LATVIA`S FIRST BIENNIAL TRANSPARENCY REPORT

under Paris Agreement

December 2024

DATA SHEET

Title

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ABREVIATIONS

AU – Animal units
BEMU – Battery electric multiple unit
BEV – Battery electric vehicle
BR5 – Fifth biennial report
BTR1 – First biennial transparency report
CAP – Common Agricultural Policy
CCD – Climate Change Department
CF – Cohesion Fund
CHP – Combined heat and power plants
CH_4 – Methane
CIS – Commonwealth of Independent States
CNG – Compressed natural gas
CO_2 – Carbon dioxide
CO_2 eq. – Carbon dioxide equivalent
CO – Carbon monoxide
CoM – Cabinet of Ministers
CoM Regulation No. 675 (25th October 2022) – Regulations of the Cabinet of Ministers No. 675 adopted on 25th October 2022 "Procedures for Establishing and Maintaining the System for Greenhouse Gas Inventories, the Projection System, and the System for Reporting on the Adaptation to Climate Change"
CP Programme – Latvia's EU Cohesion Policy Programme for 2021-2027 programming period
CRT – Common reporting tables
CTF – Common tabular format
CSB – Central Statistical Bureau
DH – District heating
DOC – Degradable organic carbon
EC – European Commission
EMEP/EEA 2023 – EMEP/EEA air pollutant emission inventory guidebook 2023
EAAI – Emission Allowances Auctioning Instrument
EAFRD – European Agriculture Fund for Rural Development
EEA – European Economic Area
EEOS – Energy Efficiency Obligation Scheme
EMU – Electric multiple unit
EMS – Energy Management Systems
EPI - Energy performance indicator
EU – European Union
ESD – Energy Sustainability Department
ESR – Effort Sharing Regulation
ETS – Emission Trading Scheme
ERDF – European Regional Development Fund
EV – Electric Vehicles
FADN – Farm Accountancy Data Network
FEC – Final energy consumption
FID – Department of Financial Instruments
FIT – Feed-in tariffs
GE – Gross energy
GHG – Greenhouse Gases
GDP – Gross domestic product
GPEC – Gross primary energy consumption
ha – hectare
HFC – Hydrofluorocarbon
HWP – Harvested wood products
IE – Included elsewhere
IPCC – Intergovernmental Panel on Climate Change
2006 IPCC Guidelines – 2006 IPCC Guidelines for National Greenhouse Gas Inventories
IPCC Wetlands Supplement - 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands
2013 IPCC Kyoto Protocol Supplement – 2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol
IPE – Institute of Physical Energetics
IPPC – Integrated Pollution Prevention Control
IPPU – Industrial processes and product use
LASAM – Latvian Agricultural Sector Analysis Model
LBTU – Latvia University of Life Sciences and Technologies
LEGMC – Latvian Environment, Geology and Meteorology Centre

LSFRI “Silava” - Latvian State Forest Research Institute “Silava”
LULUCF – Land Use, Land Use Change and Forestry
MCF – Methane conversion factor
MES – Ministry of Education and Science
MFA – Ministry of Foreign Affairs
MS – Member states
MoA – Ministry of Agriculture
MoCE – Ministry of Climate and Energy
MoE – Ministry of Economic
MoF – Ministry of Finance
MoT – Ministry of Transport
MoSARD –Ministry of Smart Administration and Regional Development
MMS – Manure management system
NECP – National Energy and Climate Plan
NID – National inventory document
NFI – National forest inventory
N_2O – Nitrous oxide
NOx – Nitrogen oxides
NA – Not applicable
ND – Nitrates Directive
NC8 – Eight National Communication
NE – Not estimated
NMVOC – Non-methane volatile organic compounds
NO – Not occurring
NOP – National Operational Programme “Growth and Employment”
ODS – Ozone-depleting substances
PAM – Policies and measures
PFC – Perfluorocarbon
PHEV – Plug-in hybrid electric vehicle
PPD – Pollution Prevention Department
PT – Public transport
PV – Photovoltaic
QA/QC – Quality assurance and Quality control
RES – Renewable energy sources
RRF Plan – Latvia’s Plan of EU Recovery and Resilience Facility
SF_6 – Sulfur hexafluoride
SO_2 – Sulfur dioxide
SWD – Solid waste disposal
UAA - Utilised agricultural area
UNFCCC – United Nations Framework Convention on Climate Change
UWWTD – Urban Waste Water Treatment Directive 91/271/EEC
VA – Value added
WEM_HD - Alternative scenario
WEM – scenario with existing measures
WAM – scenario with additional measures
WFD – Water Framework Directive

EXECUTIVE SUMMARY

Latvia is a country by the Baltic Sea covering area of 64 589 km^2, with a population of 1 875 757 (2022) inhabitants[1]. Baltic coastline is approximately 498 km long. Since the beginning of the previous century the forest area in Latvia has almost doubled, reaching 3 281.99 kha (50.8% from the total area of the country in 2022). Latvia lies in a temperate climate zone where an active cyclone determines rapid changes in weather conditions (190-200 days per year), and the annual mean precipitation is 600-700 mm. The main rocks are clay, dolomite, sand, gravel, limestone and gypsum.

As the economy of Latvia is small and open there is a significant dependence on the trends of global economy. Foreign trade is important, with exports of goods and services accounting for about 60% of the gross domestic product (GDP). The services sector had the dominating share in Latvia`s value added (VA) total followed by manufacturing and construction, while the agriculture sector and other industries had a minor role. In 2022, the most important sectors in the manufacturing industry were wood processing, food and beverages, electrical appliances, fabricated metal products, chemical industry and non-metallic minerals.

On 22nd April 2016, the Republic of Latvia signed the Paris Agreement that sets long-term goals to guide all nations to substantially reduce global greenhouse gas (GHG) emissions to hold global temperature increase to 2°C above pre-industrial levels and pursue efforts to limit it to 1.5°C above pre-industrial levels.

The European Climate Law establishes the objective of achieving climate neutrality by 2050, with an interim aim of reducing net GHG emissions by at least 55% by 2030 compared to 1990 levels. The 2030 target aligns with the European Union's (EU) Nationally Determined Contribution (NDC) target. Latvia, as a Member State of the EU, contributes to meeting this commitment by implementing Climate Policy on national level.

In 2022, Latvia’s total GHG emissions including indirect carbon dioxide (CO_2), without Land Use, Land Use Change and Forestry (LULUCF) showed a decrease of 61.1% compared to 1990, but GHG emissions including indirect CO_2, with LULUCF have increased by 10.3% compared to 1990. The base year of projections is 2022. It is projected that in 2030 total GHG emissions (without LULUCF, with indirect CO_2 emissions) will decrease by 13.0% in scenario with existing measures (WEM) and by 14.9% in scenario with additional measures (WAM) compared to 2022. Likewise, total GHG emissions (with LULUCF, with indirect CO_2 emissions) in 2030 in WEM scenario will decrease by 22.2% and by 23.5% in WAM scenario compared to 2022. It is projected that in 2030 total GHG emissions (without LULUCF, with indirect CO_2 emissions) will decrease by 66.2% in WEM scenario and by 66.9% in WAM scenario, compared to 1990. Likewise, total GHG emissions (with LULUCF, with indirect CO_2 emissions) in 2030 in WEM scenario will decrease by 14.2% and by 15.7% in WAM scenario compared to 1990. In 2050, it is projected that Latvia will reduce its total GHG emissions (without LULUCF, with indirect CO_2 emissions) by 42.0% in WEM and by 59.3% in WAM scenarios compared to 2022. Total GHG emissions (with LULUCF and indirect CO_2 emissions) in 2050 in WEM scenario are projected to decrease by 34.3% and in WAM scenario will decrease by 45.9% compared to 2022.

[1] CSB database IRD010. Resident population at the beginning of the year. Available: https://data.stat.gov.lv/pxweb/en/OSP_PUB/START__POP__IR__IRD/IRD010/

INTRODUCTION

This report represents First biennial transparency report (BTR1) of the Republic of Latvia under Article 13 of the Paris Agreement and Decision 18/CMA.1 "Modalities, procedures and guidelines (MPG) for the transparency framework for action and support referred to in Article 13 of the Paris Agreement". It covers issues related to the implementation of the United Nations Framework Convention on Climate Change (UNFCCC) by Latvia and shows progress Latvia is making towards meeting its emission reduction goals.

The purpose of Enhanced Transparency Framework is to provide information on climate change action (Article 13, paragraph 5, of the Paris Agreement) including clarity and tracking of progress towards achieving NDCs under Article 4, also to provide information about adaptation actions under Article 7. In accordance with Article 13, paragraph 6, of the Paris Agreement, the purpose is to provide clarity on support provided and received by relevant individual Parties in the context of climate change actions under Articles 4, 7, 9, 10 and 11.

Latvia's BTR1 comprises six chapters and seven annexes. Chapter 1 presents information on Latvia`s GHG emissions in the annual inventory which has been submitted to the UNFCCC on 16th December 2024. Information on NDC, Policies and measures (PaMs) and projections are included in Chapter 2. Information on climate change impacts and adaptation is presented in Chapter 3. Information on support provided and mobilized can be found in Chapter 4. Information on improvements in reporting is included in Chapter 5, but Chapter 6 includes other information. Annexes includes information on national inventory document (NID), Common reporting tables (CRT) for GHG emissions and removals, Common tabular forma (CTF) tables for information necessary to track progress and support provided and mobilized, and information in relation to the participation in cooperative approaches.

CTF tables according to the Decision 5/CMA.3 – Guidance for operationalizing the modalities, procedures and guidelines for the enhanced transparency framework referred to in Article 13 of the Paris Agreement – are submitted separately to the UNFCCC using the ETF platform CTF tables.

NID and CRT tables are provided separately to the UNFCCC.

Information provided in BTR1 on GHG emissions and trends is consistent with information in Latvia's 2024 GHG inventory[2]. Projections are prepared in two scenarios: WEM and WAM. The base year for scenarios is 2022.

[2]Latvia's 2024 GHG inventory. Available: https://unfccc.int/ghg-inventories-annex-i-parties/2024

1. NATIONAL INVENTORY DOCUMENT

This section presents summary information on the national GHG emissions since 1990 to 2022. The information is consistent with the most recent annual inventory submission to the UNFCCC where detailed information on GHG emissions and their estimation is described. NID and CRT are provided as a separate document to the UNFCCC in line with 18/CMA.1 Annex para. 12.

Description of emission trends by sector

As a Party to the UNFCCC and the Paris Agreement as well as being a Member State of the EU, Latvia has an obligation to prepare, publish and submit GHG inventories on an annual basis.

The annual submission (NID and CRT) contains emission estimates for the time series from 1990 till year prior to the previous year (x-2).

Latvia's 2024 GHG inventory is prepared according to the UNFCCC Decision 18/CMA.1, Decision 5/CMA.3, the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas inventories, 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands and 2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol.

The emission data presented in this chapter and in CTF table 6 are based on the Latvia's 2024 GHG inventory, submitted to the UNFCCC on 16th December 2024[3]. Table 1.1 and Figure 1.1 shows a time series of CO_2 equivalent emissions by sectors without LULUCF, including indirect CO_2.

Table 1.1 Latvia`s GHG emissions by sector, kt CO_2 eq.

	1990	1995	2000	2005	2010	2015	2020	2022
1.Energy	19529.57	9628.98	7438.01	8175.79	8532.14	7195.32	6796.07	6418.86
2.Industrial processes and product use	655.40	225.71	283.32	366.93	751.60	788.38	865.93	858.47
3.Agriculture	5030.48	2030.45	1680.55	1790.84	1870.07	2151.47	2250.41	2253.83
4.Land Use, Land-Use Change and Forestry	-12390.09	-14838.26	-11851.13	-5905.33	-1894.77	362.90	758.29	4944.16
5.Waste management	805.03	702.50	764.59	686.51	717.26	619.23	578.99	588.61
Indirect CO_2	41.00	32.49	25.16	21.60	16.44	17.13	13.13	11.24
Total (without LULUCF, with indirect)	26061.47	12620.13	10191.63	11041.68	11887.50	10771.52	10504.53	10131.01
Total (with LULUCF, with indirect)	13671.39	-2218.13	-1659.49	5136.35	9992.74	11134.42	11262.82	15075.18

According to Table 1.1 in 2022, Latvia's GHG emissions composed 10131.01 kt CO_2 eq. excluding LULUCF in total including indirect CO_2, showing in 2022 a decrease of 61.1% compared to the base year 1990. The largest decrease is observed in Energy sector – 67.1%, followed by the 55.2%

[3]Latvia's 2024 GHG inventory. Available: https://unfccc.int/ghg-inventories-annex-i-parties/2024

decrease in Agriculture sector. In Waste management sector GHG emissions decrease is 26.9%. In 2022, compared to 1990, emissions in Industrial processes and product use (IPPU) sector have increased by 31.0%. GHG emissions in LULUCF sector (mainly in forest land) increased since 1990 due to several factors with complex, cumulative effect. Ageing of forests (nearly half of forests in Latvia originated from abandoned farmlands after World War Two and reached maturity age during the recent decades) resulted not only in decrease of the increment and increase of natural mortality, but also in significant increase of the commercially accessible stock. This, in turn, resulted to increase of harvest stock, particularly after completion of land reform. At the same time the annual harvest stock does not exceed 3-5% of the commercially accessible stock. In spite of the increase of harvest stock (about tripled in 2021 compared to 1990) the area of mature forests in Latvia continues to increase, resulting in even higher mortality rate and more significant carbon losses in living biomass due to natural disturbances. Other factor significantly contributing to the increase of GHG emissions in LULUCF sector is changes in peat industry - switching from production of energy peat accounted under energy sector to production of peat for horticulture; thus, in spite the total peat production significantly reduced in 90ths the contribution to the emissions in LULUCF sector increased.

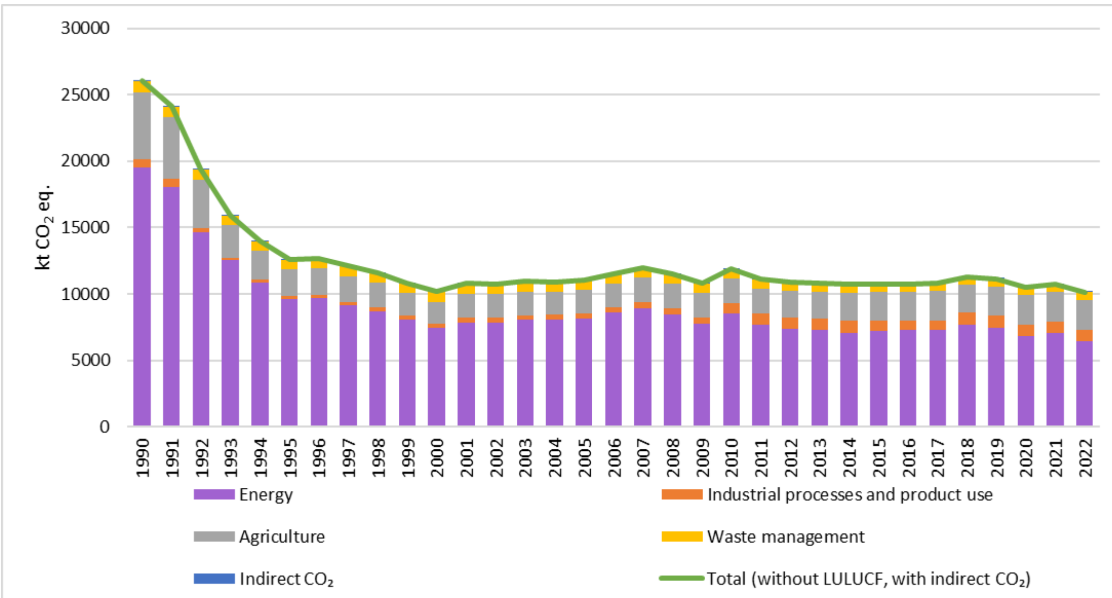

Figure 1.1 GHG emission time series for 1990–2022, kt CO_2 eq.

GHG emissions had considerably decreased during the time period 1990–1995 (51.6%) when the national economy of Latvia transformed from central planning to a market economy. This transformation created structural changes of the economy: the share of industry in GDP had considerably decreased and, on the contrary, the share of services – increased. The IPPU and Agriculture sectors had the largest decrease of GHG emissions against 1990 in this period, respectively 65.6% and 59.6%. Emissions in Energy sector have decreased by 50.7% in this period.

The rapid growth of Latvia's economy in the period 2000-2007, during which GDP growth constituted 82.4%, resulted also in the growth of the total GHG emissions by 17.3%. In its turn, in the period 2007-2022 the active implementation of climate PaMs took place, which resulted in GHG emission decrease in 2022 per 15.2% compared to 2007.

Total GHG emissions in 2022, compared to 2021, decreased by 5.7% due to emission decrease in Energy and IPPU sector.

The Energy sector is the most significant source of GHG emissions with a 63.4% share of the total emissions in 2022. A large part of the Energy sector emissions is emitted in the Transport sector (48.9%), Other Sectors (24.2%) and Energy Industries (15.6%). Total emissions in Energy sector in 2022 decreased by 67.1% if compared to the base year and decreased by 8.8% if compared with previous year. GHG emissions fluctuate in the latest years mainly due to economic trends, the energy supply structure and climate conditions as heat production is an essential part of Latvia's energy production. Use of biomass has increased more than 2 times and use of fossil fuels have significantly decreased - liquid fuel (-58.5%), solid fuel (-98.2%), peat (-97.1%) and natural gas (-71.2%) since 1990. The share of biomass has increased from 8.6% in 1990 to 41.3% in 2022.

Agriculture is the second most significant source of GHG emissions in 2022, 22.2% of Latvia's total GHG emissions excluding LULUCF. In 2022, GHG emissions increased by 0.04% compared to 2021 due to the increase of livestock and crop productivity. The annual emissions have been reduced approximately by 55.2% since 1990 due to decrease in agricultural production. In 2022, given in kt CO_2 eq., N_2O contributed 49.5%, CH_4 contributed 46.8% of total GHG emission from the Agriculture sector, remaining 3.7% refer to CO_2 emissions from liming and urea application. Total agriculture emissions have been quite steady last years, because there is a decrease in the number of livestock, however statistical data shows an increase of intensive agricultural production.

Emissions from IPPU sector constitute 8.5% of the total GHG emissions in 2022. Compared to 1990 emissions from IPPU increased by 31.0% but, compared to 2021, emissions decreased by 2.1%. The largest decrease in IPPU sector emissions occurred between 1991 and 1993, when industry was affected by a crisis. In the last years emissions fluctuated due to activity in industrial production processes and sectors using F-gases. F-gases emissions from Product use as substitutes for ozone depleting substances (ODS) constitute 2.5% from total GHG emissions in 2022. Emissions from hydrofluorocarbons (HFC) and sulfur hexafluoride (SF_6) have grown significantly in 2022 since 1995 but, compared to 2021 total F-gas emissions decreased by 3.1%.

In 2022, NMVOC emissions from the Solvent Use sector decreased by 20.9%, compared to 2021, due to the decrease in activity data of Domestic solvent use including fungicides and Other solvent and product use. This reduction can be explained by decreased usage of these products. Compared to 1990, emissions increased by 19.6% in 2022.

In 2022, emissions from the Waste management sector were about 5.8% of total GHG emissions (excluding LULUCF, including indirect CO_2). Solid waste disposal and wastewater handling sectors are the main sources of GHG emissions in Waste sector producing accordingly 68.7% and 20.7% of all Waste management sector emissions in 2022. Biological treatment of solid waste together contributes 10.6% of GHG emissions from Waste management sector in 2022. GHG emissions from Waste management sector have fluctuated from 1990-2022. In 2022, emissions have decreased by 26.9% compared to 1990. The largest influence for decrease of Wastewater handling emissions in the beginning on 1990s was closure of many industrial enterprises.

Indirect CO_2 emissions constitute 0.1% from Latvia`s total GHG emissions without LULUCF, with indirect CO_2 in 2022. In 2022, Indirect CO_2 emissions decreased by 72.6%, compared to 1990.

The following Figure 1.2 shows the total GHG emissions including LULUCF sector.

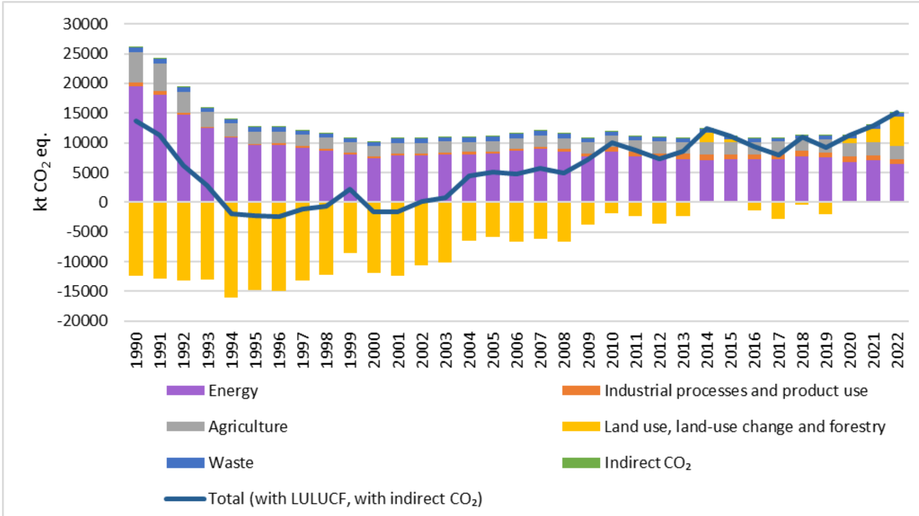

Figure 1.2 GHG emissions in Latvia by reporting sector (with LULUCF, indirect CO_2), kt CO_2 eq.

Net GHG emissions from LULUCF in 2022 were 4944.16 kt CO_2 eq. compared to -12390.09 kt CO_2 eq. in the base year (1990). Change from base to the latest reported year of emissions/removals from LULUCF constitutes -140%. This decrease of removals from LULUCF sector is associated with the increase of harvesting stock, and the increase of natural mortality due to ageing of forest stands and reduction of increment in mature forests. Increase of the GHG emissions in 1999 is associated with significant increase of harvesting stock in forest land due to favourable economic conditions, but the increase of the GHG emissions in 2014 and 2020-2022 are cumulative result of increase of the harvest rate, higher mortality rate and reduction of increment of living biomass in forest land according to the National Forest inventory (NFI) data. In 2022, the increased harvesting rate in forest land was related to Russia's aggression in Ukraine, disruption of the existing wood supply chains, and timber market turbulences. Latvia's wood resources had to compensate for the previous wood supply from Russia and Belarus.

Description of emission trends by gas

Latvia's GHG emissions presented by gas are shown in the Table 1.2.

CO_2 is the main GHG causing climate change in Latvia. In 2022, CO_2 emissions constituted 65.4% of Latvia's total GHG emissions (without indirect CO_2 emissions). In 2022, total CO_2 eq. emissions without LULUCF and indirect CO_2 emissions decreased by 66.3% compared to 1990. The most important source of CO_2 emissions (kt) in 2022 was fossil fuel combustion – 89.8%, including Energy Industries – 14.4%, Manufacturing Industries and Construction – 8.2%; Transport – 46.9% and Other sectors (Commercial/institutional, Residential and Agriculture/forestry/fishing) – 19.9%. Other anthropogenic emission sources of CO_2 are IPPU – 8.9% and Agriculture 1.3%.

Main sectors of CH_4 emissions in Latvia are Enteric Fermentation of Livestock and Solid Waste Disposal Sites. Other important sources of CH_4 emissions are leakage from natural gas pipeline systems and combustion of biomass. CH_4 emissions in 2022 contributed to 18.7% of total GHG emissions (excluding LULUCF, excluding indirect CO_2). CH_4 emissions (kt) decreased 53.4% in 2022 since 1990.

Agricultural soils are the main source of N_2O emissions in Latvia generating 78.0% of all N_2O emissions (kt) in 2022. Other N_2O emission sources are Transport sector and, biomass, liquid and other solid fuel combustion in other Energy sectors, also IPPU and Waste management sectors. Since 1990 total N_2O emissions had decreased by 41.5% in 2022, mainly due to decrease of the emissions from Agriculture.

Emissions from HFCs and SF_6 consumption are reported for the period of 1995-2022. Since 1995 HFC emissions have increased significantly due to substitution of ozone depleting substances in refrigeration and air conditioning as well as due to increase of cars, trucks and buses equipped with mobile air conditioners. SF_6 emissions from electrical equipment contributed to 12.27 kt CO_2 eq. in 2022. Perfluorocarbon (PFC) and NF_3 emissions do not occur (NO) in Latvia for all time series.

Table 1.2 Latvia's GHG emissions (without LULUCF, without indirect CO_2), kt CO_2 eq.

	1990	1995	2000	2005	2010	2015	2020	2022
CO_2	19661.60	9133.94	7081.63	7810.76	8554.52	7262.43	6997.99	6619.72
CH_4	4060.56	2443.01	2107.92	2091.40	2002.96	1967.09	1898.05	1893.19
N_2O	2298.32	994.27	914.16	1012.78	1089.66	1262.58	1339.80	1344.30
HFCs, SF_6	NO,NA	16.43	62.76	105.13	223.93	262.29	255.57	262.57
Total (without LULUCF, indirect CO_2)	26020.48	12587.64	10166.47	11020.07	11871.07	10754.39	10491.40	10119.77

Precursors and SO_2

The emissions trends of precursors (nitrogen oxides (NO_x), carbon monoxide (CO) and non-methane volatile organic compounds (NMVOC)) and sulfur oxide (SO_2) are presented in Table 1.3.

Table 1.3 Precursors and SO_2, kt

Year	NO_x	CO	NMVOC	SO_2
1990	97.79	400.31	84.80	100.45
1995	52.42	291.15	62.18	49.39
2000	43.44	247.62	53.09	17.75
2005	46.28	211.99	49.98	8.74
2010	41.79	154.15	39.75	4.31
2015	37.61	109.04	35.14	3.56
2020	32.97	100.24	34.76	3.51
2022	32.38	99.89	32.20	3.75

In the period from 1990 to 2022 precursors have decreased: NO_x by 66.9%, CO by 75.0%, NMVOC by 62.0% and SO_2 by 96.3%.

NO_x emissions were 32.38 kt in 2022. 79.8% of NO_x emissions were generated in the Energy sector, 13.5% in Agriculture and 6.4% in IPPU. Small part of NO_x emissions is produced in LULUCF sector (0.3% from total NO_x emissions). Transport sector was responsible for 37.2% of the total NO_x emissions. The total NO_x emissions have decreased from 1990 to 2022. Generally, the reduction is due to decrease of total fuel consumption that was caused by transformation of national economy as well as the energy efficiency and control measures and also solid fuels and heavy liquid fuels replacement with natural gas and biomass fuels.

91.1% of CO emissions appear in Energy sector, mainly from fuel combustion in Residential and Commercial/Institutional subsectors (72.7% from all CO emissions). The remaining part of CO emissions come from LULUCF sector (5.7%), IPPU sector (3.2%) and Waste management sector (0.0006%). The CO emission trend shows the decrease of the emissions for period 1990-2022.

Total NMVOC emissions were 32.20 kt in 2022 from which 39.6% comes from IPPU (mainly from non-energy products from fuels and solvent use which constitute 35.6% from total NMVOC emissions in 2022) and 37.7% are generated in Energy sector (mainly residential stationary combustion). Also 22.0% from NMVOC emissions come from Agriculture mainly from manure management but the remaining 0.8% comes from Waste management sector. The NMVOC emission trend shows a decrease of emissions for period 1990-2022.

In 2022, SO_2 emissions were 3.75 kt from which 96.6% originated in the Energy sector, 3.4% from the IPPU and a negligible part of SO_2 comes also from Waste management sector (Waste incineration). SO_2 emissions have decreased significantly from 1990 to 2022. The reduction is mainly due to use of fuels with lower content of sulfur as well as fuel switching from solid and liquid types of fuel to natural gas and biomass.

2. INFORMATION NECESSARY TO TRACK PROGRESS

2.1. National circumstances and institutional arrangements

This section provides national circumstances relevant to progress made in implementing and achieving EU NDC, a summary of national system for preparing Latvia's 2024 GHG inventory and BTR1.

Detailed information of GHG inventory institutional arrangements is included in the Latvia's 2024 GHG inventory.

2.1.1. National circumstances

2.1.1.1. Government Structure

Latvia is a parliamentary republic. The unicameral parliament (Saeima), with 100 members, is elected in general, equal, direct, secret and proportional elections for a four-year period. The Saeima and the people, have the right to legislate, in accordance with the procedures, and to the extent, provided by the Constitution. Draft laws may be submitted to the Saeima by the President, the Cabinet of Ministers (CoM), committees of the Saeima, by not less than five members of the Saeima, or, in accordance with the procedures and in the cases provided for in the Constitution, by one-tenth of the electorate.

The Saeima elects President for a term of four years. The President represents the State in international relations, appoints and also receives the diplomatic representatives. The President has the right to initiate legislation. The President proclaims laws passed by the Saeima. The President, by means of a written and reasoned request to the Chairperson of the Saeima, may require a law to be reconsidered.

The candidate for the post of the Prime Minister who is invited by the President invites ministers to form the Government. CoM is a collegial institution. CoM, within the scope of its competence, considers policy planning documents, external and internal legal acts, orders of the CoM, informative statements, national positions and official opinions of the State. Ministries are top-level direct administration institutions that are directly subordinated to a respective minister - Member of the CoM. There were 14 ministries in Latvia in 2024, as well as the State Chancellery.

From the 1st July 2021, Latvia's administrative division consists of 43 municipalities: (i) territories of 7 state cities (valstpilsētas) and (ii) 36 territories of local municipalities (novadi). Territories of local municipalities consists of rural territories divided in parishes (pagasti) and towns (pilsētas), as well as three of local municipalities include also territory of state cities.

The overall responsibility for climate policy making lies within the Ministry of Climate and Energy (MoCE), and a number of other national institutions are involved in the implementation of this policy, including the Ministry of Smart Administration and Regional Development (MoSARD), Ministry of Finance (MoF), Ministry of Economics (MoE), Ministry of Transport (MoT), Ministry of Agriculture (MoA), Ministry of Education and Science (MoES), and institutions supervised by relevant ministries.

Matters related to the UNFCCC fall within the administrative responsibility of the MoCE, which acts as the national focal point to the UNFCCC.

Implementation of climate policy within the government structure

In Latvia, the ministry responsible for the climate, environment and energy policy is MoCE.

MoCE Climate Change Department (CCD) was established in 2023, and it is directly subordinated to the Deputy Secretary for Climate Action. Before 2023 CCD was a part of Environmental Protection and Regional Development Ministry. CCD develops legislation and climate policy planning documents as well as defends Latvia's interests in the EU and internationally. CCD cooperates with other ministries to ensure the integration of GHG and climate resilience objectives into sectoral policies, to promote changes in the Latvian economy. CCD also monitors the operation of the EU Emission Trading Scheme in Latvia, coordinates the preparation of national GHG inventory. Department of Financial Instruments (FID) is directly subordinated to the Deputy Secretary for Finances and develops the operation of climate and energy financial instruments (including Emission allowances auctioning instrument).

The main functions of CCD and FID are:

- to develop Latvia`s climate policy including developing of policies for promotion of climate change mitigation and adaptation, to work on a development planning documents and legislation as well as to promote the integration of climate policy aspects into other sectoral policies;
- to represent Latvia's interests in the development of international and EU climate policy and to coordinate the implementation of the UNFCCC, it`s Kyoto Protocol and the Paris Agreement, as well as to fulfil the other international commitments related to climate policy;
- to ensure coordination of the data and information collection system for climate change mitigation and adaptation, preparation of relevant submissions to the EU and the UNFCCC;
- to ensure the operation of the EU ETS in Latvia;
- to ensure the management of Latvia's GHG emission units and Latvia's participation in the GHG emission unit trading;
- to ensure that the public, merchants and state and local governmental institutions are informed about climate change, mitigation and adaptation to climate change;
- to organize and coordinate projects on international cooperation in the field of climate change including preparation of international agreements and coordination of their implementation.

MoCE Pollution Prevention Department (PPD) is subordinated to the Deputy Secretary of Environmental Protection. The PPD deals with policy development in the field of substances that deplete the ozone layer and F-gases in Latvia and natural resources management (including peat). The PPD deals also with the waste and wastewater sector.

MoCE Energy Sustainability Department (ESD) of is responsible for promoting the production and use of renewable energy through the development of national policies, relevant legal and regulatory frameworks.

The main functions of MoCE ESD are:

- to plan, develop and coordinate energy policy by developing policy planning documents and draft legislation in following areas: electricity, heat production, transport energy from sustainable energy sources and energy climate policy;
- to participate in the development and improvement of the legal framework of the EU as well as to cooperate with the EU institutions and international organizations the areas mentioned in the paragraph above;
- to make a proposal for state aid policy;

CCD together with ESD in co-operation with the co-responsible institutions and structural units of the MoE, as well as the social partners, to prepare the National energy and climate plan (NECP) 2021-2030, as well as long-term policy planning documents within the competence of ESD.

2.1.1.2. Population Profile

Population of Latvia was 1 875 757 at the beginning of 2022. During the last three decades, since 1990, the population has decreased by about 792 383. In all the decades the average decline was about 1.1% per year though different tendencies could be observed in urban and rural population. In the period 1990-2000 the urban population showed more rapid average annual decrease than the rural, but in the period 2010-2022 the situation was reverse – the rural exceeded the urban. In 2022, the urban population constituted 68.0% and the rural – 32.0% (Figure 2.1). At the beginning of 2022 in Rīga, the capital of Latvia, the population was 605 802 people, constituting 31.8% of the entire population of the country.

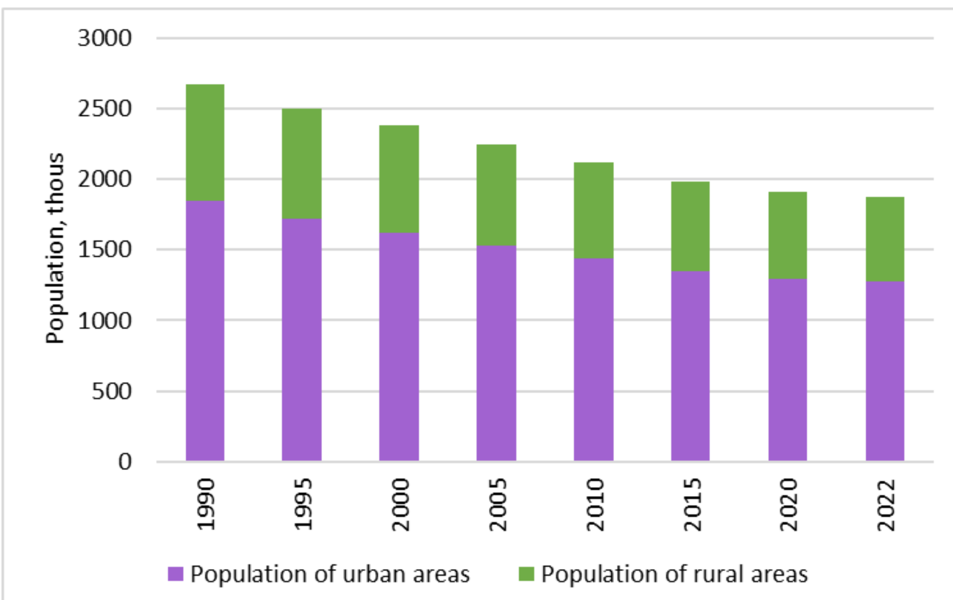

Figure 2.1 Changes in Latvian population in 1990–2022 (Central Statistical Bureau (CSB))

At the beginning of 2022 the population density in Latvia was 29 people per 1 km², but in 1990–1992 it was 41 persons. The population density fluctuated between 4 persons per 1 km² (Rucava region) up to 2 409 people per 1 km² (Rīga), but in the regions near Rīga (Stopiņi region) it was 226 people per 1 km² (Figure 2.2).

