2023 period was 40,91and 4,093 MJ/m^2, which is 12% and 6% higher than the 1991–2020 long-term average values 3,642 and 3,873 MJ/m^2.

Wind

The 1991–2020 climatic normal of mean wind speed in Lithuania is 3.1 m/s (Figure 2-9) (in 1961–1990 climatic normal was 3.7 m/s). The strongest winds blow from November to January (at the seaside 5 m/s, elsewhere approximately 3–4 m/s), the weakest – from May to September (at the seaside 3–4 m/s, elsewhere 2–3 m/s). In autumn and winter the most often south, south-west and west winds are blowing, while in summer – west and north-west winds dominate. Most, by 0.5–1.1 m/s, winds weaken in Klaipėda in the late summer and autumn (Figure 2-10).

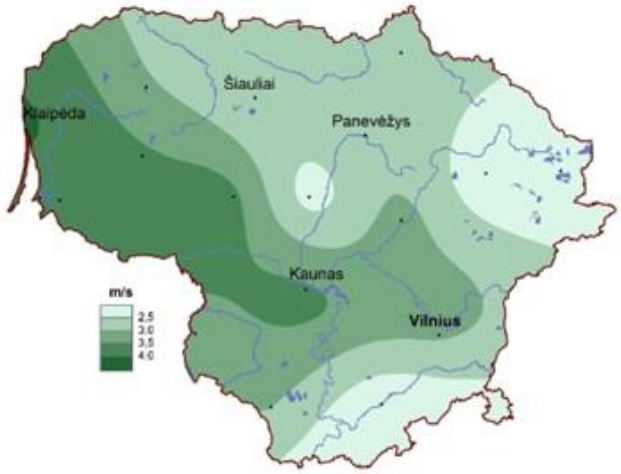


Figure 2-10. The average annual wind speed in 1991–2020, m/s

When wind speed increases to 15 m/s it is perceived as a dangerous meteorological phenomenon. In Lithuania 15 m/s and stronger wind blows on average for 24 days (from 52 days at the seaside to less than 10 days at the eastern part of Lithuania) per year.

The maximum wind gusts speed at the Baltic Sea can reach 35–40 m/s and in other places of Lithuania a little bit less. Analysing the maximum wind speeds during the period of 1991–2023 no significant changes have been identified in their long-term trends. However, it should be noted that frequency of winds with hurricane strength may increase because of climate warming.

2.1.1.6. Energy

Lithuania's energy vision is to become self-sufficient in energy production and an energy-exporting country, while establishing a climate-neutral, high-value-added energy industry. Currently, Lithuania is dependent on imports of natural gas, oil and electricity, but by 2050 the situation will change fundamentally, gradually phasing out fossil fuels and replacing them with electricity from renewable energy sources, biogas and hydrogen. For natural gas, the LNG Terminal in Klaipėda, which was put in operation in December 2014, has allowed for significant diversification of gas imports. The Klaipėda LNG terminal significantly enhanced security of natural gas supply for all consumers in the Baltic States by providing an alternative gas supply source. The terminal regasification capacities are sufficient to cover around 90% of all the current demand of the Baltic States. From 2022 Lithuania has stopped Russian oil, natural gas and electricity imports. Lithuania's gas needs are endured via the Klaipėda LNG terminal with cargoes from the US, its electricity needs are met through local power generation and imports from EU countries through existing interconnections with Sweden, Poland and Latvia, while JSC "Orlen Lietuva", the only oil importer in Lithuania, refused to import Russian crude oil. In line with the general EU energy policy, the country's energy policy is focused on gradual increase of consumption of renewable energy resources and increase of energy efficiency.

The total primary energy consumption in Lithuania has sharply decreased in the early 1990s and has fluctuated around 350–400 PJ level until 2009. Since 2010, due to the closure of Ignalina Nuclear Power Plant (NPP), nuclear energy was no longer used in Lithuania and total energy consumption stabilized around 300 PJ level. Oil and oil products were the most important fuel in Lithuania over the previous

decade, fluctuating about 33.2%. In the latest years the large share of oil products is caused by growing demand of motor fuel in transport sector, while other sectors, are gradually decreasing their oil product consumption. The share of natural gas was fluctuating about 27.1% over the period 2000–2022. Total consumption of natural gas decreased owing to reduction of its use for non-energy needs (mineral fertilizers production) in 2008 and 2009. The consumption of natural gas started to decrease since 2011 and in 2022 its share was 17.9% in the balance of primary energy consumption. Contribution of renewable energy sources into the country's primary energy balance during the period 1990–2022 is increasing. During the period 1990–2022 primary energy supply from renewable sources increased 374.2%.

Dynamics of primary energy consumption in Lithuania during 1990–2022 is presented in Figure 2-11.

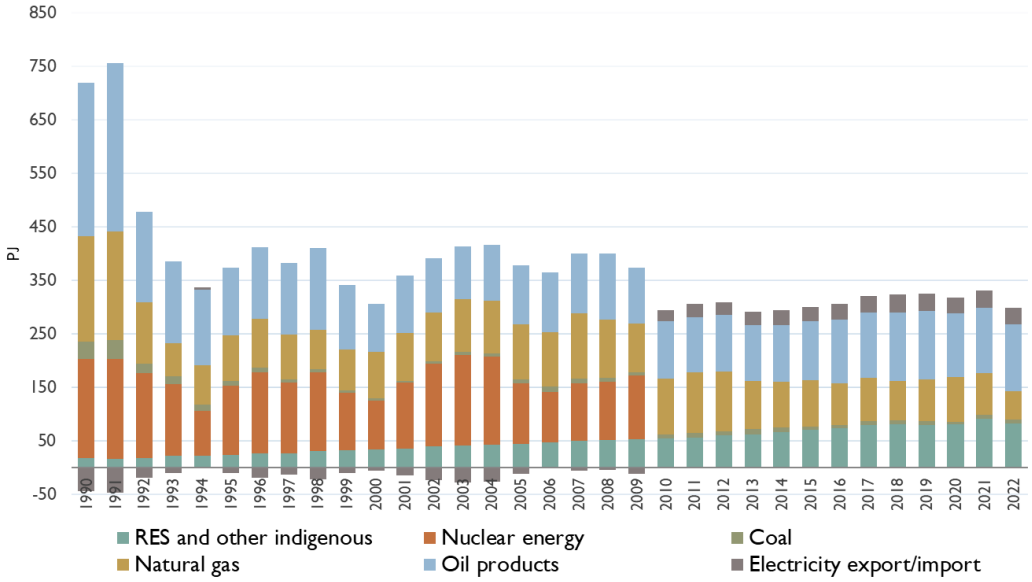


Figure 2-11. Primary energy consumption in Lithuania

Lithuania develops renewable energy resources based on the National Energy Independence Strategy and the National Energy and Climate Action Plan (NECP), where long-term goals in the field of energy are set. The goals to be achieved for the share of renewable energy resources until 2050 have been set in total final energy consumption, heating and cooling, transport and electricity sectors. Pursuant to the Law on Renewable Energy Resources of the Republic of Lithuania, Lithuania has set the goal that by 2030 renewable energy consumption would reach at least 55%.

The consumption of renewable energy sources by energy forms are presented in Figure 2-12. Currently the main domestic energy resource is solid biomass (70.2% in the balance of RES in 2022). The second largest renewable energy source is wind energy (7.2%). Liquid biomass (bioethanol and biodiesel) accounted 6.6% and ambient heat provides 5.4% of total renewable energy. Other types of RES generated in the country are: biogas, hydro energy, renewable waste, solar energy and geothermal energy.

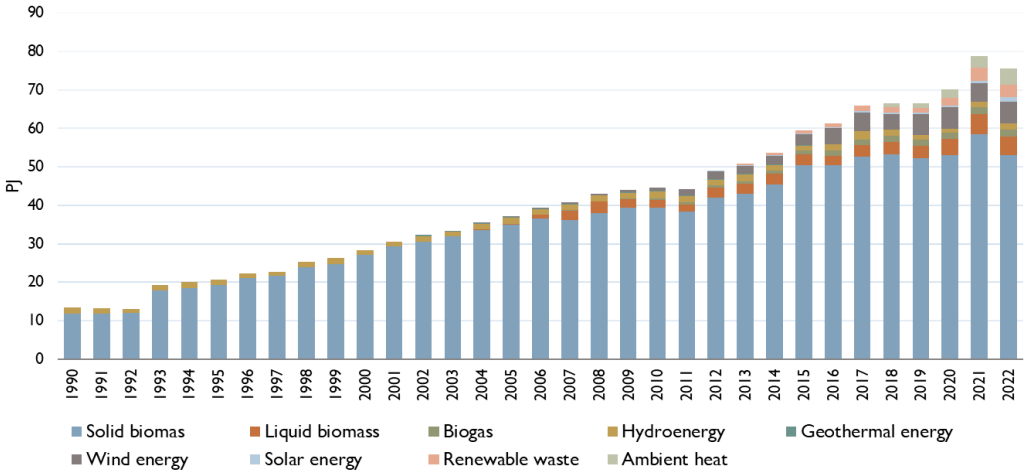


Figure 2-12. Consumption of renewable energy sources in Lithuania

Many factors had influence on changes of energy consumption: deep economic slump in 1991–1994, fast economic growth over the period 2000–2008, dramatic reduction of economic activities in all branches of the national economy and the closure of Ignalina NPP in 2009, a significant increase of energy prices, an increase of energy efficiency and other reasons. The trends of total final energy consumption (excluding non-energy use) provided in (Figure 2-13).

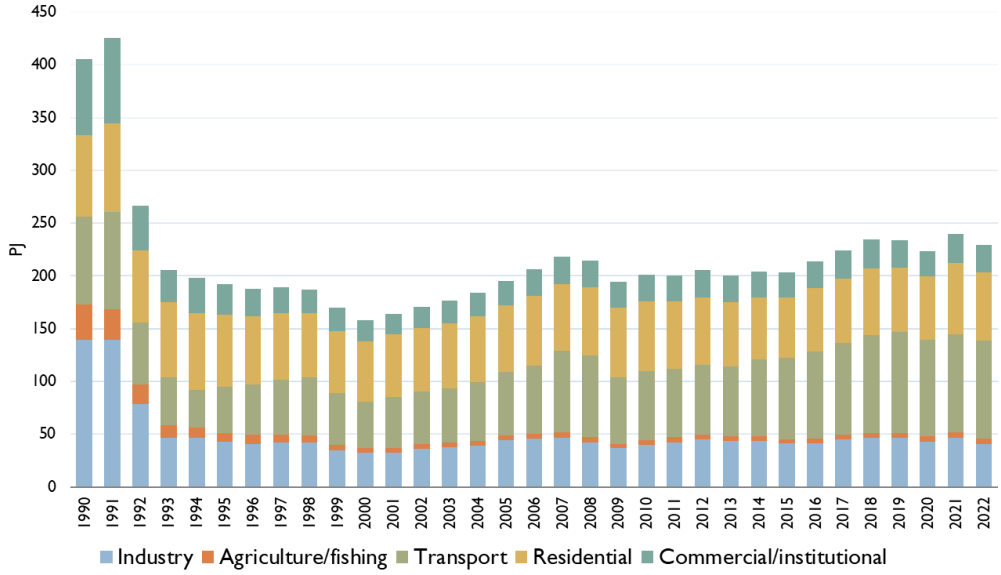


Figure 2-13. Final energy consumption in Lithuania

Currently the transport sector is the largest energy consuming sector. In 2022 the transport sector accounted for 40.4% in the total final energy consumption. This sector faces significant challenges due to slow transition towards climate friendly modes of transport and significant investment requirements. Residential and Commercial/institutional sectors accounted for 28.6% and 11.2% of total final energy consumption respectively. In these sectors a large share of energy comes from renewable energy sources, such as biomass. Industry consumes 17.6% of total final energy consumption, however most of the emissions from this sector fall under EU ETS, which contribute significantly towards reaching Lithuania's climate goals. In the period of 2005–2022 emissions from the energy sector decreased by 36%.

2.1.1.7. Transport

Due to its geographical location, Lithuania has been positioned as a strategically important country in the European transport system since the time of regaining independence. This is also reflected in the composition of Lithuania's GDP – in 2022 the share created by the transport sector amounted to 11.2% and was one of the most important sectors along with construction, industry and agriculture. In 2022, the transport and logistics sector employed about 15.2% of all employed persons in the country. The transport sector is extremely important for the Lithuanian economy and its consistent growth.

Lithuania's road network is one of the densest in Europe, and the state highway network ensures connectivity within the country and with foreign nations in all directions. The total length of European (E category) roads in the country is 1,639 km. 6 European highways pass through Lithuania's territory. The total length of state roads in Lithuania is 21,238 km.

The railway network in Lithuania comprises 1520 mm and 1435 mm gauge railways, enabling connections with both EU and Eastern countries. The current total length of the railway lines is 1,868.8 km. In 2022, only 152.4 km (8% of the network) was electrified. Electrified traction was used exclusively for passenger transport, while freight transportation by rail relied on thermal locomotive traction (diesel-powered), contributing to GHG emissions.

The marine transport sector of Lithuania is made of the marine merchant fleet, Klaipėda State Seaport, Šventoji State Seaport and the Būtingė Oil Terminal as well as companies and agencies which provide shipping agent services, freight forwarding, ship supply, towage and other services. Sea transport volumes in Lithuania are growing, despite the fact that Klaipėda Port faces competition from neighbouring Baltic Sea ports.

Four state-managed international airports operate in Lithuania. Vilnius, Palanga and Kaunas airports are civil airports. They render services to regular and charter flights for passengers and goods. Šiauliai airport is a military airport, but the flights of civil aircraft are also permitted. In 2023, Lithuania was connected with the world via 95 air routes. In Lithuania more than 6 million passengers flew by plane in 2023.

The total number of freights in tonnes (excluding sea transport) in Lithuania during 2000–2023 increased by 33.7%. In domestic freight transport rail transport is predominant, for international freight transport – the road transport represents a highest share (Table 2-2). Inland waterway and air freight transport takes only negligible share of total freight transport in Lithuania.

Table 2-2. Freight carried by all modes of transport in 2000–2023, thousands of tonnes

Goods carried by different modes of transport	2000	2005	2010	2015	2020	2023
Rail	30,711.9	49,287.3	48,060.7	48,053.2	53,429.7	27,224.2
Road	45,013.4	55,333.5	44,716.3	58,601.1	107,041.6	120,396.2
Inland waterway	852.4	745.4	996.3	1,095.3	1,167.3	1,474.5
Air	3.3	7.6	2.9	0.8	2.1	4.9

data source: State Data Agency

Decreasing passengers number carried by public transport are observed due to the declining population and the increasing number of personal vehicles. Generally, the total number of road vehicles is increasing

(except trolleybuses). According to the more than twenty years data passenger cars takes the largest part of road vehicles. In 2023 passenger cars accounted 82.7% of all road vehicles. Other vehicles (motorcycles, mopeds, busses, trolleybuses, lorries, road tractors, semi-trailers, special purpose road vehicles) accounted 17.3%. Detailed information about trends of number of road vehicles is provided in the table below.

Table 2-3. Number of registered road vehicles at the end of the year in 2000–2023

	2000	2005	2010	2015	2020	2023
Passenger cars	1,172,394	1,455,276	1,691,855	1,244,063	1,565,465	1,700,524
of which personal	1,097,797	1,342,972	1,554,270	1,112,167	1,358,872	1,487,766
Personal cars per 1000 population	315	408	479	385	486	516
Buses	15,069	14,839	13,261	6,856	7,655	7,573
Trolleybuses	474	472	467	430	415	383
Lorries	88,346	106,247	113,113	78,115	101,287	118,035
Road tractors	10,267	16,239	20,808	24,781	41,984	54,451
Trailers	6,479	12,852	20,400	14,962	17,426	20,408
Semi-trailers	9,875	16,590	23,819	25,565	41,366	52,423
Special purpose road vehicles	11,798	11,526	14,598	10,521	11,062	15,131
Motorcycles	19,842	24,027	38,995	26,651	45,883	67,283
Mopeds	NA	NA	17,276	11,102	15,028	20,369

data source: State Data Agency

In 2022, the number of passengers carried by all modes of transport amounted to 308.8 million, which is by 24.9% less than in 2013 and by 47.9% more than in 2021. In 2013–2022, an average annual decrease of 2.4 per cent was observed. In 2022, national passenger transport by road predominated: it accounted for 97.6% of total national passenger transport. Passenger transport by rail accounted for 1.5%, by inland waterways – 0.9%.

During the period of 1990–1995 fuel consumption significantly decreased by 46.3%. From 1995 the fuel consumption in road transport started to increase and rapid growth began in 2000. Motor gasoline was one of the main fuel types until 2000; from that year diesel usage started to increase more rapidly and in 2020 diesel amounted to 78.5%, motor gasoline – 11.8%, biofuel – 4.8%, liquid petroleum gas – 4.5% and CNG – 0.4% (Figure 2-14).

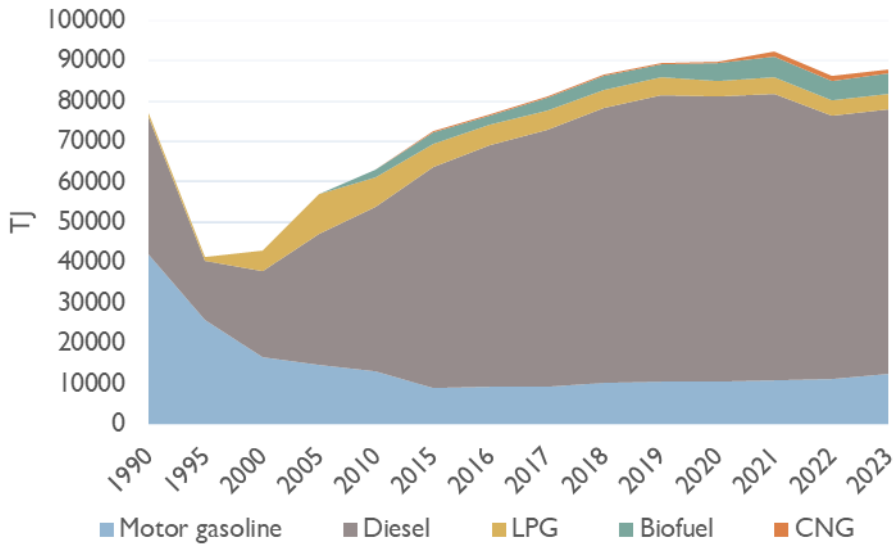


Figure 2-14. Use of fuels in transport in 1990–2023

Transport accounted for 32% of Lithuania's total GHG emissions in 2022, making this sector the largest GHG emitter. The transport sector's emissions have increased by 40% over the last decade. The country's dispersed settlement pattern and low population density make road transport the dominant transport mode for both passengers and freight. As a result, road transport is the most important source of GHGs, contributing 98% of the sectors emissions in 2022. Cars represented 54% of the total road transport GHG emissions in 2022, followed by trucks (41%), which is a rather high share by international comparison. The country has an ageing vehicle fleet and relatively high share of imported second-hand, highly polluting cars. In 2023, almost 69% of registered passenger cars were diesel cars with an average age of 16 years.

2.1.1.8. Industry

Lithuanian industry sector accounts for a significant share of gross value added in the country's economy. Division of the country's economy as per the classifier of economic activity indicates that on the first level industry consists of four activities: manufacturing; extracting industry (mining and quarrying); supply of electricity, gas and steam; supply of water and sewage management, waste management and remediation activities. Manufacturing constituted 82.7% of the total industrial production (excluding construction) in 2023 (Figure 2-15).

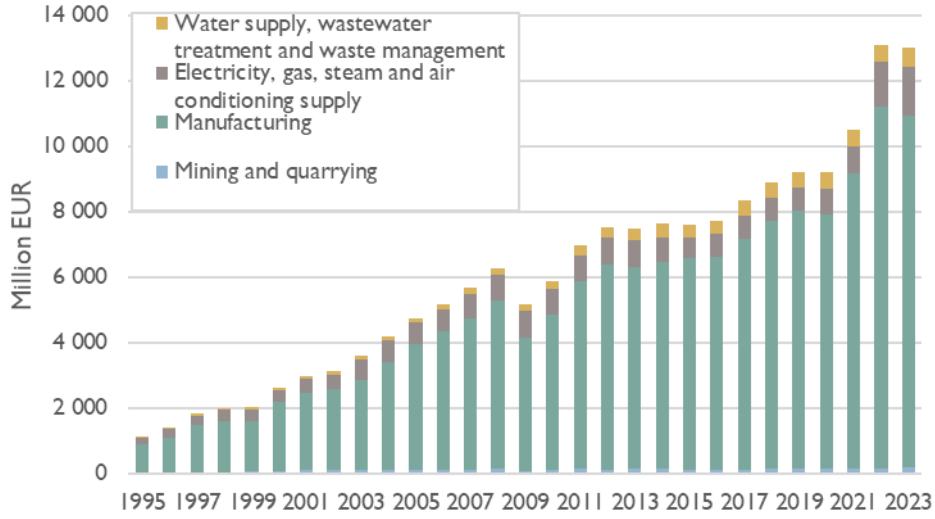


Figure 2-15. GVA per industrial economic activities in Lithuania in 1995–2023, EUR million

Four most important subsectors within manufacturing cumulatively produced 62.8% of production:

- Manufacture of refined petroleum products (21%);
- Manufacture of wood products and furniture (15.7%);
- Manufacture of food products and beverages (13.6%);
- Manufacture of chemicals and chemical products (12.1%).

Emissions from manufacture of refined petroleum products and manufacture of chemicals and chemical products comprise majority of total emissions in industry sector, however these emissions fall under EU ETS, which successfully contributes toward decarbonizing industrial sector. In the period of 2005–2022 total emissions from industry sector have decreased by 35%. Share of the main sectors in manufacturing products in Lithuania is presented in Figure 2-16 below.

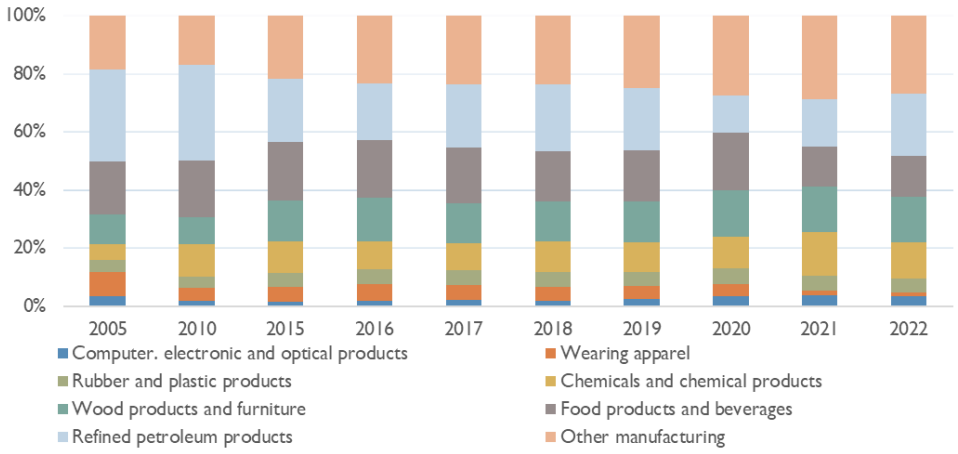


Figure 2-16. Share of production in manufacturing industry in 2005–2022, %

2.1.1.9. Agriculture

Agriculture is a source of economic wealth which supply food and energy resources. This sector has a great influence on the development of Lithuanian rural area as 31.8% of residents live in countryside.

Significant reforms were introduced in early 1990s, particularly after the restoration of independence. The reform included the re-establishment of private ownership and management in the agriculture sector. Legislation defined dismemberment of the collective farms, but they did not definitively ensure their replacement by at least equally productive private farms or corporations. Agricultural production decreased by more than 50% from 1989 to 1994. The farms were broken into small holdings, averaging 8.8 ha in size, often not large enough to be economically viable.

In recent years Lithuanian economy has experienced a lot of structural changes – contribution of industrial and services sectors have increased rapidly, however, agriculture remains one of the most important sectors in export, and it provides income to the tenth of Lithuanian population.

More than a half of Lithuania's land is suitable for agriculture. According to the data of State Data Agency as of 1st January 2022 the total land area was 6,528.6 thousand ha; total area of land intended for agricultural purposes made 2,937.8 thousand ha, of which arable land – 2,279.1 thousand ha; orchards and berry gardens – 29.9 thousand ha; meadows and natural pastures – 622.6 thousand ha.

Table 2-5. Main agricultural production in Lithuania

	2000	2005	2010	2015	2020	2023
Grain, thous. t	2,730.7	2,870.0	2,866.8	6,521.4	6,935.4	5,997.1
Rape, thous. t	81.0	201.2	416.7	512.2	967.0	815.0
Sugar beet, thous. t	881.6	798.5	706.7	619.5	948.5	1,041.2
Potatoes thous. t	1,791.6	894.7	476.9	399.2	302.6	274.5
Vegetables, thous. t	329.4	369.2	188.6	215.9	225.7	223.4
Fruit and berries, thous. t	111.1	110.7	44.0	87.1	73.2	54.9
Meat (carcass weight), thous. t	186.4	238.6	221.2	270.1	275.9	249.7
Milk, thous. t	1,724.7	1,861.6	1,736.5	1,738.5	1,491.7	1,473.0
Eggs, million pcs.	692.0	864.1	829.6	786.2	881.2	831.2
Wool (physical weight), t	30	44	109	256	289	285

data source: State Data Agency

In 2023 the proportion of crop production in the total agricultural production is significant and made up 68%, of which cereals – 34.9, rape – 12.1, fodder crops – 7.4, vegetables – 3.9%. The proportion of animal production made up 32%, of which animal and poultry breeding – 14.5%, milk yield – 12.9 per cent.

On 1st of January 2024 there were 623.5 thous. of cattle, 497.1 thous. of swine (Table 2-6). The number of all livestock categories has fallen steadily since the 2000, except for sheep and poultry. The number of cattle has decreased by 30.6%, swine number has fallen by 46.9% since 2000.

Table 2-6. Number of livestock and poultry at the beginning of the year in Lithuania (thous.)

	2000	2005	2010	2015	2020	2024
Cattle	897.8	792.0	759.4	736.6	634.6	623.5
of which dairy cows	494.3	433.9	374.6	314.0	240.9	212
Swine	936.1	1,073.3	928.2	714.2	550.8	497.1

Sheep	13.8	22.2	52.5	123.9	152.1	127.9
Goats	24.7	26.9	14.7	13.0	15.2	13.9
Horses	74.9	63.6	49.0	18.2	12.8	12.8
Poultry	6,372.6	8,419.4	9,308.7	10,218.4	8,649.0	10,655.3

data source: State Data Agency

In Lithuania, agriculture is the second most important sector not participating in the EU ETS in terms of GHG emissions (29% of total non-ETS emissions). GHG emissions from the livestock sector are constantly decreasing, due to the decreasing number of livestock in Lithuania, on the contrary – emissions from the crop sector, mainly from the use of mineral nitrogen fertilizers, have been steadily increasing since 2008 (except in 2022, when the price of fertilizers increased significantly). The use of mineral nitrogen fertilizers increased by 49% in the period 2005–2020 (from 119 to 177 thousand t N).

2.1.1.10. Forest

The total forest land area by the 1st of January 2024 was 2,209.8 thousand ha, covering 33.8% of the country's territory (Figure 2-17). Since 2001 the forest land area has increased by 180.5 thousand ha that is 8.2% of the total forest growth. The area occupied by forests is constantly increasing.

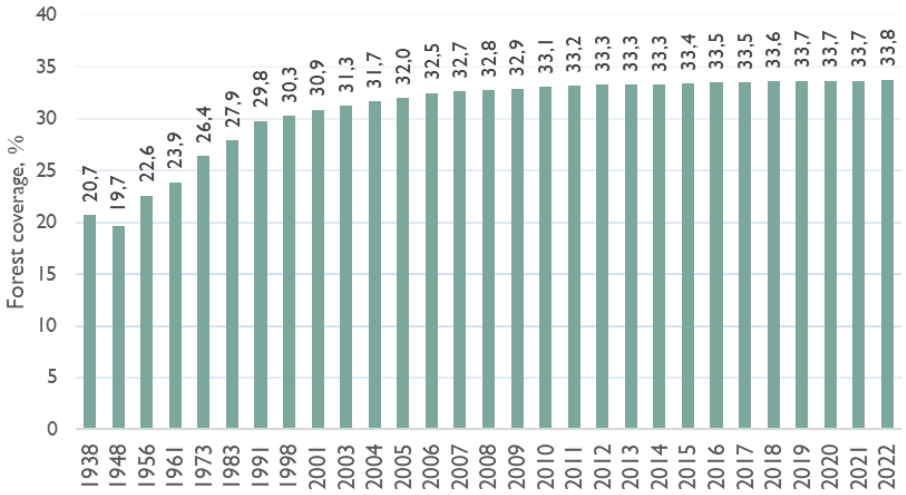


Figure 2-17. Forest cover changes in Lithuania, %

Coniferous stands prevail in Lithuania, covering 55.7% of the forest area, followed by softwood deciduous forests (40.9%) and hardwood deciduous forests (3.4%). Scots pine occupies the biggest share in Lithuanian forests followed by Norway spruce and birch stands (the largest area among deciduous trees), as shown in Figure 2-18.

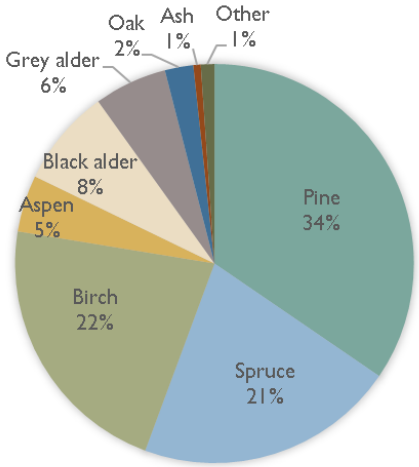


Figure 2-18. Forest stands area by dominant tree species as of 1st January 2022, %

In 2021 around a half of all forest land in Lithuania was of State importance – 1,114 thousand ha. The registered area of private forests is 863 thousand ha. The estimated area of private forests is 929 thousand ha. According to NFI data, since 2003 total growing stock volume increased from 453.4 million m³ up to 566.7 million m³. Pine stands accumulated growing stock of 232.0 million m³. In a period of eighteen years, they accumulated 52.0 million m³. The growing stock in spruce stands increased from 75.8 to 102.2 million m³.

All Lithuanian forests are distributed into four functional groups. In the beginning of 2023, the distribution of forests by functional groups was as follows: group I (strict nature reserves) – 27.7 thousand ha (1.3%); group II (ecosystem protection and recreational) – 250.2 thousand ha (11.3%); group III (protective) – 272.8 thousand ha (12.3%); and group IV (commercial) – 1,659.0 thousand ha (75.1%).

In Lithuania LULUCF sector for 1990–2022 acted as a CO_2 sink (except in 1996 when emissions were observed due severe storms followed by beetles' invasions and other calamities which had a huge impact in biomass loss which eventually resulted in CO_2 emissions). LULUCF GHG removals have been steadily decreasing since 2011 and one of the main factors is related to changing age class distribution in forests, as majority of pine forests are getting older and at this age, their removal potential is decreasing.

2.1.1.11. Waste

Waste and wastewater management is one of Lithuania's priorities for national environmental governance. During the reorganization of waste management infrastructure, all landfills and dumps not in line with the environmental protection and public health safety requirements were closed. As a result, waste disposal in the old landfills stopped in 2009. Since then, all waste has been disposed of in 11 regional non-hazardous landfills. Additionally, 3 waste incineration plants are operational in Lithuania.

In 2022, Lithuania's total waste generated annually was about 5.4 million tonnes, of which municipal waste generation is 1.35 million tonnes. According to data provided by municipalities, waste collection services on average were provided to 99.9% of population. In 2022, municipal waste generation in Lithuania remained just slightly below the EU average (465 kg/year/inhabitant compared to around 513 kg on average).

In 2022, Lithuania recycled 26.2%, composted 21.9%, incinerated 40% with energy recovery and disposed of 13.7% of municipal waste in landfills. During the last five years, Lithuania increased waste recycling almost by 11% and waste incineration went up by more than 112.1%. As a result, the volume of waste in landfills declined by more than 57.2%. Additionally, in the period of 2005–2022, waste sector emissions have decreased by 48%.

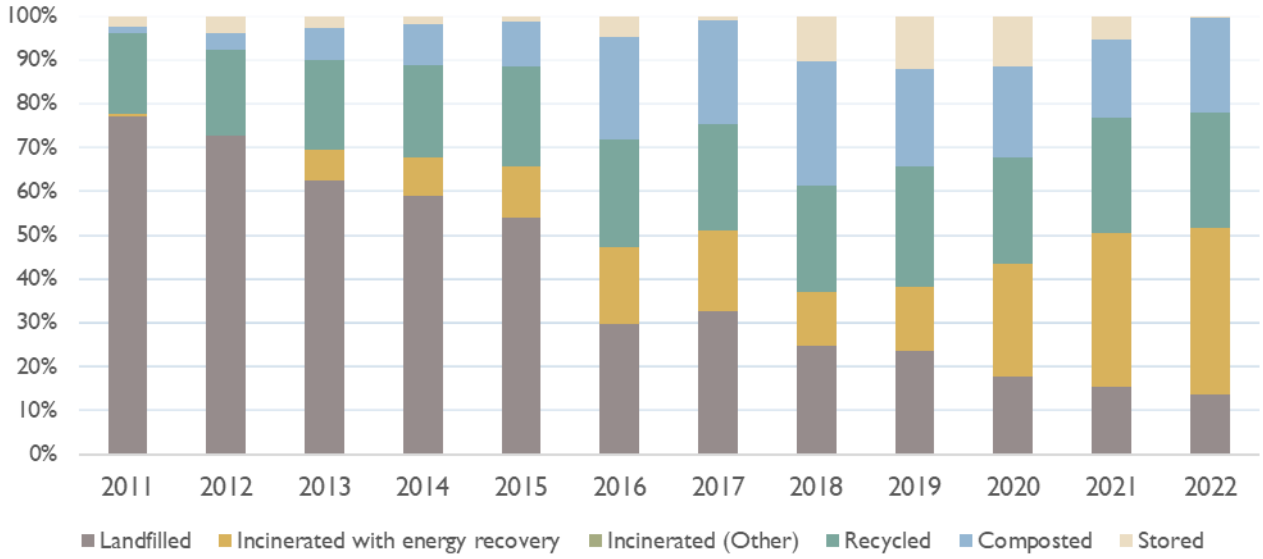


Figure 2-19. Municipal waste treatment in Lithuania (2011–2022), %

2.1.2. Institutional arrangements

2.1.2.1. Institutional arrangements for tracking progress

Institutional arrangements in the European Union (EU)

The EU's Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action (Governance Regulation)[1] establishes a governance mechanism and specific arrangements to track the progress of the Union and its Member States towards the implementation and achievement of the EU's climate and energy targets and commitments under the UNFCCC and the Paris Agreement. These arrangements include the monitoring of GHG emissions and removals, the reporting of policies and measures, projections of GHG emissions and removals and progress on adaptation to climate change.

Under the Governance Regulation, the EU has established a Union Inventory System to ensure the timeliness, transparency, accuracy, consistency, comparability and completeness of the data reported by the EU and its Member States. This inventory system includes a quality assurance and quality control programme, procedures for setting emission estimates, and comprehensive reviews of national inventory data to enable the assessment of compliance towards climate goals.

Each EU Member State compiles its GHG inventory in accordance with the requirements of the Paris Agreement[2] and the relevant Intergovernmental Panel on Climate Change (IPCC) guidelines[3]. Inventory data on GHG emissions and removals, including information on methods, are submitted electronically using a reporting system managed by the European Environment Agency (EEA). The submitted data are subject to quality control procedures and feed into the compilation of the GHG inventory of the EU. Net GHG emissions, calculated from emissions and removals reported in the GHG inventory of the EU, are the key information used for tracking progress towards the EU NDC target of a least -55% net emission reduction by 2030 compared to 1990.

Given the scope of the EU NDC related to international aviation and navigation, a specific share of international aviation and navigation emissions as reported in the GHG inventory data is calculated based on the Joint Research Centre's Integrated Database of the European Energy System (JRC-IDEES)[4]. Details on the methodology applied to identify GHG emissions from international aviation and navigation in the scope of the EU NDC, which are added to the national totals from the EU GHG inventory, are given in Annex II to this BTR.

Under the Governance Regulation each Member State must report to the Commission biennially on the status of implementation of its integrated National Energy and Climate Action Plans (NECPs). This process allows the Commission to ensure that the EU and the Member States remain on track to achieve the

[1] Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action, http://data.europa.eu/eli/reg/2018/1999/oj.

[2] Chapter II of the annex to decision 18/CMA.1, https://unfccc.int/documents/193408; and decision 5/CMA.3, https://unfccc.int/documents/460951.

[3] 2006 IPCC Guidelines for National Greenhouse Gas Inventories, https://www.ipcc-nggip.iges.or.jp/public/2006gl/; and on a voluntary basis: 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, https://www.ipcc.ch/report/2019-refinement-to-the-2006-ipcc-guidelines-for-national-greenhouse-gas-inventories/.

[4] European Commission, Joint Research Centre, Rózsai, M., Jaxa-Rozen, M., Salvucci, R., Sikora, P., Tattini, J. and Neuwahl, F., JRC-IDEES-2021: the Integrated Database of the European Energy System – Data update and technical documentation, Publications Office of the European Union, Luxembourg, 2024, https://publications.jrc.ec.europa.eu/repository/handle/JRC137809.

climate-neutrality objective and progress on adaptation. Under the Governance Regulation, Member States further operate national systems for policies and measures and projections and submit and report standardised information, which is subject to quality and completeness checks. Based on the submitted data, the EEA compiles projections of GHG emissions and removals for the EU. The EU-wide information is summarised annually in the Climate Action Progress Report[5] by the European Commission and in the "Trends and projections" report by the EEA[6]. Both the Union and the national systems are subject to continuous improvements.

The national energy and climate action plans (NECPs) were introduced by the Governance Regulation.

For Member States, the NECP for 2021–2030 play a key role to enabling the tracking of progress towards the 2030 climate and energy targets. The update of the NECPs provides an opportunity for Member States to assess their progress, identify gaps and revise existing measures or plan new ones where needed.

Member States were due to submit their final updated NECPs, taking account of the Commission's assessment and recommendations, by 30 June 2024.

Institutional arrangements in Lithuania

The arrangements to track the progress towards the implementation and achievement of the climate and energy targets and commitments under the UNFCCC and the Paris Agreement include the monitoring of GHG emissions and removals, the reporting of policies and measures, projections of GHG emissions and removals and progress on adaptation to climate change.

Detailed description of Lithuanian institutional arrangements for GHG inventory preparation is provided in Lithuania's National Inventory Document 2024, Chapter 1.2.

The main institutions (see Figure 2-20) involved in the reporting of the policies and measures (hereinafter – PaMs) and GHG emission projections are:

- Ministry of Environment;
- Sectoral ministries and other data providers;
- Environmental Protection Agency;
- Lithuanian Energy Agency;
- State Forest Service.

[5] Climate Action Progress Report 2024, https://climate.ec.europa.eu/document/download/d0671350-37f2-4bc4-88e8-088d0508fb03_en?filename=COM_2024_498_F1_REPORT_FROM_COMMISSION_EN_V4_P1_3729454.PDF

[6] Trends and Projections in Europe 2024, https://www.eea.europa.eu/en/analysis/publications/trends-and-projections-in-europe-2024https://www.eea.europa.eu/en/newsroom/news/eea-trends-and-projections

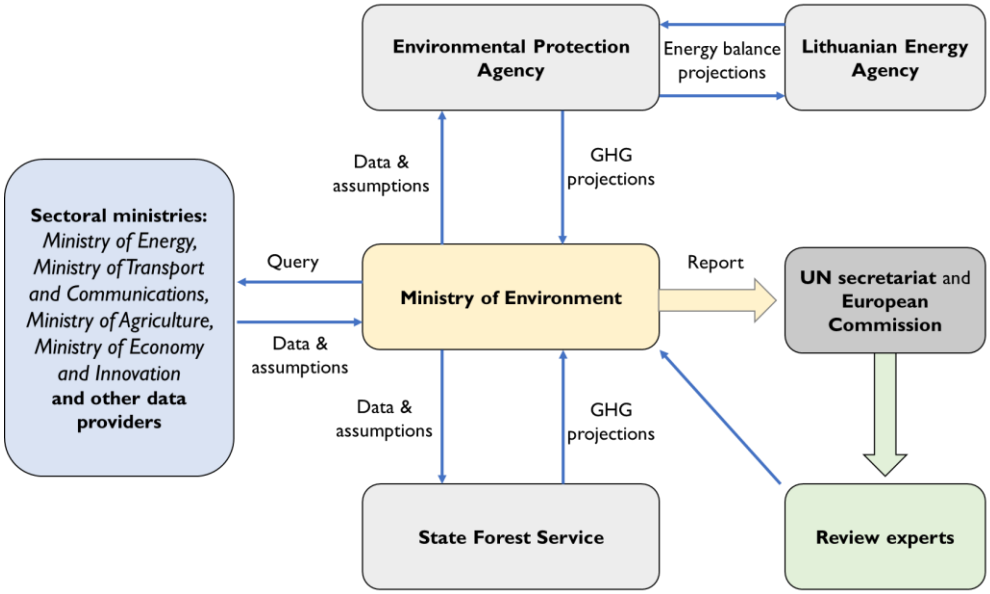


Figure 2-20. The scheme of the institutional arrangements for the PaMs and GHG emission projections reporting

Ministry of Environment

The Ministry of Environment of the Republic of Lithuania (MoE) is the main responsible and coordinating institution for the development of climate change policy and its implementation in Lithuania. It has overall responsibility and coordinates the national system of PaMs and projections reporting, and oversees the legal, institutional and procedural arrangements for the national system and the further strategic development. Among other tasks the Climate Policy Group of the MoE responsibilities are the collection of information from sectoral ministries, data providers on the currently adopted or planned PaMs in different sectors and preparation of the final report; an official consideration, QA and approval, submission of the PaMs and GHG emission projections report, coordination of technical UN and EC reviews of these reports.

Sectoral ministries and other data providers

Relevant sectoral ministries (*Ministry of Energy, Ministry of Transport and Communications, Ministry of* Agriculture, *Ministry of* Economy and Innovation etc.) and other institutions are obliged to provide available information on relevant sector economic development projections, strategic plans, planned activity intensity of individual policies and measures, sectoral models' data and other information needed to project GHG emissions. Key industrial companies also provide information on their planned production capacities.

Environmental Protection Agency

Lithuanian Environmental Protection Agency (EPA) under the Ministry of Environment since 2013 is responsible for estimation of GHG emissions projections based on activity data received from data providers and the preparation of part on GHG emission projections of the report for energy, industrial processes and product use, agriculture and waste sectors. EPA has the following functions and responsibilities:

- Evaluation of individual policies and measures GHG reduction potential (energy, IPPU, transport, agriculture and waste sectors measures);
- Analysis of activity data received from sectoral ministries and other data providers, preparation of assumptions and calculation of GHG projections;

- Implementation of initial QC procedures for GHG projections estimates;
- Performing the sensitivity analysis of GHG projections.

Lithuanian Energy Agency

The Agency implements State policy measures in the energy sector in accordance with the procedures established by laws and other national and EU legislation, carries out analysis and monitoring of the implementation of these measures, performs the functions of the central organization that accumulates and manages oil products and oil reserves. LEA is currently developing a model of Lithuania's energy system to forecast energy consumption, calculate the impacts of individual policy measures in energy sector, track the achievement and implementation of national energy targets.

The State Forest Service

The State Forest Service (SFS) compiles the National Forest Inventory (NFI) and the forest information system, carries out monitoring of the status of the Lithuanian forests, collects and manages forestry statistical data etc. The SFS functions are under the Ministry of Environment. Starting from 2013 SFS estimates the GHG emission projections for LULUCF sector and evaluates individual policies and measures GHG reduction potential in LULUCF sector. These estimates are provided directly to EPA for the compilation of GHG emission projections report.

Since the preparation of Lithuania's initial National Energy and Climate Action Plan (NECP) for the period 2021–2030 in 2019, reporting of policies and measures and projections is integrated in the NECP preparation process and regular progress reporting of NECP implementation to European Commission. More on this process see Chapter 2.1.2.2. of this report.

Description of Lithuanian institutional arrangements for climate change adaptation policy is provided in Chapter 3.1. of this report.

2.1.2.2. Institutional arrangements for implementation of the NDC

Institutional arrangements in the European Union (EU)

The EU and its Member States have set up a comprehensive system for the implementation of the EU climate change mitigation targets. The European Climate Law[46] sets the goal of climate neutrality by 2050 and the intermediate target of reducing net GHG emissions by at least 55% by 2030 compared to 1990 levels. These targets cover emissions and removals that are regulated in the Union law.

To ensure that the EU and its Member States achieve their target, the 2030 Climate and Energy Framework - the EU "Fit for 55" legislative package was put in place. The main legal acts of this framework are the EU Emissions Trading System (EU ETS) Directive[7], which caps GHG emissions in energy, industry, aviation and maritime transport; the LULUCF Regulation which includes national net removal targets for the LULUCF sector; and the Effort Sharing Regulation (ESR) which establishes national reduction targets for GHG emissions not covered by the EU ETS or the LULUCF Regulation i.e. domestic transport (excluding

[7] This refers to the ETS1, i.e. the Emission Trading System for stationary sources (Chapter III of the ETS Directive) and for aviation and maritime transport (chapter II of the ETS Directive). Note that the 'Emissions trading system for buildings, road transport and additional sectors' (ETS2), added in 2023 as Chapter IVa of the ETS Directive, forms an instrument under the Effort Sharing Regulation (ESR).

aviation), buildings, agriculture, small industry and waste. The implementation of the ESR is supported by additional sectoral policies and measures (details can be found in this BTR in the chapter on mitigation policies and measures). The legislative acts under the 2030 Climate and Energy Framework require the European Commission and the EU Member States to set up the institutional arrangements for implementing the specific policies and measures.

The revised EU ETS Directive increases the level of ambition in the existing system from 43% to 62% emissions reductions by 2030, compared to 2005 levels and extend the system to also apply to international maritime transport. A separate carbon pricing system will apply to fuel combustion in road transport and buildings and small-emitting sectors (ETS2) with a 42% emission reduction target compared to 2005 across the sectors covered. The amended Effort Sharing Regulation (ESR) increased, for the sectors that it covers, the EU-level GHG emission reduction target from 29% to 40% by 2030, compared to 2005, which translates in updated 2030 targets for each Member State. The new LULUCF Regulation sets an overall EU-level objective of 310 Mt CO_2 equivalent of net removals in the LULUCF sector in 2030.

The ESR sets national targets for the reduction of GHG emissions in the Member States by 2030. Member States are also subject to gradually decreasing annual emission limits for each year from 2021 to 2030. The annual progress towards the national targets under the Effort Sharing Regulation is assessed by comparing GHG emission levels from the sectors covered by the ESR with the relevant annual emission allocations under the legislation (AEAs). To achieve compliance under the ESR, Member States are permitted to use flexibility measures to a certain extent.

Progress in the implementation of these policies and measures is monitored under the Governance Regulation. Relevant information which is reported regularly and archived at the EEA include GHG inventories, approximated GHG inventories for the previous year, information on policies and measures, projections, and progress towards the implementation of integrated National Energy and Climate Action Plans (NECP). This information helps the EU and its Member States to correct their course if progress towards the targets of the 2030 Climate and Energy Framework is behind schedule. As an example, the European Commission assesses the drafts of new or updated NECPs and provides recommendations for improved planning and implementation. In addition, the reported information is subject to quality checks, and the GHG inventories reported by EU Member States are subject to comprehensive reviews in 2025, 2027 and 2032[8].

All EU legislation, including the legislation under the 2030 Climate and Energy Framework, is subject to a stakeholder engagement process. So-called 'better regulation tools' ensure that policy is based on evidence and the best available practice[9]. During the preparation of legislative proposals, the European Commission invites citizens, businesses and stakeholder organisations to provide their views about the new legislation. These comments are documented in a dedicated portal[10], and the European Commission reports on how it takes these comments into account in the development of the legislative proposals. Furthermore, the Governance Regulation sets requirements for Member States to ensure that the public is given early and effective opportunities to participate in the preparation of the NECPs.

[8] Consolidated text (2023) of Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action, https://eur-lex.europa.eu/eli/reg/2018/1999/2023-11-20.
[9] Decision-making process, https://ec.europa.eu/info/strategy/decision-making-process/how-decisions-are-made_en.
[10] Have your say – Public consultation and feedback, https://ec.europa.eu/info/law/better-regulation/have-your-say_en.

Institutional arrangements in Lithuania

In Lithuania, climate policy is integrated with the decision-making processes in energy, transport, industry, agriculture, waste, forestry and land-use sectors and territorial planning. The Ministry of Environment is the main responsible and coordinating institution for the development of climate change mitigation and adaptation policy and its implementation in Lithuania. The Ministry of Energy is responsible for overall energy policy and its implementation. In developing integrated energy and climate policy, both ministries actively cooperate with the Office of the Government, other sectoral ministries and relevant supervised institutions, as well as relevant committees of the Parliament, municipalities, the Lithuanian Research Council, State science and study institutions, companies, organisations and other social partners and individuals.

Issues related to development and implementation of the climate change policy are carried out by:

- Transport sector – Ministry of Transport and Communications;
- Industry (including EU ETS) sector – Ministry of Economy and Innovations, Ministry of Environment;
- Energy sector (including buildings) – Ministry of Energy, Ministry of Environment
- Agriculture sector – Ministry of Agriculture;
- Green Investments development – Ministry of Finance;
- Waste sector – Ministry of Environment;
- LULUCF sector – Ministry of Environment, Ministry of Agriculture;
- Carbon Border Adjustment Mechanism (CBAM) – Ministry of Finance, Ministry of Foreign Affairs.

The Lithuanian climate change policy is developed in line with the targets and objectives laid down in the international agreements under the United Nations Framework Convention on Climate Change (UNFCCC), the EU strategic documents and legislation. The Parliament of the Republic of Lithuania approves the main national energy and climate change strategies/agendas, and the Government approves the action plans for their implementation and the development programmes of all economic sectors. New plans are prepared every five years, and if there is a need at the national level, more often.

To support the implementation of climate change mitigation targets and requirements of Regulation (EU) 2018/1999 on the Governance of the Energy Union and climate action NECP for the period 2021–2030 was initially adopted in 2019 and updated in 2024. The NECP has been prepared based on and integrating the provisions, objectives, and tasks of the Lithuanian national legislation, international and EU obligations, strategies, and other planning documents, as well as measures being implemented and planned to be implemented.

In 2020, a working group was established by the Prime Minister's Decree to coordinate the implementation of the NECP and address issues of the Green Deal agenda. The working group includes representatives of 10 ministries: the Environment, Energy, Economy and Innovation, Finance, Social Security and Labour, Transport, Education, Science and Sports, Internal Affairs, Foreign Affairs and Agriculture. The working group meetings are organized regularly to discuss matters related to the preparation of the NECP, the financing of its measures and implementation.

Every year, ministries and institutions of their system prepare strategic plans, which plan measures with appropriations for a 3-year period. Funds for the implementation of projects and measures are allocated annually from the state and municipal budgets. A significant part of the investments allocated to the energy and climate sector are EU funds – EU Structural and Investment Funds and other targeted financing instruments (e.g. the European Infrastructure Networks Facility), as well as funds from the national Climate Change Programme and the Modernisation Fund. It is expected that investments from the Innovation, Social Climate Funds and the "New Generation Lithuania" plan (Recovery and Resilience Facility (RRF)) will also significantly contribute to the implementation of the energy and climate objectives.

The major policies and measures evaluation exercise was performed during the preparation of the NECP. During initial NECP preparation process in 2019, the Ministry of Environment launched a study to indicate the main concerning sectors regarding GHG emissions and possible contribution to reach the domestic target, and the consultants identified the possible measures. However, the sectorial ministries reviewed the proposed measures based on the sectorial objectives, development trends, economic and social aspects. Environmental Protection Agency experts together with external consultants re-evaluated the final list of policies and measures.

The policies and measures set in the NECP were revised in 2024 to meet the increased ambition of the European climate legislation (EU "Fit for 55" package and REPowerEU plan) and GHG reduction targets set in Lithuania's National Climate Change Management Agenda, which was adopted in 2021. To achieve high quality result, the Ministry of the Environment, together with the Ministry of Energy, has set up sectoral working groups, where representatives of business, science and NGOs gave suggestions on GHG reduction measures. The update of the NECP is an important part of the implementation of the international climate change objectives set out in the Paris Agreement and the EU climate change and energy policy mitigation (GHG reduction) targets and objectives until 2030.

This process involved the social partners, who were brought together in 5 decarbonisation working groups covering 5 economic sectors in Lithuania: agriculture and forestry, energy, industry, transport and waste/circular economy. Members were briefed on existing and planned NECP measures, the OECD expert analysis, participated in discussions and proposed additional measures to achieve the 2030 mitigation targets. The institutions, involved in technical evaluation of proposed mitigation measures potential and estimation of their GHG emission reduction effects were Environmental Protection Agency (energy, transport, agriculture, IPPU, waste sectors measures), Lithuanian Energy Agency (energy sector measures) and State Forest Service (LULUCF sector measures).

The NECP was updated in the following order:

- Review and discussion of existing decarbonisation measures;
- Collection and discussions of new alternative/additional decarbonisation measures;
- Evaluation of all decarbonisation measures (technical potential, (public) investment needs, GHG reduction effectiveness, impact on jobs, air pollution, social indicators);
- Modelling of the GHG impacts of the updated list of decarbonisation measures (alignment with OECD proposals);
- Adoption of the updated decarbonisation measures for NECP;
- Public and regional consultations;

- Revision of the updated NECP based on comments;
- Approval of the updated NECP by the Government of the Republic of Lithuania and submissions to the European Commission;
- Final version of NECP was submitted to EC on 3rd October 2024.

2.2. Description of the Nationally Determined Contribution

Under their updated NDC[11] the EU and its Member States, acting jointly, are committed to a legally binding target of a domestic reduction of net greenhouse gas emissions by at least 55% compared to 1990 by 2030. The term 'domestic' means without the use of international credits.

The NDC consists of a single-year target, and the target type is 'economy-wide absolute emission reduction'. The scope of the NDC covers the 27 Member States of the EU.

The 17 October 2023 updated NDC scope is supplemented by additional information to clarify the precise amount of international aviation and maritime emissions which are covered under the EU NDC. Details on the EU NDC can be found in Table 2-7 and Annex II.

Table 2-7. Description of the NDC of the EU

Information	Description
Target and description	Economy-wide net domestic reduction of at least 55% in greenhouse gas emissions by 2030 compared to 1990. The term "domestic" means without the use of international credits.
Target type	Economy-wide absolute emission reduction.
Target year	2030 (single-year target)
Base year	1990
Base year value	Net greenhouse gas emissions level in 1990: **4,699,405 kt CO_2 eq.**
Implementation period	2021–2030
Geographical scope	EU Member States (Belgium, Bulgaria, Czechia, Denmark, Germany, Estonia, Ireland, Greece, Spain, France, Croatia, Italy, Cyprus, Latvia, Lithuania, Luxembourg, Hungary, Malta, the Netherlands, Austria, Poland, Portugal, Romania, Slovenia, Slovakia, Finland, Sweden) including EU outermost regions (Guadeloupe, French Guiana, Martinique, Mayotte, Reunion, Saint Martin (France), Canary Islands (Spain), Azores and Madeira (Portugal)).
Sectors	**Sectors as contained in Annex I to decision 5/CMA.3**: Energy, Industrial processes and product use, Agriculture, Land Use, Land Use Change and Forestry (LULUCF), Waste. ***International Aviation:*** Emissions from civil aviation activities as set out for 2030 in Annex I to the EU ETS Directive are included only in respect of CO_2 emissions from flights subject to effective carbon pricing through the EU ETS. With respect to the geographical scope of the NDC these comprise emissions in 2024–2026 from flights between the EU Member States and

[11] The update of the nationally determined contribution of the European Union and its Member States, https://unfccc.int/sites/default/files/NDC/2023-10/ES-2023-10-17%20EU%20submission%20NDC%20update.pdf.

Information	Description
	departing flights to Norway, Iceland, Switzerland and the United Kingdom. ***International maritime Navigation:*** waterborne maritime navigation is included in respect of CO_2, methane (CH_4) and nitrous oxide (N_2O) emissions from maritime transport voyages between the EU Member States.
Gases	Carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF_6), nitrogen trifluoride (NF_3)
LULUCF categories and pools	The included LULUCF categories and pools are as defined in decision 5/CMA.3.
Intention to use cooperative approaches	The EU's at least 55% net reduction target by 2030 is to be achieved through domestic measures only, without contribution from international credits. The EU will account and report for cooperation with other Parties in a manner consistent with the guidance adopted by CMA1 and any further guidance agreed by the CMA.
Any updates or clarifications of previously reported information, as applicable	The information on the NDC scope contains clarifications/further details compared to the information provided in the updated NDC of the EU.