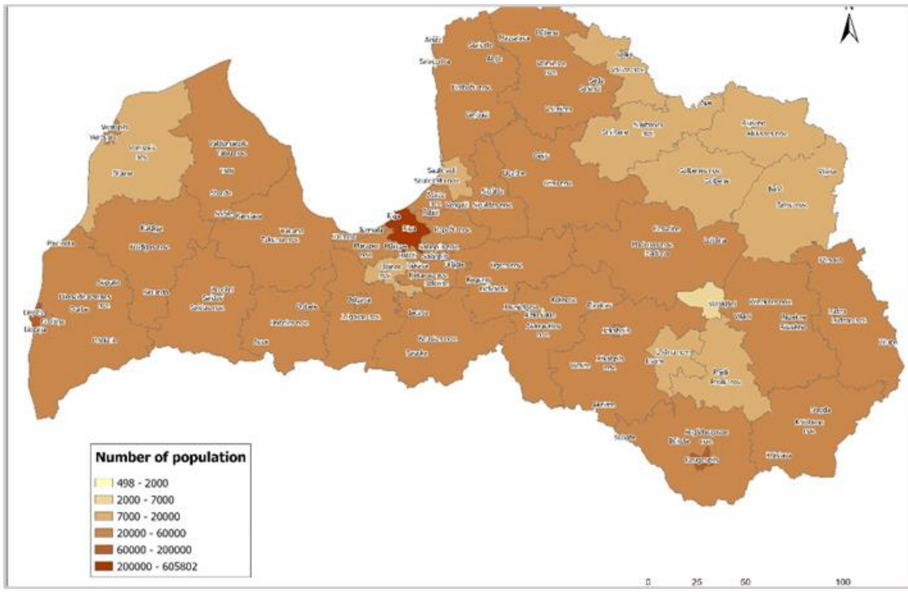

Figure 2.2 Distribution of the Latvian population at the beginning of 2022 (CSB)

The aging of the population continues. The ratio of the working age population has decreased by 4.2% points in 2022 compared to 2015. At the same time the ratio of people above the working age has increased by 8.2% points (Figure 2.3).

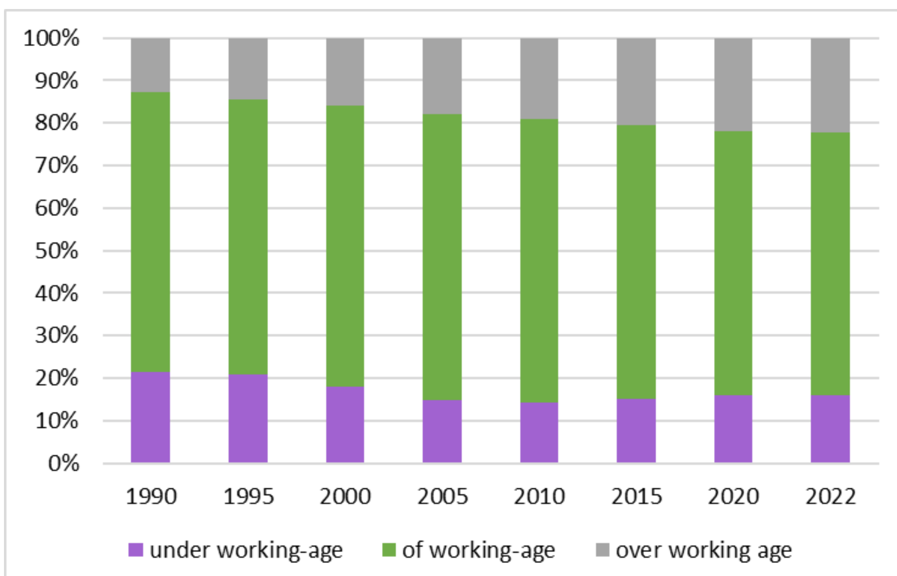

Figure 2.3 Changes in demographic dependency ratio in Latvia in 1990–2022 (CSB)

At the beginning of 2022 the number of households in Latvia was 825.2 thousand which was by 11.1% less than in 2000. The average size of households has shrunk. In 2000, it was 2.53 people, while it was 2.24 persons in 2022.

In 2022, Latvia`s GHG emissions per capita was 5.4 tons of CO_2 eq. (Figure 2.4). Among the EU Member States Latvia has third lowest GHG emissions without LULUCF per capita in 2022[4].

[4] EEA greenhouse gases viewer. Available: https://www.eea.europa.eu/data-and-maps/data/data-viewers/greenhouse-gases-viewer

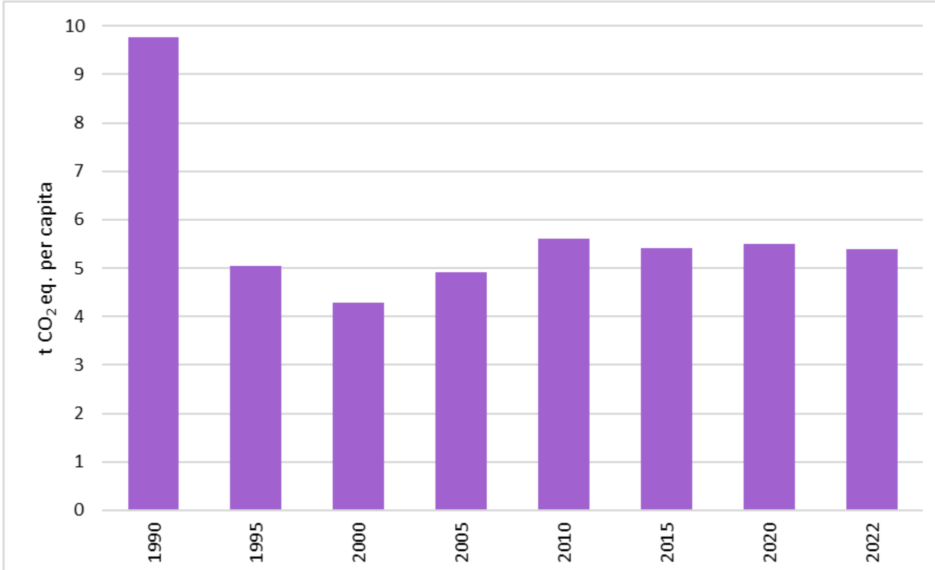

Figure 2.4 Latvia`s GHG emissions per capita in Latvia in 1990–2022

2.1.1.3. Geographic Profile

Latvia is situated on the edge of the Eastern European Plain near the Baltic Sea between 55°40' and 58°05' Northern latitude and between 20°58' and 28°14' Eastern longitude. The total length of the border of Latvia amounts to 1 368 km on land and 498 km along the Baltic Sea coast. Latvia borders with Estonia in the North, with Lithuania in the South, with Belarus - in the South East and with Russian Federation - in the East.

The territory covers an area of 64 589 km^2 in total. Its length in the North – South direction is 210 km, and the width in the West – East direction – 450 km. Latvia is a typical lowland country, and its terrain is characterized by flat, low areas and hilly elevations. The average height above sea level is 87 m and the highest peak is Gaiziņkalns (311.6 m above sea level). Latvia also has more than 3 000 lakes and 12 000 rivers. According to the National Forest inventory (NFI) the total forest area (including afforested lands) in 2022 was 32 819.9 km^2, cropland 15 781.3 km^2 and grassland 8 837.1 km^2, wetland 3 950.8 km^2, settlements 3 147.1 km^2.

About 35% of the territory of Latvia is located closer than 50 km from the shores of the Baltic Sea or the Gulf of Riga. The closeness of the sea, the characteristics of the atmospheric circulation and the prevailing air masses, as well as the characteristics of the relief determine the climatic and weather conditions, as well as the distribution of temperature and precipitation. The location in the respective latitudes determines the solar radiation or energy supply, the ratio of day and night lengths. Geologically, Latvia is located on the continental part of the Eurasian lithosphere plate, near its western edge, on the north-western edge of the European continental plain, and is characterized by low absolute and relative elevations.

Latvia's geographical situation and climate features determine that building heating is necessary around 200 days per annum. As the consequence of Latvia's geographical location, a large proportion of fuel resources utilized in stationary combustion equipment is used for heating of buildings, and the relatively large fluctuations in the emissions from year to year are observed due to changes in heating degree days.

2.1.1.4. Economic Profile

As a member of the EU and euro area, Latvia's economy is integrated with the economies of other EU countries. Reforms implemented in Latvia and integration in the EU have left a positive impact on the economic development of the country. Rapid economic growth was observed in 2000-2007. A substantial inflow of foreign capital from 2005 to 2007 stimulated significant increase in the private consumption and investments in Latvia. The average growth rate of the GDP in 2000–2007 was around 9.0%.

Since the second half of 2007, the growth rates began to decrease which was determined by the processes influencing both internal (weakening of domestic demand) and external (decrease of growth rates globally) economic environment. As the economy of Latvia is small and open there is a significant dependence on the trends of a global economy. During the crisis, the GDP decreased by one fifth. Since 2010, the economic recession in Latvia has stopped, and the growth resumed. From 2011 to 2019, the GDP increased on average by 3.0% annually. The Covid-19 pandemic, which began in Latvia in March 2020, had a significant impact on the economy. In total, GDP in Latvia in 2020 decreased by 3.5% compared to 2019. The extensive government and EU funds support measures, as well as the improvement of the epidemiological situation in 2021, contributed to the recovery of Latvia's economy, and GDP grew by 6.7%. After the rapid recovery of the economy from the crisis of the Covid-19 pandemic in 2021, growth in Latvia slowed to 3.4% in 2022. The economic development in 2022 was significantly influenced by the disruptions in supply chains caused by Russia's invasion of Ukraine, the rise in inflation caused by the cost of energy and food, as well as the decline in global demand (Figure 2.5).

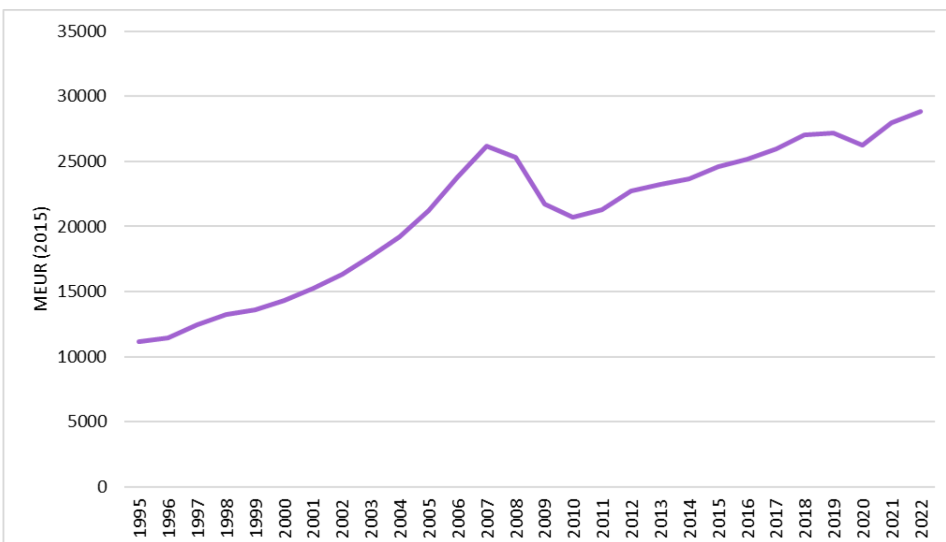

Figure 2.5 Gross Domestic Product, 1995 – 2022 (at 2015 prices) (CSB)

In Latvia, the services sector had the dominating share (around 74.7% in the year 2022) in total VA followed by manufacturing and construction (around 18.2%), while the agriculture sector (4.1%) and other industries (3.0%) had a minor role. During the last 10 years only minor changes in the relative contribution of the above-mentioned sectors in total VA may be noted, e.g. the contribution of the service sector increased by 1.4% points, whereas the contribution of other industry decreased by 1.3% points. The increase in the impact of the service sector over the last 20 years has reduced the energy intensity of the economy and the intensity of GHG emissions.

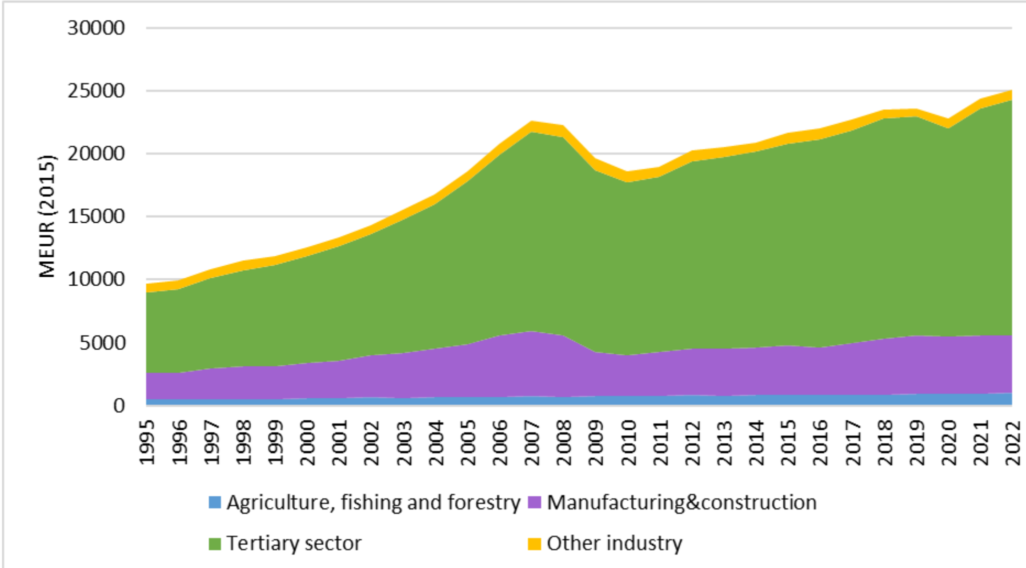

Figure 2.6 Value added by sectors in Latvia 1995-2022 (CSB)

External trade of Latvia experienced a dynamic development after the crisis in 2008-2009. Starting from 2010, exports have grown faster than imports and in 2022 it was about 2.9 times higher than in 2010. It should be noted that export prices increased significantly in 2022, especially to EU countries – the main trading partner countries of Latvia. The export-import balance has been balanced from a markedly negative in 2003-2008 and, starting from 2017 until 2020, is close to zero, then import is higher than export.

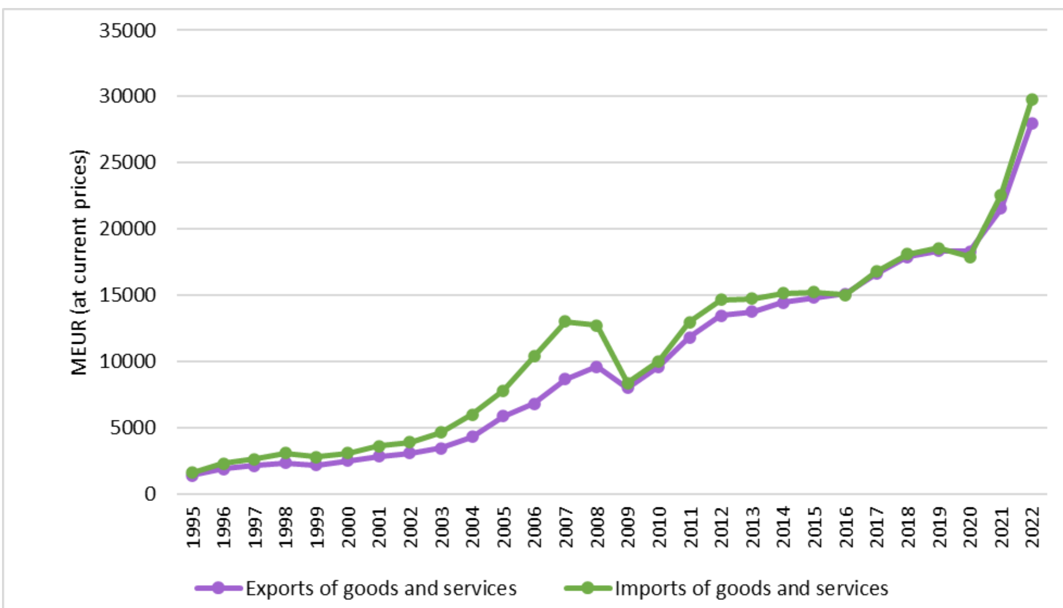

Figure 2.7 Exports and imports in Latvia, million EURO (CSB)

Exports are one of the main drivers of economic growth, and their dynamics are closely linked to external demand and the pace of economic development in partner countries. About 2/3 of Latvia's exports are exports of goods and the rest is exports of services. This proportion has not changed significantly in recent years.

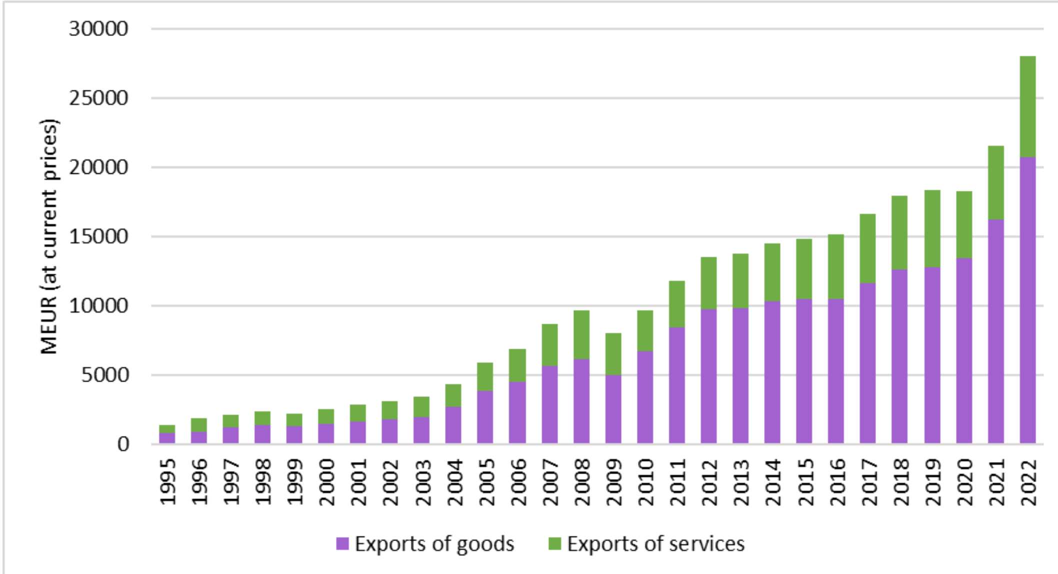

Figure 2.8 Exports of Latvian goods and services, million EURO (CSB)

Over the last five years the main exported goods have remained relatively stable and in 2022 they are agricultural and food products (19.9%), wood and its products (17.2%), mineral products (12.8%), machinery and mechanical and electrical equipment (14.3%), chemical industry products (11.3%). In 2022, the main exported services included transportation (32.2%), information and computing services (17.2%), travels (14.5%).

As usual, the most important export markets for Latvia are EU countries, including its neighbours – Lithuania and Estonia. Exports to Commonwealth of Independent States (CIS) countries, including Russia, keep getting smaller. It should be noted that Russian military aggression in Ukraine has a negative impact on the volume of trade deals with both Russia and Belarus. This is partly compensated by the increase in export volumes to other CIS countries. Exports to other countries, to which the United Kingdom belongs since the first half of 2020, make up an increasingly higher share in the total export structure. In recent years, exports to other countries have been twice as high as exports to CIS countries.

Imports of goods and services have developed similarly to exports over the last five years. Since 2017, imports of services have grown faster, but imports of goods have grown more moderately. In turn, in 2020, due to Covid-19, imports of services decreased significantly, while imports of goods practically remained at the previous year's level. Since 2021 imports of services and goods have increased rapidly. In 2022, the increase in imports of goods was affected by growth in imports of almost all main groups of goods. The value of imports of mineral products, land transport, electrical appliances and equipment, as well as machinery and appliances increased at a faster pace.

The main import partners of Latvia are EU countries, including its neighbours – Lithuania and Estonia. In total, the products of these countries in 2022 accounted around 3/4 of Latvian imports.

In 2022, Latvia`s GHG emissions per GDP was 351.52 tons CO_2 eq. to MEUR (2015) (Figure 2.9).

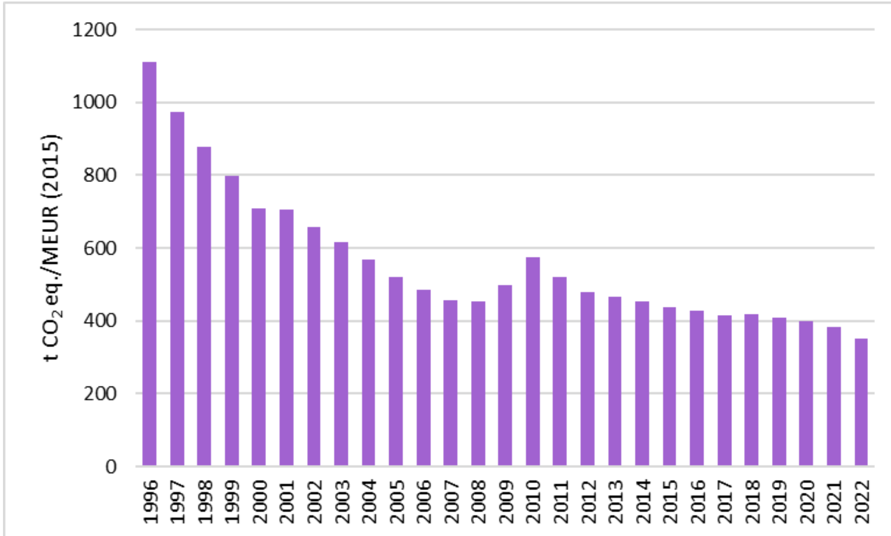

Figure 2.9 Latvia`s GHG emissions per GDP in Latvia in 1990–2022

2.1.1.5. Climate Profile

The main driver of climate conditions in Latvia is the received solar radiation. Latvia is in the moderate climate zone, characterised by seasonality and a different length of daytime. The overall nature of the climate in Latvia is also influenced by the circulation of the atmosphere – the prevailing winds and the amount of rainfall depend largely on the transfer of air masses from the Atlantic. Latvia's climate is also affected by several other factors, such as terrain forms, the distance to the Baltic Sea and the Gulf of Riga and urbanisation, resulting in differences between the individual regions of Latvia. Climate is characterised by long-term statistics of meteorological parameters such as air temperature, precipitation amount, wind, snow cover. The report is based on the current climate normal period (1991-2020) defined by the World Meteorological Organization (WMO).

Solar radiation

The Sun is the most powerful source of energy and heat that is vital for life on Earth. The energy generated by the sun is dependent on solar radiation intensity. In Latvia, due to seasonality, the duration of the daytime and hence sunshine varies greatly throughout the year. The sunniest month in Latvia is July, with an average of 289 hours of sunshine, while the least sunshine is in December – only 24 hours (Figure 2.10). According to the 1991-2020 normal the total annual sunshine duration in Latvia is 1856 hours, with local variation from 1693 hours in Zosēni (Vidzeme Upland) up to 2030 hours in Liepāja (south-west Latvia).

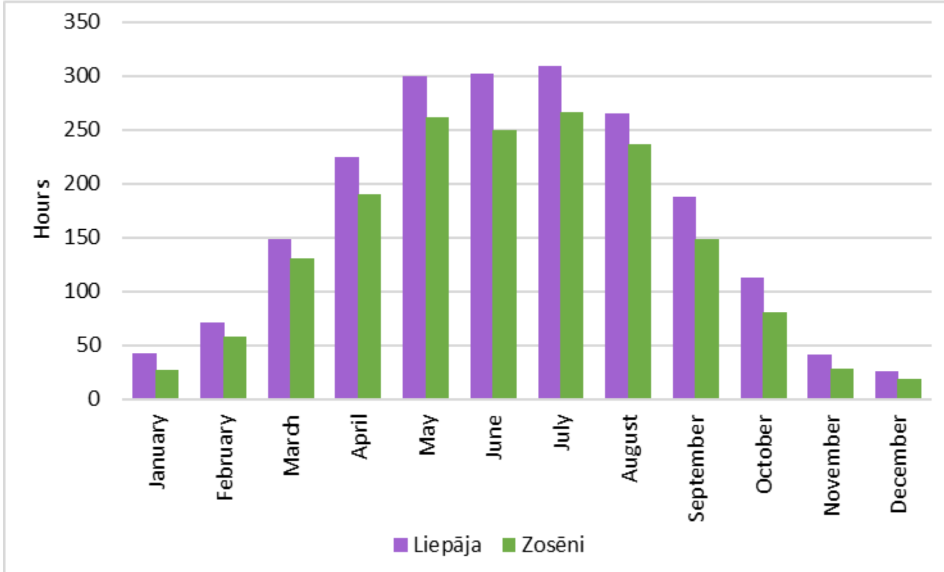

Figure 2.10 Monthly sunshine duration normal (1991-2020) in Liepāja and Zosēni (LEGMC)

Air temperature

In 1991-2020 normal period annual mean air temperature in Latvia is +6.8 °C. Lowest annual mean air temperature (+5.7 °C) is in the Alūksne and Vidzeme Uplands, but highest is in coastal areas of Baltic Sea: +7.5... +7.9 °C, thus, illustrating how the proximity to the Baltic Sea and elevation changes impact climatic conditions notably. The only exception to this territorial distribution is Rīga, where due to influence of city "heat island" is the highest annual mean air temperature: +8.0 °C. Over the course of the year, the warmest month in Latvia is July, with mean air temperature of +17.8 °C. Meanwhile, the coldest month of the year, with mean air temperature of -3.1 °C, is February. The highest air temperature recorded so far in Latvia is +37,8 °C, which was observed in Ventspils on 4th August 2014, while the lowest (-43.2 °C) was observed on 8th February 1956 in Daugavpils.

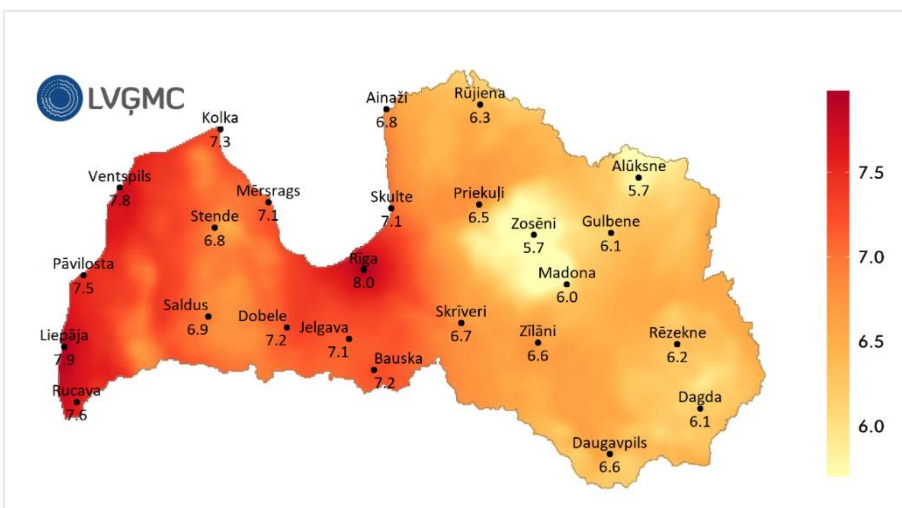

Figure 2.11 Annual average air temperature normal for 1991-2020 period, °C (LEGMC)

Precipitation

The normal of the annual precipitation amount for 1991-2020 period in Latvia is 685.6 mm. The territorial distribution of precipitation amount is affected by the terrain and prevailing wind directions, so the highest annual precipitation amounts are recorded on the western slopes of Vidzeme and Rietumkursa Uplands, where annual precipitation normal is 878.5 mm in Sigulda and 777.7 mm in Rucava. At the same time, the smallest annual precipitation amount is in the Zemgale plain – in Dobele and Bauska annual precipitation is below 600 mm, 580.5 and 590.1 mm respectively. The highest number of days with precipitation are in the autumn and winter seasons, when weather conditions are most affected by cyclones moving eastward from the Atlantic, while the smallest – is in the spring season. The largest precipitation amount due to the convective processes is observed in summer months – in August and July average precipitation is 76.8 and 75.7 mm, while the driest months are in the spring – the driest of them all, with average precipitation amount of 35.8 mm, is April.

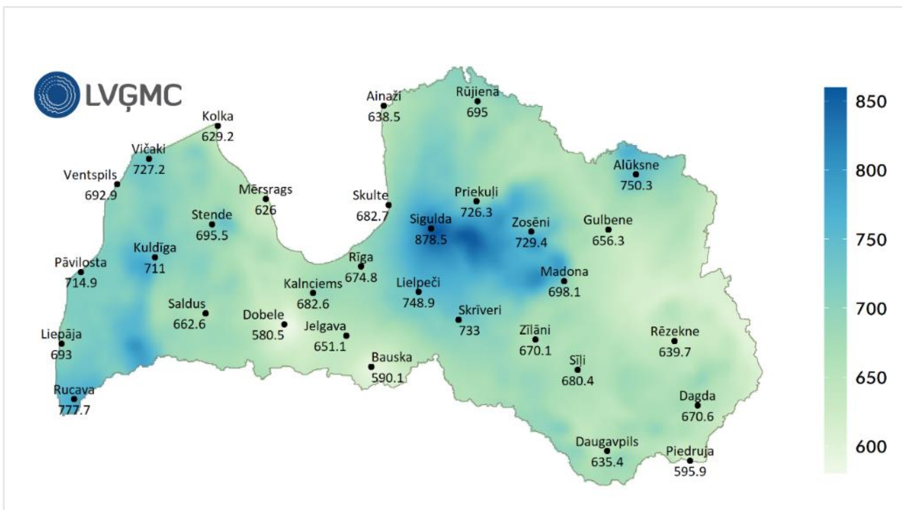

Figure 2.12 Annual precipitation amount normal for 1991-2020 period, mm (LEGMC)

Snow cover

In winter, a large part of the precipitation is in the form of snow. The seasonal snow cover stores large quantity of water, which afterwards greatly influences the water cycle. Hence, the snow cover characteristics are directly related to the development of hydro-electric power generation and assessment of flood risk. The snow cover duration and its depth have a pronounced effect on the growth of natural and cultivated plants, recreational and winter sports and road maintenance.

On average Latvia has 77 days a year with a snow cover. The longest period with snow cover is in Alūksne – 119 days a year, but the shortest period is in Rucava – on average only 49 days a year. The first snow cover onset usually is in November, but sometimes the first snow cover can be observed already in October. The earliest snow cover on record was registered on 23 September 1973 in Rēzekne. The snowiest month is usually February, with an average of 20 days with snow cover and average thickness of the snow cover in Latvia – 10 cm. Snow cover thickness in February is from 4 cm in Liepāja and Rucava up to 21 cm in Alūksne. The last snow cover in most of the country melts in April, but sometimes a snow cover can disappear even in February or March, while the latest recorded snow cover was observed on 29th May 1953 in Kazdanga.

Wind

Annual average 10 m height wind speed in 1991-2020 period in Latvia is from 2.3 m/s in Madona to 4.4 m/s in Ventspils. Mean wind speed is closely related to distance from sea – higher mean wind speed is observed in coastal areas, but calmest regions are the eastern uplands. There is also a pronounced seasonality in the mean wind speed: the fastest average wind speed is in the autumn and winter months, when cyclone activity is greater, while the slowest mean wind speed is in the spring and summer. The windiest months in Latvia are January and December with mean wind speed 3.6 m/s, but the slowest mean wind speed of 2.5 m/s is in July and August.

Maximum wind gusts are characterized by short-term wind speed peaks, which in most cases have a more destructive effect than the mean wind speed. The peak wind gusts are not only related to the activity of the autumn and winter seasons of cyclones and storms, but also to the convective processes of summer, when thunderstorms are accompanied by strong gusts and even whirlwinds. Average annual peak wind gusts speed is from 8.6 m/s in Daugavpils and Skrīveri to 11.5 m/s in Ventspils.

2.1.1.6. Energy Profile

NECP 2021-2030 sets objectives and courses of action for next decade. The two main energy policy objectives for Latvia are:

- strengthen security of energy supply and enhancing energy supply safety that implies available to consumers stable energy supply, reducing geopolitical risks, diversifying the sources and routes, developing interconnections and infrastructure of the state internal energy supply;
- to promote the decarbonisation of the national economy including sustainable energy that ensures sustainability within the meaning of economic, social and environmental sustainability. The plans for achieving the above are by investments in the development of innovation, improving energy efficiency, introducing smart technologies and promoting highly efficient production technology and renewable energy technologies.

Consumption of primary sources in Latvia is ensured by local (peat) and renewable energy sources (RES) (biomass (solid, liquid and gaseous), hydropower, wind and solar) and imported sources (oil products, natural gas, coal, etc.).

Consumption of primary energy sources declined sharply up to 1995 when it decreased by about 42% compared with 1990 (Figure 2.13). The main reason was vital structural changes in economy. In the years up to 2000 it dropped further by about 19% but starting with 2001 consumption of primary energy sources started to grow, reaching the greatest consumption in 2007. Due to the economic recession, energy consumption by 2009 decreased by about 8.4% compared to 2007. Starting with 2010, the economic recovery began, and, at the same time, energy efficiency measures were implemented more widely. As a result, primary energy consumption in 2022 is 4.2% lower than in 2010, while GDP has increased by 39.1% over this period. During this period there has been a decoupling of primary energy consumption from economic development.

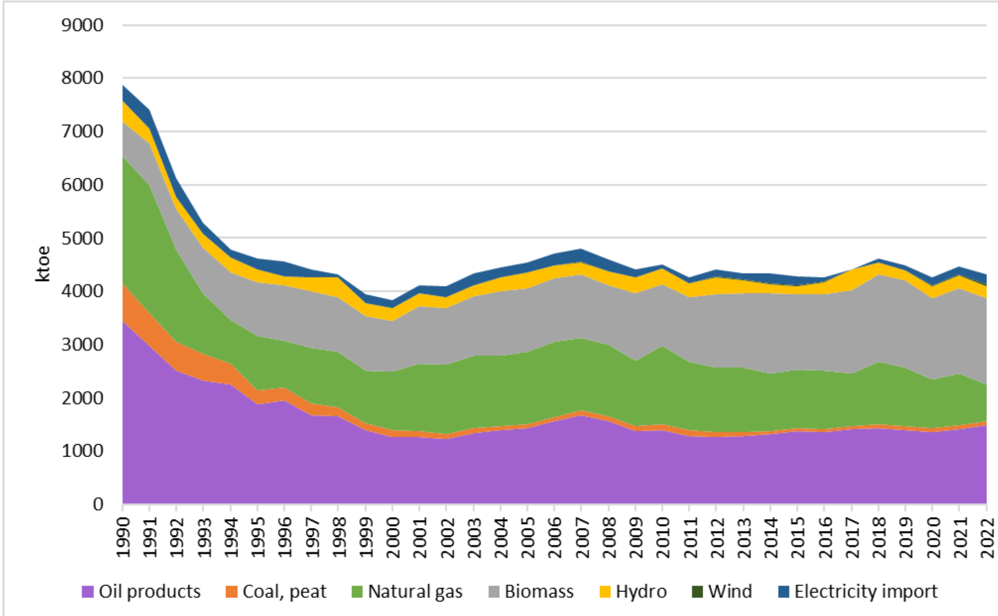

Figure 2.13 Consumption of primary energy sources in Latvia in 1990-2022 (CSB)

The structure of primary energy sources has changed over years. The first crucial changes took place by 1995 when natural gas, and sometimes also biomass, replaced residual fuel oil for generating electricity and heat, and coal for heat production. Further vital changes began in 2010 when through different state support measures natural gas and other fossil fuels started to be replaced by biomass (solid and gaseous) for heat production in district heating systems and power production. Wider use of solid biomass also begun in some industries.

Today three types of energy sources dominate in the supply of primary energy sources in Latvia: biomass (37.2%), used mainly for heating in different sectors and generating electricity and heat in combined heat and power plants (CHPs); oil products (34.4%), which are mainly petrol and diesel fuel used in the transport sector; natural gas (16.1%), mainly for generating electricity and heat in CHPs as well as in end use sectors.

Like many other EU countries Latvia depends on the import of primary sources, however, Latvia's dependency has decreased from 88.9% (in 1990) to 38.7% (in 2022), mainly due to increasing the use of wood biomass and other RES. At present RES take a considerable share in the balance of Latvia's primary energy sources. The main and widely used sources are solid biomass and hydropower, to a lesser degree also biogas, liquid biofuels, wind energy, and solar energy. The share of renewable energy in the supply of primary energy sources has grown from 31.0% (in 2000) to 43.1% (in 2022).

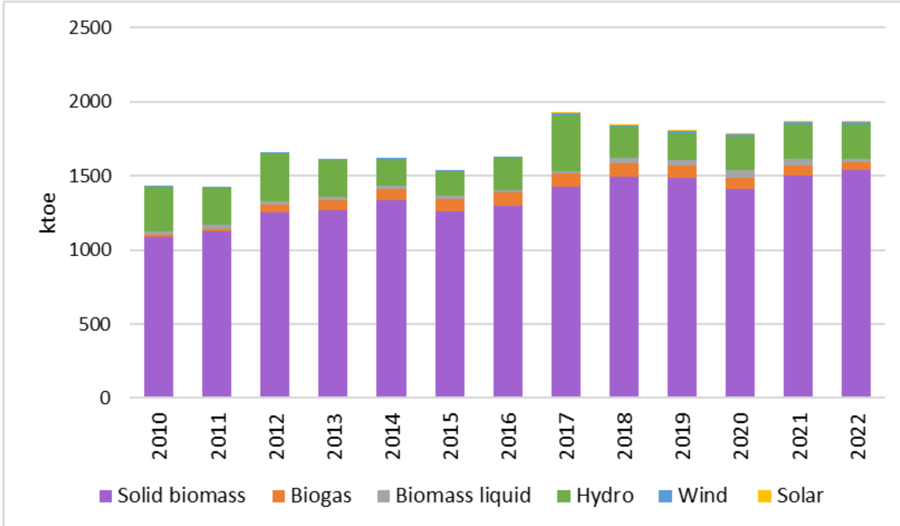

Figure 2.14 Renewable energy consumption in Latvia in 2010-2022 (CSB)

In 2022, RES consumption has increased by 30.3% compared to 2010. The consumption of biogas and wind has been the fastest growing, while solid biomass accounts for about 82% of total RES consumption in 2022. Solar photovoltaic (PV) installation is growing rapidly from 2022 onwards.

The above changes in the structure of primary energy sources have vitally decreased the carbon intensity of primary energy sources (measured as CO_2 t/toe in primary sources), allowing reduction of CO_2 emissions in the energy sector. The carbon intensity in primary sources has decreased from 2.37 t CO_2/toe in 1990 to 1.38 t CO_2/toe in 2022, or by 41.9%. Implementation of energy efficiency policies in various consumer sectors and growth in RES utilisation significantly contributes to limiting the GHG emissions in energy sector.

Electricity generation was 5.0 TWh in 2022. It consisted of electricity produced in hydro power plants (55.0%), electricity produced from natural gas in CHPs (24.1%), electricity produced in solid and gaseous biomass CHP (16.0%) and wind and solar power plants (4.6%). The power system is interconnected with the power systems in Estonia, Lithuania, Russian Federation and Belarus. Estonia, Latvia, and Lithuania will disconnect their electricity systems from the Russian and Belarusian network (BRELL) on February 8, 2025. From February 9 they will continue as a part of the Continental European network.

Net imports from the neighbouring countries vary considerably from year to year, mainly due to variations in hydropower production in Latvia and electricity price in bidding area of electricity exchange Nord Pool.

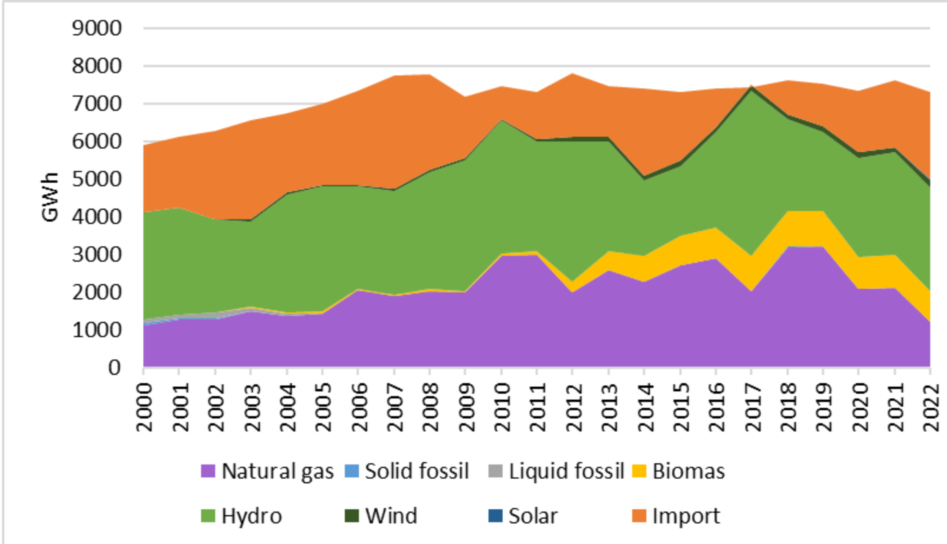

Figure 2.15 Electricity supply by production mode in Latvia in 2000-2022 (CSB)

The final energy consumption underwent trends like those of the consumption of primary energy sources, namely, in 2000 it was by about 49% lower than in 1990 (Figure 2.16). Starting with 2001, increase in the final energy consumption (FEC) was observed. Starting with 2010, programmes to increase energy efficiency in buildings (residential and public) and industry were implemented. Consequently, with GDP growing by 39.7% in 2022, compared to 2010, the FEC decreased by 6.7%. In 2022 it was 3.82 Mtoe.

The greatest changes occurred in the residential sector where energy consumption in 2000-2022 decreased by about 16.1% and its share in the final energy consumption decreased by about 4.2% points and in 2022 was 29.1%. The other largest share in the final energy consumption was in the transport sector, constituting 27.0% in 2022 and the decrease was by 2.3% points against 2000. In industry the final energy consumption had grown by around 57% in 2000-2022 and in 2022 its share was about 23.7% of the total consumption and the increase was by about 4.8% points, compared with 2000.

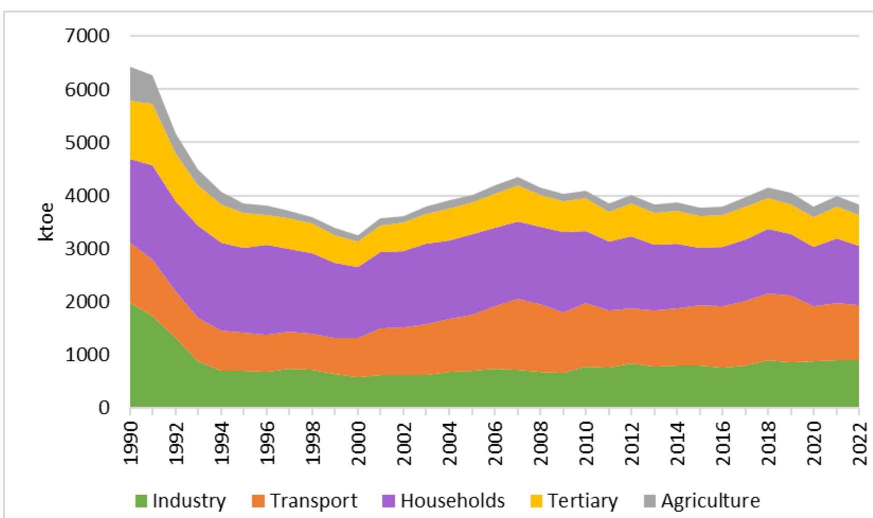

Figure 2.16 Final energy consumption by sector in Latvia in 1990-2022 (CSB)

When analysing the total final consumption as to structural fuel and energy changes in the period 2000-2022, the following key factors could be underlined:

- the share of district heating (DH) fell from 18.4% to 14.9%, the main causes − the measures taken for improving energy efficiency in buildings (residential and public) connected to DH system which led to decrease in the DH consumption (in absolute units);
- the consumption of oil products increased by 24.5% but the share grew from 32.5% to 34.7%, the main cause − rapid increase in the number of private cars and travelled vehicle km;
- the growth in the number of electric appliances in households and services sector, as well as the development of industrial sector raised the total electricity consumption by around 44.4%, while its share in the total final consumption increased by 2.8% points;
- if the consumption of biomass has increased by about 19.2% and its share in the FEC in 2022 was 25.9%, then the consumption of natural gas has decreased by 9.5% and its share in the FEC in 2022 is 7.8%.

Energy market

Latvia started opening its electricity market on 1st July 2007 when amendments to the Electricity Market Law took effect ensuring the right to electricity consumers to change the electricity trader. The next important step was taken on 1st November 2012 when all electricity consumers which were legal entities were obliged to purchase electricity for agreed price from the trader, and thus about 24500 entities, consuming about 75% of electricity, bought it in the free market. The market liberalization was completed on 1st January 2015 as all individual consumers (households) could become the free market participants.

According to the electricity trade register of the Public Utilities Regulation Commission (hereinafter referred to as the Regulator), 16 active traders for households and 24 legal entity consumers were registered for the sale of electricity in January 2022. The consumption of electrical energy is about 6.6 TWh and the major consumers in 2020 are tertiary sector (40.1%), manufacturing and building sector (28.6%) and residential sector (26.8%).

The Latvian bidding area of electricity exchange Nord Pool started its operation on 3rd June 2013. Currently, Nord Pool bidding areas are opened in all three Baltic States; and electricity trade is carried out in a uniform and consistent manner throughout the Baltic Sea region. Market participants of the Nord Pool Latvian open electricity bidding area may submit their quotes for transactions that will take place the following day (day-ahead market) or intraday market. The existence of both markets not only ensures greater liquidity of the Latvian electricity market, but also a more efficient utilisation of network transfer capability, and transparent energy price that the market participants can rely upon.

In fulfilment of common rules for the internal market in electricity, Latvia has separated the electricity distribution and transmission functions from the electricity trade and production company. As of 1st July 2007, functions of the electricity distribution system operator are performed by Sadales tīkls AS, independent subsidiary of Latvenergo AS (MoE is the holder of capital shares). In Latvia, the Regulator has issued 11 licences in total to distribution system operators, of which Sadales tīkls AS provides the service in 99% of the territory of the country.

On 1st January 2012, Augstsprieguma tīkls AS started operating outside the Latvenergo Group as an independent transmission system operator, all capital shares of which are held by MoF. Assets of the transmission system are owned by Latvijas Elektriskie tīkli AS, subsidiary of Latvenergo AS, which started its operation on 1st April 2011. Until 2020, Augstsprieguma tīkls AS rented transmission system assets from Latvijas Elektriskie tīkli AS, but on 8th October 2019 CoM adopted the decision on supporting Latvijas Elektriskie tīkli AS in contributing in the form of capital shares in the share capital of Augstsprieguma tīkls AS, and as a result of that Augstsprieguma tīkls AS will obtain in property transmission system assets – poles, lines, high-voltage substations, related real estates and other. Augstsprieguma tīkls AS is the only transmission system operator in Latvia and is operating in conditions of natural monopoly.

Efficient electricity transmission interconnections are one of the most important preconditions for optimal functioning of the electricity market. The Latvian electricity market, just like the energy market of the Baltics, is currently connected to the common European energy market with two sea cables connecting the Estonian and Finnish power systems – Estlink I, with the transmission capacity of 350 MW, and the Estlink II, with the transmission capacity of 650 MW. Estonia, Latvia, and Lithuania will disconnect their electricity systems from the Russian and Belarusian network (BRELL) on 8th February 2025. From February 9 they will continue as part of the Continental European network.

Since April 2017, the natural gas market has been fully liberalised, which is mainly related to the purpose of creating an effectively functioning and integrated EU energy market, ensuring high flexibility of the system, as well as strengthening energy security. In order to promote the development of competition and independence of operators of the transmission and distribution system, and at the same time observing the amendments to the Energy Law adopted on 11th February 2016, the historical natural gas monopoly Latvijas Gāze AS had to separate its natural gas transmission and storage infrastructure from the natural gas trading and distribution functions, namely legally separated natural gas transmission and storage system operator Conexus Baltic Grid AS and distribution system operator GASO AS were created. Natural gas consumption in recent years has been around 40 PJ, but it fell to around 29 PJ due to geopolitical conditions in 2022 and 2023. Around 50–55% of natural gas is consumed by the CHPs and district heating enterprises, while the rest is consumed in approximately equal proportions by the residential, tertiary and manufacturing sectors.

One of the most significant processes in the natural gas sector is the establishment of a single regional natural gas market of the Baltic States and Finland on 1st January 2020. This was possible due to the completion of the Estonia-Finland interconnection (Balticconnector) project in 2019 and its commercial use since 1st January 2020. Balticconnector is a gas pipeline between Finland and Estonia that will enable the natural gas markets of the Baltic countries and Finland to be connected and allow the integration of these markets with the EU common energy market.

At present, a single gas transmission tariff zone is functioning in Finland, Estonia and Latvia. The single natural gas market started functioning with two balancing zones – the combined Latvian and Estonian balancing zone and Finland. Further diversification of supplies of natural gas, as well the creation of a highly liquid and integrated regional natural gas market in Latvia and in the entire Baltic region are considered to be one of the most important future priorities on the natural gas market.

2.1.1.7. Transport Profile

Transport sector demand and supply are influenced primarily by development of economy, demographic factors, employment patterns and the provision of infrastructure.

The main types of transport include rail transport, road transport (public and private), air transport (domestic and international) and water transport (domestic and international). Road transport constitutes the largest share of energy consumption in the domestic transport. In 2022, passenger cars, trucks, buses and motorcycles were responsible for about 96.7% of energy consumption in domestic transport. Due to the decrease in rail freight transport over the last 5 years the share of rail transport in the total consumption decreased and in 2022 it constituted only 2.8%. The remaining 0.5% was made up by domestic air and domestic water transport. The share of road transport energy consumption in total domestic transport consumption has increased by 3.6% points over the last 10 years, while rail transport has decreased by 3.7% points. The share of electricity is only about 0.8% of total energy consumption in domestic transport.

The infrastructure of roads, railway, seaports and airports forms the Latvian transport network. In 2020, the total road length, excluding streets and forest roads, in Latvia was 50 036 km, out of which 20 061 km were national roads and 29 975 km municipal roads. The average road density was 1.094 km per 1 km^2, but the average density of the national road network is 0.310 km per 1 km^2.

The total length of Latvian rail network is 1 860 km, out of which 350 km are double-track and 250 km are electrified. In 2022, approximately 95% of the structure of rail freight transport was international rail freight transport, mainly from Latvia's neighbouring and CIS countries to Latvian ports (East-West transit corridor). The share of domestic transport was only 5%, which can be explained by the relatively short transport distances.

Latvian ports are important logistics hubs in the Baltic region. Latvia has three big ports (Ventspils, Rīga and Liepāja), the ratio of which in total cargo turnover constituted 95.4% in 2022, and seven small ports (Engure, Jūrmala, Mērsrags, Pāvilosta, Roja, Salacgrīva, Skulte). The three big ports are outspokenly ports of export as the cargos shipped from them (mainly transit cargos from Russian Federation, Belarus and other CIS countries) exceed greatly the volume of the cargos received.

Though air transport is not of significance for local transportation, the development of Riga International Airport plays an important role in the development of other sectors, especially tourism. Riga International Airport is the biggest international airport in the Baltic States and the number of passengers it serves increases continuously; it reached 5.4 million passengers in 2022.

Passenger Transport

Despite of 21% population decline in 2022 compared to 2000, passenger transport (as measured in passenger kilometres) has increased by 1%. The rapid growth was ensured by the trends developing up to 2007, when the average annual growth reached 4.3% per year. The growth rate was due to the rapidly increasing number of passenger cars up to 2007. Due to the economic recession, mobility indicators declined sharply between 2008 and 2010, but from 2013 the growth rate stabilized through 2019. Due to the Covid-19 pandemic in 2020 and 2021, passenger traffic decreased, especially for the public transport (Figure 2.17).

In 2022, most of passenger movement was ensured by road transport: passenger cars – 85.3%, buses – 9.7% and railway (train and tram) – 5.0%. These modes of transport have demonstrated different trends since 2000 (Figure 2.17). The passenger kilometres travelled by passenger cars in Latvia increased steadily in the period under consideration (by 11.0%) and their share in the total passenger transport increased by 7.7% points, while rail and tram travel decreased by around 23.3% and their share in passenger transport decreased by 1.6% points and passenger kilometres travelled by bus decreased by around 38.1%, but their share decreased by 6.1% points. As a result, the share of public transport in total passenger traffic in 2022 is 7.7% points lower than in 2000, which has a negative impact on GHG emission reduction in the transport sector. Due to the slow pace of replacement of private cars by new, more efficient and alternative fuel ones (compressed natural gas (CNG), battery electric vehicle (BEV) and plug-in hybrid electric vehicle (PHEV)), it has not been possible to decouple the increase in GHG emissions from the increase in travelled vehicle km.

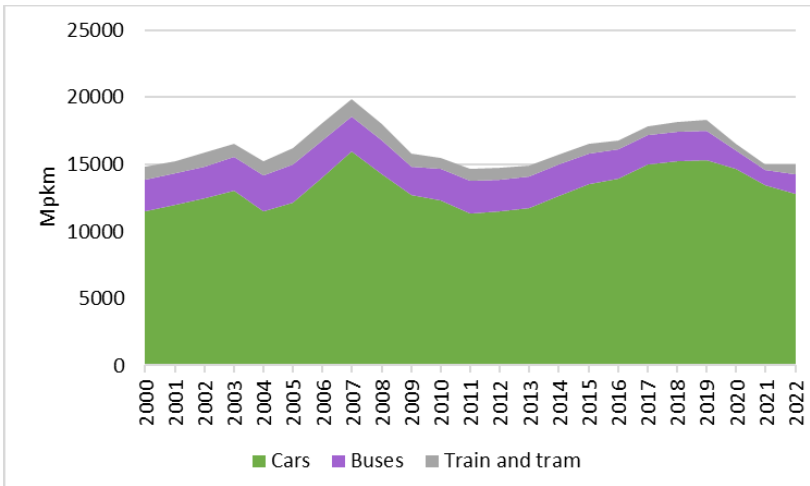

Figure 2.17 Passenger travel by transport mode

Freight traffic

The year 2022 showed the increase of freight traffic (measured in tonne-kilometres) against 2000 (21.5%) (Figure 2.18). This trend was mainly driven by the growth of road transport, excluding in cross-trade, (approximately 2 times). By contrast, freight transport by rail decreased significantly from 2020 and is 44.3% lower in 2022 than in 2000. It must be noted that the volume of rail freight strongly depends on the import and export shipment volumes in the ports and harbours of Latvia. In Latvia, the dominant position in inland transportation is taken by trucks due to transporting over short distances (less than 300 km). Rail freight transport ensures mainly export and import freight transportation from and to the ports of Latvia. In 2022, the share of road freight traffic in the total freight transportation (measured in tonne-kilometres) was 66.3%, which was by 39.8%

more than in 2000. The share of rail freight traffic constituted 33.7%. It should be noted that the share of rail transport in 2022 decreased by 16.4% points, compared to 2019.

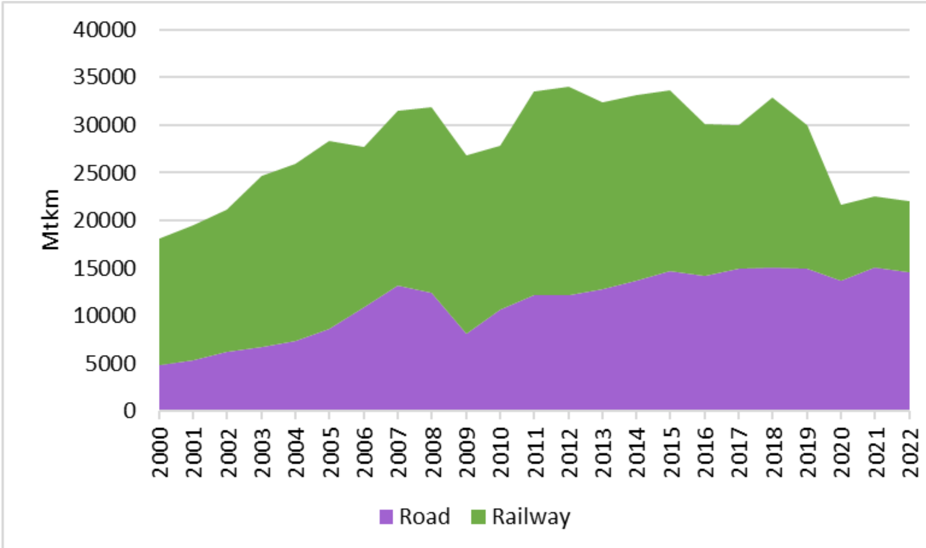

Figure 2.18 Freight traffic by transport mode

2.1.1.8. Industry

The industry is one of the largest sectors of Latvian economy. In 2022, it generated 16.7% of total VA. The manufacturing industry generated 13.7% of total VA in 2022 and employed about 15.5% of total employment. It was also vitally important for promoting foreign trade of Latvia as in recent years, as usual, around 2/3 of all products have been exported. Over the last five years, the share of exported products has slightly increased. The sub-sectors with a share of exports in sales above 85% are manufacture of vehicles, manufacture of machinery and appliances, manufacture of electrical and optical equipment, and light industry. Traditionally, most of the food industry's products are sold in the domestic market.

The share of export in the total sold production in 2022 differed significantly among different sectors. The lowest export share (around 40%) had food and beverage sector, while the highest one (more than 90%) had machinery and transport equipment production sector.

About 70% of products produced in manufacturing are sold in markets of the EU countries. The share of sales to CIS countries amounts to 10%. Sales of products in markets of other countries increased to 20%, when the United Kingdom withdrew from the EU in 2020.

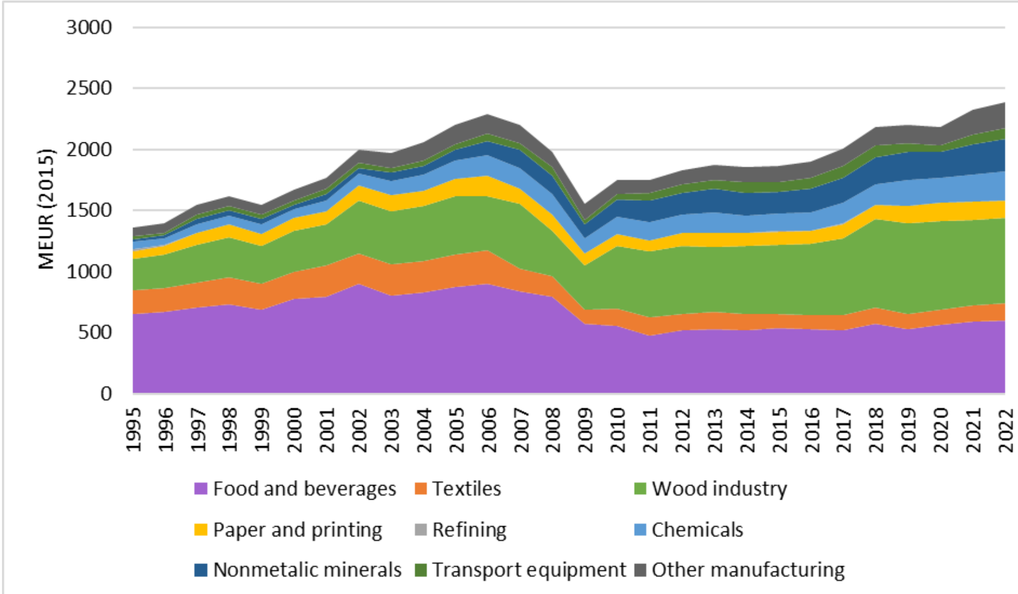

Figure 2.19 VA in the manufacturing industry, MEUR (2015) (CSB)

During the 20-year period (2020–2022) the VA in manufacturing industry increased by average 2.6% annually. The 2008-2009 economic recession had a substantial impact upon the manufacturing industry – the VA in 2009 was about 28% lower than in 2007 (Figure 2.19). After the recession of those years, the manufacturing industry successfully recovered and had good VA growth up to 2019.

The development of the manufacturing industry is promoted by the improvement of the competitiveness of Latvian producers, as well as the dynamics of demand in the largest export markets. Between 2015 and 2022, output volumes of manufacturing were growing stably – by an average of 4% per year. The growth of VA in the manufacturing industry was particularly high in 2017 and 2018 when VA, compared to the previous year, increased by 6.8% and 7.2% respectively. 2020 was full of challenges for manufacturing. In 2020, as the Covid-19 crisis hit, VA increased by only 0.14%. In 2021, manufacturing developed dynamically, reaching a total growth of 7.5% during the year. Growth of manufacturing continued in 2022, although at a slower pace.

In 2022, the significant contributions in the manufacturing industry as to VA production were provided by wood processing (21.7%), food and beverages (18.7%), machinery and metal products (24.4%), chemicals products (7.3%) and non-metallic minerals (8.1%). Compared to 2007, the most substantial changes in the structure of VA production were decrease in the shares of food and beverages by 12.8 percentage points and textiles industry by 2.7 percentage points, while it increased in machinery and metal products by 9.4 percentage points, wood processing by 2.2 percentage points, non-metalic minerals by 2.5 percentage points (Figure 2.19).

In 2022, the most important sectors in the manufacturing industry as to the number of jobs were food and beverages (19.2%), wood processing (20.0%), fabricated metal products (11.4%), light industry (8.0%), chemicals and pharmaceuticals (7.3%), non-metallic minerals (5.0%).

Energy consumption in the industry

In 2022, the VA in the manufacturing industry is 77.3% higher than in 2000. At the same time, thanks to the implementation of energy efficiency improvement measures in the sector, the final energy consumption has grown less. In 2022, the final energy consumption is 57.4% higher than in 2000.

Changes in the final energy consumption were different in manufacturing sectors (Figure 2.20). Decrease is observed in such sectors as primary metals (by 99%) due to the closure of the only metal production plant in 2016, food and beverages by 48.1%, paper and printing sector by 35.0%, textiles – by 88.2%, transport equipment – by 55.0%. At the same due to the rapid growth of production energy consumption of wood industry have grown by about 5.8 times. Energy consumption growth took place also in non-metallic minerals – by 1.5 times, chemicals – by 47.6%.

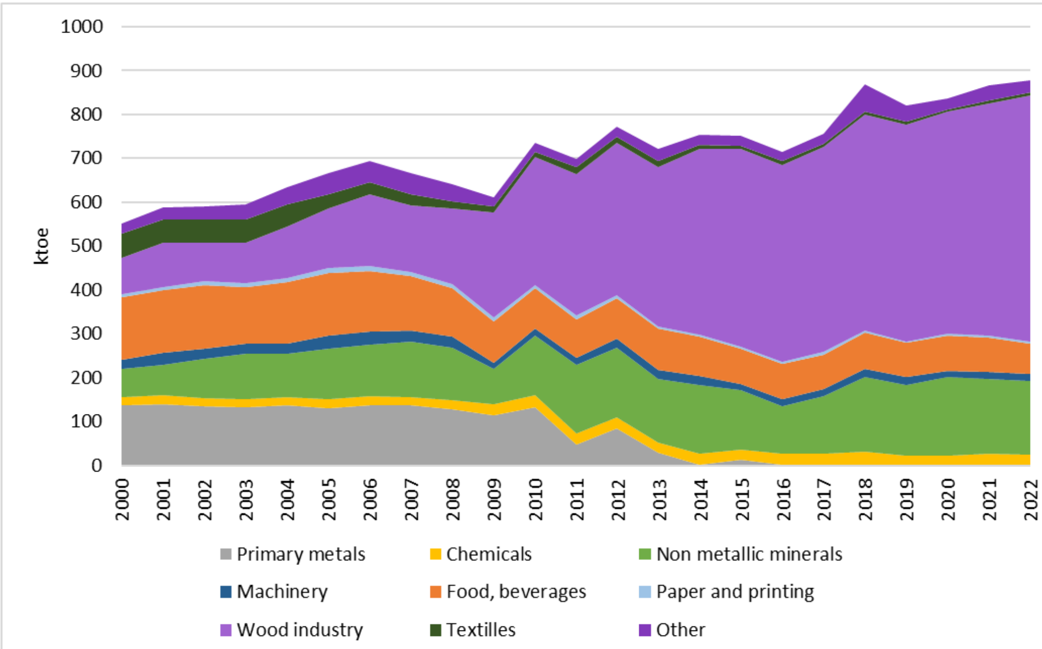

Figure 2.20 Final energy consumption in manufacturing by sectors, ktoe (CSB)

The changes in energy consumption caused the share of total consumption by each sector. Decrease in the share of food and beverage sector, textiles, steel production and the increase of wood and wood products sector share in the total consumption are seen. In 2022, wood and wood products and non-metallic minerals sectors together consumed more than 83% of the total final energy consumption in the manufacturing industry. Both sectors are relatively energy intensive and therefore production efficiency and technologies used have a significant impact on the evolution of GHG emissions in the sector. It should be noted that biomass and other renewables are used relatively widely in both sectors.

In the period 2000-2022 substantial changes occurred also in the consumption of types of energy and the structure of the energy sources consumed. Electricity consumption increased by 30.4%, but its share decreased by 3.6 percentage points and was 17.5% in 2022. Consumption of natural gas decreased by 65.7%, but its share by 29.9 percentage points and constituted 8.2% in 2022. Consumption of oil products (residual fuel and diesel oil) dropped by 77.5% and its share by 22.9 percentage points and was 3.8% in 2022. Consumption of solid biomass increased more than eight times and in 2022 its share was around 55% of total energy consumption in the manufacturing industry (Figure 2.21).

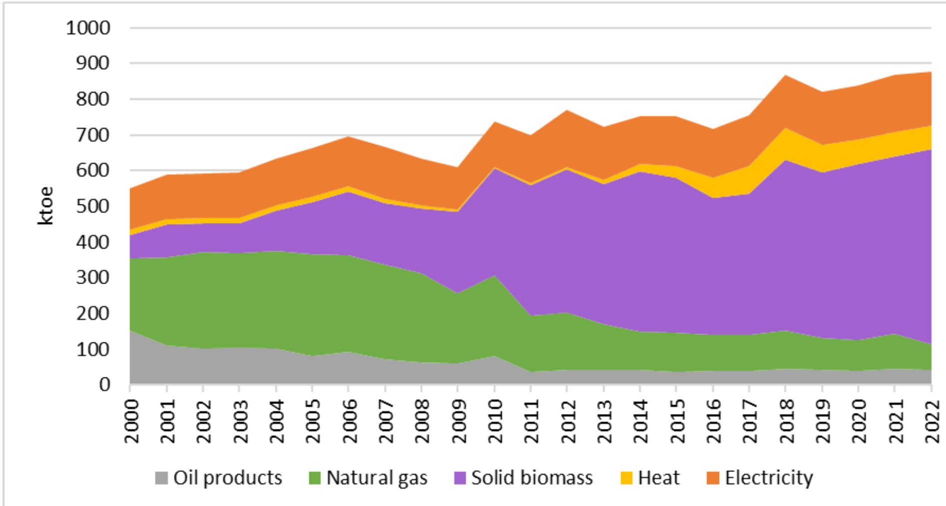

Figure 2.21 Final energy consumption in manufacturing (CSB)

In 2022, the share of fossil fuels in the total final energy consumption in manufacturing industry was only about 13%. Compared to 2000, the share of fossil fuels has decreased by about 53 percentage points.

Implementation of energy efficiency improvement measures and replacing fossil fuels with solid biomass fuels and electricity has made it possible to limit the growth of GHG emissions in the manufacturing industry.

2.1.1.9. Waste management

Waste management has acquired prior significance in the environmental protection policy as one of the instruments for sustainable use of natural resources. The purpose of the waste management system is to reduce the impact of the waste management process, which is achieved by reducing the amount of waste generated, safely treating and recovering waste, or returning waste to economic circulation.

Now 10 non-hazardous waste polygons and one polygon for hazardous waste got "A" category permits according to Integrated Pollution Prevention Control (IPPC) directive. Biogas collection and use for energy production from biodegradable waste and sludge is set as one of waste management priorities in Latvia.

The new EU policy period is marked by new strategic goals. These goals have been included in the main planning document for waste management sector - "National Waste Management Plan for 2021-2028". In 2015, the EC adopted an action plan for the transition to a circular economy. It is envisaged that the measures contained in the action plan could not only promote the sustainable management of natural resources and prevent environmental degradation, but also bring significant savings to the economy and reduce annual GHG emissions.

In 2022, approximately 5000 separate collection points and approximately 90 waste sorting areas were in operation.

Table 2.1 Generated waste in Latvia (kt)

Year	Municipal (all non-hazardous) waste	Hazardous waste	Total
2006	1420.46	54.37	1474.83
2007	1386.57	41.61	1428.18
2008	1368.79	46.40	1415.16
2009	1033.91	55.56	1089.47
2010	1131.40	55.09	1186.49
2011	1535.06	58.48	1593.53
2012	1799.44	85.12	1884.56
2013	1902.01	109.23	2011.24
2014	2128.73	80.98	2209.70
2015	2087.51	86.60	2174.11
2016	1980.28	63.66	2043.94
2017	2141.21	68.76	2209.97
2018	1587.74	118.14	1705.88
2019	1698.71	115.46	1814.17
2020	1605.95	150.03	1455.97
2021	2011.35	111.18	2122.53
2022	2099.51	79.17	2178.68

Objectives of the "National Waste Management Plan 2021-2028" plan are:

- objective 1 - to prevent the generation of waste and to ensure the total amount of waste generated significant reduction by maximizing all the best available waste prevention options and best available techniques by increasing resource efficiency and promoting more sustainable consumer behaviour model development;
- objective 2 - to ensure the rational use of waste as a resource based on the basic principles of the circular economy and encouraging the return of resources as far as possible back into economic circulation in a way that benefits the economy;
- objective 3 - to ensure that the waste generated is not hazardous or poses little risk the environment and human health by promoting appropriate product policies that are hazardous and harmful to the environment restrictions on substances and improving consumer awareness;
- objective 4 - to ensure the reduction of landfills and disposal of waste in a way that is safe for human health and the environment.

The main treatment operation for municipal solid non-hazardous waste is disposal. According to the EU requirements and "National Waste Management Plan 2021-2028" it is planned to reduce waste disposal till 10% from generation in year 2035. To reach this target complex actions need to be implemented:

1. waste sorting at source;
2. increase biodegradable waste pre-treatment;
3. biodegradable waste recycling;
4. increase production of refused derived fuel production.

Reducing waste disposal till 10% from generated amount in 2035 is a reason because CH_4 emissions from disposal almost by 50% will decrease compared to 2022.

Table 2.2 Disposed solid waste amounts 2002-2022 (kt)

Year	Total disposed solid waste amount	Disposed in polygons (MCF=1)	Stored in bioreactor	Disposed in deep unmanaged sites (urban area, MCF=0.8)	Disposed in shallow unmanaged sites (rural area, MCF=0.4)
2002	658.00	217.46	NO	303.97	136.57
2003	578.90	207.74	NO	256.07	115.05
2004	631.70	282.84	NO	240.71	108.15
2005	610.90	370.43	NO	165.89	74.53
2006	670.00	454.39	NO	148.78	66.84
2007	775.10	553.27	NO	153.09	68.78
2008	704.80	566.89	NO	95.12	42.74
2009	637.50	549.50	NO	60.71	27.28
2010	605.40	586.90	NO	12.73	5.72
2011	548.70	543.50	NO	2.60	2.60
2012	529.50	525.50	NO	1.98	1.98
2013	534.20	534.20	NO	NO	NO
2014	505.20	505.20	NO	NO	NO
2015	503.90	503.90	NO	NO	NO
2016	515.70	353.90	161.90	NO	NO
2017	517.90	230.60	287.20	NO	NO
2018	508.80	219.30	289.50	NO	NO
2019	506.39	202.78	303.61	NO	NO
2020	494.35	218.61	275.74	NO	NO
2021	502.03	283.11	218.92	NO	NO
2022	432.75	432.75	NO	NO	NO

2.1.1.10. Building Stock and Urban Structure

Residential buildings

Due to climatic conditions in Latvia heating is required for about 192-206 days a year depending on region of the country, and, thus, the share of building sector in the total final energy consumption constitutes about 30%. In the Information System of the National Real Estate Cadastre (NREC IS), 1.37 million buildings were registered with the total area of 206.6 million m^2, including various auxiliary buildings. In 2020, the total area of residential buildings was 90.1 million m^2. The major part was multi-dwelling (three and more dwellings) buildings (56.6%), while single-dwelling buildings constituted about 42.5%.

The population concentration around capital Rīga is high, as the floor space in Rīga and its suburbs constitutes about 51% of total residential building floor space in Latvia.

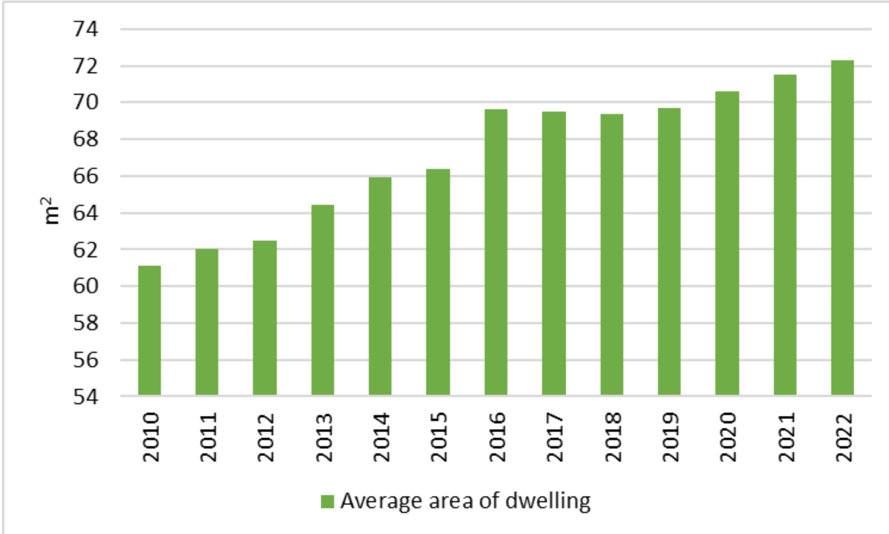

Figure 2.22 Changes in the floor space of households

The increase in the welfare of the population has contributed to the improvement of the living conditions of the population and, as a result, an increase in average area of dwelling (Figure 2.22). In 2010-2022, the indicator grew by 18.3%. The increase in the values of this indicator determines the increase in energy consumption for heating residential buildings.