Note: This table is identical to table "Description of a Party's nationally determined contribution under Article 4 of the Paris Agreement, including updates", which has been submitted electronically together with this BTR. This table is also annexed to this BTR.

Source: Updated NDC of the EU[12]

On 6 February 2024, the Commission published its Communication "Securing our future – Europe's 2040 climate target and path to climate neutrality by 2050 building a sustainable, just and prosperous society", which recommends a target of 90% reduction in net GHG emissions by 2040 compared to 1990. The 2040 target, once agreed, will form the basis of the EU's new NDC under the Paris Agreement, to be communicated to the UNFCCC well ahead of COP30. The Commission is expected to submit a legislative proposal in early 2025 to include a climate target for 2040 in the European Climate Law and to propose relevant sectoral measures in due course.

2.3. Indicator, definitions, methodologies and structured summary

2.3.1. Indicator

For the tracking of progress towards implementing and achieving the NDC of the EU, an indicator is used which has the same unit and metric as the NDC base year and target values. The chosen indicator is "annual total net GHG emissions consistent with the scope of the NDC in CO_2 eq.". Table 2-8 provides more information on this indicator.

[12] The update of the nationally determined contribution of the European Union and its Member States, https://unfccc.int/sites/default/files/NDC/2023-10/ES-2023-10-17%20EU%20submission%20NDC%20update.pdf.

Table 2-8. Indicator for tracking progress

Information	Description
Selected indicator	Annual total net GHG emissions consistent with the scope of the NDC in CO_2 eq.
Reference level and base year	The reference level is total net GHG emissions of the EU in the base year (1990). The reference level value for the EU is 4,699,405 kt CO_2 eq.
Updates	This is the first time the reference level is reported, hence there are no updates. The value of the reference level may be updated in the future due to methodological improvements to the EU GHG inventory and to the determination of international aviation and navigation emissions in the NDC scope.
Relation to the NDC	The indicator is defined in the same unit and metric as the target of the NDC. Hence it can be used directly for tracking progress in implementing and achieving the NDC target.
Definitions	Definition of the indicator "annual total net GHG emissions in CO_2 eq.": Total net GHG emissions correspond to the annual total of emissions and removals reported in CO_2 equivalents in the latest GHG inventory of the EU. The totals comprise all sectors and gases listed in the table entitled "Reporting format for the description of a Party's nationally determined contribution under Article 4 of the Paris Agreement, including updates." Indirect CO_2 emissions are included from those Member States that report these emissions.

Note: The information in this table is identical to the information in Common Tabular Format (CTF) tables 1 ("Description of selected indicators") and 2 ("Definitions needed to understand the NDC"), which were submitted electronically together with this BTR.
Source: The reference level is based on the Annual European Union GHG inventory 1990–2022.

2.3.2. Methodologies and accounting approach

The EU use the following accounting approach for tracking progress towards the joint EU NDC: annual GHG data from the national GHG inventory of the EU, complemented for international aviation and navigation with estimations from the Joint Research Centre's Integrated Database of the European Energy System[13]. The total net GHG emissions are provided in the scope of the EU NDC and are compared to the economy-wide absolute emission reduction target as defined in the NDC. The EU will account for its cooperation with other Parties in a manner consistent with guidance adopted by the CMA.

As far as emissions and removals from the LULUCF sector are concerned, net emissions are used for tracking progress towards the 2030 target of the NDC based on all reported emissions and removals.

Details on methodologies and accounting approaches consistent with the accounting guidance[14] under the Paris Agreement can be found in CTF table 3 ("Methodologies and accounting approaches"), which was submitted electronically together with this BTR.

[13] European Commission, Joint Research Centre, Rózsai, M., Jaxa-Rozen, M., Salvucci, R., Sikora, P., Tattini, J. and Neuwahl, F., JRC-IDEES-2021: the Integrated Database of the European Energy System – Data update and technical documentation, Publications Office of the European Union, Luxembourg, 2024, https://publications.jrc.ec.europa.eu/repository/handle/JRC137809.
[14] Decision 4/CMA.1, Further guidance in relation to the mitigation section of decision 1/CP21, https://unfccc.int/documents/193407.

2.3.3. Structured summary – status of progress

An important purpose of the BTR is to demonstrate where the EU and its Member States stand in implementing their NDC, and which progress they have made towards achieving it. The most recent information on GHG emissions and removals in the scope of the NDC constitutes the key information for tracking this progress. Table 2-9 summarises the current status of progress.

Table 2-9. Summary of progress towards implementing and achieving the NDC

Indicators	Unit	Base year value	Values in the implementation period			Target level	Target year	Progress made towards the NDC
			2021	2022	2030			
Total net GHG emissions consistent with the scope of the EU NDC	kt CO_2 eq.	4,699,405	3,272,650	3,205,223	NA	(at least 55% below base year level)	2030	The most recent level of the indicator is 31.8 % below the base year level.

NA: Not Applicable.

Note that an annual emissions balance consistent with chapter III.B (Application of corresponding adjustment) will be provided in a subsequent BTR upon finalisation of relevant further guidance by the CMA, based on the annual information reported under Article 6.2.

Note: More detailed information can be found in CTF table 4 ('Structured summary: Tracking progress made in implementing and achieving the NDC under Article 4 of the Paris Agreement'), which has been submitted electronically together with this BTR.

Source: The indicator values are based on the Annual European Union GHG inventory 1990–2022.

Based on the GHG inventory data and data on international aviation and navigation for 2022, **the EU and its Member States reduced net GHG emissions by 31.8% compared to 1990.** The EU and its Member States made progress towards implementing and achieving their NDC. The legal and institutional framework is in place to make further progress in the years ahead and to achieve the NDC target by 2030.

2.4. Mitigation policies and measures

2.4.1. General climate policy framework

The Lithuanian climate change policy is developed in line with the targets and objectives laid down in the international agreements under the United Nations Framework Convention on Climate Change (UNFCCC), the EU strategic documents and legislation. The main goals of climate policy are to ensure Lithuania's contribution to climate change mitigation, ensure a balance of environmental, social and economic interests and promote Lithuania's ability to adapt to climate change and its impacts.

In accordance with the **Kyoto Protocol**, Lithuania has undertaken to reduce its GHG emissions by 8% below the 1990 level during the first commitment period 2008–2012 and successfully implemented achieving 56% GHG reduction.

Furthermore, in 2012 at the Doha Climate Change Conference Lithuania – a Party of the Convention and Kyoto Protocol – together with the other EU Member States and Island, undertook a 20% GHG emissions reduction below 1990 level commitment for the second Kyoto Protocol period from 2013 to 2020. It is

therefore a joint pledge with no separate targets for Member States under the Convention. **The Doha Amendment of the Kyoto** Protocol was ratified by the Parliament (Seimas) on 20 October 2015.

The target implemented internally through EU legislation in the 2020 EU Climate and Energy Package. In this package, the EU introduced a clear approach to achieving the 20% reduction in total GHG emissions from 1990 levels, by dividing the effort between the sectors covered by the EU Emissions Trading System (EU ETS) and the sectors under the Effort Sharing Decision (ESD). Binding national targets were set for Member States under the Effort Sharing Decision.

The EU has substantially overachieved its reduction target under the Convention, which means that also its Member States, the United Kingdom and Island have fulfilled their emission reduction obligations. As stated in the 2022 EU GHG inventory submission to the UNFCCC, the total GHG emissions, excluding LULUCF and including international aviation, decreased by 34% in the EU-27 + UK compared to the base year 1990 or 1.94 billion tons of CO_2 eq.

At the Paris Climate Conference (COP21) in December 2015, 195 countries adopted the first ever universal, legally binding global climate deal. **Paris Agreement** sets out a global action plan to put the world on track to avoid climate change by limiting global warming to well below 2°C above pre-industrial levels and purse efforts to limit the temperature increase to 1.5°C above pre-industrial levels.

Lithuania signed the Paris Agreement on 22 April 2016 and ratified on 30 December 2016. Under the Paris Agreement Lithuania jointly with the EU and its Member States undertook a binding target of at least a 40% domestic reduction in economy wide GHG emissions by 2030 compared to 1990, which was endorsed in the conclusions of the European Council of 23 and 24 October 2014 on the EU 2030 climate and energy policy framework. On 6 March 2015, the Council adopted this contribution of the Union and its Member States as their intended nationally determined contribution, which was submitted to the Secretariat of the UNFCCC. The target is delivered implementing the EU legal acts on 2030 climate and energy targets by all economy sectors, with the reductions in the ETS and non-ETS sectors amounting to 43% and 30% respectively by 2030 compared to 2005.

Based on the European Green Deal strategy and the Commission's Communication of September 2020 on Stepping up Europe's 2030 climate ambition ("2030 Climate Target Plan") the EU has increased the European Union's binding target for 2030 towards at least 55% net emission reduction (compared with 1990 levels). The European Climate Law, adopted in 2021 sets the legally binding EU's climate neutrality target at the latest by 2050, and a binding Union domestic reduction target of at least 55% net emission reduction by 2030 compared to 1990. In order to follow the pathway proposed in the European Climate Law, and deliver this increased level of ambition for 2030, the European Commission has proposed a number of legislative proposals under the "Fit for 55" package laying down obligation to achieve the EU targets of reducing GHG emissions by 62% in the sectors covered by in the EU emission trading system (EU ETS) and at least 40% in non-ETS sectors by 2030 compared to 2005 (see Figure 2-21 below).

Lithuania contributes to the achievement of EU climate targets for 2030. This target is divided into sub-targets for sectors covered by the EU ETS, sectors covered by the EU Effort sharing Regulation[15] (ESR) and the LULUCF sector. ESR sectors are those not covered by the EU ETS. The binding targets on Member State level have only been set for the ESR and LULUCF sectors.

[15] Regulation (EU) 2018/842 of the European Parliament and of the Council of 30 May 2018 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2013 https://eur-lex.europa.eu/eli/reg/2018/842/oj

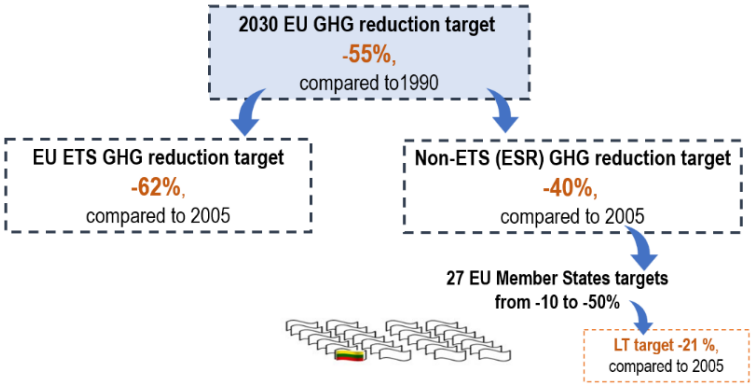


Figure 2-21. EU and it's Member States' targets 2030

Under the revised **EU ETS** Directive[16], a single ETS cap covers the EU Member States and other participating non-EU countries (Norway, Iceland and Liechtenstein, as well as Northern Ireland for electricity generation), and there are no further individual caps for Lithuania. The revisions, most of which came into effect on 1 January 2024, focused on:

- tightening the EU ETS cap to bring down emissions by 62% compared with 2005 levels by 2030;
- including emissions from maritime transport in the system;
- reducing and eliminating free allocation in the manufacturing industry and aviation;
- strengthening the Market Stability Reserve;
- introducing a new Emissions trading system (ETS2) for buildings, road transport and other sectors from 2027) etc.

For further information on recent EU ETS changes and this system application in Lithuania, please see Chapter 2.4.2.2.

EU Effort sharing legislation. For sectors outside the scope of the EU ETS and the LULUCF Regulation, binding annual GHG emission targets have been set for the EU Member States. These sectors, which include transport, buildings, agriculture, non-ETS industries and waste, account for almost 60% of total domestic EU emissions. In Lithuania ESR sector accounts 73% of total GHG emissions in 2022. In addition to the EU Member States, Iceland and Norway have agreed to implement the ESR and to commit to binding annual emission allocations for 2021 to 2030.

For the period up to 2020, the Effort Sharing Decision[17] (ESD) set a reduction target of around 10% relative to 2005 levels by 2020 for total EU emissions from the sectors covered by the legislation. National targets under the ESD ranged from -20% to +20% below 2005 emissions. In 2020, the EU's emissions in the effort-sharing sectors were 16.3% lower than in 2005 meaning that the EU overachieved its 2020 ESD target by 6 percentage points. Lithuania as a Member State with a positive limit under ESD over the years 2013–2020 was in compliance with annual emission allocation targets as there was no shortage of the annual emission allocation units during whole commitment period, except for year 2017 (the shortage of units in that year was covered with the banked surplus from previous years).

[16] Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a system for greenhouse gas emission allowance trading within the Union and amending Council Directive 96/61/EC https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02003L0087-20240301

[17] 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 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32009D0406

The Effort Sharing Regulation (ESR), which covers the period up to 2030, was originally adopted in 2018 and revised in 2023. The revision was adopted as part of a package of proposals aimed at reducing the EU's emissions by 55% by 2030 (compared to 1990 levels) and deliver the European Green Deal. As a result, the effort sharing sectors are required to collectively contribute to a 40% reduction in GHG emissions at EU level by 2030, with Member States' targets ranging from -10% to -50% below 2005 levels. The GHG emission reduction target for ESR sectors in Lithuania is a reduction of GHG emissions by 21% in 2030 compared to 2005.

In addition to establishing targets for the reduction of emissions in the Member States by 2030, the ESR also defines annual emission (AEAs) limits for the years 2021 to 2030. For that purpose, Member States are provided with a number of emission allocations (each corresponding to a tonne of CO_2 eq.) for each of the years in the period, and the number of allowances decreases every year. The Commission Implementing Decision (EU) 2020/2126[18] provides each Member State's corresponding number of AEAs for each year from 2021 to 2030.

The ESR maintained most of the flexibilities introduced by the ESD (banking of surpluses with certain banking limits, borrowing of AEAs from the following year, buying and selling AEAs allocations from and to other Member States. Additionally, from 2021 to 2030 Member States are allowed to use credits from LULUCF sector to comply with their national ESR targets.

The LULUCF Regulation[19], originally published in 2018, was amended in 2023 to introduce an EU-wide net carbon removal target of 310 million tonnes of CO_2 eq. by 2030. From 2021 to 2025, countries have to adhere to the "no debit" rule, meaning that accounted emissions from specific managed land categories must be entirely compensated by corresponding accounted CO_2 removals. In contrast, from 2026 to 2030, Member States will have to reach binding national LULUCF targets to contribute to the EU-wide target for 2030. The national target for Lithuania in the LULUCF sector is a net removal of 0.661 Mt CO_2 eq. in 2030 compared to the average GHG net emissions in 2016, 2017 and 2018.

In order to ensure the implementation in the international agreements and the EU legal acts defined targets for Lithuania, on 30 June 2021 by the Decree No XIV-490 of the Parliament of the Republic of Lithuania approved the **National Climate Change Management Agenda** (NCCMA) which lays down the targets and objectives for climate change mitigation and adaptation by 2050. The goal of the NCCMA is to develop and implement climate change management policy in Lithuania. The Agenda sets the short-term (until 2030), mid-term (until 2040) and long-term (until 2050) targets and objectives in the field of climate change mitigation and adaptation.

The national climate change mitigation targets by 2030 are as follows:

- to reduce GHG emissions by 30% compared to 2005 (including LULUCF) by shifting economic sectors towards innovative, low-emission and environmentally friendly technologies and the use of RES;
- for ETS sectors to reduce GHG emissions at least 50% compared to 2005;

[18] Commission Implementing Decision (EU) 2020/2126 of 16 December 2020 on setting out the annual emission allocations of the Member States for the period from 2021 to 2030 pursuant to Regulation (EU) 2018/842 of the European Parliament and of the Council https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02020D2126-20240731

[19] 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 https://eur-lex.europa.eu/eli/reg/2018/841/oj

- for non-ETS sectors (transport, industry, agriculture, waste, small-scale energy sector), to reduce GHG emissions at least 25% compared to 2005 (including LULUCF) and not exceed the annual emission allocations set for the period 2021–2030 by EU Effort Sharing Regulation.

The national climate change mitigation target by 2040 is to reduce GHG emissions by 85% compared to 1990. NCCMA sets a long-term objective of reaching net-zero emissions by 2050. The targets set in the NCCMA are summarised in Table 2-10.

Table 2-10. National climate change mitigation targets set in the NCCMA

GHG emission reduction targets	2030	2040	2050
Compared to 1990 level*	≥-70 %	-85 %	-100 %
Compared to 2005 level*	≥-30 %	–	–
For ETS sectors, compared to 2005 level	≥-50 %	–	–
For non-ETS sectors, compared to 2005 level*	≥-25 %	–	–

**Including LULUCF*

NCCMA also sets an indicative sectoral GHG emission reduction targets by 2030 compared to 2005 emission level, which are presented in the Figure 2-22 below.

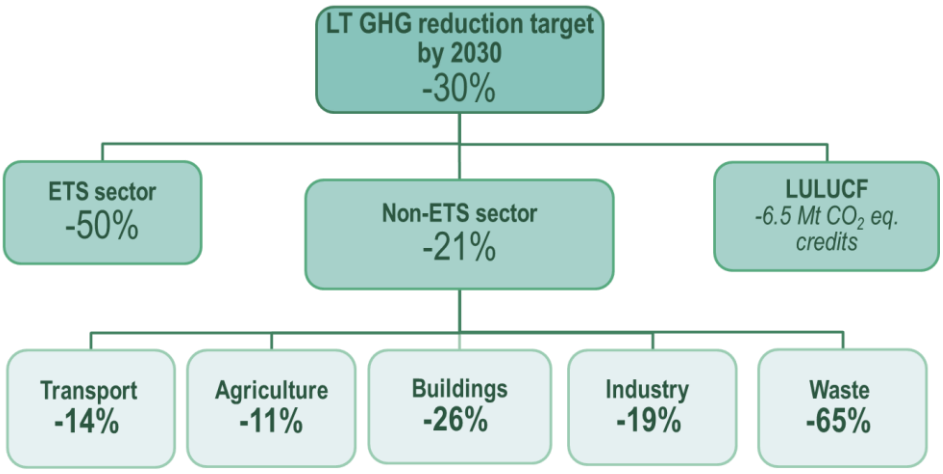


Figure 2-22. Lithuania's GHG reduction targets by 2030 compared to 2005

To support the implementation of climate change mitigation targets and requirements of Regulation (EU) 2018/1999 on the Governance of the Energy Union and climate action **Lithuania's National Energy and Climate Action Plan** (NECP) for the period 2021–2030 was adopted in December 2019 and updated in October 2024. The NECP has been prepared based on and integrating the provisions, objectives, and tasks of the Lithuanian national legislation, international obligations, strategies, and other planning documents, as well as measures being implemented and planned to be implemented. The NECP sets a number of policies targeting economy-wide emissions reductions. Rather than setting economic incentives or introducing new regulations, these are primarily complementary policies, for example integrating GHG emissions reduction evaluations into the legislative process, mainstreaming climate change within educational programmes, extending the scope for green procurement, increasing public awareness, and funding research on climate mitigation. The policies and measures set in the NECP were revised in 2021-2024 to meet the increased ambition of the European climate legislation (EU "Fit for 55" package and REPowerEU plan) and GHG reduction targets set in Lithuania's National Climate Change Management Agenda and on 3rd October 2024 Lithuania has submitted to EC updated NECP.

2.4.2. Cross-sectorial policies and measures

On 16 September 2009 the Government of the Republic of Lithuania by its Resolution No 1247 approved the updated **National Strategy for Sustainable Development**. To reach the targets and objectives, set forth in the strategy, implementation plan was prepared. Environment protection and climate change topics are under consideration in this Strategy.

On 15 May 2012 the Parliament of the Republic of Lithuania with its Resolution No XI-2015 adopted **Lithuania's Progress Strategy "Lithuania 2030".** This Strategy underlines the need for incentives for business to invest in green technologies, products and services. The main challenges and tasks in the period 2014–2020 were related to the increase of energy efficiency and use of renewable energy sources (hereinafter – RES) in final energy consumption by creating and introducing low carbon technologies in industry, agriculture and transport sectors. It is indicated that stronger cross-sectorial cooperation between research and industry is needed as well as international cooperation on joint climate change adaptation and risk prevention and management. In December 2023 the Parliament adopted **Lithuania's vision for the future "Lithuania 2050"** to pursue an economic green transition and strive for climate neutrality by 2050. This will entail a broad transformation of our energy, industry, transport, construction, waste management, agriculture, and forestry sectors, as well as a deeper shift away from consumerist values to fostering environmental awareness and responsibility.

As from 2021 targets of climate and energy are implemented through the **National Progress Plan 2021–2030 (NPP)**, which was adopted by the Government of Lithuania on 9 September 2020. The NPP has been drawn up with a view to identifying the main changes pursued by the State for the next decade and ensuring progress in the social, economic, environmental and security fields. The NPP will be implemented via sectorial development programs.

In 2018, Lithuanian Parliament adopted the **National Energy Independence Strategy**[20], which includes the state's key energy policy tasks, directions, and implementation tasks up to 2030 and a vision up to 2050. The main strategic directions of the Lithuanian energy policy development are energy security, competitiveness, green energy development and innovations. In June 2024 the Parliament updated the Strategy, which– aims to make Lithuania a fully energy independent country by 2050 that produces energy for its own needs and exports it. The Strategy has 4 main objectives – to ensure a secure and reliable supply of energy to all consumers, to achieve 100% climate-neutral energy for Lithuania and the region, to transition to an electricity economy and develop a high value-added energy industry, as well as to ensure the accessibility of energy resources for consumers. By 2030, Lithuania's national electricity grid will turn green, with the share of electricity from renewable energy sources reaching 100%. The total installed solar and wind power, having more than quadrupled since 2020, is expected to more than double by 2026. Share of renewable energy in our heating sector will also reach 100% by 2050.

Other cross-sectorial policies related to green energy transition promoting use of renewables, energy efficiency as well as climate and energy innovation policy are provided in Chapter 2.4.3.1.

To support the implementation of mentioned strategies and to conduct Regulation (EU) 2018/1999 on the Governance of the Energy Union and climate action Lithuania's NECP for the period 2021–2030 was adopted in December 2019 and updated in 2024. More information on NECP is provided in Chapter 2.4.1.

[20] Source: http://enmin.lrv.lt/uploads/enmin/documents/files/National_energy_independence_strategy_2018.pdf

New **Comprehensive Plan of the Territory of the Republic of Lithuania** adopted on 29 September 2021 by the Government provides for the long-term development prospects of the territory of the country (until 2050). It will become one of the country's key development instruments, with solutions up to 2030 and a proposed vision up to 2050. The projected spatial development orientations focus heavily on climate change mitigation and adaptation.

2.4.2.1. National economic and financial instruments for climate change management

The implementation of Lithuania's climate goals and the above-mentioned policies and measures also requires financing.

Climate Change Programme

The Ministry of Environment of Republic of Lithuania administrates a Climate Change Programme (hereinafter – Programme). As it is stated in the Law on Climate Change Management a Climate Change Programme was developed to collect additional funding for climate change management measures. All the Funds are used only for climate change mitigation and adaptation measures nationally and internationally.

The Funds for the Programme are accumulated in a separate account of the State Treasury and is regarded as part of national state budget. The Law states that the sources of financing of the Programme these:

- The funds obtained from the transfer of assigned amount units;
- The funds obtained from the auctioned allowances under the EU ETS;
- The funds obtained from the economic penalties in accordance with the procedure laid down in Chapter VII of this Law;
- The funds donated by natural and legal persons for implementation of the measures aimed at mitigation of climate change;
- The funds obtained from the sold CBAM certificates;
- Other funds received in legal ways.

The funds of the Programme are used for:

1. Energy consumption and production efficiency enhancement processes: modernization of dwelling houses and public buildings, implementation of other projects permitting most efficient reduction of GHG emissions in the energy, industry, construction, transportation, agriculture, waste management and other fields;
2. Promotion of the use of renewable energy resources, introduction of environment-friendly technologies, including efficient energy production by cogeneration;
3. Implementation of measures of the National Progress Plan, National Climate Change Management Agenda, National Energy and Climate Action Plan to increase the greenhouse gas removals capacity of land use, land use change and forestry sector;
4. To increase the GHG absorption capacity of the land use, land use change and forestry sector;
5. Provision of information to and education of the public, scientific research and dissemination thereof, consulting and training of operators and other persons on topical issues of management

and implementation of the climate change policy, enhancement of energy consumption efficiency, use of renewable energy resources and introduction of environment-friendly technologies;

6. Implementation, in the territory of the Republic of Lithuania and third countries of measures of adaptation to climate change and mitigation of climate change effects as stipulated under legal acts of the European Union, the UNFCCC, the Kyoto Protocol, Paris Agreement and other international agreements;
7. To administer Programme funds and the Union GHG registry, to prepare national greenhouse gas accounting and projecting systems, and to evaluate the impact of policies and measures on climate change mitigation.
8. To financial compensations in accordance with detailed rules laid down in the implementing act of the European Commission for final fuel users where double counting or the surrender of emission allowances for greenhouse gas emissions from fuel released for consumption cannot be avoided;
9. To co-finance measures set in the Social Climate plans as according to Regulation (EU) 2023/955 15 article.

The general provisions of the management of funds of the Programme are:

- since 2022 the four-year Programme investment plans, annual reports on the use of Programme funds are prepared and the Programme funds are administered by the Ministry of Environment;
- since 2022 four-year investment plans of the Programme and their amendments, discussed with Seimas Committee on Environment Protection, are approved by the Government;
- the Ministry of the Environment submits annual reports on the use of Programme funds for the previous calendar year to the Government and the Seimas Environmental Protection Committee;
- together with the four-year Programme investment plans and the annual reports on the use of Programme funds for the previous calendar year, information on the planned reductions in the amount of greenhouse gases for each financing direction is provided.

The rules for the use of Climate Change Programme funds are approved for individual measures by order of the Minister of the Environment. The funds of the Programme are managed by the Ministry of Environment, and the selection and monitoring of the Programme projects is carried out by the designated institution – the Environmental Projects Management Agency under the Ministry of Environment.

Currently the Government in 2022 has approved the four-year Programme with total amount of 358.6 million EUR.

Table 2-11. Approved financial measures under the Climate Change Programme for 2022–2025

Year	Financial measure		Allocated proceeds, EUR million
2022–2025	Development cooperation projects	-	8
	Modernization of multi-apartment buildings to reduce energy consumption	-	48
	Modernization of private houses to reduce energy consumption	-	1.4
	Promotion of purchase and/or use of less polluting transport	-	5

Additional funding of the 2014-2020 EU measure "Renovation of Public Central Government Buildings" under the program for increasing the energy consumption of public buildings		10
Renovation of buildings	-	16
Promotion of RES technologies	-	81
Investment to support the production of biomethane	-	33
Promotion of purchase and/or use of less polluting transport	-	12
Promotion of the reduction of GHG emissions by legal entities	-	15
Climate Neutral Government	-	5
A financial incentive for non-governmental organizations	-	0.5
For the implementation of the measures of the updated National Action Plan in the field of energy and climate:	**-**	**111.7**
Renovation of buildings		*64*
Promotion of purchase and/or use of less polluting transport		*24.6*
Promotion of the reduction of GHG emissions by legal entities		*12.1*
Promotion of second-generation biofuel and electric-powered agricultural machinery		*7*
Preservation of self-sown trees and their inclusion in forest land accounting		*4*

The diagram below shows the revenues of the Climate Change Programme, the revenue depends on ETS emissions allowances prices. As well as the annual budget of the Programme shown in the diagram. Since 2022, the Programme's revenues and budget are planned for 4 years.

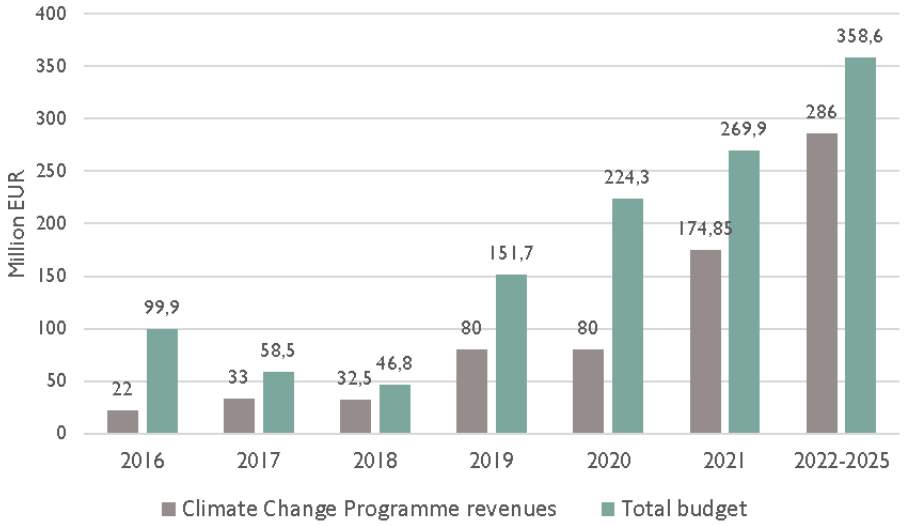


Figure 2-23. Climate Change Programme's revenues and total budget in 2016–2025, EUR million

Other financial programs for implementation of climate mitigation measures

The Modernisation Fund is a programme under the EU ETS to support 10 Member States (Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia) to meet 2030 energy targets by helping to modernise energy systems and improve energy efficiency. The Modernisation Fund provides investments in generation and use of energy from renewable sources, energy efficiency,

energy storage, modernisation of energy networks, including district heating, pipelines and grids, just transition in carbon-dependent regions: redeployment, re-skilling and upskilling of workers, education, job-seeking initiatives and start-ups. The total revenues of the Modernisation Fund may amount to EUR 48 billion from 2021 to 2030 (at 75 EUR/tCO_2 eq.), depending on the carbon price. Out of this amount, around EUR 28 billion comes from allowances that beneficiary Member States have transferred to the Modernisation Fund from their resources under Article 102(b) and 10c, and around EUR 20 billion comes from the auctioning of 2% of the total EU ETS allowances from 2021 to 2030.

Lithuania since 2021 has allocated 747 mill. EUR from Modernisation Fund for period 2021–2025. The total amount indicated for period of 2021–2030 for Lithuania – 1.3 billion EUR (this amount is subject to EU ETS prices).

Table 2-12. Lithuania's financial measures for 2021–2025 from Modernisation Fund

Year	Financial measure	Allocated proceeds, EUR million
2021–2025	Renovation (modernization) of apartment buildings	223
	Renovation (modernization) of public buildings owned by municipalities	55
	Decarbonization of industry	42
	Creation of electricity storage capacity	150
	Promotion of green hydrogen production (including hydrogen derivatives)	80
	Reduction of CO_2 emissions from the LNG terminal	6
	Renovation (modernization) of public buildings owned by central government	70
	Promotion of the purchase of bicycles and motorized bicycles	1
	Reducing fuel costs by developing no-till farming	30
	Promoting the purchase of electric vehicles	50
	Implementation of cleaner production technologies in industrial enterprises participating in the EU Emissions Trading System	40
	Total	**747**

The Innovation Fund is one of the world's largest funding programmes under the EU ETS for the demonstration of the most innovative low-carbon technologies. The Innovation Fund was established by Article 10a(8) of Directive 2003/87/EC to support across all Member States innovation in low-carbon technologies and processes. The EU Innovation Fund support is available to projects located in all EU Member States, Norway and Iceland.

The Innovation fund currently supports 1 project located in Lithuania which will contribute to decarbonisation of European industries with total expected GHG emissions of 16,669 t CO_2 eq. in the first 10 years of operation. The grant for this project is 2.6 million EUR out of total relevant costs of 7.5 million EUR.

Rural development. The Common agricultural policy supports the vibrancy and economic viability of rural areas through funding and actions that support rural development.

Rural development is the "second pillar" of the Common agricultural policy (CAP), reinforcing the "first pillar" of income supports and market measures by strengthening the social, environmental and economic sustainability of rural areas.

The CAP contributes to the sustainable development of rural areas through three long-term objectives:

- fostering the competitiveness of agriculture and forestry;
- ensuring the sustainable management of natural resources and climate action;
- achieving a balanced territorial development of rural economies and communities including the creation and maintenance of employment.

The CAP's contribution to the EU's rural development objectives is supported by the European agricultural fund for rural development (EAFRD). The EAFRD budget for 2021-2027 amounts to EUR 95.5 billion, which includes an injection of EUR 8.1 billion from the Next generation EU recovery instrument to help address the challenges posed by the COVID-19 pandemic.

At least 30% of funding for each Rural Development Programme must be dedicated to measures relevant for the environment and climate change, much of which is channelled through grants and annual payments to farmers who switch towards more environmentally friendly practices.

Lithuanian **Agriculture and Rural Development 2023–2027 strategic plan** (hereinafter – the Strategic Plan) aims at the sustainable development of the Lithuanian agricultural and food economy, increasing the added value and competitiveness of the sector, supporting the income of promising farms (especially small and medium-sized ones), the change of generations, creating a vibrant village that is attractive for farming and business and contributing to the environment and implementation of climate goals. During the 2023–2027 period almost 4 billion EUR is planned for Lithuanian agriculture and rural development from EU funds, and about 276.5 million EUR national budget funds. The strategic plan includes:

- Direct support, systems (eco-schemes) beneficial to the climate, environment and animal welfare, sectoral programs for which 3.02 billion is allocated of EU funds and about 2.8 million EUR national funding;
- For investment, cooperation, environmental protection, climate goal-seeking and other rural development measures 977.5 million EUR of EU funds and 273.7 million. EUR national funding.

Parliament adopted a law on the **Innovation Promotion Fund** in June 2020. The Fund will provide loans, guarantees and risk capital for start-ups and research and development (R&D) projects. The maximum subsidy per applicant is EUR 200,000, but the amount of the subsidy for a project may not exceed 70% of total eligible costs. The funding guidelines may set a lower amount.

EU funds and the Waste Management Programme finance new waste collection measures, recycling infrastructure and its development to help municipalities to collect and recycle more waste. The programme is funded from revenues of the tax on environmentally harmful products and packaging (paid by producers and importers) and of the landfill tax. The funds finance the setting-up, operation and development of waste management schemes, including investment projects. The programme also supports training, education and provision of information to the public and municipal staff related to waste management. It can also provide grants to municipalities and subsidies to economic entities to operate and develop waste management schemes.

In August 2022 the European Commission approved **Lithuania's Programme for the European Union (EU) Funds' Investments 2021–2027**, according to which it is planned to invest almost 8 billion EUR.

Europeans, investments are aimed at ensuring Lithuania's future well-being: investments in energy security, innovation and green economy, high quality education, social and medical services for both city and regional residents, jobs for new generations.

The **EU cohesion policy** will ensure the long-term economic and social well-being of the Lithuanian population, and to strengthen the resilience of our country's economy. The EU cohesion policy allows promoting economic, social and territorial cohesion, green and digital transitions and thus contributes to Lithuania's competitive, innovative and sustainable growth, focused on the quality of life of its citizens.

The Programme for the EU Funds' Investments 2021–2027 includes the investments of **the European Regional Development Fund, the Cohesion Fund, the "European Social Fund"** and Just Transition Fund planned to be targeted in the following areas:

Smarter Lithuania – competitiveness of the economy and transition to the economy with the higher added value;

Greener Lithuania – transition to clean energy, green investments, circular economy, adaptation to climate change, risk prevention and management of extreme climate events;

Better connected Lithuania – digital connectivity, cross-border and national, regional and local mobility, sustainable, advanced, safe and diverse trans-European transport network;

More socially responsible Lithuania – investments in people and systems in the fields of employment, education, health, social inclusion and cultural policies;

Lithuania closer to its citizens – sustainable and integrated development of cities and villages and local initiatives in order to respond to demographic challenges and reduce social and economic disparities;

Social innovation – activities aimed at the implementation of new ideas related to products or services, the benefits of which are provided to the society, are funded;

Digital infrastructure – development of very high-capacity broadband networks in "white spots" identified according to the analysis of investment needs;

Sustainable mobility – financing of relevant measures provided for in the sustainable mobility city plans of 18 cities and resorts in Lithuania.

For the even development of the country, investments will be made in 10 regional centres of Lithuania, realizing their economic potential. In this way, the benefits of investments would be felt not only by the residents of a specific city, but also the entire region.

Almost 47% of the Programme funds will be allocated to investments in innovations and green transition – sectors that will create the greatest added value for the Lithuanian economy in the long term.

30% of the Programme funds will be targeted to the strengthening of human capital, solving the challenges of social inclusion and improving achievements in the fields of education, health, culture and ensuring high employment rates in the labour market.

EUR 1.62 billion will be allocated to regions that will plan investments themselves and enable communities to agree among themselves on necessary projects that are important to the strategy and vision of that region.

In 2022 the Programme for the European Union Funds' Investments 2021–2027 the calls for proposals in the amount of EUR 1.1 billion are announced in energy, transport, education, health, culture, and social areas.

A total of EUR 8 billion of the EU Funds' investments are planned in Lithuania after the European Commission approved Lithuania's Territorial Just Transition Plan (TJTP) from **Just Transition Fund** on 14 December 2022. Under the TJTP activities are orientated towards two directions: industry decarbonisation and the creation of sustainable jobs. All investments are dedicated to three regions that are mostly affected by the transition towards climate neutrality: Kaunas, Šiauliai and Telšiai regions and municipalities operating in Jonava, Akmenė and Mažeikiai. Totally 273 million EUR will be invested to diminish the consequences of the transition. EU funding will support the introduction of 'green' hydrogen and other innovative solutions into production processes, as well as the establishing green jobs in the regions.

The Economic Recovery and Resilience Facility proposed by the European Commission is the main component of the joint "Next Generation EU" instrument of 750 billion EUR for economic recovery and preparation for future challenges, therefore the national integrated draft plan is called **"New Generation Lithuania"** in response to a common European context. 2.225 billion EUR is planned for Lithuania for grants and up to 3 billion EUR for loans. "New Generation Lithuania" milestones:

- **In the field of renewable electricity production**, to prepare for the construction of wind farms in the Baltic Sea, investments in preparatory seabed and technical research will be made, it is planned to support business and population investments in solar and wind power plants.
- **In the field of sustainable transport**, it is envisaged to expand the infrastructure network for electric vehicle charging and alternative refuelling stations. At the same time, financial incentives will be provided for public sector bodies and business to replace polluting vehicles, also public transport will be refurbished.
- **In the field of energy efficiency**, a reform of the renovation of buildings will be implemented. The goal is 1,000 multi-apartment buildings to be renovated per year.
- **In the field of digital innovation**, it is planned to develop innovations in data and digitalisation technologies in business through artificial intelligence, blockchains and automation. A separate priority is given to the flagship initiative – digitisation of the Lithuanian language resources, which would allow local and foreign market products or services "to speak" in Lithuanian (e.g. smart home management systems, Amazon Alexa, Apple Siri).
- **In the field of education**, it is planned to implement complex measures in general education with a view to improving students' achievements and reducing the gap. The aim will be to optimise the school network by investing in the Millennium schools, also the investments will be designated to increase the attractiveness of vocational training.
- **In the field of science and innovation**, it is planned to encourage the transformation of research and education institutions in such a way that the international competitiveness of studies in Lithuania, scope of scientific research and its quality would grow significantly. It is planned to improve the system of funding of studies and student enrolment by ensuring better compliance with labour market needs, to increase the efficiency of study quality assessment and to ensure systematic monitoring of R&D activities.
- **In the field of health**, investments are planned to modernise infectious diseases cluster centres in 5 major cities, which will ensure accessible, high-quality infectious disease diagnostic and treatment services for the population, as well as safe working conditions for personnel. The reception units for 10 health institutions at regional level will also be modernised. This will ensure preparedness of the

major hospitals of the country to effectively provide emergency medical services to many patients at a time in the event of an emergency (chemical pollution, radioactive contamination, nuclear accident terrorism, epidemic of communicable diseases).

- **In the field of labour market and social inclusion**, it is planned to create opportunities for jobseekers to learn and acquire high value-added qualifications and competences, as well as to subsidise job creation which contribute to the objectives of digital and green transformation. It is envisaged to subsidise job creation for persons affected by the operational changes of the company due to the COVID-19 pandemic.
- **In the field of efficiency of the public sector**, it is planned to invest in the improvement of STI and Customs activities through the introduction of advanced IT technologies, as well as to encourage reduction of cash payments, to conduct financial education of the public to create opportunities for the reduction of VAT non-collection and shadow economy. The efficiency of the activities of civil servants will be increased – centralised management of human resources and managerial careers, investments in strategic competences.

National Energy and Climate Action Plan (NECP) of Lithuania (2024) by implementing the EU climate and energy policy targets till 2030 were conducted the total investments to be financed 31 billion EUR investments, of which 13 billion EUR could be public funds. Most of the funds will be dedicated to the implementation of the goals of national energy independence and Lithuania's obligations to the EU regarding the mitigation of climate change – to promote technological and operational changes in different sectors. Also, 2.2 billion EUR planned for adaptation to climate change.

2.4.2.2. GHG emissions trading system in Lithuania

The EU ETS is a key climate policy instrument that has been implemented in the EU and three participating non-EU countries jointly to achieve its objectives of reducing GHG emissions in a cost-effective manner since 2005. Since 2013 the EU ETS covers certain activities that emit CO_2, N_2O and PFCs. Starting from 2027 EU ETS will be extended to cover fuels which are used for combustion in the buildings, road transport and additional sectors (sectors listed in Annex III of EU ETS Directive 2003/87/EC).

EU ETS is established by the EU Directive 2003/87/EC, under which each operator carrying out activities within the Directive's scope participates annually in a so-called "compliance cycle". This yearly cycle includes monitoring GHG emissions, verifying them and reporting to the competent authority. After completing the reporting, each operator is obligated to surrender EU ETS allowances equal to the amount of emitted GHG (in tonnes) during the reporting year.

Part of EU ETS allowances is allocated for free to the installation operators which are considered at risk of carbon leakage to third countries. However, this free allocation is reduced each year to encourage operators to address the shortage of allowances by modernizing their installations to reduce their GHG emissions. Since 2013, the main principle of allocation is through auctions. Operators receive only a limited number of free allowances, with the remaining needed allowances purchased either from other operators or through allowance auctions. Free allowances were also given to aircraft operators, however with the revision of EU ETS Directive 2003/87/EC, it will be phased out by the year 2026. Maritime sector, which is fully included in the EU ETS (reporting and surrendering obligations), does not receive free allowances. However, this sector will have a phase in period until 2027, after which it must cover 100% of its GHG

emissions with ETS allowances. Regulated entities that will be covered by EU ETS extension to buildings, road transport and additional sectors will not receive any free allowances.

Since 2005, Lithuania takes part in the EU Emissions Trading System. Aviation has been included in the EU ETS since 2012 and monitored since 2010. Installations within the scope of the EU ETS are required to hold a GHG emissions permit, issued by the Environmental Protection Agency, in accordance with the Order of the Minister of Environment No. D1-231, approved on 29 April 2004. These permits must be updated if there are changes to the operation of the installation.

In 2023, 73 installations and 4 aircraft operators from Lithuania carried out activities within the scope of the EU ETS. Most of these installations are small district heating units.

According to Commission Implementing Regulation (EU) 2018/2066 of 19 December 2018 on the monitoring and reporting of GHG (MRR), all 73 installations are categorized into 3 categories:

- Category A: 62 installations that emit < 50 kt CO_2 eq. per year or are low emitters (< 25 kt CO_2 eq. per year);
- Category B: 8 installations that emit > 50 kt CO_2 eq., but < 500 kt CO_2 eq. per year;
- Category C: 3 installations that emit > 500 kt CO_2 eq.

Lithuanian EU ETS operators account for approximately 27% of the country's total GHG emissions. This is based on comparison of the latest National GHG inventory Report data for 2022 (18,903.73 kt CO_2 eq.) with the EU ETS GHG registry data for 2022 (5,066.30 kt CO_2 eq.). Most of these emissions originate from 3 installations that carry out production of ammonia and nitric acid, petroleum refining and cement production. All operators of stationary installations and aircraft operators, maritime operators, and fully starting in 2027, with current monitoring period from 2024, regulated entities within the EU ETS are required to monitor and report their annual emissions in accordance with the MRR. These reported emissions are subject to obligations under the Accreditation and Verification Regulation (AVR) and must be verified by independent third-party verifiers accredited by the National accreditation bodies. Any verifier accredited within the EU Member by the State National accreditation body (NAB) may carry out verification in any of the EU Member States. In Lithuania, all verifications are performed by verifiers accredited by other EU member states NABs, as there are no verifiers accredited by the Lithuanian NAB.

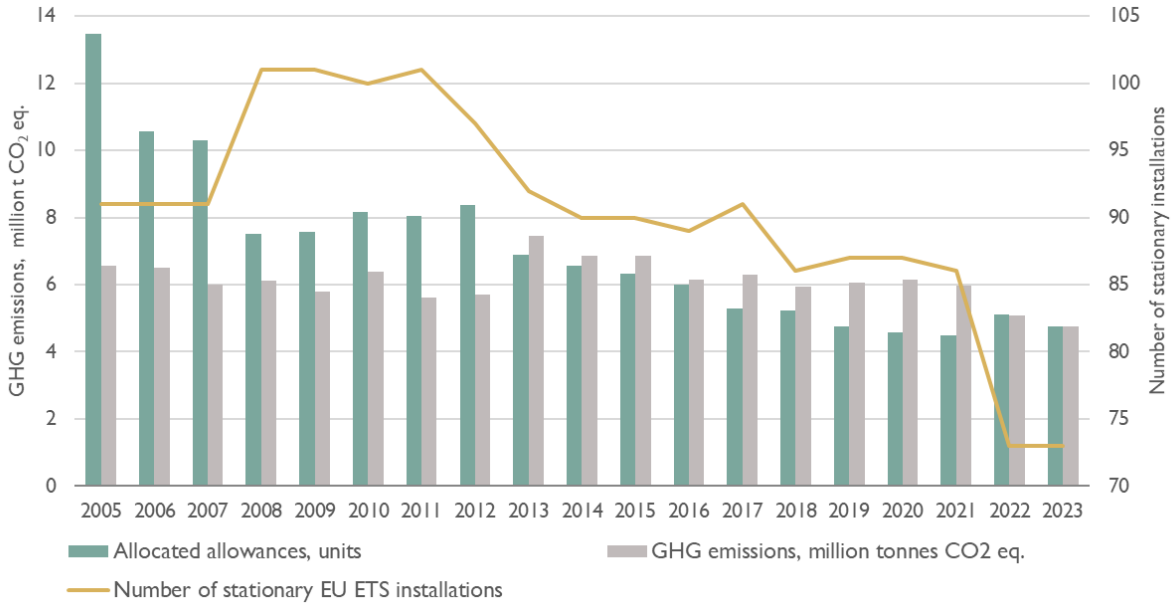


Figure 2-24. Trends of EU ETS in Lithuania[21]

During the first (2005–2007) and second (2008–2012) EU ETS trading periods, emission allowances were allocated on a national level according to EU-wide rules. Starting with the third (2013–2020) trading period, the allocation system changed, with approximately half of the allowances expected to be auctioned, with this proportion continually rising throughout the trading period. Furthermore, the EU ETS cap on total emissions was reduced by 1.74% annually, aiming for the target of 21% reduction of GHG by 2020 compared to 2005 GHG emission levels.

Revision of the EU ETS – phase 4 (2021–2030)

In March 2018, the European Parliament and Council amended Directive 2003/87/EC to enhance cost-effective emission reductions and low-carbon investments after 2020. The annual reduction in the number of allowances of the EU quota was reduced from 1.74% linear reduction factor to 2.2%, to provide the emissions reductions and thus deliver the underlying environmental objective (-43% GHG reduction by 2030 in EU ETS sectors compared to 2005). Starting from 2019, it was determined to strengthen the EU ETS by temporarily doubling the rate at which allowances are placed in the Market Stability Reserve (MSR) to reduce the existing market oversupply of allowances.

Since European leaders agreed to continue free allocation after 2021, sectorial benchmarks were updated to reflect technological progress. Adjustments to activity levels were introduced to ensure a fair methodology for free allocation. Additionally, the criteria determining the composition of the carbon leakage list were also reviewed.

Several low carbon funding mechanisms were introduced, including:

- Innovation Fund: designed to support demonstration of innovative renewable energy and low-carbon innovation technologies in the industry, as well as carbon capture, use and storage technologies (CCUS).

[21] The figure shows an increase of EU ETS GHG emissions in 2013. This is due to increase in the scope of activities that fall under the EU ETS directive (since 2013 non-combustive CO_2 emissions from ammonia production and N_2O emissions from nitric acid production started to be included in EU ETS)

– Modernisation Fund: aimed to modernising the energy systems of EU Member States with lower GDP.

Revision of EU ETS in the context of "Fit for 55" package

On July 14, 2021, the European Commission adopted the "Fit for 55" package of legislative proposals as part of the European Green Deal. The package aims to update existing legislation in line with the EU's 2030 climate target and introduce new policy measures to encourage the transformative changes needed in the economy, society and industry. These initiatives are needed to achieve climate neutrality by 2050 and to reduce net emissions by at least 55% (compared to 1990) by 2030.

In the context of "Fit for 55" package, the revision of EU's ETS will result in 61% an overall emission reduction in sectors concerned by 2030 compared with 2005. This will increase the annual GHG reduction rate from the current 2.2% to 4.2%.

The increased ambition will be achieved by strengthening the current provisions and expanding the scope of the EU ETS. This notably aims to:

- include emissions from maritime transport – which currently is required only to monitor its emissions under the EU ETS, will transition to an obligation to surrender ETS allowances;
- gradually phase out free allocation of emission allowances to aviation and to the sectors that are subject to the Carbon Border Adjustment Mechanism (CBAM), such as iron and steel, cement, fertiliser, aluminium and electricity generation;
- implement the global carbon offsetting and reduction scheme for international aviation (CORSIA) through the EU ETS;
- increase funding available from the Modernisation Fund and the Innovation Fund;
- revise the MSR to continue ensuring a stable and well-functioning EU ETS.

In addition, a new standalone ETS for buildings, road transport and additional sectors will be created to support EU Member states in meeting their national targets under the Effort Sharing Regulation in a cost-efficient manner. The proposal aims to achieve a 43% emissions reduction from these sectors by 2030, compared to 2005.

Additionally, to the update of EU ETS – **Carbon border adjustment mechanism (CBAM)** was introduced. CBAM is the EU's tool to put a fair price on the carbon emitted during the production of carbon intensive goods that are entering the EU, and to encourage cleaner industrial production in non-EU countries.

By confirming that a price has been paid for the embedded carbon emissions generated in the production of certain goods imported into the EU, the CBAM will ensure the carbon price of imports is equivalent to the carbon price of domestic production, and that the EU's climate objectives are not undermined. The CBAM is designed to be compatible with WTO-rules.

CBAM will apply in its definitive regime from 2026, while the current transitional phase lasts between 2023 and 2025. This gradual introduction of the CBAM is aligned with the phase-out of the allocation of free allowances under the EU Emissions Trading System (ETS) to support the decarbonisation of EU industry.

2.4.3. National sectoral policies and measures

The climate change mitigation targets are closely linked to the energy efficiency targets defined in the National Energy Independence Strategy, the National Renewable Energy Development Programme, the

Long-term Renovation Strategy, the Renewable Energy Law, the Alternative Fuels Law and the current NECP.

Lithuania's Strategy for Progress “Lithuania 2030” highlights the need for joint work to address challenges in the areas of sustainable development, the environment, energy, transport, the economy and strengthening democracy, but does not elaborate further. There is a strong focus on social responsibility and green growth.

The National Progress Plan (NPP) states that Lithuania aims to adequately implement Lithuania's commitments to sustainable development and climate change mitigation and to decouple economic growth from GHG emissions. The Plan’s Strategic Objective 6 aims to ensure good environmental quality and sustainability in the use of natural resources, to protect biodiversity, and to mitigate Lithuania's impact on climate change and build resilience to its impacts.

In this section, policies and measures are grouped and presented by sector. Detailed measures and the necessary policies in place are discussed under each of the sectors where GHG emissions and removals are to be improved, considering the long-term vision and objective of building a low-carbon economy and ensuring a balance between emissions and removals in line with the Paris Agreement.

The following are the policies and measures applicable to the ETS, non-ETS and LULUCF sectors that will be implemented or are planned to be implemented to achieve the GHG emission reduction targets by 2030.

2.4.3.1. Energy

Renewable energy sector

Lithuania has been proactive in developing renewable energy sources (RES), achieving its EU-mandated target of 23% RES in final energy consumption by 2020 as early as 2014. This progress has been guided by the National Energy Independence Strategy (NEIS), which sets ambitious long-term goals across various energy sectors. By 2030, Lithuania aims to reach a 55% share of RES in final energy consumption and 100% RES in electricity consumption.

In the transport sector, Lithuania plans to transition gradually to alternative fuels and electricity. By 2030, the RES share in transport is expected to reach at least 15.8% without applying multipliers from Directive 2018/2001 and surpass 29% with them. To achieve this, several measures have been implemented, such as increasing mandatory biofuel blending ratios to 6.6% for gasoline and 6.2% for diesel, calculated by energy value. Public procurement rules now require at least 100% of newly acquired passenger cars and buses to be non-polluting, and 16% of new heavy vehicles must also meet these standards by 2030. Advanced biofuels and other RES fuels are to comprise at least 3.5% of fuel suppliers’ balances by 2030, with biogas and non-biological gaseous fuels reaching a minimum 5.2% share of transport energy consumption. Additionally, the share of electric vehicles is expected to grow significantly, with 40% of annual new vehicle registrations required to be electric by 2030.

Lithuania has set the ambitious target of covering 100% of its electricity consumption with RES by 2030. To achieve this, the NEIS promotes the development of prosumers – electricity users who generate their own energy. The country aims to have at least 300,000 active and community energy participants by 2030, with community energy projects accounting for at least 1% of the national RES generation capacity.

In the heat sector, the primary goal is to fully decarbonize by 2050, transitioning to climate-neutral heating technologies. By 2030, RES must constitute at least 90% of the fuel mix in district heating, and by 2050, all heat energy should be produced from biomass and other RES. This strategy focuses on local RES development, flexible systems, and the deployment of modern, environmentally friendly technologies to ensure efficiency and investment appeal.

The Hydrogen Development Guidelines for 2024–2050 outline Lithuania's vision for integrating hydrogen technologies into industry, transport, and energy production. These guidelines set the foundation for developing flexible green hydrogen production, transport infrastructure, and a competitive market. By 2030, surplus RES capacity will support hydrogen production, and cooperation with international markets will facilitate exports. From 2030 to 2050, hydrogen technologies are expected to expand into sectors where fossil fuel dependency is particularly challenging to eliminate, with green hydrogen adoption in industry reaching 42% by 2030 and 60% by 2035. On 11th December 2024 m. by Governmental Resolution No. 1070 on the Approval of the **Action Plan for the implementation of the Hydrogen Development Guidelines in Lithuania in 2025–2027** was adopted. The Plan includes tasks and measures to create a green hydrogen ecosystem and infrastructure in Lithuania, to identify the main tasks and measures for green hydrogen development by 2030, which would implement Lithuania's energy independence goal and GHG reduction commitments, and to promote climate-neutral economic development of Lithuania.

Lithuania's broader renewable energy commitments include promoting innovative technologies, aiming for at least 5% of newly installed RES capacity to come from innovative solutions. Collaborative projects with other EU member states will also play a key role, with at least two joint projects planned by 2030. Additionally, Lithuania seeks to increase the share of RES in industrial energy use by 1.6 percentage points annually between 2021 and 2030, and to ensure that 49% of energy consumed in buildings comes from RES by 2030.

Energy efficiency

Improving energy efficiency (EE) is one of the key priorities in the energy sector until 2050, as established in the National Energy Independence Strategy (NEIS) approved in 2018 and updated in 2024. The NEIS goals in the field of energy efficiency are aligned. Lithuania, aiming to achieve these objectives, has identified the following priority directions:

- Promoting the comprehensive renovation of residential (apartment blocks and individual houses) and public buildings, with a focus on district-wide renovation, to save up to 18.6 TWh of energy by 2030.
- Encouraging the industrial sector to develop, adopt, and advance innovative, energy-efficient, and environmentally friendly technologies and equipment.
- Increasing EE in the transport sector by modernizing the vehicle fleet, transitioning to efficient public transport, optimizing transport infrastructure, and expanding the use of alternative fuels, including electrification.

In 2021 the Government of the Republic of Lithuania approved **the Long-term Renovation Strategy**, which aims for all public and private buildings in Lithuania to become completely independent from fossil fuels and achieve a zero-carbon footprint by 2050. The implementation plan for the Long-term Renovation Strategy was approved in 2022 by the Minister of Environment. One of the plan's key elements is district-

wide comprehensive renovation. In 2023 the Minister of Environment established a working group to develop a model for district-wide renovation and pilot projects, which will help refine this approach.

The Strategy sets out implementation indicators and intermediary targets for 2030, 2040, and 2050. Over the next three decades, the plan envisions creating favourable conditions for the cost-effective modernization of 440,000 buildings or about 110 million square meters of their total area. The strategy aims to reduce the annual primary energy consumption of the building stock by 60% compared to 2020 levels, transition from fossil fuel-based primary energy to renewable sources and achieve a 100% reduction in CO_2 emissions.