Figure 2.21 shows multi-apartment residential buildings by the period of construction. It reveals that about 45% were built by 1940. After 1979, just over 17% of the total number of multi-storey residential buildings has been built. After 2003, an average of 3.5 thousand dwellings have been put into operation per year, but in total about 60 thousand dwellings have been put into operation during this period.

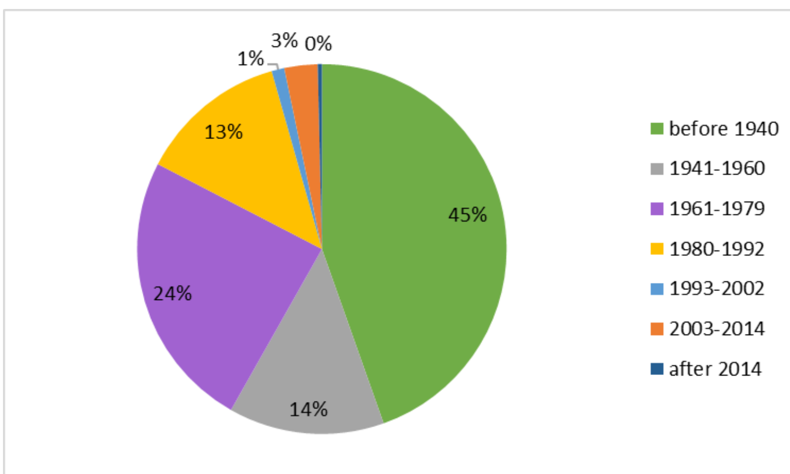

Figure 2.23 Residential buildings by the period of construction

In each period slightly different building materials and technologies were used and each period had different requirements for thermal insulation which tightened over years. Changes in the thermal and technical requirements of building envelopes since 1980 are shown in the following figure. As shown in the figure, the increase in requirements has significantly reduced the energy consumption for heating (Unit consumption per m^2 for space heating, kwh/m^2/year) in new residential buildings over time.

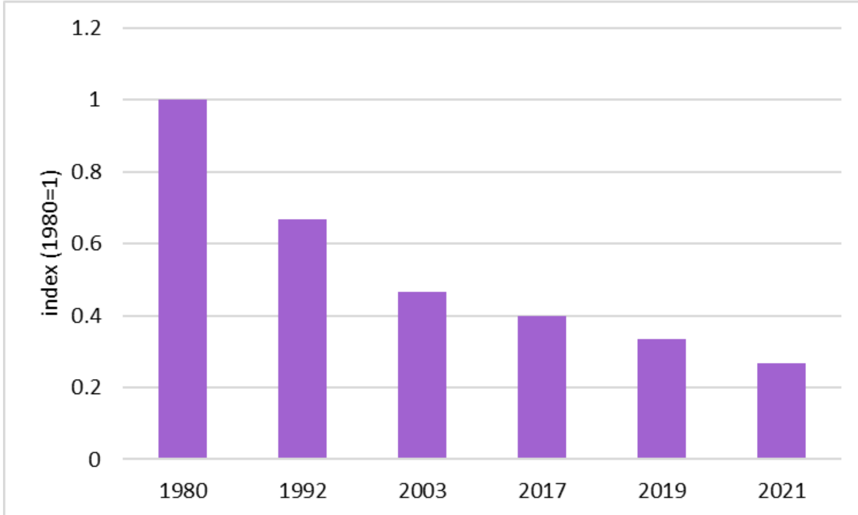

Figure 2.24 Impact of strengthening thermal engineering regulatory requirements for building envelope on unit consumption per m² for space heating in new residential buildings

Renovation of existing residential buildings, increasing energy efficiency, and strengthening the thermal regulatory requirements for building envelopes for new buildings have reduced specific energy consumption for heating by about 31% over a 13-year period, or an average of 3.1% per year. This has been one of the factors in limiting GHG emissions from residential buildings.

Figure 2.25 Unit consumption per m² for space heating with climatic corrections

Different energy sources were used for heating residential houses. In 2022, the three most important sources were wood biomass (53.0%), district heating (34.8%) and natural gas (9.8%) (Figure 2.26). Coal consumption for heating in households has declined over the past decade.

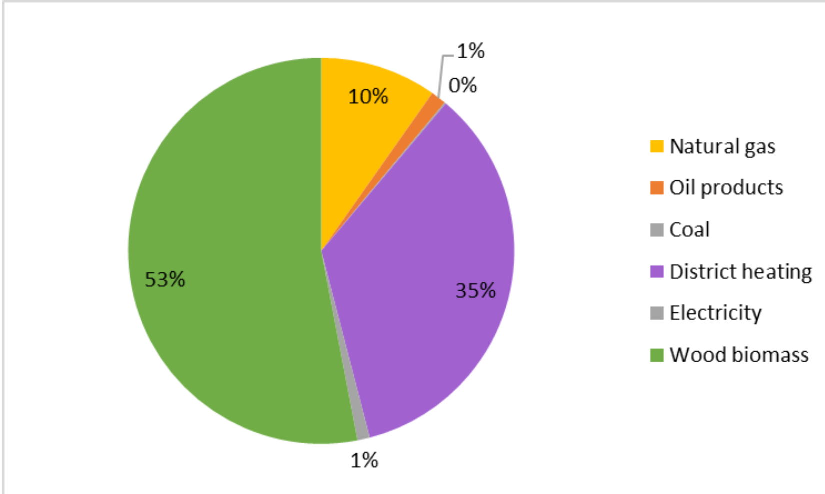

Figure 2.26 Energy sources for heating residential buildings in 2022

The low share of fossil fuels and the high proportion of solid biomass and DH for household heating are favourable conditions for non-growth of GHG emissions in households.

Non-residential buildings

The NREC IS data provide information on slightly more than 31 thousand registered commercial and public buildings, with the total area of 27.1 million m^2 which require energy for maintaining the microclimate.

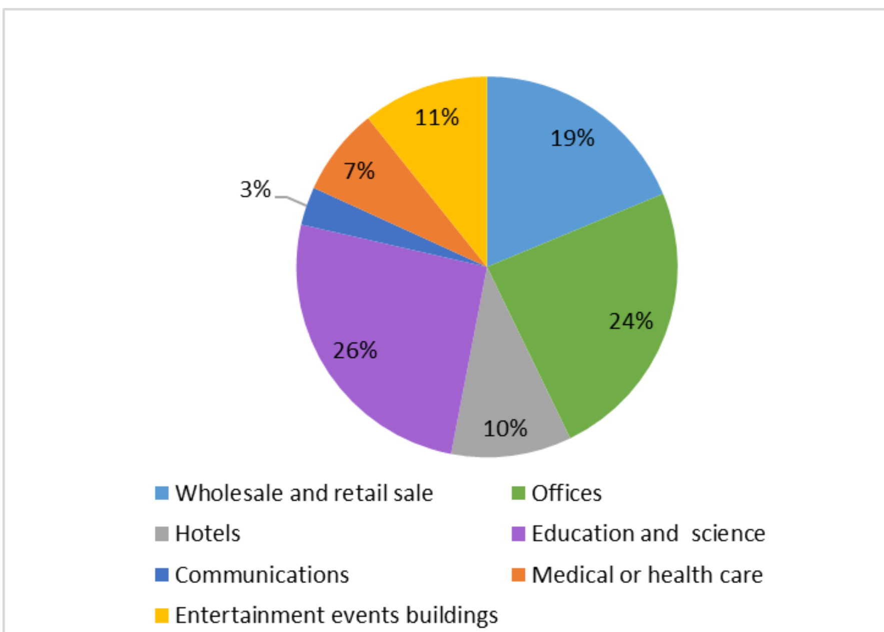

Figure 2.27 Types of non-residential buildings by area use

For the heating of commercial and public buildings in 2022, the main types of fuel and energy are district heating (39%), natural gas (31%) and biomass (17%). Compared to 2000, the share of coal consumption for space heating has significantly decreased and the share of natural gas consumption has increased. These structural changes in energy consumption have helped to limit the increase in GHG emissions as the sector expands.

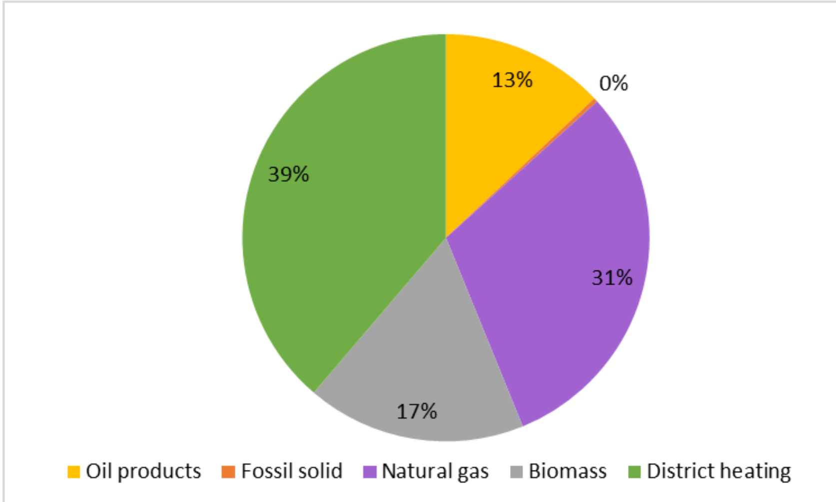

Figure 2.28 Energy sources for heating commercial and public buildings in 2022

2.1.1.11. Agriculture

Agricultural land is one of the most significant natural resources in Latvia. Climatic conditions and soil fertility are suitable for different branches of agricultural production, including grain, rape and vegetable production. The climatic conditions and soils are suitable for high yield and the efficient cultivation of meadows, pastures and perennial grass, providing excellent opportunities for the development of cattle livestock and, especially, dairy farming. The main emphasis of Soviet Latvian agriculture was animal husbandry. However, during the last years, the size of cattle herds has substantially decreased. Latvian agriculture is focused on grains, potatoes, forage crops, cattle breeding and dairy production.

About 16% of the population was involved in agriculture by 1990. After regaining independence in 1991, Latvia undertook large-scale land reform, transforming state farms into individual land. Many of the new landowners had little interest in farming. 9.5% of the population was engaged in agriculture and agriculture and provided only 4.1% of GDP in 2000. Changes occurred in 2004 when Latvia joined the EU. Now the agricultural sector in Latvia accounts for 4.2% of GDP across economic sectors but employs about 7% of Latvia's workforce (2023).

Agricultural Census 2020 carried out by the Central Statistical Bureau (CSB) shows that in 2020, there were 69 thousand economically active agricultural holdings in Latvia, managing 1.97 million ha of utilised agricultural area (UAA), or 30.5% of the territory of Latvia.

The changes have occurred despite the increase in productivity in agriculture. Agricultural intensification also means changes in the use of agricultural land. During the last decade, the share of meadows and pastures in the total agricultural land has decreased from 35% (2014) to 30% (2022). At the same time, the total UAA increased by almost 100 thousand ha or 5%. At the same time, the arable land areas increased by 150 thousand. ha or 12%.

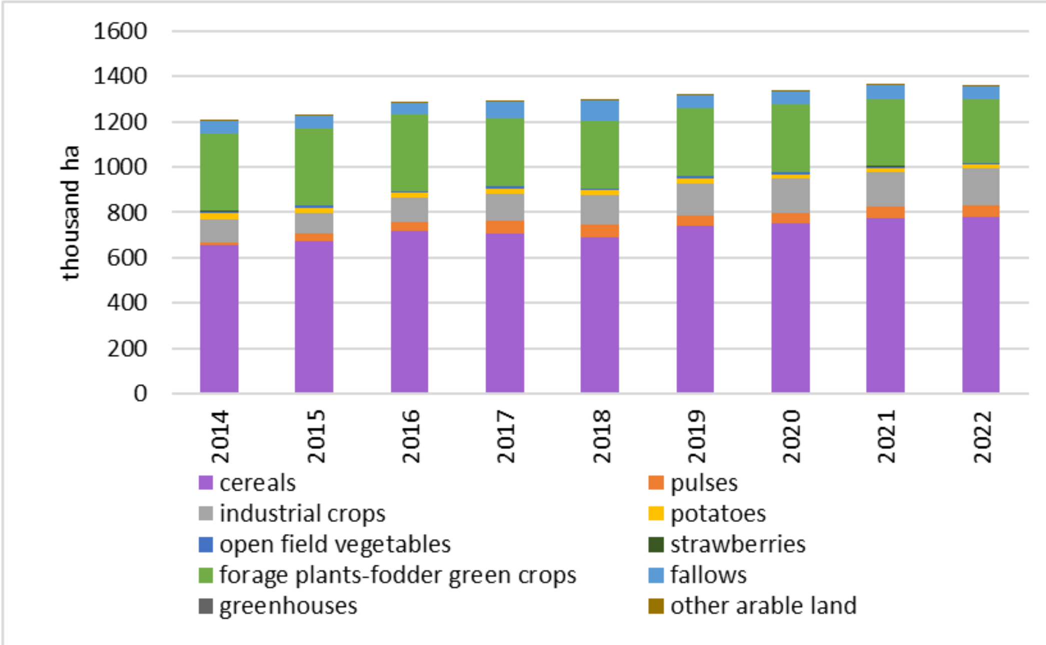

Figure 2.29 Arable land distribution by use 2014-2022 (CSB)

The largest increase in arable land areas is for cereals by 21%, as well as industrial field crops by 53%. There was a strong increase in pulses, which can be attributed to policy measures (Figure 2.29).

The total sown area increased by 48.0% during 2000-2022 (Figure 2.30). Additionally, consumption of nutrients per ha of sown area has decreased in last years. The volume of mineral fertilizers used per one ha has reduced from 117 kg in 2021 to 106 kg in 2022 or by 9.4%.

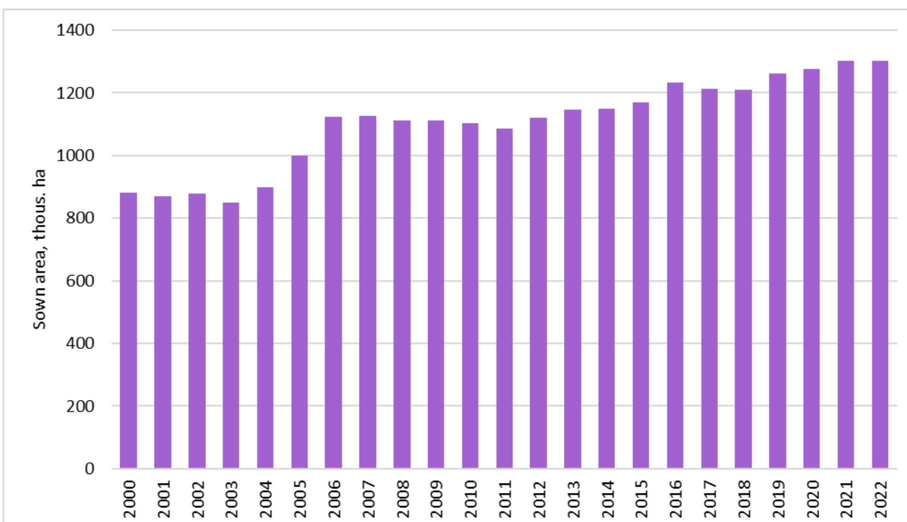

Figure 2.30 Sown area, thousand ha (CSB)

Dairy farming is one of the most important branches of agriculture in Latvia. However, at the end of 2022 the number of cattle decreased by 2.1 thousand or 0.5%. Number of dairy cows kept declining – from 131.2 thousand at the end of 2021 to 127.8 thousand at the end of 2022 or by 2.6%. In 2022, the total number of cattle accounted for 391.4 thousand. The average milk yield per dairy cow grew by 130 kg or 1.8%, reaching 7492 kg annually.

At the end of 2022, compared to the year before, the number of pigs and sheep fell by 19.1 thousand or 5.8% and 3.0 thousand or 3.3%, respectively. The number of goats and horses grew slightly – by 2.5 % and 3.3%, respectively. At the end of 2022 the number of laying hens dropped by 51.7 thousand or 1.5%[5].

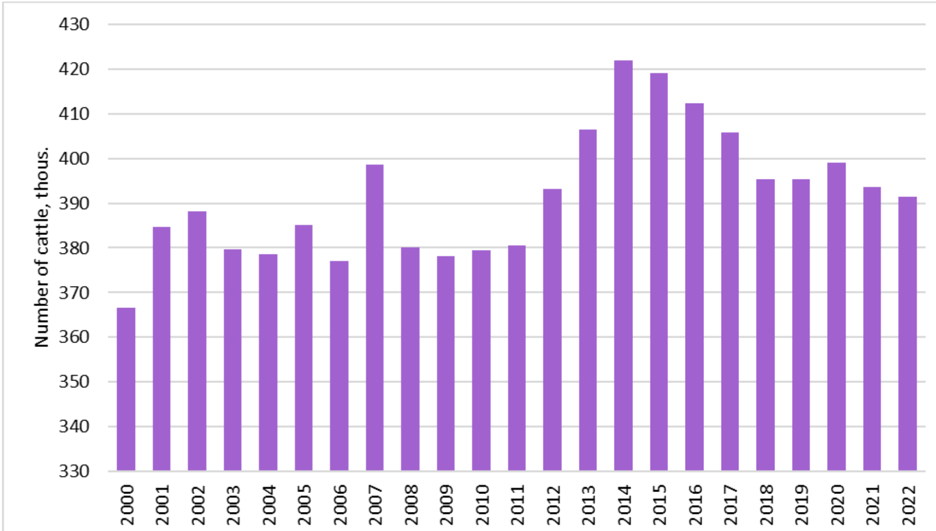

Figure 2.31 The population of cattle (CSB)

The most significant cause of emission change is the structural changes of farms. Since 2001 agricultural holdings have become larger in terms of total land area, utilised agricultural area, and number of livestock. At the end of 2023 there were 59.7 thousand agricultural holdings in Latvia and the average size of a holding constituted 46.7 ha. Agricultural area on average per holding has increased from 26.9 ha in 2020 to 32.1 ha in 2023 or by 19.3%. Over the past 20 years, the total number of agricultural holdings has reduced by 31.7% while the average size of a holding has increased 2.3 times, according to the provisional Integrated Farm Statistics 2023 compiled by the CSB. Agricultural area occupied 1.97 million ha in 2023 and has not changed over the last three years. Compared to 2020, the number of small holdings managing under 10 ha of agricultural area has reduced by 8.2 thousand in 2023. The number of large holdings managing more than 100 ha of agricultural area has increased by 0.2 thousand. Last year, large holdings were managing 68.9% of the total agricultural area (8% more than 2020) and farmed 54% of the total livestock (2.4% more than in 2020).

From 2015, the Greening Payment was introduced for observing agricultural practices favourable to the climate and the environment. Starting from 2023, the Greening Payment is replaced with the Support for Eco-schemes. For example, support can be received for climate and environmentally friendly agricultural practices, for agroecological practices in organic farms, for agricultural practices that reduce nitrogen and ammonia emissions, and pollution. Organic farming sector continues to develop and plays a crucial role in achieving the goals of sustainable development. Farmers who follow organic farming practices are granted with additional support. The number of organic farms is increasing - in 2005, 2 838 farms were organically farmed, in 2023 there are 3 610 organic farms, and they manage 16% of all agricultural land. Structural changes are taking place in organic agriculture - there is tendency to decrease the number of small farms

[5] Agriculture of Latvia. Collection of Statistics. Rīga (2023). Available: https://stat.gov.lv/en/statistics-themes/business-sectors/fishery-and-aquaculture/publications-and-infographics/15214?themeCode=ZI

(0-30 ha) and their managed area, while the number and managed area of large farms (100 ha and more) have been significantly increasing in recent years.

Agriculture is the second largest GHG emission sector after the Energy sector with a 22.2% share of the total GHG emissions in 2022. Annual emissions have been reduced by 55.2% since 1990 due to decrease mainly in the number of livestock, sown area and nitrogen fertilizers. In 2022, agricultural soils were responsible for 46.5% of the total emissions from Agriculture. The second largest emission source was enteric fermentation by contributing 42.0% of the total agricultural emissions. Manure management constituted 7.8% from the Agriculture emissions in 2022. Liming and urea application were less significant emission sources producing 3.7% of the total agricultural emissions in 2022. Largest share creates N_2O emissions constituting 49.5% followed by CH_4 emissions with 46.8% of the total GHG emissions from agricultural sector. Remaining 3.7% of the total GHG emissions from agriculture originated from liming and urea fertilization. The most important source of CH_4 emissions is dairy cattle, because of the significance of dairy sector in Latvia. Largest sources of N_2O emissions from soils are organic soils, nitrogen fertilizers and crop residues. At the end of 2022 in Latvia there were 61.8 thousand agricultural holdings, and the average size of a holding constituted 44.7 ha, which is 13.5% more than a year before. Agricultural area on average per holding has increased to 31.1 ha in 2022. Compared to 2021, in 2022 the total utilized agricultural area in the country grew by only 0.3 thousand ha and found 1 970.4 thousand ha. Over the year arable land has decreased by 5.5 thousand ha or 0.4% while areas of pastures and meadows increased by 4.8 thousand ha or 0.8%.

2.1.1.12. Forestry

Latvia is among the most densely forested countries in Europe. Since the beginning of the last century, the forest land area of Latvia has almost doubled by occupying 3300 thousand ha in 2022. In terms of property share – 48% are state owned forests, the remaining forests are under private ownership (about 135000 owners) with an average property size of 11.1 ha. Forests are of major importance for the national economy of Latvia as well as provide different ecosystem services including purification of air by capturing CO_2 and recreation. The total area of Latvia is 6.46 million ha including 6.22 million ha of land area. According to the NFI 51% of the land area is forest (excluding forest infrastructure, e.g., road networks and seed orchards), 38% is farmland (including 27% of cropland and 11% of grassland), 7% are wetlands, including water bodies, and 4% are settlements. Ditches are reported as forest, cropland, grassland, settlement or wetland depending on dominant surrounding land use category.

The species dominating in the forests in Latvia are – pine, spruce and birch occupying 73.4% from the total forest area. Though, coniferous forests dominate in state owned forests. In the result of fast overgrowing of agricultural and coniferous forest felling areas are naturally regenerated with deciduous trees the share of birch and other broadleaves is increasing in Latvia. Forest resources constitute the main national wealth.

As the forest area in Latvia has been increasing over the past 20 years, continuing the trend of previous century, when forest area more than doubled. The volume of timber in the forest, the growing stock has also increased substantially. 84% of Latvia's forest area (79% of the growing stock) were available for wood supply in 2020 without restrictions. In 2022, total growing stock volume in Latvia was 680.4 million m^3 including 368.0 million m^3 or 54% of total growing stock volume in state owned forests. According to the NFI, growing stock gross increment, including natural mortality and harvested trees, during previous 5 years was in average 26.0 million m^3 per year (6.5 m^3 ha^{-1}), natural mortality – 5.8 mill. m^3 (1.9 m^3 ha^{-1}) and harvest rate – 18.1 mill. m^3; respectively, the net increase of growing stock during the previous 5 years was 1.6 mill. m^3 yr^{-1}.

In Latvia, traditional forest management cycle (from 40 up to 120 years depending on tree species and site index) consist of following stages: regeneration (till age of 5-10 years); tending of young stands (till age of 20-40 years); forest thinning (till age of 40-90 years); regenerative felling (from 50-120 years age, depending on dominant species, management regime and site index). All of the above-mentioned forest management cycle stages are regulated according to laws and relevant regulations. All the forests owned and managed by the state are certified by Programme for the Endorsement of Forest Certification (PEFC) promoting sustainable forest management and partly Forest Stewardship Council (FSC) certified assuring that products come from responsibly managed forests that provide environmental, social and economic benefits.

In Latvia, the reforms in forestry sector were started in 1998 when the CoM Regulation adopted the Forest Policy. The main goal defined in the policy is to ensure a sustainable management of Latvian forests and it is being accomplished by documents of policy planning and regulations: the Forest Law, Forest-based Sector Development Guidelines (2015-2020) and other forest related regulations. In the context of forest policy "sustainable management" means the stewardship and use of forests and forest land in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfil, now and in the future, relevant ecological, economic and social functions, at local, national, and global levels, and that does not cause damage to other ecosystems. The Forest Policy underlines that forest is an important part of Latvian environment and economics. The goals of the policy are:

- to ensure that the area of forest is not decreasing by setting limits to the forest land transformation;
- to ensure maintenance and increase of productivity of forest land;
- to encourage afforestation of agriculturally non-effective land.

The Forest Law (adopted in 2000 with latest changes in 2017) is the central law of the forest sector of Latvia, stating the following goals:

- to promote economically, ecologically and socially sustainable management and utilization of forests by ensuring equal rights to all owners and legal possessors of forest, ownership privacy, independence in economic actions and equal duties;
- to regulate terms of management.

According to the Forest Law the CoM defines terms of evaluation of a sustainable forest management by meeting criteria and indicators of Pan-Europe. Following the definitions of this Law, the responsibility of a forest owner or legal possessor is to regenerate forest stand after regenerative felling.

The Regulation on Determination Criteria of Compensation and Calculation of Deforestation defines a procedure of calculation and compensation and criteria for negative effect caused by deforestation. It defines that the compensation to the government should be paid if the land that is registered with NREC IS as the forest area deforested. The compensation should be paid for:

- decrease of carbon dioxide attraction potential (can be compensated with afforestation);

- reduction of biological diversity;
- decrease of quality of the environmental and natural resource protection zones and sanitary protection zone functions.

In general, in Latvia, forest land was a net sink in 1990-2021 (GHG removals reached 19 758.20 kt CO_2 eq. in 1994), while in 2022 forest land was a net source of GHG emissions (total net GHG emissions in forest land, excluding harvested wood products (HWP), were 1287.54 kt CO_2 eq. in 2022). Aggregated net removals of the GHG reduced by 108% in 2022 in forest land compared to 1990 mostly due to increase in harvest rate; however, the ageing of forests also resulted in an increase in natural mortality and reduction of increment. Increased harvest rate impact is also reflected in the decrease of the net CO_2 removals in living biomass in forest land in 2014, 2015 and 2020-2022. In general, the harvest rate depends on the increased availability of forest resources in mature forests.

2.1.2. Institutional arrangements

This section provides information on the institutional arrangements in place to track progress made in implementing and achieving its NDC under Article 4, including those used for tracking internationally transferred mitigation outcomes and changes in institutional arrangements since submission of Eight National Communication and Fifth biennial report (NC8/BR5).

2.1.2.1. Institutional arrangements for tracking progress

The EU's Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action (Governance Regulation)[6] 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 (QA) and quality control (QC) 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[7] and the relevant IPCC guidelines[8]. 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 QC procedures and feed into the compilation of the GHG inventory of the EU. Net GHG emissions,

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

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

[8] 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Available: 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. Available: https://www.ipcc.ch/report/2019-refinement-to-the-2006-ipcc-guidelines-for-national-greenhouse-gas-inventories/.

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)[9]. 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 5 to this BTR.

Under the Governance Regulation each Member State must report to the EC biennially on the status of implementation of its integrated NECPs. This process allows the EC to ensure that the EU and the Member States remain on track to achieve the 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[10] by the EC and in the 'Trends and projections' report by the EEA.[11] Both the Union and the national systems are subject to continuous improvements.

The 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 EC's assessment and recommendations, by 30 June 2024.

More information about Latvia`s specific information is provided on Chapter 2.1.2.3.

2.1.2.2. Institutional arrangements for implementation of the NDC

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 was put in place. The main policies of this framework are the EU ETS[12], which caps

[9] 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. Available: https://publications.jrc.ec.europa.eu/repository/handle/JRC137809

[10] Climate Action Progress Report 2024. Available: 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

[11] Trends and Projections in Europe 2024. Available: https://www.eea.europa.eu/en/analysis/publications/trends-and-projections-in-europe-2024

[12] 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).

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 aviation), buildings, agriculture, small industry and waste. The implementation of the ESR is supported by additional sectoral PaMs (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 EC and the EU Member States to set up the institutional arrangements for implementing the specific PaMs.

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 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 eq. 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 Legislation 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 options to a certain extent.

Progress in the implementation of these PaMs 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 PaMs, projections, and progress towards the implementation of integrated 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 EC 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[13].

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[14]. During the preparation of legislative proposals, the EC invites citizens, businesses and stakeholder organisations to provide their views on the subject of the new legislation. These comments are documented in a dedicated portal[15], and the EC reports on how it takes these comments into account in the development of the legislative proposals. Furthermore, the Governance Regulation sets requirements for Member

[13] Consolidated text (2023) of Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action. Available: https://eur-lex.europa.eu/eli/reg/2018/1999/2023-11-20

[14] Decision-making process, https://ec.europa.eu/info/strategy/decision-making-process/how-decisions-are-made_en.

[15] Have your say – Public consultation and feedback. Available: https://ec.europa.eu/info/law/better-regulation/have-your-say_en

States to ensure that the public is given early and effective opportunities to participate in the preparation of the NECPs.

2.1.2.3. Institutional arrangements of Latvia

Latvia’s national GHG inventory system is designed and operated according to the Decision 18/CMA.1 to ensure the transparency, consistency, comparability, completeness and accuracy of the inventory.

Latvia’s GHG inventory is compiled according to Regulation of the Cabinet of Ministers No. 675 adopted on 25th October 2022 “Procedures for Establishing and Maintaining the System for Greenhouse Gas Inventories, the Projection System, and the System for Reporting on the Adaptation to Climate Change” (CoM Regulation No. 675 (25th October 2022)). This legislative enactment regulates institutional cooperation for establishment and maintenance of the national GHG inventory system, including data collection mechanism and the reporting procedure. CCD of the MoCE is responsible for the implementation and development of climate change mitigation and adaptation (and related) PaMs. MoCE is responsible for the actions (coordination, implementation and development) to meet the international and EU emission reduction targets. MoCE also coordinates the monitoring and reporting of GHG emission data as well as is designated as the single national entity with overall responsibility for the Latvia`s GHG inventory.

Contact information of the National Entity:
Ministry of Climate and Energy, Latgales street 165, Rīga, LV - 1019, Latvia.
Designated representative with overall responsibility for the inventory:
Agita Gancone, agita.gancone@kem.gov.lv, telephone: +371 63007313

The main institutions involved in the compilation of the Latvia’s GHG inventory are the MoCE, Latvian Environment, Geology and Meteorology Centre (LEGMC), Latvian State Forest Research Institute "Silava" (LSFRI “Silava”), Latvia University of Life Sciences and Technologies (LBTU), Institute of Physical Energetics (IPE). A schematic model for the national system is shown in Figure 2.32.

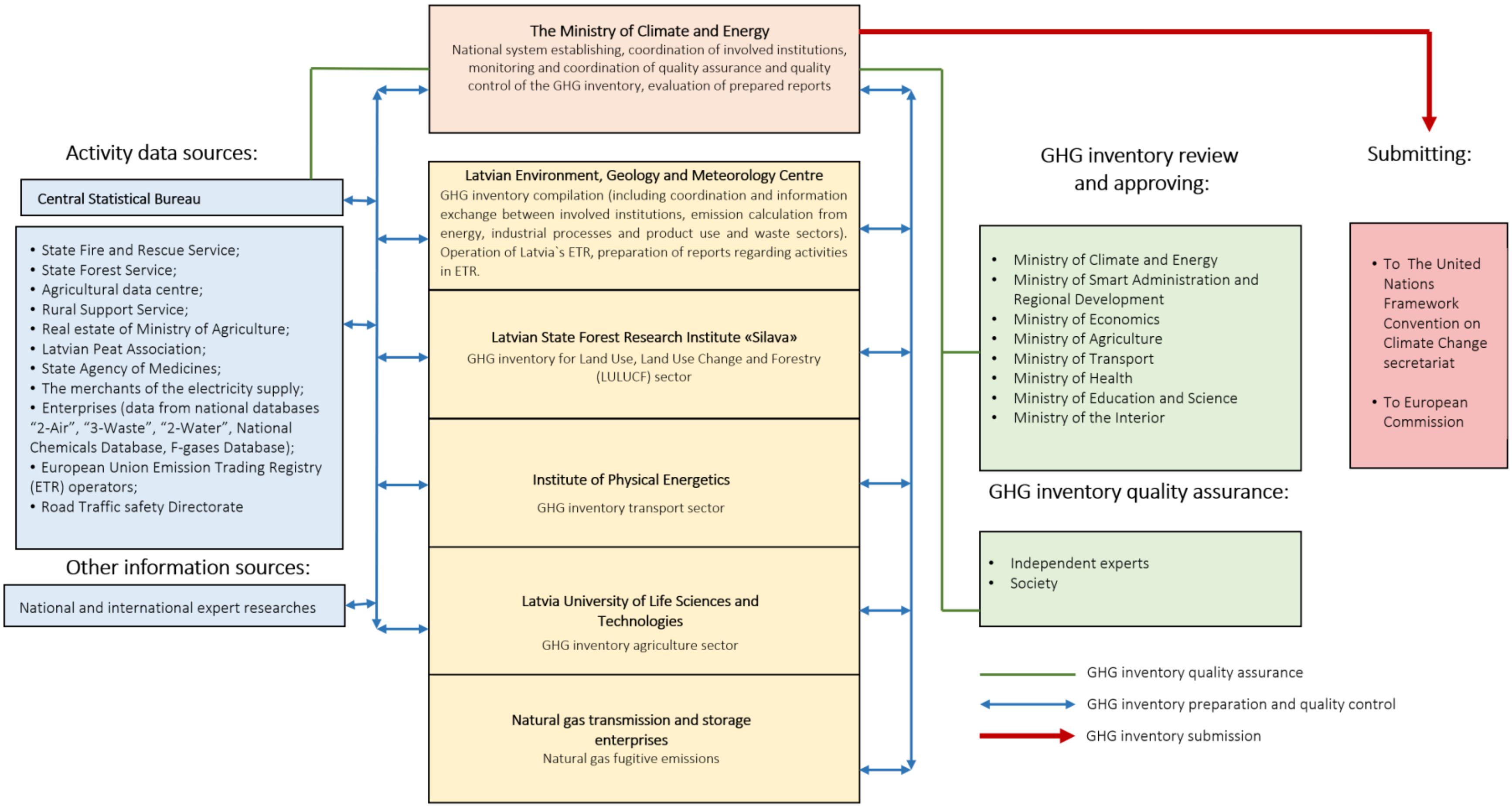

Figure 2.32 The structure of Latvia`s National Inventory System

LEGMC is a governmental limited liability company and is responsible for collecting of activity data and calculation of emissions for Energy, IPPU and Waste sectors.

Calculations of removals and emissions for the LULUCF sector are done by LSFRI "Silava" in collaboration with MoA. LSFRI "Silava" is responsible for collecting of activity data, preparation of the removals/emission estimates, preparation of QC procedures as well as documentation and archiving of used materials for calculation.

IPE calculates emissions for Transport sector. IPE is responsible for collecting of activity data, preparation of the emission estimates, preparation of QC procedures as well as documentation and archiving of used materials for calculation.

Emission calculation from Agriculture sector were done by LBTU in collaboration with MoA. LBTU is responsible for collecting of necessary activity data cooperating with CSB, preparation of the emission estimates, preparation of QC procedures as well as documentation and archiving of used materials for calculation.

The main data supplier for the Latvian GHG inventory is the CSB.

For ensuring the continuity of the functions of the national system, the delegation agreement is signed between the MoCE and LEGMC. The delegation agreement ensures the accomplishing of emission estimations and information preparation in the Energy, Industrial processes and product use and Waste sectors for the inventory, as well as GHG inventory compilation and activities related to the EU ETS.

Additionally, there are agreements with LSFRI "Silava", IPE and LBTU for emission estimations and information preparation accordingly for LULUCF, Transport and Agriculture sectors.

Before final GHG inventory is submitted to the EC and to the UNFCCC secretariat it is forwarded to the involved ministries for review and approval. Based on received comments inventory is corrected if necessary.

Several sectoral meetings were held before and during preparation of GHG inventory, to discuss and agree on the methodological issues, problems arisen and improvements need to be implemented. There were also discussions on the different issues that came up during the last inventory preparation to find the solutions on how to improve the overall system.

Inventory process and quality management

The organizations responsible for the preparation and reporting of Latvia's GHG inventory and their duties are described above.

The preparation of the annual inventory is based on schedule of the reporting under Governance Regulation and UNFCCC.

Figure 2.33 shows the annual inventory process how the inventory is prepared within the national system.

Figure 2.33 Inventory process

During the preparation of Latvia's GHG 2024 inventory, all processes relevant to the GHG inventory have been restructured according to the 2006 IPCC Guidelines and CRT tables. Detailed descriptions of the activity data and methodologies used can be found in the sectoral chapters of Latvia's 2024 GHG inventory.

Tier 1 method is used to identify key categories for time period 1990-2022. Key categories that have been identified are used for improving the GHG inventory as well results of key category analysis are included annually in Latvia's GHG inventory.

According to CoM Regulation No. 675 (25th October 2022) all institutions involved in the inventory process are responsible for implementing QC procedures.

The inventory planning stage includes the setting of quality objectives and elaboration of the QA/QC plan for the coming inventory preparation, compilation and reporting work. The quality requirements set for the annual inventories – transparency, consistency, comparability, completeness, accuracy, improvements and timelines.

The setting of quality objectives is based on the inventory principles considering the available resources.

The QA reviews are performed after the implementation of QC procedures to the finalised inventory. The inventory QA system comprises reviews to assess the quality of the inventory.

A basic review of the draft GHG emission and removal estimates and the draft report takes place before the final submissions to the EU and UNFCCC (January to March) by the involved institutions on GHG inventory preparation process.

The NID draft was sent to CSB, MoA, MSARD, MoH, MoE, MoSE and MoT for checking and approving.

UNFCCC review reports indicate the issues where inventory needs improvements and elaboration. The improvement plan for GHG inventory is compiled based on the findings of the UNFCCC, EC, internal reviews and recommendations from third part experts.

QA activities include a planned system of review procedures conducted by personnel not directly involved in the inventory compilation/development process. Periodically all sectors are revised by third part experts.

All institutions involved in GHG inventory preparation process are responsible for archiving the collected data and estimated emissions. Latvia has a centralized archiving system – all information (including corresponding letters, internal documentation on QA/QC procedures, external and internal reviews, documentation on annual key sources and key source identification, planned inventory improvements) used for inventory compilation are collected on the special server and the backup of data are made periodically. All information is archived at LEGMC. Common, password protected FTP folder is used for information storage and exchange.

Process and quality management of projections

CoM Regulation No. 675 (25th October 2022) also determines national system for projections including institutions that are responsible for preparation of GHG projections as well as general information on QA/QC procedures for projection preparation. The scheme of the institutional arrangements is shown in Figure 2.34.

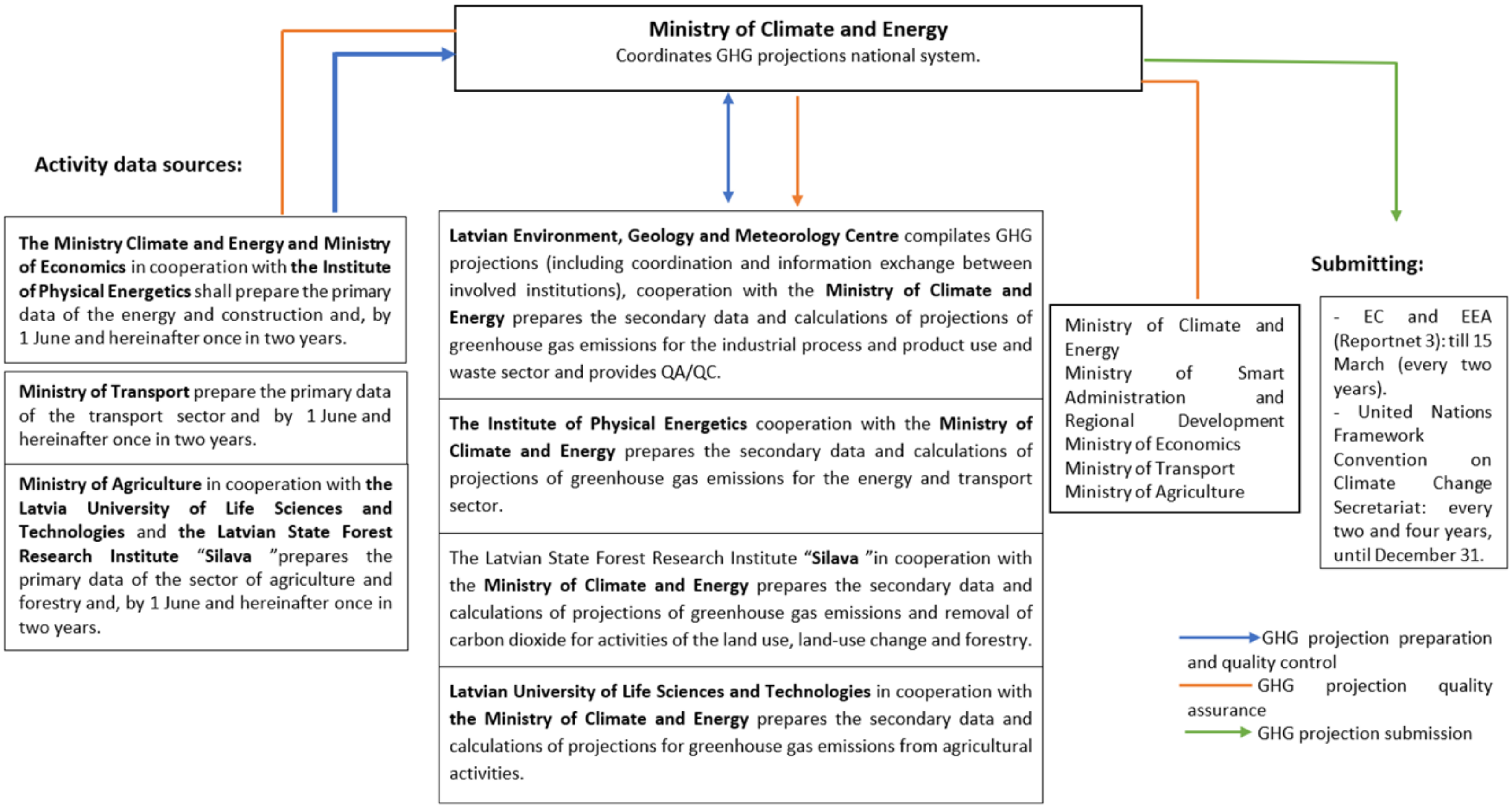

Figure 2.34 National system for the preparation of GHG projections

MoCE ensures the submission of Integrated Reporting on Policies and Measures and Projections to the relevant international institutions (EC, UNFCCC) and monitor the co-operation of the authorities involved. MoCE is responsible for preparation of legal basis for maintaining the National System, informing the inventory compilers about requirements of the national system overall coordination of GHG projection preparation process, final checking and approving of the GHG projections before official submission to the EC, and formal agreements with inventory experts and third part experts that evaluate QA process.

MoE by 30th April prepares and once in two years submits the macroeconomic indicators. MoE in cooperation with the IPE prepares the primary data of the energy and construction and submits them by 1st June once in two years.

LEGMC:

1) by 1st June once in two years prepares and submits:

- the primary data - projections of indicators of the waste management and wastewater management sector;
- the secondary data and calculations of projections of GHG emissions;
- a description of GHG projections, PaMs for the activities of industrial processes.

2) prepares a draft Integrated Reporting on Policies and Measures and Projections (measures for the activities of Energy, Transport, Agriculture, IPPU, LULUCF and Waste management sectors).

3) in cooperation with other institution prepares a BTR under the Paris Agreement.

MoA in cooperation with the LBTU and the LSFRI **"**Silava**"** prepares the primary data for Agriculture and Forestry sectors by 1st June, once in two years. LSFRI "Silava" in cooperation with the MoCE prepares the secondary data and calculations of GHG emission and CO_2 removal projections for LULUCF activities. IPE in cooperation with the MoCE prepares the secondary data and calculations of GHG emission projections for the Energy and Transport sectors. LBTU in cooperation with MoCE prepares the secondary data and GHG emission calculations from agriculture activities.

Every second year MoCE submits to the EC (until 15th March) Integrated Reporting on Policies and Measures and Projections and the BTR for submission to the UNFCCC (until 31st December).

Changes in GHG inventory arrangements since previous reporting

Since the submission of NC8/BR5 under the UNFCCC there are no changes in GHG inventory arrangements.

2.1.3. Information on legal, institutional, administrative and procedural arrangements for domestic implementation

This section provides information on legal, institutional, administrative and procedural arrangements for domestic implementation, monitoring, reporting, archiving of information and stakeholder engagement related to the implementation and achievement of its NDC under Article 4.

For the quantification of the progress to national targets for ESR (2021-2030), the amount of sectors of the economy that fall outside the scope of the EU ETS (non-ETS) GHG emissions is the key parameter.

Latvia's institutional, legal, administrative and procedural arrangements used for domestic compliance, monitoring, reporting, archiving of information and evaluation of the progress towards emission reduction targets are shown in Figure 2.35.

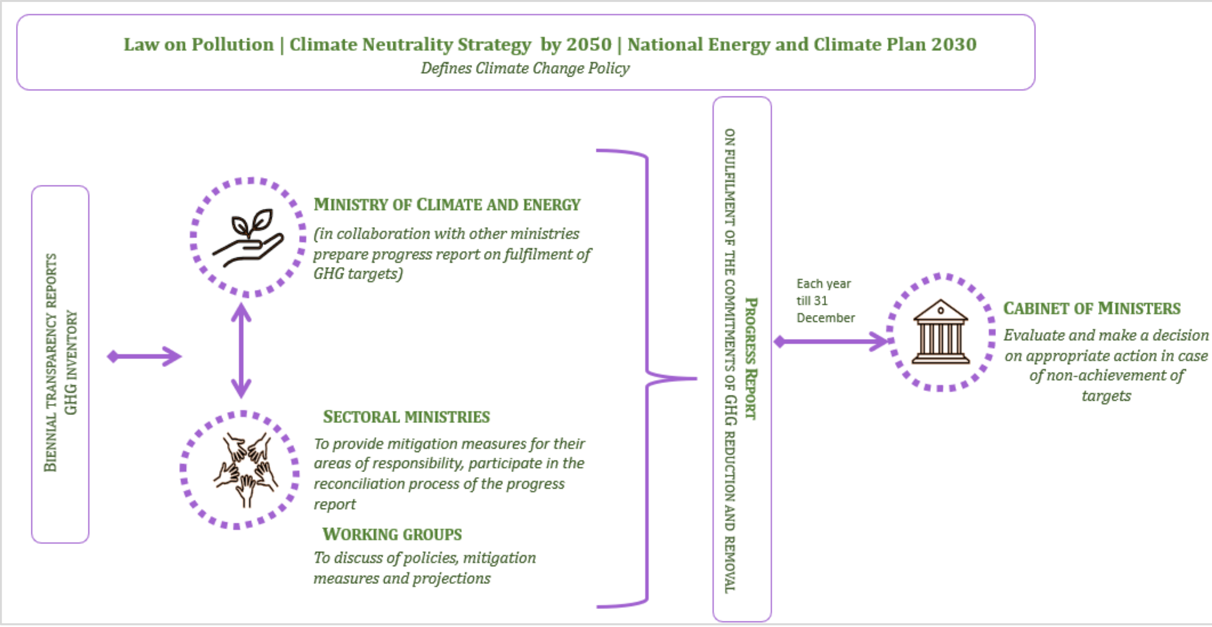

Figure 2.35 Institutional framework for Climate Policy

Law on Pollution (in the future Climate Law) is the main Climate Change policy document in Latvia. According to the Law on Pollution, the MoCE in cooperation with MoA, MoT, MoE and other ministries each year prepare and submit by 31st December a Progress Report to the Cabinet of Ministers (The Government of Latvia) on achievement of the commitments regarding GHG emission reduction and CO_2 removals. The following information is included in the Progress Report:

- the summary information regarding historical GHG emissions from GHG inventory as well as GHG projections, PaMs;
- an evaluation of the achievement of the commitments related to reduction of GHG emissions and CO_2 removals;
- if necessary, proposals regarding additional measures for the reduction of GHG emissions and CO_2 removals, corresponding to the sectoral policy planning documents for the relevant period.

Latvia is working on a national Climate Law which will determine the contribution of various sectors of the national economy in the fulfilment of obligations in one law. The purpose of the Climate law is to ensure Latvia's progress towards limiting climate change, reducing the vulnerability of society and the economy to the consequences of climate change, as well as to promote the transformation to sustainable development, continuing to ensure the competitiveness of sectors (agriculture, transport, etc.).

According to the Governance Regulation[16], every two years Latvia must submit the integrated National energy and climate progress report to the EC. Report includes the information on the progress accomplished towards reaching the objectives, targets and contributions settled out

[16] Regulation (EU) No. 2018/1999 of the European Parliament and of the Council of 11 December 2018_on the Governance of the Energy Union and Climate Action, amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council

in the NECP 2021-2030, and towards financing and implementing the PaMs necessary to meet them, including a review of actual investment against initial investment assumptions.

2.2. Description of the Nationally Determined Contribution

Under their updated NDC[17] 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 2.3 and in Annex 3.

Table 2.3 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 GHG emissions level in 1990: 4 699 405 kt CO_2eq.
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, IPPU, Agriculture, 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 2024-26 from flights between the EU Member States and departing flights to Norway, Iceland, Switzerland and the United Kingdom. ***International maritime Navigation:*** waterborne maritime navigation is included in respect of CO_2, CH_4 and N_2O emissions from maritime transport voyages between the EU Member States.
Gases	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, 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

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

Information	Description
	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[18]

Information about EU NDC is also included in EU BTR1.

2.3. Indicator, definitions, methodologies and structured summary

2.3.1. Indicator, including definitions

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 2.4 provides more information on this indicator.

Table 2.4 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 eq. 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

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

aviation and navigation with estimations from the Joint Research Centre's Integrated Database of the European Energy System[19]. 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[20] under the Paris Agreement can be found in CTF table 3 ('Methodologies and accounting approaches'), which was submitted electronically together with this BTR1.

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 2.5 summarises the current status of progress.

Table 2.5 Summary of progress towards implementing and achieving the NDC

	Unit	Base year value	Values in the implementation period			Target level	Target year	Progress made towards the NDC
			2021	2022	2030			
Indicator: 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.

[19] 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. Available: https://publications.jrc.ec.europa.eu/repository/handle/JRC137809

[20] Decision 4/CMA.1, Further guidance in relation to the mitigation section of decision 1/CP21. Available: https://unfccc.int/documents/193407

2.4. Mitigation policies and measures

The following section describes GHG emission reduction PaMs. The full list of GHG PaMs is available in the Annex 3 of the BTR1, see CTF Table 5.

Information about how PaMs are modifying longer-term trends in GHG emissions and removals is provided in the Annex 3 of the BTR1, see CTF Table 5.

2.4.1. National climate policy planning

The National Development Plan 2021–2027 (NDP2027) has been developed in accordance with the Sustainable Development Strategy of Latvia until 2030 (Latvia2030) and the UN Sustainable Development Goals (SDGs) so that the quality of life improves for each individual, and society as a whole over the next seven years.

NDP2027 defines the strategic aims committed to achieve in Latvia by 2027. It outlines sectoral policies and key reforms, as well as public investments from the state budget, local government budget, EU funds and other financial sources (including from foreign and national funds and programmes).

NDP 2027 states to create a sustainable living environment for people and to move toward a circular economy by saving energy and sustainably using resources, the principle of "energy efficiency first" should be applied when deciding on policies and infrastructure investments. Significant energy savings can be achieved through effective GHG reduction measures that increase the energy efficiency of buildings and energy production and improve heat retention. Low-emission or zero-emission transport (including railway) also contribute. To measure outcomes of goal it suggested to follow GHG reduction trajectory towards the 2030 target.

On 30th August 2022 CoM adopted Latvia's **Environmental Policy Strategy 2021-2027**. The Strategy is the national level planning document for the environmental sector that includes directions for low-carbon policies development, low-carbon technology implementation and sustainable land management in farming. The general climate policy objectives under the section No. 3 "Climate change" are defined as follows: (1) to ensure Latvia's progress towards achieving climate neutrality, and (2) to promote climate resilience and adaptation to climate change.

The following policies and measures are defined by the Strategy to mitigate climate change:

- to achieve the goal of reducing GHG emissions in 2030 and achieve climate neutrality by 2050;
- improve adaptive capacity, strengthen resilience and reduce vulnerability to climate change;
- ensure progress towards a regenerative growth model, decoupling economic growth from the use of natural resources and environmental degradation and accelerating the transition to a circular economy;
- strive for zero pollution and an environment free of toxic substances, including air, water and soil, thus also protecting the health and well-being of Europeans;
- protect, preserve and restore biodiversity and increase natural capital (especially the capital of air, water, soil and forest, freshwater, wetland and marine ecosystems);
- promote environmental sustainability and reduce the environmental and climate burden associated with production and consumption (in the areas of energy, industrial development, buildings and infrastructure, mobility and food systems, etc.).

The Strategy sets the following concrete activities, such as execution of ETS activities, ensuring the supply of economically and ecologically sustainable biomass, sustainable use of biomass for energy production, use of RES and energy efficiency in DH, energy efficiency in buildings, efficiency of lighting infrastructure, integrating climate issues in the transport policy at national and local level, development of environmentally friendly transport infrastructure and the use of RES in public transport, Green Public Procurement, low carbon emitting technologies and sustainable farming practices in agriculture, ensuring of CO_2 removal in forest land, carbon removal in wood products with long useful lifetime. These activities are implemented based on interministerial co-operation and depending on the competence of particular ministry (MoCE, MoA, MoE, MoT) and by involving local governments in the field of their competence.

Updated NECP 2021-2030[21] is a document for the long-term planning of energy and climate policy laying down the basic principles, targets and action lines of Latvia's national energy and climate policy for the next ten years, as per the outlined long-term lines of development.

Latvia's NECP 2021-2030 outline how Latvia intends to address the 5 dimensions of the energy union: decarbonisation, energy efficiency, energy security, internal energy market, research, innovation and competitiveness.

This approach requires a coordination of purpose across all government departments, and it provides a level of planning that will ease public and private investment.

Strategy for Sustainable Use of Peat Resources 2020-2030 (adopted by CoM on 24th November 2020) covers main aspects of sustainability of the peat extraction and production. In order to ensure the sustainable development of the peat industry, the main directions of action have been identified:

- inventory of peat deposits and ensuring sustainable management and use of peat resources in the national economy;
- improvement of the legal framework for the use of bogs and building institutional capacity;
- improvement of the availability of information and promoting scientific research and innovative solutions for peat extraction and development and GHG emission accounting.

For every direction of action specific measures to be performed, results to be achieved and responsible institutions are determined.

Member States had to publish the first version of **Long-term strategy for building renovation** by 30th April 2014 and update the strategy every three years by submitting each version to the EC as part of the National Energy Efficiency Action Plans. On 11th November 2020 the CoM approved latest Long-term strategy for building renovation. Strategy addresses issues concerning energy efficiency in buildings, plan investments, and consider future projections for building sector till 2050. In December 2021 the EC proposed to review the current framework within the revision of the Energy Performance of Buildings Directive (EPBD) and suggested to strengthen the long-term renovation strategies towards 'Building renovation plans'. These national plans should be submitted every 5 years, following the submission of a draft plan, and should have clear and specific chapters, based on a common template. The plans will include national targets (instead of indicative milestones) in a more unified and

[21] Updated NECP 2021-2030. Available: https://commission.europa.eu/publications/latvia-final-updated-necp-2021-2030-submitted-2024_en

comparable approach, an outline of the investment needs for their implementation and an overview of policies and measures.

Building renovation plans will be aligned with the Governance Regulation framework and will be better synchronised with the NECP.

On 7th December 2023, the co-legislators reached a provisional agreement on the EPBD revision, that went through the formal adoption process in early 2024.

The revised Energy Performance of Buildings Directive (EU/2024/1275) entered into force in all EU countries on 28th May 2024 and helps increase the rate of renovation in the EU, particularly for the worst-performing buildings in each country.

Auctioning of Emission Allowances. Within the EU ETS, in the period from 2012 till 2023 Latvia has auctioned approximately 22.77 million emission allowances (EUA and EUAA) in the primary market on the common auctioning platform – from that, 3.31 million emission allowances (EUA and EUAA) were auctioned in the first three years (2021-2023) of phase 4 of the EU ETS, generating revenues in the amount of 237.45 MEUR.

All revenues from the auctioning of emission allowances are channelled to the Emission Allowances Auctioning Instrument (EAAI) – a state budget program financed directly from the auctioning of emission allowances within the EU ETS, established in 2016. The EAAI is aimed to climate change mitigation and adaptation to climate change and operates in accordance with the national legislation and also by taking into account determined directions of the use of revenues from the auctioning of emission allowances in the NECP 2021-2030 and operational strategy of the EAAI.

During the operation of the EAAI, till 2023 seven open project tenders, one of them in two rounds, have been organized with total available EAAI co-funding in the amount of 145 MEUR (Figure 2.36)

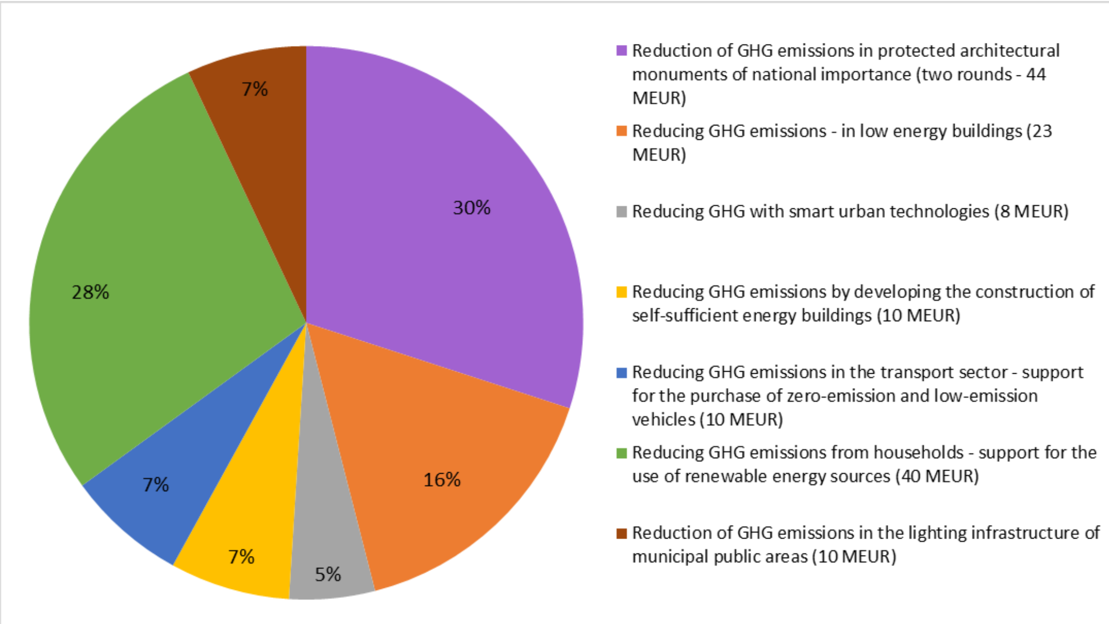

Figure 2.36 EAAI co-funding (MoCE)

As a result of the above-mentioned activities, a significant reduction in GHG emissions has been achieved. The development of project tenders within the EAAI continues in 2024 as well. In addition, additional funding for some of the above-mentioned project tenders have been granted.

All undisbursed revenues from the auctioning of emission allowances are being accumulated in order to allocate them for the specified purposes in the following years.

Norwegian Financial Mechanism 2014-2021 Programme "Climate Change Mitigation, Adaptation and Environment"[22]

The objective of the Programme was to mitigate climate change and reduce vulnerability to climate change. The Programme contributed towards addressing climate and environmental issues. The Programme included both pre-defined projects and open call. Within the framework of the Programme two pre-defined projects were implemented:

1. "Integration of climate change policy in sectoral and regional policies";
2. "Enhancement of sustainable soil resource management in agriculture".

An Open Call "Mitigation of Risks Related to Historically Contaminated Sites" dedicated to the remediation of polluted sites was implemented.

"Strategy of Latvia for the Achievement of Climate Neutrality by 2050" (Strategy) was approved by CoM in January 2020. It sets direction towards climate change mitigation and low carbon development in Latvia.

Strategy has been submitted to the EC according to the requirements of the EU Governance Regulation. The Strategy has been translated and submitted to the UNFCCC in 2020 (in line with the Paris Agreement).

The main goal of the Strategy is to reach climate neutrality in Latvia by 2050. The Strategy identifies strategic lines of action but does not reach the level of detail of the concrete measures, which is going to be identified by elaboration of shorter-term sectoral planning documents such as current NECP 2021-2030.

The milestones are included indicating GHG emission reduction for each decade. The key principles of low carbon development to be applied horizontally when preparing shorter term policy documents are included in the Strategy.

The implementation of the Strategy is coordinated by MoCE. The targets of the climate neutrality must be considered and incorporated in the sectorial strategies, programmes of financial support, research programmes for the next period 2021-2027 and beyond.

However, as within the Strategy it is said that specific measures and the contribution of different sectors of national economy to achieving the objective of climate neutrality will be specified in subsequent NECPs 2021-2030, as well as in sectoral planning documents of a shorter term, assessment of the contribution of the policy to achievement of the long-term strategy is performed by assessment of NECPs 2021-2030. As NECP 2021-2030 consists of exact policies and measures that contribute to GHG reduction and CO_2 removals, it also implements the targets set out in Strategy.

MoCE is working on updating the Strategy thus to ensure updated targets for 2030 and implementation of EU recommendations.

[22] https://www.varam.gov.lv/en/projects/norwegian-financial-mechanism-programme-climate-change-mitigation-adaptation-and-environment

2.4.2. Energy

2.4.2.1. Regulatory policies and measures

The **Energy Efficiency Law**[23], which contains legal norms arising from the Energy Efficiency Directive 2012/27/EU[24], is in force from 29th March 2016. The Amendments (14th July 2022) include the provisions of the amending Directive 2018/2002/EU, among others the *Energy efficiency first* principle.

The Law includes the framework for Energy Management Systems (EMS) and Energy Audits.

- **mandatory EMS or Energy Audits in Large Enterprises** (the transposition of the energy auditing framework defined by the Energy Efficiency Directive 2012/27/EU);
- **mandatory EMS or Energy Audits in Large Electricity Consumers (LEC)** (national measure, the electricity end-user is considered as a LEC if its own annual electricity consumption is above 500 MWh in two subsequent years).

The large enterprises and the LECs shall provide an annual report to the state authority responsible for energy efficiency monitoring (State Construction Control Bureau of Latvia) on implemented energy saving measures and energy savings reached. At least three energy efficiency measures (or all, if only one or two measures are stated) stated by the first and the following energy audit or EMS, which have the highest energy savings or the highest economic return, shall be implemented both by large enterprises (up to the 1st April 2020 for the 1st audit/EMS period) and by LECs (up to the 1st April 2022 for the 1st audit/EMS period).

The noted Amendments (14th July 2022) expand the coverage of public persons which are obliged to implement the EMS. The current regulation provides for:

- **mandatory EMS in state direct administration institutions** which have in ownership or in possession the buildings with total heated area 10000 m^2 and above;
- **mandatory EMS in those derived public persons** which have in ownership or in possession the buildings with total heated area 10000 m^2 and above (new provision of 2022 Amendments);
- **mandatory EMS in all municipalities.** The new provision reflects the administrative territorial reform, in force from the 1st July 2021. Until the Amendments of July 2022, only the largest nine cities and those municipalities which had both the territorial development index above the stated threshold and population above 10 thousand inhabitants had been obliged.

Annual report on implemented energy efficiency measures and energy savings reached shall be submitted both by municipalities and noted state direct administration institutions and derived public persons.

The recast **Law on the Energy Performance of Buildings**[25] is in force from 9th January 2013. The Law, in accordance with the provisions of the EPB Directive 2010/31/EC[26], recasts the legal framework of setting the mandatory minimum energy performance requirements for buildings, the mandatory energy efficiency certification of buildings, verification of buildings heating systems and air conditioning systems, the functionality of automation and control systems of building's engineering systems, the installation of self-regulating devices for the

[23] Energy Efficiency Law. Available: http://likumi.lv/doc.php?id=280932 *(in Latvian)*
[24] Directive 2012/27/EU of the European Parliament and of the Council of 25th October 2012 on energy efficiency
[25] Law on the Energy Performance of Buildings (recast). Available: http://likumi.lv/doc.php?id=253635 *(in Latvian)*
[26] Directive 2010/31/EC of the European Parliament and of the Council of 19th May 2010 on the energy performance of buildings

microclimate regulation in premises, recording of the energy consumed in the building, etc. The Amendments (8th October 2020) include the provisions of the amending Directive 2018/844/EU. The regulation on the energy performance of buildings has impact on district heat consumption as high share of residential multi-apartment buildings and public and commerce buildings are connected to the DH systems.

Energy Performance Indicators (EPI) for buildings

The governmental regulations on the energy efficiency of buildings include the following ones:

- the regulation on the energy certification of buildings (energy efficiency classes and related energy performance indicators, etc.);
- the regulation on the minimal requirements for existing, in exploitation, buildings (both residential and non-residential ones)[27];
- the national Construction Standard LBN 002-19 "Thermotechnics of Building Envelopes".

In 2013, six **energy efficiency classes** (A-F) for residential and non-residential buildings have been introduced[28]. On 16th April 2021 new Regulation[29] regarding energy certification of buildings came into force. The 2021 Regulation introduces EPI for both: (1) energy consumption for heating, and (2) non-renewable primary energy consumption. The 2021 Regulation also adjusts the specific energy consumption values for heating (kWh per m^2 per year) depending on the heated area of the building (before only unified approach had been applied), thus provides for cost-effective values in smaller buildings.

New Buildings. The nearly-zero energy building (NZEB) shall correspond to the A class (A+ is the voluntary one). The LBN 002-19 "Thermotechnics of Building Envelopes" (in force since 1st January 2020) has provided the transition period to the NZEB, as presented in the Table 2.6. The NZEB values need not be applied if application of the relevant requirements is either technically or functionally impossible and cost-benefit analysis on the useful lifetime of the relevant building indicates to losses.

Table 2.6 Minimum permissible level of energy performance of buildings: EPI for heating of new buildings (source: Latvian Construction Standard LBN002-19)

Time period of approval of a construction intention	for residential buildings		for non-residential buildings	
	multi-apartment buildings	one-apartment or two-apartment buildings	buildings which are in the ownership of the State or local government and in the possession of the authorities and where the State or local government authorities are located	other non-residential buildings
From 1st January 2019 to 31st December 2020	≤ 50 kWh/m^2 per year	≤ 60 kWh/m^2 per year	nearly zero-energy building ≤ 45 kWh/m^2 per year	≤ 65 kWh/m^2 per year

[27] Cabinet of Ministers Regulation No 730 (10th December 2020) "Minimal Requirements for Existing, in Exploitation, Buildings". Available: https://likumi.lv/ta/id/319443 *(in Latvian)*

[28] Cabinet of Ministers Regulation No. 383 (09.07.2013) "Regulations Regarding Energy Certification of Buildings": historical version, in force 19th July 2013 – 15th April 2021. Available: https://likumi.lv/doc.php?id=258322 *(in Latvian)*

[29] Cabinet of Ministers Regulation No 222 (8th April 2021) „Regulations Regarding Energy Certification of Buildings and Energy Efficiency Calculation Method". Available: https://likumi.lv/ta/id/322436 *(in Latvian)*

<table>
<tr><th rowspan="2">Time period of approval of a construction intention</th><th colspan="2">for residential buildings</th><th colspan="2">for non-residential buildings</th></tr>
<tr><th>multi-apartment buildings</th><th>one-apartment or two-apartment buildings</th><th>buildings which are in the ownership of the State or local government and in the possession of the authorities and where the State or local government authorities are located</th><th>other non-residential buildings</th></tr>
<tr><td>From 1st January 2021</td><td>nearly zero-energy building ≤ 40 kWh/m² per year</td><td>nearly zero-energy building ≤ 40-60 kWh/m² per year (depending on the heated area)</td><td colspan="2">nearly zero-energy building ≤ 45-50 kWh/m² per year (depending on the type of use and heated area)</td></tr>
<tr><td colspan="5">The presented values for 2021 and afterwards correspond to the re-casted values provided by the new 2021 Regulation on energy certification of buildings.</td></tr>
</table>

Reconstructed or renovated buildings. For the time periods of approval of a construction intension 21th November 2015 – 31th December 2020 and from the 1st January 2021 the EPI values for heating for the buildings to be reconstructed or renovated are directly included in the LBN 002-19 "Thermotechnics of Building Envelopes"[30]. They are as follows:

- for multi-apartment residential buildings – should not exceed 90 kWh per m^2 per year (21st November 2015 – 31st December 2020); from the 1st January 2021 – should not exceed 80 kWh per m^2 per year;
- for one-apartment and two-apartment residential buildings – should not exceed 100 kWh per m^2 per year (21st November 2015 – 31st December 2020); from the 1st January 2021 – should not exceed 90 kWh per m^2 per year;
- for public (state and municipal) buildings – should not exceed 110 kWh per m^2 per year (21st November 2015 – 31st December 2020), from the 1st January 2021 – should not exceed 90 kWh per m^2 per year;
- for other non-residential buildings - should not exceed 110 kWh per m^2 per year (21st November 2015 – 31st December 2020), from the 1st January 2021 – should not exceed 100 kWh per m^2 per year.

Minimum thermal insulation standards. The national Construction Standard LBN "Thermotechnics of Building Envelopes" systematically increases the requirements. The Amendments[31] (in force since 22nd April 2014) to the LBN 002-01 "Thermotechnics of Building Envelopes" had transposed the provisions of the recast EPB Directive 2010/31/EU. On 1st July 2015 the LBN 002-15 "Thermotechnics of Building Envelopes"[32] had come into force. From the 1st January 2020 the new LBN 002-19 "Thermotechnics of Building Envelopes" is in force. Due to the new Construction Standard incorporates directly the EPI for heating (in kWh per m^2 annually) for new buildings and buildings on-going reconstruction, there is no necessity to

[30] Latvia Construction Standard LBN 002-19 "Thermotechnics of Building Envelopes", in force 01.01.2020. Available: https://likumi.lv/ta/id/307966 *(in Latvian)*

[31] The Amendments (8th April 2014) to the LBN 002-01 "Thermotechnics of Building Envelopes". Available: http://likumi.lv/doc.php?id=265703 *(in Latvian)*

[32] Latvian Construction Standard LBN002-15 "Thermotechnics of Building Envelopes. Available: http://likumi.lv/ta/id/275015 *(in Latvian)*

apply the normative values for particular construction elements. In its turn, the objective of the maximal U values is to eliminate the design of unsafe construction elements.

Mandatory individual heat energy metering. The individual heat energy metering by installing heat meters or heat cost allocators, if heating is supplied from a common heat source or a DH system, has become compulsory enabling residents to supervise their individual consumption and the energy costs thus encouraging users to save energy. The provision has been introduced in several steps:

- from the 31st December 2016 - applies to new buildings and buildings to be converted or renovated, if funded by EU funds, State or municipal budgets (construction permit issued after 1st January 2016)[33];
- from the 1st January 2021 – applies to all existing buildings, on condition if the individual accounting is economically justified (a re-assement after a renovation of a heating system); installation of remotely readable metering devices required, for the devices, installed before 1st January 2021, a remote readability must be ensured by the 1st January, 2027[34];
- from the 26th October 2020 – applies to all renovation projects of multi-apartment buildings, connected to DH system (remote readability shall be ensured)[35].

Energy consumption management in buildings. By 1st January 2025, the existing non-residential buildings with an effective rated output for heating or air conditioning/ventilation system or combined system exceeding 290 kW shall be equipped with a building automation and control system. All new buildings, construction intentions of which are approved starting from the 26th October 2020, shall have installed self-regulating equipment to control air temperature in each of premises or group of premises, on condition it is technically possible and economically justifiable.

The measures based on the Energy Efficiency Law, the Law on the Energy Performance of Buildings, governmental regulations issued pursuant to the Laws are included in the WEM scenario.

Two following planned measures, presented below, are included in the WAM scenario.

Mandatory energy consumption reduction target and energy consumption monitoring for public bodies. The updated NECP 2021-2030[36] states to set the mandatory target for public sector institutions -1.9% energy consumption reduction annually. The energy coverage includes electricity, heat energy, natural gas and other fuels, transport fuels. The obligation relates to energy consumed in the buildings owned or in possession by state and municipalities, energy consumed by state and municipal authorities and state and municipal capital companies. Thus, the target is set in accordance with the Article 5 of the new Energy Efficiency Directive 2023/1791/EU[37] - the total final energy consumption of all public bodies combined shall be reduced by at least 1.9% each year, when compared to 2021. To support the implementation of the given PaM, the updated NECP 2021-2030 states for the mandatory implementation of EMS in all public sector, including public capital companies.