In the transport sector, the **National Climate Change Management Agenda (NCCMA)** sets the following EE goals by 2030:

- By 2027, all public transport, taxis, and ride-sharing vehicles in major cities will use only renewable energy sources.
- Zero-emission vehicles (electric and other) will comprise at least 20% of the light vehicle fleet, with a corresponding expansion of the required infrastructure.
- Increase the share of zero-emission vehicle purchases:
  - By 2025, M1 electric vehicles will make up at least 10%, and N1 vehicles at least 30% of annual purchases.
  - By 2030, M1 electric vehicles will comprise at least 50%, and N1 vehicles 100% of annual purchases.
  - Starting January 1, 2030, new registrations of internal combustion N1 vehicles will be prohibited, except for those powered by alternative fuels.
  - By December 31, 2030, ensure that all vehicles acquired through public procurement are zero-emission: 100% for M1, M2, M3, and N1 categories; 16% for N2 and N3 categories.
  - By 2035, reduce fossil fuel use in road transport by 50% and ensure that passenger and logistics services in cities use only zero-emission vehicles.

In total there are 53 existing and planned policy measures in the energy sector. In the table below policies and measures that have the most significant impact on GHG emissions or removals are presented.

Table 2-13. Existing and planned policy measures in the energy sector by 2030

No	Policy measures	Total GHG reduction effect, thous. t CO_2 eq. 2021-2030	Total fuel and energy savings, GWh
	Existing policy measures		
EE2-E	Renovation/modernisation of multi-apartment buildings	206.32	5,293.03
EE4-E	Agreements with energy suppliers on consumer education and advice	248.96	2,773.21
EE5-E	Relief for industrial companies from paying for services of general interest	110.27	4,227.70
EE6-E	Energy saving agreements with state and municipally owned companies	107.66	3,744.84
EE7-E	Replacing boilers with more efficient technologies	276.05	7,622.81

AEI9-E	Reduce CO_2 emissions from the LNG terminal	71.47	-
AEI10-E	Investment support for the installation of biomethane production and biogas purification plants	1,383.5	0.29
AEI12-E	Mandatory blending of biofuels into mineral fuels	1,372.6	1.78
AEI15-E	Developing green hydrogen production	193.97	-
AEI16-E	Renewal and/or modernisation of the heat transmission network and its installations/elements	65.52	0
AEI17-E	Promoting the use of RES in district heating	2,083.84	0.06
	Planned policy measures		
EE2-P	Renovation/modernisation of multi-apartment buildings	293.06	3,196.42
EE7-P	Replacing boilers with more efficient technologies	50.66	1,217.18
EE10-P	Renovation/modernisation of one- and two-apartment dwellings of natural persons	191.96	1,199.43
EE15-P	Renovation of non-residential buildings (Renovation/modernisation of non-residential buildings of legal persons)	156.61	526.12
AEI10-P	Investment support for the installation of biomethane production and purification facilities	191.88	0.18
AEI15-P	Developing green hydrogen production	556.37	-

Note. The measure number starting with "EE" belongs to the energy efficiency group and the measures starting with "AEI" belongs to the renewable energy sources group.

Descriptions of the policy measures:

EE2-E. Renovation/modernisation of multi-apartment buildings. Lithuania will continue to prioritise the renovation of multi-apartment buildings, reduce consumers' heating bills and improve living conditions in multi-apartment buildings. The Multi-apartment Building Renewal Programme will continue to be implemented. This existing measure runs from 2021–2026. The renovation of the building should result in a B or C class building and annual energy savings of 40% of the building's energy consumption. The measure should renovate around 2,269 apartment blocks by the end of 2026 and save 5.29 TWh of energy (2021–2026)

EE4-E. Agreements with energy suppliers on consumer education and advice. The aim of these agreements is to educate and advise consumers on energy-saving measures and solutions that change consumer behaviour and habits to improve energy efficiency. Energy suppliers will ensure the implementation of the scope of consumer education and advice, and the measures provided for in the agreements between them or through other parties. The implementation of this measure and the change in consumer behaviour is expected to result in energy savings of 2.77 TWh by 2030 (2021–2030).

EE5-E. Relief for industrial companies from paying for services of general interest. A support mechanism that will finance the implementation of energy efficiency improvement measures in all major Lithuanian industrial enterprises that consume more than 1 GWh of electricity per year. Companies will receive compensation for the implementation of energy efficiency improvement measures – they can recover 85% of the cost of the public service paid for electricity consumption exceeding 1 GWh in the previous calendar year, provided that the recovered funds are used to invest in energy saving measures. It is planned that energy efficiency measures will be installed annually, resulting in annual energy savings of around 77 GWh and 4.23 TWh of energy savings by 2030 (2021–2028).

EE6-E. Energy saving agreements with state and municipally owned companies. Energy companies will make energy savings in line with the energy levels specified in the energy savings agreements (by themselves or through others), by applying economically sound energy efficiency improvement measures at the end-users' installations (plant, equipment, transport). This measure is expected to result in annual savings of around 68 GWh and by 2030 around 3.75 TWh (2021–2030).

EE7-E. Replacing boilers with more efficient technologies. The implementation of the measures set out in the plan will achieve the key objective of replacing 50,000 boilers in households by 2030 and adopting other heat efficiency measures, which will result in savings of at least 139 GWh annually or 7.62 TWh by 2030. The plan is to upgrade 5,000 boilers per household each year. This measure will compensate up to 50% of the costs incurred by households not connected to the district heating supply system for the replacement of inefficient individual boilers with individual boilers using more efficient technologies (2021–2030).

AEI9-E. Reduce CO_2 emissions from the LNG terminal. The measure aims to reduce GHG emissions by up to 30% reduction of CO_2 emissions through the installation of an electricity interconnection from the LNG terminal to land. The effect of the measure is expected from 2028 (2023–2028).

AEI10-E. Investment support for the installation of biomethane production and biogas purification plants. The measure aims to finance biomethane production facilities, including biogas treatment plants. The aim is to create a production capacity of 1400 GWh of biomethane gas production by 2030. The construction of a gas pipeline to the common gas grid is not financed (2020–2030).

AEI12-E. Mandatory blending of biofuels into mineral fuels. Fuel outlets must sell petrol complying with Lithuanian or European standards, containing at least 6.6% biofuels based on the total energy value of the blend of fuels and biofuels (blending into A98-grade petrol is not compulsory), and diesel fuels, containing at least 6.2% biofuels based on the total energy value of the blend of fuels and biofuels (2022–2030).

AEI15-E. Developing green hydrogen production. The measure includes: 1) Developing green hydrogen production capacity in the transport sector. New green hydrogen (hydrogen produced by electrolysis using electricity from RES) production capacity will be developed for use in the transport sector to replace conventional fossil fuels and reduce GHG emissions (2023–2026). 2) Developing green hydrogen capacity (I). New green hydrogen production capacity (65 MW) will be developed in various sectors to replace the use of polluting fossil fuels (2023–2028). 3) Developing green hydrogen capacity (II). The plan is to finance the flexible development of green hydrogen production capacity (21 MW) to replace fossil fuels in various sectors, to help balance the electricity system and to produce hydrogen derivatives. The measure will contribute to increasing the flexibility capacity of the electricity system (2024–2030).

AEI16-E. Renewal and/or modernisation of the heat transmission network and its installations/elements. Modernisation of heat transmission network pipelines by replacing old (duct) type pipelines with new, ductless type pipelines, reducing technological losses in heat transmission and increasing the reliability of heat supply. Rehabilitation and modernisation of deteriorated heat transmission networks, 1000 km (2015–2023).

AEI17-E. Promoting the use of RES in district heating. The measure includes: 1) Promotion of small-scale biofuel cogeneration. This measure provides funding for cogeneration plants under construction up to 20 MWth and 5 MW of electrical capacity (total rated thermal output between 1 MW and 20 MW) (2019–2022). 2) Installation of small-scale biofuel cogeneration plants adapted to the combustion of logging residues. This measure provides funding for cogeneration plants up to 20 MWth and 5 MW of electrical

power (total rated thermal input up to 20 MW) (2023–2030). 3) Implement local and RES-based CHP projects, with priority given to Vilnius and Kaunas. In December 2016, Vilnius CHP plant was granted a €190 million loan from the European Investment Bank, secured by the European Fund for Strategic Investments – a key element of the Investment Plan for Europe. The Vilnius CHP plant will generate around 0.3 TWh of electricity. The plant will have a total electrical capacity of around 92 MW. The boiler will use only municipal waste left over after sorting and not suitable for recycling. The other two biofuel boilers, with a capacity of about 3 times that of the waste boiler, will use biofuels. The Kaunas CHP plant was not supported. A high-efficiency waste-fired cogeneration plant will be installed with an electrical capacity of about 26 MW. It will use municipal waste left over after sorting and not suitable for recycling, non-hazardous industrial waste and sludge from water treatment plants. This capacity will generate around 175 GWh of electricity annually. The activity also contributes to the flexibility of the electricity system (2014–2023). 4) Use of residual heat in central heating systems. Installations for recovering and adapting waste heat energy to the needs of central heating consumers. Heat can be recovered from wastewater treatment, from digital information data centres, from industrial plants, etc. (2023–2030). 5) Installation of heat storage tanks. The measure would install facilities to store the thermal energy produced by biofuel boilers. The accumulated "green" heat energy would be used to meet the peak demand of the heating system, avoiding the production of heat in fossil fuel plants. The final beneficiaries of the measure are heat suppliers, independent heat producers operating biofuel-fired heat production systems (2023–2030). 6) Installation of heat pumps. The adaptation of heat pumps in central heating systems is mainly related to the optimisation of the operation of biofuel systems and, for natural gas systems, to the reduction of the fossil fuel share in the balance sheet by replacing fossil fuel units wholly or partly with compressor heat pumps. The measure shall be implemented by heat suppliers and independent heat producers operating biofuel and/or natural gas fired heat production systems (2023–2030). 7) Construction of solar collector systems for district heating activities. The measure aims at reducing the use of primary fossil fuels or biofuels for energy production. The measure is implemented by heat suppliers and independent heat producers operating biofuel and/or natural gas fired heat production systems (2023–2030). 8) Construction of boilers burning biofuels produced from logging residues. The measure aims at diversifying the fuels used for heat production and reducing the use of fossil fuels. The measure is implemented by heat suppliers and independent heat producers operating biofuel and/or natural gas fired heat production systems (2023–2030).

EE2-P. Renovation/modernisation of multi-apartment buildings. This measure will be a continuation of the EE2-E measure and will be implemented between 2024 and 2030. The measure will require a multi-apartment building to be upgraded to class B and deliver 40% energy savings. By the end of 2030, 5,042 apartment buildings are to be renovated, of which 860 are to be renovated/retrofitted using standardised modular products (panels) manufactured in a factory from renewable natural organic resources. This measure is expected to result in total energy savings of 3.20 TWh by 2030 (2024–2030).

EE7-P. Replacing boilers with more efficient technologies. By 2030, 11,305 boilers will be replaced by heat pumps in households, which will result in savings of around 58 GWh per year and 1.22 TWh by 2030 (2025–2030).

EE10-P. Renovation/modernisation of one- and two-apartment dwellings of natural persons. The measure will be a continuation of the EE10-E measure, to be implemented from 2023–2030. It will provide a financial incentive for owners of individual houses to renovate their individual houses. The obligation is to achieve an energy performance class of at least B and to reduce the calorific thermal energy consumption (kWh/per square metre of useful floor area of the building (part of the building) per year) by

at least 40% compared to the calorific thermal energy consumption before the renovation/modernisation. In total, the measure plans to renovate 18,000 individual houses, which will result in energy savings of 1.12 TWh by 2030 (2024–2030).

EE15-P. Renovation of non-residential buildings (Renovation/modernisation of non-residential buildings of legal persons). Upgrade non-residential buildings to class B and save 40% of energy. This measure is expected to save 0.53 TWh of energy by 2030 (2024–2030).

AEI10-P Investment support for the installation of biomethane production and purification facilities. The measure aims to develop additional biomethane production capacity. The EU and Lithuanian regulatory environment and planned requirements for the management of agricultural waste and food waste are becoming increasingly stringent, resulting in an increasing amount of bio-based raw materials that can be used for energy production. Demand for biomethane is emerging not only in the transport sector, but also in other sectors such as industry, heating and agriculture. The RePower EU initiative foresees that EU biomethane production is set to increase to 35 billion cubic metres by 2030, and in this context, biomethane production capacity and deployment infrastructure needs to be proactively increased. The aim is to provide at least 600 GWh of additional biomethane production capacity, which together with the implementation of the AEI10-E measure would result in 2 TWh of biomethane production in 2030 (2026–2030).

AEI15-P. Developing green hydrogen production. The measure includes: 1) Developing green hydrogen capacity (III). The anticipated need, in line with Lithuania's hydrogen vision, to ensure flexible development of green hydrogen production, using the hydrogen produced to reduce GHG emissions, balance the electricity system and produce hydrogen derivatives. The planned electrolysis plant has a capacity of 996 MW (2024–2030). 2) Assessment of the development of hydrogen infrastructure. A feasibility study will be carried out together with the gas transmission system operators of neighbouring countries for the construction of a European hydrogen corridor linking Finland with Germany (Nordic-Baltic Hydrogen Corridor) (2024–2026).

Table 2-14. Indicative funding needs for existing and planned measures in the energy (energy efficiency and renewable energy sources) sector

Sector	Existing measures, mill. Eur		Available funding sources	Planned measures, mill. Eur		Possible funding sources
	Total funds	Public funds		Total funds	Public funds	
Energy efficiency (EE)	3,004.11	1,152.89	Climate Change Programme, Modernization Fund, EU investment funds (2014–2020 and 2021–2027), Recovery and Resilience Facility, Municipal Development Funds, State budget	6,774.93	2,038.82	Climate Change Programme, Modernization Fund, EU investment funds (2021–2027), returned loans to Energy Efficiency or Municipal Development Funds, State budget, other sources
Renewable energy sources (RES)	2,417.67	1,806.05	Climate Change Programme, EU investment funds (2014–2020 and 2021–2027), Recovery and Resilience Facility, other sources	3,237.4	1,047.4	Climate Change Programme, Modernization Fund, *Connecting Europe Facility* (CEF), State budget, other sources

2.4.3.2. Transport (including international transport)

Obligations for the transport sector are enshrined in Objective 6.1 “Increase the share of energy from renewable energy sources and the use of alternative fuels in the transport sector, promote sustainable intermodal mobility and reduce environmental pollution caused by transport” of the 6th objective **of the National Progress Plan (NPP)** “Ensure good environmental quality and the sustainability of the use of natural resources, conserve biodiversity and mitigate Lithuania's impact on climate change and increase its resilience to its effects”.

The Transport Development Programme for 2022–2030 (the “Transport Development Programme”) has also been developed in line with the objectives of the NPP for the transport sector. This Programme aims to formulate the state policy in the areas of the functioning of the transport system and the development of all modes of transport infrastructure, electronic communications and the postal service, as well as to formulate the state policy in the areas of traffic safety, transit, logistics and combined transport, passenger and freight transport by rail, road, sea, inland waterway and air, and to organise, coordinate and control the implementation of these operational objectives. The objectives set out in the NPP will be pursued through the implementation of tasks, the cross-cutting outcome of which will ensure the implementation of the horizontal principles of sustainable development, innovation (creativity) and equal opportunities for all in the field of transport, as well as the solution of identified problems and the elimination of the causes of the problems.

Specifically the implementation of objective 6.1 “Increase the share of energy from renewable energy sources and the use of alternative fuels in the transport sector, promote sustainable intermodal mobility and reduce environmental pollution caused by transport” contributes to the reduction of GHG and nitrogen oxide (NO_x) emissions in transport; increasing the share of renewable energy sources in total energy consumption in the transport sector and energy savings in the transport sector; increasing the share of cycling and other non-motorised transport in the total travel pattern and the share of train travel in the total travel pattern; and increasing the share of rail and inland waterway transport in total freight transport.

The Law on Alternative Fuels of the Republic of Lithuania provides for the development of the use of alternative fuels in the transport sector in the Republic of Lithuania. The aim of this Law is to reduce the impact of the transport sector on climate change and air pollution, so that by 2030 the share of renewable energy sources in the transport sector in relation to total final energy consumption is at least 15%. This objective is achieved by consistently increasing the diversity of energy sources in the transport sector, by imposing obligations on fuel suppliers to supply fuel from renewable energy sources, by increasing the use of advanced biofuels, by promoting the use of electricity in transport, by developing the infrastructure for alternative fuels, by increasing the number of clean vehicles registered in Lithuania and by setting requirements for public procurement in the transport sector. By 2030, 60,000 charging points should be installed in the Republic of Lithuania, of which 6,000 should be publicly accessible. Amendments to the law are currently being drafted to consider the provisions of the EU Regulation (EU) 2023/1804, which entered into force.

The National Air Pollution Reduction Plan aims to limit national emissions of SO_2, NO_x, NH_3, $PM_{2.5}$ and NMVOCs from anthropogenic sources to ambient air to meet the 2020 and 2030 targets set in the Environmental Strategy for Lithuania. The road transport sector is the largest contributor to NO_x emissions. Although NO_x emissions from trucks and buses decreased by 29.5% in 2022 compared to 2005, their share in the total NO_x emissions structure in 2022 was as high as 35.3% of total NO_x emissions. The passenger

car sector is also important, accounting for more than 18.4% of total NO_x emissions in 2022. One of the priorities for ambient air protection highlighted by the Environmental Air Protection Act is the reduction of vehicle emissions by reducing the use of internal combustion engine vehicles and increasing the use of electric vehicles.

The Action Plan for the Development of Electric Vehicle Use and Charging Infrastructure aims to set out measures and actions to increase the use of electric vehicles and to ensure the effective development of electric vehicle charging infrastructure in Lithuania in the period 2022–2030. The number of electric vehicles is projected to reach at least 262,248 by 2030. The Plan will be updated to consider the amendments to the Law on Alternative Fuels and the provisions of the EU Regulation (EU) 2023/1804 which entered into force.

The Roadmap for the development of hydrogen refuelling infrastructure and the promotion of hydrogen powered road vehicles in Lithuania aims to provide targets and measures to ensure the development of hydrogen refuelling infrastructure and to promote the use of hydrogen powered vehicles in Lithuania for the period 2023–2030. The objective is to have at least 10 hydrogen refuelling stations (public and private) on the territory of Lithuania by 2030 and at least 5% of all new vehicles purchased in the country to be hydrogen powered.

In total there are 53 existing and planned policy measures in transport sector. In the table below policies and measures that have the most significant impact on GHG emissions or removals are presented.

Table 2-15. Existing and planned policy measures in the transport sector by 2030

No	Policy measures	Total GHG reduction effect, thous. t CO_2 eq. 2021–2030	Total fuel and energy savings, GWh
	Existing policy measures		
T1-E	Promoting the purchase of electric cars	709.07	2,287.77
T2-E	Promoting alternative fuels infrastructure and vehicles	1,029	2,414.2
T3-E	Electrification of railways and rolling stock	315.05	750.31
T4-E	Promoting intermodal transport	155.86	581.76
T5-E	Promoting less polluting mobility modes	115.09	482.86
T6-E	Car registration tax	152.89	127.21
T8-E	Electronic tolls in freight transport	344.59	1,342.67
T9-E	Traffic congestion reduction	365.18	1,395.95
T11-E	Renewal of vehicles through green procurement	277.44	1,685.60
T13-E	Electric car charging infrastructure	547.21	1,625.18
T14-E	Environmentally friendly driving	174.84	709.90
T15-E	Implementation of sustainable mobility measures	527,22	2,378,70
T23-E	Promoting sustainable mobility	134.56	551.21
T27-E	Law on excise duties	769.03	7,435.06
T28-E	Implementation of ETS2	283.14	2,584.74
	Planned policy measures		

T1-P	Promoting the purchase of electric cars	98.37	346.57
T2-P	Promoting alternative fuels infrastructure and vehicles	333.93	732.49
T4-P	Promoting intermodal transport	164.66	614.62

Descriptions of the policy measures:

T1-E. Promoting the purchase of electric cars. This measure aims to reduce pollution in the transport sector by encouraging the acquisition and use of electric vehicles (EVs) through a series of measures planned for 2022–2030. From 2022 to 2027, subsidies are provided for individuals to purchase new or used (up to 4 years old) passenger EVs and for businesses to acquire new passenger (M1) and commercial (N1) EVs. Between 2023 and 2026, the public sector receives support to adopt zero-emission vehicles, such as electric or hydrogen-powered cars. In rural areas, measures are implemented from 2022 to 2030 to replace polluting public transport with EVs, introduce charging infrastructure, and enable on-demand services like social taxis. Starting in 2030, registration of fossil-fuel-powered N1 vehicles will be banned, except for those using alternative fuels. Additional initiatives include tax exemptions for commercial EVs and hydrogen-powered vehicles (2023–2030), with a 75% road tax reduction beginning in 2026. From 2023, VAT deductions are allowed for EV purchases up to €50,000 (including VAT). Notably, during 2021–2022, over 2,600 EVs were purchased with financial incentives provided to individuals and businesses.

T2-E. Promoting alternative fuels infrastructure and vehicles. The measure includes: 1) Promoting the acquisition of clean public transport vehicles (2017–2023). Financial incentives for the purchase of alternative fuel buses (electric or natural gas) in categories M2 or M3. Under the measure, 189 public transport vehicles have been purchased in Lithuania, including 90 trolleybuses, 51 electric buses and 48 buses powered by compressed natural gas, through projects financed by EU funds from 2014–2020 and national funds. 2) Development of a zero-emission urban and suburban public transport fleet and the necessary charging/refuelling infrastructure (2024–2029). Financial incentives for the purchase of fully clean (electric or hydrogen) M2 or M3 buses and the development of the necessary charging/refuelling infrastructure; 3) Promotion of the production/conversion of electric public transport vehicles (2024–2026). Financial incentives to promote the production of clean (electric) M2 or M3 buses and the conversion of polluting fossil fuel buses to clean (electric) M2 or M3 buses; 4) Establishment/development of charging/refuelling infrastructure for alternative fuels (electricity, biogas and hydrogen) (2023–2027). Financial incentives for the creation and development of public compressed biogas refuelling points, public hydrogen refuelling points, public charging infrastructure for heavy electric transport; 5) Encouraging the purchase of heavy duty (categories N2, M2, N3 and M3) vehicles powered by alternative fuels (2024–2030). Financial incentives for the purchase of clean and zero-emission vehicles powered by electricity, hydrogen or biogas produced from Directive (EU) 2018/2001 (RED II) compliant raw materials; 6) National legal and regulatory measures for the development of alternative fuels infrastructure (2023–2030). National development targets and measures to promote change are identified; 6) EU legal and regulatory framework for the development of alternative fuels infrastructure (2023–2030). Requirements and scopes for the development of publicly accessible charging/refuelling infrastructure at identified locations.

T3-E. Electrification of railways and rolling stock. The measure includes 1) Railway Electrification 2016–2023 and 2) Railway Electrification 2022–2027. It foresees the renewal, improvement and extension of the 1520 mm gauge railway infrastructure (including the construction and electrification of second tracks) in transport corridor IX B, the electrification of the Vilnius node, the electrification of the Kaišiadorys-Radviliškis, Radviliškis-Klaipėda sections (total of about 420 km), and the electrification of the electrified

Rail Baltica railway line in Lithuania (394 km); 3) Acquisition of trains powered by alternative energy sources to provide public services (2024–2028). Replacement of non-compliant diesel trains with modern, environmentally friendly electric and battery trains for passenger transport; 4) Installation of charging infrastructure for battery trains (2023–2026). Installation of charging bays for charging battery trains on non-electrified sections of part of the routes.

T4-E. Promoting intermodal transport. Promoting intermodal transport on the 1520 mm network (2022–2023). The measure has been implemented by adapting flat wagons of a defined model (manufacture and installation of reusable semi-trailer attachments).

T5-E. Promoting less polluting mobility modes. The measure includes financial incentives for natural persons who have surrendered a polluting passenger car that has been in service in Lithuania for a specified period of time as an end-of-life vehicle: 1) Compensatory allowance for the purchase of a low-emission car; 2) Compensatory allowances for the purchase of alternative means of transport such as bicycles, e-scooters, e-bikes, public transport passes, or ridesharing; 3) Compensatory allowances to the poor for the purchase of a less polluting car (2020–2025).

T6-E. Car registration tax. The Law on Registration Tax on Motor Vehicles of the Republic of Lithuania establishes that from 1 July 2020, registration of passenger cars and light goods vehicles (M1 and N1 categories) will be subject to a registration tax, depending on the type of fuel and their combinations, and when the CO_2 emissions exceed more than 130 g/km (2020–2030).

T8-E. Electronic tolls in freight transport. The measure includes: 1) Implementation of E-tolling for freight transport (2026–2030). Introduction of a new road charging system E-tolling, where the charge is not based on time but on distance travelled, encouraging vehicle operators and users to move away from empty mileage, consolidate shipments, optimise routes, use environmentally friendly vehicles, and purchase less polluting (higher EURO class) vehicles; 2) Road charging based on Euro-classes of vehicles and concession for the least polluting vehicles (2024–2030). The range of tariff levels will be linked to the EURO class of vehicles. The highest Euro class will also include non-polluting vehicles and will be subject to the lowest rate.

T9-E. Traffic congestion reduction. The measure includes: 1) Changes in traffic organisation through traffic planning measures (flow distribution, peak hour traffic restrictions) and/or smart traffic control technology (smart traffic lights, crossings, etc.) (2021–2030); 2) Recommendations to municipalities covering spatial planning solutions contributing to efficient traffic organisation (optimal location of public transport recharging points, development of commercial areas in line with traffic volume, etc.) 3) Educating and informing employers and employees on the use of flexible working time options (remote work, flexible start and end times, additional days off, etc.) to reduce the number of journeys to and from work (2019–2030).

T11-E. Renewal of vehicles through green procurement. The measure implements a change in the legislative framework to increase the use of clean vehicles and reduce the number of conventionally fuelled vehicles in line with the necessary public procurement targets (2022–2030).

T13-E. Electric car charging infrastructure. The measure includes: 1) Development of publicly accessible charging infrastructure (2023–2029). Financial incentives for the acquisition/installation of publicly accessible charging points in municipalities according to prepared plans and on private initiative, alongside public roads on private initiative; 2) Development of public charging infrastructure (for light and

heavy transport) (2024–2026). Financial incentives for the development of publicly accessible charging infrastructure alongside the trans-European transport network roads and in other locations as required by the EU; 3) Development of primary public charging infrastructure for electric vehicles (2021–2022). With financial incentives, the first 160 charging bays will be installed in municipalities and on major national roads. 4) Development of private EV charging infrastructure (2022–2027). Financial incentives for the acquisition/installation of private charging bays in locations where EVs spend most of their time parked: private properties, apartment blocks, courtyards, parking lots, workplaces, etc. Private charging infrastructure is promoted by providing smart charging features; 5) Legal and regulatory incentives to develop charging infrastructure: Adoption of an action plan for the development of electro-mobility; level playing field for operators to install and develop publicly accessible charging points alongside national roads; changes to road traffic rules to increase the attractiveness of electric vehicles; Compensation for connection of charging infrastructure to the electricity grid, simplification of conditions for connection to the electricity grid, implementation of separate metering of electricity per consumption facility, ensuring separate metering of charging of electric vehicles, possibility to participate in the fuel from renewable energy sources accounting system, obligations to ensure publicly available charging infrastructure capacity per electric vehicle (2021–2030); 6) EU legal and regulatory obligations for the development of charging infrastructure under the Regulation 2023/1804/EU on the deployment of alternative fuels infrastructure, which foresees the provision of public charging infrastructure for light and heavy vehicles on the territory of the EU Member States by 31 December 2030 at the latest, in accordance with the requirements set out in the Regulation (capacity, distances, etc.), so as to allow the seamless movement of electric cars and trucks across the EU (2023–2030).

T14-E. Environmentally friendly driving. Driving schools have already included eco-driving training in their driver training programmes since 2010, and JSC "Regitra" has been successfully testing the knowledge and skills of economical and eco-driving in its driving tests since 2014. As a result, new drivers are familiar with the principles of eco-driving. However, those who have previously learned to drive may not have the knowledge of eco-driving, and it is therefore planned to develop a publicly accessible eLearning platform/computer-based eLearning programme for economical and eco-driving in cyberspace, in order to enable every member of the public to benefit from information and communication technology tools and to receive high quality and effective training in economical and eco-driving (2021–2030).

***T23-E. Promoting sustainable mobility*.** The measure includes: 1) Making public transport more attractive by making fares lower/free, allowing faster travel, convenient transfers, and access to electric car sharing, bike rental (2023–2030); 2) Implementation of JSC "Lietuvos geležinkeliai" smart ticketing system with new ticketing channels, loyalty system based on CO_2 consumption history and adapted for persons with disabilities (2024-2030); 3) Harmonisation of passenger train and public road passenger transport timetables, setting up of places for electric car sharing, bicycle rental services (2023–2030); 4) Convenient interchanges at inland waterway and maritime passenger ports to public road transport, if compatible, rail transport, use of electric car sharing, bicycle rental facilities (2023–2030); 5) Increasing the attractiveness of public transport by allowing faster movement along defined routes (2023–2030); 6) Keep public transport fares under constant review or at a discount (2023–2030); 7) Revision of bus stop layout, routes and timetables, with inter-coordination between urban/suburban/intercity and long-distance routes (2023–2030).

***T27-E. Law on excise duties*.** From 2024, the excise duty reductions (or their scope) for heating gas oil, coal, coke, lignite, LPG for heating (bottled and unbottled in household gas cylinders) are phased out or

reduced, and the excise duty rates for gas oil, coal, coke and lignite are gradually increased over the period from 2024–2026. Excise duties are introduced on a new fuel, peat for heating purposes, and gradually increased (to prevent this polluting fuel from becoming an alternative to coal) (from 2024). From 2025, the amendments to the Excise Duty Law will add to the excise duty rates on petrol, kerosene, diesel, gas oil for heating, petroleum gas and gaseous hydrocarbons (except for non-business heating), coal, coke, lignite, fuel oil, and orimulsion a CO_2 component proportional to the CO_2 emissions of the fuel type in relation to calorific value, which will be increased proportionately each year from 2025 to 2030 (from 2025). In addition (to the CO_2 component of €60/1000 l already introduced from 2025), a safety component will be introduced from 2025 for gas oils for agricultural use, which will amount to €25/1000 l in 2025 and €50/1000 l in the period 2026–2030.

T28-E. Implementation of ETS2. The ETS2 system is levied on fuel suppliers who supply fossil fuels or fuels to the market. The amount of fuel supplied is converted into tonnes of CO_2 and for each tonne of CO_2, fuel suppliers will have to pay with allowances purchased on the market. The aim is to accelerate the phase-out of fossil fuels and the increased use of renewable energy sources (from 2027). A public awareness campaign will also be carried out to raise the awareness of the population and small businesses about the inclusion of the heating and transport sectors in the ETS, and the implications for fuel prices and the possibilities to change their heating and transport choices.

T1-P. Promoting the purchase of electric cars. Financial support measures for purchasing EVs and developing or upgrading charging infrastructure will remain in place until EVs constitute at least 10% of all registered passenger cars in the country. For individuals, funding supports the acquisition of new and used M1 category electric cars. For businesses, funding is available for purchasing new M1 and N1 categories electric cars, with specific measures planned for 2026–2030.

T2-P. Electrification of railways and rolling stock. The measure includes: 1) Upgrading urban and suburban public transport by promoting the use of vehicles powered by alternative fuels (electricity and hydrogen) (2027–2030); 2) Promotion of the development of charging and refuelling infrastructure for alternative fuels (electricity and hydrogen) (2026–2030); 3) Promotion of the use of heavy duty vehicles of categories N2, M2, N3 and M3 powered by alternative fuels (2025–2030); 4) Digital solutions to optimise the flow of freight and to reduce empty mileage (2024–2030); 5) Assessment of the technical feasibility of connecting charging infrastructure to the electricity transmission grid and review of the pricing of the electricity transmission service associated with charging infrastructure (2026–2030).

T4-P. Promoting intermodal transport. The measure includes: 1) Promotion of intermodal transport on the 1435 mm network in the Italian direction (2023–2030); 2) Promotion of intermodal transport on the 1435 mm network (2022–2030); 3) Technical development of the intermodal terminals of Vilnius and Kaunas (2022–2025). The aim is to adapt the terminals to semi-trailer handling and to higher container flows; 4) Adjusting the tax base to favour the least polluting mode of transport (e.g. increase of road tolls for trucks, compensation of railway infrastructure tax, etc.) and promotion of less polluting freight transport (2025–2030). 5) Feasibility study on the transfer of heavy goods transported through Lithuania to railways (2024–2030). To transfer freight that has reached the Lithuanian border onto rails where possible and to continue transporting it by rail, it is necessary to determine the feasibility and effectiveness of such a measure by means of a feasibility study.

Table 2-16. Indicative funding needs for existing and planned measures in the transport sector

Existing measures, mill. Eur		Available funding sources	Planned measures, mill. Eur		Possible funding sources
Total funds	Public funds		Total funds	Public funds	
4,055.2	1,576.0	Climate Change Programme, Modernization Fund, EU investment funds (2014–2020 and 2021–2027), Recovery and Resilience Facility, other sources	2,796.32	480.53	Climate Change Programme, Modernization Fund, EU investment funds (2021–2027) including Connecting Europe facility (CEF), Social Climate Fund, EU ETS-2 resources, other sources

International transport

On EU level the following policies and measures for GHG emissions from international transport are currently in place:

- The EU Emissions Trading System, which covers emissions from international aviation and international maritime transport. Aviation activities have been included in the EU ETS since 2012. Starting from 1 January 2024, the EU ETS has been extended to cover CO_2 emissions from large ships entering ports in the European Economic Area regardless of the flag they fly. For more information see Section 2.4.2.2.
- ReFuel EU Aviation, which aims to increase both demand and supply of sustainable aviation fuels. The ReFuelEU Aviation Regulation[22], which entered into force in November 2023, aims to increase both demand for and supply of sustainable aviation fuels (SAF). It obliges aviation fuel suppliers at EU airports to gradually increase the minimum share of SAF supplied to aircraft operators from 2% in 2025 to 70% in 2050. Airports are required to guarantee that aircraft operators can access all the necessary infrastructure to deliver, store and refuel with the required shares of SAF.
- Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) was adopted to address CO_2 emissions from international aviation, which oblige airlines to offset the growth of their CO_2 emissions post-2020. Under CORSIA, all airline operators with annual emissions greater than 10 000 tonnes of CO_2 are required to report their emissions from international flights on an annual basis since 1st January 2019. CORSIA is implemented in three phases: a pilot phase (2021–2023), a first phase (2024–2026), and a second phase (2027–2035). For the first two phases (2021–2026), participation is voluntary. From 2027 onwards, participation will be determined based on 2018 revenue tonne kilometres (RTK) data. From 2021 until 2026, only flights between states that volunteer to participate in the CORSIA pilot and/or first phase will be subject to offsetting requirements. Offsetting requirements started from 2021. At the end of each 3-year compliance period, operators will have to demonstrate that they have met their offsetting requirements by cancelling the appropriate number of emissions units.

[22] Regulation (EU) 2023/2405 on ensuring a level playing field for sustainable air transport (ReFuelEU Aviation), https://eur-lex.europa.eu/eli/reg/2023/2405/oj

- The FuelEU Maritime Regulation[23], which enters into force in 2025, lays down rules limiting the GHG intensity of the energy used on board ships above 5,000 gross tonnage calling at European ports, regardless of the flag they fly. The rules apply to 50% of the energy used for voyages starting or ending outside the EU and 100% of the energy used for voyages between two EU ports. The annual average reduction in greenhouse gas intensity will gradually increase (-2% in 2025 to -80% in 2050 compared to the average in 2020). The targets cover not only CO_2 but also CH_4 and N_2O.

In addition to EU level policies and measures, on national level Lithuania has developed following measures to reduce GHG emissions from international transport:

- T26-E. Development of sustainable airport infrastructure: ensuring electricity supply for aircraft parked at the airport at Vilnius, Kaunas and Palanga airports (2024–2030).
- T26-P. Development of sustainable airport infrastructure. The measure includes: 1) implementation of sustainable aviation fuel supply infrastructure; 2) upgrading of airport infrastructure by installing new or adapting existing aircraft parking areas according to the criteria required for servicing hydrogen and/or electric aircraft (2024–2030).
- T30-E. Use of alternative fuels in the port of Klaipėda. Installation of public hydrogen refueling points: for sea, land transport and (or) mobile (2023–2026).
- T31-E. Development of electricity supply in the seaport. Installation of an electricity supply system for moored ro-ro and ro-pax ships in the port of Klaipėda. Central Klaipėda Terminal (CKT) plans facilities at three existing berths, Klaipėda Container Terminal (KKT) – at one existing berth. Shore power connections will allow ferries to turn off auxiliary engines and provide ships with electricity during their stay in the port, the energy required for hotel operations will also be obtained from the shore power grid (2026).
- T34-E. Port Environmental Review System (PERS). A port sector-specific Port Environmental Review System (PERS) has been implemented, adapted to ensure effective port environmental management. PERS is based on the policy recommendations of the European Sea Ports Organization (ESPO), the scheme is specifically designed to help port authorities achieve compliance with legal acts and ensure sustainable development of port activities, protect the environment, and address climate issues (2023–2025).
- T25-P. Development of electricity supply in the seaport. The measure includes: 1) installation of an electricity supply system for moored ships in the port of Klaipėda; 2) ensuring the seaport's minimum electricity supply infrastructure for maritime containers and passenger ships (2024–2030).

2.4.3.3. IPPU

Obligations for industry related to the transition to climate neutrality are set out in the strategic documents of the Republic of Lithuania.

Article 4, Clause 4.1 of the **Law on Energy Efficiency** of the Republic of Lithuania establishes that the Ministry of the Economy and Innovation is responsible for implementing energy efficiency measures in the

[23] Regulation (EU) 2023/1805 of the European Parliament and of the Council of 13 September 2023 on the use of renewable and low-carbon fuels in maritime transport, and amending Directive 2009/16/EC

industrial sector from January 1 of 2021 to December 31 of 2030. These measures aim to achieve mandatory energy savings of no less than 5,456 GWh.

The National Climate Change Management Agenda (NCCMA) defines the following national climate change mitigation goals and tasks for industry to meet GHG emission reduction targets by 2030:

For sectors participating in the EU ETS:

- Enhance energy efficiency in the industrial sector by promoting the replacement of polluting technologies with cleaner alternatives, applying circular economy principles to conserve resources and prevent waste, implementing advanced solutions, and introducing new business models.
- Promote the transition to less polluting industrial processes and raw materials in major industries through programs that improve and retrain workforce skills, ensuring a just transition to less climate-harmful technologies.
- Encourage industrial enterprises to become energy-producing consumers by utilizing RES.
- Foster the use of hydrogen in industrial processes, such as in fertilizer and other product manufacturing.
- Support pilot projects for green hydrogen production to help reduce industrial process impacts on climate change and environmental pollution and diversify traditional fuel and raw material types in the industrial sector.
- Promote waste-free and low-waste production, circular economy models, reuse and/or recycling of waste, and industrial symbiosis in industrial enterprises.
- Encourage the efficient use of resources, secondary raw materials, and climate-friendly raw materials to achieve by 2025 a circularity rate index not lower than the EU average (11.9% in 2019).
- Promote industrial process innovations that reduce energy consumption and support industrial reorientation and digitalization projects.

For sectors not participating in the EU ETS, aiming to reduce GHG emissions by at least 19% by 2030 compared to 2005 levels:

- Implement innovative, energy-efficient technologies, fostering a competitive circular economy and bioeconomy based on biomass raw materials.
- Reduce the use of fluorinated GHGs in the domestic market by 79%, replacing them with alternatives and tightening import and use controls.
- Rapidly expand RES and industries producing alternatives to fossil fuels.
- Improve energy efficiency to achieve 5.45 TWh of energy savings and increase the use of RES and alternative fuels in industry.
- Promote waste-free and low-waste production, circular economy models, and recycling through an eco-innovation index of 122 by 2025 and 133 by 2030.
- Reduce the use of natural resources by promoting the reuse of materials, products, and waste; implement circular economy goals across all economic sectors; and ensure material recovery rates of 8.1% by 2025 and 10.6% by 2030, with a circularity rate index not lower than the EU average by 2025.
- Encourage energy-intensive enterprises to adopt energy efficiency measures.
- Ensure that all public buildings are constructed with at least 50% organic and wood-based materials, actively using secondary raw materials and reducing construction waste.

The above-mentioned obligations for Lithuanian industry are enshrined in the **National Progress Plan (NPP)**. To achieve the first objective, "Transition to a sustainable economic development model based on scientific knowledge, advanced technologies, and innovation, while enhancing international competitiveness," objective 1.4 "Reorient industry towards a climate-neutral economy" has been set. The Ministry of the Economy and Innovation is responsible for achieving this task's impact indicators, including changes in GHG emissions in the industrial sector compared to 2005 levels, energy savings in the industrial sector, and others.

In total there are 23 existing and planned policy measures in industrial processes and product use sector. In the table below policies and measures that have the most significant impact on GHG emissions or removals are presented.

Table 2-17. Existing and planned policy measures in industrial processes and product use sector by 2030

No	Policy measures	Cumulative GHG reduction effect, thous. t CO_2 eq. 2021–2030	Total fuel and energy savings, GWh
	Existing policy measures		
P1-E	Reducing fluorinated gases	184.75	-
P2-E	Improving energy efficiency	795.44	6,545.70
P5-E	Replacing polluting technologies	691.34	608.87
P12-E	Improving energy efficiency in enterprises	96.56	4,830.20
P15-E	Innovative green products and services	95.92	481.49
P19-E	Decarbonisation of industry	356.2	1,189.23
P22-E	Promoting industrial change	114.9	4,572.38
	Planned policy measures		
P17-P	Deployment of alternative fuels	199.9	311.05
P19-P	Decarbonisation of industry	116.3	361.69

Descriptions of the policy measures:

P1-E. Reducing fluorinated gases. The measure includes: 1) The implementation of Regulation (EU) No 2024/573 of the European Parliament and of the Council of 7 February 2024 on fluorinated greenhouse gases, amending Directive (EU) 2019/1937 and repealing Regulation (EU) No 517/2014, which will result in a reduction of emissions from the use of fluorinated gases by 2030 by two thirds compared to 2014 levels (2015–2030); 2) The Kigali Amendment to the Montreal Protocol to ensure global climate protection from the use and production of hydrofluorocarbons (HFCs) – greenhouse gases with a high global warming potential (2019–2032).

P2-E. Improving energy efficiency. The measure includes: 1) Payment relief for services of general interest for industrial companies participating in the EU ETS, i.e. companies will be compensated for the implementation of energy efficiency improvement measures, equivalent to the measure EE5 (2021–2028); 2) The deployment of energy-efficient production technologies for energy-using manufacturing enterprises participating in the EU ETS in the large- and medium-size manufacturing sector, i.e. the digitalisation,

upgrading, modernisation, optimisation, automation and optimisation of the manufacturing processes (2023–2030).

P5-E. Replacing polluting technologies. Actions for companies participating in the EU ETS: 1) Replacing polluting production technologies with less polluting ones, implementing best available techniques, etc. (2020–2021); 2) promotion of investments in the production and use of RES electricity in manufacturing industry, including investments in physical assets (equipment, technologies) that lead to GHG emission reductions and ensure continued environmental performance (2023–2030).

P12-E. Improving energy efficiency in enterprises. The measure includes: 1) Incentives for energy efficiency audits in industrial enterprises. Based on the results of the audits, investments will be made to improve energy efficiency and reduce its intensity by enabling industrial enterprises to invest in the application of the latest and environmentally friendly equipment and technological solutions in their production processes, ensuring the continuity of these production processes, i.e. the renewal of the necessary technological equipment and infrastructure of existing technological processes (2022–2027); 2) Energy efficiency training in industrial enterprises to provide education and competence building in the field of energy efficiency (2022–2027).

P15-E. Innovative green products and services. A financial instrument and a dedicated knowledge exchange platform will be set up to promote the development of environmentally friendly products and technologies. The measure aims to establish green hubs (Hubs for Circularity). These hubs would foster green and digital transformation. Possible activities of the hubs: a) investment in infrastructure; b) Investment in ecosystem facilitation and international networking; c) advisory services for green innovation; d) Investment in high technology readiness level (6-9) R&D activities (2022–2026).

P19-E. Decarbonisation of industry. The measure aims to encourage companies to invest in energy efficiency improvements and to replace polluting technologies with less polluting ones. It supports investments in tangible assets (equipment, technologies) that increase energy efficiency and reduce the negative environmental impact of economic activities and ensure a continued environmental performance, i.e. investments in cleaner production innovations, digitisation, modernisation, optimisation and automation of production processes, which increase the efficiency of the use of energy and/or raw material resources and contribute to the reduction of GHG emissions (2025–2030).

P22-E. Promoting industrial change. As part of the implementation of the European Green Deal in the industry, the provision of debt financing (subordinated loans, syndicated loans, direct loans) to improve the availability of finance for companies investing in transformation (change) by increasing circularity, investing in decarbonisation and energy efficiency, the deployment of environmentally friendly, low-impact, innovative and digital technologies, the production of high value-added products with a low CO_2 footprint in the fields of the defence and security industry (2024–2026).

P17-P. Deployment of alternative fuels. The activities of measure T17-E would continue (2025–2027).

P19-P. Decarbonisation of industry. The activities of measure T19-E would continue (2027–2030).

Table 2-18. Indicative funding needs for existing and planned measures in industrial processes and product use sector

Existing measures, mill. Eur		Available funding sources	Planned measures, mill. Eur		Possible funding sources
Total funds	Public funds	Climate Change Programme, Modernization Fund, EU funds (2014–2020 and 2021–2027), Recovery and Resilience Facility, Just Transition Fund, other sources	Total funds	Public funds	Climate Change Programme, Modernization Fund, next Multiannual Financial Framework (MFF), Recovery and Resilience Facility, other sources
2,951.31	1,760.04		235.47	96.94	

2.4.3.4. Agriculture

The National Climate Change Management Agenda (NCCMA) establishes the following climate change mitigation goals and tasks for the agricultural sector to be achieved by 2030:

- Implement innovative technologies, promote sustainable farming practices, and increase the added value across all branches of agriculture;
- Ensure efficient, cost-effective, and environmentally friendly use of fertilizers, aiming to reduce the use of nitrogen-based mineral fertilizers in agriculture by at least 15% compared to 2020 levels;
- Promote innovative, pollution-reducing livestock farming technologies and practices, including advanced cattle feeding methods, digitization of livestock farms, and productivity research;
- Enhance the sustainability of manure and slurry management to reduce methane, nitrous oxide, and ammonia emissions in livestock farming, ensuring that at least 70% of all manure and slurry generated is managed sustainably;
- Implement measures to reduce the direct and indirect release of nitrogen compounds into the environment due to agricultural activities;
- Double the area of organic farming compared to 2020 levels;
- Ensure that 50% of swine and cattle manure is used for biogas production;
- Encourage the use of scientifically proven, safe alternative methods for crop protection against pests and diseases, reduce the use of chemical pesticides, and expand the integrated pest management system;
- Shorten the food supply chain to bring it closer to consumers and promote urban agriculture to reduce transportation needs and distances;
- By no later than 2025, develop and implement a GHG accounting system at the farm level.

To achieve the sixth strategic objective of the **National Progress Plan (NPP)** – "Ensure good environmental quality, sustainable use of natural resources, protect biodiversity, mitigate Lithuania's impact on climate change, and increase resilience to its effects" sustainable activities based on bioeconomy principles are planned in the agriculture, forestry, and fisheries sectors (Progress Task 6.2). This includes expanding environmentally friendly farming and promoting the adoption of low-GHG emission technologies. A sustainable farming policy will be implemented, emphasizing the efficient use of mineral fertilizers and pesticides to reduce water pollution from nitrogen and phosphorus compounds and air pollution from ammonia. Efforts will be made to strengthen knowledge among economic operators about the

consequences of climate change, air pollution, and biodiversity loss. Investment support will be linked to the adoption of sustainable production methods and technologies, and the sustainable use of soil, water, and other production resources. Additionally, afforestation, planting of perennial plants, wetland conservation and restoration will be encouraged to increase the amount of GHG absorbed by agricultural land and forests. Adaptation measures to climate change will also be implemented in agriculture and forestry.

The 2022–2030 Program for the Development of Agriculture, Food, Rural Areas, and Fisheries identifies challenges faced by these sectors, including those related to climate change mitigation and resilience-building, as well as the causes of these issues.

The Lithuanian Agriculture and Rural Development Strategic Plan 2023–2027 (SP 2023–2027) sets a specific objective to contribute to climate change mitigation and adaptation. This includes reducing GHG emissions, increasing carbon dioxide sequestration, and promoting sustainable energy development (Specific Objective 4, SO4). The implementation of this objective will be supported by standards for Good Agricultural and Environmental Condition (GAEC) and Management Requirements (MR) and various intervention measures. GAEC and MR standards and interventions will aim to reduce the use of mineral fertilizers and associated GHG emissions, lower GHG emissions from the livestock sector, increase the incorporation of plant residues into soil, reduce the mineralization of soil organic carbon, and enhance carbon sequestration in soil. These measures will ensure biomass growth and increase GHG removals in forests while improving the resilience of farms to climate challenges. Farmers will be incentivized with investment support to adopt technologies that reduce GHG and ammonia emissions, improve air quality, and convert farm manure and waste into energy, such as biogas plants for on-farm use. Investments in technological solutions that enhance animal welfare, which can also help reduce GHG emissions, will also be encouraged. The funding for SP 2023–2027 will be supplemented by resources from other sources, including the state budget, the 2021–2027 EU Funds Investment Program, the European Recovery and Resilience Facility, and the Modernization Fund.

The National Water Sector Plan for 2022–2027 and the Sustainable Soil Use Action Plan up to 2030 outline measures to reduce air, water, and soil pollution from agriculture, food production, and fisheries activities. These measures aim to ensure more sustainable use of these resources, while also contributing to climate change mitigation and adaptation efforts.

In total there are 25 existing and planned policy measures in agriculture sector. In the table below policies and measures that have the most significant impact on GHG emissions or removals are presented.

Table 2-19. Existing and planned policy measures in agriculture sector by 2030

No	Policy measures	Total GHG reduction effect, thous. t CO_2 eq. 2021–2030	Total fuel and energy savings, GWh
	Existing policy measures		
A1-E	Climate-friendly livestock farming (manure management)	683.52	-
A3-E	Developing precision fertilisation	50.27	50.27
A5-E	Promoting short supply chains	268.76	833.60
A6-E	Development of protein crops	192.63	-

A7-E	Development of no-till technologies, especially direct seeding	392.67	1,101.11
A9-E	Promoting organic farming	120.91	-
A14-E	Reducing the use of fossil fuels	246.15	849.44
A15-E	Revision of the technology cards	515.85	1,780.1
A16-E	Promoting research	83	-
A21-E	Balanced fertiliser system	452.78	-
	Planned policy measures		
A1-P	Climate-friendly livestock farming (manure management)	825.09	-
A3-P	Developing precision fertilisation	41.22	12.5
A19-P	Sustainable use of public land	62.98	-
A20-P	GHG accounting on farms	35.88	-

Descriptions of the policy measures:

A1-E. Climate-friendly livestock farming (manure management). Investments will be directed towards efficient equipment and technologies to reduce GHG emissions from livestock farms, particularly those related to manure management. The aim is to apply acidification of slurry, incorporation of slurry into the soil and use of manure for biogas production. In addition to reducing GHG emissions, this will also lead to an increase in the efficient application of organic fertilisers to plants (according to actual plant needs and ensuring all soil quality parameters) (2023–2027).

A3-E. Developing precision fertilisation. The measure will support the acquisition of precision technologies that will save fuel, reduce the use of crop protection products and fertilisers and improve soil health (2022–2023).

A5-E. Promoting short supply chains. Short supply chains reduce the number of potential intermediaries between the producer and the final consumer and reduce transport costs. This has a significant impact on the viability of small and medium-sized farms and the greater integration of producers into the food supply chain. The measure contributes to the objectives of environmental protection and public health by encouraging the consumption of local produce, with particular emphasis on organic and quality system produce, and by reducing the carbon footprint by optimising transport costs. Short supply chain schemes aim to reduce the distances over which produce is transported to the final consumer. Also bringing the food supply chain closer to urban consumers by promoting urban agriculture/farming in urbanised areas (2024–2027).

A6-E. Development of protein crops. The cultivation of bell grasses requires large amounts of fertiliser to achieve fertility, which releases N_2O gas into the atmosphere. Leguminous grasses, which have formed symbiotic relationships with nitrogen-fixing bacteria, do not require additional nitrogen fertilisers, unlike bell grasses, when soil air permeability and mineral content are sufficient. Also, legumes have a high nutritional value, especially in terms of protein content, so that the cultivation of such a composition of grasses ensures a sustainable further use of protein material throughout the food chain (2023–2027).

A7-E. Development of no-till technologies, especially direct seeding. The measure aims to promote no-till agriculture, with a particular focus on promoting direct seeding. No-till agriculture, and in particular direct seeding, improves soil properties, soil fertility and carbon storage (2023–2027).

A9-E. Promoting organic farming. The measure is designed to promote organic farming. The measure will address the challenges of providing the population with quality food, reducing negative environmental impacts, preserving biodiversity and maintaining the stability of ecosystems (2023–2027).

A14-E. Reducing the use of fossil fuels. The measure aims to promote the reduction of fossil fuel use in agriculture, forestry and fisheries through: 1) Regulatory action (e.g. limiting the amount of gasoil used in agricultural activities) (2021–2030); and 2) The design of new investment measures to promote the switch from fossil fuels to renewable energy sources and to increase energy efficiency (2022–2027). Also, through advice and the creation of a platform, to encourage the sharing of machinery between farmers, which would allow the exploitation of the overall potential of Lithuania's agricultural machinery resources. A potential land manager can farm with all the services he needs and can farm without capital, using existing capacities (2023–2027).

A15-E. Revision of the technology cards. The aim is to reduce the use of gas oils for agricultural use. The reduced fuel allocation would lead to savings of 20% of fuel consumption (2023–2030).

A16-E. Promoting research. The tool would investigate different farming practices by measuring their GHG emissions, production and carbon sequestration. The objective is to identify the most energy efficient and climate-friendly farming practices (2024–2027).

A21-E. Balanced fertiliser system. Establishing a balanced fertiliser system with an efficient and reduced use of mineral fertilisers (per unit of yield or per hectare of crop): requiring the farm to report on the use of mineral fertilisers on the farm (by active ingredient); develop a methodology for the preparation of fertilisation plans to calculate the optimum amount of fertiliser per crop and require farms to prepare fertilisation plans for mineral and organic fertilisers. The measure also foresees the creation of a dedicated digital database for fertiliser and chemical plant protection products accounting, national accounting and control, and other digital solutions. The use of mineral N fertilisers on cropland is expected to decrease by 10% (2021–2024).

A1-P. Climate-friendly livestock farming (manure management). Expected extension of the scope of measure A1-E (2023–2027).

A3-P. Developing precision fertilisation. It aims to adapt the national legislative framework for the wider use of precision technologies (including drones), to transfer knowledge to end-users of the technologies, and to promote the acquisition of these technologies. Enabling the technologies will lead to fuel savings, reduced use of crop protection products and fertilisers and improved soil health (2024–2030).

A19-P. Sustainable use of public land. The measure requires new contracts for the lease of public land to include requirements for organic or very low-pollution farming (e.g. limited use of mineral fertilisers and plant protection products, indicating that no-tilled farming is allowed, etc.). Ensure sustainability of activities on leased public land and limited negative impacts on the environment and climate (2023–2030).

A20-P. GHG accounting on farms. The measure is designed to enable the collection of data on farms (GHG emissions, soil conditions) and, using this data, the provision of advice to farmers, where the advice relates to energy efficiency improvements, livestock production or crop technology, to identify and advise

on how to reduce GHG emissions in production, on the farm itself. Enable the application of data-driven GHG reduction solutions on farms (2022–2025).

Table 2-20. Indicative funding needs for existing and planned measures in agriculture sector

Existing measures, mill. Eur		Available funding sources	Planned measures, mill. Eur		Possible funding sources
Total funds	Public funds	Modernization Fund, Agriculture and Rural Development 2023-2027 strategic plan, Lithuania's Rural Development Programme 2014–2020, Lithuanian Fisheries Sector Programme 2021–2027	Total funds	Public funds	Climate Change Programme, Modernization Fund, EU funds (2021–2027 m.), other sources
887.30	823.13		204.40	119.05	

2.4.3.5. Waste

The National Climate Change Action Agenda (NCCMA) sets the following climate change mitigation goals and objectives for the waste sector to be achieved by 2030:

- Address the issue of food waste by reducing the amount of food waste per capita by 50% (2019 baseline: 41 kg per capita);
- Ensure that the share of municipal waste disposed of in landfills does not exceed 5% of the total weight of generated municipal waste;
- Recycle at least 70% of all packaging waste (by weight);
- Reuse and recycle at least 60% of municipal waste (by weight);
- By 2025, achieve a circularity rate (secondary raw material utilization index) at least equal to the EU average (2019 baseline: 11.9).

The Sustainable Development Strategy emphasizes that applying the "polluter pays" principle ineffectively in waste management will not create an effective waste management system. Without ensuring universal, high-quality, and accessible public municipal waste services, environmental pollution by waste could increase. The vision highlights that a regional waste management system will be established, and primary waste sorting will significantly reduce waste sent to landfills, increasing recycling. Currently, a regional waste management system has been established, and primary waste sorting is encouraged through both regulatory and financial measures.

The National Progress Plan (NPP) states that to rationally use natural resources, ensuring the quality of environmental services would contribute to improving the quality of life. A separate task in the program is dedicated specifically to the waste sector. In implementing this task, the focus is not only on municipal waste but also on preventing the generation of waste from economic activities so that the amount of production and other economic activity waste does not increase or at least increases at a much slower rate (at least twice as slow as production growth). The goal is to recycle as much waste as possible or reuse it, encourage the implementation of technologies and production methods that reduce resource use and/or prevent waste generation, and increase the use of secondary raw materials. The Industry Development Program emphasizes the goal of encouraging companies to implement the principles of regional industrial symbiosis, which allow saving raw materials and reducing waste.

The State Waste Prevention and Management Plan 2021–2027 (SWPMP), approved by the Government of the Republic of Lithuania on June 1, 2022 (Resolution No. 579), identifies the opportunities and threats related to waste management in Lithuania, emphasizing that the implementation of waste prevention measures at the national level will reduce the amount of waste generated and not reused, rationalize the use of natural resources and materials, and reduce the negative impact of waste on public health and the environment. One of the key indicators of the SWPMP is to reduce GHG emissions from the waste sector. The goal is to increase the reuse and recycling of municipal waste by 2030 so that at least 60% of generated municipal waste (by weight) is reused and recycled. The amount of waste sent to landfills, in line with the task set in the National Progress Plan, should be significantly reduced by 2030, with only up to 5% of all generated municipal waste (by weight) disposed of in landfills.

In implementing these goals, the SWPMP specifies that municipal waste management should be organized in a way that encourages waste to be properly prepared for reuse and recycling. By 2023, the amount of separately collected biological waste and sorted municipal waste should account for at least 60% of the total municipal waste generated. This target will increase to 65% in 2024, 70% in 2025, 75% in 2026, and 80% in 2027. By 2024, it is planned to ensure that households have access to biological waste collection tools or that waste is composted on-site.

The plan also aims to encourage the development of infrastructure for recycling textiles, plastics, green waste, and food waste by 2030, with the goal of recycling an additional 88.5 thousand tons of waste into secondary raw materials. Additionally, it encourages the implementation and expansion of technologies that ensure the possibility of using more secondary raw materials in production, thus promoting recycling and reusing waste as raw materials, reducing resource consumption, waste quantities, and GHG emissions.

An equally important aspect of GHG reduction in the waste sector is waste prevention. The plan sets the goal that the amount of municipal waste generated per capita should not exceed the EU average. The SWPMP also plans to promote the reuse of items and place greater emphasis on food waste prevention.

Lithuania's Guidelines for Transition to a Circular Economy by 2035, which were approved by the Government on June 21, 2023, aim to establish a framework for implementing circular economy policies. The goal is to create conditions for more sustainable resource use across the entire lifecycle of products and materials, ensuring cooperation among stakeholders. The aim is not only to create an environmentally friendly economic system but also to take advantage of the country's growth and competitiveness opportunities by applying new technologies, business models, and forms of collaboration. The guidelines aim to address the problems caused by the traditional linear economy ("take-make-dispose"), which results in the depletion of natural resources, waste, and environmental degradation, all of which significantly affect climate change, biodiversity loss, and the worsening of environmental quality, posing an increasing threat to the well-being of the population.

In total there are 8 existing and planned policy measures in waste sector. In the table below policies and measures that have the most significant impact on GHG emissions or removals are presented.

Table 2-21. Existing and planned policy measures in waste sector by 2030

No	Policy measures	Total GHG reduction effect, thous. t CO_2 eq. 2021–2030
	Existing policy measures	
K1-E	Waste management	115.83
K2-E	Development of waste collection facilities	171.56
K3-E	Wastewater management	374.48
K4-E	Waste sorting	20.15
K5-E	Food waste prevention	21.2
	Planned policy measures	
K6-P	Circularity in public procurement	28.64
K8-P	Home composting	30.35

Descriptions of the policy measures:

K1-E. Waste management. The measure includes: 1) subsidies and grants for the acquisition and management of bio-waste collection facilities through the creation and/or adaptation of existing infrastructure for the treatment of food/kitchen waste (2021–2023); 2) the development of infrastructure for the treatment of bio-waste, through the support of projects for the production of biomethane gas and/or the setting up of biogas purification plants (2020–2030); and) the alignment of the tax for the treatment of environmental pollutants, including an increase in landfill tax (2021–2023).

K2-E. Development of waste collection facilities. The measure includes: 1) raising awareness of the residents about the opportunities, benefits and disposal sites of waste sorting through various information dissemination channels and tools. Information includes both theoretical information on the benefits and environmental impacts of recycling and practical information on where and how they can sort their waste (2024–2030); 2) development of infrastructure for separate collection of municipal waste: upgrading, refurbishing or new construction of bio-waste collection containers and/or composting facilities for individual households; installation/refurbishment of container sites and purchase of containers for container sites; installation/refurbishment of bulky waste collection sites and/or adapting them for preparing waste for re-use (2014–2024); 3) Subsidies and grants for the purchase of individual containers for secondary raw materials (glass/paper/cardboard/plastics/metal) and textiles, and for the purchase of bio-waste collection facilities (2021–2026).

K3-E. Wastewater management. The measure includes: 1) projects involving the reconstruction and new construction of wastewater treatment plants (2018–2023); 2) projects involving the reconstruction and/or new construction of drinking water supply and/or wastewater collection networks and the reconstruction and/or new construction of water improvement and/or wastewater treatment plants (2014–2023); 3) the construction of sewage sludge treatment plants to treat sewage sludge generated by wastewater treatment plants in the Telšiai and Utena regions (2015–2023); 4) the development of wastewater management systems, including the installation of separate and group wastewater management systems, which would ensure environmental protection equivalent to that of a centralised wastewater collection system; the reconstruction of urban wastewater treatment plants that discharge untreated wastewater into the natural

environment and/or have a pollution load above or close to the treatment plant's design capacity, and for which the construction has not been financed by the EU (2024–2030).

K4-E. Waste sorting. The measure will finance: 1) the development of separate collection of municipal waste, with priority given to the collection of household food (kitchen), green, textile, hazardous waste, the installation of bulky waste collection sites, and infrastructure for the collection of reusable waste (2024–2030); 2) the modernisation and development of infrastructure for the preparation of waste for recycling and recycling; installation of new facilities for textiles, furniture, plastics, combined packaging, bio-waste, electrical and electronic waste and other waste (2024–2030); 3) publicity campaigns by municipalities to promote the separate collection of waste (especially food, textiles, construction, furniture, packaging, tyres, hazardous waste) (2024–2027).

K5-E. Food waste prevention. The objective is to finance national publicity campaigns on reducing and preventing food waste and reusing things (2024–2027).

K6-P. Circularity in public procurement. Supplement the description of the procedure for applying environmental criteria in green procurement with circularity criteria/principles (2024–2025).

K8-P. Home composting. The measure plans to amend the legislation to provide for a lower waste management charge for residents who compost their household bio-waste (2023).

Table 2-22. Indicative funding needs for existing and planned measures in waste sector

Existing measures, mill. Eur		Available funding sources	Planned measures, mill. Eur		Possible funding sources
Total funds	Public funds	EU funds (2014-2020 and 2021-2027), Waste prevention and management program	Total funds	Public funds	Waste prevention and management program
830.38	549.24		3.00	3.00	

2.4.3.6. LULUCF

The National Climate Change Management Agenda (NCCMA) has set the following climate change mitigation goals and objectives for this sector by 2030:

- By 2030, harmoniously use agricultural land and forest land, protect and restore natural habitats that store organic carbon (forests, meadows, wetlands, swamps), ensure their good ecological condition, increase the use of wood in construction and production of long-lived products, without causing additional negative impacts on ecosystems. The goal is to increase the carbon absorption potential and use it efficiently, ensuring that the sector absorbs a significantly higher amount of GHG emissions than it generates, aiming for at least 6.5 million tons of CO_2 eq. from 2021 to 2030;
- Achieve a continuous reduction in the GHG emissions from cultivated land in the sector by implementing soil-friendly farming methods and improving soil condition;
- Increase the organic carbon stocks in forests and wood products, intensify annual organic carbon absorption through sustainable forestry, and extensively use local raw materials in wood products;

- Increase national forest coverage to at least 35% by 2024, giving priority to areas naturally covered by trees and shrubs, while adhering to ecological principles;
- Increase the area of perennial meadows by at least 8,000 hectares;
- Increase the areas where non-tillage technologies are used by 1.5 times by 2024 and three times by 2030.
- Ensure that at least 4% of agricultural land is used for biodiversity-rich landscape elements by 2024, and 10% by 2030;
- Restore at least 8,000 hectares of high-carbon ecosystems, ensuring their sustainable use, and halt the new exploitation of natural peatlands by 2024;
- Promote changes in consumption habits by increasing the use of products and energy from renewable wood resources, while reducing the use of more polluting non-renewable resources;
- Ensure and continually monitor the sustainability requirements to produce renewable wood products to avoid additional negative impacts on ecosystems;
- Promote the cultivation of industrially suitable plants (such as fiber plants) and their use in industrial sectors, increasing the organic carbon stocks in long-lasting products, ensuring that this does not have additional negative effects on ecosystems;
- Develop a high-added-value and circular bioeconomy, increasing its contribution to the national GDP.

The State Progress Strategy "Lithuania's Future Vision: Lithuania 2050" envisions Lithuania's strategic ambition to develop a climate-neutral, climate-resilient economy based on the restoration of natural ecosystems, balanced growth, and the principles of moderation. Lithuanian producers and consumers follow widely accepted and proven principles of responsible resource use and the circular economy. The state appropriately values and carefully uses all the benefits provided by nature (ecosystem services).

The National Sustainable Development Strategy outlines the opportunities for the sector to afforest lands on more fertile soils. It emphasizes the need for economic and administrative measures to restore exploited quarries, peat bogs, and abandoned old farm buildings. A national landscape management plan is being developed. The vision is that with natural reforestation and increasing forest cover and perennial plant areas in Lithuania, the expansion and integration of protected areas into international ecological networks will ensure landscape and biodiversity protection, slow soil erosion, and increase ecological stability. The mission states that increasing Lithuania's forest coverage will not only allow for more rational use of abandoned, low-yield, and agricultural land unsuitable for production but will also strengthen the country's nature's frame by adding forest elements and creating necessary connections, making it easier to integrate Lithuania's protected areas into European ecological networks.

The National Environmental Protection Strategy and the General Plan for the Territory of the Republic of Lithuania specify that the country's forest cover should reach 35% by 2030.

The National Landscape Management Plan aims to strengthen the nature's frame and ecological balance, improve land use processes, and address the issue of forest development and increasing forest coverage comprehensively (from the perspective of landscape and biodiversity, as well as ecological, social, and economic aspects), prioritizing the afforestation of ecologically depleted nature's frame areas.

The National Progress Plan (NPP) provides for the development of sustainable activities based on bioeconomy principles in the agriculture, forestry, and fisheries sectors. The main directions for environmental protection and climate change management are outlined in the 2022–2030 Environmental Protection and Climate Change Management Development Program of the Ministry of Environment of the Republic of Lithuania.

The Ministry of Environment's Environmental Protection and Climate Change Management Development Program has specific measures aimed at increasing forest coverage and developing a sustainable forestry sector. These include measures to form more productive forests, rational forest use, develop the forestry industry, and increase forest resilience and adaptability to climate change. The program allocates state budget funds to activities that address the problems and causes identified in the Ministry's program.

The Land Holdings Program sets the goal of improving landholding structures and reducing the area of abandoned land. Measures to achieve this include restoring the good agricultural condition of fertile abandoned land, including drainage works (evaluation criteria: restored agricultural land area in 2020 – 90 ha); preparing low-yield land unsuitable for agricultural use for afforestation, including forming the nature's frame and creating ecologically stable landscapes.

The Lithuanian Agricultural and Rural Development Strategic Plan 2023–2027 (SP 2023–2027) includes specific goals for contributing to climate change mitigation and adaptation, such as reducing GHG emissions and increasing carbon dioxide sequestration. It also focuses on developing sustainable energy (fourth specific goal, SO_4). These goals will be implemented through good agricultural and environmental condition standards and various intervention measures. The implementation of these standards and measures will increase the incorporation of plant residues into soil, reduce the mineralization of organic carbon in soil, increase carbon sequestration, ensure biomass growth in forests, and increase GHG absorption, thereby improving farm resilience to climate challenges.

The SP 2023–2027 plans to commit 404,000 hectares (13.59%) of agricultural land to climate change adaptation measures and 839,000 hectares (28.21%) to commitments aimed at reducing GHG emissions or maintaining/increasing carbon stocks in soil and biomass.

A total area of approximately 1.67 million hectares (56%) of agricultural land will be supported by intervention measures related to climate change mitigation, adaptation, and increasing absorption potential.

Over 90% of the savings in the sector are planned to come from measures outlined in the SP 2023–2027, such as promoting crop rotation, encouraging cover crops, protecting drained peat soils used in agriculture, as well as extensive meadow maintenance and expanding no-till farming.

Parliament Resolution on Forest Policy outlines the Parliament's position on the long-term balanced direction of forest policy. The resolution is a non-normative act aimed at formally confirming the Parliament's view on a state matter. The challenges posed by climate change and biodiversity loss, as well as changing societal demands on the country's forests, prompted a fundamental review of Lithuania's forest policy directions. The Ministry of Environment initiated a National Forest Agreement in 2021, aimed at reaching consensus on the long-term, balanced direction of forest policy and addressing the concerns of different interest groups. The project for this national agreement was developed by about 40 different organizations and nearly 400 participants. Discussions took place in 150 events, and the final agreement was formed by nine thematic groups, six of which reached consensus. These have been incorporated into the Parliament's resolution, adopted with 72 votes in favour. In the summer of 2024, the government approved amendments

to the Forest Law and related laws prepared by the Ministry of Environment, which will establish qualitative changes in the forestry sector, pending approval by the Seimas.

In total there are 22 existing and planned policy measures in LULUCF sector. In the table below policies and measures that have the most significant impact on GHG emissions or removals are presented.

Table 2-23. Existing and planned policy measures in LULUCF sector by 2030

No	Policy measures	Total GHG reduction effect, thous. t CO_2 eq. 2021-2030	Total fuel and energy savings, GWh
	Existing policy measures		
L1-E	Peatland restoration (restoration of hydrological regime on agricultural land)	-487	-
L2-E	Conservation and restoration of grasslands	-2,772.33	386.8
L4-E	Promotion of cover-crops	-5,112.76	800
L5-E	Promotion of crop rotation	-8,188.86	-
L6-E	Peatland restoration (grassland conversion)	-967	-
L7-E	Promoting green cover	-190	-
L8-E	Protection of landscape elements	-146	-
L9-E	Afforestation	-129	-
L14-E	Protection of self-seeded trees	-250.44	-
L19-E	Promoting organic construction	-1,051	-
	Planned policy measures		
L1-P	Peatland restoration (restoration of hydrological regime on agricultural land)	-162.45	-
L14-P	Protection of self-seeded trees	-375.55	-

Descriptions of the policy measures:

L1-E. Peatland restoration (restoration of hydrological regime on agricultural land). Identify former drained peatland wetland areas in which it is appropriate to restore the hydrological regime, identifying their effectiveness in reducing emissions and, in the long term, absorbing GHG. Promote the restoration of drained swamps (peatland wetlands), restoring appropriate water levels and maintaining ecosystems through sustainable economic activities, paying special attention to peatland farming, the development of which would contribute to the development of a circular economy and the preservation of natural habitats (2024–2026).

L2-E. Conservation and restoration of grasslands. The measure is intended to encourage farmers to preserve grasslands and natural habitats. This measure intends for compensation for farmers who meet the specified requirements (for the management of natural grasslands of EC importance; for protection of wild birds outside the Natura 2000 area; support for Natura 2000 agricultural land) (2023–2027). The maintenance and care of permanent grasslands and the conversion of arable land to permanent grasslands are also encouraged (conversion of arable land to grasslands, their maintenance and care) (2024–2027).

L4-E. Promotion of cover-crops. By implementing this measure, agricultural entities will be encouraged to grow cover-crops. Increasing cover-crop areas will not only improve the agrochemical composition and physical properties of arable land, but will also significantly contribute to reducing environmental pollution and negative effects of climate change (activities on arable land – Cover-crops) (2023–2027).

L5-E. Promoting of crop rotation. Under this measure, the annual application of at least 4 crop rotations will have a positive impact on the preservation of soil fertility. By switching from monoculture farming and applying crop rotation, the amount of organic carbon in the soil will be increased. By contributing to increasing carbon sequestration in the soil and reducing GHG emissions, this measure will have a direct impact on achieving the objectives related to climate change mitigation and adaptation. This measure intends for compensation for farmers who meet the specified requirements (activities on arable land – Crop rotation) (2023–2027).

L6-E. Peatland restoration (grassland conversion). The conversion of arable peatlands to grasslands will have a positive impact on reducing GHG emissions from peatlands, preserving soil fertility, reducing erosion, the formation of which in the soil is significantly influenced by intensive agriculture, and increasing the amount of organic matter. The measure aims to contribute to reducing the extent of ploughing of organic soils, promoting the restoration, preservation and regular maintenance of herbaceous plant cover of organic soils. (2023–2027).

L7-E. Promoting green cover. The measure aims to reduce soil erosion and GHG emissions, increase the amount of organic matter in the soil and biomass by establishing grass strips, establishing and maintaining grassland on eroded land areas. By converting arable land into grasslands, it contributes to stopping soil erosion and reducing GHG emissions (measures: replacing eroded land with meadows; short-lived melliferous plant strips; perennial grass strips) (2023–2027).

L8-E. Protection of landscape elements. The measure aims to preserve and restore the traditional mosaic landscape. Areas with high mosaicity create conditions for various plant and animal species to live and reproduce, thus contributing to the preservation of biodiversity. Landscape elements will protect the soil from erosion, therefore the measure may have a direct positive impact on the implementation of the national objectives of preserving soil fertility, increasing the amount of organic matter, reducing erosion, and, depending on the type of landscape element, reducing GHG emissions and increasing removals (2023–2027).

L9-E. Afforestation. The measure aims to increase the country's forest cover by providing support to private landowners for afforestation, maintenance and protection (7 years after afforestation) (2024–2027).

L14-E. Protection of self-seeded trees. The measure is intended to support the maintenance of self-seeded trees growing spontaneously on non-forest land (by compensating for part of the lost income from agricultural activities and the costs of inclusion in forest land accounting), with the aim of increasing the country's forest area by 2030 (2024–2025).

L19-E. Promoting organic construction. The measure includes: 1) implementation of pilot building renovation (modernization) projects using standardized modular structures made of organic materials and the preparation of recommendations on their basis for the mass application of these solutions, which would allow for an average reduction in primary energy consumption by at least 30 percent (2023–2025); 2) support for the deployment of standardized modular structures made of organic materials production

capacities in Lithuania, necessary to implement the objectives set out in the Long-Term Renovation Strategy (2023–2025).

L1-P. Peatland restoration (restoration of hydrological regime on agricultural land). Widening of the scope of L1-E measure (2026–2030).

L14-P. Protection of self-seeded trees. Continuation of L14-E measure activities (2026–2030).

Table 2-24. Indicative funding needs for existing and planned measures in LULUCF sector

Existing measures, mill. Eur		Available funding sources	Planned measures, mill. Eur		Possible funding sources
Total funds	Public funds	Recovery and Resilience Facility, Agriculture and Rural Development 2023-2027 strategic plan, State budget, Climate Change Programme	Total funds	Public funds	Programme for the Financing of General Forestry Needs, Climate Change Programme, other sources
598.19	561.83		21.80	21.80	

2.4.3.7. Information how the mitigation actions interact with each other

Energy sector. When assessing the planned energy efficiency (EE) measures, it is projected that the greatest impact on energy savings will be exerted by measures to modernise individual and multi-apartment residential buildings as well as non-residential buildings. These measures will be implemented while continuing the implementation of the Multi-apartment Building Renovation Programme and achieving the objectives of the Lithuanian Long-term Renovation Strategy. The energy saved will reduce the impact of existing measures to promote the development of RES, as saving some of the energy will require less energy from renewable energy sources (RES).

Transport sector. The existing measure T3-E "Electrification of railways and rolling stock" has an impact on the additional measure T4-P "Promoting intermodal transport", since the increase in rail freight transport due to the T4-P measure does not directly increase the GHG emissions from rail transport (due to T3-E, a large part of railways will use electricity instead of fossil fuels). On the other hand, the additional measure T3-P, which purchases electric locomotives, will have a greater effect due to the existing measure T4-E "Promoting intermodal transport", since the volume of rail freight transport will increase. Measure T11-E "Green procurement" is intended to implement the objectives set out in Directive (EU) 2019/1161, but the objectives set out in the measure are more ambitious than those set out in the Directive. Measures T1-E, T6-E, T10-E, T11-E, T12-E, T13-E, T1-P, T27-E and T28-E together contribute to the increase in the number of electric cars and include aspects such as car and fuel pollution taxes, subsidizing their purchase, infrastructure development and social dissemination. The absence of any of these aspects would significantly reduce the planned number of electric cars, e.g. in the absence of pollution taxes, it would be more difficult to subsidize the purchase of electric cars, in the presence of poor infrastructure, electric cars would not be attractive. Of the listed measures, only T1-E, T1-P and T13-E are specifically designed to increase the number of electric cars - all others reduce GHG emissions in other ways as well. One of the greatest impacts on reducing GHG emissions will be implemented by measures related to fuel pollution

taxes (T27-E and T28-E). Failure to implement these measures will not only fail to achieve the reduction target, but also the implementation of many other measures that require funding may not be possible.

IPPU sector. The planned P19-P measure includes increasing energy efficiency and promoting the replacement of polluting technologies with less polluting ones. The GHG savings of the planned measures related to fuel combustion in industry and construction are included in the energy sector. To achieve energy efficiency goals in industrial enterprises by continuing the implementation of existing measures, it is planned to implement measures recommended in energy consumption audits, to promote the implementation of internal energy efficiency monitoring systems in business enterprises and industry, and to increase the technological and energy efficiency of industrial enterprises by implementing artificial intelligence and digital twin technologies.

Agriculture sector. Measures related to the use of mineral N fertilizers in the agricultural sector influence each other (A3-P, A9-E and A21-E). When assessing these measures, the interrelationships of these measures were taken into account. Measures A1-E, A1-P and A21-E will have the greatest impact on the amount of GHG generated. Measures A1-E and A1-P related to biogas production will affect the amount of GHG generated not only in the agriculture but also in the energy sector. The GHG savings of the existing (A3-E, A14-E and A15-E) and planned measures (A13-P and A3-P) related to the fuel consumption of agricultural machinery are included in the energy and transport sectors.

LULUCF sector. In the LULUCF sector, the measures that change land cultivation practices in agriculture (A7-E, L4-E, L5-E, L7-E) have the greatest impact and the best-defined links in the WEM scenario. When assessing these measures, it was assumed that sustainable land cultivation practices can be applied together, in the same area. These measures will also have an effect in the agricultural sector, as they may change the amount of fertilizers used and the amount of fuel used for transport. Another group of measures (L1-E, L2-E, L6-E) focuses on increasing biodiversity and protecting and preserving organic soils. The implementation of these measures will contribute to achieving the objectives of the EU Nature Restoration Regulation. This regulation identifies organic soils as those that must be restored if we want to preserve the uniqueness and biodiversity of wetlands. It also serves the purpose in the context of climate change, as these soils emit a significant amount of GHG emissions on productive land. Finally, the last group of measures (L8-E and L9-E) is related to the maintenance and planting of landscape elements (e.g. individual trees and shrubs, tree and shrub belts, groups, etc.) on agricultural land and forest development. These measures do not have a particularly large effect in the general context of the NECP, but they are an investment in the future, as they need time to reach their maximum efficiency. In the WAM scenario, the greatest effects are concentrated in measures related to forests and wood products (L14-P). These measures contribute to increasing the area of forests, improving their quality, and protecting organic soils. They will also encourage the use of local wood production on the national market, rather than exporting it as raw material.

Waste sector. Planned policies and measures in the waste sector are complementary to existing policies and measures, which are expected to achieve the objectives set out in European Union legislation (EU Waste Directive, EU Packaging Waste Directive, EU Landfill Directive). The main objective of the planned policies and measures is to promote Green Procurement, household composting and focus on circularity research.

2.4.4. Assessment of aggregate policies and measures

As a European Union Member State, Lithuania is subject to EU climate policy, and thus it applies EU Common and Coordinated Policies and Measures relevant to climate change. Lithuania believes that country's policies and measures modifying long term trends in anthropogenic GHG emissions and removals consist with the objective of the UNFCCC.

Lithuania has substantially improved the effect evaluation process of policies and measures during the National Energy and Climate Action Plan (NECP) initial preparation and update process putting much effort into planning and assessing the GHG reduction effect of decarbonization policies.

In Table 2-25 we presented all policies and measures that are adopted, implemented and planned in Lithuania, in different sectors, for 2021–2030. It is important to note that number of policies and measures, as well as GHG reduction effects presented in the Table 2-25 and Table 2-26 do not match number of policies and measures and their effects reported in CTF table 5, as in CTF we included only those policies and measures that have the most significant impact on GHG emissions or removals.

Table 2-25. Number of adopted, implemented and planned decarbonization policies in Lithuania

Sector	Number of policies and measures
Energy	53
Transport	41
IPPU	23
Agriculture	25
LULUCF	22
Waste	8
Total	**172**

For the total effect of policies and measures the approach was used individually assess the effect of each significant policy and measuring and aggregating the individual effects to arrive at a total. Therefore, the total effect of PaMs is presented only for 2030. The effect of adopted and implemented measures is estimated to reach about 6,767 kt CO_2 eq. in 2030. The highest reduction of GHG emissions is planned in energy, transport and LULUCF sector.

Table 2-26. Estimated aggregated effect of policies and measures in different sectors in 2030

PaMs in different sectors	GHG emission reduction, kt CO_2 eq. in 2030
Adopted	***6,623***
Agriculture	230
Energy	1,224
LULUCF	2,730
IPPU	401
Transport	1,933
Waste	105
Implemented	***144***
Transport	144
Planned	***1,384***
Agriculture	158
Energy	649
LULUCF	172

IPPU	183
Transport	211
Waste	11
Total PaMs	**8,151**

The effect of the planned measures in 2030 might reach 1,384 kt CO_2 eq. The estimated difference between WEM and WAM's projected emission in 2030 is 1,612 kt CO_2 eq.

It is assessed that implemented and planned measures will have the most effect on reducing CO_2 emissions (energy, transport and LULUCF sectors); also, implementing F-gas regulation, the amount of these gases is planned to decrease efficiently. The measures implemented and planned in the agriculture and waste sectors will affect methane emission reduction most. Additionally, the successful implementation of synthetic fertilizer use regulation could benefit the reduction of N_2O emissions.

2.4.5. Policies and measures no longer in place

During the reporting period (since policies and measures reported in Lithuania's 8th National Communication and 5th Biennial Report) most of the policies and measures were continued without major changes. On the other hand, some documents, legal acts expired due to the target dates. As a rule, some policy documents, strategies, legal acts were replaced with the new versions, which generally apply similar measures. Overview of some major documents expired and replaced during the reporting period is given below in the table.

Table 2-27. Policies and measures no longer in place

Policy document reported in NC8/ BR5	Status
National Energy and Climate Action Plan of Lithuania (2019)	Replaced by National Energy and Climate Action Plan of Lithuania submitted to European Commission in October 2024.
National Energy Independence Strategy adopted in 2018	Repealed on 27th June 2024 by Parliament Resolution No. XIV-2856 "On approval of National Energy Independence Strategy".
National Forestry Sector Development Program 2012–2020, adopted in 2012	On 27th June 2024, Lithuanian Parliament adopted a resolution "On Forest Policy" No. XIV-2851, which sets out the Parliament's approach to long-term sustainable forest policies.

2.4.6. Effect of policies and measures on longer-term trends

Lithuania believes that policies and measures described in Chapter 2.4 are modifying long-term trends in anthropogenic GHG emissions and removals, consistent with the objective of the EU commitments and international agreements.

Lithuania is aware of the importance of setting long-term goals and actively trying to achieve them. A large proportion of current climate and energy policies also contribute reducing GHG emissions in the longer term. For example, buildings have long lifetimes, therefore, the energy efficiency regulations of new and existing renovated buildings have long-lasting impacts. Also, the improving possibilities for cycling and using public transportation decrease CO_2 emissions from the transport sector. Furthermore, waste recycling, the disposal of biodegradable waste on landfills can be expected to lead to permanent changes in current practices, and therefore to yield permanent emission reductions.

Measures that promote investments in renewable energy and energy efficiency are the mostly contributed towards transition to low carbon development in all economy sectors in the longer term. Lithuania's renewable energy share, expressed in percentage of gross final energy consumption, was about 26% in 2020, above its 2020 target of 23%. This good performance was driven mostly by the heating sector, where the share of renewables reached 46%, as opposed to 39% renewables share anticipated for 2020 by Lithuania's National Renewable Energy Action Plan. In 2023 Lithuania's renewable energy share in gross final energy consumption was already above 31.5%.

Renewed National Energy Independence Strategy (NEIS), which was approved by Parliament (Seimas) on 27 June 2024, sets ambitious gross of the final RES energy consumption targets: 90% until 2030 and 100% until 2050 for central district heating sector, 85% until 2030 and 100% until 2050 for individual housing sector, 15.8% until 2030 and 90% until 2050 for transport sector; as well as energy efficiency target to reduce final energy consumption by 1.2% annually (in 2030 final energy consumption 65,8 TWh, in 2050 – 51,5 TWh).

Both the ETS and the effort-sharing system have been extended to 2030, with more stringent emission limits. They will, therefore, contribute to reducing emissions further and keeping GHG emissions on their downward trajectory.

2.4.7. Information on the assessment of economic and social impacts of response measures

Since 2004 Lithuania is a Member State of the EU and, as such, designs and implements most of its policies in the framework of EC directives, regulations, decisions, and recommendations. In this context, the minimization of adverse impacts on developing countries is also largely dictated by the European Union's policy on climate change and by its policies and programmes affecting developing countries. Regulation at the European level also controls or influences market conditions, fiscal incentives, tax and duty exemptions and subsidies in all economic sectors in EU Member States. It is crucial for policies and measures to be designed in such a way that they produce co-benefits, while supporting a just transition and minimizing adverse economic and social consequences. The Council Recommendation of 16 June 2022[24] on ensuring a fair transition towards climate neutrality provides an EU framework for developing and implementing policy measures designed to leave no-one behind in the green transition.

The impact assessment of new policy initiatives has been established in the European Union, which allows their potential significant adverse social, environmental, economic and social impacts on various stakeholders, including developing country Parties, to be identified and limited at an early stage within the legislative process. The findings of the impact assessment process are summarized in an impact assessment report, which lays out the environmental, social and economic impacts, the stakeholders affected by the initiative and the ways in which they are affected. Impact Assessment Guidelines specifically address impacts on third countries and also issues related to international relations. This provides a framework in which Member States like Lithuania can also ensure a high level of protection of the

[24] Council Recommendation of 16 June 2022 on ensuring a fair transition towards climate neutrality, 2022/C 243/04, https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A32022H0627%2804%29

environment and contribute to the integration of environmental considerations into the preparation and adoption of specified plans and programmes with a view to promoting sustainable development.

The European Union actively undertakes many activities bringing positive impacts on third countries and their ability to tackle climate change, specifically through capacity building and technology transfer activities. Chapter 4 provides information on Lithuania's participation and support of programmes which aim to minimize adverse effects of climate change on developing countries.

2.5. Summary of greenhouse gas emissions and removals

This Chapter contains information on Lithuania's GHG emissions trends (descriptive summary). The GHG inventory summary tables are provided in CTF table 6. The data used in Lithuania's 1st Biennial Transparency Report is in accordance with its National Inventory Document (NID) and accompanying Common Reporting Tables (CRT) that were submitted in December 2024 to the Secretariat of the UNFCCC in compliance with the decision 18/CMP.1 "Modalities, procedures and guidelines for the transparency framework for action and support referred to in Article 13 of the Paris Agreement". This submission covers the inventory of GHG emissions of Lithuania for the period 1990–2022. It has been also submitted to the European Commission in compliance with European Parliament and the Council Regulation (EU) 2018/1999. It should be noted that more detailed data and explanations are provided in the Lithuania's NID 2024.

Disclaimer:

Please note that Lithuania's total GHG emissions in Common Reporting Tables (CRT) reported in new Enhanced Transparency Framework (ETF) reporting tool, which have been made available by the UNFCCC secretariat in July 2024, due to technical issues of CRT electronic tool are not fully correctly accounted and do not correspond to total GHG emissions in CRF tables reported to European Commission (internal EU annual 15th March submission in 2024) using at the time of GHG inventory preparation and submission available the existing CRF Reporter. The emission figures as contained in the CRF Reporter are based on our actual national GHG emissions data. Due to technical issues caused by the CRT electronic tool (incorrect summing of total LULUCF sector emissions regarding indirect N_2O) our national GHG emissions totals (in CO_2 eq., incl. LULUCF) reported in CRT are lower for all years 1990–2022 within 13–22 kt CO_2 eq. than actual GHG emission totals. Data for CTF table 6 (Summary of GHG emissions and removals) is automatically transferred from CRT electronic tool, thus national GHG emissions totals (in CO_2 eq., incl. LULUCF) reported in CTF are also incorrect (13–22 kt CO_2 eq. difference).

Please note, that **GHG emission figures reported in Lithuania's National Inventory Document (NID) 2024 and 1st Biennial Transparency report represent correct and actual GHG emissions of Lithuania**, as these reports were drafted based on correct emission figures CRF tables reported to European Commission (15th March submission in 2024)).

Lithuania does not accept responsibility and should not be held liable for any remaining technical issues and errors caused by the CRT and CTF electronic tool affecting the quality of underlying GHG inventory during the relevant technical expert reviews.

2.5.1. General greenhouse emission trends

In 2022, Lithuania's total GHG emissions amounted to 18,903.7 kt CO_2 eq. excluding LULUCF. GHG emission level drastically fell in 1992 and remained steady at approx. 20 Mt CO_2 eq. during the last 14 years (Figure 2-25).

A significant decrease in 1992 was caused by the collapse of the Soviet economy, which led to the transition from a centrally-planned economy to a market-based economy by restructuring manufacturing industries, energy industries and agriculture. Upon its independence from the Soviet Union in 1990, after 50 years of annexation, Lithuania inherited an economy with high energy intensity. A blockade of resources imposed by USSR during 1991–1993 led to a sharp fall in economic activity, as reflected by the decrease in GDP in the beginning of the nineties. The financial situation improved in the middle of the last decade and GDP has been increasing until 2008, when the global economic recession affected Lithuania as well followed by GDP decrease to negative factor in 2009. The annual estimates of macroeconomic indicators since 2011 showed an economic revival. In the period 1990–2022 GDP increased by 136% and GHG emissions were reduced by 61%.

At the beginning of the 1990s, mostly fossil fuel was combusted in manufacturing industries, energy industries and agriculture. A comparison of annual general fuel balances in the period of 1990–2020 shows a significant decrease in the use of fuel oil (e.g. from about an annual quantity of 57,900 TJ in 1990–1991, to 19,307 TJ in 1992 and 13,126 TJ in 1995, to less than 600 TJ since 2008), also a decrease of use of coal, petrol, natural gas, but an increase of use of biomass. The decrease of use of fuel oil, first of all, was influenced by environmental requirements: since 1 January 2004 consumption of sulphurous fuel oil was forbidden, and it was followed with stricter requirements since 2008. As the elimination of sulphur from fuel oil was not economically efficient for companies, these requirements led to the shift of fuel oil to other fuel types (e.g. natural gas), resulting in a considerable decrease in annual GHG emissions.

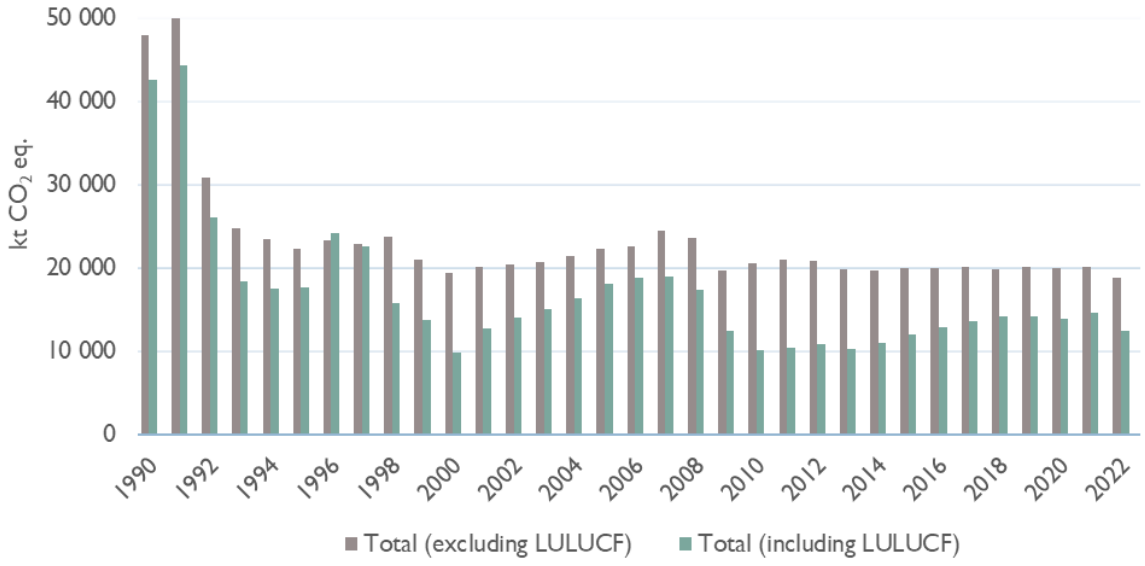


Figure 2-25. GHG emissions 1990–2022, kt CO_2 eq.

Last considerable decrease in 2009 was related with the economic crisis in Europe, while after 2009 GHG emissions stabilized at approx. 20 Mt CO_2 eq. Comparing with 2021 the total GHG emissions have decreased by 6.3% (excl. LULUCF) in 2022 and have dropped below 20 Mt CO_2 eq. (18,903.7 kt CO_2 eq.).

The composition of GHG emissions by sector in 2022 is presented in Figure 2-26.

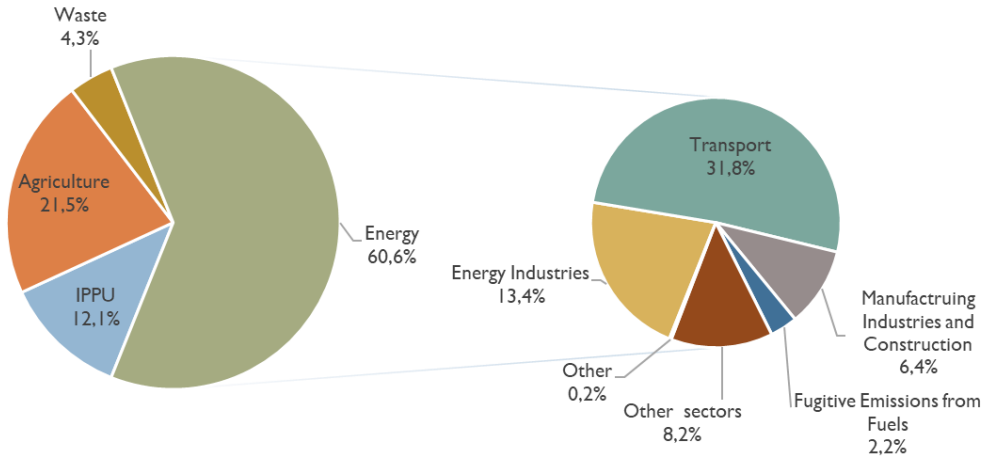


Figure 2-26. The composition of Lithuanian GHG emissions (%) by sector (excl. LULUCF) in 2022

The energy (incl. transport) sector is the most significant source of GHG emissions in Lithuania with a 62.1% share of the total emissions (excl. LULUCF) in 2022. Emissions from energy include CO_2, CH_4 and N_2O gases.

CO_2 emissions from the energy sector constituted 86.5% of the total national CO_2 emissions (excl. LULUCF) in 2022. The main categories are transport and energy industries which contribute 46% and 19% to the total national CO_2 emission (excl. LULUCF) respectively. Compared with 2021 CO_2 emissions from the energy sector have decreased by 3.6% in 2022. The emissions of CH_4 have decreased by 20.8% and N_2O emissions decreased by 7.8%.

The second most important source of GHG emissions is agriculture sector accounting for 21.5% of the total national GHG emissions (excl. LULUCF). This sector is the most significant source of CH_4 and N_2O emissions accounting for 63.2% and 87.9% of the total CH_4 and N_2O emissions, respectively. The main source of CH_4 emissions is enteric fermentation contributing 86.9% to the total agricultural CH_4 emissions. Agricultural soils are the most significant source of N_2O emissions accounting for 91.7% of the total agricultural N_2O emissions. Compared to 2021 GHG emissions in agriculture sector have decreased by 5.9% in 2022.

Emissions from industrial processes and product use (IPPU) sector amounted to 12.1% of the total GHG emissions (excl. LULUCF) in 2022. The main categories are ammonia production, nitric acid production and cement production. Ammonia production is the largest source of CO_2 emissions in the industrial processes and product use sector contributing 7.2% to the total national CO_2 emissions (excl. LULUCF) in 2022. Nitric acid production is the single source of N_2O emissions in the IPPU sector and accounted for 4.1% of the total national N_2O emissions (excl. LULUCF) in 2022. GHG emissions in 2022 from the industrial processes and product use sector have decreased by 16.9% compared to 2021.

The waste sector accounted for 4.3% of the total GHG emissions in 2022 (excl. LULUCF). Solid waste disposal on land is the second important source of CH_4 emissions. It contributes 17.9% to the total CH_4 emissions (excl. LULUCF). There was a 4.5% decrease in CH_4 emission from the waste sector in 2022 compared to 2021.

LULUCF sector in Lithuania absorbs more GHGs than it emits, removing significant volumes of carbon from the atmosphere. Thus, it is the only sector with negative emissions. In 2022 LULUCF sector activities removed net -6,355.9 kt CO_2 eq., equal to 33.6% of the Lithuania's annual greenhouse gas emissions. Removals have grown by 15.5% in 2022 compared to 2021.

In total Lithuania's GHG balance the share of GHG emissions from sectors participating in the EU ETS has been consistently decreasing since 2005, while the share of GHG emissions from sectors not participating in the EU ETS (non-ETS) has had a growing trend (see Figure 2-27).

In 2022, non-ETS sectors generated 73.2% of Lithuania's total GHG emissions. In 2022, GHG emissions in the non-ETS sector decreased by 2.8% compared to 2021 emissions level. Despite this decrease, during 2005–2022 period non-ETS sector's GHG emissions has increased by 5.9%, therefore if the current development of economic sectors will continue without applying relevant GHG reduction measures, achieving the set GHG reduction targets by 2030 would pose a significant challenge.

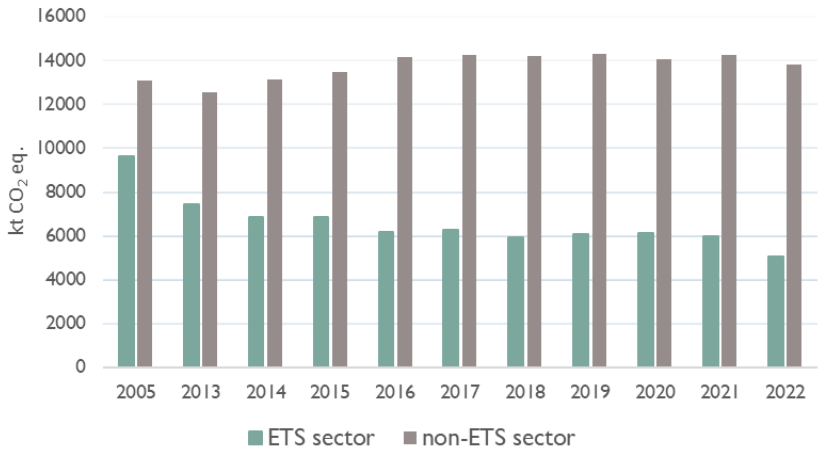


Figure 2-27. Trends of GHG emissions of ETS and non-ETS sectors in 2005–2022, kt CO_2 eq.

Within the non-ETS sector, the transport sector accounts for the largest share – 44% of total non-ETS sector emissions. GHG emissions from the transport sector increased significantly between 2005 and 2022 – by more than 40%. Together with the agriculture sector, they make up the largest portion (73%) of non-ETS sector GHG emissions.

2.5.2. Greenhouse gas emissions trends by gas

GHG emissions trends by gas in CO_2 eq. are presented in the Figure 2-28 below and reflect the main tendencies of GHG level in general.

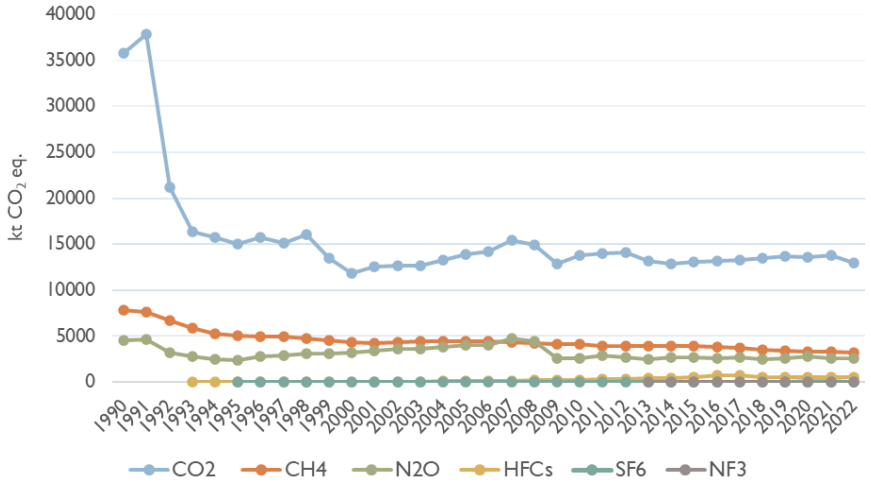


Figure 2-28. Trends of GHG emissions by gas in 1990–2022, kt CO_2 eq. (excl. LULUCF)

The most important GHG in Lithuania is carbon dioxide, it contributes 67.3% to the total national GHG emissions. In 2022, the actual CO_2 emission (excl. LULUCF) was 63.8% lower than the emission in 1990. Comparing with 2021 CO_2 emissions decreased by 6.2% (excl. LULUCF). The largest source of CO_2 emissions is energy sector which contributes around 86.5% of all CO_2 emissions. Transport category contributes for 53.0% and energy industries accounts 22.0% of the CO_2 emission in energy sector. Comparing with 2021 CO_2 emission from energy sector in 2022 have decreased by 3.6% whereas emissions from manufacturing industries and construction decreased by 5.4%, and CO_2 emission from the energy industries decreased by 9.1%. Emissions from transport decreased by 1.7%.

Distribution of CO_2 emissions in 2022 by the main sectors and subsectors is shown in Figure 2-29.

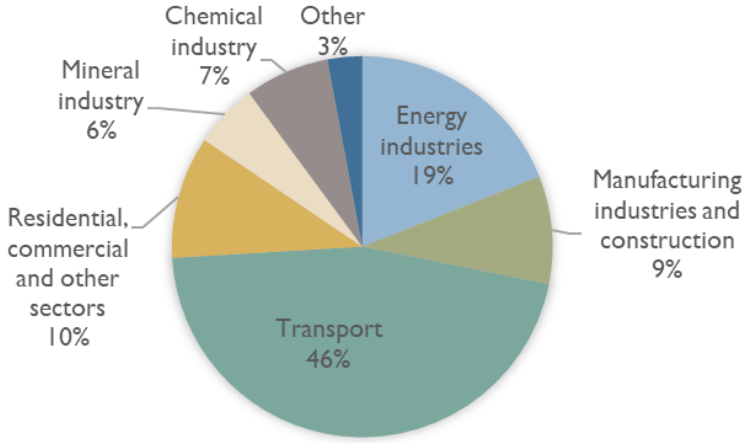


Figure 2-29. Distribution of CO_2 emissions by sector in 2022

Methane is the second most important GHG accounting for 17.0% in the total national GHG emissions (excl. LULUCF). The largest sources of methane emissions are: agriculture sector, contributing with 63.2% in 2022, waste sector – 24.6% and fugitive emissions from oil and natural gas operations – 6.4% (Figure 2-30). The emissions from agriculture derive from enteric fermentation and manure management contributing with 54.9% and 8.3% respectively of the total national CH_4 emission (excl. LULUCF).

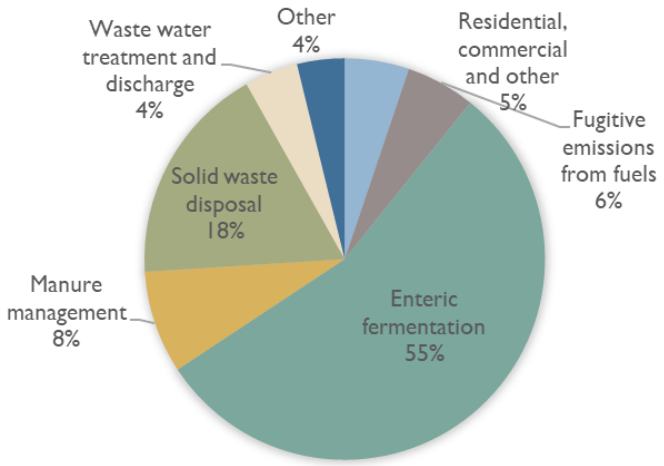


Figure 2-30. Distribution of CH_4 emissions by sector in 2022

Nitrous oxide is accounting for 11.6% in the total national GHG emissions (excl. LULUCF). Agriculture is the main source of N_2O emissions which contributed 87.9% to the total N_2O emissions in 2022.

The other significant source of N_2O emissions is manure management. It contributes 7.3% to the total N_2O emissions. Figure 2-31 shows the distribution of N_2O emissions in 2022 by the main sectors and subsectors.

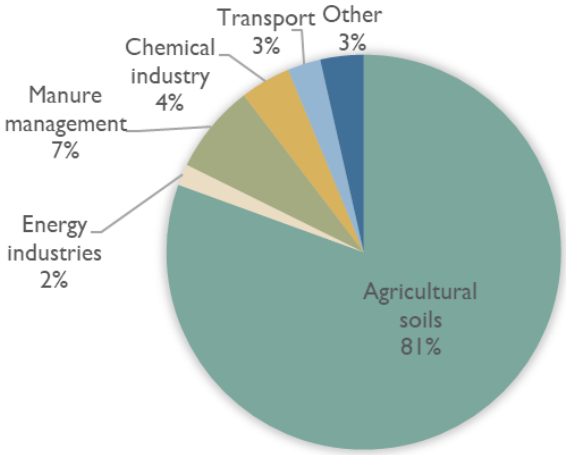


Figure 2-31. Distribution of N_2O emissions by sector in 2022

The F-gases contribute 2.9% to the total national GHG emissions in 2022. The emissions of F-gases have increased significantly during 1993–2022. A key driver behind the trend has been the substitution of ozone depleting substances (ODS) by F-gases in many applications. With the adoption of Regulation (EU) No 517/2014 (F-gases regulation) the European Union has set out restrictions to reduce HFC emissions, and as a result of implementation of this Regulation, HFCs emissions started to decrease in 2017. Figure 2-32 shows the trend of F-gases emissions during the period 1993–2022.

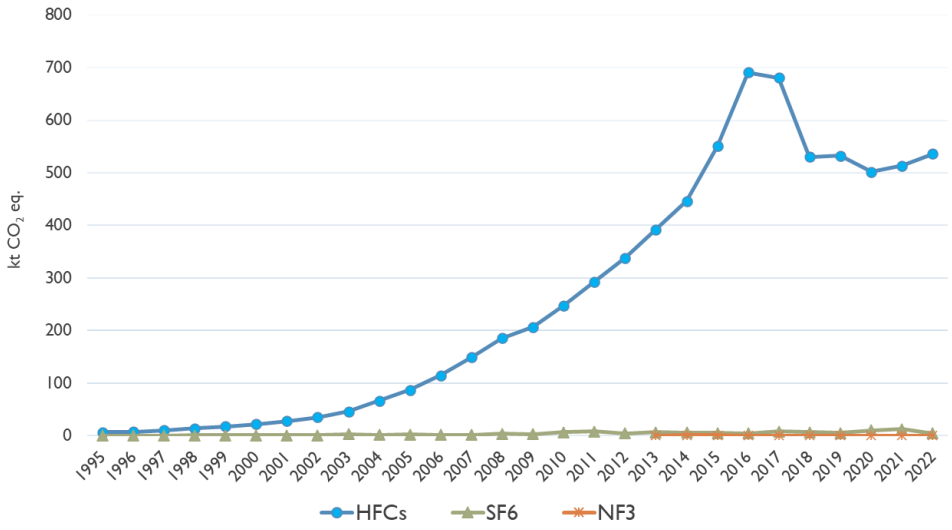


Figure 2-32. Emission trends for F-gases for the period 1995–2022 (kt CO_2 eq.)

2.5.3. Greenhouse gas emissions trends by sector

The trends of GHG emissions by sector expressed in CO_2 eq. are presented in Table 2-28. The most significant source of GHG emissions in Lithuania is energy sector with 62.1% share of the total emissions in 2022. Agriculture is the second most significant source and accounted for 21.5% of the total emissions. Emissions from industrial processes contributed 12.1% of the total GHG emissions, waste sector – 4.3%.

Table 2-28. Greenhouse gas emissions/removals by sector during the period 1990–2022, kt CO_2 eq.

Years	Energy	IPPU	Agriculture	LULUCF	Waste	Total (including LULUCF)	Total (excluding LULUCF)
1990	33,145.2	4,299.9	8,922.7	-5,336.9	1,652.3	42,683.2	48,020.0
1991	35,203.8	4,324.3	8,770.4	-5,656.3	1,680.7	44,322.9	49,979.1
1992	19,937.0	2,526.3	6,830.8	-4,856.4	1,653.0	26,090.7	30,947.2
1993	16,065.2	1,600.5	5,477.6	-6,391.3	1,681.8	18,433.9	24,825.1
1994	15,137.5	1,816.7	4,825.5	-5,903.4	1,655.6	17,531.8	23,435.2
1995	14,186.8	2,096.7	4,459.4	-4,629.9	1,658.6	17,771.5	22,401.5
1996	14,669.6	2,459.3	4,587.0	898.6	1,655.7	24,270.3	23,371.7
1997	14,217.6	2,413.3	4,613.9	-316.0	1,674.1	22,602.8	22,918.8
1998	14,914.7	2,789.2	4,451.1	-7,905.8	1,654.8	15,904.0	23,809.8
1999	12,473.7	2,717.9	4,169.6	-7,219.8	1,640.7	13,782.1	21,001.8
2000	10,945.0	2,849.1	3,961.0	-9,511.0	1,639.1	9,883.3	19,394.2
2001	11,624.2	3,078.5	3,791.5	-7,339.6	1,672.5	12,827.1	20,166.7
2002	11,688.4	3,235.2	3,929.5	-6,386.5	1,670.6	14,137.1	20,523.6
2003	11,701.9	3,309.7	4,015.8	-5,619.6	1,662.5	15,070.3	20,689.9
2004	12,320.6	3,476.6	4,063.1	-5,074.4	1,628.5	16,414.4	21,488.8
2005	13,172.8	3,504.1	4,074.0	-4,179.2	1,584.4	18,156.2	22,335.4
2006	13,222.6	3,803.7	4,086.8	-3,772.0	1,545.4	18,886.5	22,658.5
2007	13,447.8	5,443.0	4,184.1	-5,605.2	1,515.6	18,985.2	24,590.4

2008	13,326.2	4,865.8	4,106.7	-6,287.7	1,424.0	17,435.1	23,722.8
2009	12,147.0	2,005.8	4,165.3	-7,248.9	1,395.6	12,464.8	19,713.7
2010	13,131.7	2,007.3	4,124.3	-10,412.0	1,369.5	10,220.8	20,632.8
2011	12,273.1	3,265.9	4,155.9	-10,514.7	1,300.4	10,480.5	20,995.3
2012	12,312.4	3,183.8	4,210.5	-10,079.3	1,264.8	10,892.1	20,971.4
2013	11,692.5	2,735.4	4,180.4	-9,504.1	1,236.8	10,340.9	19,845.1
2014	11,314.7	2,872.3	4,377.6	-8,751.9	1,175.0	10,987.7	19,739.6
2015	11,286.4	3,179.2	4,448.2	-7,917.0	1,115.7	12,112.5	20,029.5
2016	11,606.2	3,037.8	4,352.7	-7,116.0	1,096.5	12,977.1	20,093.1
2017	11,545.8	3,276.9	4,307.8	-6,532.8	1,086.9	13,684.5	20,217.3
2018	11,900.9	2,844.8	4,185.8	-5,717.1	965.8	14,180.2	19,897.3
2019	11,914.7	3,072.3	4,198.9	-5,903.0	924.1	14,207.0	20,110.0
2020	11,833.1	2,878.4	4,400.9	-6,073.3	897.5	13,936.6	20,009.8
2021	12,255.2	2,745.4	4,314.5	-5,501.2	859.0	14,672.9	20,174.0
2022	11,742.5	2,281.7	4,058.8	-6,355.9	820.8	12,547.8	18,903.7
2022/ 1990, %	**-64.6**	**-46.9**	**-54.5**	**19.1**	**-50.3**	**-70.6**	**-60.6**

Energy

Energy sector is the most significant source of GHG emissions in Lithuania with 62.1% share of the total emissions (excl. LULUCF) in 2022. Emissions from energy include CO_2, CH_4 and N_2O.