[33] Amendments (3rd November 2015) to the Cabinet of Ministers Regulation No. 876 (2008) "Heat Energy Supply and Consumption Regulations". Available: http://likumi.lv/doc.php?id=277661 *(in Latvian)*

[34] Cabinet of Ministers Regulation No 730 (10th December 2020) "Minimal Requirements for Existing, in Exploitation, Buildings". Available: https://likumi.lv/ta/id/319443 // *(in Latvian)* Amendments (4th October 2022) to the Cabinet of Ministers Regulation No. 876 (2008) "Heat Energy Supply and Consumption Regulations". Available: http://likumi.lv/doc.php?id=336253 *(in Latvian)*

[35] Amendments (16th June 2020) to the LBN 231-15 "Heat Supply and Ventilation (Conditioning) of Residential and Public Buildings". Available: https://likumi.lv/ta/id/315565 *(in Latvian)*

36 Updated National Energy and Climate Plan 2021-2030. Approved by the Cabinet of Ministers Ordinance No 573, 12th July 2024. Available: https://tapportals.mk.gov.lv/legal_acts/f4ee17e0-b0f3-4171-a263-976a957bcbf7 , page 72 & 74 *(in Latvian)*

[37] Directive (EU) 2023/1791 of the European Parliament and of the Council of 13 September 2023 on energy efficiency

Energy Management Obligation in Large Energy Consuming Entities. The PAM expands the coverage of the enterprises for which the energy audit is mandatory. The updated NECP 2021-2030 states to set mandatory Energy Management Obligation – Energy Audit or EMS or Supplemented Environmental Management System – and implement energy efficiency improving measures in large energy consuming entities with the annual energy consumption of 1.7 – 2.8 GWh. Thus, the measure transposes the requirements of the new Energy Efficiency Directive's 2023/1791/EU Article 10.2.

Energy Efficiency Requirements for DH Systems. The CoM Regulation No. 243 (19th April 2016)[38] defines the minimum efficiency requirements for DH technologies: (1) heat production boilers (respectively, 92% - gaseous fuel, 85% - liquid fuel, 75% - solid fuel), (2) CHP units (respectively, 80% - gaseous and liquid fuels, 75% - solid fuels), (3) solar heat collectors (respectively, 70% - vacuum tube collectors, 75% - flat plate collectors), (4) heat pumps (shall correspond at least class "C"), (5) annual maximum heat losses in DH pipeline network (from 1st January 2018 – not higher than 19%, from 1st January 2019 – not higher than 17%). The measure is included in the WEM scenario.

2.4.2.2. Economic policies and measures

Due to the programmes of the EU Funds programming period of 2014-2020 are implemented until 31st December 2023, the measures implemented within the framework of these programmes are presented in this section and are included in the WEM scenario.

Programme for District Heating Systems

In **EU funds 2014-2020 programming period** the increasing efficiency and RES share in DH systems is co-financed by Cohesion Fund (CF) within the framework of the national Operational Programme (NOP) "*Growth and Employment*", Thematic Objective (ThO) No.4 *"Supporting the shift towards a low-carbon economy in all sectors"*, the Specific Objective (SO) 4.3.1. *"To promote energy efficiency and use of local RES in DH systems"*. Activities co-financed: (i) new RES-heat production facilities (both additional RES capacities to supply new DH customers and replacement of existing fossil fuel capacities), (ii) reconstruction/renovation for increase of energy efficiency of existing heat production facilities utilising RES, (iii) construction of heat accumulation units, (iv) construction (expanding) and reconstruction of DH transmission and distribution pipeline networks aimed at reducing heat losses, as well as (v) reconstruction of CHP plant to heat only plant utilising RES[39]. The measure is included in the WEM scenario.

Programmes for Household sector

Energy Efficiency in Apartment Buildings

The measure is co-financed by the EU funding. In **EU Funds programming period of 2014-2020** increasing of energy efficiency in multi-apartment buildings is co-financed by the ERDF within the framework of the NOP *"Growth and Employment".* The financing is provided within the (i) ThO No. 4 *"Supporting the shift towards a low-carbon economy in all sectors"*, SO 4.2.1.1 *"To increase energy efficiency in residential buildings"* and (ii) additional SO 13.1.1.2 "*To support heat insulation of multi-apartment buildings*" as one of the recovery measures, due to Covid-

[38] Cabinet of Ministers Regulation No. 243 (2016) "Regulations Regarding the Energy Efficiency Requirements for District Heating Systems in the Possession of a Licensed or Registered Energy Supply Merchant and the Procedures for the Conformity Examination Thereof". Available: http://www.likumi.lv/doc.php?id=281914 *(in Latvian)*

[39] Cabinet of Ministers Regulations No 135 (17th March 2017, 1st Open Call. Available: https://likumi.lv/ta/id/289471), No 495 (22th August 2017, 2nd Open Call, https://likumi.lv/ta/id/293209) and No 167 (8th March 2022, 3rd Open Call, https://likumi.lv/ta/id/330758) *(in Latvian)*

19 pandemics, of the national economics (ERDF *React-EU* financing). Beneficiaries - communities of apartment owners of multi-apartment buildings. The financial assistance is provided in the form of combined financial instrument: (1) subsidy (grant), up to 50 % of eligible cost of energy efficiency improvement project, (2) repayable low-interest loan, issued by the state-owned JSC "Development Finance Institution ALTUM", (3) guarantee for the loan, issued by the commercial financial institutions (banks)[40]. In **2023-2029 period** the support for energy efficiency improvement of multi-apartment buildings continues. The financing is provided by two funds. Within the funding of **Latvia's Plan of EU Recovery and Resilience Facility** (hereinafter - **RRF Plan**, the First Component "Climate Change and Environmental Sustainability" of the Plan) the submission of projects has been opened on 8th December 2022, the projects shall be implemented up to 31st March 2026. The financial assistance is provided in the form of a combined financial instrument with a subsidy (grant) up to 49% of the eligible costs of the project. Activities relate to energy efficiency increase of building envelope, reconstruction of engineering systems (heat supply, hot water supply, installation of recuperation system), smart energy consumption control and management. The renovation of multi-apartment building can be combined with the installation of renewable energy microgeneration technologies for self-consumption[41]. In its turn, **Latvia's EU Cohesion Policy Programme for 2021-2027 programming period** (hereinafter – **CP Programme) funding**, the measure No1 under the SO 2.1.1 "Promotion of energy efficiency and reduction of GHG emissions" will start after the contracting of the RRF Plan funding[42]. The described measure is included in the WEM scenario. Investments in energy efficiency of multi-apartment buildings have impact on district heat consumption as high share of multi-apartment buildings are connected to the DH systems.

The following planned measure, presented below, is included in the WAM scenario.

Further increase of energy efficiency of multi-apartment buildings. The given PAM, stated by the updated NECP 2021-2030[43], further increases the financial support volume. It is planned to provide in addition approximately the same financing volume as provided by the described above WEM scenario's measure. The activities relate to energy efficiency increase of building envelope, reconstruction of engineering systems, smart energy consumption control and management. Additional funding is planned by both national and EU funding.

RES Technologies Implementation in Residential buildings

The following two programmes are included in the WEM scenario.

The EAAI financed programme "GHG emissions reduction in households – support for utilisation of RES" has been approved on 1st March 2022[44]. The projects submission has been opened on 15th March 2022 and continues up to 31st December 2024. The programme aims to reduce GHG emissions in residential buildings of different type. It supports the purchase of (1) RES-heat technology (heat boiler utilising wood pellets, heat pump, both up to 50 kW capacity, solar heat panels system with storage tank capacity up to 300 litres) to replace

[40] Cabinet of Ministers Regulation No 160 (2016) "Regulations regarding implementation of the 4.2.1.1. Measure "Energy Efficiency Measures in Residential Buildings" of the SO No 4.2.1 "To increase energy efficiency in public and residential buildings" and the 13.1.1.2 Measure "Support for Insulation of Apartment Buildings" of the SO 13.1.1 "Recovery measures in economics" of the NOP "Growth and Employment"": consolidated version. Available https://likumi.lv/ta/id/281323 *(in Latvian)*

[41] Cabinet of Ministers Regulation No 460 (14th July 2022) "Implementing Rules of the Latvia's Plan of the EU Recovery and Resilience Facility, the reform 1.2 "Energy Efficiency Improvement", the investment No 1.2.1.2.i "Energy Efficiency Improvement and transition to RES-utilizing technologies in multi-apartment buildings"". Available: https://likumi.lv/ta/id/334084 *(in Latvian)*

[42] Latvia's EU Cohesion Policy Programme for the 2021-2027 planning period. Information on measures financing. Available: https://www.esfondi.lv/pieejamais-atbalsts/planotas-atlases/es-fondu-planotas-projektu-atlases *(in Latvian)*

[43] Updated National Energy and Climate Plan 2021-2030: page 77 & 79

[44] Cabinet of Ministers Regulation No 150 (1st March 2022) "Implementing Rules of the EAAI financed projects Open Call "GHG emission reduction in household – support for RES utilization": consolidated version. Available: https://likumi.lv/ta/id/330568 *(in Latvian)*

existing fossil fuel one, and (2) RES-electricity microgeneration technology (solar PV and wind energy technologies, including inverters and electricity storage equipment). Within the single project or step-by-step projects, the beneficiary can purchase several noted above technologies. The programme also supports the building's connection to DH system and establishment of related heating unit.

The programme's on energy efficiency improvement and RES-electricity technology implementation in single-family, semi-detached, row and two-apartment buildings target group is families with child/children. The programme has been adopted in February 2021 and re-casted in March 2022[45] and is financed by the revenues of the State Energy Efficiency Fund[46], project implementation finishes in 2024. The programme includes (i) technical assistance grant and (ii) investment grant. The programme consists of two principal parts (the grant does not add up):

- **energy efficiency improvement** of building and its engineering systems, RES-heat production equipment installation might be included (no mandatory requirement for a replacement of a fossil fuel utilising heat production boiler). As a result of the project, heat energy consumption for heating should be reduced by at least 20% and the building should correspond at least energy efficiency class "C" (namely, heat energy consumption for heating should not be higher than 80-95 kWh/m^2 annually, depending on the heated area of the building);
- purchase and installation **RES-electricity equipment** for self-consumption, primary energy consumption should be reduced by at least 20%. The installation of the RES-electricity technology can be done without performing the energy efficiency improvement measures for the whole building.

The approved projects demonstrate the domination of solar PV technologies within both programmes (more than 90% of all RES technologies installations within EAAI programme[47]).

Programmes for Industrial and Commerce Buildings and Technologies

Efficient use of energy resources, reduction of energy consumption and transfer to RES in manufacturing industry: 2014-2020 EU Funds programming period. Investment for new innovative energy-saving technologies, measures increasing energy efficiency and share of RES is co-financed by CF within the framework of the NOP "*Growth and Employment*", ThO No. 4 "*Supporting the shift towards a low-carbon economy in all sectors*", the SO 4.1.1. "*To promote efficient use of energy resources and reduction in energy consumption in the manufacturing industry sector*". The general intensity of support is 30%. The following quantitative criteria should be reached: (1) energy efficiency improvement at least 15% after implementation of energy efficiency improvement measures, (2) heat energy consumption for heating of industrial building should not be higher than 110 kWh per m^2 per year[48,49]. The measure is included in WEM scenario.

In its turn, **investments support to improve energy efficiency in food processing enterprises in 2017-2025 period** is provided within the framework of the Measure 04.2 *"Investments"* of

[45] Cabinet of Ministers Regulation No 103 (11th February 2021, re-cast 8th March 2022) "Regulations Regarding Support Programme for Renovation and Energy Efficiency Improvement of Single-Family Buildings and Two-Apartment Buildings": consolidated version. Available: https://likumi.lv/ta/id/321021 *(in Latvian)*

[46] Currently the Fund receives the revenues due to energy efficiency duty paid by non-compliant with the Energy Efficiency Law large electricity consumers

[47] Latvian Environmental Investment Fund. The statistics of the programme implementation. Available: http://ekii.lv/index.php?page=atbalsts-majsaimniecibam. Accessed 19th August 2024 *(in Latvian)*

[48] not applicable if only improvements of energy efficiency in production process are implemented

[49] Cabinet of Ministers Regulations No 590 (06.09.2016, 1st Open Call, https://likumi.lv/ta/id/284596), No 38 (16.01.2018, 2nd Open Call, https://likumi.lv/ta/id/296683) and No 506 (05.11.2019, 3rd Open Call, https://likumi.lv/ta/id/310544) *(in Latvian)*

the national Rural Development Programme of 2014-2022 programming period, co-financed by Agriculture Fund for Rural Development (EAFRD). Energy efficiency improvement project shall provide the following results[50]: 1.Buildings: (1) at least 20% of energy savings shall be reached for existing building, (2) for new buildings the thresholds of heat penetrability specific values for particular elements of building envelope are defined. 2. In case of other energy efficiency improvement measures – improvement of lighting, production technologies as well as other technologies (e.g., heating & air conditioning equipment) – energy efficiency shall be increased by 20% as well compared to the replaced technology, or the alternative option is the implementation of the equipment corresponding to the two highest energy efficiency classes or whose high energy efficiency is certified by the manufacturer. General support intensity 30-40% depending on enterprise annual turnover, the fulfilment of stated above energy efficiency criteria increases the general support intensity by 10%. The support might be used also for implementation of RES technologies in the enterprise. The measure is included in the WEM scenario.

In 2023-2029 period the support for energy efficiency improvement and RES technologies implementation in manufacturing industry continues. The financing is provided by both **RRF Plan, CP Programme and Latvia's Territorial Just Transition Plan**. The support is extended also to commerce sector. These financing measures are included in the WEM scenario.

RRF Plan funding provides aid for the wide range of activities. Beneficiaries are registered in Latvia enterprises operating in any economic sector, except specific ones. The programme is implemented in the form of combined financial instrument - loan with a capital rebate (grant). JSC "Development Finance Institution ALTUM" issues both loans and parallel loans. The grant for the single beneficiary is provided for up to 30% of the project's total cost (not including VAT), but not more than 1.5 MEUR. The **energy efficiency criteria** to be met by the energy efficiency improvement projects: (i) at least 30% primary energy saving for building's energy efficiency improvement project, (ii) at least 30% primary energy savings for production processes' energy efficiency improvement project, (iii) in case of the combined energy efficiency improvement for building and production processes – at least 20% primary energy saving should be ensured for the building. For the **RES technologies implementation** projects, the minimum financial efficiency threshold for CO_2 savings is stated –at least 0.18 tons of annual CO_2 emission reduction per 1000 EUR of capital rebate (grant)[51]. The submission of the projects (1st Call) was opened on 4th November 2022 – 4th January 2023, afterwards following Open Calls have been announced. The decision on providing the aid may be adopted until the 31st December 2025. The deadline for allocating the costs of the RRF Plan is 31st August 2026. The **CP Programme funding,** the measure No2 under the SO 2.1.1 "Promotion of energy efficiency and reduction of GHG emissions", also provides investment aid for energy efficiency improvement and RES technologies implementation in industry and commerce sector[52]. **Latvia's Territorial Just Transition Plan**[53] includes the measure focused to greening the

[50] Cabinet of Ministers Regulation No 600 (2014) "Regulations on the State and EU financial support for the Measure's "Investments" open calls". Available: http://likumi.lv//doc.php?id=269868/ *(in Latvian)* // Cabinet of Ministers Regulation No 778 (30th November 2021) "Regulations on the State and EU financial support for the Measure's "Investments" open call within the transition period, 2021 and 2022, of the 2014-2020 programming period". Available: https://likumi.lv/ta/id/328179 *(in Latvian)*

[51] Cabinet of Ministers Regulation No 594 (20th September 2022) "Implementing Rules of the Latvia's Plan of the EU Recovery and Resilience Facility, the reform No 1.2 "Energy Efficiency Improvement", the investment No 1.2.1.2.i , the Measure 1 "Energy efficiency improvement in business sector (including the transition to renewable technologies)". Available: https://likumi.lv/ta/id/336032 *(in Latvian)*

[52] Latvia's EU Cohesion Policy Programme for the 2021-2027 planning period. Information on measures financing. Available: https://www.esfondi.lv/pieejamais-atbalsts/planotas-atlases/es-fondu-planotas-projektu-atlases *(in Latvian)*

[53] Approved by the Cabinet of Ministers Ordinance No 793, 2nd November 2022: the measure No 4 of the Specific Objective 6.1.1 of Latvia's EU Cohesion Policy Programme for 2021-2027 EU Funds programming period.

business sector by increasing energy efficiency of buildings and production technologies and implementation of RES technologies.

To promote the energy efficiency improvements in existing facilities, JSC "Development Finance Institution ALTUM" provides the grants (85% of the total costs) for energy auditing and technical assistance. The first agreement with the ELENA programme[54] had been signed in December 2018 for the period 2019-2021, the grants had been issued starting from May 2019. In July 2022, the JSC "Development Finance Institution ALTUM" has signed the Second agreement "Energogrants" with the ELENA programme for the period 2022-2025[55]. The grant can be received by wide range of interested parties – individual merchants, enterprises, state and municipalities institutions and capital companies. The beneficiary should perform investments in energy efficiency of at least 20-fold of the amount of technical assistance received. For the 2nd agreement, the beneficiary shall provide these investments up to end 2026. The measure is included in the WEM scenario as supplementing measure to investment support measures in industry and commerce sectors.

The following planned measure, presented below, is included in the WAM scenario.

Further increase of RES capacities and energy efficiency in industry and service sector. The given PAM, stated by the updated NECP 2021-2030[56], relates to industrial production entities, commercial services providers, municipal institutions, and municipal capital companies. The PAM further increases the financial support volume beyond the support provided by the WEM scenario's measures. The financial support is planned for installation of new renewable energy production capacities and modernisation of existing ones with the focus on zero emission technologies, installation of energy efficient production technologies and auxiliary equipment, replacement of building's inner and outer engineering systems and networks. It would be determined that renovated industrial buildings should correspond to the nearly zero emission ones and that at least 50% of the energy consumed shall be provided by RES, as well as to state the obligation to install solar energy equipment in the construction of new commercial buildings of a certain capacity and renovation of existing ones. As a result, updated NECP 2021-2030 envisages to have significant renewable energy production capacity increase in the noted sectors.

Programmes for Public Sector

Increasing Energy Efficiency in Municipal Buildings. The measure is co-financed by the EU funding. In **EU Funds programming period of 2014-2020** increasing of energy efficiency and implementation of RES technologies in municipal buildings is co-financed by the ERDF within the framework of the NOP *"Growth and Employment".* The financing is provided within the (i) ThO No. 4 *"Supporting the shift towards a low-carbon economy in all sectors"*, the SO 4.2.2 *"To facilitate the increase of energy efficiency in municipal buildings, according to the integrated development programme of the municipality"*[57] and (ii) additional SO 13.1.3.1 "*Energy efficiency increase in municipal infrastructure*" as one of the recovery measures, due

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[54] ELENA (European Local Energy Assistance) is a joint initiative by the European Investment Bank and the European Commission under the Horizon 2020 programme

[55] ELENA project "Energogrants" factsheet (2nd stage 2022-2025). Available: https://www.eib.org/attachments/documents/143-project-factsheet-energogrants.pdf *(in Latvian)*; ALTUM. Grant for energy efficiency (*Grants energoefektivitātes projektu izstrādei*). Available: https://www.altum.lv/pakalpojumi/biznesam/aizdevumi-uznemumu-eneregoefektivitatei?tab=4 *(in Latvian)*

[56] Updated National Energy and Climate Plan 2021-2030: page 50 & 53

[57] Cabinet of Ministers Regulation No. 152 (2016) "Regulations regarding the implementation of the 4.2.2. Specific Objective "To Facilitate the Increase of Energy Efficiency and Utilisation of Renewable Sources in Municipal Buildings, according to the Integrated Development Programmes of Municipalities" and of the 13.1.3.1 measure "Energy Efficiency Increase in Municipal Infrastructure for Economics Improvement" of the 13.13 Specific Objective "Recovery Measures in Environmental and Regional Development Sectors" of the National Operational Programme "Growth and Employment". Available: http://likumi.lv/doc.php?id=281111 *(in Latvian)*

to Covid-19 pandemics, of the national economics (ERDF *React-EU* financing). The support intensity is up to 85%. The measure is included in the WEM scenario.

In 2023-2029 period the support for municipal buildings continues. The financing is provided by two funds – RRF Plan and CP Programme. The support is provided for energy efficient renovation of buildings and their engineering systems, installation of smart energy consumption control and management equipment, installation of RES-utilising energy production (both heat and electricity) technologies for self-consumption. The buildings coverage includes the buildings of municipalities, municipal capital companies and public-private capital companies providing public services. Within **the RRF Plan** funding the submission of projects under two Open Calls took place in 2023, the projects shall be implemented up to 31st December 2025, the RRF plan provides the grant for 100% of the eligible costs of the project[58]. In its turn, within the **CP Programme** the intensity of aid is up to 85%. The same buildings do not apply and receive support from various EU funds. The eligible buildings and eligible activities of the CP Programme will be the same as for the RRF Plan funding. The measure is included in the WEM scenario.

Increasing Energy Efficiency in State Public Buildings. The measure is co-financed by the EU funding. In **EU Funds programming period of 2014-2020** increasing of energy efficiency in state buildings is co-financed by the ERDF within the framework of the NOP *"Growth and Employment"*, ThO No.4 *"Supporting the shift towards a low-carbon economy in all sectors"*, the SO 4.2.1.2 *"To increase energy efficiency in state buildings".* The support intensity is 85%. At least 30% of heat energy (or heat energy plus electricity) savings should be reached in the building as a result of the implementation of the energy efficiency project; specific annual thermal energy consumption for heating should not be higher 90 kWh per m^2 (1st tender) or 110 kWh per m^2 (2nd tender)[59]. The beneficiaries might be state direct administration authorities, institutions supervised by them, state-founded universities, higher education institutions and research institutions, state capital companies which fulfil the management of state real estates (1st tender); the beneficiaries might be also state ltd. companies of the health care sector (hospitals, rehabilitation centres), culture sector, sport centres of national status, dedicated several vocational education institutes, and also several dedicated non-governmental organisations having status of public benefit organization and fulfilling state delegated tasks (2nd tender). The measure is included in the WEM scenario.

In 2023-2029 period the support for state buildings continues. The financing is provided by two funds – RRF Plan and CP Programme, the form – restricted Calls. The support is provided for energy efficiency improvement of buildings and their engineering and technological systems, implementation of smart energy consumption control and management equipment, installation of RES-utilizing energy production technologies for self-consumption. Both funding is included in the WEM scenario.

The CP programme provides the financing (aid intensity 85%), within the SO 2.1.1 "Promotion of energy efficiency and reduction of GHG emissions", for the buildings of:

[58] Cabinet of Ministers Regulation No 709 (8th November 2022) "Implementing Rules of the Latvia's Plan of the EU Recovery and Resilience Facility, the reform No 1.2 "Energy Efficiency Improvement", the investment No 1.2.1.3.i "Improvement of the municipal buildings and infrastructure by promoting the transition to the use of renewable energy technologies and improving energy efficiency)". Available: https://likumi.lv/ta/id/337385 *(in Latvian)*

[59] Cabinet of Ministers Regulations regarding the implementation of 4.2.1.2 Specific Objective "Increase of Energy Efficiency in State Buildings" of the National Operational Programme "Growth and Employment": 1st tender's Regulation No 534 (adopted 09.08.2016 https://likumi.lv/ta/id/284333) and 2nd tender's Regulation No 13 (adopted 04.01.2018, https://likumi.lv/ta/id/296336) respectively *(in Latvian)*

- state direct administration institutions[60];
- Latvian universities (state founded);
- vocational education institutions and colleges;
- buildings in which the culture sector functions are performed;

projects' implementation period - up to 31st December 2029.

For the buildings in which the culture sector functions are performed, the support is provided also by the First Component "Climate Change and Environmental Sustainability" of the **RRF Plan** (the grant for 100 % of the eligible costs of the project), the projects' implementation up to 1st June 2026[61].

Investment Support Programmes to reduce GHG emissions: national EAAI. The EAAI financing is used for financing the energy efficiency measures in public sector buildings, the supported projects have high demonstration value. The particular EAAI programmes included in WEM scenario, are:

(1) energy efficiency improvement of the public buildings having the status of national significance architecture monuments: (i) 1st Call projects implemented 2016-2022, (ii) 2nd Call projects on-going implementation up to February 2028. The support intensity is up to 85% of project eligible cost, eligible investments include both energy efficiency improvement of the building and its engineering systems and implementation of RES-heat and RES-electricity technologies[62];
(2) low energy buildings: projects implemented 2016-2019[63];
(3) new energy self-sufficient buildings: two demonstration projects implemented 2019-2021[64], with annual specific energy consumption for heating below 15 kWh per m^2.

The following planned measure, presented below, is included in the WAM scenario.

Financial and knowledge support to municipalities for the implementation of energy efficiency measures. The measure further increases the financial support for municipalities, beyond the amount of support provided by the PaM "Investment Support Programme to Increase Energy Efficiency in Municipal Buildings" of the WEM scenario. Activities relate to energy efficient renovation of buildings and their engineering systems, installation of smart energy control and management equipment, installation of RES utilising energy production technologies. The financial support is combined with the providing adequate knowledge support – energy managers in municipalities (partial covering of staff cost or outsourcing cost), aid in preparation of technical documentation of the projects, support in ICT solutions for energy consumption monitoring and demand management, etc.

Important, the investment support measures in 2024+ period facilities the fulfilment of the public renovation obligation, defined by the Article 6.1 of the new Energy Efficiency Directive

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[60] Includes the buildings of the Ministry of Welfare, the Ministry of the Interior, the Ministry of Health, the Ministry of Smart Administration and Regional Development, the Ministry of Agriculture, the Ministry of Education and Science, the Ministry of Finances, the Parliament (*Saeima*), Latvijas Banka, the buildings managed by the state SC "Real Estate Properties" (*VAS "Valsts nekustamie īpašumi"*) and ltd. "Courthouse Agency" (SIA "Tiesu namu aģentūra")

[61] Cabinet of Ministers Regulation No 443 (8th August 2023) "Implementing Rules of the Latvia's Plan of the EU Recovery and Resilience Facility, the reform 1.2 "Energy Efficiency Improvement", the investment No 1.2.1.4.i "Improvement of Energy Efficiency in State Sector Buildings, including Historical Ones". Available: https://likumi.lv/ta/id/344285 *(in Latvian)*

[62] Cabinet of Ministers Regulation No35 (12th January 2016) "Regulations of the Open Call "GHG Emission Reduction in Buildings which are Architectural Monuments of State Significance" for the Projects Financed by the EAAI": Recasted 14th July 2022 by inclusion of the second Open Call. Consolidated version. Available: https://likumi.lv/ta/id/279830 *(in Latvian)*

[63] Cabinet of Ministers Regulation No 69 (2016) "Regulations of the Open Call "GHG Emissions Reduction – Low Energy Buildings" for the Projects Financed by the EAAI". Available: http://likumi.lv/ta/id/280234 *(in Latvian)*

[64] Cabinet of Ministers Regulation No 418 (2018) "Regulation of the Open Call "GHG Emissions Reduction by Developing Energy Efficient Self-Sufficient Buildings" for the Projects Financed by the EAAI". Available: https://likumi.lv/ta/id/300500 *(in Latvian)*

2023/1791/EU - at least 3% of the total floor area of heated and/or cooled buildings that are owned by public bodies should be renovated each year.

Investments in energy efficiency of public buildings have impact on district heat consumption (energy industries sector) as high share of municipal and state buildings are connected to the DH systems.

The national EAAI supports also the implementation of smart urban technologies, particularly efficient public areas lighting. Three subsequent Open Calls have been announced:

- the 1st Call of the tender "GHG emissions reduction by smart urban technologies"[65], contracted projects' implementation 2019-2022;
- the Call of the tender "GHG emission reduction in the lighting infrastructure of municipal public areas"[66], contracted projects' implementation finishes in the period March 2024 – April 2025;
- the 2nd Call of the tender "GHG emissions reduction by smart urban technologies", contracted projects implementation 2025-2027.

For all noted Calls the EAAI support intensity is up 70% of project's total eligible costs. The measure is included in the WEM scenario.

Programme for Solar (PV) Energy. In 2021-2027 EU Funds programming period the **CP Programme** provides the support in the form of financial instrument – loan issued by JSC "Development Finance Institution ALTUM", guarantee for loan issued by the commercial financial institution, subsidy (grant) - for the implementation of solar PV technologies, related electricity storage equipment and smart solutions to ensure the overall system operation. Wide range of beneficiaries are stated – companies, municipal capital companies, cooperatives, energy communities, households. The measure is included in the WEM scenario.

Impact on PAMs on longer-term trends in GHG emissions

Building (both residential and public ones) renovation measures have a long lifetime, at least 30 years, and thus have the long-term impact until 2050.

The existing energy performance of buildings legal regulation, particularly on minimum energy performance of new buildings (residential and non-residential buildings), also has the long-term impact, as it affects and determines the infrastructure of future buildings.

A range of the energy efficiency measures, which have a lifetime of 3-10 years, have a direct impact on the GHG emission trend with a shorter and medium period of time. As technology advances in these segments, upcoming measures will have an even greater impact.

The installation of renewable energy technologies for electricity production (wind, solar) as well as for heat supply (heat pumps), considering the technical lifetime of the technologies, has a long-term positive impact on GHG emission trends in these sectors.

2.4.2.3. Fiscal policies and measures

The following measures – fuel taxation and taxation applicable for electricity – are included in the WEM scenario.

[65] Cabinet of Ministers Regulation No 333 (12th June 2018) "Regulations of the Open Call „GHG Emissions Reduction by Smart Urban Technologies" for the Projects Financed by the EAAI". Available: https://likumi.lv/ta/id/299903 *(in Latvian)*

[66] Cabinet of Ministers Regulation No 454 (14th July 2022) "Regulations of the Open Call "GHG Emission Reduction and Energy Efficiency Improvement in the Public Areas Lighting Infrastructure of Municipalities" for the Projects Financed by the EAAI". Available: https://likumi.lv/ta/id/334008 *(in Latvian)*

Fuel taxation[67]

Excise duty on natural gas. Sections 6^1 & 15^1 of the Law "On Excise Duties"[68] determine the rates of duty for natural gas. Natural gas is the dominating fossil fuel in energy production in Latvia. Starting from the 1st January 2014 the differentiated rates are applied (Table 2.7). The reduced rate promotes the industrial production and the particular activities of agriculture sector.

Table 2.7 Excise Tax rates for Natural Gas (NG) utilized for energy production

Aim of utilisation of natural gas	Rate, EUR	
	1st January 2014-31st March 2017	from 1st April 2017
Utilised as fuel	17.07 EUR/1000 m^3	1.65 EUR/1 MWh highest calorific value (HCF)
Utilised as fuel to provide (see note 1) **(i) industrial production processes as well as other processes related to production,** **(ii) the operation of technological equipment for agriculture raw materials pre-treatment,** **(iii) necessary climate condition in the premises of industrial production and agriculture sector's raw materials pre-treatment** **(iv) utilised by entities placed in industrial parks**	5.65 EUR/1000 m^3	0.55 EUR/1 MWh, HCF
Utilised to provide heating of greenhouses, industrial scale henhouses/sheds and incubators (see note 2)	Exempted	Exempted till 30 April 2020 From the 1st May 2020 - 0.55 EUR/1 MWh, HCF.
Used for other purposes (not as fuel), utilised in two ways (including processes of chemical reduction, electrolytic and metallurgy processes)	Exempted	
Amount of NG used by the operator of NG transmission, storage and distribution system for the technological needs of NG supply, including losses during supply	Exempted	

Notes:
(1) As the industrial production it is stated the production processes which corresponds to the Annex I, part C "Manufacturing industry", chapters 10.-22 and 24-33 of the Regulation No 1893/2006; the agriculture sector raw materials pre-treatment processes corresonds to the Annex I, part A "Agriculture, Forestry and Fishery", section 01.63 of the given Regulation.
(2) includes the production processes which corresponds to the Annex I, part A, sections 01.13, 01.19, 01.25, 01.28, 01.47

Excise duty on oil products. Sections 5 & 14 of the **Law "On Excise Duties"** determine the rates of duty for **mineral oils** and their substitutes utilised for heat energy production. The actual rates are: (i) residual fuel oil – 15.65 EUR/ton, (ii) kerosene, diesel (gas oil) – 60 EUR/1000 litres. The exempt is made for the oil products utilised for electricity production and for production in CHP mode. Oil gasses and other hydrocarbons if supplied for utilisation as heating fuel or in gas furnaces (not as the transport fuel) are exempted from the duty as well.

[67] For transport fuel taxation see below, in Transport chapter
[68] Law "On Excise Duties". Available: http://likumi.lv/doc.php?id=81066 *(in Latvian)*

Duty on coal, coke and lignite (brown coal). The procedure of taxation applicable for these fuels is prescribed by the **Natural Resources Tax Law**[69]. From the 1st January 2020 tax rate has been doubled and is 0.76 EUR/GJ or 21.3 EUR/ton if information of specific heating value of coal is not available. Up to 31st December 2019 zero tax rate had been stated for coal, coke and lignite utilised for electricity production and in CHP mode.

Taxation applicable for electricity

The procedure is prescribed by the **Electricity Tax Law**[70]. The rate is 1.01 EUR/MWh. It shall be taxable electricity supplied to an end user, as well as electricity, which is supplied for own consumption, except for the cases specified in the Law. Tax shall apply to entities who are engaged in the generation, distribution, supply, selling of electricity as well as purchasing electricity in spot exchange. The exemption applies for the autonomous producers, who generate and consume electricity for their own needs and fulfil the following requirements: the total generation capacity does not exceed 2 MW, and energy resources taxable with excise duty, coal taxable with the nature resource tax or electricity taxable with the electricity tax is used for the generation of the electricity. Related to other end-use consumers, the exemptions/zero rate is applied to (i) household users, (ii) street lighting services. From the 1st January 2023, the exemption for the electricity used for the electricity generation is re-enacted.

2.4.2.4. Information and Education policies and measures

The measures below are included in the WEM scenario.

Informing Energy Consumers of Residential Sector. The given PAM motivates to renovate buildings, particularly in the frame of the EU funds co-financed measure of increasing energy efficiency in multi-apartment buildings. The programme *"Let's live warmer!''* has started in EU Funds 2007-2013 programming period, in 2010, and is continued for the following programming periods. Wide scope of methods is applied to reach and to inform and consult communities of the apartments' owners (housing societies) regarding benefits of energy efficiency increase and the best practices of it, to present the typical faults during energy efficient renovation process, etc. Updated information on available financial support and conditions to receive it is provided regularly. Important, the programme consult on not only renovation but also the practice of maintaining the apartment building after renovation ("Life of building after renovation"). In recent years the programme "Let's live warmer!" has extended the activities to the target group of single-family and two-apartment buildings as well. The implementation of the programme is based on wide stakeholders cooperation. In February 2010, at the initiative of the MoE, the first Stakeholders Memorandum of Understanding had been signed, by 31th December 2016 the Memorandum had been signed by 39 organizations. On 4th March 2020 the Renewed Memorandum of Cooperation, committing to jointly ensure the availability of information on possibilities of the renovation, reconstruction and energy efficiency improvement of buildings has been signed by 31 stakeholders, the signing is permanently open and on September 2023 the Memorandum is signed by more then 40 stakeholders - ministries, state administration institutions, state capital companies, professional non-governmental organizations, Latvian union of district heating utilities, Latvian Union of Local Municipalities, Latvian Union of Cities, Riga city and Zemgale region energy agencies, Vidzeme planning region, Riga Technical university, etc.

[69] Natural Resources Tax Law. Available: https://likumi.lv/doc.php?id=124707 *(in Latvian)*
[70] Electricity Tax Law. Available: http://www.likumi.lv/doc.php?id=150692 *(in Latvian)*

Labelling of appliances. The national legislative framework by transposition of the Ecodesign Directive 2009/125/EC and of the Directive on Labelling and Standard Product Information of Energy Related Products (2010/30/EU) has been implemented in Latvia in due time[71]. The provisions, stated by the Energy Labelling Regulation 2017/1369/EU, new Ecodesign Regulation 2024/1781/EU and particular Commission Regulations on eco-design and labelling for appliances, are implemented directly by the responsible parties.

2.4.2.5. Expired Measures which have an effect, or is expected to continue to have an effect on greenhouse gas emissions

PaMs developed during the last decade are well-established. Most of the PAMs, included in the NC8/BR5, have been renewed and strengthened for the period 2023-2030. For the particular investment support measures the general objectives remain by adjusting the focus, target groups and detailing the supported activities.

Since NC8/BR5, two measures are expired (completed) which have a long-term impact on GHG emissions projections.