Emissions of total GHG from energy sector have decreased almost 3 times from 33,145.2 kt CO_2 eq. in 1990 to 11,742.5 kt CO_2 eq. in 2022 (Figure 2-33). Significant decrease of emissions was mainly due to economic slump in the period 1991–1995. During the fast economic growth over the period 2000–2008 GHG emission in energy sector was increasing about 2.5% per annum. The global economic recession had impact on GHG reduction in energy sector by 8.9% in 2009. The closure of Ignalina NPP and GDP increase had impact on GHG increase by 8.1% in 2010.

During the period 1990–2022 the share of transport sector significantly increased. In 1990 transport sector accounted for 17.5% of total GHG emission in energy sector whereas in 2022 – 31.8%. This growth is influenced by increasing the volume of goods transported by road and number of road vehicles as well as significant reduction of GHG emissions in other energy subsectors.

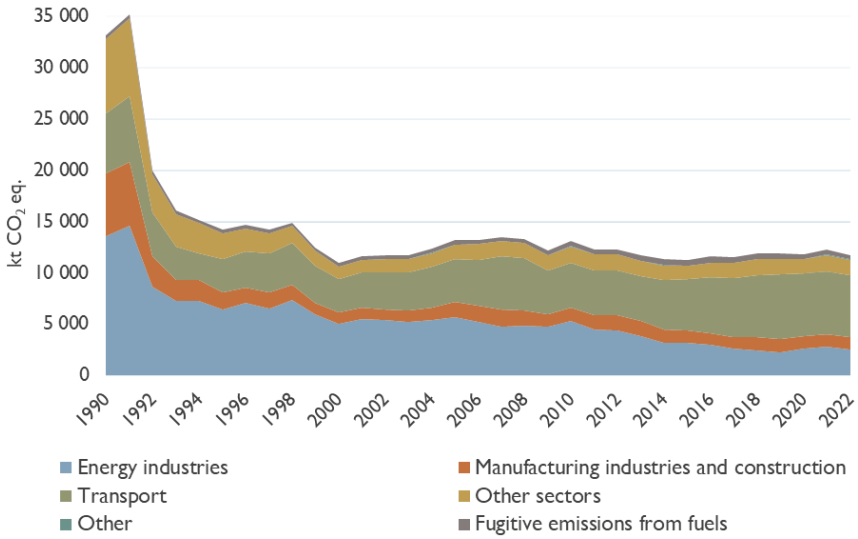


Figure 2-33. Trend of GHG emissions in energy sector during the period 1990–2022

The increase of GHG emissions from fugitive sources is mainly caused by the increase of CO_2 emissions from hydrogen production in oil refinery reflecting amount of hydrogen produced. In 2007–2010 GHG emissions from hydrogen production were increasing by average 50.5% per annum.

Industrial Processes and Product Use (IPPU)

Emissions from industrial processes and product use (referred to as non-energy related ones) amount to 12.1% of the total emissions (excl. LULUCF) in 2022. Emissions from industrial processes and product use include CO_2, N_2O and F-gases emissions. Emissions of total GHG from the industrial processes and product use sector have decreased from 4,299.9 kt CO_2 eq. in 1990 to 2,281.7 kt CO_2 eq. in 2022 (Figure 2-34). In Lithuania the largest GHG emission sources from the IPPU sector are: chemical industry (ammonia and nitric acid production), cement production and products use as ozone depleting substances (ODS) substitutes (F-gases emissions).

CO_2 emissions from ammonia production contributed 44.7% to the total IPPU sector emissions in 2022. The lowest emission of CO_2 was in 1993 due to decrease of the ammonia production and the peak of CO_2 emissions were in 2007 when the ammonia production increased drastically. Comparing with 2021 CO_2 emissions decreased by 33.8% mostly due to drop of production volumes influenced by high natural gas prices.

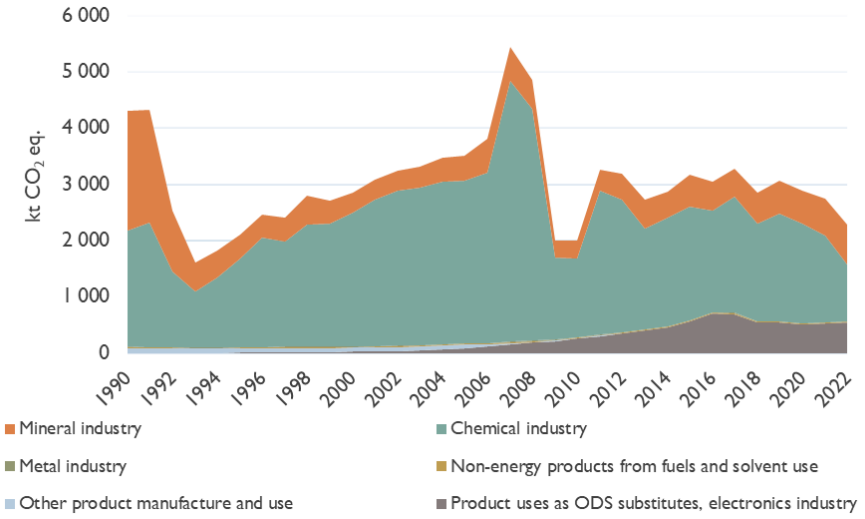


Figure 2-34. Trend of GHG emissions in industrial processes and product use sector during the period 1990–2022

Nitric acid production is the single source of N_2O emissions in industrial processes sector and accounts for 4.0% in the total national N_2O emissions (excl. LULUCF) in 2022. N_2O emissions had been increasing since 1995 and reached its peak in 2007. After the installation of the secondary catalyst in nitric acid production enterprise in 2008 the emissions of N_2O dropped drastically. Comparing with 2021 N_2O emissions from nitric acid production has decreased by 22.9%.

The main source of F-gases emissions is the use of HFCs in refrigeration and air conditioning equipment. The consumption of HFCs were constantly increasing during 1993–2016 period. However, with the adoption of EU F-gases Regulation the restrictions to reduce HFC emissions has been set out, and as a result HFCs emissions in Lithuania started to decrease in 2017.

Agriculture

Agriculture sector is the second most important source of GHG emissions in Lithuania contributing 21.5% to the total GHG emission (excl. LULUCF). The emissions from agriculture sector include CH_4, N_2O and CO_2 emissions. Emissions of total GHG from agriculture sector have decreased more than 2 times from 8,922.7 kt CO_2 eq. in 1990 to 4,058.8 kt CO_2 eq. in 2022 (Figure 2-35).

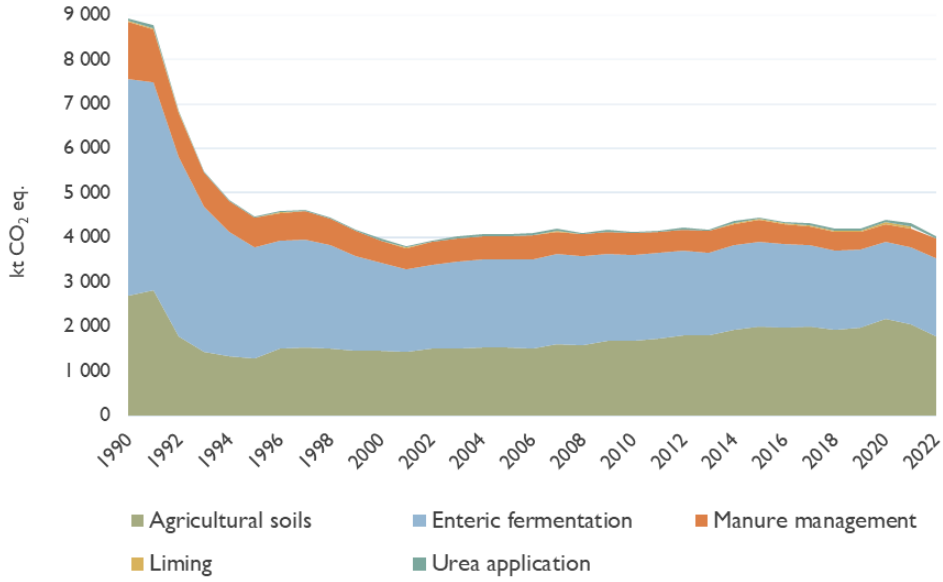


Figure 2-35. Trend of GHG emissions in agriculture sector during the period 1990–2022

Emissions from agriculture sector decreased substantially in the beginning of 1990s. The agriculture sector contributed 24% of the national GDP in 1992 and employed 19% of the labour force. Lithuania's agriculture, efficient according to the past soviet standards, produced a huge surplus that could not be consumed domestically. Lithuania was producing crops, developing livestock farming and food processing industry. Crops accounted for 1/3 and livestock for 2/3 of the total value of agricultural output. Lithuanian agricultural production was high enough to allow the export of about 50% of the total output.

Significant reforms were introduced in the early 1990s, particularly after the restoration of independence. The reform included the re-establishment of private ownership and management in the agriculture sector. Legislation defined dismemberment of the collective farms, but they did not definitively ensure their replacement by at least equally productive private farms or corporations. Agricultural production decreased by more than 50% from 1989 to 1994. The farms were broken into small holdings, averaging 8.8 ha in size, often not large enough to be economically viable. After Lithuania has joined EU in 2004, macroeconomic indicators of agriculture sector along with food processing industry has been constantly improving.

Agriculture sector is the most significant source of the CH_4 and N_2O emissions accounting for 63% and 88% in the total CH_4 and N_2O emissions, respectively. In 2022 the emissions of CH_4 and N_2O from agriculture sector decreased by 64% and 31% compared to the base year, respectively. The reduction of CH_4 emissions is mostly caused by the decrease in total number of livestock population.

A major part of the agricultural CH_4 emission originates from digestive processes. Enteric fermentation contributes 54.9%, manure management – 8.3% to the total national CH_4 emissions.

Agricultural soils are the most significant source of N_2O emissions accounting for 76% in the total national N_2O emissions. Application of inorganic N fertilizer and cultivation of histosols leads to substantial emissions of N_2O from agricultural soils. After the restoration of Lithuanian independence consumption of fertilizers drastically declined up to 40 kt per year in 1995. Since 1995 consumption of fertilizers was constantly rising as the economy was progressing together with the growth of agriculture, demand of crops and vegetables. In 2020 the use of synthetic N fertilizers consumption has increased to more than double

compared to 2000. In 2022 emissions from inorganic N fertilizer consumption has decreased by 30% compared with 2021. This decrease is related with drastically increased inorganic N fertilizer prices, which is related to the energy resources crisis after the war started in the Ukraine in 2022.

LULUCF

In general, historical GHG emissions from sources and removals in sinks in the Land Use, Land-Use Change and Forestry (LULUCF) sector in Lithuania are mostly related to three main categories – forest land, cropland and grassland, with addition to wetlands if there are significant amounts of peat extracted in peat extraction areas or conversions to flooded land. Historical land use patterns, usually determined by economic and political situation play a key role in land use changes and emissions or removals afterwards. Perfunctory forest land accounting during inter-war and later occupation period as well as introduction of various support schemes for agricultural land, afforestation/reforestation (especially after Lithuania joined the EU and Common Agricultural Policy have launched) has led to rather considerable land use changes and different land management, which in the end has caused fluctuations in total emissions and removals trend.

LULUCF sector for 1990–2022 acted as a CO_2 sink except in 1996 when emission constituted to 898.6 kt CO_2 eq. (Figure 2-36). That is explained by severe storms followed by beetles' invasions and other calamities which had a huge impact in biomass loss which eventually resulted in CO_2 emissions. LULUCF removals have been steadily decreasing since 2011 and one of the main factors until 2018 was significantly decreasing removals in Forest land. Declining GHG removals in Forest land is mostly related to changing age class distribution in forests, as majority of pine forests are getting older and at this age, their removal potential is decreasing. For comparison, in 2011 Forest land generated -10,182 kt CO_2 eq. and in 2022 – -6,462 CO_2 eq.

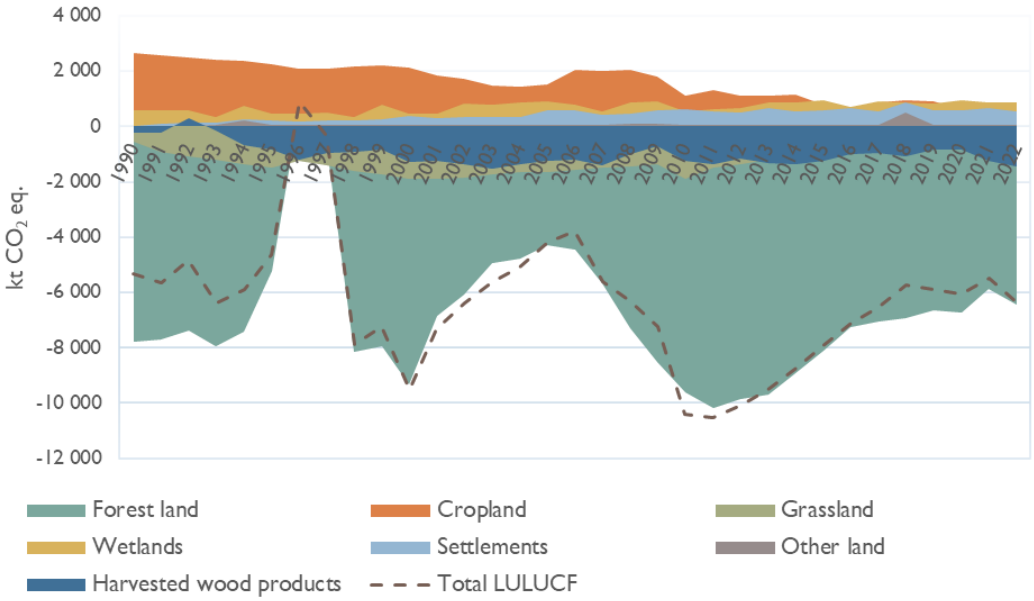


Figure 2-36. Total GHG emissions/removals from LULUCF sector for the period 1990–2022

Waste

The waste sector accounted for 4.3% of the total greenhouse gas emissions in 2022 (excl. LULUCF). The emissions from the waste sector included CO_2, CH_4 and N_2O emissions. Emissions of the total GHG from

the waste sector have decreased from 1,652.3 kt CO_2 eq. in 1990 to 820.8 kt CO_2 eq. in 2022 (Figure 2-37).

Solid waste disposal on land (including disposal of sewage sludge) is the largest GHG emission source from the waste sector. It contributed around 69.8% of the total GHG emission from the waste sector in 2022. GHG emissions occurring due to solid waste and sewage sludge disposal on land were increasing slightly from 1990 to 2003 and then started to decrease due to reduction of disposed waste, extraction of landfill gas and anaerobic digestion of sewage sludge.

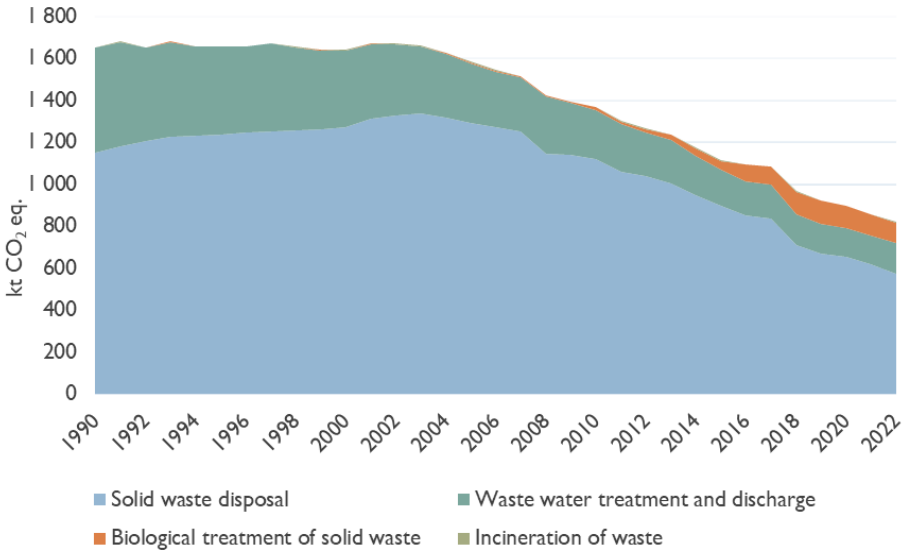


Figure 2-37. Trend of GHG emissions in waste sector during the period 1990–2022

Wastewater treatment and discharge contributed around 18% of GHG emissions from waste sector in 2022. Wastewater in Lithuania is treated in aerobic treatment systems with minimum CH_4 generation. However, about 23.9% of population (2022) still does not have connection to public sewerage systems and emissions from sewage collected from septic tanks are significant.

Biological treatment of waste includes composting and anaerobic digestion. GHG emissions from biological treatment have increased substantially after establishment of the regional waste management systems in 2010 and once again after implementation of waste mechanical-biological treatment facilities in 2016. Emissions from biological treatment reached 12.1% of the total waste sector emissions in 2022.

2.6. Projections of greenhouse gas emissions and removals

2.6.1. Projections results

2.6.1.1. General trends

This section provides information of future trends in GHG emissions and removals in Lithuania, given current national circumstances and adopted and implemented policies and measures described in Chapter 2.4 above.

Projections of GHG emissions have been calculated by carrying out systematic modelling of economic sectors of Lithuania. The model is based on an integrated approach and relies on statistical data, reflecting

the existing situation of ***base year 2021*** and particular assumptions which affect the long-term development of the economic sectors, with the account of the EU climate change and energy objectives by 2030 and targets by 2040. ***As the main work for projections development has started with the preparation of NECP update at the end of 2023 and at the time of preparation only actual GHG emissions for year 2021 were available, 2022 was not used as the base year.*** The same GHG projections were used for the Lithuanian National Energy and Climate Action Plan submitted to European Commission in 2024. The starting point for projections is the year 2022 (the first year projected).

In this Biennial Transparency Report projections by 2050 are reported. GHG projections are also reported in CTF table 7 and table 8.

Information on models and approaches used for projections such as gases and sectors covered, interaction to other models/approaches etc. is provided in Annex III "Summary information on the models/approaches used for the GHG projection estimation". The information on main underlying assumptions and parameters used for the projections development until 2050 is provided in CTF table 11.

Projections as well as policies and measures are divided into the following reporting categories: energy, transport, industrial processes, agriculture, LULUCF and waste.

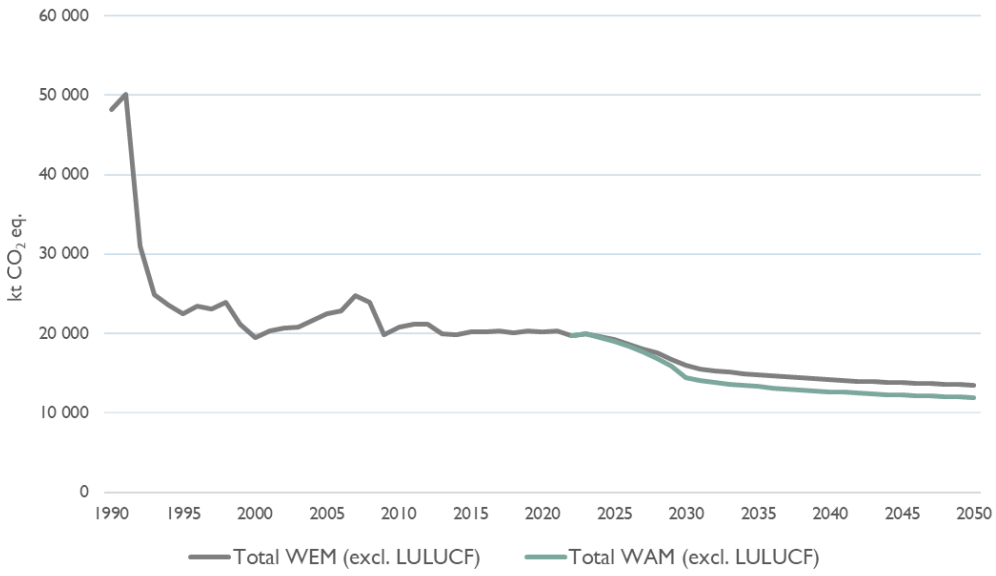


Figure 2-38. Aggregated projected GHG emissions by 2050, kt CO_2 eq.

Table 2-29. Projected GHG emissions in case of WEM scenario, kt CO_2 eq.

Sector	2021	2025	2030	2035	2040	2045	2050
Energy	6,149	5,661	4,858	4,871	4,840	4,823	4,807
Transport	6,125	5,560	4,020	3,139	2,780	2,525	2,312
IPPU	2,756	3,096	2,675	2,543	2,457	2,412	2,400
Agriculture	4,328	4,169	3,866	3,825	3,751	3,711	3,667
LULUCF	-6,091	-6,607	-7,474	-7,192	-6,956	-6,482	-5,180
Waste	894	696	498	405	342	297	264
Indirect CO_2 eq.	40.27	32.08	30.26	28.56	27	25.57	24.22

Total excl. LULUCF	**20,292**	**19,213**	**15,947**	**14,811**	**14,198**	**13,794**	**13,475**
Total incl. LULUCF	**14,201**	**12,607**	**8,473**	**7,618**	**7,242**	**7,312**	**8,296**

Table 2-30. Projected GHG emissions in case of WAM scenario, kt CO_2 eq.

Sector	2021	2025	2030	2035	2040	2045	2050
Energy	6,149	5,586	3,908	3,920	3,890	3,874	3,858
Transport	6,125	5,512	3,847	2,949	2,572	2,299	2,069
IPPU	2,756	3,096	2,492	2,360	2,275	2,229	2,218
Agriculture	4,328	4,081	3,700	3,661	3,587	3,547	3,503
LULUCF	-6,091	-6,587	-7,604	-7,299	-6,982	-6,509	-5,180
Waste	894	689	487	393	331	286	253
Indirect CO_2 eq.	40.27	32.08	30.26	28.56	27	25.57	24.22
Total excl. LULUCF	**20,292**	**18,995**	**14,465**	**13,312**	**12,682**	**12,261**	**11,925**
Total incl. LULUCF	**14,201**	**12,408**	**6,861**	**6,013**	**5,700**	**5,752**	**6,745**

GHG emissions projections suggest that decreasing natural gas consumption in electricity and heat production, ongoing GHG reduction measures in transport sector, as well as decreasing consumption of F-gases and consumption of inorganic nitrogen fertilizer for agriculture soils will result in the decrease of GHG emissions. The implementation of additional measures will result in total 1,550 kt CO_2 eq. (excluding LULUCF) decrease in 2050. GHG emission projections by gas are provided in the table and figures below, both WEM and WAM scenarios.

Table 2-31. GHG emissions WEM and WAM projections by gas (excl. LULUCF)

Scenario	Gas	2021	2025	2030	2035	2040	2045	2050
WEM	CO_2	13,870	13,271	10,658	9,795	9,412	9,141	8,909
WAM		13,870	13,149	9,358	8,476	8,078	7,790	7,543
Difference		*0%*	*-1%*	*-12%*	*-13%*	*-14%*	*-15%*	*-15%*
WEM	CH_4	3,301	2,888	2,487	2,375	2,285	2,236	2,198
WAM		3,301	2,820	2,371	2,264	2,173	2,125	2,087
Difference		*0%*	*-2%*	*-5%*	*-5%*	*-5%*	*-5%*	*-5%*
WEM	N_2O	2,594	2,634	2,486	2,456	2,401	2,362	2,324
WAM		2,594	2,605	2,420	2,387	2,330	2,290	2,250
Difference		*0%*	*-1%*	*-3%*	*-3%*	*-3%*	*-3%*	*-3%*
WEM	F-gases*	525	451	344	212	127	82	70
WAM		525	451	344	212	127	82	70
Difference		*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*

* no additional measures for F-gases

2.6.1.2. Energy

The emissions from energy sector for WEM and WAM scenarios are provided in the table and figure below.

Table 2-32. Projected GHG emissions in case of WEM and WAM scenarios, kt CO_2 eq.

	2021	2025	2030	2035	2040	2045	2050
WEM scenario	6,149	5,661	4,858	4,871	4,840	4,823	4,807
WAM scenario	6,149	5,586	3,908	3,920	3,890	3,874	3,858
Difference (WEM-WAM), kt CO_2 eq.	0	75	950	950	950	949	949
Difference (WEM/WAM), %	0%	1%	24%	24%	24%	25%	25%

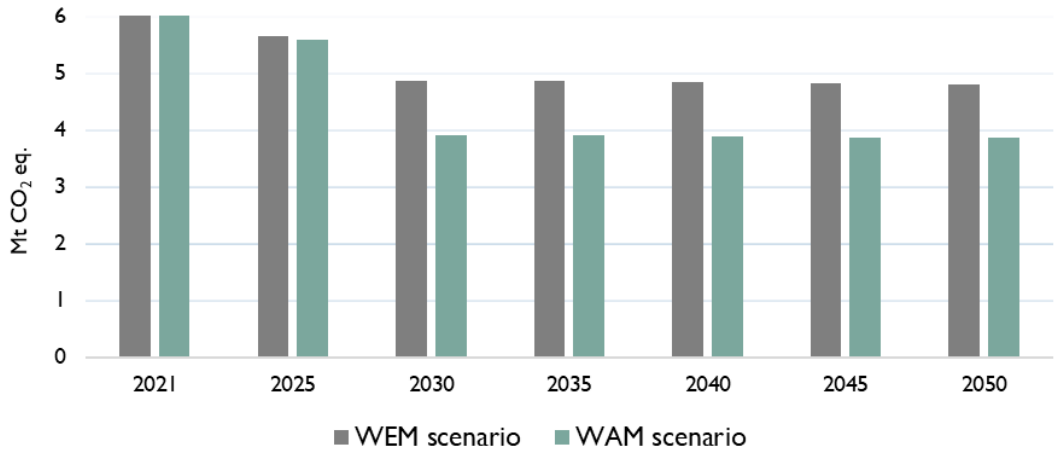


Figure 2-39. Projection of the WEM and WAM scenarios in energy sector

Scenario "with existing measures" (WEM)

The GHG emissions in energy sector were determined by firstly estimating the consumption of fuel in energy consumption sectors.

It is estimated that the total primary energy consumption will gradually decrease. The decrease in primary energy consumption is mainly associated with improvement of energy efficiency and decreasing population in Lithuania. The regular population was 2.789 million in 2021 in Lithuania, and it was assumed that the population will be 2.576 million in 2030 and 2.138 million in 2050.

The share of each energy subsector in total projected GHG emissions is presented in Table 2-33 it is estimated that public electricity and heat production, petroleum refining, and residential sectors will remain the main sources of GHG emissions in the energy sector. Emissions in manufacturing industries shall decrease more than 2 times and will not belong to the main sources.

Table 2-33. Projected GHG emissions from energy subsectors, kt CO_2 eq.

Sector	2021	2025	2030	2035	2040	2045	2050
Public Electricity and Heat Production	1,529	1,301	1,223	1,308	1,308	1,306	1,306
Petroleum Refining	1,212	1,291	1,186	1,186	1,186	1,186	1,186
Manufacture of Solid Fuels and Other Energy Industries	43	28	27	28	28	28	28
Manufacturing industries and construction	1,275	1,054	667	541	525	512	497
Commercial/Institutional	303	238	166	168	167	166	166

Residential	1,015	905	798	847	834	832	830
Agriculture/Forestry/Fishing	256	261	225	226	227	228	229
Other	27	27	27	27	27	27	27
Fugitive emissions from fuels	488	555	538	538	538	538	538

It was estimated that increased energy consumption efficiency and use of biomass and waste together with the change of polluting technologies will decrease the use of fossil fuel in manufacturing industries and construction sub-sector by 52% in 2030 which will lead to decrease in GHG emissions in this sector. Increased energy consumption efficiency, use of biomass, wind and solar energy will decrease the use of fossil fuel in public electricity and heat production sector by 32% in 2030. It was also estimated that increased use of heat pumps and implemented CO_2 taxes will decrease the use of fossil fuel in commercial/institutional sector by 34% in 2030. Increased energy consumption efficiency together with the latter aspects will decrease the use of fossil fuel in residential sector by 19% in 2030 which will lead to decrease in GHG emissions in this sector. GHG emissions in other sectors shall remain rather stable.

The overall situation in the energy sector starting from 1990 and the projected emissions up to the year 2050 are presented in Figure 2-40.

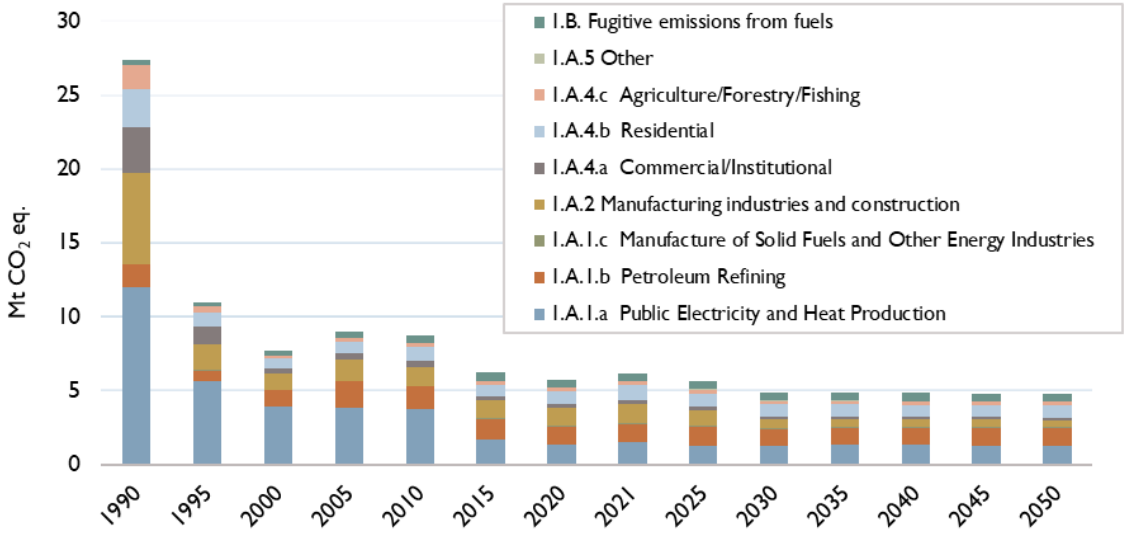


Figure 2-40. Historical and projected GHG emissions 1990–2050, kt CO_2 eq. (excl. transport sector)

It is estimated that the overall GHG emissions from energy sector (excluding the transport sector) will decrease by 82% in 2050 compared to 1990. Figure 2-41 shows the share of GHG emissions from each energy subsector in 2030.

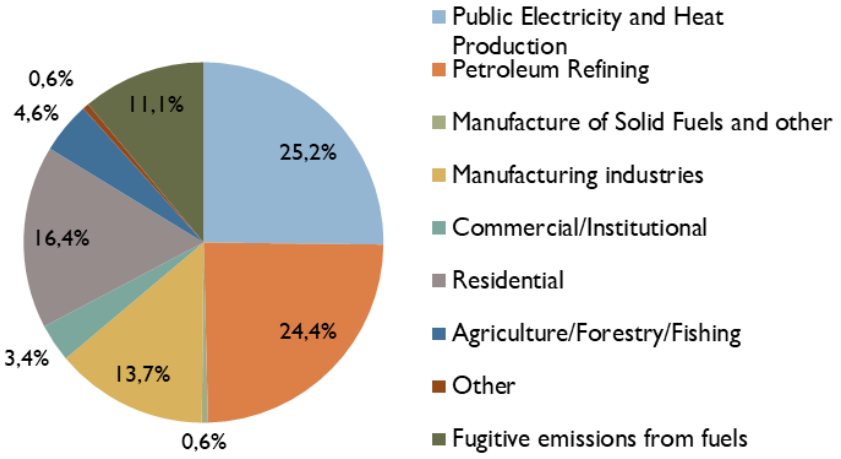


Figure 2-41. Estimated GHG emissions share by sectors in 2030

GHG emissions are estimated to reach a total of 4,858 kt CO_2 eq. in 2030. Most of the GHG will originate from public electricity and heat production (25%), petroleum refining (24%) and residential sector (16%). manufacture of solid fuels and other energy industries as well as other (military aviation) sectors are still expected to remain the smallest GHG emitters of energy subsectors.

Several factors determine GHG emission projections in the EU ETS sectors and mainly in the public electricity and heat production sector. These sectors underwent a trend of switching fossil fuel to the use of biomass up to 2024, but the result is still not seen in fuel balance. Emissions in public electricity and heat production sector shall also reduce up to 2030 due to the building renovation program. New biomass-fuelled CHP boilers started operation in Vilnius in July 2023. This reduces electricity imports for Lithuania and reduces GHG emissions in public electricity and heat production. For the current GHG projections it was assumed that the EU ETS carbon price will remain stable until 2050.

Scenario "with additional measures" (WAM)

The WAM scenario includes measures which pay the most attention to RES development, increasing energy efficiency and improving energy market.

The list of PaMs and total GHG reduction effect applying additional policies and measures is presented in Chapter 2.4.

Table 2-34. Projected GHG emissions from energy sector (kt CO_2 eq.)

	2021	2025	2030	2035	2040	2045	2050
Public Electricity and Heat Production	1,529	1,283	955	955	955	953	953
Petroleum Refining	1,212	1,265	1,112	1,112	1,112	1,112	1,112
Manufacture of Solid Fuels and Other Energy Industries	43	28	25	25	25	25	25
Manufacturing industries	1,275	1,023	434	407	391	378	364
Commercial/Institutional	303	238	156	167	166	165	165
Residential	1,015	905	790	814	800	798	796
Agriculture/Forestry/Fishing	256	261	223	224	225	226	227
Other	27	27	27	27	27	27	27
Fugitive emissions from fuels	488	555	186	189	189	189	189

Additional measures will allow reduction of GHG emissions from energy sector by 36% in 2030, compared to 2021.

Comparing to 1990, it is projected that applying additional policies and measures GHG emissions in energy sector should decrease by 86% in 2030 and remain approximately at the same level up to 2050.

2.6.1.3. Transport

The emissions from transport sector for WEM and WAM scenarios are provided in the table and figure below.

Table 2-35. Projected GHG emissions in case of WEM and WAM scenarios, kt CO_2 eq.

	2021	2025	2030	2035	2040	2045	2050
WEM scenario	6,125	5,560	4,020	3,139	2,780	2,525	2,312
WAM scenario	6,125	5,512	3,847	2,949	2,572	2,299	2,069
Difference (WEM-WAM), kt CO_2 eq.	0	48	173	191	208	226	243
Difference (WEM/WAM), %	0%	1%	4%	6%	8%	10%	12%

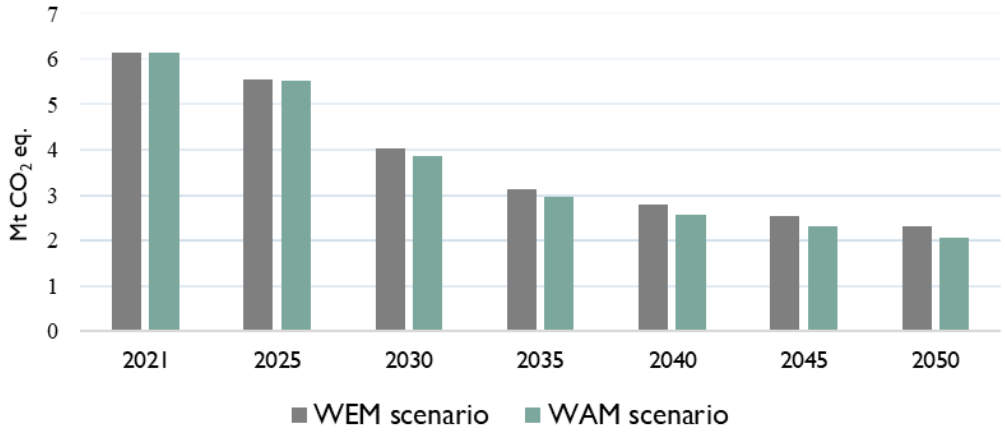


Figure 2-42. Projection of the WEM and WAM scenarios in transport sector

Scenario "with existing measures" (WEM)

Road transport sector is the main source of GHG emissions and fuel consumption in transport sector. It was assumed that GHG emissions in road transport sector are directly linked with fuel consumption which is influenced by the number of fossil fuel powered road vehicles registered in Lithuania, their kilometrage and fuel consumption per kilometre. The total projected number of cars registered in Lithuania was calculated using regression analysis for baseline scenario. This number of cars is anticipated without measures with the start of implementation in 2021 or later, therefore impacts of these new measures were additionally included in calculations of number of cars and anticipated fuel consumption of WEM scenario.

Road transport sector is projected to remain the only gasoline and the main diesel oil consumption source in transport sector. Road transport will remain the main fuel consumer in transport sector. As a result, it will remain the main GHG emissions source in this sector (97% of total transport sector emissions) in 2030. This is a result of increased vehicle number in Lithuania and the ongoing electrification of railways. It is projected that diesel oil and gasoline will remain the main fuel used in transport sector. This is mainly influenced by the fuel use trend in road transport sector.

GHG emissions from transport sector are projected to decrease down to 4,020 kt CO_2 eq. in 2030 (Figure 2-43). Compared to 2021, the GHG emissions from this sector will decrease 1.5 times in 2030. The

decrease of GHG occurs due to the implementation of existing GHG reduction measures, due to increasing energy efficiency in road transport and due to decreasing population.

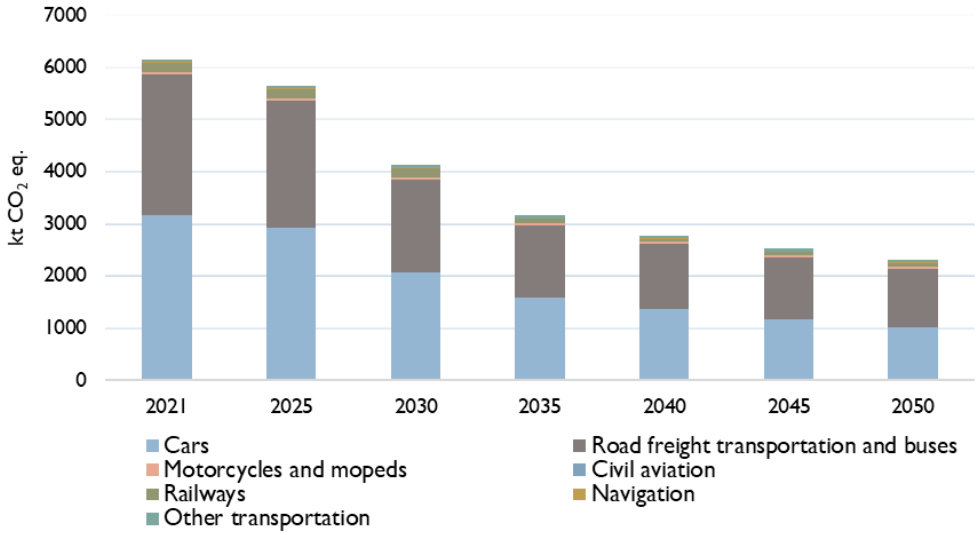


Figure 2-43. Projected total GHG emissions in transport sector (WEM scenario)

The second largest GHG emissions source in transport sector will remain railways sector. In civil aviation subsector it is estimated that the GHG emissions would not change until 2030, and this sector will remain a minor source of GHG emissions as there are only 8 aircraft operators[25] that have valid license issued to perform air communication in Lithuania. Most of the flights performed by the Lithuanian aircraft operators are international and are excluded from the projections for the national total.

Railways sector is projected to emit less amount of GHG in 2030 (59 kt CO_2 eq. – decreased by 65% compared to 2021). This is because the fuel consumption in railways would decrease by 39.3%, influenced by electrification of railways and by significantly decreased freight turnover in 2022. An additional reason for the reduction of GHG emissions in railways is an obligatory higher share of biofuel blended in gas/diesel oil required by the Law of alternative fuels.

Transport sector is less affected by the EU ETS carbon price as in current situation only aviation, navigation sectors and pipeline transportation companies are involved in the EU ETS market. In Lithuania there are several aircraft operators that fall under the scope of the EU ETS and according to the latest data from EUROCONTROL[26] only two aircraft operators were not considered as small emitters in 2023 (emitted 11,492 t CO_2 per year under EU ETS).

Scenario "with additional measures" (WAM)

The WAM scenario is based on the additional measures provided by the Ministry of Environment, the Ministry of Transport and Communications, the Ministry of Energy and the Ministry of Agriculture. The implementation period of measures will cover the period of 2024–2030. For the period of 2031–2050 all additional measures will continue to be implemented at the same rate as is expected in 2030. Most of these measures focus on incentives to change vehicles to the ones powered by alternative sources (electricity, biomethane, hydrogen), also on fuel-efficiency (combined intermodal transport, sustainable mobility, etc.).

[25] Lithuanian transport safety administration data: https://ltsa.lrv.lt/lt/veiklos-sritys/oro-transportas-1/licencija-oro-susisiekimui-vykdyti/informacijos-apie-licencijas-vykdyti-oro-susisiekima-skelbimas/

[26] European Organisation for the Safety of Air Navigation https://www.eurocontrol.int/

Promoting alternative fuels infrastructure and vehicles will have the largest effect for GHG emission reduction.

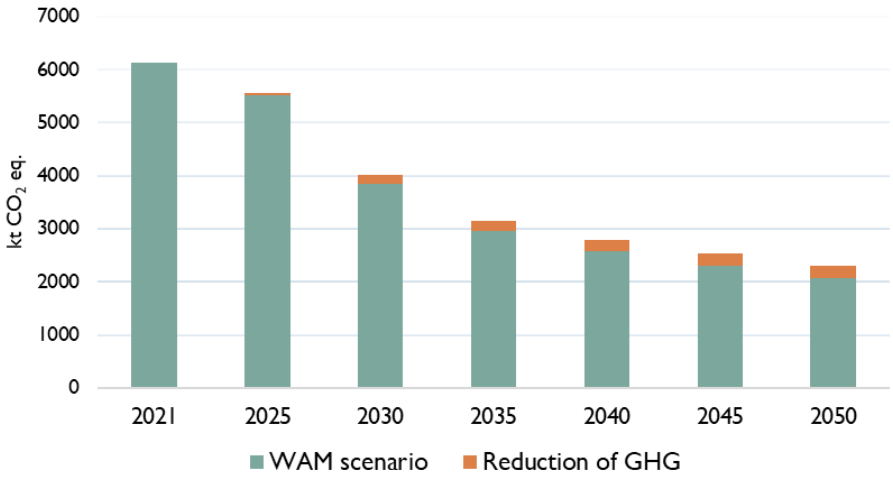


Figure 2-44. Projected emissions in the transport sector under WAM scenario

The list of PaMs and total GHG reduction effect applying additional policies and measures is presented in Chapter 2.4.

Additional measures will allow reduction of GHG emissions in the transport sector by 37% in 2030, compared to 2021. Compared with 1990, it is projected that applying additional policies and measures GHG emissions in transport sector should decrease by 34% in 2030, and by 64% in 2050.

2.6.1.4. IPPU

GHG emissions from Industrial processes and product use (IPPU) sector from WAM and WEM scenarios is displayed on figure and table below.

Table 2-36. Projected GHG emissions in IPPU sector in the case of WEM and WAM scenarios, kt CO_2 eq.

	2021	2025	2030	2035	2040	2045	2050
WEM scenario	2,756	3,096	2,675	2,543	2,457	2,412	2,400
WAM scenario	2,756	3,096	2,492	2,360	2,275	2,229	2,218
Difference (WEM-WAM), kt CO_2 eq.	0	0	183	183	183	183	183
Difference (WEM/WAM), %	0	0	7%	8%	8%	8%	8%

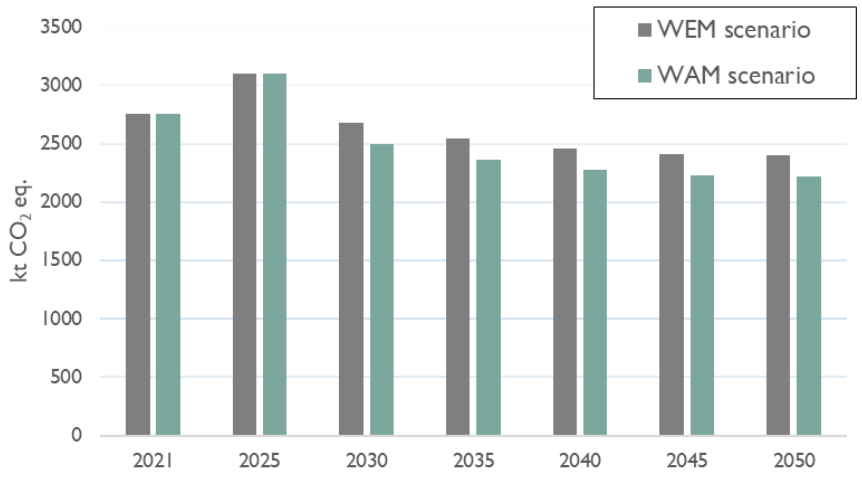


Figure 2-45. WEM and WAM scenarios in IPPU sector

Scenario "with existing measures" (WEM)

The largest contributing source for GHG emissions is chemical industry, along with mineral industry and product uses as substitutes for ODS (F-gases). Using WEM scenario currently, it is projected that chemical industry will remain foremost contributing sub-sector of GHG emissions. Overall, with WEM scenario it is estimated that the total GHG emission from IPPU sector will decrease during the projected period, mainly due to significant decrease of emissions from the use of F-gases due to restrictions of Regulation (EU) No 517. In comparison to 2021, aggregate GHG emissions in IPPU sector are expected to decrease by 3% in 2030, by 12% in 2040 and by 15% in 2050.

A significant share of GHG emissions in mineral industry sector are subject to the CO_2 emissions from cement production. The projections of CO_2 emissions from clinker production were based on activity data provided by the cement production company. It is projected that the clinker production will decrease slightly and remain consistent for the projected period. In general, GHG emissions in mineral industry are expected to decrease by 11% in 2030 in contrast to 2021, and are projected to remain consistent throughout 2040 and 2050 in comparison to 2030.

The main GHG emissions source in IPPU sector is nitric acid and ammonia production. It is expected that the production will peak in 2025 and subsequently decrease and stabilise for years 2030–2050. GHG emissions from chemical industry are projected to increase by 24% in 2025 in contrast to 2021 and afterwards decreasing by 18% in comparison to 2025, remaining consistent afterwards. The largest currently implemented measure contributing to reduction of GHG emissions in chemical industry is P13-E "Hydrogen production and usage". During the projected period, it is assumed that the local ammonia production plant will transition to in-situ hydrogen production, thereby eliminating the need for natural gas as a hydrogen source.

Table 2-37. Projected GHG emissions for IPPU sector in the case of WEM scenario, kt CO_2 eq.

IPPU sector category	2021	2025	2030	2035	2040	2045	2050
Mineral industry	656	591	591	591	592	592	592
Chemical industry	1,551	2,030	1,716	1,716	1,716	1,716	1,716
Metal industry	0	0	0	0	0	0	0
Non-energy products from fuels and solvents	20	20	20	20	20	20	20

Electronics industry	12	12	12	12	12	12	12
Product uses as substitutes for ODS	513	438	332	199	114	69	57
Other product manufacture and use	3.8	4.3	4.1	3.9	3.7	3.6	3.5
Solvent use	0	0	0	0	0	0	0
Total GHG emissions	**2,756**	**3,096**	**2,675**	**2,543**	**2,457**	**2,412**	**2,400**

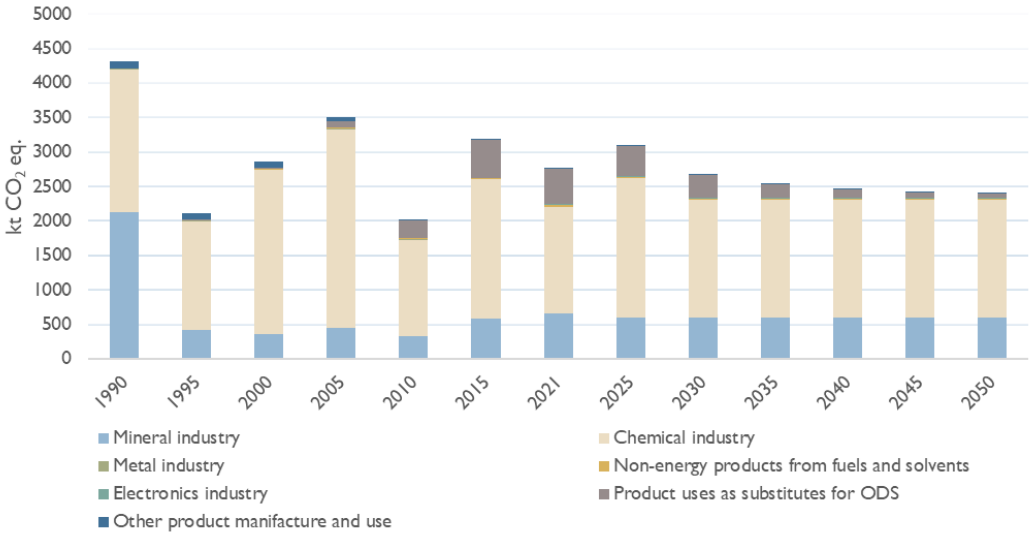


Figure 2-46. Historical and projected GHG emissions in IPPU sector

Scenario "with additional measures" (WAM)

The WAM scenario is based on the additional measures provided by the Ministry of the Economy and Innovation and the Ministry of Environment, the implementation period of measures will cover period of 2021–2030. For the period of 2031–2050 all additional measures will continue to be implemented at the same rate as it is expected in 2030.

The planned policies and measures in the industrial sector focus on implementing and promoting technological eco-innovation and modern technologies, providing partial financing to replace pollutant technologies with greener alternatives, encouraging traditional industrial transformation, and reducing the use of natural gas in industries.

List of policies and measures and cumulative GHG reduction effect for 2021–2030 is provided in Chapters 2.4.3. and 2.4.4.

Table 2-38. Projected GHG emissions for IPPU sector in the case of WAM scenario, kt CO_2 eq.

IPPU sector category	2021	2025	2030	2035	2040	2045	2050
Mineral industry	656	591	591	591	592	592	592
Chemical industry	1,551	2,030	1,533	1,533	1,533	1,533	1,533
Total GHG emission	0	0	0	0	0	0	0
Metal industry	20	20	20	20	20	20	20
Non-energy products from fuels and solvents	12	12	12	12	12	12	12

Electronics industry	513	438	332	199	114	69	57
Product uses as substitutes for ODS	4	4	4	4	4	4	3
Other product manufacture and use	0	0	0	0	0	0	0
Solvent use	0	0	0	0	0	0	0
Total GHG emissions	**2,756**	**3,096**	**2,492**	**2,360**	**2,275**	**2,229**	**2,218**

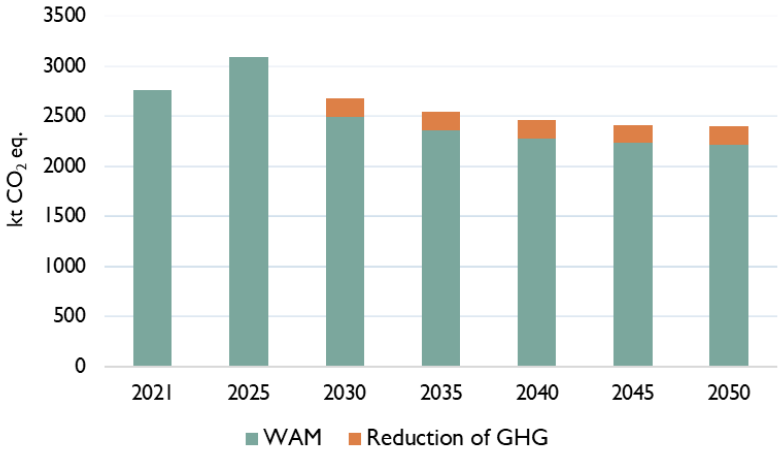


Figure 2-47. Projected emissions of IPPU sector under WAM scenario

2.6.1.5. Agriculture

The emissions from agriculture sector for WEM and WAM scenarios are provided in the table and figure below.

Table 2-39. Projected GHG emissions in case of WEM and WAM scenarios, kt CO_2 eq.

	2021	2025	2030	2035	2040	2045	2050
WEM scenario	4,328	4,169	3,866	3,825	3,751	3,711	3,667
WAM scenario	4,328	4,081	3,700	3,661	3,587	3,547	3,503
Difference (WEM-WAM), kt CO_2 eq.	0	88	166	164	164	164	164
Difference (WEM/WAM), %	0%	2%	4%	4%	5%	5%	5%

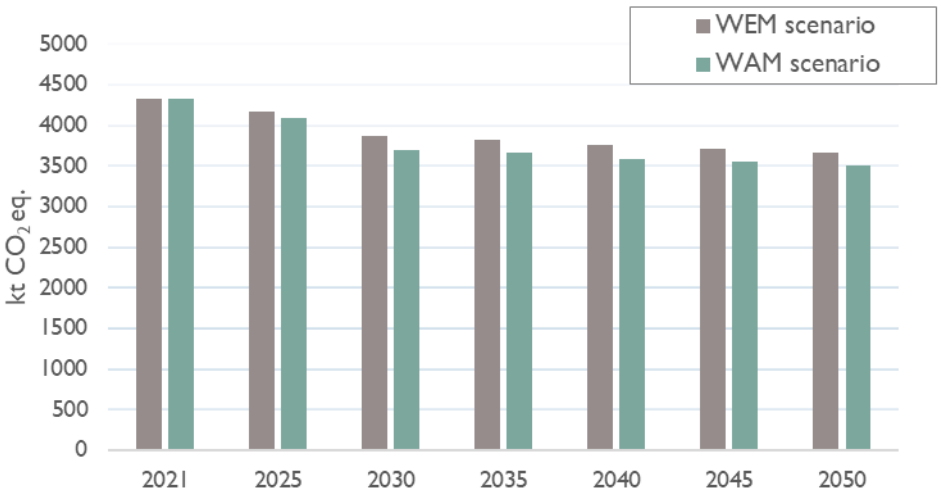


Figure 2-48. Projection of the WEM and WAM scenarios in agriculture sector

Scenario "with existing measures" (WEM)

GHG emissions projections for the agriculture sector are provided for five subsectors: enteric fermentation, manure management, agricultural soils and CO_2 emissions from liming and urea. The table below presents aggregated GHG emissions from the agriculture sector. The largest source of GHG emissions is agricultural soils, particularly direct soils emissions. The share of GHG emissions will not change a lot during projected period, agricultural soils subsector will remain the largest source of emissions in agriculture sector. Compared to 2021 emissions from agriculture sector will decrease by 11% in 2030, by 13% in 2040 and 15% in 2050.

Table 2-40. Projected GHG emissions from agriculture sector by category in case of WEM scenario, kt CO_2 eq.

Agriculture sector categories	2021	2025	2030	2035	2040	2045	2050
Enteric fermentation	1,720	1,679	1,570	1,555	1,538	1,538	1,538
Manure management	417	330	218	210	201	196	184
Agriculture soils	2,076	2,084	2,002	1,985	1,938	1,906	1,877
Urea application	57	23	23	23	23	23	23
Liming	58	52	53	52	51	48	45
Total GHG emissions	**4,328**	**4,169**	**3,866**	**3,825**	**3,751**	**3,711**	**3,667**

The figure below represents GHG emissions trend during the historical and projected period.

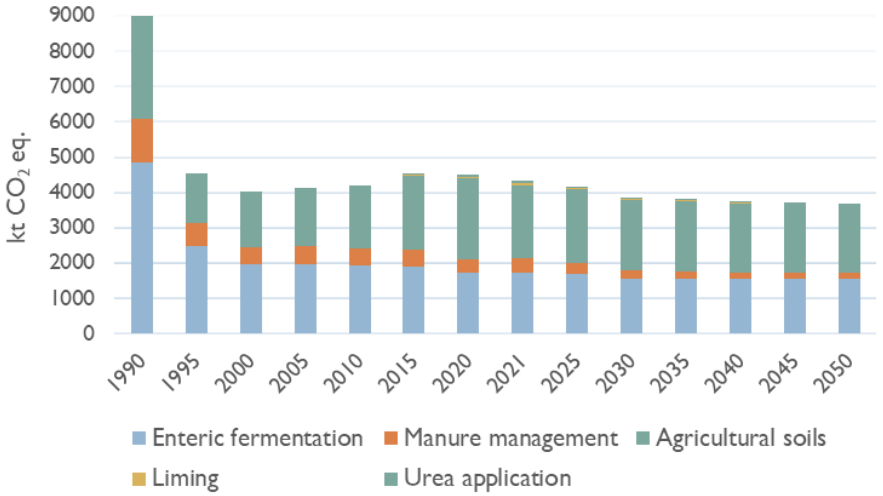


Figure 2-49. Historical and projected GHG emissions from agriculture sector by category under WEM scenario

Compared to 2021, GHG emissions from agriculture are projected to decrease by 11% by 2030 and by 3% in 2040 (compared to 2030) and by 2% in 2050 (compared to 2040). The largest GHG reductions in livestock production will be seen in the manure management category in 2030. This decrease is attributed to the impact of measure A1-E "Climate-friendly livestock production (manure management)", the implementation of the development of biogas plants. GHG emissions from enteric fermentation will decrease by 9% in 2030 compared to 2021, partly due to the decrease in the livestock population, but also to the implementation of the measure on feed substitution. GHG emissions from enteric fermentation are projected to decrease by a further 2% by 2040. GHG reductions in agriculture soil is projected to decrease by 5% in 2030 compared to 2021, mainly due to a decrease in the use of inorganic N fertilisers, as a result of the application of existing policy measures that promote sustainable farming practices (organic farming, use of no-till technology, promotion of crop rotation, precision fertilisation, etc.). GHG emissions from agricultural soils will decrease by a further 3% by 2040.

Scenario "with additional measures" (WAM)

The WAM scenario is based on the additional measures provided by the Ministry of Agriculture, the implementation period of measures will cover the period of 2021–2030. For the period of 2031–2050 all additional measures will continue to be implemented at the same rate as it is expected in 2030. Most of these measures focus on more sustainable use of inorganic N fertilizers and application of environmentally friendly technologies.

List of policies and measures and cumulative GHG reduction effect for 2021–2030 is provided in Chapters 2.4.3. and 2.4.4.

The emissions from agriculture sector WAM scenario and GHG emissions reduction are provided in the table and figure below.

Table 2-41. Projected GHG emissions from agriculture sector according to WAM scenario (kt CO_2 eq.)

	2021	2025	2030	2035	2040	2045	2050
Enteric fermentation	1,720	1,678	1,567	1,552	1,535	1,535	1,535
Manure management	417	256	90	89	81	76	64
Agricultural soils	2,076	2,071	1,968	1,945	1,898	1,865	1,836
Liming	57	23	23	23	23	23	23

Urea application	58	52	53	52	51	48	45
Total GHG emissions	**4,328**	**4,081**	**3,700**	**3,661**	**3,587**	**3,547**	**3,503**

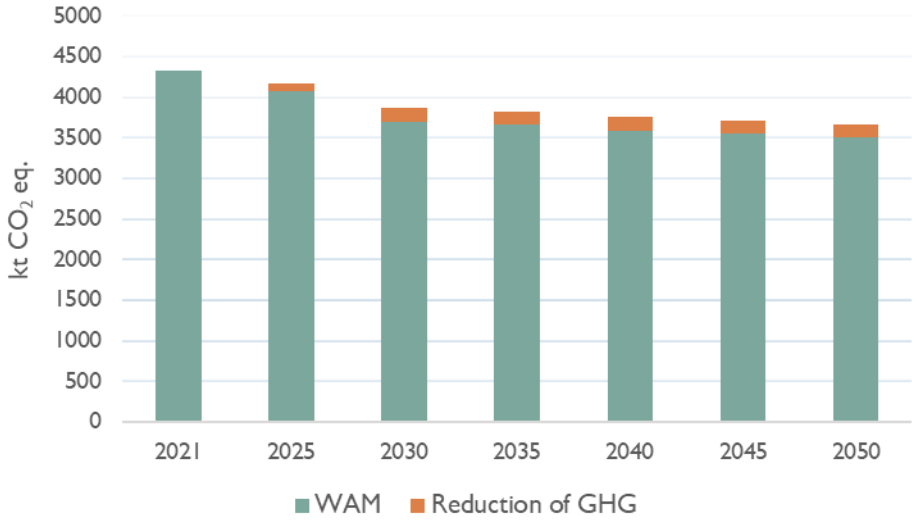


Figure 2-50. Projected emissions of agriculture sector under WAM scenario

Compared to 2021, the planned additional measures are projected to reduce total GHG emissions from agriculture by 15% in 2030, by 3% in 2040 (compared to 2030) and by 2% in 2050 (compared to 2040). The planned policy measures are projected to result in the largest GHG reductions in the manure management category, with the continued development of the planned measure A1-P "Climate-friendly livestock farming (manure management)" resulting in a 78% reduction in GHG emissions in this category in 2030 compared to 2021, The decrease is attributed to a reduction in the consumption of inorganic N fertilisers through the promotion of precision fertiliser technology, the promotion of more sustainable manure management techniques (slurry acidification, direct incorporation) and other planned policy measures. By 2040, GHG emissions in agriculture soil category will be reduced by 4% compared to 2030.

2.6.1.6. Waste

The emissions from waste sector under WEM and WAM scenarios are provided in the table and figure below.

Table 2-42. Projected GHG emissions in case of WEM and WAM scenarios, kt CO_2 eq.

	2021	2025	2030	2035	2040	2045	2050
WEM scenario	894.03	695.64	498.44	404.91	341.96	297.32	264.37
WAM scenario	894.03	688.54	487.01	393.48	330.53	285.89	252.94
Difference (WEM-WAM), kt CO_2 eq.	0	7.1	11	11.43	11,43	11.43	11.43
Difference (WEM/WAM), %	0%	1.0 %	2.2%	2.8%	3.3%	3.8%	4.3%

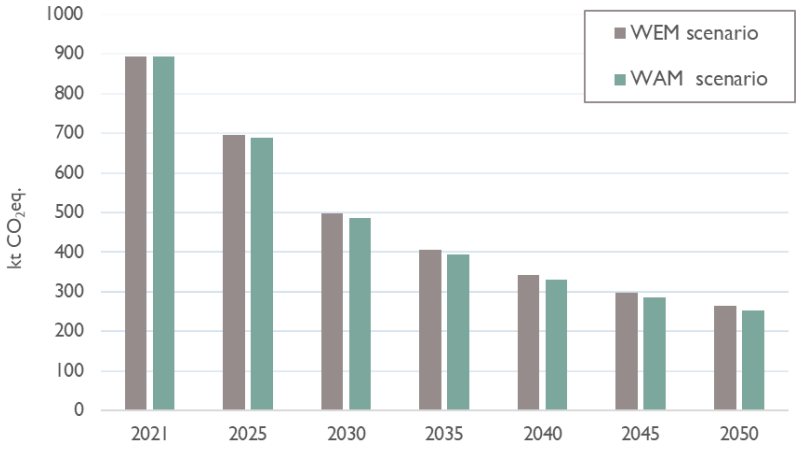


Figure 2-51. Projections in waste sector in case of WEM and WAM scenarios

Scenario "with existing measures" (WEM)

GHG emissions projections are provided in four subsectors: disposal in landfills, biological treatment of solid waste, incineration of waste and wastewater treatment and discharge. In the WEM scenario the amount of waste disposed in landfills is expected to continue a decreasing trend, mainly as a result of the requirements of the Landfill Directive, but also because waste incineration and other forms of treatment are becoming more important.

Historical and projected GHG emissions are presented in the table and figure below. Compared to 2021 emissions from waste sector will decrease by 44% in 2030, by 62% in 2040 and 70% in 2050.

The analysis of the sector's forecasts showed that GHG emissions are gradually decreasing due to the planned development of sortable waste collection (food, textiles, etc. biodegradable waste), preparation of waste for recycling, modernisation of capacity for incineration, reuse or other use (sorting lines, other equipment) and modernisation of the waste management information system and monitoring. The largest reduction in GHG emissions is expected from waste going to landfills (48% in 2030, 73% in 2040 compared to 2021) and wastewater management and discharge (62% in 2030, 65% in 2040 compared to 2021). GHG emissions projections for the waste sector are provided for four subsectors: solid waste disposal, biological treatment of waste, waste incineration, wastewater treatment and discharge. The table below presents aggregated GHG emissions from the waste sector. Solid waste disposal on land, including stored sewage sludge, is the most significant GHG emission source from the waste sector. Waste incineration without energy recovery is the smallest source of GHG in waste sector and it is not expected to expand. Assumptions on the projected amounts of incinerated hazardous and clinical waste are based on historical data.

Table 2-43. Projected GHG emissions from waste sector (kt CO_2 eq.) under WEM scenario

	2021	2025	2030	2035	2040	2045	2050
Solid waste disposal*	616.95	461.46	321.23	228.69	167.79	125.74	95.25
Biological treatment of waste	100.89	107.32	108.48	110.57	111.34	111.34	111.34
Waste incineration	2.52	2.17	2.17	2.17	2.17	2.17	2.17
Wastewater treatment and discharge	173.66	124.69	66.56	63.48	60.66	58.07	55.61
Total GHG emissions	**894.03**	**695.64**	**498.44**	**404.91**	**341.96**	**297.32**	**264.37**

**Including emissions from sewage sludge and CH_4 recovery*

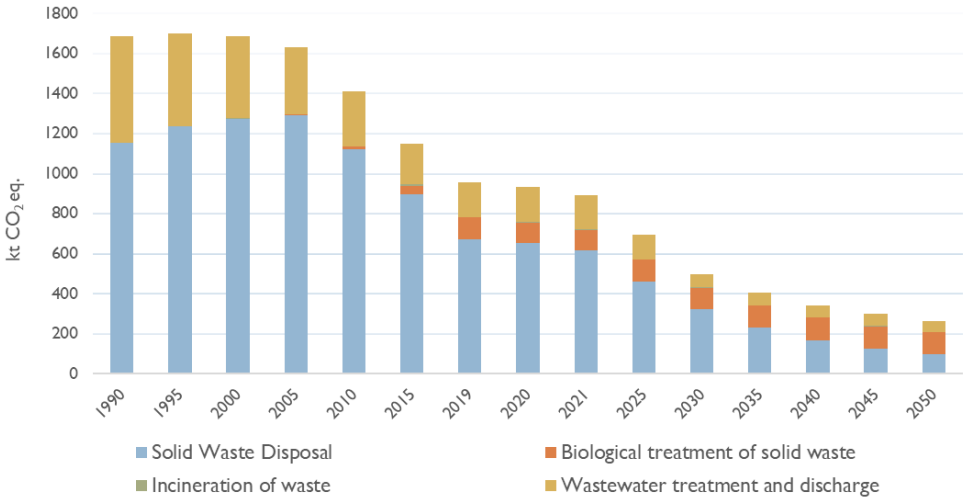


Figure 2-52. Historical and projected GHG emissions from waste sector under WEM scenario

Table 2-44. Projected GHG emissions from waste sector (kt CO_2 eq.)

	2021	2025	2030	2035	2040	2045	2050
Solid waste disposal*	616.95	454.36	309.80	217.26	156.36	114.31	83.82
Biological treatment of waste	100.89	107.32	108.48	110.57	111.34	111.34	111.34
Waste incineration	2.52	2.17	2.17	2.17	2.17	2.17	2.17
Wastewater treatment and discharge	173.66	124.69	66.55	63.48	60.66	58.07	55.61
Total GHG emissions	**894.03**	**688.54**	**487.01**	**393.48**	**330.53**	**285.89**	**252.94**

**Including emissions from sewage sludge and CH_4 recovery*

Solid waste disposal on land

GHG projections were estimated based on the assumption that national targets such as reduction of the quantity of landfilled waste, increase of biodegradable waste composting, increase of the recovered gas use for energy will be achieved. These targets will be achieved through the implementation of existing measures. Implementation of these measures will lead to gradual reduction of CH_4 emissions and will reach 264,37 kt CO_2 eq. (incl. CH_4 recovery) by 2050.

Biological treatment of solid waste

One of the main national targets is to reduce the amount of biodegradable waste going to landfills; for this reason, the mechanical-biological treatment plants have been launched in 2016. As was expected, the amount of biodegradable waste going to landfills was reduced, resulting in lower emissions. However, the GHG emissions from the biological treatment of waste will grow due to the increase in treated waste.

Wastewater treatment and discharge

There are close to 1,800 wastewater discharge points in Lithuania. 99% of wastewater is treated in centralized aerobic wastewater treatment plants. The main source of CH_4 emissions is septic tanks. CH_4 emissions will decrease due to increased population connected to centralized sewer networks and are projected to be 56 kt CO_2 eq. by 2050.

The N_2O emissions from human sewage were calculated based on the protein consumption constant value. Emissions will drop due to a decrease in the population, and it is projected to be 32 kt CO_2 eq. by 2050.

Incineration of waste

Emissions from waste combustion for energy recovery are reported in Energy Sector. In general, municipal, industrial and hazardous wastes are combusted for energy recovery. Only small amount of hazardous waste is incinerated without energy recovery.

Scenario "with additional measures" (WAM)

The WAM scenario is based on the additional measures provided by the Ministry of Environment. The implementation period of measures will cover the period of 2020–2030. For the period of 2031–2050 all additional measures will continue to be implemented at the same rate as is expected in 2030. The planned policies and measures focus on the principle of circularity in public procurement, to finance scientific and applied research for the circular economy themes K31-P, regulatory of the changes in the development of household composting. All planned policies and measures will reduce the amount of waste going to landfills, leading to progressive reductions in GHG emissions from landfills.

Table 2-45. Projected GHG emissions from waste sector (kt CO_2 eq.)

	2021	2025	2030	2035	2040	2045	2050
Solid waste disposal*	616.95	454.36	309.80	217.26	156.36	114.31	83.82
Biological treatment of waste	100.89	107.32	108.48	110.57	111.34	111.34	111.34
Waste incineration	2.52	2.17	2.17	2.17	2.17	2.17	2.17
Wastewater treatment and discharge	173.66	124.69	66.55	63.48	60.66	58.07	55.61
Total GHG emissions	**894.03**	**688.54**	**487.01**	**393.48**	**330.53**	**285.89**	**252.94**

**Including emissions from sewage sludge and CH_4 recovery*

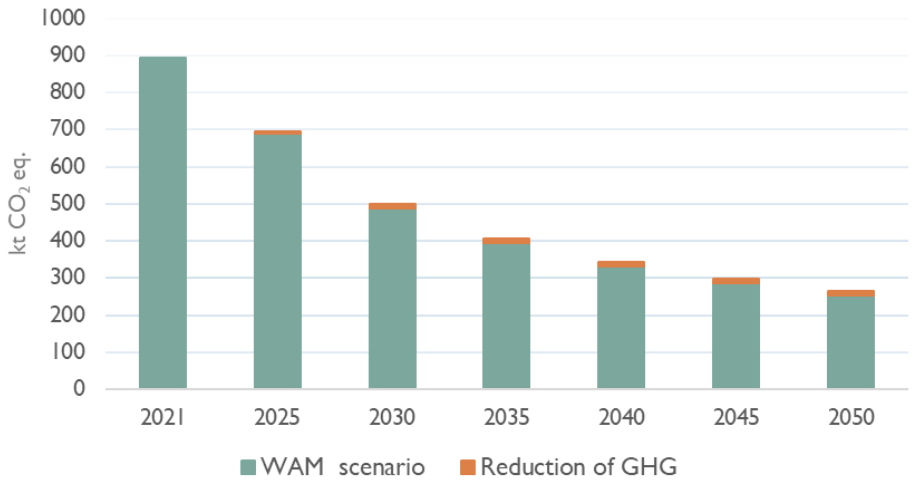


Figure 2-53. Projected emissions of waste sector under WAM scenario

The largest reduction in waste disposal is expected with existing measures, additional ones will also have an impact, but the reduction will not be as intense.

2.6.1.7. LULUCF

Projected GHG removals and emissions from LULUCF sector, according to scenario with existing measures (WEM) and scenario with additional measures (WAM) are presented in the table and figure below.

Table 2-46. Projected total GHG removals from LULUCF sector under WEM and WAM scenarios, kt CO_2 eq.

LULUCF sector	2021	2025	2030	2035	2040	2045	2050
WEM scenario	-6,091	-6,607	-7,474	-7,192	-6,956	-6,482	-5,180
WAM scenario	-6,091	-6,587	-7,604	-7,299	-6,982	-6,509	-5,180
Difference (WEM-WAM), kt CO_2 eq.	0	-20	130	106	26	27	0
Difference (WEM/WAM), %	0	-0.3	1.7	1.5	0.4	0.4	0.0

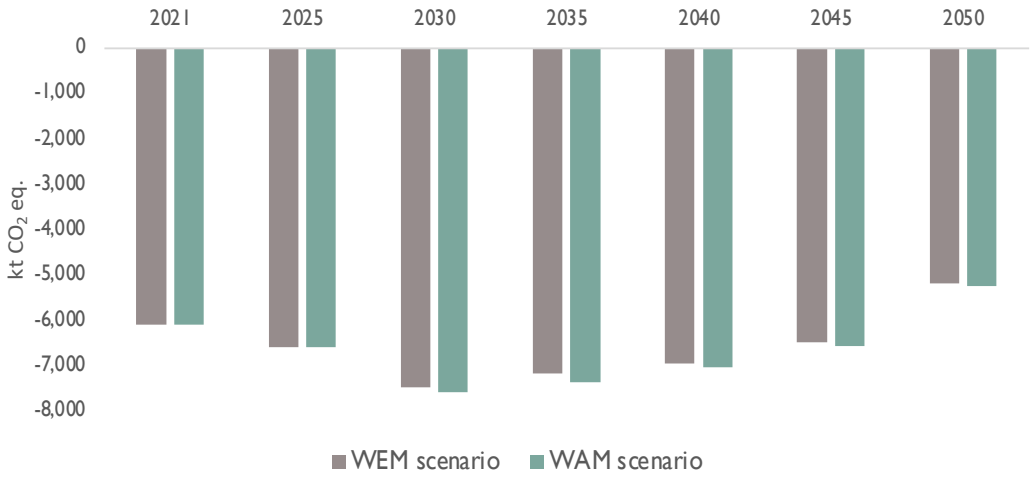


Figure 2-54. Projections under WEM and WAM scenarios in LULUCF sector

Projection of GHG emissions and removals in LULUCF sector include all relevant categories and subcategories as reported for the EU and the UNFCCC for LULUCF sector, including all relevant parameters such as land-use area, annual carbon stock change in living biomass, annual carbon stock change in dead wood and litter, carbon stock change in mineral and organic soils, implied emission factors for drainage of soils and burning of biomass, etc. Carbon stock changes and GHG emissions/removals in forest land were calculated for above and below-ground biomass, dead wood and harvested wood products applying projected growing stock volume change, felled and naturally dead trees' volume. For the estimation of GHG emissions/removals calculation spreadsheets as used in annual GHG inventory were applied with national and default factors, using 2006 IPCC Guidelines.

Total projections of GHG emissions and removals from LULUCF sector under WEM and WAM scenarios showed both scenarios reflect increase in carbon sink until 2030 as a tipping point and decline until 2050. The increase can be explained by projected wide adoption of sustainable land management practices in croplands. However, this effect runs out of effectiveness at 20 years mark. Furthermore, decline is explained by decreasing GHG removals in forest land remaining forest land biomass due to the aging forest stands.

To define the most accurate development for each of the sector's categories the following policies were taken into account preparing estimations of projections with existing measures:

- National Climate Change Management Agenda (NCCMA);

- Updated National Energy and Climate Action Plan for 2021–2030 (NECP).

Lithuania is using 2006 IPCC Guidelines for GHG emissions and removals estimation in LULUCF sector and GHG projections as well, while 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands are not yet implemented since it is not mandatory in this commitment period.

Scenario "with existing measures" (WEM)

Scenario "with existing measures" considers the following land-use subsectors: forest land, cropland, grassland, wetlands, settlements, other land and harvested wood products. The table below presents the aggregated GHG data for LULUCF sector. During the whole projected period, Forest land will remain as the land-use with the highest absorptions. Grasslands and HWP will also remain as a relevant CO_2 sequestration part of the LULUCF sector. Furthermore, it is projected, that for a period from 2025 to 2045 Croplands will also generate the net absorptions in this sector. Compared to 2021 the LULUCF absorptions in 2030 will increase by 23%, by 14% in 2040 and will be reduced by 15% in 2050.

Table 2-47. Projected total GHG emissions from LULUCF sector, kt CO_2 eq. (WEM)

LULUCF sector categories	2021	2025	2030	2035	2040	2045	2050
Forest land	-6,483	-6,068	-6,103	-5,640	-5,470	-5,394	-5,331
Cropland	677	-276	-1156	-1306	-1274	-1,004	162
Grassland	-708	-722	-670	-706	-740	-680	-665
Wetlands	876	829	837	843	850	852	857
Settlements	678	628	557	498	498	478	461
Other land	57	36	12	0	0	0	0
Harvested wood products	-1,209	-1034	-950	-880	-819	-734	-662
Total GHG removals	**-6,091**	**-6,607**	**-7,474**	**-7,192**	**-6,956**	**-6,482**	**-5,180**

The Figure 2-55 below represents GHG emissions trend during the historical and projected period.

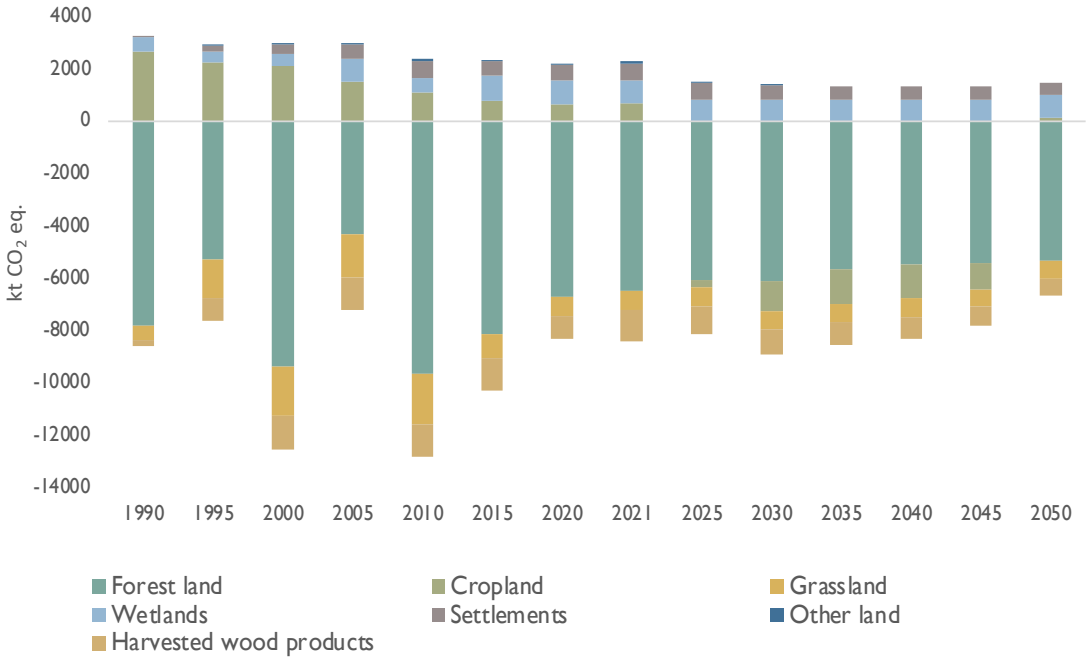


Figure 2-55. LULUCF sector historical trends and projections (WEM scenario)

There is a wide array of measures, that are planned in LULUCF sector for the period until 2030, with remaining effect continuing well into 2050's. Most of the existing measures are tailored for the agricultural part of the LULUCF – change of Cropland management practices as planned in measures L4-E "Promotion of cover-crops" and L5-E "Promotion of crop rotation". These measures will help to take Croplands from net GHG emitter to sequestration. GHG emissions from Croplands will decrease by 171% and will becomes absorptions. Another huge impact is expected from nature restoration measures L1-E "Peatland restoration (restoration of hydrological regime on agricultural land)" and "Peatland restoration (grassland conversion)". These measures will promote the conversion of drained organic soils in Croplands to Grasslands or Wetlands. This will help not only to avoid emissions, but also will increase the biodiversity in restored areas, that were worn down by human activity. Further measures of measures L2-E "Conservation and restoration of grasslands" and L7-E "Promoting green cover" will further help to avoid emissions from natural ecosystems destruction and conversion to Croplands. All mentioned measures will help to reach reduction of emissions in Cropland category and increase absorptions in Grasslands. Furthermore, measures L9-E "Afforestation" and L14-E "Conservation of self-seeded trees" will help to slow down the decrease of removals in Forest land. Unfortunately, this land-use category will have absorptions decreased by 6% when comparing 2021 to 2030.

Scenario "with additional measures" (WAM)

Scenario with addition measures is not as extensive as WEM scenario and contains only a few measures that covers the period 2021–2030. However, as this period has only reached the mid-point, it is expected that more measures will be planned by the Ministry of Environment (MoE). Furthermore, period 2031–2050 will be critical to reach Europe's carbon neutrality target and in turn more measures shall be implemented. Currently WAM measures mostly targets the environmental part of the LULUCF sector.

The emissions from LULUCF sector WAM scenario and GHG emissions reduction are provided in the table and figure below.

Table 2-48. Projected total GHG emissions from LULUCF sector, kt CO_2 eq. (WAM)

	2021	2025	2030	2035	2040	2045	2050
Forest land	-6,483	-6,049	-6,198	-5,749	-5,498	-5,422	-5,329
Cropland	677	-276	-1197	-1311	-1279	-1,008	158
Grassland	-708	-722	-669	-705	-739	-679	-664
Wetlands	876	830	842	848	855	856	857
Settlements	678	628	557	498	498	478	461
Other land	57	36	12	0	0	0	0
Harvested wood products	-1,209	-1034	-950	-880	-819	-734	-662
Total GHG removals	**-6,091**	**-6,587**	**-7,604**	**-7,299**	**-6,982**	**-6,509**	**-5,180**

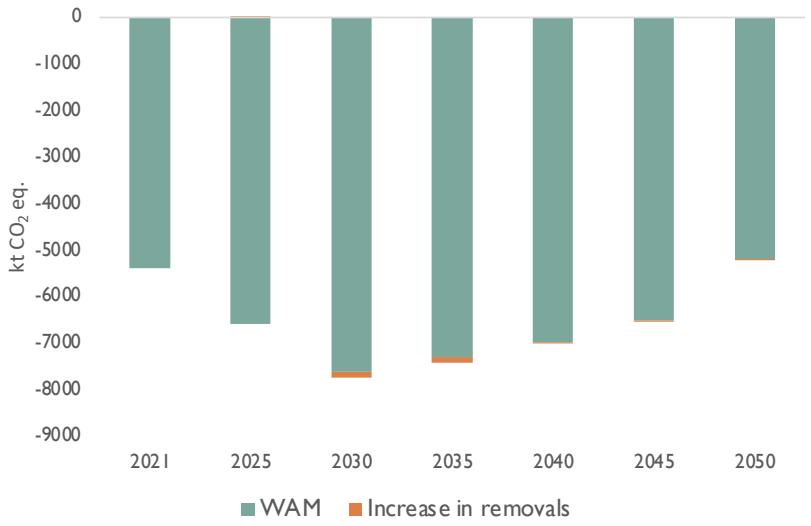


Figure 2-56. Projected emissions of LULUCF sector under WAM scenario

The projected increase of GHG removals in LULUCF sector in WAM scenario is 39% when comparing 2021 with 2030. Highest impact in WAM scenario will have the L14-P measure "Preservation of self-seeded trees" on Forest land. When comparing forest land removals in 2030 with 2021, it will decrease by 4%. Measure concerning Croplands L1-P "Peatland restoration (restoration of hydrological regime on agricultural land)" will have an addition impact on drained organic soils and their restoration to natural state. Compared to 2021 Croplands emissions will be reduced by 177% in 2030.

2.6.2. Models and approaches, key underlying assumptions and parameters used

2.6.2.1. General information

General methodology of the GHG emission projections calculations was based using the same structure as in the national GHG inventory. The data structure for activities, input data, emission factors and emission calculations are based on the Common Reporting Tables (CRT) of the UNFCCC, the outputs are aggregated. Emission projections are generally calculated using similar methodology based on IPCC 2006 Guidelines, as in the case for the national GHG inventory.

Base year 2021 was selected for the emission projection. Global warming potentials (GWPs) from IPCC Fifth Assessment Report (AR5) were used.

In this report results for ‚with existing measures' (WEM) and ‚with additional measures' (WAM) scenarios are provided. The "without measures" (WOM) scenario is not applicable to Lithuania and therefore has not been developed in preparation for the GHG projections.

'With existing measures' scenario (WEM) – includes policies and measures (PaMs) adopted and implemented at the EU and national levels. 'With additional measures' scenario (WAM) – includes new initiatives or enhancements to existing policies that are not yet fully adopted or enforced.

Information on models and approaches used for projections such as gases and sectors covered, interaction to other models/approaches etc. is provided in Annex III "Summary information on the models/approaches used for the GHG projection estimation". The information on main underlying assumptions and parameters used for the projections development until 2050 is provided in CTF table 11.

2.6.2.2. Energy

Energy sector constitutes of six main subsectors (*Energy Industries, Manufacturing Industries, Transport, Other sectors, Other and Fugitive emissions from fuels*) for which GHG emissions are projected. Projections of GHG emissions from Transport sector are reported separately in Chapters 2.6.1.3 and 2.6.2.3.

The projections were carried out by firstly determining the consumption of fuel in every subsector up to the year 2050. The obtained fuel consumption was then multiplied by emission factors of every fuel to estimate projected GHG emissions. Thus, GHG projections fully correspond to the methodology used for preparation of National GHG inventory.

The fuel consumption trends up to the year 2050 were obtained carrying out systematic modelling of consumed fuel and energy types in economy sectors of Lithuania. The model relies on statistical data, reflecting existing situation of energy consumption, and special assumptions which affect projections of energy consumption change (such as measures for the increase of direct energy consumption efficiency, electricity and heat production efficiency, measures for the change of fuel consumed, promotion of the change of consumer behaviour, technology trends observed in the market, etc.). The model is controlled by Lithuanian Energy Agency.

Fuel demand for house heating will decline due to the increased energy efficiency and renovation of residential and public buildings.

The military aviation activity (category 1.A.5 Other) is defined as activities using fuel purchased by or supplied to the military authorities of the country. The GHG emissions in this sector are mainly related to the consumption of jet kerosene as the main fuel. However, it is very difficult to anticipate fuel consumed by NATO airships, so the forecast shows no change in fuel consumption in the future.

Forecast of activity data of oil production up to 2040, which was used in subsectors 1.B.2.a Oil and 1.B.2.c Venting and flaring, was provided by Lithuanian Geological Survey. It was assumed that oil production shall decrease after 2040 and will be stopped in 2050. For projections in category 1.B.2.b.iv Natural gas transmission and storage, forecast of natural gas leakages was provided by natural gas transmission enterprise. For category 1.B.2.b.v Natural gas distribution, natural gas leakages were expected not to change since 2022.

The scenario “with existing measures” includes the national legislation documents that include projections of energy demand, climate change mitigation measures, projects currently in development and will be set in motion during the period 2023–2040.

Main measures and assumptions used for projecting GHG emissions in the energy sector:

- National Energy Independence Strategy determines the target to achieve that the part of RES in the final energy consumption balance would be no less than 55% by 2030 and 95% by 2050.
- National Energy Independence Strategy determines the target to reduce energy consumption by 1.23 times in 2030 compared to 2022 level, and by 1.5 times in 2050, compared to 2022 level.
- When evaluating the new EU ETS 2 (measure T28-E) it was assumed that the price of an emission allowance in this scheme will increase from €25/t CO_2 in 2027 to €50/t CO_2 in 2030. This price has been converted into a direct increase in the price of fuel for each fuel type and the effect of the measure has been calculated using price and fuel elasticities.
- AEI17-E (activity No. 3). Additional biofuel CHP unit entered operation in Vilnius in 2023. The CHP unit in Vilnius generates electricity for the Lithuanian power grid and heat for the district heating system of Vilnius. The CHP plant consists of two units, one fueled by non-recyclable municipal waste and the other by biomass. The biomass unit has a capacity of 73 MW of electrical power and 175 MW of thermal power. It’s planned that the project promotes energy efficiency with expected energy savings of around 40%. Promotion of high efficiency cogeneration in Vilnius, and the promotion of use of biofuel for heat energy generation – these assumptions were incorporated during the calculation of final fuel used in Lithuania.
- AEI17-E. Promoting the use of RES in district heating. According to the approved measure, 158.25 MW of power of biomass heat plants will be built until 2030.
- EE2. Renovation/modernization of multi-apartment buildings. Renewed in 2014, this measure is planned up to 2026 in case of WEM scenario. Further application of the measure is foreseen in WAM scenario. The objective of this measure is to renovate 1,086 apartment buildings each year. Planned heat savings due to the complex renovation will be up to 70 kWh/m^2.
- EE4-E. Agreements with energy suppliers on consumer education and advice. Since 2017, energy suppliers must make agreements with Ministry of Energy concerning education and consulting of end users for issues of increasing efficiency. It is planned that this measure will save about 280 GWh of energy because of behavioural changes in end users each year up to 2030.
- EE5-E. PSO relief for industrial companies. This measure is approved in 2019. According to it, large industry companies are promoted to install measures increasing energy efficiency, thus reducing consumption of energy. It is planned that about 77 GWh of energy will be saved each year until 2028 in manufacturing industries.
- EE6-E. Energy saving agreements with state and municipally owned companies. Since 2017, energy companies must make agreements on energy saving with the Ministry of Energy. According to these agreements, they must install measures to increase energy efficiency for end users. It is planned that this measure will save about 68 GWh of energy each year until 2030.
- AEI9-E. Reduce CO_2 emissions from the LNG terminal. The measure aims to reduce GHG emissions in the terminal by up to 30% through the installation of an electricity interconnection from the LNG terminal to land. The effect of the measure is expected from 2028.

- AEI10-E. Investment support for the installation of biomethane production and biogas purification plants. The measure aims to finance biomethane production facilities, including biogas cleaning facilities. The aim is to create a production capacity of 1,400 GWh of biomethane gas in 2030.
- AEI15-E. Developing green hydrogen production. New green hydrogen (hydrogen produced from renewable energy sources) production capacity (in total 91 MW) will be developed in various sectors to replace conventional fossil fuels, help balance the power system, produce hydrogen-derived products and reduce GHG emissions.

The main additional (WAM scenario) measures to increase energy efficiency, which will reduce energy consumption until 2050, are continued renovation of multi-apartment, one- and two-apartment and non-residential buildings and continued replacement of boilers with more efficient technologies.

An additional measure, which will contribute most to the promotion of RES consumption in electricity and heat production until 2050, is investment support for the installation of biomethane production and purification facilities.

2.6.2.3. Transport

The scenario "with existing measures" includes the national legislation documents that include projections of energy demand, climate change mitigation measures, projects currently in development and will be set in motion during the period 2021–2050.

The baseline scenario projections of the number of cars by fuel and energy type were calculated using regression analysis. Regarding number of freight transport vehicles and buses, baseline scenario projections were calculated using anticipated data of goods transport and passenger transport by road, respectively, obtained from the study "Assessment of the effectiveness of measures to reduce greenhouse gas (GHG) emissions in the transport sector and modelling of forecasts", prepared by JSC "Smart Continent"[27]. Then, using anticipated number of transport vehicles, their average kilometrages (obtained from association of technical vehicle inspection companies) and fuel consumption per kilometre, anticipated fuel consumption was calculated by type of road vehicle and fuel. JSC "Lietuvos geležinkeliai" provided the required activity data for the estimation of projections in the railway sub-sector. The Ministry of Transport and Communications of Lithuania provided the activity data (fuel consumption) for the estimation of projections in the civil aviation sub-sector, therefore the GHG emissions were calculated by applying the specific fuel emission factors used in NIR 2023.

Domestic civil aviation is essentially narrow (0.04% of GHG emissions in transport) in Lithuania. Aviation gasoline (avgas) is used for piston-type powered aircraft engines, while the jet fuel is used in turbine engines for aircraft and diesel engines. Aviation gasoline as a fuel is more common in private aircraft, while jet fuel is used in airlines and other large aircraft.

Baseline projection of GHG emissions in the railway sub-sector was carried out by using data received from the railway operator JSC "Lietuvos geležinkeliai". WEM scenario fuel consumption projection, calculated by including impact of existing measures from data provided by the company, is shown in Table below.

Table 2-49. Anticipated fuel consumption in railways subsector, TJ

Fuel type	2021	2025	2030	2035	2040	2045	2050

27 https://sumin.lrv.lt/uploads/sumin/documents/files/Transporto%20priemoniu%20SESD%20vertinimas%2020210610.pdf

Diesel oil	2,090	1,098	719	719	719	719	719
Biodiesel	179	108	173	173	173	173	173

No other measures were applied for determination of fuel consumption in railways subsector therefore the GHG emissions were calculated by applying the specific fuel emission factors used in NIR 2023.

Road transportation is the most important GHG emissions source in the transport sector. This sector includes all types of vehicles on roads (passenger cars, light duty vehicles, heavy duty trucks, buses, motorcycles, mopeds). GHG emissions from road transport subsector accounted for 5,898.3 kt CO_2 eq. in 2021.

Baseline scenario GHG emissions from Road transport calculation was based on the change of vehicle number which was forecasted using regression analysis (for passenger cars and motorcycles) and using the anticipated change of tonne-kilometres or passenger kilometres in public transport for cargo vehicles and buses according to the study performed by JSC "Smart Continent"[28]. Using a distribution of cars by power source in 7 historical years, a forecast of the breakdown of the passenger car fleet by a power source was calculated for baseline scenario. Baseline projections of numbers of cargo vehicles were created proportionally to the growth of the projected tonne-kilometres in road transport, and projections of buses were created considering projected passenger kilometres in public road transport. The obtained numbers of vehicles were then combined with kilometrages, fuel consumption per kilometre and GHG emission factors to produce projected emissions. Fuel consumption per kilometre was assumed to be by average 4% lower in 2030 than it was in 2021 for the whole vehicle fleet.

Additionally, the support from EU funds to municipal administrations for purchasing low-emission urban public transport vehicles (EU-funded instrument for 2014–2020, continued up to 2030) provided funding for acquisition of environmentally safe buses. It is estimated that introduction of these buses will reduce GHG emissions from the road transport sector by 5.7 kt CO_2 eq./year. Total GHG emission reduction by 2029 will amount to 35.6 kt CO_2 eq.

For buses and other heavy-duty vehicles, establishment/development of charging/refuelling infrastructure for alternative fuels (electricity, biogas and hydrogen) is being implemented. 30 biogas, 4 hydrogen and 300 charging stations for heavy transport are foreseen to be installed by 2027. It was estimated that this activity will additionally generate nearly 4,500 alternative fuel or energy powered vehicles by 2030, and this will reduce GHG emissions by 121.6 kt in that year.

Moreover, promoting the purchase of electric cars and electric car charging infrastructure together should significantly increase the number of electric cars in Lithuania. It was estimated that such activities as "Promoting the purchase of battery electric cars", "VAT deductions for EV purchases", "Development of private EV charging infrastructure", "Compensation for connection of charging infrastructure to the electricity grid" and "EU legal and regulatory obligations for the development of charging infrastructure" under the Regulation 2023/1804/EU should have the largest impact for GHG reduction (in total 214,6 kt CO_2 eq. in 2030).

According to the Law of alternative fuel, a yearly sum of gasoline and diesel oil supplied to Lithuanian market by a fuel supplier must contain an increasing part of fuel from renewable energy sources: form at least 6.8 % in 2022 to at least 16.8% in 2030 by energy value.

Financial incentives are provided for persons who transferred its property rights of a car to a waste handler in Lithuania. The incentive is flat-rate compensation which can be used to purchase an electric scooter,

28 https://sumin.lrv.lt/uploads/sumin/documents/files/Transporto%20priemoniu%20SESD%20vertinimas%2020210610.pdf

moped, bicycle or a used or new passenger car that meets low levels of emission criterion. This measure should reduce CO_2 eq. emissions by 13.8 kilotons by the year 2025.

There is a measure for freight transport providing incentives for carriers of intermodal units instead of transporting intermodal units by road to choose combined transport. It is estimated that combined transport should reduce GHG emissions by 31 kt CO_2 eq. by 2030 in road transport but increase emissions in railways. The increase in railway sector should be lower after 2027 due to the electrification of railways.

E-tolling for freight transport is going to apply differentiated "user pays" and "polluter pays" principles to freight transport. Since fuel consumption for heavy duty transport does not decrease when the Euro standard increases, the direct effect is seen only on those companies who switch from conventional (non-Euro) vehicles into ones meeting Euro standards. However, as the tax is paid for every kilometre driven, carriers should plan optimal routes and decrease their kilometrage. Additionally, a lower tax rate is planned for electric and hydrogen-powered trucks, so it is expected that some of the trucks will be changed to the mentioned ones. All in all, it is estimated that this measure should reduce fuel consumption of heavy-duty transport by 928.9 TJ in 2030.

Formation and promotion of eco-driving skills impacts drivers in all modes of road transport: cars, freight transport and buses. It is assumed that the GHG reduction impact of promotion of eco-driving in road transport is 3.2 kt CO_2 eq./year. Later, when an E-learning platform is created, the impact is estimated to be by average 5 kt CO_2 eq./year starting from 2026, and in 2030 the effect should reach 38 kt CO_2 eq.

An ambitious measure is investment support for biomethane plant facilities, providing priority for transport to use biomethane. Under these conditions, there is an assumption that all gas-powered public transport will run on a biomethane. It is evaluated that yearly demand in transport will be 3,211 TJ of biomethane by 2030 and this will reduce GHG emissions by 178.3 kt CO_2 eq. in the transport sector in that year.

The measure "Renewal of transport fleet by using green public procurement for transport" is dedicated to implement the objectives provided in the Directive of European Parliament and Council (EU) 2019/1161, however, the objectives provided in the Law of alternative fuel are more ambitious than they are in the mentioned Directive.

Higher fuel excise tax and an additional CO_2 component in fuel prices will have a large effect for GHG emission reduction. It is implemented by amending the Law of Excise Tax. It is evaluated that, when implementing this measure, the price for one liter of diesel oil will increase by almost 0.3 euro (approximately 19%) by 2030 and the measure should reduce GHG emissions by 196 kt CO_2 eq. in transport in 2030. EU emission trading system for transport will additionally rise fuel prices and this should have additional GHG emission savings.

Policy measures in transport were assessed based on the extent of each measure as provided by the authorities responsible for the measures, e.g. the number of non-polluting cars to be supported, the amount of freight to be transferred to rail, etc. These quantities were multiplied by average multipliers to calculate fossil fuel and energy savings and multiplied by GHG emission factors to calculate GHG savings. Soft and infrastructure improvement measures in transport have been assessed based on studies or expert assumptions. Fiscal measures and incentives (T1-E "Exemptions for RES vehicles", T6-E "Car Registration Tax", T8-E "Electronic Tolls in Freight Transport", T27-E "Law on Excise Duties" and T28-E "Implementation of ETS2") have been calculated using price and fuel elasticities (including the new EU ETS 2). For the new EU ETS 2 measure (T28-E), it was assumed that the price of an emission allowance in this scheme would increase from 25 €/t CO_2 in 2027 to 50 €/t CO_2 in 2030. This price has been converted into a direct increase in the fuel price (EUR/1000 litres) for each fuel. As there is a wide variety of policy measures in the transport

sector, the methodology for their assessment also varies and for some of the measures a specific methodology has been developed for one specific measure only.

The GHG emissions from natural gas transportation in the pipelines sector in 2023 were estimated by adding up anticipated natural gas consumption provided by their transmission operator and the calculated consumption of their distribution operator. Emissions from 2024 were estimated according to the projected gross consumption of natural gas obtained from the modelling of the energy sector and from industrial company regarding non-energy use. The GHG emissions from this sector should have significantly increased due to the new gas interconnection Poland-Lithuania (GIPL).

International transport

The projections for the national total exclude emission projections related to fuel sold to ships and aircraft engaged in international transport to correspond to IPCC 2006 Guidelines. The anticipated fuel consumption for aircrafts used for civil international flights is provided in Table below.

Table 2-50. Anticipated fuel consumption in international aviation, TJ

Fuel type	2021	2025	2030	2035	2040	2045	2050
Aviation gasoline	0	0	0	0	0	0	0
Jet kerosene	2,588.0	4,802.1	5,720.5	5,975.1	6,229.7	6,507.0	6,784.2

GHG emission projections for international navigation were based on anticipated ship loading in Klaipėda harbour up to 2024. From 2025 to 2040, GHG reductions (%) from the LMT Feasibility Study Project Report[29], table 1.2 (p. 15) were used. From 2041, the projections were carried out on the assumption that the GHG emissions from navigation sector should be reduced by 40% by 2050, compared to 2005 level.

Scenario "with additional measures" (WAM)

Additionally, it is estimated that measures for developing domestic navigation (especially "Construction of new cargo vessels and barges") should reduce GHG emissions by 26.5 kt CO_2 eq. by 2030.

Compared to WEM scenario, WAM has an objective to additionally reduce actual amount of fuel consumption and to implement fuel-switch measures. A rapid decrease of diesel oil consumption is planned which is sought to be partly changed by biomethane and hydrogen use as well as electrification. However, due to additional biomethane demand in transport and high methane emission factor from gaseous fuel consumption in road transportation, methane emissions from road transportation in WAM scenario are higher than in WEM scenario from year 2025.

A lot of measures together contribute to the increase of the number of electric cars and cover such aspects as an additional CO_2 component in fuel prices (already existing measure), continued higher subsidies for their acquisition, development of the recharging infrastructure (already existing measure) and lectures about sustainable mobility. An absence of any of these aspects would significantly reduce the planned number of electric cars, e.g., there wouldn't be any possibility of subsidizing the acquisition of electric cars in the absence of CO_2 components in fuel price, and electric cars would not be attractive if there was poor infrastructure. These measures contribute to other existing measures promoting electric cars: an ability to use specially marked public transport lines in Vilnius, exemptions for car parking and entrance fees in Lithuanian towns, registration charge according to the level of pollution, subsidies for acquisition of electric cars, raising public awareness, creation of low pollution areas in towns and EU emission trading system for transport. Only measures T1 "Promoting the purchase of electric cars" and T13-E "Electric car charging

[29] https://sumin.lrv.lt/media/viesa/saugykla/2024/1/s_xfEW3iD7k.pdf

infrastructure" and are intended to namely increase the number of electric cars – all other measures reduce GHG emissions in other ways, too.

Assumptions for the evaluation of additional policy measure T1-P "Promoting the purchase of electric cars", T2-P "Promoting alternative fuels vehicles was evaluated considering the number of vehicles to be replaced and the average fuel consumption of one vehicle to be replaced; T2-P "Promotion of the development of refuelling infrastructure for alternative fuel (hydrogen)" was assessed taking into account the number of hydrogen refuelling points built and survey data on the proportion of the population encouraged to switch between vehicles by infrastructure development alone, T2-P "Digital solutions for optimising freight flows and reducing empty mileage" was assessed according to the number of digital subscriptions, the average share of empty lorry mileage and the savings achieved by subscribing digital solution, T3-P "Electrification of railways and rolling stock" and T4-P "Promoting intermodal transport" were assessed considering the transfer of freight traffic to electrified railway sections and the average fuel consumption per tonne-kilometre, T25-P "Developing electricity supply at seaport" was assessed in accordance with the annual berthing time of different types of vessels and their diesel consumption per hour, and T26-P "Developing sustainable airport infrastructure" was assessed considering the amount of fuel used in domestic aviation and the share of this fuel that will be replaced by sustainable aviation fuels.

Continued promoting alternative fuels infrastructure and vehicles will have the largest effect for GHG emission reduction. New biomethane, electricity or hydrogen powered heavy duty vehicles could additionally be purchased by 2030: 1,478 buses and 1,768 cargo vehicles. It is also evaluated that, when implementing other activity of this measure, 6,750 trucks could apply digital solutions for the empty mileage reduction and reduce their empty mileage by 30%. In total, the measure should reduce GHG emissions by 65 kt CO_2 eq. in 2030. Promoting intermodal transport in 1,435 mm railway network will additionally reduce fossil fuel consumption in freight transportation on roads and this should have additional GHG emission savings.

2.6.2.4. IPPU

GHG emissions projections for the IPPU sector, based on existing policies and measures, were estimated using projected production level data (activity data) through 2050, provided by major emitters in the sector, including clinker, lime, glass, ammonia, and nitric acid producers. In 2021, emissions from these industries accounted for approximately 80% of the total IPPU sector emissions.

Projections of CO_2 emissions arising from ammonia production are calculated using projected natural gas consumption data and applying the 2006 IPCC Guidelines Tier 3 method, which states that CO_2 recovered for downstream use in urea production must be subtracted from the total quantity of CO_2 generated from ammonia production. However, EU ETS emissions are estimated according to data provided by the companies where CO_2 recovered for downstream use in urea production are not subtracted from the total quantity of CO_2 generated from ammonia production. This difference in methodologies leads to differences in estimated total GHG and EU ETS emissions in chemical industry.

All projected data were available for 2020, 2030, 2040 and 2050. The data in between were linearly interpolated. The base year for the GHG IPPU projections is 2021.

F-gases emission projections are performed at the same subcategory level as in Lithuanian GHG inventory using 2006 IPCC Guidelines emission factors. The WEM projection scenario for F-gases are generally based on the assumptions from Annexes III and V of F-gases Regulation , that creates bans, controls on

the use and emissions of F-gases and EU MAC Directive, which prohibits the use of F-gases with GWP of more than 150 in new types of cars and vans introduced from 2011, and in all new cars and vans produced from 2017.

Summary table of assessed emission sources from agriculture sector, methods applied, and emission factors are provided in the table below.

Table 2-51. Methods and emissions factors used to estimate GHG emission for IPPU sector

CRF	Source	GHG emissions reported	Methods	Emission factor
2.A	Mineral industry	CO_2	T1, T2	CS, D, PS
2.B	Chemistry industry	CO_2, N_2O	T3	CS, PS
2.C	Metal industry	CO_2	T2	D
2.D	Non-energy products from fuels and solids	CO_2	T1	D, CR
2.E	Electronic industry	SF_6	T3	PS
2.F	Product uses as substitutes for ODS	HFCs	T1a, T1b, T2	CS, D, PS
2.G	Other product manufacture and use	N_2O, SF_6	T1, T3	D, OTH, PS
2.H	Other production	CO_2	T1	D

The projected emissions for the mineral industry are based on forecasts from industrial companies, considering planned maximum production capacities and the best available technologies implemented in accordance with the companies' environmental permits. The projections of CO_2 emissions from lime production are based on activity data provided by the sole lime production company. The projections of CO_2 emissions from glass production are based on activity data provided by two glass manufacturing companies. The projections of CO_2 emissions from mineral wool production were based on activity data provided by the singular company's authorities and it is projected that mineral wool production will be increasing gradually during the projected period.

Projected emissions from the chemical industry are based on forecasts from a single ammonia and nitric acid production plant assuming it is operating at optimal capacity. The industry is expected to invest in biomethane-fuelled cogeneration systems and the in-situ generation of hydrogen as a key precursor for ammonia production.

Existing policies and measures to achieve the objective include various initiatives, with additional actions planned to enhance their effectiveness. Among these, the most significant impact on GHG reductions is expected from P19-P "Industrial Decarbonisation". Measure P19-P "Industrial Decarbonisation" builds upon previously implemented projects, using their outcomes as a basis to evaluate the measure's full impact.

2.6.2.5. Agriculture

Projections of GHG emissions from agriculture sector with existing (WEM) measures is based on projected livestock population, milk production, milk fat, and the share of manure management systems for the main livestock categories (dairy cattle, non-dairy cattle and swine). GHG projections of agricultural soils category are based on projected consumption of inorganic and organic N fertilizers, main harvested crops and area harvested, application of urea and consumption of liming materials (limestone and dolomite) used for soils. Projections of the data mentioned above are provided by the Ministry of Agriculture (MoA). Scenario with

additional measures (WAM) is based on additional measures provided by the MoA. GHG emissions have been calculated based on the methods provided in the 2006 IPCC Guidelines.

All projected data were available for the years of 2025, 2030, 2040 and 2050. The data in between were interpolated.

Summary table of assessed emission sources from agriculture sector, methods applied, and emission factors are provided in the table below.

Table 2-52. Methods and emissions factors used to estimate emission from agriculture sector

CRF	Source	GHG emissions reported	Methods	Emission factor
3.A	Enteric fermentation	CH_4	T1, T2	CS, D
3.B	Manure management	CH_4, N_2O	T1, T2	CS, D
3.D	Agricultural soils	N_2O	T1, T2	D
3.G	Liming application	CO_2	T1	D
3.H	Urea application	CO_2	T1	D

The changes of the livestock population over the projected period have been projected considering historical fluctuations in livestock numbers, livestock productivity, prevailing market prices, demand and exports, and the legislation adopted. The amount of inorganic and organic (compost and sewage sludge) N fertilisers consumption and soil liming materials have been projected considering the changes in the crop area. The demand for mineral N fertilisers will decrease with the expansion of the use of environment friendly technologies. Crop yield projections have been made considering crop and soil fertility, projected crop area and the cropping technologies promoted. Crop area forecasts are based on historical data, the world market situation and the development of agro-biotechnologies. Crop yields are projected to increase, and wheat, barley and oilseed rape are expected to remain the main crops grown.

Overall, livestock populations are projected to decrease by 9% in 2030 compared to 2021. It is projected that the largest declines will be in dairy cattle (19%), poultry (10%) and swine (6%) populations. A slight increase in livestock population is projected in 2040 (1%) compared to 2030, with growth in goats (3%), poultry (2%) and horses (1%). However, cattle and swine populations will continue to decline.

Inorganic N fertiliser consumption will decrease by 5% by 2030 compared to 2021, with a continued downward trend until 2050, linked to the implementation of policy measures aimed at more sustainable agriculture (organic farming, crop rotation, etc.). The use of organic N fertilisers will also decrease due to the declining population of livestock. Crop yields and harvested area are projected to increase by 6% by 2030 compared to 2021, with a particular increase in the production of legumes (28%). One of the reasons for this increase will be the pursuit of the objective of changing the composition of fodder (where the aim is to make use of local protein raw materials) and the mastery of the technology of using leguminous crops for fodder. Also, the use of rotations of 5 or more crops will encourage the reduction of wheat areas and the introduction of a wider range of crops for both food production and the technical industry, resulting in higher yields of other cereal crops: buckwheat (19%), triticale (18%) and oats (15%). Perennial crops, including perennial grasses, will increase on infertile farmland (22%). Due to the projected decline in arable land, grassland will increase (5%) by 2030, also because of the promotion of the restoration of eroded land and the application of organic soil protection measures.

The assumptions to the assessment of existing policies and measures: for measure A1-E, A1-P “Climate-friendly livestock farming (manure management)”, the assessment of biogas production was carried out

considering the capacity of the planned biogas plants and the estimated amount of manure that could be used. A1-E, A1-P "Climate-friendly livestock farming (manure management)" measure acidification of slurry and slurry application has been evaluated considering the amount of manure that may be affected by the measures. A5-E "Promotion of short supply chains" will not have direct impact but would strengthen the development of organic farming. However, the effect of measure A5-E that relates to fuel use was assessed in the transport sector. Measures A3-E, A3-P "Development of precision fertilisation", A6-E "Development of protein crops", A7-E "Development of no-till technologies, especially direct seeding", A19-P "Sustainable use of public land", A21-E "Balanced fertiliser system", L5-E "Promotion of crop rotation", and L4-E "Promotion of cover-crops" will all have an impact on the reduction of the consumption of inorganic N fertilisers. The assessment of these measures has been carried out considering the potential share of the reduction in inorganic N fertiliser consumption as presented in the consultation with scientists, as well as the area and/or number of farms affected by the measure. The impacts of measures A14-E "Reducing the use of fossil fuel" and A15-E "Revision of technology cards" were assessed in the energy sector. For measure A20-P "GHG accounting on farms", the assumption of the proportion of farms affected was used to estimate the measure. The mitigation effect of GHG emissions of existing policies and measures were estimated by applying the above-described assumptions and estimated according to the 2006 IPCC Guidelines.

2.6.2.6. Waste

Waste sector GHG emissions projections are based on the existing measures (National Waste Management Plan[15] for 2014-2020) and planned measures in the National Waste Prevention and Management Plan for 2021-2027, the targets set in the Landfill Directive, and data provided by the Ministry of Environment, the Environmental Protection Agency, and the Regional Waste Management Centres.

Solid waste disposal on land, including stored sewage sludge, is the most significant GHG emission source from the waste sector. Projections of waste generation are based on historical as well as projected data on the population and GDP. The data on population trends was gathered from State data agency, the GDP trend from the European Commission.