Preferential Feed-in Tariffs (FIT) for renewable electricity production prescribed by the **Electricity Market Law**[72] and the CoM Regulations[73] issued pursuant to the Law. No new FIT rights had been issued both for RES-electricity producers (from 26th May 2011) and RES-CHP producers (from 10th September 2012). The legislative provisions are adopted to ensure a controlled closure of the FIT scheme. Thus, the preferential FIT continued for the existing RES-electricity and RES-CHP plants which had obtained the FIT rights before the date noted above, until FIT right expire or waive by the RES-electricity of RES-CHP producer. Number of RES utilities, participating in FIT scheme, gradually decreased. By considering the technical lifetime of the installed renewable electricity production technologies, the WEM scenario considers the long-term impact of FIT on GHG emissions trend.

In 2018 -2020 Latvia used **Energy Efficiency Obligation Scheme** (EEOS) in accordance with the provisions of the Energy Efficiency Directive 2018/2002/EU. The EEOS framework is stated by the Energy Efficiency Law, in April 2017 the detailed procedures had been adopted by the government. The obliged parties for the EEOS start period and the first period (up to 31 December 2020) were electricity retail sellers which sold at least 10 GWh of electricity in 2016 or in any of 2017-2020 years. Starting from 2021 the EEOS is not used. A range of investment measures, implemented in 2017-2020 by obliged parties, have the long-term impact.

2.4.2.6. Co-benefits from Mitigation Measures

Latvia's mitigation actions yield significant adaptation and economic co-benefits in the Energy sector, aligning with Article 13 of the Paris Agreement (Decision 18/CMA.1, para 84). These measures enhance the resilience of Latvia's energy infrastructure to climate change impacts and contribute directly to reducing GHG emissions.

[71] (1) Cabinet of Ministers Regulation No. 941 (in force from 15.12.2011) "Regulations regarding Ecodesign Requirements for Energy-related Goods (Products)". Available: http://likumi.lv/doc.php?id=241282 ; (2) Cabinet of Ministers Regulation No. 480 (in force 20.07.2011-19.05.2020) "Regulation regarding Labelling of Energy and Other Resources Consumption Related Products as well as Their Advertisment and Supervision": historical version http://likumi.lv/doc.php?id=232553 *(in Latvian)*

[72] Electricity Market Law. Available: http://likumi.lv/doc.php?id=108834 *(in Latvian)*

[73] (1) Cabinet of Ministers Regulation No. 560 (2020) "Regulations regarding the Production of Electricity Using Renewable Energy Sources, the Procedures for the Determination of the Price and the Supervision". Available: http://likumi.lv/doc.php?id=317215 , (2) Cabinet of Ministers Regulation No. 561 (2020) "Regulations regarding Electricity Production, Supervision and Price Determination upon Production of Electricity in Cogeneration". Available: http://likumi.lv/doc.php?id=317216 *(in Latvian)*

Increased Energy Security

By expanding the capacity of RES, Latvia reduces its dependency on imported fossil fuels, thus ensuring a more stable and reliable energy supply. This is particularly critical during extreme weather events or geopolitical conflicts that may disrupt conventional energy systems. Key mitigation measures, such as implementing the Latvian-Estonian offshore wind park ELWIND project, significantly enhance Latvia's energy security. Moreover, the measure to improve regulations for issuing construction permits for wind power and clarification of construction regulations for solar power stations streamlines the integration of renewable energy into the national grid through the RES Directive. Implementing energy storage solutions and promoting pilot projects in high-capacity energy production plants that implement energy and heat storage solutions will improve infrastructure durability by integrating advanced, climate-resilient technologies. Energy Security has significant implications for public safety and the Latvian economy. Therefore, shifting to Latvian-owned renewable power sources is probably the most critical opportunity for co-benefits of all mitigation measures.

Improved Public Health

Measures to improve energy efficiency in buildings will directly contribute to better public health by reducing the need for energy-intensive cooling and heating systems, particularly during extreme weather events. Promoting energy efficiency in buildings, especially regarding cooling systems and insulation, can reduce health risks related to extreme temperatures (e.g., heatwaves). Updated heating and cooling systems also allow for quicker, more efficient reactions to the enhanced early warning systems that are part of the climate adaptation plan. Improved heating, ventilation, and air conditioning systems will also enhance air quality within buildings and allow for better control systems to limit the spread of airborne pathogens and viruses. Measures such as funding for improved energy efficiency in Apartment buildings and mandatory EMS for large electricity consumers lead to reduced emissions from fossil fuels, improving air quality and reducing respiratory and cardiovascular diseases associated with air pollution. Additionally, promoting RES in CHP plants and infrastructure modernization further decreases harmful emissions, enhancing air quality and public health outcomes, especially in urban areas.

Economic Resilience

The economic resilience of Latvia is bolstered by several key measures in the energy sector. The measure to promote the use of electricity storage technologies in businesses and households, including within support programs, reduces energy costs by enabling more efficient energy use and storage. By promoting energy efficiency and supporting the use of renewable energy in households, particularly low-income ones, energy costs can be reduced, thereby lowering the incidence of energy poverty and improving living conditions. This economic stability is crucial for mitigating the impacts of energy price volatility, particularly during periods of climate or conflict-induced economic disruption. Furthermore, the mandatory implementation of RES production technologies by service providers fosters the growth of the green energy sector, creating jobs and supporting economic diversification. The requirement for large enterprises and municipalities to improve energy efficiency also reduces operational costs, freeing up resources for investment in other climate resilience measures. Additionally, these measures drive technological innovation, positioning Latvia as a leader in sustainable energy technology development and further contributing to global GHG emission reductions.

2.4.3. Transport

2.4.3.1. Regulatory policies and measures

Biofuel Blend Obligation Requirement

The given PAM ensures growth of the renewable energy share in transport sector and is included in the WEM scenario. The Obligation has been introduced on 1st October 2009[74]. Table 2.8 presents the requirements in force from 2018. From the 1st January 2020 the mandatory volumes of blend are increased. In the period 1st July 2022 - 31st December 2023 the biofuel blend was voluntary to mitigate sharp increase in transport fuel price. The Obligation applies to fuels offered on the Latvian market for the operation of spark-ignition and compression-ignition engines for road transport vehicles, all-terrain vehicles, agricultural and forestry tractors, inland waterway vessels, as well as recreational craft when not sailing at sea, considering the technical requirements of these engines in relation to health and environment protection. Blended biofuels shall correspond to the sustainability criteria.

Table 2.8 Biofuel Blend Obligation in Latvia

	1st April 2018 - 31st December 2019	from 1st January 2020
Bioethanol blend, mandatory for the gasoline of "95" trademark	4.5-5% (volume) of total volume	At least 9.5% (volume) of total volume
Biodiesel blend	(a) 4.5-7% (volume), of total volume, if the biodiesel produced from rapeseed oil, blended	At least 6.5% (volume) of total volume
	(b) at least 4.5% (volume) of total volume, if the paraffinic diesel, produced from biomass, blended	

Exemptions are made for:

- diesels utilised: (i) in case of winter climate, namely, in the period 1st November - 1st April, (ii) in sea and avio transport engines;
- gasoline utilised: (i) in cars participating in sport competitions, (ii) in avio engines.

Mandatory annual systematic inspection of technical conditions of motor vehicles

Mandatory annual technical inspections of motor vehicles ensure that only those vehicles that comply with technical and environmental requirements are being allowed to take part in the road transport[75]. Mandatory systematic inspection of technical conditions relates also to tractors. The measure is included in the WEM scenario.

In general, the inspection of road vehicles is annual. To reduce administrative burden for owners of new cars, which have not been registered either in Latvia or abroad before, from the 1st January 2018 it is introduced by the Road Traffic Law the provision that first two inspections are performed bi-annually (the first of the periodic inspections not later than 24

[74]Cabinet of Ministers Regulation No. 332 (2000, with amendments) "Requirements for Conformity Assessment of Petrol and Diesel Fuel": consolidated version. Available: https://likumi.lv/ta/id/11217 *(in Latvian)*

[75] Cabinet of Ministers Regulation No. 295 (2017) „Regulations on motor vehicles state technical inspection and technical roadside inspection". Available: https://likumi.lv/doc.php?id=292396 *(in Latvian)*

months after the relevant new car has been registered in Latvia for the first time, the second periodic inspection - not later than 24 months after the first one). In its turn, subsequent periodic technical inspections shall be performed on an annual basis.

Note. Vehicles which have been registered abroad before shall be subject to the first-time periodic technical inspection not later than five days after the relevant vehicle has been registered in Latvia.

Public Procurement: Promotion of clean and energy efficient road transport

The detailed description of this PAM is included below in the Cross-Sectorial section, in the PaM “Green Public Procurement”. The measure is included in the WEM scenario.

2.4.3.2. Economic policies and measures

Electric Vehicles (EV) Charging Infrastructure Development

In Latvia two largest EV charging networks are (1) *E-mobi*, operated by the State SC “Road Traffic Safety Directorate”[76] - 141 fast charging stations, each with two charging points (DC and AC) with capacity up to 50 kW, and (2) the charging network of the largest private investor *Electrum Drive* - in middle of 2024 consists of more than 100 public charging locations (stations) with more than 350 charging points, of which more than 50 ones have the capacity 50+ kW[77]. In November 2022 the cooperation agreement has been concluded between *E-mobi* and *Electrum Drive* charging networks, it makes easier for EV users to receive a charging service, regardless of whether they are charging in the *E-mobi* or *Elektrum Drive* network, by allowing them to use a single login to charge at most charging stations in Latvia. This cooperation will improve both the quality of service and the availability of charging infrastructure.

EV Charging Infrastructure Development in Public Areas is supported by the RRF Plan funding. Power distribution system operator SJSC “Sadales tīkls” in cooperation with the customers is installing (up to 31st May 2026) 2060 grid connection points for installation of new publicly available EV charging points and/or solar PV micro-generation equipment throughout Latvia. The infrastructure from the power distribution network to the metering substation is designed and built by DSO "Sadales tīkls" (RRF Plan funding), the customers - municipality, state or municipal institution (authority), state or municipal capital company, public-private company, EV charging point operator – are financing the installation of charging point and related equipment and connection from the substation. The charging point is up to 22 kW [32 A, 0,4 kV][78]. The measure is included in the WEM scenario.

EV purchase support.

Two target groups are supported: natural persons (national EAAI instrument) and merchants (Latvia’s RRF Plan). Both measures are included in the WEM scenario.

Natural persons (households): EAAI programme in 2022-2024. Support is provided for M1 and N1 category EVs which are (i) new and exploited zero emission battery-EVs (BEV) and (ii) new plug-in hybrid EVs (PHEV), having specific GHG emissions up to 50 grams CO_2 per km. The annual mileage per EV to be reached is stated 52000 km during 5 years (10400 km annually in average). The amount of grant is differentiated: (1) purchase of new BEV and new PHEV –

[76] Established in 2014-2020 EU funds programming period, construction finished end of 2021

[77] The *Electrum Drive* is the EV charging service which is offered within the overall energy services provided by the “Electrum” (the trademark of the SC “Latvenergo”) – one of the largest electricity traders in Latvia. *Electrum Drive* charging network. Available: https://elektrumveikals.lv/lv/majai/e-auto-uzlade/publiska-uzlade Accessed 29th June 2024 *(in Latvian)*

[78] Cabinet of Ministers Regulation No 726 (15th November 2022) “Implementation Rules of the Latvia’s Recovery and Resilience Facility Plan's measure “Modernisation of Power Transmission and Distribution Networks””. Available: https://likumi.lv/ta/id/337225 *(in Latvian)*

4500 EUR, (2) purchase of exploited BEV – 3350 EUR. For the large families increased support applies: (1) purchase of 5-seats exploited BEV – 5000 EUR, (2) purchase of 5-seats new BEV and new PHEV, of 7-seats exploited BEV – 6750 EUR, (3) purchase of 7-seats new BEV and new PHEV – 9000 EUR. When purchasing a new BEV or PHEV, it is also provided support (2000 EUR) for the scrapping of an existing vehicle by handing it over to a treatment company. Also, the trader merchant - BEV and PHEV seller - shall offer the customer a program that has an additional incentive effect (discount, attractive leasing conditions, maintenance, etc.) of 1000 or 500 EUR respectively for new EV and exploited EV[79]. Around 2.5 thousand EVs are expected to be purchased up to end of 2024[80].

Merchants (Businesses): RRF Plan funding[81] facilitates the purchase of new M1 and N1 category BEV, the combined financial instrument consisting of the loan guarantee and the capital rebate (grant) for a full or partial reduction of the principal amount of the lease from another financier is provided. The financial instrument is administrated by the JSC "Development Finance Institution ALTUM". The beneficiaries are registered in Latvia enterprises operating in any economic sector, except specific ones. Important, in case of N1 category vehicle, five years from the moment the purchased BEV is registered in Latvia, the vehicle is both not used for commercial cargo transportation and is not rented out to others for commercial cargo. The aid is granted as *de minimis* aid. The decision on providing the aid may be adopted by the JSC "Development Finance Institution ALTUM" up to 31st December 2025; in its turn, the deadline for allocating the costs of the RRF is 31st August 2026. The maximum grant for the purchase of (i) one M1 category BEV is 5000 EUR; (ii) one N1 category BEV is 10000 EUR, and up to 180 thousand EUR for the single beneficiary for the purchase of all BEV within the whole project. The grant shall not exceed the 30% of the eligible costs of the project. The beneficiary provides at least one year from the moment the purchased BEV is registered in Latvia the annual mileage of at least 20 thousand km.

The following planned measure, presented below, is included in the WAM scenario.

Further increase of the number of battery electric cars. The given PaM supports the increase of the number of BEV beyond the WEM scenarios above measure "EV purchase support". The increase relates to all users – natural persons, merchants, state and municipal institutions. updated NECP 2021-2030 provides: (1) to use diverse funding to support the EV purchasing – EU funds, EAAI, Modernisation Fund, (2) to develop also new financing instruments, e.g., soft loan and loan guarantee programme for natural persons, (3) to consider the amendments to the licensing of commercial transport, setting the obligation for the use of EVs, as well as the provisions of national regulation and support programmes to motivate the writing-off old fossil fuel vehicles. As a result, updated NECP 2021-2030 envisages to have at least 20 thousand EV in 2030 which is around tripled existing number of July 2024[82].

Promotion of modal shift to users-convenient zero emission public transport

The following measures are included in the WEM scenario:

- development of zero emission public transport: new electric buses,

[79] Cabinet of Ministers Regulation No 896 (21st December 2021) "Regulations of the Open Tender "GHG Emissions Reduction in Transport Sector – Support for the Purchase of Zero and Low Emission Vehicles" for the Projects Financed by the EAAI". Available: http://likumi.lv/ta/id/328761 *(in Latvian)*
[80] Evaluation based on the trend of the EV purchase within the programma. Latvian Environmental Investment Fund website on programme statistics: https://ekii.lv/index.php?page=atbalsts-transportlidzekliem
[81] Cabinet of Ministers Regulation No 594 (20th September 2022) "Implementing Rules of the Latvia's Plan of the EU Recovery and Resilience Facility, the reform No 1.2, investment No 1.2.1.2.i , the Measure 1 "Energy efficiency improvement in business sector (including the transition to renewable technologies)". Available: https://likumi.lv/ta/id/336032 *(in Latvian)*
[82] Updated National Energy and Climate Plan 2021-2030: page 33 & 38

- electrification of the Latvia's railway network and implementation of state-of-art new Electric multiple unit (EMU) trains,
- promotion of multi-modality of public transport.

In its turn, the following planned measures are included in the WAM scenario:

- new battery–EMU trains,
- electrifying of public transport and improving its electricity infrastructure

By implementing all measures related to public transport development, the updated NECP 2021-2030 plans significantly increase the number of public transport users.

Development of zero emission public transport (PT)

In the period up to 2029 the investment support to purchase electric buses for public and municipal transport is provided by both **RRF Plan and Latvia's Territorial Just Transition Plan.** The support is provided for the purchase of more than 70 new electric buses (incl. replacing previously used fossil fuel utilizing ones)[83]:

- **the RRF Plan,** within the Third Component "Reducing inequalities" (with focus on the consequences of 2021 administrative territorial reform) provides the support for municipalities for the purchase of electric school buses[84]. The selection of beneficiaries (eligible - all Latvia municipalities, except capital city Rīga) has been done in Open Calls in 2023. At least 15 electric buses (M2 and M3) and related charging equipment will be purchased up to 31st December 2025.
- **Latvia's Territorial Just Transition Plan** provides the support for municipalities for the purchase of electric buses (M2 and M3), as well as M1 specialized zero-emission vehicles which are intended for transporting people in wheelchairs and people with special needs, to ensure municipal services in the education, social services, healthcare and culture sector[85]. The selection of beneficiaries (eligible – all Latvia municipalities, except Rīga region) has been done in Open Calls in 2024. At least 38 electric buses and related charging infrastructure will be purchased up to 31st December 2029.
- **RRF Plan funding** (within the first component "Climate Change and Environmental Sustainability"), provides wide complex investment for greening transport in the Rīga metropolitan area. One of the activities is purchase of at least 17 electric buses and related charging infrastructure[86].

Electrification of the Latvia's railway network

The policy of zero-emission multi-modal public transport development, including railway as the central element, is included in the NDP 2021-2027 and NECP 2021-2030. **RRF Plan**, 2022-2026 invests for the complex improvement of electrification of railway system in Rīga metropolitan area. The investment to modernise and increase the electrified railway area is

[83] On the 1st January 2024 there were 112 electric buses registered in Latvia, thus, the implementation of the measure will significantly increase the number of electric buses.

[84] Cabinet of Ministers Regulation No 673 (25th October 2022) "Implementing Rules of the Latvia's Plan of the EU Recovery and Resilience Facility, the Third Component "Reducing inequalities", the reform No 3.1 "Regional policy", the investment No 3.1.1.6.i "Purchase of zero-emission vehicles for implementation of municipal functions and provision of municipal services". Available: https://likumi.lv/ta/id/336738 *(in Latvian)*

[85] Cabinet of Ministers Regulation No 65 (23th January 2024) "Implementing Rules of the Latvia's EU Cohesion Policy Programme for 2021-2027 planning period: the specific objective 6.1.1 ""Mitigating the economic, social and environmental consequences of the transition to climate neutrality in the most affected regions", the measure 6.1.1.6 "Promoting zero emission vehicles in municipalities". Available: https://likumi.lv/ta/id/349316 *(in Latvian)*

[86] Cabinet of Ministers Regulation No 237 (9th May 2023) "Implementing Rules of the Latvia's Plan of the EU Recovery and Resilience Facility, the reform and investment direction No 1.1 "Emission reduction in transport sector", reform No 1.1.1.r "Greening of Riga metropolitan area transport system", the investment 1.1.1.2.i "Environmental friendly improvements in Riga public transport system"". Available: https://likumi.lv/ta/id/341828 *(in Latvian)*

provided also by the **CP programme.** In total, zero-emission railway infrastructure length to be increased by 45 km, the modernisation of 245 km of existing electrified lines to be provided in 2030. Thus, the infrastructure for the operation of modern electric trains will be ensured. In 2024-2026 the 32 new EMU trains will be put in operation (a half of them operate already in 2024), financing for purchase provided by EU funding. New modern EMUs replace worn-out previous-generation EMUs and allows for more frequent traffic schedule performed by user-convenient vehicles.

Promotion of multi-modality of public transport (PT)

The given PAM facilitates the passenger-convenient connecting points between rail and buses transport modes, as well as private electric mobility (including EV charging points) and micromobility modes. The investment for the development of multi-modal mobility points and Park&Ride infrastructure, is included in the **CP Programme's** Specific Objective "*To promote the sustainable and diverse mobility in cities/towns*". Project submitter & financial beneficiary – municipality or municipal capital company. As a result of the PAM, at least 25 multi-modal railway – public transport connection points shall be constructed up to 31st December 2029. In its turn, **RRF Plan** provides investment for the improving PT access infrastructure of particular railway stations in Rīga area by creating eight smart digitalized multi-modal points up to 31st May 2026[87].

The following planned measures, presented below, are included in the WAM scenario.

New battery–EMU (BEMU) trains. Updated NECP 2021-2030 provides for the purchase and operation of 9 battery-EMUs, financing to be provided by the CP programme[88] and state budget. BEMU will be put into operation gradually after 2027. The operation of BEMU will replace worn-out diesel trains.

Electrifying of public transport and improving its electricity infrastructure. The given PAM supports the further increase of the number of user convenient EVs in public transport, beyond the WEM scenario's above measure "Development of zero emission public transport". Updated NECP 2021-2030 provides to use EU funding and municipalities' budgets to purchase new zero emission vehicles of public transport and their charging infrastructure and plans to have 265 new electric buses in Latvia as well as 100 new trolleybuses and 24 new low-floor trams in Rīga city by 2030[89].

Impact on PAMs on longer-term trends in GHG emissions

Well-developed EV charging infrastructure is the key-condition for the long-term promotion EV market and rapid growth of the number of EV.

The investments in zero-emission public transport have long-term lifetime and by establishing users-convenient system facilities long-term societal acceptance of modern public transport.

2.4.3.3. Fiscal policies and measures

The following fiscal measures are included in the WEM scenario:

- excise tax – Transport sector;

[87] Cabinet of Ministers Regulation No 51 (16.01.2024) "Implementing Rules of the Latvia's Plan of the EU Recovery and Resilience Facility, the reform and investment direction No 1.1 "Emission reduction in transport sector" ,reform No 1.1.1.r "Greening of Riga metropolitan area transport system", the investment 1.1.1.2.i "**Environmental friendly improvements in Riga public transport system**", the measures 1.1.1.2.i.3 and 1.1.1.2.i.3" (**multi-modality points**). Available: https://likumi.lv/ta/id/349171 *(in Latvian)*

[88] atvia's EU Cohesion Policy Programme for the 2021-2027 planning period. Information on measures financing. Available: https://www.esfondi.lv/pieejamais-atbalsts/planotas-atlases/es-fondu-planotas-projektu-atlases *(in Latvian)*

[89] Updated National Energy and Climate Plan 2021-2030: page 35

- annual taxation of vehicles;
- exemption from electricity tax for the electricity used for carriage of goods and public carriage of passengers including on rail transport and public transport in towns (Electricity Tax Law).

Excise Tax – Transport sector

Law "On Excise Duties" establishes procedure by which duty shall be imposed. The Sections 5, 14 and 18 determine the rates of duty for gasoline and diesel oil. The Sections 6^1&15^1 determine the rate for natural gas (Table 2.9).

Table 2.9 Excise duties for fuels utilised in transport sector

	Duties, EUR per 1000 litres		
	2018-2019	1st January 2020 – 1st February 2021	From 1st February 2021
Unlead gasoline	476	509	509
Unlead gasoline with 70-85% (volume) of bioethanol (produced from agriculture origin raw materials in Latvia or imported from EU member state) mix	30% of the base rate (if mixed in Latvia or imported from EU member state)		360
Lead gasoline	594	594	594
Diesel oil (including diesel oil with any mix of biodiesel)	372	414	414
Diesel oil utilised in agriculture sector (earmarked amount per ha)	15% of the base rate		
Pure rapeseed biodiesel (produced in Latvia or imported from EU member state)	0 (if produced in Latvia or imported from EU member state)		330
Another pure biodiesel and paraffinic diesel produced from biomass	372	414	330
Oil gasses and other hydrocarbons (per 1000 kg)	244	285	285
Natural gas (per 1 MWh, highest calorific value)	9.64	9.64	1.91 (01.01.2021-31.12.2025) 10 (from 01.01.2026)

To promote natural gas utilising vehicles, the reduced rate for natural gas - 1.91 EUR per MWh – is stated for the period 1st January 2021 – 31st December 2025. From the 1st January 2026 tax rate of 10 EUR per MWh will be applied.

Annual taxation of vehicles. The vehicle annual operation tax, based on the specific CO_2 emissions of the vehicle, grams per km (plus fixed supplement for those engines capacity of which exceeds 3500 cm^3), is being calculated for the cars firstly registered from 1st January 2009 and for the light duty vehicles (LDV) firstly registered from 1st January 2012. For the cars and LDV with the specific CO_2 emissions not more than 50 grams per km zero tax rate is applied[90]. For the older cars and LDV the tax is differentiated based on engine capacity, maximal power of engine and the gross weight of the car. In its turn, for buses and heavy duty vehicles (HDV) with gross weight above 3500 kg the annual operational tax is based on EURO class. For light buses (≤3500 kg) annual operational tax continues to base on the gross weight.

2.4.3.4. Information and Education policies and measures

New passenger cars labelling on fuel economy rating provides information regarding fuel consumption (litres per 100 km or km per litre) and CO_2 emissions (grams per km). On 20th July 2004 CoM Regulation No. 608[91] came into force transposing the requirements of the Directive 2003/73/EC. The measure is included in the WEM scenario.

2.4.3.5. Expired Measures which have an effect, or is expected to continue to have an effect on GHG emissions

Since NC8/BR5, two measures are expired (completed) which have a long-term impact on GHG emissions projections.

Within the framework of the NOP "Growth and Employment" (ThO No 4 "*Supporting the shift towards a low-carbon economy in all sectors*") of EU Funds 2014-2020 programming period, a single national level fast charging infrastructure coverage (*E-mobi* charging network) has been ensured in the end 2021: 141 fast charging stations, each with two charging points (DC and AC) with capacity up to 50 kW[92]. The E-mobi network is operated by the State SC "Road Traffic Safety Directorate". The measure provides the technical background for the implementation of the WEM and WAM scenarios measures of electromobility development, particularly ensuring significant number of electric cars, the purchase of which are/will be supported by public budget.

In **EU Funds programming period of 2014-2020** the development of the infrastructure of PT had been co-financed by CF within the framework of the NOP "*Growth and Employment*", ThO No. 4 "*Supporting the shift towards a low-carbon economy in all sectors*". The increase of number of environmentally friendly vehicles of PT (trams[93] and buses) and length of tram lines had been provided. Investments had been made in accordance with cities development plans[94,95]. These investments resulted in around 20 km new and improved tram lines, purchase or more than 40 new tram carriages, purchase or upgrade of 143 environmentally friendly buses and thus promoted the modal shift to public transport.

[90] Law „On the Vehicle Operation Tax and Company Car Tax". Available: https://likumi.lv/ta/id/223536 *(in Latvian)*
[91] Cabinet of Ministers Regulation No. 608 (2004) „Regulations Regarding Consumer Information to be Provided in Labelling and Promotional Publications on Fuel Consumption and CO_2 Emissions of New Passenger Cars". Available: http://likumi.lv/doc.php?id=91538 *(in Latvian)*
[92] Cabinet of Ministers Regulation No. 637 (03.11.2015) "Regulations regarding the implementation of the Operational Programme's "Growth and Employment" 4.4.1. Specific Objective "To Develop the Electric Vehicles' Charging Infrastructure in Latvia". Available: https://likumi.lv/doc.php?id=277693 *(in Latvian)*
[93] In capital city Riga, Liepaja and Daugavpils cities
[94] Cabinet of Ministers Regulation No 467 (2020) "Regulations regarding Implementation of the Operational Programme's "Growth and Employment" Measure 4.5.1.1. "To Develop the Infrastructure of Environmentally Friendly Public Transport (Rail Transport)". Available: http://likumi.lv/doc.php?id=316400 *(in Latvian)*
[95] Cabinet of Ministers Regulation No 848 (2016) "Regulations regarding Implementation of the Operational Programme's "Growth and Employment" Measure 4.5.1.2 "Development of Environmentally Friendly Public Transport (Buses) Infrastructure". Available: http://likumi.lv/doc.php?id=287628 *(in Latvian)*

2.4.3.6. Actions, policies and measures that influence GHG emissions from international transport

Development of EV charging infrastructure on TEN-T network, 2024-2029 period. **CP Programme for 2021-2027 programming period** allocates financing for establishment of large capacity EV charging points in the Trans-European Transport Network (TEN-T) roads[96]. In its turn, *Electrum Drive* installs large capacity charging stations on TEN-T network with the support of Connecting Europe Facility.

Establishment of shore-sited power supply points for marine vessels. Elimination of waste release in environment. On 13th August 2024 the CoM has approved the regulation[97] on the investments in two large harbours – Ventspils Free Port and Harbour of Liepāja Special Economic Zone - infrastructure. The investments are financed by the CF within the **CP Programme's** Specific Objective 3.1.1 "Development of a sustainable, climate-resilient, intelligent, safe and multimodal TEN-T infrastructure". The investments aim to (1) establish shore power supply points for marine vessels (including electricity supply equipment, increasing capacity of power supply network, necessary ICT solutions for operating the power supply points), (2) purchase and install the equipment for receiving harbour oil and other waste, including residues of exhaust gas purification systems, to comply with environmental requirements, and (3) implement measures to ensure safe shipping conditions, thus mitigating harbours impacts on climate and cities environment. Implementation up to 31st December 2029. The CF aid intensity is up to 85 % of projects eligible costs.

Reduction of CO_2 emissions of aircraft engines during taxi-in in Riga International Airport. In EU funds 2014-2020 programming period it is provided investment support within the framework of NOP "Growth and Employment" (priority direction "Sustainable transport") to improve the manoeuvring of income flights[98]. The investment activities include construction of the second fast ramp of the manoeuvring road and modernisation of manoeuvring roads of around 10 thousand meters length. As a result, the decrease of the average amount of CO_2 emissions produced by aircraft engines during taxi-in (the course RWY18) is promoted.

Reduction of aviation related emissions in the EU ETS. Since 2012 the EU ETS has been covering the aviation sector in Europe. ETS participating Latvian airline *airBaltic* (Air Baltic Corporation SC) is the leading airline in the Baltic states. *airBaltic* offers connections to more than 70 destinations in Europe, the Middle East, North Africa, and the Caucasus region. Its primary shareholder – Latvian state (in 2024 holds almost 98% of the stock) takes permanent efforts to ensure energy efficient and environmentally friendly development of the company. The *airBaltic* fleet consists of 48 Airbus A220-300 aircraft, making it one of the youngest fleets in Europe. *airBaltic* moved to an all A220 fleet in 2020 - earlier than expected. It enabled the airline to operate the most efficient aircraft available. The aircraft offers 25% lower fuel burn and CO_2 emissions per seat compared to previous generation aircraft.

[96] Latvia's EU Cohesion Policy Programme for the 2021-2027 planning period. Information on measures financing, the measure 2.4.4.1. Available: https://www.esfondi.lv/pieejamais-atbalsts/planotas-atlases/es-fondu-planotas-projektu-atlases *(in Latvian)*

[97] Cabinet of Ministers Regulation No 538 (13th August 2024) "Implementing Rules of the Latvia's EU Cohesion Policy Programme's for 2021-2027 planning period measure 3.1.1.6 "Development of Public Infrastructure of Large Harbours" of the specific objective 3.1.1 "Development of a sustainable, climate-resilient, intelligent, safe and multimodal TEN-T infrastructure"'". Available: https://likumi.lv/ta/id/354281 *(in Latvian)*

[98] Cabinet of Ministers Regulation No 652 (27th October 2020) "Implementing Rules of the National Operational Programme's "Growth and Employment" Specific Objective No 6.1.2 "Facilitate safety and compliance with environmental requirements at the international airport "Riga" " of the Priority "Sustainable Transport System". Available: https://likumi.lv/ta/id/318317 *(in Latvian)*

2.4.3.7. Co-benefits from Mitigation Measures

Latvia's mitigation actions yield significant adaptation and economic co-benefits in the transport sector, aligning with Article 13 of the Paris Agreement (Decision 18/CMA.1, para 84). These measures enhance the resilience of Latvia's transport infrastructure to climate change impacts and contribute directly to reducing GHG emissions.

Increased Transport Resilience and Accessibility

The modernization and greening of railway infrastructure, including the acquisition of new electric and efficient low-emission trains, significantly contribute to the resilience of Latvia's transport systems. These measures reduce dependency on fossil fuels, thereby ensuring a more stable and reliable transport system that is less vulnerable to disruptions from climate-induced extreme weather events or geopolitical conflict. Additionally, the development of accessible railway passenger infrastructure and the promotion of freight transfer to rail further enhances the resilience of the transport sector by diversifying transport modalities and reducing road congestion. Transportation measures, particularly the development of EV infrastructure and the promotion of biofuel blends, are significantly enhancing transport accessibility for both rural and city-based Latvians. In urban areas, the expansion of EV charging stations and the introduction of zero-emission public transport are making sustainable transport more accessible.

Improved Air Quality and Public Health

Mitigation measures in the transport sector, such as the increase in zero-emission light passenger vehicles, directly contribute to improved air quality by reducing emissions from diesel and gasoline-powered vehicles. The shift to zero-emission vehicles, supported by the expansion of charging infrastructure and the promotion of zero-emission micromobility tools, leads to a significant reduction in particulate matter and nitrogen oxide emissions, major contributors to air pollution. Improved air quality has direct public health benefits, particularly in urban areas with prevalent respiratory and cardiovascular diseases. Sustainable transportation measures such as developing green corridors and increasing the use of EV can reduce the urban heat island effect, lowering ambient temperatures and contributing to a more comfortable and healthier urban environment. Furthermore, the electrification of public transport and the installation of publicly accessible hydrogen filling points enhance air quality by replacing older, polluting vehicles with cleaner alternatives.

Economic Resilience and Job Creation

The transport sector's adaptation measures also bolster economic resilience by promoting the transition of commercial transport to a zero-emission fleet, which reduces operational costs related to fuel and maintenance. This transition is supported by incentives for the increase in zero-emission medium and heavy-duty vehicles, which lower the economic burden on businesses. Additionally, the development of Zero Emission Zones and micromobility infrastructure will contribute to economic diversification by creating new business opportunities in areas with increased pedestrian and bike routes and public transportation transfer locations. Transportation measures can also bolster job creation by stimulating demand for green technologies and services, leading to new business opportunities in areas such as vehicle maintenance/compliance/scrapping, electric vehicle production, and public transportation-related positions.

Enhanced Public Safety and Infrastructure Durability

Strategic development of hydrogen and methane filling points for public transport ensures the long-term durability of private transport infrastructure by promoting fuels that are less corrosive and damaging to vehicle engines and fuelling stations. Traffic calming measures, particularly in urban areas like Rīga, and the optimization of the public transport system contribute to enhanced public safety by reducing the risk of accidents and improving traffic flow. These measures also support the resilience of urban infrastructure by reducing the wear and tear on roads and minimizing the impact of heavy traffic on residential areas. By decreasing the overall volume of traffic and encouraging the use of more sustainable transport options, the demand for costly infrastructure maintenance and construction can be significantly reduced, leading to long-term savings for municipalities and better allocation of resources for other critical urban developments. Coastal protection adaptation measures can enhance the resilience of transport networks in coastal areas, ensuring the longevity of critical transport infrastructure like roads and railways along the coast by safeguarding them from the impacts of erosion, rising sea levels, and extreme weather events.

These specific measures in the transport sector exemplify Latvia's commitment to enhancing the resilience of its transport infrastructure while simultaneously achieving significant GHG emission reductions, aligning with the objectives of the Paris Agreement.

2.4.3.8. Total effect of policies and measures in Energy and Transport sector

This section provides an overview of the impact of implemented (WEM scenario) and planned (WAM scenario) PaMs in Energy and Transport sectors on GHG emissions projections.

The aggregated estimates for the GHG reduction impacts of implemented individual policies and measures are 751 kt CO_2 eq. for 2030.

Table 2.10 The total effect of the policies and measures (PaMs) calculated based on estimated impact of PaMs for the year 2030 (kt CO_2 eq./year).

	Implemented measures	Planned measures
CO_2	695	184
N_2O	23	6
CH_4	33	8
Total GHG	**751**	**198**

The planned measures will reduce GHG emissions increasingly after 2025 reaching an additional annual reduction of 198 kt CO_2 eq. in 2030. Most of the reduction in total GHG emissions comes from CO_2 emissions.

Considering the implemented measures, in the Energy sector the largest contribution in GHG emissions reduction is provided by the investment support measures to switch from fossil fuels to RES (biomass) to produce heat energy in the district heating system and switch from natural gas to wind energy and solar PV to produce electricity (Table 2.11). The second largest emission reduction is in the transport sector, where the main contribution is from the use of biofuels and the next from the green public procurement procedure.

The energy efficiency improvement measures implementation in buildings and manufacturing industries also provides a considerable contribution.

Table 2.11 Estimated effects of policies and measures implemented in Energy and Transport, by sector (kt CO_2 eq./year)

Sector	Implemented measures	Planned measures
Energy industries	377	-
Buildings (Residential and Service sector)	86	19
Manufacturing industries	69	19
Transport	219	160
Total	**751**	**198**

If we analyse the impact of the planned measures, the main contribution here is in the transport sector from replacing fossil fuels with modern biofuels and increasing the number of electric cars.

The total effect of policies and measures contains noticeable uncertainties. The impact estimates of individual policies and measures are not fully additive, which may result in an overestimation of the mitigation impact in certain sectors. To avoid overlapping of estimates, the several individual measures are considered as the single package and thus the impact of the whole package is evaluated. This approach is applied for particular cases if such combination of measures is applicable and rational, e.g., the typical case of such package comprises the information measures and economic measures (investment support programmes).