Methane emission arising from *Solid Waste Disposal* on land is calculated applying the IPCC (Intergovernmental Panel on Climate Change) Tier 2 (First Order Decay) method, considering historical waste disposal data. This method assumes that the degradable organic component in waste decays slowly throughout a few decades. CH_4 is generated because of degradation of organic material under anaerobic conditions. Part of the CH_4 generated is recovered for energy; therefore, CH_4 emitted part is smaller than the generated. The model calculations are performed using national statistics of landfill site characteristics and amounts of waste fractions deposited each year. The parameters used for emission projections are the same as those used in the Lithuanian GHG inventory.

Biological Treatment of solid waste covers composting of green waste, composting and anaerobic digestion in MTB plants and household composting. Methane and nitrous oxide emissions from Biological Treatment of waste are calculated by multiplying the amount of waste by the emission factors (IPCC 2006 default emission factors from biological treatment of waste: CH_4 EF – 10g CH_4/kg waste treated, N_2O EF – 0.6 g N_2O/kg waste treated.). CH_4 emissions from anaerobic digestion are calculated using the IPCC 2006 default EF of 5% CH_4 of biogas produced.

Regional Waste Management Centres provided the projected data on the amount of composted waste and waste treated in anaerobic digestion plants. The amount of waste undergoing mechanical-biological treatment assumed to increase because in the 2024 years, 51 out of 60 municipalities began to collect separate kitchen and food waste. Household composting was evaluated by the number of composting bins distributed and the amount of composted waste (220 kg) per household.

Wastewater treatment and discharge

Biochemical oxygen demand (BOD) is one of the main parameters for assessing discharged wastewater compliance with requirements for discharges from urban wastewater treatment plants. BOD data was predicted based on historical data as well as the future development of wastewater collection and treatment system. BOD is expected to increase in line with the rising percentage of population connected to wastewater collecting system. The projected data on BOD and percentage of population connected to wastewater collecting system has been provided by the Ministry of Environment.

The main parameter to estimate N_2O emissions from human sewage is protein consumption. Protein consumption per capita was evaluated by the Health Education and Disease Prevention Centre (77.4 g/capita/day in 1998, 78.1 g/capita/day in 2002, and 81.9 g/capita/day in 2007, 63.6 g/capita/day in 2013, 70.1 g/capita/day in 2020). The protein consumption value is used as for 2020 and remains stable during the 2021–2050 period.

Incineration of waste

Waste incineration without energy recovery is the smallest source of GHG in Waste sector and it is not expected to expand. Assumptions on the projected amounts of incinerated hazardous and clinical waste are based on historical data.

Cogeneration power plant has started incineration of MSW in 2013 and two additional MSW incinerators are in operation since end of 2020. It is assumed that operation of three MSW power plants will reduce the amount of MSW disposed of by landfilling and will overlay portion of fossil fuel used in public electricity and heat production sector. This assumption was incorporated in the final fuel used in Energy sector.

Carbon dioxide, CH_4 and N_2O emissions from *Waste Incineration* are calculated based on the IPCC Tier 1 method and default emission factors are applied. Emission factors are consistent with the emission factors used in the Lithuanian GHG inventory.

Summary table of assessed emissions from waste sector, method applied, and emission factors is provided below.

Table 2-53. Methods and emissions factors used to estimate emission from waste sector

CRF	Source	Emissions reported	Methods	Emission factor
5.A	Solid Waste Disposal	CH_4	T2	D
5.B	Biological Treatment of Waste	CH_4, N_2O	T1	D
5.C	Incineration of Waste	CO_2, CH_4, N_2O	T1	D
5.D	Wastewater Treatment and Discharge	CH_4, N_2O	T1, T2	D

2.6.2.7. LULUCF

GHG projections for LULUCF sector with existing measures (WEM) are based on Land-Use change trends that were observed in Lithuania for the last 5 years. They are based on National Forest Inventory (NFI) data where all Land-Use changes are being monitored. The main data source for growing stock volume changes in forest land is NFI, started in 1998 on forest land. Based on these data, the annual forest increment was modelled in publication "Lithuanian national forest inventory 1998–2017. From measurements to solutions" *("Lietuvos nacionalinė miškų inventorizacija 1998–2017. Nuo matavimų iki sprendimų")*. Based on these data, modelling was done for the period from 2020 to 2050 by applying technical correction from newer data, projection from publication was corrected for the whole period. Other important parameters for modelling were LULUCF Land-Use category areas, annual forest volume increment and increment change, volume of dead trees, sustainable management areas for agriculture and drained organic soils areas methodology for estimation of projected GHG emissions and removals is the same as used for annual GHG inventory submitted under UNFCCC. Short description of the methodology used for GHG projections estimation is provided in this section, detailed description of the methodology for GHG emissions and removals estimation in LULUCF sector is provided in National GHG Inventory Document 2024, Chapter 6.

Summary table of reported emissions from sources and removals from sinks as well as methods and emission factors used is provided in the table below.

Table 2-54. Reported emissions/removals and calculation methods for LULUCF sector categories

CRF category	Emission / removal reported	Methods used	Emission factor used
4.A Forest Land; 4.B Cropland; 4.C Grassland; 4.D Wetlands; 4.E Settlements; 4.F Other land			
Carbon stock change	CO_2	T1; T2	CS; D
4(II) Emissions and removals from drainage and rewetting and other management of organic and mineral soils	CO_2; N_2O	T1; T2	D
4(III) Direct N2O Emissions from N Mineralization/Immobilization	N_2O	T1: T2	CS; D
4(V) Biomass Burning	CO_2; N_2O	T1; T2	D
4.G Harvested wood products			
Sawnwood	CO_2	T1; T2	D
Wood panels	CO_2	T1; T2	D
Paper and Paperboard	CO_2	T1; T2	D

The general forecast of Lithuanian tree volume, volume growth, felled and naturally dying volumes was compiled considering the change in forest volume and use inventoried by the NMI in 2002–2017. The forecast of these parameters was based on data according to the forest productivity forecast in the NMI publication, applying a correction factor to it. According to the data obtained, the amount of living biomass accumulated in forests ranges from 4.49 to 5.49 million m^3. For the forecast for the entire period until 2050, a uniform forest use (felling) of 10.4 million m^3 of wood was used. Also, the dead wood component in the general balance of forest volume growth ranges from 2.6 to 3.0 million m^3.

Many assumptions were made for the best assessment of existing measures. Measures L1-E "Peatland restoration (restoration of hydrological regime on agricultural land)" and L6-E "Peatland restoration (conversion to grassland)" assumed that organic soils in crops would be converted to wetlands or

grasslands due to lower GHG emissions. Measures L2-E “Grassland conservation and restoration” assumed that greenhouse gas emissions would be avoided, i.e., no carbon would be released from biomass and soil when changing from one land use to another. Measures L4-E “Promotion of catch crops” and L5-E “Promotion of crop rotation” assumed that non-agricultural technology from measure A7-E would also be applied in these areas. The impact of these measures is calculated assuming that no-till and other conservation tillage methods have a greater effect than applying only one measure. Therefore, part of the impact of measure A4-E is considered in measures L4-E and L5-E. Measure L7-E “Promotion of green cover” assumes that the entire area will be converted from crops to grassland, i.e. active land use change, not preventive. Measure L8-E “Preservation of landscape elements” provides that “green” tree strips will be planted on the edges of crop fields, which will help protect against wind erosion. The impact is calculated taking into account the biomass of trees growing in these grasslands. Measures L9-E “Afforestation”, L14-E “Protection of self-seeded trees” assumed that Cropland or Grassland would be converted into forest land, which would absorb carbon from biomass and increase carbon stocks in mineral soils. Measure L19-E “Promotion of ecological construction” assumed that currently exported industrial roundwood would be directed to the local market and used to produce modular structures and building renovation works.

GHG projections for LULUCF sector with additional measures (WAM) was based on the same assumptions, that were used in WEM scenario. This decision was made, because they are an extension of already planned measures.

2.6.3. Changes in the methodology since the most recent biennial transparency report

As this is the first Biennial Transparency Report submitted by Lithuania, no changes to a previous report are reported.

2.7. Other information

According to paragraph 103 of the annex to decision 18/CMA.1, “each Party may provide any other information relevant to tracking progress made in implementing and achieving its NDC under Article 4 of the Paris Agreement”. All relevant information can be found in sections 2.1–2.6, hence, no additional information is provided here.

REFERENCES

2006 IPCC Guidelines for National Greenhouse Gas Inventories https://www.ipcc-nggip.iges.or.jp/public/2006gl/

Lithuania's 8th National Communication and 5th Biennial Report under the United Nations Framework Convention on Climate Change, 2022 https://am.lrv.lt/uploads/am/documents/files/KLIMATO%20KAITA/%C5%A0ESD%20apskaitos%20ir%20kt%20ataskaitos/8th%20NC%20and%205th%20BR_20230105%20final.pdf

Lithuania's National Energy and Climate Action Plan, 2024 https://commission.europa.eu/publications/lithuania-final-updated-necp-2021-2030-submitted-2024_en

Lithuania's National GHG Inventory Document 2024 https://am.lrv.lt/media/viesa/saugykla/2024/3/8CXXUPWkOJI.pdf

National Climate Change Management Agenda, 2021 https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/219a2632a6b311ecaf79c2120caf5094?jfwid=-cgcikcupu

Lithuanian Transport Development Strategy until 2050, 2020. The Ministry of Transport and Communications https://sumin.lrv.lt/uploads/sumin/documents/files/Strategija%202050%20m_%202020-12-07_Nr_%203-746(1).pdf

The First Biennial Report from the European Commission to the United Nations Framework Convention on Climate Change under the Enhanced Transparency Framework, European Commission 2024 https://unfccc.int/sites/default/files/resource/EU%20FIRST%20BTR.pdf

OECD Environmental Performance Reviews: LITHUANIA (Report), 2021 https://www.oecd.org/en/publications/2021/09/oecd-environmental-performance-reviews-lithuania-2021_4f177f6c.html

Official statistics portal, State Data Agency of Lithuania https://osp.stat.gov.lt/statistiniu-rodikliu-analize#/

Official website of the Ministry of Energy https://enmin.lrv.lt/lt/

Official website of the Ministry of Environment https://am.lrv.lt/

Official website of the European Union – Climate Action https://climate.ec.europa.eu/index_en

3. Climate change impacts and adaptation

3.1. National circumstances, institutional arrangements and legal frameworks

National circumstances relevant to adaptation actions

Lithuania, located in Northern Europe, is characterised by its temperate climate, diverse ecosystems and significant forest coverage. The country experiences increasing climate variability, with trends indicating rising annual average temperatures, reduced snow cover, and intensified weather extremes such as heatwaves, heavy rainfall and drought (Ministry of Environment, 2022).

Demographically, Lithuania's population is ageing, with a median age of 44. In 2023, the average life expectancy of the country's population was 77.43 years. Although life expectancy for men has increased faster in the last decade, the gap between life expectancy for men and women remains significant. Currently, life expectancy for Lithuanian women is 81.71 years, compared to 72.86 years for men (Statistics Lithuania. State Data Agency, 2023). Unfortunately, data from the Population Health Survey shows that healthy life expectancy in the country has even declined over the decade: after 57 years in 2011, men's healthy life expectancy will be 55.4 years in 2021, while women's healthy life expectancy will have fallen from 62 years in 2011 to 59.8 years in the same period (Statistics Lithuania, State Data Agency, 2022). This shows that, once the population reaches older age, they live a long time burdened by various health problems.

Lithuania's economy is also heavily reliant on agriculture, energy, and manufacturing sectors, which are particularly vulnerable to climate change. Infrastructure, including transportation and energy systems, faces challenges from changing climatic conditions, such as more frequent extreme weather events.

The country has developed its adaptive capacity by integrating climate adaptation measures into national and municipal plans, which emphasize socio-economic resilience and sustainable infrastructure.

Institutional arrangements and governance

Climate change adaptation is a critical component to enhance resilience and reduce the impacts of climate change on its ecosystems, economy, and society. Effective implementation of adaptation policies requires a well-coordinated institutional framework involving various stakeholders, including government institutions, municipalities, businesses, academia, and the public. An overview of the institutional arrangements that ensure the successful development and implementation of climate change adaptation measures in Lithuania is given below.

Ministry of Environment

The Ministry of Environment of the Republic of Lithuania (MoE) is the primary coordinating institution for climate change adaptation policy development and implementation. It oversees the legal, institutional, and procedural framework for adaptation efforts and coordinates the integration of sectoral goals into national adaptation strategies. The MoE collaborates with other ministries and governmental institutions to collect relevant information, align sectoral objectives, and ensure coherence in policy implementation.

Sectoral Ministries

Climate change adaptation goals are pursued across multiple sectors within the competence of the Ministry of Economy and Innovation, Ministry of Energy, Ministry of Finance, Ministry of National Defence, Ministry of Culture, Ministry of Social Security and Labour, Ministry of Transport and Communications, Ministry of Health, Ministry of Education, Science and Sport, Ministry of Foreign Affairs, Ministry of the Interior, and Ministry of Agriculture. Each ministry is responsible for implementing adaptation measures relevant to their respective sectors, developing sector-specific plans, and contributing to the integration of adaptation goals into broader national strategies and projects.

Municipalities

Local governments play a critical role in implementing climate adaptation measures by incorporating national objectives into regional and local development plans. They address local vulnerabilities, manage resources, and engage with communities to foster resilience at the local level. Additionally, municipalities are responsible for developing and implementing their own adaptation plans, which outline specific actions and strategies to address local risks related to climate change.

Lithuanian Hydrometeorological Service

The Lithuanian Hydrometeorological Service under the Ministry of Environment plays a pivotal role in climate change adaptation by monitoring and analysing meteorological, hydrological, and climatic data, preparing long-term climate projections based on global and regional models, and providing information for early warning systems for extreme hydrometeorological events. These efforts support risk assessments and strategic planning.

Research and Academia

Academic institutions and research organizations contribute by providing evidence-based recommendations, conducting vulnerability and impact assessments, and offering innovative solutions for adaptation challenges.

Legal and policy frameworks

Lithuania has a robust legal framework for adaptation to climate change. In 2021 Lithuania adopted the National Climate Change Management Agenda (NCCMA), where climate change adaptation targets and objectives for 2030 and a long-term direction for adaptation to climate change by 2050 are set out. NCCMA shall be updated every 10 years or in the event of changes in the legal framework. The targets and objectives outlined in the NCCMA for the 2021–2030 period shall be pursued through the implementation of the National Progress Plan and the NCCMA implementation plan, i.e. the NECP. This plan adheres to the requirements of Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action. The NECP, approved by the Government on 11 December 2024, has included the National Adaptation to Climate Change Plan as an annex.

The implementation of the NCCMA shall be financed from the state budget of the Republic of Lithuania, municipal budgets, the EU, international organisations, the private sector and other sources.

Lithuania's climate change adaptation management policy is formulated and implemented by both national and EU strategic documents and legal acts. The NCCMA has been prepared regarding the Law on Climate

Change Management of the Republic of Lithuania, and its implementation is based on both sector-specific development programmes or short-term planning documents, as well as cross-sectoral policy documents, such as the 2021–2030 National Progress Plan, National Strategy for Sustainable Development, New Comprehensive Plan of the Territory of the Republic of Lithuania, contributes to the goals and objectives of the National Energy Independence Strategy and the interests of national security identified in the National Security Strategy. The climate change adaptation objectives and targets are also implemented in accordance with the EU Climate and Energy 2030 framework, the EU Green Deal initiatives, the EU Adaptation Strategy and the long-term climate change policy planning documents, and in implementation of the Communication from the European Commission to the European Parliament, the Council, the European Economic and Social Committee of the Regions "Managing climate risks – protecting people and prosperity".

3.2. Impacts, risks and vulnerabilities, as appropriate

Current and projected climate trends and hazards

In 2021, Lithuania updated its climate projections, presenting variations in climate conditions from the present to the end of the century – projections to 2100 (Ministry of Environment, 2023). These projections were developed using CORDEX data, a coordinated framework for regional climate modelling and downscaling. The work combined two global climate models (GCMs) and two regional ones (RCMs) to ensure accuracy and reduce model biases. Possible climate variations were projected for two greenhouse gas emission scenarios: RCP4.5 and RCP8.5. Observational data from the Lithuanian Hydrometeorological Service and standard climate norms were used to refine the baseline (2006–2035). The projections cover three future periods: 2021–2050, 2046–2075, and 2071–2100.

Mean air temperature and solar radiation duration projections

The average air temperature (see *Table 3-1*) is projected to increase from the current 7.3°C by between 1.2°C (RCP4.5) and 2.8°C (RCP8.5). The greatest warming is projected in winter (December-January, 3.9–4.4°C RCP8.5) and the least in late spring and early summer in May-July (1.9–2.1°C RCP8.5). RCP4.5 predicts a slower temperature increase in the second half of the century, while RCP8.5 predicts a steady temperature increase. The spatial distribution of projected temperatures remains unchanged: (a) moderately warmer in western Lithuania and the lowlands of central Lithuania, with cooler temperatures in the highlands of the country; (b) warmer in winter in the western region than in the eastern part of the country; (c) warmer spring temperatures in the central and southern regions; (d) cooler summers in the western and north-eastern regions.

The **daily maximum temperature** in Lithuania will also increase from the current 11.3°C from 1.2°C (RCP4.5) to 2.8°C (RCP8.5). The highest annual daily temperature maximum values are forecasted for the central and southern regions.

Daily minimum temperatures in Lithuania will rise slightly from 1.4°C (RCP4.5) to 3.2°C (RCP8.5) compared to the current 3.5°C. A particularly large increase is expected in winter, from -5.5°C to -0.4°C in January. The lowest annual daily temperature maximums are predicted in the central and southern regions.

Rising temperatures will increase the risk of **heatwaves** (days when the maximum temperature exceeds 30°C for at least three consecutive days). The average number of such days could increase from the current 2 days to 7 days per year. In the south-eastern region, the duration of heatwaves can reach 2 weeks.

Tropical nights (when night-time temperatures remain ≥ 20°C) are more common as the climate changes. On average, one tropical night is currently recorded every 2 years, and by the end of the century, between 1.5 (RCP4.5) and 7 (RCP8.5) tropical nights are predicted. The coastal and south-central regions are more vulnerable to an increase in the number of tropical nights (up to 10 episodes in Vilnius). **The number of cold days** with daily minimum temperatures below -15°C will decrease from the current 5.8 days by 3 days under RCP4.5 and 4.7 days under RCP8.5, to an average of one cold day per year by the end of the century. In the coastal area, cold days may disappear completely, while in Vilnius they will decrease from the current 10 days to 6-8 days in the RCP4.5 scenario and 3-6 days in the RCP8.5 scenario.

The vegetation season is projected to become longer due to climate change. On average, the length of the vegetation season in Lithuania will increase from 16 (RCP4.5) to 37 (RCP8.5) days by the end of the century, compared to 206 days today. The length of the growing season will increase more in western Lithuania, reaching 260–270 days.

The number of **heating days** below 10°C is projected to decrease as the climate changes. On average, in Lithuania, the decrease from the current 207 days will be between two weeks (RCP4.5) and one month (RCP8.5) by the end of the century. Longer warming periods in the hilly eastern and mid-western regions and shorter periods in the coastal and central/southern lowlands are projected to persist until the end of the century.

The changing climate is expected to increase the number of **cooling days** with average temperatures above 15°C. On average in Lithuania, this will increase from the current 78 days to two weeks (RCP4.5) to one month (RCP8.5) by the end of the century. Longer cooling periods of up to 120 days under RCP8.5 are projected for the coast and central/southern lowlands.

Frost episodes during the period of active vegetation period are the events when the mean air temperature is above 10°C and the minimum surface temperature falls below 0°C. On average there is 1 such episode per year. Climate projections do not provide a single answer as to whether such events will occur more or less frequently in the future. This is because the active growing season will start earlier in the future, which increases the likelihood of surface temperatures falling below 0°C on such days, despite the overall warming.

Fire risk is assessed by the number of days per year with a fire weather class of 3. The risk of fire increases with increasing temperature and decreases with increasing precipitation. Both parameters increase with climate change, so the trend in fire risk under RCP4.5 is not clear, while under RCP8.5 the number of days at risk increases from the current 13.4 to 18.4. Higher fire risks are expected in central and northern Lithuania due to lower rainfall and in coastal area due to stronger winds.

Shortwave solar radiation is projected to decrease slightly over the century from the current 115 W/m^2 to 111 W/m^2 in RCP4.5 and 108 W/m^2 in RCP8.5. The reason for this remains unclear (most likely because of an increase in cloud cover). The largest decrease is expected in December-March (10–20% in RCP8.5) and the smallest in August-September (0–2% in RCP8.5). The highest solar radiation values are observed in the west-south-western part of the country.

Climate change will reduce the **sunshine duration** in Lithuania from the current 1,854 hours, ranging from 64 hours or 3.2% (RCP4.5) to 103 hours or 5.5% (RCP8.5). The greatest reduction is expected in November–January (27–37% RCP8.5) and no change is expected in August-September. Longer sunshine durations continue to be recorded in the western part of the country.

Table 3-1. Mean air temperature and solar radiation indicators. Indication of change: red – increasing, blue – decreasing, green – neutral

Climate indicator	Current value	Future projections (2071–2100)	
		RCP4.5	RCP8.5
Annual mean air temperature, °C	7.3	8.5	10.1
Mean air temperature (January), °C	-3.1	-1.7	1.3
Mean air temperature (July), °C	18.3	18.7	20.4
Daily temperature maximum, °C	11.3	12.5	14.1
Daily temperature minimum, °C	3.5	4.9	6.7
Heatwaves, days	2.1	3.5	7.0
Tropical nights, number of episodes	0.5	1.5	6.9
Cold days	5.8	6.5	4.7
Vegetation season duration, days	206	222	243
Heating days	207	193	175
Cooling days	78	92	111
Frost, number of episodes	1.1	0.9	0.9
Fire risk, days	13.4	13,8	18.4
Solar radiation, W/m^2	115	111	108
Solar duration, hours	1,854	1,790	1,751

Precipitation and hydrological projections

Lithuania is projected to receive an increase in **precipitation** (*see Table 3-2*) from the current 684 mm (RCP4.5) by 42 mm or 6% to 98 mm or 14% (RCP8.5). Annual precipitation will reach 726 mm to 782 mm respectively. The RCP8.5 scenario projects a more even distribution of seasonal precipitation. The largest increase in precipitation (more than 20%, in Vilnius as much as 60% in December) is projected for October–May, while July–August will even see a decrease in precipitation according to RCP8.5. However, July remains the rainiest month of the year. A clear maximum is observed in the Samogitian highlands, a secondary maximum in the north-east of the country, while the central part (especially the southern and northern lowlands) is the driest. This rainfall distribution will not change much with climate change, except that the central drier zone will increase eastwards.

The number of days of **heavy precipitation** above 10 mm from the current 16 days will increase by 9% under RCP4.5 and 28.5% under RCP8.5, reaching 17.5 and 20.5 days respectively by the end of the century. The highest values of heavy rainfall days are observed in the western regions, with a secondary maximum zone in the south-east. The lowest rainfall is expected in the central part of the country.

The number of **very heavy precipitation** days with precipitation totals above 20 mm will increase from the current 3.4 days by 9.5% under RCP4.5 and 38% under RCP8.5, to 3.7 and 4.7 days by the end of this century. Thus, the increase is projected to outpace the increase in the number of days of heavy precipitation.

Extreme rainfall or **daily rainfall** (mm) with 10-year recurrence period by the end of the century will increase from the current 54 mm to 58 mm (7%) under RCP4.5 and to 61 mm (12%) under RCP8.5.

The summer maximum rainfall is the sum of the 5% of the summer days (June–September) with the highest rainfall. The indicator describes the shift in the distribution of precipitation, showing the proportion of precipitation that falls during extreme events. The rainfall on the 5% of very wet days increases from the current 103 mm as the climate changes from 7 mm (RCP4.5) to 19 mm (RCP8.5). Thus, future rainfall episodes can be expected to be more concentrated, increasing the risk of both extreme precipitation and dry spells.

The **precipitation-free days** indicator is not expected to follow a clear trend. The number of days is forecast to remain at 190 days. More dry days are expected in the central region and fewer in the western and eastern highlands.

Drought risk is defined as the number of days when the temperature-precipitation index TPI30 falls below a value of 3.5. Drought risk increases with increasing temperature and decreases with increasing precipitation. Both parameters increase with climate change, so there is no clear trend in drought risk. For RCP4.5, the risk of drought increases after mid-century and returns to its current level of 4 days by the end of the century. For RCP8.5, drought risk will increase throughout the century and reach a value of 6.3 days by 2100. The central part of the country is the most vulnerable to drought risk.

The number of days with snow cover is decreasing markedly as the climate changes. By the end of the century, it is projected to decrease from the current 8 weeks per winter to 5 weeks under RCP4.5 and only one week under RCP8.5. At the end of the century, more days with snow cover remain in the continental south-east of the country, with a secondary maximum in the coastal region and in the north of the country. In south-western and central Lithuania, snow cover almost disappears.

Table 3-2. Precipitation and hydrological indicators. Indication of change: orange – increasing, blue – decreasing, green – neutral

Climate indicator	Current value	Future projections (2071-2100)	
		RCP4.5	RCP8.5
Annual precipitation, mm	684	726	782
Average January precipitation, mm	50	54	64
Average July precipitation, mm	85	92	83
Number of days with heavy precipitation	16	17.5	20.5
Number of days with very heavy precipitation	3.4	3.7	4,7
10-year rainfall, mm	54	58	61
Maximum summer rainfall, mm	103	110	122
Days without precipitation	193	190	190
Drought, number of days	4,4	4.0	6.3
Number of days with snow cover	54	33	8
Maximum snow cover, cm	21,5	18.8	18.2
Number of freeze-thaw cycles	66	55	39

The maximum snow cover will decrease from the current 21.5 cm by the end of the century with climate change by 2.7 cm (12.6%) in the RCP4.5 scenario and 3.4 cm (15.6%) in the RCP8.5 scenario. The highest snow cover is projected for eastern Lithuania and the western Samogitian Highlands. By the end of the century, the maximum snow cover will not exceed 25 cm across Lithuania. A more rapid decrease in maximum snow cover is expected towards the end of the century.

The number of **freeze-thaw cycles** is the number of days when the minimum air temperature is below, and the maximum air temperature is above 0°C. The number of freeze-thaw cycles decreases with climate change from the current 66 to the end of the century by 12 days (18%) under the RCP4.5 scenario and by 28 days (42%) under the RCP8.5 scenario. Contrary to common perception, the highest number of such events is recorded in the highlands and southern Lithuania. This suggests that cold nights in spring (continental climate) have a greater influence on the number of freeze-thaw cycles than winter thaws (typical of marine climates).

Wind and sea level projections

Neither the average wind speed, which remains at 3 m/s, nor its seasonality is affected by climate change. The spatial distribution of the average wind speed is characterised by a pronounced maximum at the coast (around 4 m/s), with minima in the eastern part of the country and in the northern lowlands (less than 2.5 m/s).

Climate models do not predict clear trends in peak **wind gusts**. Peak wind gusts are predicted to remain at 15.7 m/s and their seasonal distribution is expected to remain unchanged. Wind gusts will be stronger in the coastal areas (18.5 m/s) and lower in the south and east of the country (up to 15 m/s).

The **number of calm days** or days with calm winds will not change much in this century. The value of the indicator varies between 10 and 10.5 days per year. There is a significant gradient in the spatial distribution of the number of days in the north-west/south-east direction, with up to 30 calm days in the south-east and only 5 calm days on the coast.

Climate change will lead to an average change in the **Baltic Sea level** (see *Table 3-3*) ranging from 22 cm (RCP4.5 scenario) to 35 cm (RCP8.5 scenario). The existing seasonality of sea levels, with higher sea levels observed during the storm season (October–January) and lower sea levels observed during the spring (April–May), will continue throughout the century. Slightly higher sea level rise is expected during the storm season (up to 44 cm in December).

Table 3-3. Indicators of wind speed and Baltic Sea level. Indication of change: orange – increasing, blue – decreasing, green – neutral

Climate indicator	Current value	Future projections (2071-2100)	
		RCP4.5	RCP8.5
Average wind speed, m/s	3.0	2.9	3.0
Highest wind gusts, m/s	15.7	15.7	15.8
Storminess by wind speed criterion, days	19.9	19.2	21
Storminess by wind gust criterion, days	17.3	15.8	20.1
Number of calm days	10.4	10.5	10.1
Sea level rise, cm	–	22	35

Observed and potential impacts of climate change

In 2023, a study on the sensitivity and vulnerability of Lithuanian municipalities to climate change was prepared, the results of which informed the identification, understanding and assessment of climate change risks, thus contributing to the effectiveness of climate change adaptation measures in different sectors of the economy. The most vulnerable sectors to climate change in Lithuania are public health, agriculture,

forestry, ecosystems and biodiversity, water resources, energy, buildings and infrastructure, and cultural heritage and tourism (*see Table 3-4*).

Table 3-4. Summary of the assessment of climate change risks for different sectors. Both overall sectoral and individual risk levels are presented. The level of risk in 2050 and 2100 is assessed under the RCP8.5 scenario

Sectors and risks	Risk level		
	2024	2050	2100
1. Public health	Low	Medium	Medium
1.1. Impact of extreme weather events	Low	Medium	High
1.2. Air quality fluctuations	Low	Medium	Medium
1.3. Spread of vector borne diseases	Very low	Low	Low
1.4. Food safety and water supply issues	Very low	Low	Medium
2. Agriculture	Very low	Low	Medium
2.1. Increasing frequency of heatwaves and dry spells	Low	Medium	High
2.2. Heavy rain and storms	Low	Low	High
2.3. Increase in the length of the vegetation season, spread of diseases and pests in agricultural crops	Very low	Low	Medium
3. Forestry, ecosystems and biodiversity	Low	Low	Medium
3.1. Changes in the species composition of trees and other plants	Low	Low	Medium
3.2. Increase in diseases and pests	Low	Low	Medium
3.3. Forest fires	Low	Medium	High
4. Water resources	Low	Medium	Medium
4.1. Changes in floods and flash floods	Low	Low	Medium
4.2. Eutrophication and changes in water quality	Low	Medium	Medium
5. Energy	Low	Low	Medium
5.1. Damage to electricity production and transmission equipment	Low	Low	Medium
5.2. Change in heating and cooling demand	Low	Medium	High
6. Buildings and infrastructure	Low	Low	Medium
6.1. Damage to road infrastructure	Low	Low	Medium
6.2. Damage to buildings, digital and other infrastructure	Low	Low	Medium
7. Cultural heritage and tourism	Very low	Low	Medium

Public health: climate change can have a wide range of impacts on people's physical and psychological well-being. The effects can be direct (heat stroke, dehydration, heat-related weakness/fatigue) or indirect (exacerbating the symptoms of pre-existing chronic diseases, affecting people's productivity and cognitive performance). Dry, calm weather favours the accumulation of air pollution, which has negative health consequences, especially for those suffering from chronic respiratory diseases or pollen allergies. Forest fires, which often accompany heat waves and droughts, release large quantities of particulate matter and other toxic substances into the atmosphere. The extremely high temperatures and smoke inhalation can endanger the cardiovascular system, the eyes and the mental state of a person. Increases in average and maximum temperatures can have an impact on food safety, both in terms of direct effects on agriculture and food storage conditions and indirect effects on supply chains. Increasing average temperatures, milder winters and wetter summers due to climate change create conditions for the spread of new diseases and vectors.

Agriculture: arid conditions, especially at the beginning of the growing season, have a major impact on harvests. Heatwaves and dry conditions during the summer period can quickly damage horticulture and livestock production. Heatwaves cause losses of vegetable crops and, in the livestock sector, lower productivity and higher mortality. Increasing annual average and average maximum summer temperatures

also contribute to the loss of organic matter in soils. Higher temperatures lead to a faster decomposition of soil organic matter, resulting in lower soil fertility.

Forestry, ecosystems and biodiversity: changing climatic conditions are predicted to result in increasingly favourable conditions for broad-leaved tree species in Lithuania. In the future, not only the species composition of trees will change, but also the phenological seasons (flowering, fruit and seed ripening, etc.). Changing thermal and moisture conditions in Europe are leading to an increase in forest diseases and pests. For example, in recent decades, the European spruce bark beetle (*Ips typographus*) has been observed to produce several generations per season due to the warmer and drier spring and summer periods. Dry periods also lead to slower plant growth, and more frequent recurrences of droughts prevent plants and trees from recovering and make them more vulnerable to diseases.

Water resources: it is more common to capture several flood peaks, spread over both winter and spring, rather than a single large spring flood. These processes are the result of rising average winter temperatures and more frequent thaws, which allow the snow cover to melt. Rising water temperatures due to climate change may increase phytoplankton blooms and eutrophication.

Energy: more frequent extreme weather events such as hail, lightning, windstorms, torrential rain or wet snow can damage power lines and solar plants. Older, overhead power lines are particularly vulnerable. As average temperatures rise, Lithuania will experience fewer heating days and more cooling days. Cooling demand will increase especially in densely populated central parts of cities, where the urban heat island effect develops.

Buildings and infrastructure: heavy rain, changes in freeze-thaw cycles and heat waves can cause damage to road surfaces, damage to vehicles (tyres) due to overheating, accidents due to reduced friction, reduced visibility, difficult driving conditions, obstacles in the road etc. Poorly constructed or worn-out culverts can lead to washouts of streets and road embankments during heavy rainfall or spring floods. Climate change is affecting the operational conditions of buildings and infrastructure and may exceed their resilience limits. Damage to infrastructure caused by extreme weather events can disrupt essential public services such as hospitals, drinking water and sanitation, policing, fire protection, education and other public facilities.

Cultural heritage and tourism: sudden direct damage can be caused by extreme weather events, while the slow deterioration of the property can be caused by rising annual average temperatures and increasing rainfall. Changes in climatic conditions can have both positive and negative effects on tourism. Increasing annual average temperatures, decreasing relative humidity and decreasing average wind speeds are predicted to increase the climatic index for tourism across Lithuania. However, the negative impacts of climate change on green spaces and water bodies may lead to the decline or loss of some natural tourist attractions.

3.3. Adaptation priorities and barriers

Domestic priorities

Lithuania's climate change management policy vision for 2050: Lithuania's economy is circular and climate neutral. The country's economic sectors and regions are resilient to the environmental changes brought about by climate change, with modern, resource-efficient, socially responsible and competitive

development based on innovative technologies and research, while economic growth is decoupled from resource use. A climate-resilient society, adapted to the inevitable impacts of climate change, is emerging. The environmental factors and risks having negative impacts on citizens' health and well-being have been contained; society's vulnerability to climate change is being reduced and well-being increased by ensuring that the planet's potential is not exceeded.

The goal of Lithuania's policy on adaptation to climate change is to reduce the current and foreseeable vulnerability of the country's natural ecosystems and economic sectors, to strengthen adaptive capacity, to cost-effectively mitigate risks and damage and to maintain and increase resilience to climate change, with a view to securing a favourable environment for public life and sustainable economic activity to ensure food production is not endangered. In implementing this goal, it will be aimed by 2030:

- To apply flood protection measures to all residents in flood-prone areas;
- To ensure that the share of climate-related economic losses in the country's GDP does not exceed 0.08 % per year;
- The proportion of dangerous, natural disasters and catastrophic meteorological events predicted is at least 90 % of the actual events.

The climate change adaptation goal will be pursued through adaptation measures in climate-sensitive areas such as agriculture, energy, transport, industry, forestry, ecosystems and biodiversity, landscape, public health, water resources and the coastal zone, urbanised areas, etc., in line with the main short-term directions by 2030:

- **Adaptation actions at the local level**: to promote regional cooperation and active involvement of municipal authorities and the local community in the planning and implementation of climate change adaptation measures;
- **More systematic adaptation:** coherence and synergies between climate change mitigation and adaptation measures;
- **Data-driven solutions:** to increase knowledge and research on climate change impacts, vulnerability and adaptive capacity, promote R&D;
- **Open data:** to collect and disseminate information on ongoing climate change, the resulting damages and the magnitude of losses, to provide information to stakeholders and the public and to share best practices and examples.

Adaptation barriers

While significant progress has been made in addressing climate change impacts, Lithuania still faces several challenges that hinder the full implementation and effectiveness of planned adaptation measures. A key challenge lies in the insufficient awareness across economic sectors and society regarding the risks posed by climate change and the necessity to adapt proactively. Many sectors, such as agriculture and transport, remain highly vulnerable to extreme weather events. Yet the uptake of adaptation solutions – such as soil conservation practices or crop diversification strategies – remains limited. This is further exacerbated by the lack of long-term loss accounting systems to evaluate climate-induced damages on sectoral and national levels.

Another notable barrier is securing innovative and sustainable financing mechanisms to support adaptation measures. While opportunities exist within EU and international programs, additional funding is needed to ensure the implementation of adaptation measures, as existing resources may prove insufficient to meet

long-term climate resilience goals. Additionally, there is deficient institutional capacity, particularly at the municipal level, where adaptation planning and implementation often lack resources, knowledge, and technical expertise. Overcoming these barriers requires enhancing cross-sector collaboration, prioritizing nature-based solutions, and ensuring adequate financing to foster systemic resilience and reduce future risks.

A first Review of fiscal risks has been prepared on the potential impact of risks on government finances and the planned medium-term fiscal targets (Ministry of Finance, 2020). The Review drew on the good practices of the International Monetary Fund and foreign countries. The Review was prepared in a context of high uncertainty about the evolution of the COVID-19 pandemic and its impact on the Lithuanian economy, health and social environment, and assesses the impact of the risks of climate change as an extreme natural phenomenon on society, industry and the economy. It argues that the costs of implementing all climate change-related agreements will put pressure on government finances but that the real risk is non-compliance with the expected agreements. These impacts would manifest themselves through more extreme natural events, changes in the labour market and working conditions caused by climate change, and fines that increase government spending in the event of non-compliance with international commitments.

3.4. Adaptation strategies, policies, plans, goals and actions to integrate adaptation into national policies and strategies

The Ministry of the Environment coordinates the development and implementation of Lithuania's climate change adaptation policy. The goals and objectives of the NCCMA are also implemented in cross-sectoral policies, such as the National Progress Plan 2021–2030, the National Strategy for Sustainable Development and sector-specific development programmes or short-term planning documents.

The National Adaptation Plan 2024–2030 (NAP) has been prepared to ensure that Lithuania is ready to respond effectively to the challenges posed by climate change, protect natural ecosystems, minimise economic losses and ensure social well-being through innovative solutions and effective inter-institutional cooperation. The NCCMA is implemented by the National Energy and Climate Action Plan (NECP), and the NAP is therefore part of the NECP, which contains the measures for the implementation of the NCCMA’s climate change adaptation goals and targets.

The climate change adaptation objective will be pursued through adaptation measures in climate-sensitive areas such as emergency management, infrastructure, forestry, ecosystems, biodiversity, transport, urban areas, water resources, public health, agriculture, etc., in line with the key short-term objectives for 2030. Priorities are set considering the vulnerability and strategic importance of sectors.

According to the latest assessments, flooding poses the greatest risk to human health, the environment, cultural heritage and economic activity in 43 Lithuanian territories covering more than 6,000 hectares. In areas with relatively high densities of development and settlements, some 4,500 inhabitants are unprotected in the highest-risk priority areas. These areas can only be effectively flood-proofed through the reconstruction or installation of newly engineered structures to protect areas from swamping and flooding. The installation of temporary protection measures (sandbags, concrete blocks, temporary barriers made of prefabricated metal structures and combinations thereof) is not feasible due to the excessive depth of flooding, the size of the area, or the one-off cost of their use is equal to or even higher than the cost of

construction and operation of permanent engineered flood protection structures. It is economically viable to reconstruct or construct new engineered structures (construction and operation costs are lower than the potential flood damage) (Environmental Protection Agency, 2023).

The fundamental principles of flood risk management in Lithuania are addressed in 3 documents: the Flood Risk Management Plan 2023–2027, which provides all the essential information on the implementation of the requirements of the EU Floods Directive; the Water Development Plan 2022–2027, which defines the main principles, government objectives and measures to reduce flood risk in Lithuania; the Action Implementation Plan 2022–2027, which lists specific actions for the implementation of the measures, deadlines for their implementation, and the institutions responsible for implementation.

As part of the implementation of the first Flood Risk Management Plan, the Water Management Program 2017–2023 and the Action Implementation Plan 2017–2023, a wide range of engineering and non-structural flood protection measures are planned and implemented in Lithuania for flood prevention, preparedness, recovery and recovery, which will protect around 8,000 inhabitants.

In addition, the Coastal Zone Management Programme 2023–2032 was approved, which provides for the covering of the banks and dune slopes with branch sheets, the reinforcement of the ridge with frog fences, and the creation of more paths and stairs to protect the banks and dune slopes from the adverse effects of storms and other natural processes. These measures to stop sand erosion have been the most successful so far. To protect the ridge from the negative impacts of high recreational flows, the recreational infrastructure network will be upgraded in many sections of the intensively used coastline, with the installation of boardwalks and stairs and the repair of existing infrastructure.

Municipalities, together with the relevant national authorities, are responsible for the implementation of local climate change adaptation goals, targets and objectives and certain adaptation measures. Guidelines on mitigation and adaptation for municipalities were developed in 2017. The publication provides information on what adaptation measures are available, guidance for municipal spatial planning and funding opportunities for adaptation projects. For the period 2023–2024, the ClimAdapt-LT project has prepared Climate change adaptation plans and guidelines for Emergency management plans for 8 municipalities in Lithuania: Klaipėda City, Birštonas District, Panevėžys City, Tauragė District, Ukmergė District, Utena District, Varėna District, Vilnius City.

The Municipal Climate Change Adaptation Plans are the first local planning documents to address climate challenges. They provide a detailed assessment of each municipality's risks and vulnerable sectors, outline municipal adaptation goals/objectives and strategic directions for adaptation, and provide the actions and/or measures needed for adaptation to climate change and the mechanisms for implementing them. It is expected that other Lithuanian municipalities, following a good example, will also initiate the preparation of climate change adaptation plans.

Stakeholder engagement was a critical component in the development of municipal climate change adaptation plans. Workshops and stakeholder seminars were organized to facilitate discussions with municipal administration representatives and local stakeholders, including community groups and sectoral experts. During these sessions, participants collaboratively identified key strategic directions, assessed local vulnerabilities, and provided input on actionable measures to address climate challenges.

Emergency management is closely linked to climate challenges, and emergency management plans are intended to be continuously updated to adapt to new climate change impacts, considering the latest climate

data and forecasts, so that the municipality, its businesses and residents can respond effectively to changing conditions.

3.5. Progress on implementation of adaptation

Adaptation policy aims to strengthen adaptive capacity, increase resilience and reduce vulnerability to the impacts of climate change to contribute to sustainable development, and ensure appropriate adaptation responses. For climate change adaptation, existing policy measures are currently implemented in vulnerable sectors (agriculture, energy, transport, industry, forestry, ecosystems and biodiversity, landscape, public health, water resources and the coastal zone, urbanised areas, etc.).

Emergency management measures in Lithuania focus on enhancing preparedness and response capabilities to address extreme weather events and other climate-induced risks. Key actions include the development and modernization of warning and information systems to ensure timely dissemination of critical information to the public. For instance, the Ministry of the Interior is expanding public warning and information infrastructure, while the Ministry of Environment together with the Lithuanian Hydrometeorological Service is modernizing meteorological forecasting systems to deliver impact-based warnings. Additionally, efforts to strengthen firefighting and rescue capacities include upgrading technical equipment and infrastructure.

Infrastructure measures in Lithuania focus on enhancing the resilience of electricity distribution networks to climate and environmental impacts. The Ministry of Energy, in collaboration with economic operators, is prioritizing the replacement of overhead power lines with underground cables, particularly in high-risk areas such as forests and regions with frequent disruptions or ageing infrastructure. Additional efforts include improving voltage quality and implementing solutions to strengthen the network's capacity to withstand climate change impacts.

Forestry, ecosystems, biodiversity, and landscape adaptation measures focus on enhancing the resilience of natural systems to climate change while promoting sustainable development. Key actions include implementing coastal management solutions to strengthen the resilience of the seashore to climate impacts and developing an advanced forest fire monitoring system to improve early detection and response capabilities. Scientific research is being conducted to improve forest adaptability, including the selection and breeding of tree species better suited to changing climatic conditions. Efforts also focus on promoting diverse and mixed forest stands to enhance ecosystem stability and mitigate the impacts of climate change. Additionally, natural ecosystem restoration is being prioritized in agricultural areas, aiming to improve ecological balance and provide high-quality ecosystem services.

Transport adaptation measures focus on enhancing resilience to extreme weather events and climate change impacts mostly in road infrastructure. The Ministry of Transport and Communications (SUMIN), 'Via Lietuva', and other stakeholders are upgrading infrastructure to mitigate climate risks by 2030 and improving road weather information systems. Critical road segments prone to flooding or damage are being identified, with municipalities and SUMIN developing tools for targeted interventions. Additionally, technical standards for roads, bridges, and railways are being revised by SUMIN, the Ministry of Environment, and other institutions to address evolving climate challenges and ensure long-term infrastructure sustainability.

Adaptation measures for **urban areas** focus on enhancing local-level climate resilience through systematic planning and assessment. Municipalities are tasked with developing and regularly updating adaptation plans for urban territories, ensuring these plans remain responsive to evolving climate challenges.

Water resource-related efforts include reviewing and enhancing existing disease monitoring systems in water bodies and ensuring the regular updating of flood risk management plans. The Ministry of Environment, along with municipalities, is also implementing flood risk management projects that incorporate preventive measures such as green infrastructure solutions. Additionally, water management and protection projects aim to modernize surface and groundwater monitoring systems, conducting assessments of water body resilience to climate impacts.

Public health adaptation measures focus on mitigating climate-related risks and building resilience, particularly for vulnerable groups. Key initiatives include training health professionals to address climate impacts on health, organizing vaccination campaigns against tick-borne diseases like encephalitis, and providing timely public recommendations to reduce heat-related health risks during extreme weather events. Municipalities are implementing measures to alleviate heat stress, such as installing cooling infrastructure like fountains, misting stations, and hydration points in urban areas. Efforts to expand green infrastructure, including multifunctional green spaces, aim to improve urban cooling, air quality, and overall well-being, with a special focus on high-risk groups such as the elderly and individuals in care facilities. These comprehensive actions strengthen public health systems, reduce vulnerabilities, and support communities in adapting to the growing challenges posed by climate change.

Agriculture efforts include promoting livestock and crop insurance to provide financial protection against unforeseen climate impacts, such as extreme weather events, and ensuring effective risk management. Additionally, the government is fostering the development of innovative risk management tools, including stabilization funds and mutual aid schemes, to support farmers in coping with climate variability. Advanced drainage and irrigation systems are being implemented in key agricultural areas to improve water management by reducing excess moisture during wet periods and ensuring water availability during droughts.

Cross-cutting climate adaptation measures emphasize integrated planning, improved data systems, and international cooperation. Key actions include updating climate scenarios to refine adaptation measures, offering advisory services for businesses, and modernizing observation systems. Additionally, Lithuania actively engages in international collaborations to exchange knowledge, share best practices, and contribute to global adaptation policy development, ensuring a comprehensive and coordinated approach to climate resilience.

During the preparation of the NAP, a systematic and inclusive approach was undertaken to ensure the plan's comprehensiveness and relevance. All information on existing and planned measures, including financial sources and allocations, was collected from the respective sectoral ministries responsible for their implementation. This process also entailed a detailed assessment of Lithuania's current state in terms of climate change adaptation, encompassing both vulnerabilities and progress made.

Once the draft plan was developed, it was submitted for public consultation through the *E.Citizen* (www.epilietis.lrv.lt) platform, allowing all stakeholders, including citizens and community organizations, to provide feedback and suggestions. Following these consultations, the finalized NAP was prepared as an annex to the NECP) and subsequently submitted to the European Commission.

3.6. Monitoring and evaluation of adaptation actions and processes

Adaptation planning requires effective monitoring to ensure that all stakeholders have access to accurate and timely information. In Lithuania, monitoring and reporting are carried out in line with EU requirements, including Directive 1999/2018. Data on adaptation progress is collected every two years and submitted to the European Environment Agency (EEA). This information is available in the EEA country profile and is also published on the Climate-ADAPT platform. Additionally, up-to-date information on Lithuania's adaptation policymaking and implementation can be accessed on the national Climate Change portal (www.klimatokaita.lt), ensuring transparency for all interested parties.

If we want to make sure that the process of adaptation to climate change is effective and sustainable, we need to continuously assess the implementation of planned actions and their impacts and analyse the results. Monitoring not only helps to assess the effectiveness of the measures taken but also allows for adjustments to be made for those that have proved to be less effective to be removed or replaced. In Lithuania, the progress and monitoring of climate change adaptation is coordinated by the Ministry of the Environment together with the institutions responsible for the measures. Municipalities are responsible for planning and implementing adaptation measures at the local level. They cooperate with national authorities in the preparation and implementation of specific plans.

The implementation of adaptation measures may be subject to change for the following reasons: the latest scientific data on climate change and its impacts, extreme hydrometeorological events and their consequences requiring urgent action, changes in legislation at the EU and national level, changes in funding sources and conditions, and the needs of local communities.

Changes would be made through regular reviews, which would assess the results achieved and identify new priorities and actions. The 8 Lithuanian municipal climate change adaptation plans set out monitoring indicators to assess the effectiveness of the selected measures (Table 3-5). The indicators will be monitored at least once a year.

In addition, the implementation and monitoring of adaptation measures must align with the requirements of the EU Taxonomy Regulation. This regulation establishes criteria to determine the sustainability of investments, including infrastructure projects, ensuring that they contribute to climate change adaptation goals. New projects are required to undergo assessments to evaluate their alignment with climate resilience and adaptation objectives, as well as to ensure that they do no significant harm to other environmental goals.

Table 3-5. Possible monitoring indicators to improve the effectiveness of the measures selected in the Climate Change Adaptation Plan

No.	Indicator	Possible Data Source
1.	Number of people visiting healthcare institutions (cases per 100,000 inhabitants) with diagnosed conditions directly or indirectly related to extreme meteorological events (e.g., heatwaves) or air pollution. This also includes deaths related to such causes, such as cardiovascular and respiratory diseases, trauma caused by extreme events, diseases from heat or cold exposure, or neglect.	Healthcare institutions, Ministry of Health, Health Information Centre, Hygiene Institute
2.	Financial losses due to the impact of extreme climate events (in euros)	Municipalities

3.	Number of fires related to extreme climate events (drought, storms)	Fire and Rescue Department under the Ministry of Interior
4.	Number of infrastructure objects affected during storms	Municipalities
5.	Number of trees fallen during storms	Municipalities
6.	Areas of cities flooded due to insufficient surface water collection infrastructure	Municipalities and companies managing water supply networks
7.	Number of hydro-technical structure accidents caused by extreme meteorological events	Municipalities
8.	Damage to transportation infrastructure caused by flooding or other extreme climate events	Municipalities
9.	Ecological status of surface water bodies	Lithuanian Environmental Protection Agency
10.	Exceedances of air pollution limit values per year	Municipalities
11.	Number of air or water pollution incidents caused by extreme meteorological events	Municipalities
12.	Forest or woodland damaged by pests in urban areas (hectares per year)	State Forest Service

3.7. Information related to averting, minimizing and addressing loss and damage associated with climate change impacts

As part of Lithuania's preparedness to meet the challenges of the civil protection system in emergencies, the National Risk Analysis was updated (Fire and Rescue Department under the Ministry of the Interior, 2021) and assessed the extreme events that could lead to unplanned government expenditure. This analysis identifies groups of emergencies, for each of which the impact of climate change is assessed. Natural, catastrophic hydrological and meteorological phenomena have been assigned a very high-risk level and are included among the 19 potential hazards that could lead to a national emergency.

The national level assessments described above and in section 3.2 coincide with the risk assessments at the European level. The first European Climate Risk Assessment (EUCRA) identifies 36 climate risks that pose a threat to Europe's energy and food security, ecosystems, infrastructure, water resources, financial stability, and people's health. Many of these risks have already reached critical levels and can become catastrophic without urgent and decisive action.

Lithuania has established a robust public early warning system designed to avert, minimize, and address loss and damage associated with dangerous weather events. This system is part of the country's broader disaster risk reduction framework and serves as a critical adaptation measure to increase climate variability. The early warning system integrates several key elements to ensure effective communication and rapid response during extreme weather events. The Lithuanian Hydrometeorological Service plays a pivotal role in monitoring weather patterns, analysing data, and issuing forecasts. The Fire and Rescue Department is the primary authority responsible for the operation and management of the Public Warning and Information System. Its duties include issuing warnings about imminent threats, coordinating emergency response efforts, and ensuring the dissemination of information to the public through various channels, such as sirens and mobile alerts. The National Crisis Management Centre coordinates crisis and national emergency preparedness for state institutions and bodies. Institutional arrangements are regulated by the Law on Crisis Management and Civil Protection of the Republic of Lithuania.

Alerts are disseminated via multiple channels, including SMS text messages, television, radio, and online platforms. Lithuania's Mobile Early Warning System sends location-based SMS notifications to residents and visitors in affected areas. These messages are tailored to the specific risks, such as severe thunderstorms, flooding, or high winds. Lithuania's color-coded warning system plays a vital role in communicating the severity of weather events, utilizing a clear and internationally recognized scheme of green, yellow, orange, and red levels. Each colour represents a specific intensity of the potential hazard and provides corresponding recommendations for precautionary actions. Information is visualized through an interactive map on the Lithuanian Hydrometeorological Service's website (www.meteo.lt), and the European *Meteoalarm* platform (meteoalarm.eu).

For the aforementioned 8 Lithuanian municipalities with climate change adaptation plans, recommendations for the Emergency management plans have also been prepared, supplemented with climate change data. The guidelines explain why climate change risks need to be considered when developing such plans, present the main risks posed by climate change and provide recommendations for improving the emergency management plan by integrating climate change aspects.

3.8. Cooperation, good practices, experience and lessons learned

Lithuania actively participates in both national and international cooperation and knowledge-sharing initiatives, demonstrating a strong commitment to collective efforts in addressing climate change impacts. The country values the exchange of experiences and practices as essential for enhancing resilience and adaptive capacities. Lithuania is not only eager to learn from the successes and lessons of other nations but also takes pride in contributing its own expertise and best practices.

The aforementioned ClimAdapt-LT project included various training and experience-sharing workshops, focusing on building the capacity of municipal staff in climate change adaptation. In the first place, training sessions were held for municipal chief architects, who were introduced to the latest assessment of municipalities' sensitivity and vulnerability to climate change and to interactive tools that can be useful for municipal infrastructure planning. This was followed by training for municipal staff working on environmental and climate change issues.

During the same project, an experience-sharing seminar was held in Norway, attended by representatives of the Ministry of Environment of the Republic of Lithuania, the Association of Municipalities of Lithuania, Lithuanian and Norwegian municipalities, and the Norwegian Directorate of Civil Protection. The seminar focused on nature-based solutions that can be applied in both countries.

In 2024, the Ministry of Culture of the Republic of Lithuania was also actively involved in bilateral projects assessing the vulnerability of UNESCO World Heritage properties to climate change. To assess the site's vulnerability to climate change and to plan activities to increase resilience to climate change, the Climate Vulnerability Index (CVI) methodology, developed by experts from James Cook University in North Queensland, Australia, was selected. The tool assesses the vulnerability of both community and World Heritage sites. Two sites were selected for the assessment – Røros Mining Town and the Circumference in Norway and the Curonian Spit in Lithuania.

To better understand and address the challenges of climate change, various Lithuanian municipalities are participating in the European Commission's European Horizon 2021–2027 mission 'Adaptation to Climate Change' and are members of the European climate change adaptation community of practice. By

participating in the mission, municipalities are contributing to making Europe the world's first climate-neutral continent to fully adapt to the inevitable consequences of climate change.

In 2023, Lithuania also established the National Climate Change Committee, an advisory body of the Ministry of Environment, providing independent scientific advice on the formulation, assessment and implementation of national climate change management policies, and composed of representatives of scientific and research institutions. Scientists contribute their knowledge to the development of the national climate change management policy. Scientific stakeholders present the latest climate change research and findings that are important to consider in policymaking, while the Ministry’s experts provide information on existing and planned policy measures.

REFERENCES

Ministry of Environment, 2022. Lithuania's climate change projections to 2100 (available in Lithuanian). https://klimatokaita.lt/media/17396/ivadine-ataskaita-elle_3f-1.pdf

Ministry of Environment, 2023. Study on sensitivity and vulnerability to climate change of municipalities in Lithuania (available in Lithuanian). https://klimatokaita.lt/media/17620/lietuvos-savivaldybiu-jautrumo-ir-pazeidziamumo-klimato-kaitai-tyrimas.pdf

National Adaptation Plan 2024–2030 (available in Lithuanian). https://enmin.lrv.lt/public/canonical/1727959989/5217/Priedas%20Nr.%205%20Prisitaikymo%20prie%20klimato%20kaitos%20planas.pdf

Statistics Lithuania. State Data Agency, 2022. Population Health Survey data. https://data.gov.lt/datasets/1622/resource/9503

Statistics Lithuania. State Data Agency, 2023. Life expectancy data. https://osp.stat.gov.lt/statistiniu-rodikliu-analize?hash=4bfe20d3-c07b-4592-80fc-5038c842fc09#/

Environmental Protection Agency. 2023. Flood Risk Management Plan 2023-2027 (available in Lithuanian). https://aaa.lrv.lt/uploads/aaa/documents/files/2023%2004%2026%20Visas%20planas.pdf

Ministry of Finance, 2020. Overview of the fiscal risks (available in Lithuanian). https://finmin.lrv.lt/uploads/finmin/documents/files/Fiskaliniu_riziku_apzvalga_2020.pdf

Fire and Rescue Department under the Ministry of the Interior, 2021. Lithuania's national risk analysis (available in Lithuanian). https://pagd.lrv.lt/lt/veiklos-sritys/civiline-sauga/nacionaline-rizikos-analize/

4. Information on financial, technology development and transfer and capacity-building support provided and mobilized

Pursuant to Article 13, paragraph 9, of the Paris Agreement in accordance with the relevant modalities, procedures and guidelines (MPGs), Lithuania has, in this chapter and the accompanying common tabular format (CTF), provided information on financial, technology development and transfer and capacity-building support provided and mobilized under Articles 9-11 of the Paris Agreement. To provide this information in a clear and consistent manner, this chapter is structured along the lines of the relevant MPGs (decision 18/CMA.1, para. 118–129).

4.1. National circumstances and institutional arrangements

Lithuania provides flexible funding to multilateral organisations, including through softly earmarked voluntary contributions to trust funds (e.g., for Ukraine). The lion's share of Lithuania's Official Development Assistance goes to meeting its mandatory commitments to the European Union, World Bank Group and United Nations agencies. However, in the aftermath of Russia's war of aggression on Ukraine, Lithuania is increasing its noncore contributions to multilateral organisations, most of which are softly earmarked for a specific country, region, theme or purpose. In addition to its core partners noted above, other key partners include the International Committee of the Red Cross, the United Nations High Commissioner for Refugees, the United Nations Office for the Coordination of Humanitarian Affairs and the United Nations Children's Fund.

Lithuania became an official provider of development co-operation in 2004, the same year it joined the European Union. Its development co-operation programme started even earlier, in 2001, with the aim of leveraging its own transitional experience to assist neighbouring countries facing similar challenges. Over the past two decades, it continued to build on this asset, concentrating its efforts in areas where it has developed strong expertise. Environment is also a clear priority for Lithuania within its implementation of the 2030 Agenda for Sustainable Development. The EU's development cooperation policy is supported by the new Neighbourhood, Development and International Cooperation Instrument (NDICI), which came into force in 2021 and brings together all the EU's external action funding instruments. It aims to help partner countries eradicate poverty, promote sustainable development, prosperity, peace and stability.

As part of the European Union, Lithuania voluntary has been providing technical and financial support in climate change area to developing countries since 2011. In 2015 after the adoption of the Paris Agreements, the Member states of the European Union (including Lithuania) once again undertook to provide financial support and technological assistance to developing countries.

Lithuania's aim to ensure financial and technological support for the implementation of climate change mitigation and adaptation measures in other countries, as well as cooperating with other countries in developing climate change-oriented projects is determined in various legal acts: **Law on Development Cooperation and Humanitarian Assistance** (approved by the Parliament on 16th May 2013 and subsequently updated in 2016, 2020 and 2022, 2023) – provides the overarching framework, setting the institutional framework for Lithuania's development co-operation and humanitarian aid policy and

designating the Ministry of Foreign Affairs as the central coordination point. According to the Law, the Ministry of Finance is responsible for the coordination of implementation of the development co-operation policy with international financial institutions. This law determines the goals of the Lithuanian development cooperation policy, formation, implementation, coordination and financing of the Lithuanian development cooperation, and ways of providing humanitarian aid. One of the priority areas of cooperation development is climate change mitigation and adaptation measures. Most recently, amendments have provided for the establishment of a new fund with the aim of extending capacity for implementation of larger scale projects and programmes in collaboration with key partners. Development co-operation is part of Lithuania's commitment to the 2030 Agenda for Sustainable Development. The Law has particular emphasis on poverty reduction and promotion of democracy, human rights and gender equality. Furthermore, the **National Progress Plan for 2021–2030 (NPP)** sets out domestic action in support of Agenda 2030 and other international agreements. The Law also seeks to inform Lithuanian society about development co-operation policies of Lithuania within the broader context of United Nations and EU efforts. **Law on Financial Instruments for Climate Change Management** (approved by the Parliament in 2009), from January 1, 2022, the name of the Law was changed to **Law on Climate Change Management** states that the funds of the Climate Change Programme may be used for climate change mitigation and adaption measures in third countries in accordance with the EU legislation, the UNFCCC, the Kyoto Protocol and other international agreements.

On 13 July 2022, the **Development Cooperation and Humanitarian Aid Fund** in Lithuania started its activities, the main objective of which is to help implement a flexible, responsive, sustainable development cooperation policy focused on continuous results and to enable Lithuanian public and private sector institutions to implement large-scale, significant value-added projects in partner countries. The Fund's Governing Board is composed of 7 members delegated by the Ministry of Foreign Affairs, the Ministry of Finance, the Central Project Management Agency, the Lithuanian Information and Communication Technology Association "Infobalt", the Association of Lithuanian Municipalities, and non-governmental organisations active in the field of development cooperation. The work of the Fund's Governing Board is organised by the Ministry of Foreign Affairs. The Central Project Management Agency (CPMA) acts as the administrator and secretariat of the Fund. The decision on the allocation of the Fund's financing is taken by the Governing Board.

Lithuania has been a member of the OECD since 2018. From 2022 Lithuania became the 31st member of the Organisation for Economic Co-operation and Development (OECD) **Development Assistance Committee (DAC).** The overarching objective of the DAC for the period 2018–2022 is to promote development co-operation and other relevant policies to contribute to implementation of the 2030 Agenda for Sustainable Development, including sustained, inclusive and sustainable economic growth, poverty eradication, improvement of living standards in developing countries, and to a future in which no country will depend on aid.

On 27 December 2021, The Strategic Directions for Lithuanian **Development Cooperation 2022–2025 were approved by the minister of Foreign Affairs** to ensure the planning and management of a more coherent, rational and sustainable development cooperation policy. Lithuania's Strategic Guidelines for Development Cooperation 2022–2025 reflect the key objectives set out in Lithuania's Law on Development Cooperation and Humanitarian Assistance "in accordance with the needs of partner countries". They also include a strong emphasis on climate change action and partnerships. The strategy underlines Lithuania's rationale for prioritization of the EU's Eastern Partnership (EaP) Region, as well as countries of migration

origin and transit in the Middle East, Central Asia, and Africa. In the EaP countries, co-operation is based on sharing Lithuania's own transitional experience on democratic governance and implementation of reforms, while co-operation with other partners also focusses on other thematic areas where Lithuania believes it has a comparative advantage. The overarching policy framework for climate change in Lithuania is the National Climate Change Management Agenda. The agenda foresees the provision of financial and technological support to developing countries in climate change mitigation and adaptation. Lithuanian institutions responsible for financial support to developing countries in the field of climate change mitigation and adaptation through are:

- Ministry of Environment through the funding from the Climate Change Programme (the main financial fund for climate related projects).
- Ministry of Foreign Affairs taking on the central role in planning, implementing, and coordinating development cooperation policy and activities across Lithuania's, some of the projects are climate related.
- Ministry of Finance that makes contribution to international funds and programs, including EPTATF.

The Climate Change Programme administered by the Ministry of Environment is the primary instrument used to support climate-related activities developing countries. From 2014 onwards the Ministry of Environment supports bilateral development cooperation projects related to climate change. The decision to focus on bilateral support was due to new legislation and policy adopted by the Government of Lithuania. The Ministry of Environment concludes that bilateral support is more efficient and beneficial for both parties, not only helps to share Lithuanian experience and gain valuable relationships through cooperation but creates enabling environment to using public finances to mobilize private sector investments into low carbon solutions under bilateral cooperation projects transferring technologies to developing countries. All public and private funding for bilateral development cooperation climate related projects was provided in the form of grants.

Multilateral activities

Most multilateral contributions given to date have taken the form of assessed contributions, there is currently no stand-alone strategy to guide multilateral implementation. Since accession to the European Union in 2004, Lithuania has contributed flexible funding and relevant expertise to European efforts in development cooperation, stepping up coordination efforts in times of crisis. Lithuanian representatives actively participate in all relevant formats of the European Union Council, European Commission, and the European Development Fund, contributing to decision making and the coordination of the European Union Team Europe joint responses. Lithuania also engages in regional, global, and country level Team Europe initiatives, on areas where it can offer relevant technical expertise. Furthermore, Lithuania is a highly active contributor to the European Investment Bank's Eastern Partnership Technical Assistance Trust Fund and Economic Resilience Initiative. Also, Lithuania has made financial contributions to the UNFCCC secretariat, World Bank funds, Eastern Partnership Technical Assistance Trust fund.

Annex III Tables III.1, III.2 and III.3 of the 1st Biennial Transparency Report cover climate financing provided in the calendar years 2021 and 2022. All figures are in Euros and US-Dollars. The conversion is based on OECD reference exchange rates for 2021 and 2022. The OECD and the UNFCCC allow for reporting Parties to calculate climate finance according to their own methods aligned with the methodologies laid out by OECD and UNFCCC.

4.2. Underlying assumptions, definitions, and methodologies

In line with the MPGs, and to enhance the transparency of reporting, this section provides a description of the underlying assumptions, methodologies, and definitions, as applicable, used to identify and/or report the financial, capacity development and technology development and transfer support.

The main types of climate finance from Lithuania are as follows: grant aid (public and mobilized private finance), technical cooperation, contributions to international organizations. More information about types of climate finance presented in sections below.

4.3. Information on financial support provided and mobilized under Article 9 of the Paris Agreement

Under Article 9 of the Paris Agreement, developed countries are required to provide financial resources to assist developing nations in their efforts to address climate change through mitigation and adaptation measures. This includes direct financial aid and support mobilized from the private sector. Lithuania, as a developed country under this framework, contributes to climate finance primarily through its contributions to international funds and initiatives such as the Green Climate Fund and the Global Environmental Facility. Lithuania, in alignment with EU-wide strategies, contributes to collective climate financing, focusing on targeted sectors like renewable energy, sustainable agriculture, and climate resilience projects in developing countries.

Lithuania ‘s support for developing countries accords importance to establishing a mechanism that not only ensures the effective use of public financing but also facilitates the mobilization of private financing.

4.3.1. Bilateral, regional and other channels

The Climate Change Programme administered by the Ministry of Environment is the primary instrument used to support climate-related activities in developing countries. From 2014 onwards the Ministry of Environment supports bilateral development cooperation projects related to climate change. Lithuania works closely with bilateral partners to deliver effective global response to climate change. Variety of Lithuanian entities (private and public) are eligible for this bilateral support which intends to implement climate change mitigation and adaptation projects in developing countries. Each year the Ministry’s Commission on development cooperation and humanitarian aid announces calls for project concepts/applications and selects the most distinguished projects. Requirements for projects and all procedural issues are laid down in the Manual on the implementation of development cooperation activities by state and municipal institutions and agencies, approved on 26 March 2014 by Resolution No 278 of the Government). Generally, applicants are required to contribute financially at least 30% of total eligible costs of the project. In this way Lithuania is seeking to mobilize private finance. This information about 2021 years provides in CTF table financial mobilized (public interventions). In 2021 from Climate change program ministry of environment allocated 1.94 million euros for bilateral development cooperation, this money allowed to attract private funds 1.15 million euros. 2022 we did not announce the call for bilateral development cooperation from the Climate change program, we moved the funds to 2023 (information about 2023-2024 projects provide in Table 4-1). The Commission approves the list of eligible countries, usually Lithuania gives priority (additional evaluation points) to the Eastern European partnership countries.

Calls for submission of bilateral development cooperation projects are announced each year on www.apvis.apva.lt and in the national press or on the national news portals. The decision to focus on bilateral support was due to new legislation and policy adopted by the Government of Lithuania. The Ministry of Environment concludes that bilateral support is more efficient and beneficial for both parties, not only helps to share Lithuanian experience and gain valuable relationships through cooperation but creates enabling environment to using public finances to mobilize private sector investments into low carbon solutions under bilateral cooperation projects transferring technologies to developing countries. Activities are implemented by the Lithuanian companies in close cooperation with Ministry of Environment, Environmental Projects Management Agency under the Ministry of Environment, government institutions in developing countries. Bilateral development cooperation climate-relevant activities are the support for technology development and implementation (in 2014–2024 support was allocated to solar power construction in developing countries), the harnessing and replicating successful practices, to reduce the amount of GHG emissions in developing countries. In 2014–2024 period 9.01 mill. EUR by grants were provided to climate mitigation projects in developing countries from Climate Change Programme. Total these project value, including private funds about 15.08 million EUR.

Lithuania is attentive to developing countries' needs and priorities, GHG emissions reductions when selecting projects and its implementing partners for its work with developing countries. Assistance for climate action is designed jointly and based on a clear demonstration of demand and need by the partner country. Generally, all bilateral projects must be endorsed by the partner country (Lithuanian companies and a partner in a developing country sign an agreement on cooperation). Information about development cooperation projects, financed from Climate Change Programme provided in table below.

Lithuania's development cooperation policy priority is the EU's Eastern Partnership countries. The focus is on Ukraine and Moldova, which have been granted EU candidate status, Georgia, which has the prospect of becoming an EU member state, and Armenia, which has signed a Comprehensive and Enhanced Partnership Agreement with the EU.

Table 4-1. The data on bilateral development cooperation projects financed from Climate Change Programme 2023–2024

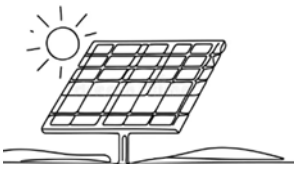
Recipient country	The name of the project	Installed solar power, kW	Project subsidy from the Climate Change Program excl. VAT, EUR	Mobilised private finance, excl. VAT, EUR	Project value (public+ private finance) excl. VAT, EUR	The status of the project
2023 call						
Ukraine	Solving climate change problems by providing energy freedom in Ukraine by installing a 363 kW solar power plant and transferring the experience of Lithuania	363	276,842	150,313	427,155	in progress
Ukraine	The solution to climate change problems by providing energy freedom in Ukraine by	316	252,146	136,512	388,658	in progress

	installing a 316 kW solar power plant and transferring Lithuania's experience					
Ukraine	Solving climate change problems by providing energy freedom in Ukraine by installing a 468 kW solar power plant and transferring Lithuanian experience	468	363,257	186,501	549,758	in progress
Ukraine	Solving climate change problems by providing energy freedom in Ukraine by installing a 506 kW solar power plant and transferring Lithuanian experience	506	384,395	181,675	566,070	in progress
Uzbekistan's	Solving climate change problems by providing energy freedom in Uzbekistan by installing a 119 kW solar power plant and transferring Lithuania's experience	119	109,315	74,580	183,895	in progress
Armenia	Solving the problems of climate change by providing energy freedom in Armenia by installing a 358 kW solar power plant and transferring Lithuanian experience	358	334,434	158,780	493,214	in progress
Georgia	Solving climate change problems by providing energy freedom by installing a 375 kW solar power plant in Sakartvelo and transferring Lithuanian experience	375	300,054	166,600	466,654	in progress
Moldova	Addressing climate change issues by providing energy freedom in the EaP country of Moldova with the installation of a 504 kW solar power plant	504	355,517	216,000	571,517	in progress
Moldova	Addressing climate change issues by providing energy freedom in the EaP country of Moldova with the installation of a 464 kW solar power plant	464	344,788	206,900	551,688	in progress
Armenia	Addressing climate change issues by providing energy freedom in the EaP country Armenia by installing a 140 kW solar power plant	140	166,912	74,300	241,212	in progress
Georgia	Bilateral cooperation in the implementation of photovoltaic energy solutions	180	156,860	128,139	285,000	in progress

	in Ambro Lauri and Kazbegi hospitals					
2024 call						
Georgia	Bilateral cooperation in the implementation of photovoltaic energy solutions	456	192,600	204,200	396,800	in progress
Ukraine	Solving climate change issues by providing energy freedom in Eastern Partnership country Ukraine by installing a 780 kW solar power plant since the war	780	467,134	471,588	938,722	in progress
Ukraine	Solving climate change issues by providing energy freedom in Eastern Partnership country Ukraine by installing a 514 kW solar power plant since the war	515	328,092	341,770	669,862	in progress
Georgia	Solving climate change problems by providing energy freedom in the Eastern Partnership country Georgia by installing a 718 kW solar power plant	718	429,178	462,820	891,998	in progress

All implemented or are being implemented projects are in the energy sector, they contribute to the increase of renewable energy in developing countries, also the transfer of Lithuanian experience in the field of renewable energy resource. The main objective of most of these projects are climate mitigation. Given that these projects were aimed at supplying solar energy for schools and other educational institutions, they contributing to climate adaptation as they strengthen local communities' self-sufficiency and resilience to future hazards. Public and private funding for bilateral development cooperation projects was given as grants.

Detailed information about previously funded projects submitted in Lithuania's 8th National Communication.

Solar power plant total capacity (2014–2024)	**Public funds (2014–2024)**	**Private funds (2014–2024)**
		
11.6 MW	**9.01million EUR**	**6.06 million EUR**

Lithuania's climate-related development cooperation has steadily increased over the last years. Starting from 2018 Lithuania is voluntarily doubling its climate finance to developing countries and had intended to mobilize 1 million EUR for climate financing from public and private sources annually till 2020. For the implementation of development cooperation projects in 2022–2025, Ministry of Environment will allocate 8 million EUR (2 mill. EUR annually) from Climate Change Programme. At least another 2.4 million EUR are planned to be raised from private funds in 2022–2025 for development cooperation projects.

4.3.2. Multilateral channels

Most multilateral contributions given to date have taken the form of assessed contributions, there is currently no stand-alone strategy to guide multilateral implementation. Since accession to the European Union in 2004, Lithuania has contributed flexible funding and relevant expertise to European efforts in development cooperation, stepping up coordination efforts in times of crisis. Lithuanian representatives actively participate in all relevant formats of the European Union Council, European Commission, and the European Development Fund, contributing to decision making and the coordination of the European Union Team Europe joint responses. Lithuania also engages in regional, global, and country level Team Europe initiatives, on areas where it can offer relevant technical expertise. Furthermore, Lithuania is a highly active contributor to the European Investment Bank's Eastern Partnership Technical Assistance Trust Fund and Economic Resilience Initiative. Also, Lithuania has made financial contributions to the UNFCCC secretariat, World Bank funds, Eastern Partnership Technical Assistance Trust fund. Lithuania provides multilateral development assistance through mandatory and voluntary contributions and contributions to the European Development Fund, other development cooperation funds and international organisations, as well as humanitarian aid to countries affected by natural disasters and conflicts. Information about multilateral activities in 2021-2022 provided in CTF table (financial multilateral channels).

4.3.3. Information on finance mobilized through public interventions

Part of the funds for the implementation of projects in developing countries are allocated from the Climate Change Program, the other part is the contribution of Lithuanian companies implementing projects in developing countries. 2021-2022 the funds from Climate Change Program funds are 70%, and 30% are provided by companies. Detailed information presented in CTF table 3 financial mobilized (public interventions). From 2024, the subsidy for the Climate Change Program funds is 50%, and 50% are provided by companies. Detailed information on financial support mobilised through public interventions presented in the table 4.1 column "*project subsidy from the Climate Change Program",* column mobilised private finance presented information about mobilise support.

4.4. Information on support for technology development and transfer provided under Article 10 of the Paris Agreement

Under Article 10 of the Paris Agreement, which focuses on technology development and transfer, countries commit to promoting and facilitating environmentally sound technology innovation and dissemination to achieve climate goals. Lithuania, as an active member of the European Union (EU), supports technology development and transfer through national and EU-level initiatives aligned with the Paris Agreement.

Lithuania integrates technology development and transfer into its National Energy and Climate Action Plan and Low Carbon Development Strategy. These frameworks outline pathways for decarbonization through innovation in energy, industry, and transportation sectors. Investments in renewable energy technologies, particularly solar, have been prioritized to reduce dependency on fossil fuels.

As an EU member, Lithuania benefits from EU funding mechanisms such as the Horizon Europe program, which supports research and development of climate-smart technologies. Lithuania actively participates in international platforms and partnerships promoting technology transfer, such as the Climate Technology Centre and Network under the Paris Agreement framework. It also contributes to regional collaborations in the Baltic States to share expertise in clean technologies.

Good examples of support for the development and enhancement of capacities and technologies include a range of programmes implemented by the Lithuanian companies presented in Table 4-1.

4.5. Information on capacity-building support provided under Article 11 of the Paris Agreement

Under Article 11 of the Paris Agreement, capacity-building aims to enhance the ability of developing countries to effectively implement climate actions, including mitigation, adaptation, and fulfilling obligations under the Agreement. Lithuania contributes to international climate finance mechanisms, including the Green Climate Fund and Global Environment Facility, which support capacity-building in developing countries.

Humanitarian aid

Humanitarian needs are raising every year – emerging and ongoing conflicts, the COVID-19 pandemic, and Russia's war in Ukraine have a major impact on the global humanitarian context. Coordination of humanitarian aid is being strengthened both at EU and UN level to bridge the gap between humanitarian needs and humanitarian funding. As a full-fledged EU Member State and an international donor, it is essential for Lithuania to respond quickly, timely and flexibly to international requests for assistance and even with limited resources to provide aid where it is needed the most.

In 2024 Lithuania has provided humanitarian aid worth 460 thousand EUR (from the Strategic Action Plan of the Ministry of Foreign Affairs of the Republic of Lithuania “Strengthening Lithuania’s participation in the implementation of the 2030 Agenda for Sustainable Development in partner countries” funds – 350 thousand EUR) (Table 4-2).

Table 4-2. Lithuania’s Humanitarian Aid projects in 2024

Humanitarian aid from the Strategic Action Plan of the Ministry of Foreign Affairs of the Republic of Lithuania "Strengthening Lithuania's participation in the implementation of the 2030 Agenda for Sustainable Development in partner countries" funds; EUR	**350,000**
United Nations International Children's Emergency Fund (UNICEF), humanitarian aid to Sudan	50,000
Humanitarian aid to Taivan affected by the earthquake	50,000
Ukraine Humanitarian Fund (UHF), humanitarian aid to Ukraine	200,000
United Nations Relief and Works Agency for Palestine Refugees in the Near East (UNRWA), humanitarian aid for Palestinian refugees	50,000
Humanitarian aid from the Government Reserve Fund; EUR	**110,000**

Humanitarian aid to the Republic of Armenia affected by floods (the Government Reserve Fund, Government of the Republic of Lithuania)	100,000
Ministry of Health of the Republic of Lithuania, membership fee of the Republic of Lithuania to the International Committee of the Red Cross (ICRC)	10,000
Humanitarian Aid in 2024 (in total, EUR)	**460,000**

Technical Assistance and Information Exchange (TAIEX)

TAIEX (Technical Assistance and Information Exchange) – EU institution-building instrument (was introduced in 1996) is designed to provide short-term support to public administrations in a unique peer-to-peer fashion: TAIEX experts come as volunteers from the public administrations of EU Member States to share their experience with their peers on how to apply EU law. Lithuania actively participates in the TAIEX program, an initiative of the European Commission designed to support public administrations in applying EU legislation effectively.

EU Twinning Programme

Lithuania is an active participant in the EU Twinning Programme and is one of the leading EU Member States implementing projects under the programme. Since 2004, Lithuania has implemented 144 EU Twinning projects, either independently or with other EU partners; half of them were implemented in the EU Eastern partnership countries: 17 in Azerbaijan, 13 in Ukraine, 12 in Moldova, 11 in Georgia, 4 in Armenia and 4 in Belarus. The most experienced LT institutions are involved in Twinning projects in the following areas: food safety, finance, law, public services, transport, law and order, anti-corruption, customs modernization, money laundering. In 2022, Lithuania was awarded 8 Twinning projects with a total value of 12 million euro. For the last five years, Lithuania has been ranked among the top five in the European Union (EU) for the number of contracted and implemented Twinning projects. Its development efforts are concentrated mainly on Eastern Europe, with a strategic emphasis on fostering democracy, promoting good governance, empowering women, advancing digitalization, improving education and protecting the environment. In 2023, Lithuania was involved in Twinning either as a leader in 10 projects or a junior partner (13 projects).

Table 4-3. The data on environment EU twinning projects

Recipient country/ region	Programme or project title, implementation period	Description of programme or project
Azerbaijan	Strengthening hydrometeorological and climate services in Azerbaijan **2022–2024**	Lithuania, together with Finland and France, participates in the EU Twinning Program project "Strengthening hydrometeorological and climate services in Azerbaijan". The project will be gradually implemented over 2 years by the experts of the Lithuanian Hydrometeorological Service and the Environmental Projects Agency. It is planned that about 20 experts (specialists) from LHMT will participate in short-term missions to Azerbaijan. The aim of this project is to contribute to the improvement of Azerbaijan's national regulation of hydrometeorology and climate services, to share good practices and experiences so that the local Office meets EU and World Meteorological Organization (WMO) standards and recommendations. The project also aims to improve the adaptability of the citizens of Azerbaijan and different social sectors to the effects of climate change

		and to prepare for natural disasters. The project develops the weather, climate, and early warning services of the Azerbaijan Hydrometeorological Service (NHMS) in accordance with international standards and best practices.
Palestine	Environment and climate change are mainstreaming in national development strategies and policies **2023–2025**	Over the course of two years, the Twinning project "Environment and climate change mainstreaming in national development strategies and policies" will convene Lithuanian, Austrian and Palestinian experts tackling climate change. Together they will work towards the project's main objective of integrating environment and climate change into national planning processes, along with the operationalization of the sectoral strategies. The expertise provided by the Twinning project will support the Environment Quality Authority in enhancing coordination and assistance to relevant stakeholders across sectors in Palestine. The project is expected to look at the current mainstreaming process, identify gaps, prepare and roll out a new methodological guideline that will be used by different sectors, mainstreaming environment and climate change priorities.
Moldova	Twinning air quality and environment **2024–2027**	Lithuania (Junior MS) with Finland and Sweden implements the project to strengthen Moldova's capacity to fulfil environment-related commitments, in line with the EU-Republic of Moldova Association Agreement, the EU Integration process and international agreements. Specifically, the project aims to increase the pace of approximation and implementation of the acquis communautaire in the fields of air quality and air pollution reduction, environmental information, circular economy/waste management and sustainable management of chemicals.

By providing financial support, technical expertise, and institutional capacity, Lithuania aligns with the objectives of Article 11, demonstrating its commitment to enabling developing nations to address climate challenges effectively.

5. Improvements in reporting over time

As per the modalities, procedure and guidelines (MPGs), each Party should, to the extent possible, identify, regularly update and include as part of its biennial transparency report information on areas of improvement in relation to its reporting. Lithuania will improve its biennial transparency report continuously. As this BTR is the first report under the Paris Agreement, Lithuania is planning to further improve its reporting in subsequent BTRs according to the technical expert review team's recommendations.

REFERENCES

Fund for the Development Cooperation and Humanitarian Aid https://ltaid.urm.lt/

Organization for economic co-operation and development webpage https://www.oecd.org/en/about/news/press-releases/2022/11/lithuania-joins-the-oecd-development-assistance-committee-dac.html

The Strategic Directions for Lithuanian Development Cooperation 2022-2025 https://ltaid.urm.lt/en/doclib/wzul6ssdrk9j49dd6gpbx1rggnft8nu8

Website of the Ministry of Environment https://am.lrv.lt

Abbreviations

ABBREVIATIONS	
BTR	Biennial Transparency Report
BY	Base year
CHP	Combined heat and power
CRF	Common reporting format
CTF	Common tabular format
EaP	Eastern Partnership
EC	European Commission
EF	Emission factor
EPA	Environmental Protection Agency
EPMA	Environmental Projects Management Agency
EPTATF	Eastern Partnership Technical Assistance Trust Fund
ESD	Effort Sharing Decision
ESR	Effort Sharing Regulation
ETS	Emissions Trading System
EU	European Union
EUA	European Union emission allowance
GCOS	Global Climate Observing Systems
GDP	Gross domestic product
GHG	Greenhouse gases
GWP	Global warming potential
IPCC	Intergovernmental Panel on Climate Change
LULUCF	Land Use, Land-Use Change and Forestry
MoA	Ministry of Agriculture
MoE	Ministry of Environment
NC	National Communication
NECP	Lithuania's National Energy and Climate Action Plan for 2021–2030
NID	National Inventory Document
NGOs	Non-governmental organizations
NMVOC	Non-methane volatile organic compounds
Non-ETS	Sectors not included in EU ETS
NPP	Nuclear Power Plant
QA/QC	Quality assurance/ Quality control
RES	Renewable energy sources
SMEs	Small and medium enterprises
SFS	State Forest Service
UNFCCC	United Nations Framework Convention on Climate Change
WAM	Scenario with additional measures
WEM	Scenario with existing measures
WOM	Scenario without measures

CHEMICAL FORMULAS	
CH_4	Methane
CO_2	Carbon dioxide
HFCs	Hydrofluorocarbons

N	Nitrogen
N_2O	Nitrous oxide
NF_3	Nitrogen trifluoride
NO_x	Nitrogen oxides
PFCs	Perfluorocarbons
SF_6	Sulphur hexafluoride
VOC	Volatile organic compounds

UNITS OF MEASUREMENT

CO_2 eq.	CO_2 equivalent
^oC	Degree Celsius
GWh	Gigawatthour
ha	Hectare
kg	Kilograms
km^2	Square kilometres
kt	Kilotonnes
ktoe	Kilotonne of oil equivalent
Mill	Million
Mt	Million tonnes
MW	Megawatt
%	Per cent
PJ	Petajoule
thous.	Thousand
toe	Tonnes of oil equivalent
TJ	Terajoule
TWh	Terawatt hours

Annex I. CRT and CTF tables

The following annexes are available as separate submissions of Lithuania on the UNFCCC website:

- Common reporting tables (CRT) for GHG emissions and removals
- Common tabular formats (CTF) for information necessary to track progress
- Common tabular formats (CTF) for information on financial, technology development and transfer and capacity building support provided and mobilised

The National Inventory document (NID) is submitted as a stand-alone document and it is available also on the UNFCCC website.

Annex II. Methodology used to identify GHG emissions from international aviation and navigation in the scope of the EU's NDC

The scope of the EU's NDC goes beyond national GHG emissions and removals in the scope of the national GHG inventory; it also includes specific emissions from international aviation and navigation. This annex describes the methodology for identifying these emissions. International aviation and maritime emissions are estimated using the Joint Research Centre's Integrated Database of the European Energy System (JRC-IDEES)[30]. It allows to split the international transport CO_2 emissions into intraEU/extraEU and intraEEA/extraEEA categories backwards in time (i.e. 1990)[31]453. EEA stands for the European Economic Area, comprising the 27 EU Member States, Iceland, Liechtenstein and Norway.

For international transport, JRC-IDEES uses a decomposition methodology that reconciles the scopes of available primary statistics and harmonises historical data on international aviation and maritime emissions, energy use and transport activity. The resulting annual dataset covers 1990–2021 and distinguishes between domestic, intra-EU/intra-EEA and extra-EU/extra-EEA activity for each EU Member State, Norway and Iceland.

In aviation, JRC-IDEES distinguishes between passenger and freight modes, with three geographical categories of flight origin/destination for each mode: domestic, intra-EEA plus the UK, and extraEEA plus the UK. Intra-EU, the UK and EEA categories are also used internally during calibration but aggregated for reporting. For each mode/category combination, JRC-IDEES estimates activity (as passenger-km or tonnes-km), energy use and CO_2 emissions, aircraft stock (expressed as representative aircraft), load factors, and aircraft efficiencies. As country-specific activity statistics are not available, the breakdown first

[30] European Commission, Joint Research Centre, Rózsai, M., Jaxa-Rozen, M., Salvucci, R., Sikora, P., Tattini, J. and Neuwahl, F., JRC-IDEES-2021: the Integrated Database of the European Energy System – Data update and technical documentation, Publications Office of the European Union, Luxembourg, 2024, doi:10.2760/614599

[31] The JRC-IDEES analytical database is designed to support energy modelling and policy analysis, by combining primary statistics with technical assumptions to compile detailed energy-economy-emissions historical data for each key energy sector. For aviation, EEA emissions include emissions related to the UK but not to Switzerland, where total CO_2 emissions for the scope are additionally estimated using EUROCONTROL data.

allocates EU-level activity data from the Transport Pocketbook[32] of the European Commission's Directorate-General for Mobility and Transport to each country and flight category.

For passenger modes, this allocation calculates average load factors using Eurostat data on total passengers and flights. These load factors and total flight numbers are combined with average flight distances from EUROCONTROL, the pan-European organisation dedicated to air traffic management, to yield an initial estimate for passenger transport activity. For intra-EU activity, a uniform scaling factor is then applied across Member States to match total EU-level Transport Pocketbook data. Freight activity follows a similar process, using a "representative flight" concept with a common load factor across all Member States to account for mixed passenger-freight flights.

Next, the decomposition estimates fuel use from EUROCONTROL data, by deriving a distance dependent average aircraft efficiency, then applying it to the country-specific ensemble of flights and routes. The final step scales the estimates to meet Eurostat energy balances for total domestic and international consumption back to 1990 values, maintaining intra-EEA/extra-EEA fuel use ratios derived from EUROCONTROL. JRC-IDEES additionally reports resulting differences with submissions by Parties to the UNFCCC. The above process is followed throughout the entire decomposition period (1990–2021). Data gaps are estimated from the existing indicators as follows:

- The process iterates backwards towards 1990, starting from the oldest years in which data are available in each Member State.
- Average flight distance is kept constant for early years without EUROCONTROL data (generally before 2004).
- If the load factor (passengers per flight) cannot be calculated due to a lack of passenger and/or flight data, it is estimated from the trend of the existing time series.
- Missing numbers of flights are calculated from the load factor and the passengers carried.
- If no passenger data are available, the total mileage is estimated from the energy consumption and combined with average flight distance to estimate the number of flights. The number of flights is then combined with the load factor to estimate the total passengers carried.
- For early years without data, constant values are assumed for the factors used to i) scale intraEU activity to the Transport Pocketbook, ii) adjust the estimated fuel use to EUROCONTROL data for specific routes, and iii) scale this adjusted fuel use to Eurostat energy balances (e.g. before 1995 for Transport Pocketbook data; before 2004 for EUROCONTROL data).

For international maritime transport, JRC-IDEES estimates data both for intra-EU/extra-EU and intra-EEA/extra-EEA geographical categories. The emission estimates in the GHG inventory already include CO2, CH4, and N2O gases. Transport activity (tonnes-km) is estimated from Eurostat data on gross weight of transported goods, using port-level and country-level data for intra-EU and extra-EU categories, respectively. Intra-EU activities are then scaled to match the Transport Pocketbook totals, accounting for domestic coastal shipping (calibrated separately in JRC-IDEES). Next, transport activity is combined with data reported under the monitoring, reporting and verification system for maritime transport under the EU ETS (THETIS MRV[33]), namely EU-level mileage data and country-specific vessel sizes to estimate load

[32] Statistical pocketbook 2023, https://transport.ec.europa.eu/facts-funding/studies-data/eu-transport-figures-statistical-pocketbook/statistical-pocketbook-2023_en

[33] THETIS MRV https://mrv.emsa.europa.eu/#public/eumrv

factors (tonnes per movement). The load factors and resulting annual mileage (km) are calibrated to meet EU-level THETIS MRV mileage. The annual mileage is in turn combined with THETIS MRV average efficiency to yield a total technical energy consumption, with corresponding emissions derived from default emissions factors. This energy consumption is scaled to Eurostat energy balances to minimise discrepancy to total intra-EU THETIS MRV emissions. As with aviation, JRC-IDEES reports corresponding differences to submissions under the UNFCCC. Early years with data gaps are estimated from existing indicators as follows.

- The process iterates backwards towards 1990, starting from the oldest years in which data are available in each Member State.
- Average distance of voyages is kept constant for early years without Eurostat activity data (generally before 1997–2000).
- If the load factor (tonnes per movement) cannot be estimated due a lack of activity data, it is kept constant.
- If activity data are not available, it is estimated from Eurostat energy consumption.
- Missing mileage data are derived from the activity and load factor estimates.
- For early years without data, constant values are assumed for the factors used to i) scale intra EU activity to the Transport Pocketbook, ii) scale estimated mileage to meet EU-level THETIS MRV mileage, and iii) scale domestic and intra-EU CO_2 emissions estimated from energy consumption to match total THETIS MRV CO_2 emissions.
- Finally, the ratios between the estimated MRV emissions and the CO_2 emissions for the reported transport activity (for intra-EU/EEA and extra-EU/EEA categories) between 2018 and 2021 are used to calculate the MRV compliant estimates back to 1990 levels.

For the year 2022, the international navigation and aviation emissions under the EU NDC scope have been estimated by applying the same share of those emissions on the total international navigation and aviation emissions (as reported in the GHG inventory) as in 2021.

Table 1 provides an overview of the resulting net GHG emissions in the scope of the NDC.

Table 1. Summary of GHG emissions in the scope of the NDC

Scope	Unit	1990	2021	2022
Net GHG emissions from the national GHG inventory of the EU	kt CO_2 eq.	4,649,007	3,215,997	3,132,670
GHG emissions from international aviation in the scope of NDC	kt CO_2 eq.	23,906	26,326	41,405
GHG emissions from international navigation in the scope of NDC	kt CO_2 eq.	26,492	30,327	31,149
Net GHG emissions in the scope of the NDC (used for tracking progress and presented in CTF Table 4)	kt CO_2 eq.	4,699,405	3,272,650	3,205,223

Source: GHG inventory of the EU; calculations based on JRC-IDEES, EUROCONTROL and THETIS MRV as described above.

Annex III. Summary information on the models/approaches used for the GHG projection estimation

Model 1	
Model name (abbreviation)	Energy system model
Full model name	Model of fuel and energy consumption in the sectors of the Lithuanian economy
Model version and status	Not applicable
Latest date of revision	2024-06-03
URL to model description	Not applicable
Model type	Spreadsheet-based calculator
Summary	Energy model is based on statistical data and assumptions regarding certain macroeconomic factors with various existing and planned policy measures taken into account. Primarily used to evaluate and predict achievement of national targets in energy efficiency and renewable energy source use. Results of Energy model are used to assess GHG emissions.
Intended field of application	Primary and final energy consumption projections for National energy and climate action plan, Renewable Energy share calculations and tracking of targets and indicative trajectories.
Description of main input data categories and data sources	Statistical data reflecting the current energy consumption situation and specific assumptions influencing the energy consumption projections. Information on existing and planned energy efficiency, renewable energy source promotion and green-house-gas emission reduction measures.
Validation and evaluation	General quality control procedures where applied estimating Energy projections: analysis of projected activity data trends, consistency check of activity data sources, completeness check and etc.
Output quantities	Primary and final energy consumption by fuel and energy type
GHG covered	Not applicable
Sectoral coverage	Energy sector
Geographical coverage	Lithuania
Temporal coverage (e.g. time steps, time span)	2050 year per year
Other models which interact with this model, and type of interaction (e.g. data input to this model, use of data output from this model)	Data input from Transport model and output to Energy emissions tool (fuel and energy consumption)
Input from other models	Fuel and energy consumption in transport
References to the assessment and the technical reports that underpin the projections and the models used	Policies & Measures and Projections of Greenhouse Gas Emissions in Lithuania
Model structure (if diagram please attach to your submission in Reportnet)	Not applicable
Comments or other relevant information	Not applicable

Model 2	
Model name (abbreviation)	Energy GHG calculator
Full model name	Energy emissions calculator
Model version and status	Not applicable
Latest date of revision	2024-06-13
URL to model description	Not applicable
Model type	Spreadsheet-based calculator
Summary	The obtained fuel consumption data in energy sector is multiplied by emission factors of every fuel in order to estimate projected GHG emissions. Thus, GHG projections fully correspond to the methodology used for preparation of National GHG inventory.
Intended field of application	Projections of emissions from energy sector
Description of main input data categories and data sources	Consumption of different fuel types in each subsector of energy. Projected activity data are provided by several companies (petroleum refining, other energy industries and fugitive emissions) and Energy system model.
Validation and evaluation	General quality control procedures where applied estimating Energy projections: analysis of projected activity data trends, consistency check of projected emissions in the Energy emissions calculator and projected emissions in the GovReg_Proj_T1a_T1b_T5a_T5b template, consistency check of activity data sources, completeness check and etc.
Output quantities	GHG emissions
GHG covered	Energy sector GHG emissions (CO2, CH4 and N2O)
Sectoral coverage	Energy sector excluding transport
Geographical coverage	Lithuania
Temporal coverage (e.g. time steps, time span)	2050 year per year
Other models which interact with this model, and type of interaction (e.g. data input to this model, use of data output from this model)	Data input form Energy system model (fuel consumption)
Input from other models	Consumption of different fuel types in each subsector of energy
References to the assessment and the technical reports that underpin the projections and the models used	Policies & Measures and Projections of Greenhouse Gas Emissions in Lithuania
Model structure (if diagram please attach to your submission in Reportnet)	Not applicable
Comments or other relevant information	Not applicable
Model 3	
Model name (abbreviation)	Transport model
Full model name	Transport emissions calculator
Model version and status	Not applicable
Latest date of revision	2024-06-13
URL to model description	Not applicable
Model type	Spreadsheet-based calculator

Summary	The determined fuel consumption of each fuel type or other activity data for every transport sub-sector is multiplied by emission factors of every fuel to estimate projected GHG emissions. Thus, GHG projections fully correspond to the methodology used for preparation of National GHG inventory.
Intended field of application	Projections of emissions from transport sector
Description of main input data categories and data sources	Consumption of different fuel types and other activity data in each subsector of transport, vehicle fleet and mileage data from JSC "Regitra" and association of vehicle inspection firms "Transeksta".
Validation and evaluation	General quality control procedures where applied estimating transport projections: analysis of projected activity data trends, consistency check of the projected emissions in the GovReg_Proj_T1a_T1b_T5a_T5b template, consistency check of activity data sources, completeness check and etc.
Output quantities	GHG emissions
GHG covered	Transport sector GHG emissions (CO_2, CH_4 and N_2O)
Sectoral coverage	Transport sector
Geographical coverage	Lithuania
Temporal coverage (e.g. time steps, time span)	2050 year per year
Other models which interact with this model, and type of interaction (e.g. data input to this model, use of data output from this model)	Data output to Energy system model (fuel and energy consumption)
Input from other models	Not applicable
References to the assessment and the technical reports that underpin the projections and the models used	Policies & Measures and Projections of Greenhouse Gas Emissions in Lithuania
Model structure (if diagram please attach to your submission in Reportnet)	Not applicable
Comments or other relevant information	Not applicable
Model 4	
Model name (abbreviation)	Industrial emission calculator
Full model name	MS Excel based industrial emission calculator
Model version and status	Not applicable
Latest date of revision	2024
URL to model description	Not applicable
Model type	MS Excel based calculator
Summary	Projections of GHG emissions from IPPU sector is based on projected data provided by the main emitters in IPPU sector: clinker, lime, glass, ammonia and nitric acid, mineral wool producing companies. The projection of fluorinated greenhouse gases is based on the prohibitions outlined in the Regulation (EU) 2024/573.
Intended field of application	IPPU GHG emissions projections

Description of main input data categories and data sources	Projected production data provided by the main emitters in IPPU sector: clinker, lime, glass, ammonia and nitric acid, mineral wool producing companies which provide information about projected amount of ammonia production, natural gas consumption, nitric acid production, clinker production, lime production, glass production, mineral wool production. In other subcategories historical data and population are used.
Validation and evaluation	General quality control procedures where applied estimating IPPU projections: analysis of projected activity data trends, consistency check of projected emissions in the IPPU emissions accounting tool and projected emissions in the GovReg_Proj_T1a_T1b_T5a_T5b template, consistency check of activity data sources, completeness check and etc.
Output quantities	CO2 emissions from cement, lime, glass production, ceramics, other uses of soda ash, mineral wool production, ammonia production, cast iron production, lubricant, paraffin wax, solvents use, urea-based catalyst, from asphalt roofing, road paving with asphalt. N2O emissions from nitric acid production, from propellant for pressure and aerosol products and medical applications. HFCs emissions from product uses as substitutes for ozone depleting substances (ODS), SF6 emissions from semiconductor manufacturing, electrical equipment and NF3 emissions from photovoltaics.
GHG covered	IPPU sector GHG emissions (CO2, N2O, HFCs, SF6, NF3)
Sectoral coverage	Mineral, chemical, metal industry, non-energy products from fuels and solvent use, electronics industry, product uses as substitutes for ODS, other product manufacture and use.
Geographical coverage	Lithuania
Temporal coverage (e.g. time steps, time span)	2050 year per year
Other models which interact with this model, and type of interaction (e.g. data input to this model, use of data output from this model)	Not applicable
Input from other models	Not applicable
References to the assessment and the technical reports that underpin the projections, and the models used	Policies & Measures and Projections of Greenhouse Gas Emissions in Lithuania
Model structure (if diagram please attach to your submission in Reportnet)	Not applicable
Comments or other relevant information	Not applicable
Model 5	
Model name (abbreviation)	Agriculture emissions calculator
Full model name	MS Excel based agriculture calculator
Model version and status	Not applicable
Latest date of revision	2024
URL to model description	Not applicable
Model type	MS Excel based calculator
Summary	Projections of GHG emissions from agriculture sector is based on projected livestock population, milk production, milk fat, and the share of manure management systems for the main

	livestock categories (dairy cattle, non-dairy cattle and swine). GHG projections of agricultural soils category are based on projected consumption of inorganic and organic N fertilizers, main harvested crops and area harvested, application of urea and consumption of liming materials (limestone and dolomite) used for soils.
Intended field of application	Agriculture GHG emission projections
Description of main input data categories and data sources	Main livestock population data, Main harvest of crops and area harvested, Inorganic N fertilizer, Amount of limestone materials consumed, Application of urea All projected activity data are provided by Ministry of Agriculture
Validation and evaluation	General quality control procedures where applied estimating Agriculture projections: analysis of projected activity data trends, consistency check of projected emissions in the agriculture emissions calculator and projected emissions in the GovReg_Proj_T1a_T1b_T5a_T5b template, consistency check of activity data sources, completeness check and etc.
Output quantities	Methane (CH_4) emissions from enteric fermentation of livestock; CH_4 and nitrous oxide (N_2O) (direct and indirect) emissions from manure management; direct and indirect N2O emissions from managed soils; carbon dioxide (CO_2) emissions from soil liming and application of urea
GHG covered	Agriculture sector GHG emissions (N_2O, CH_4, CO_2)
Sectoral coverage	Agriculture sector (Enteric fermentation, Manure management, Agriculture Soils, Liming, Urea application)
Geographical coverage	Lithuania
Temporal coverage (e.g. time steps, time span)	2050 year per year
Other models which interact with this model, and type of interaction (e.g. data input to this model, use of data output from this model)	1. Data input from LULUCF model (data of organic CL and GL area and average annual soil carbon stock change in mineral soil) 2. Data output to IPPU model (CO_2 emissions from urea)
Input from other models	data of organic CL and GL area and average annual soil carbon stock change in mineral soil from LULUCF
References to the assessment and the technical reports that underpin the projections and the models used	Policies & Measures and Projections of Greenhouse Gas Emissions in Lithuania
Model structure (if diagram please attach to your submission in Reportnet)	Not applicable
Comments or other relevant information	Not applicable
Model 6	
Model name (abbreviation)	IPCC Waste Model
Full model name	IPCC Waste Model
Model version and status	Not applicable
Latest date of revision	2024
URL to model description	https://www.ipcc-nggip.iges.or.jp/public/2006gl/vol5.html
Model type	MS Excel based

Summary	Projections of GHG emissions from Solid waste disposal on land is based on generated amount of municipal solid waste, amount of waste disposed of in the landfills, the amount of CH4 recovered. Projections of waste generation are based on historical as well as projected data on the population, GDP and amount of generated waste per capita.
Intended field of application	Projections of GHG emissions from solid waste disposal on land
Description of main input data categories and data sources	Data on municipal waste disposed of in the landfills, CH_4 recovery. Other parameters (DOC, DOCf, OX and etc.) are default, provided in the model.
Validation and evaluation	General quality control procedures where applied estimating Waste sector projections: analysis of projected activity data trends, consistency check of projected emissions in the Waste sector emissions calculator and projected emissions in the GovReg_Proj_T1a_T1b_T5a_T5b template, consistency check of activity data sources, completeness check and etc.
Output quantities	Methane (CH_4) emissions from solid waste disposal on land
GHG covered	Methane (CH_4)
Sectoral coverage	Solid waste disposal on land
Geographical coverage	Lithuania
Temporal coverage (e.g. time steps, time span)	2050 year per year
Other models which interact with this model, and type of interaction (e.g. data input to this model, use of data output from this model)	Not applicable
Input from other models	Not applicable
References to the assessment and the technical reports that underpin the projections and the models used	Policies & Measures and Projections of Greenhouse Gas Emissions in Lithuania
Model structure (if diagram please attach to your submission in Reportnet)	Not applicable
Comments or other relevant information	Not applicable
Model 7	
Model name (abbreviation)	Waste tool
Full model name	MS Excel based waste calculator
Model version and status	Not applicable
Latest date of revision	2024
URL to model description	Not applicable
Model type	MS Excel based calculator
Summary	Projections of GHG emissions from Biological treatment of waste is based on amount of waste composted (data from Regional Waste Management Centres); projections of GHG emissions from waste incineration is based on historical data; projections of GHG emissions from Wastewater treatment and discharge is based on historical amount of organically degradable material in wastewater, population connected to wastewater collecting system (projection of the Ministry of Environment).

Intended field of application	Projections of GHG emissions from biological treatment of waste, waste incineration and wastewater treatment and discharge.
Description of main input data categories and data sources	Data on biodegradable waste composted, incinerated waste (without energy recovery), amount of organically degradable material in the wastewater (TOW), population connected to wastewater collecting system, protein consumption per capita, emission factors (IPCC default), population.
Validation and evaluation	General quality control procedures where applied estimating Waste sector projections: analysis of projected activity data trends, consistency check of projected emissions in the Waste sector emissions calculator and projected emissions in the GovReg_Proj_T1a_T1b_T5a_T5b template, consistency check of activity data sources, completeness check and etc.
Output quantities	Methane (CH_4) and nitrous oxide (N_2O) emissions from biological treatment of waste; CO_2, CH_4 and N_2O emissions from waste incineration; CH_4, N_2O emissions from wastewater treatment and discharge
GHG covered	CO_2, CH_4, N_2O
Sectoral coverage	Biological treatment of waste, Incineration of waste, Wastewater treatment and discharge
Geographical coverage	Lithuania
Temporal coverage (e.g. time steps, time span)	2050 year per year
Other models which interact with this model, and type of interaction (e.g. data input to this model, use of data output from this model)	Not applicable
Input from other models	Not applicable
References to the assessment and the technical reports that underpin the projections and the models used	Policies & Measures and Projections of Greenhouse Gas Emissions in Lithuania
Model structure (if diagram please attach to your submission in Reportnet)	Not applicable
Comments or other relevant information	Not applicable
Model 8	
Model name (abbreviation)	LULUCF calculator
Full model name	MS Excel based LULUCF calculator
Model version and status	Not applicable
Latest date of revision	2024
URL to model description	Not applicable
Model type	MS Excel based calculator
Summary	Projections of GHG emissions and removals in LULUCF sector is based on projected areas of land remaining in land category and land converted to other land category and areas of different cropland management practices; in addition to this, projected growing stock volume changes, harvested volume, natural mortality (dead wood volume) in forest land; volume of peat extracted for horticultural use in peat extraction remaining peat extraction subcategory are necessary for projection of GHG emissions and removals in LULUCF sector.

Intended field of application	GHG emissions and removals in LULUCF sector
Description of main input data categories and data sources	Growing stock volume changes, harvested wood volume, dead wood volume, land use area and land use area changes for all categories (forest land, cropland, grassland, wetlands, settlements, other land) Projected activity data is a combination of data provided by the Ministry of Agriculture (MoA) and State Forest Service (SFS)
Validation and evaluation	General quality control procedures where applied estimating LULUCF sector GHG projections: analysis of projected activity data trends, consistency check of projected emissions in the LULUCF GHG emissions and removals calculator and projected emissions in the GovReg_Proj_T1a_T1b_T5a_T5b template, consistency check of activity data sources, completeness check and etc.
Output quantities	Carbon stock changes in biomass, dead organic matter and soils (both mineral and organic) in all land use categories (forest land, cropland, grassland, wetlands, settlements and other land); CH4 emissions due to wildfires in forest land, cropland and grassland categories; direct N2O emissions due to drainage and N mineralization/immobilization in forest land, cropland, grassland, wetlands, settlements and other land; indirect N2O emissions due to Nitrogen leaching and run-off (in all land use categories).
GHG covered	CO_2, CH_4, N_2O
Sectoral coverage	LULUCF sector (forest land, cropland, grassland, wetlands, settlements, other land)
Geographical coverage	Lithuania
Temporal coverage (e.g. time steps, time span)	2040 year per year
Other models which interact with this model, and type of interaction (e.g. data input to this model, use of data output from this model)	1. Data input from other calculators of growing stock volume change, harvested volume, dead wood volume; 2. Data output to Agriculture sector model (areas of cropland and grassland organic soils and mineral soil carbon stock changes in cropland remaining cropland);
Input from other models	Data of growing stock volume change, harvested wood volume, dead wood volume
References to the assessment and the technical reports that underpin the projections and the models used	Policies & Measures and Projections of Greenhouse Gas Emissions in Lithuania
Model structure (if diagram please attach to your submission in Reportnet)	Not applicable
Comments or other relevant information	Not applicable
Model 9	
Model name (abbreviation)	Forest land calculator
Full model name	MS Excel based Forest land increment structure calculator
Model version and status	Not applicable
Latest date of revision	2024
URL to model description	Not applicable
Model type	MS Excel based calculator
Summary	Projections of forest land increment structure consist of growing stock volume increment, harvested wood volume and dead

	volume, which are projected taking into account historical data obtained from National Forest Inventory (NFI) measurements of 2002–2017 (data of growing stock volume increment and its use, age class structure).
Intended field of application	GHG emissions and removals in LULUCF sector
Description of main input data categories and data sources	Historical data of growing stock volume increment and its use (growing stock volume increment, harvested wood volume and dead volume) as well as age class structure, obtained from National Forest Inventory (NFI) measurements of 2002–2017 Projected activity data is provided by State Forest Service (SFS)
Validation and evaluation	General quality control procedures where applied estimating LULUCF sector GHG projections: analysis of projected activity data trends, consistency check of projected emissions in the LULUCF GHG emissions and removals calculator and projected emissions in the GovReg_Proj_T1a_T1b_T5a_T5b template, consistency check of activity data sources, completeness check and etc.
Output quantities	Growing stock volume changes, harvested wood volume, dead wood volume in cubic meters
GHG covered	CO_2
Sectoral coverage	LULUCF sector forest land category
Geographical coverage	Lithuania
Temporal coverage (e.g. time steps, time span)	2040 year, 10 year time steps
Other models which interact with this model, and type of interaction (e.g. data input to this model, use of data output from this model)	1. Data output to LULUCF model (growing stock volume changes, harvested wood volume, dead wood volume); 2. Data output to IPCC HWP Worksheet (harvested wood volume)
Input from other models	Actual NFI data
References to the assessment and the technical reports that underpin the projections and the models used	Policies & Measures and Projections of Greenhouse Gas Emissions in Lithuania
Model structure (if diagram please attach to your submission in Reportnet)	Not applicable
Comments or other relevant information	Not applicable
Model 10	
Model name (abbreviation)	IPCC HWP Worksheet
Full model name	IPCC HWP Worksheet
Model version and status	Not applicable
Latest date of revision	2024
URL to model description	https://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html
Model type	MS Excel based calculator
Summary	Projections of GHG removals in harvested wood products relate on projected total harvested wood volume and historical volume share between sawnwood, wood-based panels, paper and paper board and proportion of harvested wood products produced from total harvested wood volume.
Intended field of application	GHG emissions and removals in LULUCF sector
Description of main input data categories and data sources	Main input data is provided from Forest land calculator (harvested wood volume) and actual activity data for harvested wood products subcategories are subdivided according to

	historical share of volume between sawnwood, wood-based panels, paper and paper board and proportion of harvested wood products produced from total harvested wood volume.
Validation and evaluation	General quality control procedures where applied estimating LULUCF sector GHG projections: analysis of projected activity data trends, consistency check of projected emissions in the LULUCF GHG emissions and removals calculator and projected emissions in the GovReg_Proj_T1a_T1b_T5a_T5b template, consistency check of activity data sources, completeness check and etc.
Output quantities	GHG removals (CO_2) in harvested wood products categories: sawnwood, wood-based panels and paper and paper board
GHG covered	CO_2
Sectoral coverage	Forest land harvested wood products category
Geographical coverage	Lithuania
Temporal coverage (e.g. time steps, time span)	2040 year per year
Other models which interact with this model, and type of interaction (e.g. data input to this model, use of data output from this model)	1. Data input from Forest land calculator (harvested wood volume)
Input from other models	Forest land calculator
References to the assessment and the technical reports that underpin the projections and the models used	Policies & Measures and Projections of Greenhouse Gas Emissions in Lithuania
Model structure (if diagram please attach to your submission in Reportnet)	Not applicable
Comments or other relevant information	Not applicable