It should also be paid attention to the overlapping effect when evaluating the effect due to implementation of such measures as energy efficiency improvement in buildings and fossil fuel replacement by RES in heat supply. These are typical interacting measures and the overall impact of them usually is less than the total impact obtained as the summed impacts of individual measures.

The top-down evaluation method is another possibility both to avoid such overestimation and provide possibility to evaluate the impact of those types of policies and measures, which cannot be evaluated by bottom-up method, e.g., fiscal policies. In Latvia's Energy (including Transport) sector the top-down evaluation method has been done by applying TIMES - Latvia model.

2.4.4. Industrial processes and product use

Implementation of best available techniques (BAT) is particularly important one for GHG emissions reduction in IPPU. Requirements set in Directive 2010/75/EU of the European Parliament and of the Council of 24th November 2010 on industrial emissions (integrated pollution prevention and control) are overtaken with national Law on Pollution. Law on Pollution states principal framework for the implementation of BAT. Namely, conclusions on the BAT are a description of the BAT specified by the EC for the sector of industry or polluting activity, as well as the emission levels associated with the BAT, consumption levels of raw materials, monitoring of the polluting activity and the remediation measures of the site applicable to the polluting activity. Operator of pollution activity shall use the conclusions regarding the BAT as the basis.

The Law's section 21 "BAT and Choice Thereof in Respect of Category A Polluting Activities" states that (1) BAT are applicable to the most effective and progressive technological and operational methods development stage in which is shown the actual applicability of specific methods in order to prevent and – in cases where prevention is impossible – reduce emissions and the impact on the environment as a whole, and they are intended in order to specify the basic principle for the calculation of emission limits, (2) the concept “techniques” shall include the technology used and the way in which the installation is designed, built, maintained, operated or decommissioned, (3) techniques are available if they are economically and technologically substantiated and, irrespective of whether they have previously been used or introduced in production in Latvia, it is possible to implement them in a specific industrial sector, taking into account the relevant costs and advantages, (4) techniques are the best if they include such technologies and methods by the application of which it is possible to ensure the highest level of environmental protection at large.

The responsible authority - the State Environmental Service - is checking the operators` applications for receiving polluting activity permits, including the operator’s proposal regarding the choice of BAT. The implementation of BAT is expected to influence and reduce long-term trends in GHG emissions, contributing to overall environmental protection and sustainability goals.

F-gases

The most important EU regulations affecting the amount of F-gases are:

- the Regulation (EU) No 517/2014 of The European Parliament and of the Council on fluorinated greenhouse gases and repealing Regulation (EC) No 842/2006;
- the Directive 2006/40/EC of the European Parliament and of the Council relating to emissions from air-conditioning systems in motor vehicles and amending Council Directive 70/156/EEC.

Also, technical development has affected the development of emissions. The F-gas Regulation follows two tracks of action:

- improving the prevention of leaks from equipment containing F-gases. Measures comprise: containment of gases and proper recovery of equipment; training and certification of personnel and of companies handling these gases; labelling of equipment containing F-gases; reporting on imports, exports and production of F-gases. Several bans on the placing in the market, maintenance and service products and equipment containing HFCs with high GWPs are requirements of the Regulation;
- avoiding F-gases in some applications where environmentally superior alternatives are cost-effective. Measures include restrictions on placing in the market and use of certain products and equipment containing F-gases.

At national level the CoM Regulation No. 704[99] (19th October 2021) “Requirements for Activities Involving Ozone-depleting Substances and Fluorinated Greenhouse Gases” was adopted on 1st November 2021. CoM Regulation No. 704 was developed with the aim to improve the accuracy and quality of F-gases data and to implement more precisely Regulation (EU) No 517/2014. CoM Regulation No. 704 is related to containment, use, recovery and destruction of certain F-gases. These rules accompany the provisions relating to the labelling of products and equipment containing these gases, to the notification of information, to prohibitions on commercialization, as well as to the training and certification of personnel and enterprises.

[99]Cabinet of Ministers Regulation No.704 (2021) “Requirements for Activities Involving Ozone-depleting Substances and Fluorinated Greenhouse Gases”. Available: https://likumi.lv/ta/id/327117-prasibas-darbibam-ar-ozona-slani-noardosam-vielam-un-fluoretam-siltumnicefekta-gazem *(in Latvian)*

Solvent Use

The Law on Pollution establishes the procedures for limiting emissions of volatile organic compounds from installations using organic solvents. This law incorporates legal provisions derived from the following directives:

- Directive 2010/75/EU of the European Parliament and of the Council of 24th November 2010 on industrial emissions (integrated pollution prevention and control);
- Directive 2004/42/EC of the European Parliament and of the Council of 21st April 2004 on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain paints and varnishes and vehicle refinishing products and amending Directive 1999/13/EC;
- CoM Regulation No. 186, adopted on 2nd April 2013 "Regulations to Limit Emissions of Volatile Organic Compounds from Installations Using Organic Solvents" incorporates legal provisions derived from Directive 2010/75/EU, and CoM Regulation No.231 adopted on 3rd April 2007 "Regulations Regarding the Limitation of Emissions of Volatile Organic Compounds from Certain Products" incorporates legal provisions derived from Directive 2004/42/EC.

Co-Benefits from Mitigation Measures

Latvia's mitigation efforts in IPPU sector present significant adaptation and socioeconomic co-benefits, aligning with Article 13 of the Paris Agreement (Decision 18/CMA.1, para 84). BAT and EU regulations regarding F-gases and Solvent use enhance the resilience of Latvia's industrial sector and contribute directly to reducing GHG emissions while supporting economic growth and job creation.

Economic Resilience and Industrial Innovation BAT regulations can contribute to the diversification of Latvia's economy by supporting the growth of sustainable industries and enhance the adaptability of Latvia's industrial sector to changing economic conditions and environmental challenges, implementing green technology and innovation.

Health and Environmental Benefits BAT and EU regulations in the IPPU sector also provide significant health and environmental benefits. Implementing BAT for specific equipment directly contributes to cleaner air and improved public health outcomes, particularly in industrial areas where emissions have historically been higher. By reducing pollutants associated with industrial processes, it is possible to decrease the prevalence of respiratory and cardiovascular disease exacerbated by poor air quality.

2.4.5. Agriculture

2.4.5.1. Regulatory policies and measures

Implementation of the Nitrates Directive (ND) 91/676/EEC and Water Framework Directive (WFD) 2000/60/EEC in to national legislation promoted several measures to reduce GHG emissions and indirectly affected ammonia emissions set in the National Emission Ceilings Directive 2001/81/EC. Legal norms arising from Council Directive 91/676/EEC concerning the protection of water against pollution caused by nitrates from agricultural sources have been included in Law "On Pollution"[100] (15th March 2001) that set base to regulation on protection of water and soil from pollution with nitrates caused by agricultural activity. The Law sets requirement to the CoM to regulate the criteria for determination and managing of highly

[100] Saeima (2001) "Law on Pollution". Available: https://likumi.lv/ta/en/en/id/6075

vulnerable territories with increased requirements for the protection of water and soil. Law "On Pollution" also classifies the polluting activities into Categories A, B, and C, considering the quantity and effect or the risk of pollution caused to human health and the environment. In agriculture sector polluting activities requiring a Category A permit are farms for the intensive rearing of pigs and poultry with more than 40000 places for poultry or with more than 2000 places for production pigs with weight over 30 kg (with more than 750 places for sows). These farms shall apply the BAT to prevent pollution.

The purpose of Law "On Environmental Impact Assessment" (1998)[101] is to prevent or reduce the negative impact of the implementation of the activities of a planning document thereof on the environment. Objects requiring Impact Assessment in agriculture sector are installations for the intensive rearing of pigs or poultry with more than 85000 places for broilers; 60000 places for hens; 3000 places for production pigs (over 30 kilograms); and 900 places for sows.

According to Law "On Pollution" several requirements regarding agricultural practice and manure spreading were introduced in the CoM Regulation No. 834[102] adopted on 23rd December 2014 "Requirements Regarding the Protection of Water, Soil and Air from Pollution Caused by Agricultural Activity" and the CoM Regulation No. 829 adopted on 23rd December 2014 "Special Requirements for the Performance of Polluting Activities in Animal Housing"[103].

GHG emission reduction measures that arise from the above-mentioned requirements are described below. In CTF Table 5 GHG emission reductions for PaMs – "Promote and support for precision application of inorganic nitrogen fertilisers", "Management of nitrate vulnerable territories", "Requirements for the protection of soil and water from agricultural pollution caused by nitrates", "Crop fertilization plans in vulnerable zones", "Maintenance of amelioration systems", "Maintenance and modernization of amelioration systems on agricultural land", "Support for evolving of precision agriculture technologies in crop growing farms to reduce nitrogen use"- are included in the PaM "Support for fertilisation planning" therefore for each mentioned PaM is used IE in CTF Table 5.

Effect of PaMs GHG reductions is mentioned in each relevant PaM below.

It should be noted that all the measures described are in WEM scenario. In Agriculture, measures to reduce GHG emissions are part of the already current Common Agricultural Policy (CAP).

Management of nitrate vulnerable territories. Management of nitrates in highly vulnerable zones and requirements for pollution decrease caused by nitrates from agricultural sources include restriction for nitrogen usage, reduction of nitrogen leaching and indirect N_2O emissions. The limit of nitrogen usage is 170 kg of nitrogen from manure and digesters per ha in a year or 1.7 animal units (AU). If farm produces more than 170 kg of nitrogen per ha of managed agricultural land in a year, proof of the transfer of manure or fermentation residuals to other farm or alternative use need to be documented.

Requirements for the protection of soil and water from agricultural pollution caused by nitrates. According to CoM Regulation No. 834 (23rd December 2014) "Requirements Regarding the Protection of Water, Soil and Air from Pollution Caused by Agricultural Activity" to ensure the protection of water and soil from pollution with nitrates caused by agricultural

[101] Saeima (1988) Law on Environmental Impact Assessment. Available: https://likumi.lv/doc.php?id=51522 *(in Latvian)*

[102] Cabinet of Ministers No.834 (2014) "Regulations on protections of water and soil from pollution caused by nitrates from agricultural activities". Available: https://likumi.lv/doc.php?id=271376 *(in Latvian)*

[103]Cabinet of Ministers No.829 (2014) "Special Requirements for the Performance of Polluting Activities in Animal Housing". Available: https://likumi.lv/ta/en/en/id/271374

activity, the several requirements are set for fertilisers spread, storing and using livestock manure and fermentation residues. Sewage sludge and the compost shall be used in accordance with the laws and regulations regarding the use, monitoring and control of sewage sludge and the compost. Regarding to the amount of nitrogen in one ha of agricultural land, the amount of livestock manure and fermentation residues permitted for application shall be calculated based on the amount of nitrogen in livestock manure and fermentation residues. When building a new reservoir or re-building one for the storage of fermentation residues, it shall be intended that the capacity thereof provides for accumulation of the fermentation residues for at least eight months. At sites where the groundwater level rises up to the surface of the ground, mineral fertilisers shall be used only after the subsidence of the groundwater level and the drying up of the field. Nitrogenous mineral fertiliser shall be used in basic fertiliser shortly before sowing or planting.

Crop fertilization plans in vulnerable zones. According CoM Regulation No. 834 (23rd December 2014) “Requirements Regarding the Protection of Water, Soil and Air from Pollution Caused by Agricultural Activity” in highly vulnerable zones farmers who manage the agricultural land with an area of 20 ha and more, and grow vegetables, potatoes, fruit trees or fruit bushes in an area of three ha and more, are required to document the field history for each field and shall keep field history documentation for at least three years and, if using fertilisers, shall prepare a crop fertilisation plan for each field not later than until the sowing or planting of a crop, for perennial sowings and plants - until the start of vegetation. According to CoM Regulation No. 1056 (15th September 2009) “Requirements for Integrated Cultivation, Storage and Labelling of Agricultural Products and the Procedures for Control Thereof” crop fertilisation plans must use professional users of plant protection products who use plant protection products of the second registration class, and to persons who, for using plant protection products of the second registration class, use services provided by professional users of plant protection products in all territory[104]. Crop fertilisation planning is based on the knowledge of physical and chemical properties of soil and involves performing soil tests, designing a fertilisation plan and its practical implementation as well as calculating the balance of nitrogen (N), which plays an important role in efficient farming. The main purpose is to ensure optimum crop fertilisation, increase crop growth and yields, meanwhile decreasing the amount of unabsorbed N results in economic and environmental losses, as N_2O emissions are produced.

Requirements for manure spreading and storage. The main target of the measure is to increase nutrient uptake efficiency and decrease nutrient run-off and N_2O emissions. Injections or sub-surface application of manure promote denitrification and decrease direct and indirect N_2O emissions. Basic requirements are to incorporate solid manure within 24 hours and slurry – within 12 hours if it is used as a basic fertilizer. It is assumed for Latvia that slurry injection may increase manure N use efficiency compared to broadcast systems.

An appropriate manure management system allows storing manure in an environment friendly way, avoiding and reducing N_2O emissions. The measure consists of renovating/improving an existing manure management system or constructing a new system. Requirements refer to farms with more than 10 AU, and 5 AU in vulnerable territories depending on manure type and are stated in CoM Regulation No. 829 adopted on 23rd December 2014 “Special Requirements for the Performance of Polluting Activities in Animal Housing”. This Regulation prescribes special requirements for the performance of polluting

[104] Cabinet of Ministers No.1056 (2009) “Requirements for Integrated Cultivation, Storage and Labelling of Agricultural Products and the Procedures for Control Thereof”. Available: https://likumi.lv/ta/en/en/id/197883-requirements-for-integrated-cultivation-storage-and-labelling-of-agricultural-products-and-the-procedures-for-control-thereof

activities in animal housing. Several requirements are determined for the collection, drainage and storage of livestock manure, including the manure storage facilities. Specific requirements are determined for the storage of liquid manure, semi-liquid manure and urine.

2.4.5.2. Economic policies and measures

CAP is contributing to the reduction of GHG emissions. In the planning period 2014–2022, CAP They included greening payment with crop diversification, maintaining maintenance of permanent grasslands and introduction of ecological focus areas. Crop diversification is designed to encourage a diversity of crops on holdings which have arable land. Land that is considered as Ecological Focus Area may include: buffer strips, nitrogen fixing crops, and other. Buffer strips promote minimizing of nitrogen leaching, however introduction of leguminous plants on arable land leads to the fertility improvement of the farm's agro system by fixing atmospheric nitrogen.

The latest reform of the CAP from 2023 introduces enhanced conditionality and a new instrument - the Eco-scheme: covering climate, environment, and animal welfare schemes. CAP also maintains Agri-environment schemes that covering environment, climate, and other management obligations, as well as profitable and unprofitable Investment schemes for GHG and ammonia reduction measures and climate change mitigation and adaptation measures implementation on farms. The measures that directly or indirectly promote biodiversity, reduce GHG and ammonia emissions, improve the welfare of farm animals.

Eco-schemes and are designed differently in each Member State based on its environmental needs. Eco-schemes are voluntary applicable for the farmers. In Latvia, eco-schemes are designed to ensure enhanced crop diversification and introduction of ecological focus areas including legumes, green fallow and catch crops, promoting farmers' adaptation to climate change, improving water and soil quality and fertility, reducing disease and pest risks. Land that is considered as Ecological Focus Area may include: nitrogen fixing crops, and other. Introduction of leguminous plants on arable land leads to the fertility improvement of the farm's agro system by fixing atmospheric nitrogen[105]. CAP included the greening payment, to deal with the environmental impacts of agriculture. The greening measures include crop diversification, maintaining permanent grasslands and introduction of ecological focus areas. A mandatory condition for receiving CAP support is to comply with the Good Agricultural and Environmental Condition (GAEC).

Available investment support increases the possibilities of farms to change farming practices associated with more expensive technologies (such as digitalization, such as precision agriculture) and construction (such as improvements in manure storage and use). They also include measures that promotes carbon farming and precision farming to reduce pesticide use needs, risks, and leakages. The use of precision technologies will help reduce ammonia emissions. These measures are in line with the emission reduction measures developed by researchers at the LBTU and with the objectives of Latvia's 'Air Pollution Reduction Action Plan 2020-2030' and the measures to reduce GHG emissions in agriculture included in the NECP 2021-2030.

The "Law on Agriculture and Rural Development"[106] (7th April 2004) provide a legal basis for agricultural development and to specify sustainable agricultural and rural development policy

[105] Documents relating to the approval of the CAP Strategic Plans (2023). Available: https://agriculture.ec.europa.eu/cap-my-country/cap-strategic-plans/latvia_en

[106] Saeima (2004) "Law on Agriculture and Rural Development". Available: https://likumi.lv/ta/en/en/id/87480

in accordance with the CAP of the EU. CoM Regulation[107] based on the "Law on Agriculture and Rural Development" sets procedures for awarding of payments to farmers. According to the "Law on Agriculture and Rural Development" and resulting regulations following mitigation measures are taking place in Latvia.

Promote inclusion of leguminous plants in crop rotation for nitrogen fixation. Growing leguminous plants considerably increase the accumulation of symbiotically fixed atmospheric nitrogen in soil. Legumes can fix up to 300 kg N ha^{-1} and this N amount is equivalent obtained by means of fertilisers. In addition, legumes provide the aftercrop with the N accumulated in soil, which reduces the amount of N to be applied in the next season. The main aim of the measure is to expand arable land and increase number of farms where leguminous plants are included in crop rotation thus contributing to atmospheric nitrogen fixation and reduction of application of inorganic nitrogen fertilizers. Measures that stimulate the cultivation of nitrogen-fixing crops, supported in accordance with CAP TM4.2. " Eco-scheme support for an ecological focus area", as well as TM U5.14. "Coupled income support for Protein Crops". The annual GHG reduction of the measure is 54.1 kt CO_2 eq.

Promote organic dairy farming (low emission dairy farming). This measure includes environmentally friendly farming methods with no influence on nature, improved cropland management and reduction of synthetic fertiliser use. Benefits of this measure are decreased nitrate leaching, increased biodiversity and reduced N_2O emissions. The state ensures support to organic farmers through subsidies. The aim of the measure is also to promote transition of small and medium-sized conventional dairy farms to the organic farming system, thus facilitating low emission dairy farming. The measure is supported within the framework of CAP II pillar agri-environmental intervention, LA11. "Organic agriculture". Among other things, they provide for the replacement of conventional cows with organic ones. Which reduces GHG emissions in many ways, as both breeds and the way cows are kept, as well as feeding and grazing are changed. The annual GHG reduction of the event is 126 kt CO_2 eq.

Maintenance and modernization of amelioration systems on agricultural land. The measure involves the renovation and maintenance of existing amelioration systems. An amelioration system allows draining excessive water from the area of the root of a crop; as a result, oxygen can access the root as well as an optimum moisture regime sets in. The soil structure, which is improved by amelioration system, ensures better fertiliser absorption and less nitrogen run-off, thus affecting N_2O emissions. The main aim of the measure is to increase arable land area with improved and maintained amelioration systems, thereby reducing N leaching and run-off from agriculture. Support according to CAP LA 4.3. "Support for investments in agricultural and forestry infrastructure in development" is provided for amelioration system of national significance and local government significance for common use and will contribute to the development of the rural economy, it will provide support for investments to improve drainage systems in agricultural land and forestland.

Promote the production of biogas. The purpose of measure is to use bioresources (mainly or only manure) to produce biogas which is burnt to generate electric and/or thermal energy. By implementing this measure, the manure is efficiently used, odour is reduced and high-quality fertilizer called digestate is obtained. The main aim of the measure is to ensure the installation of biogas production on farms that do not yet have biogas production. Rapid and relatively generous biogas promotion measures raised electricity prices and created dissatisfaction in the community. As a result, there are very strict restrictions on the development of biogas

[107] Cabinet of Ministers Regulation No.198. (2023). Available: "Procedures for Granting Direct Payments to Farmers" Available: https://likumi.lv/ta/en/en/id/341260

production. At the same time, the measure has been supported by LA4.1.4. “Support for investments to use renewable energy production or increase energy efficiency”. The annual GHG reduction of the event is 14 kt CO_2 eq.

Support for fertilisation planning and Precision fertiliser application. Fertilization planning, which determines the effectiveness of the measure, is a mandatory condition for the use of precise technologies. Precision fertiliser application is a set of activities that involve the use of the newest technologies (the GPS, the GIS, sensors, software, applications, specially equipped fertiliser spreaders, etc.) in planning fertiliser application rates and in fertiliser spreading. This measure also provides fertilizer planning in the electronic system using common methodology. Fertiliser planning is intended to ensure optimal supply of plant nutrients to crops.

This measure is market driven and leads to fertiliser savings which results in reduction of N_2O emissions. The main advantages of this activity are (1) increase in yields providing optimum crop fertilisation, (2) financial saving by ensuring that field areas with sufficient crop nutrients are not over-fertilised, (3) environmental benefits by N_2O emissions decrease and decrease in nitrate leaching. The implementation of measure can reach fertilizer savings to 15-80%.

The main aim of measure is to expand arable land and increase number of farms were precision technologies for application of nitrogen fertilisers (**Promote and support for precision application of inorganic nitrogen fertilisers**) are used in the planning of fertiliser schemes and spreading. Also, direct incorporation of organic fertilisers into the soil (**Promote and support for direct incorporation of organic fertilisers into the soil**) reduces nitrogen and ammonia emissions and promote the accurate and efficient use of fertilisers (organic fertilisers and mineral fertilisers) in order to reduce the risks associated with the use of fertilisers in the long term and to reduce leakage. The measure is supported by CAP Interventions (TM4.5.) "Nitrogen and ammonia emission and pollution-reducing agriculture practice" and assuming that the farmer will ensure fertilization planning, the amount of nitrogen used on the farm did not exceed the amount specified in the fertilization plan and the application of fertilizer will be carried out with precise technologies, including direct application of organic fertilizer (liquid manure) to the soil using a tape spreader or injection method, also contribute to the achievement of the goals of the EU Green Deal. The annual GHG reduction of the event is 47.9 kt CO_2 eq.

Increased welfare requirements and emissions-reducing livestock farming. Feed planning is a set of concerted activities: acquiring information about livestock needs (productivity tests), designing feed recipes, doing feed tests, and preparing the feed. Feed planning means optimising the content of nutrients in the feed according to what is needed for animals, i.e., according to their sex, age, reproductive status, and productivity goal. The quality of feed also plays a significant role. This measure reduces the negative impact on the environment, as a balanced diet and animal performance influence the production of N from manure, which, in its turn, affects N_2O emissions. The main aim of measure is to increase number of cows whose feed rations are balanced for reduced crude protein level without loss in milk production and to increase number of cows whose are fed with high digestible feed. The measure is supported within the framework of the CAP Intervention LA10.3 "Increased welfare requirements and emission-reducing livestock farming" and foresees an increase in the proportion of cattle units (LUs) with respect to which there are supported obligations (among them manure management). The annual GHG reduction of the event is 170 kt CO_2 eq.

Conservation farming practices. The purpose of the activity is to promote gentle soil cultivation methods, ensuring the improvement of the soil's natural fertility and health, air, and moisture circulation, i.e. the soil is treated sparingly or not plowed. Such practices help reduce the effects of wind erosion and nitrogen leaching. Conservation agricultural practices will increase the content and amount of organic matter accumulated in the topsoil and can also increase the amount of phosphorus in the soil. The activity will promote the use of minimum tillage methods, which will also contribute to the reduction of GHG emissions and help achieve the goals of the EU initiative on carbon farming. The measure is supported within the framework of the CAP Intervention TM4.4 "Conservation farming practices" and farmers undertake to cultivate the soil in a certain way, without using herbicides more often than twice.

Promotion of grassland conservation. The aim of the activity is to preserve grassland areas suitable for animal husbandry. It also contributes to the mitigation of climate change, including the reduction of GHG emissions from agricultural practices and the maintenance of soil carbon stocks. The intervention to preserve grasslands (no plowing) will contribute to achieving the goals of the Green Deal by implementing the directions foreseen in the Biodiversity Strategy and EU initiatives on carbon agriculture, as it will allow address climate change issues (adaptation and mitigation), taking into account the ability of perennial grasslands to store and sequester carbon from the atmosphere. The measure is supported within the framework of the CAP Intervention TM4.6 "Promotion of grassland conservation" and the planned target area is 317 thous. ha.

Increase of land area under organic farming relative to total agricultural land. The organic farming support payment encourages farmers to use environmentally friendly farming methods and to meet high standards of animal welfare. In order to avoid the return of farmers to traditional farming, it is necessary to support both transition period and farms producing with organic farming methods. Farmers should be encouraged to change their usual production practices, at least in the first years by allowing parallel production - applying organic farming methods in a separate part of the farm. Simultaneously with the implementation of this intervention, it is necessary to promote the development of not only the field of crop farming, but also the field of livestock farming, stimulating both the dairy farming sector, which makes a significant contribution to reducing emissions (especially ammonia), as well as other livestock farming sectors. The measure is supported within the framework of the CAP Intervention LA11 "Organic farming", and plans support for the lost profit in crop cultivation (for specific plants), as well as for the maintenance of grasslands used in animal husbandry.

2.4.5.3. Expired Measures which have an effect, or is expected to continue to have an effect on GHG emissions

Programmes of EU Funds planning period of 2007-2013

- <u>the co-financing for biogas production and its use for energy (electricity) production</u> had been provided for the agriculture sector business entities & service co-operatives by national Rural Development Programme, co-financed by EAFRD (implementation finished 2015).

Programmes of EU Funds planning period of 2014-2020

- <u>support for evolving of precision livestock feeding approach in cattle breeding farms</u> had been provided for the agriculture sector business entities & service co-operatives by Strategic Plan for the Common Agriculture Policy of Latvia 2014-2020 (implementation finished 2020).

2.4.5.4. Co-benefits from Mitigation Measures

Latvia’s agriculture sector benefits significantly from integrating climate mitigation measures, which also yield adaptation and socioeconomic co-benefits, aligning with Article 13 of the Paris Agreement (Decision 18/CMA.1, para 84). These measures align with the national strategy to enhance resilience to climate change while promoting sustainable agricultural practices.

Enhanced Soil Health Water Management

Mitigation measures like promoting organic dairy farming and the precise use of inorganic nitrogen fertilizers directly contribute to improving soil health and increasing carbon sequestration. For instance, organic dairy farming not only reduces GHG emissions by lowering the reliance on synthetic inputs but also enhances soil organic matter, improving soil structure and fertility. This leads to better water retention and resilience against droughts. The reconstruction and renovation of drainage systems in agricultural lands is a critical mitigation measure supporting adaptation by improving water management and reducing flood risks. Enhanced drainage systems help manage excess water during heavy rainfall events, preventing soil erosion and maintaining agricultural productivity. These actions align with the adaptation measures that focus on protecting agricultural lands from the adverse effects of climate change.

Economic Resilience and Sustainable Farming

Mitigation actions can foster economic resilience by reducing dependency on expensive inputs, enhancing crop yields and creating new markets for agricultural products. Small farmers' reduced reliance on expensive synthetic inputs directly translates into increased profitability and more sustainable farming operations. This practice also enhances soil health over time, leading to improved crop yields and greater resilience against climate-induced stresses, such as droughts and soil nutrient depletion. Improving feed quality through better feed ration planning and incorporating high-nutrient crops supports livestock health and productivity. Mitigation measures that promote crop diversification, such as including legumes and other nitrogen-fixing crops in rotations, offer small farmers opportunities to diversify their income streams. Diversification can reduce the risk of relying on a single crop or product, making small farming operations more resilient to market fluctuations and climate-related disruptions. Additionally, these practices encourage innovation in farming techniques, such as precision farming and organic agriculture, which can open new market opportunities for small farmers who adopt sustainable practices. These practices contribute to rural development by supporting sustainable agricultural practices that increase farm profitability and reduce input costs. Additionally, they create opportunities for diversification and innovation in farming practices, promoting long-term economic stability in rural areas using mitigation and adaptation measures.

Food Health and Biodiversity

Measures like promoting the use of organic fertilizers and including beans and peas in crop rotations contribute to mitigation by reducing emissions and enhancing biodiversity. By adopting organic fertilizers, farmers improve the soil's natural fertility, which supports the growth of diverse plant species in and around farms. Nitrogen-fixing crops like beans and peas replenish soil nutrients and encourage a wider variety of plant and animal life, creating habitats for pollinators and beneficial insects. This diversification leads to a more resilient and sustainable agricultural ecosystem capable of withstanding the impacts of climate change. Additionally, by reducing the reliance on synthetic fertilizers and pesticides, these practices minimize harmful runoff into waterways, protecting aquatic ecosystems and contributing to the overall health of the environment. For local communities, these practices offer direct health benefits by providing access to local, healthy food options and maintaining clean water sources.

These specific mitigation measures in the agriculture sector exemplify Latvia's commitment to enhancing the resilience of its agricultural systems while achieving significant GHG emission reductions. They contribute to broader national goals of sustainable development, rural economic growth, and social well-being.

2.4.6. Land use, land use change and forestry

NDP 2027 emphasize knowledge intensive bioeconomy and cost-effective local renewable energy resources as one of sustainable ways how to ensure competitiveness, economic growth, quality living environment and to reduce Latvia`s energy dependency on fossil fuels. Forest and agriculture related natural resources are expected to contribute to achieving these goals by sustainably intensified resource management. Increasing carbon sequestration and efficient use of bioresources are among measures foreseen to be implemented.

CAP Strategic plan aims to provide significant financial support to promote sustainable farming practices and address climate and environmental issues. The CAP Strategic plan will include various interventions to mitigate climate change, improve water, soil, and air quality, preserve biodiversity, and promote sustainable forestry. Latvia has set higher targets for environmental and climate action compared to the previous planning period. The program aims to support environmental and climate ambitions without compromising the competitiveness of the sector, while ensuring the support of farmers' incomes and promoting sustainability. The direct payment system will be differentiated to achieve more targeted, effective, and fair income support. Almost all measures included in LULUCF sector are those listed in the CAP Strategic plan.

In Latvia, the reforms in forestry sector were started in 1998 when the CoM of the Republic of Latvia adopted the **Forest Policy**. The main goal defined in the policy is to ensure a sustainable management of Latvian forests and it is being accomplished in accordance with documents of policy planning and regulations: the **Forest Law**[108], **Forest-based Sector Development Guidelines**[109] and other forest related regulations.

The Forest Policy underlines that forest is an important part of Latvian environment and economics. The goals of the policy are:

- to ensure that the area of forest is not decreasing by setting limits to the forest land transformation;
- to ensure maintenance and increase of productivity of forest land;
- to encourage afforestation of agriculturally low-valued lands.

The **Forest Law** is the central law of the forest sector of Latvia, stating the following goals:

- to promote economically, ecologically and socially sustainable management and utilization of forests by ensuring equal rights to all owners and legal possessors of forest, ownership privacy, independence in economic actions and equal duties;
- to regulate terms of management.

[108]Parliament of Republic of Latvia. Forest Law (with changes till 01.07.2020). Latvijas Vēstnesis, 2000. Available: https://likumi.lv/ta/id/2825-meza-likums *(in Latvian)*

[109]Ministry of Agriculture of Republic of Latvia, Guidelines for the development of forest and related sectors. Available: https://likumi.lv/ta/id/276929-par-meza-un-saistito-nozaru-attistibas-pamatnostadnem-2015-2020-gadam *(in Latvian)*

The CoM defines terms of evaluation of a sustainable forest management by meeting criteria and indicators of Pan-Europe. Following the definitions of this Law, the responsibility of a forest owner or legal possessor is to regenerate forest stand after regenerative felling.

The Regulation on Determination Criteria of Compensation and Calculation of Deforestation[110] defines a procedure of calculation of compensation and criteria for negative effect caused by deforestation. It defines that the compensation to the government should be paid if the forest area, that is registered in National Real Estate Cadaster information system, is deforested. The compensation should be paid for:

- decrease of CO_2 removal potential;
- reduction of biological diversity;
- decrease of quality of the environmental and natural resource protection zones and sanitary protection zone functions.

Forest-based Sector Development Guidelines is a medium-term policy planning document. Guidelines consist of the forest-based sector development medium-term (2014-2020) strategic goals, policy development guidelines, directions for actions to achieve these goals, problems hindering achievement of these goals, and results in policies. Forest-based Sector Development Guidelines are the main document of growth and development of Latvian forestry sector. The development solutions included in this document give fundamental investment in achieving goals of other planning documents.

Effect of PaMs GHG reductions is mentioned in each relevant PaM below.

Reconstruction and development of drainage systems in cropland and grassland (until 2028). The measure is continuation of measure listed in the Rural Development Programme 2014-2020 "Development and adaption of drainage systems in cropland". The total area that could be affected by the measure until 2027 is 201 kha. This is indicative value and will be updated during adoption of the measure in the policy documents.

The objective of the measure is to rebuild and improve existing drainage systems in cropland to maintain and increase the economic value of the land and the productivity of the crops in the drained areas. The measure may have a direct and indirect impact on GHG emissions, both in the short and long term. The direct impact of the measure on arable land is linked to the accumulation of CO_2 in the soil due to increased productivity in reclaimed land and improved land management practices. Implementation of the measure contributes to the removal or to avoid losses of CO_2 in the soil – 1.32 t CO_2 ha^{-1} per year for 20 years after the implementation of the measure. The calculation of the impact of the measure is based on the assumption that reconstruction of drainage systems takes place as preventive measure avoiding collapse of the existing drainage systems and decrease of productivity of affected croplands.

The projection of the effect of the measure, especially between 2022 and 2030, is hampered by the fact that it is not currently possible to predict which areas will receive support and the status of the systems to be reconstructed, i.e., whether the implementation of the measure will significantly change the growth conditions in the affected areas by 2027 and whether there will be an increase or no reduction of carbon stock in the soil compared to when measure is not implemented.

[110] Cabinet of Ministers of Republic of Latvia. Regulations on criteria, calculation and payment order of compensation for deforestation activities (Regulations of Cabinet of Ministers of Republic of Latvia No. 889). Latvijas Vēstnesis, 201 (4804), 2012. Available: http://likumi.lv/doc.php?id=253624 *(in Latvian)*

The projected impact of the measure will be improved by development of methodologies for accounting of activity data of the measure and modelling of carbon stock change using remote techniques, which will allow to assess the impact of the reconstruction of drainage systems on GHG emissions. Significant methodological improvements must be implemented to evaluate impact of this measure at a single field level.

Long term effect of the measure does not require additional investments, assuming that maintaining of the land value and requirement to implement sustainable agriculture practices will ensure high carbon input into soil. Summary of the proposed effect of the measure is provided in Table 2.12. This measure will contribute to retaining of existing carbon stock in soil, therefore, alternate scenario would lead to increase of emissions, while implementation of the measure will retain existing carbon stock.

Table 2.12 Summary of the proposed effect of the measure

No.	Parameter and units	Value
1.	**Affected area, kha**	200.48
2.	**Duration of implementation, years**	5
3.	**Duration of impact, years**	20
4.	**Annual GHG reduction potential per area unit, tons CO_2 eq. $year^{-1}$ ha^{-1}**	1.32
5.	**Total GHG reduction potential per area unit, tons CO_2 eq. ha^{-1}**	26.44
6.	**Total GHG reduction potential, kt CO_2 eq.**	5300.44

Establishment of new orchards. The measure is continuation of the measure "Support to introduction and promotion of integrated horticulture" and "Organic farming" which is implemented within the scope of the Rural Development Programme for Latvia 2014-2020. The projected area of new orchards is 0.3 kha in the period between 2023 and 2027. This is an indicative value and will be updated during adoption of the measure in the policy documents.

The substantiation of the measure is based on increase of input of organic matter into soil with plant residues resulting in the increase of carbon stock in living biomass and soil. It is assumed that the measure is implemented in fertile croplands on mineral and organic soils. Additional impact accounted in organic soils and substantiating accumulation of carbon in soil is reduction of CO_2 emissions from soil due to land use changes.

Long term effect of the measure does not require additional investments, assuming that orchards will be retained after the implementation period. Summary of the proposed effect of the measure is provided in Table 2.13. This measure will contribute to retaining of existing carbon stock in soil and biomass, therefore, alternate scenario would lead to increase of emissions, while implementation of the measure will retain existing carbon stock.

Table 2.13 Summary of the proposed effect of the measure

No.	Parameter and units	Value
1.	**Affected area, kha**	0.3
2.	**Duration of implementation, years**	5
3.	**Duration of impact, years**	30
4.	**Annual GHG reduction potential per area unit, tons CO_2 eq. $year^{-1}$ ha^{-1}**	8.90
5.	**Total GHG reduction potential per area unit, tons CO_2 eq. ha^{-1}**	267.00

No.	Parameter and units	Value
6.	**Total GHG reduction potential, kt CO_2 eq.**	80.1

Undergrowth plants sown with winter crops. The measure has been implemented already within the scope of the Agricultural practice beneficial for the climate and the environment/greening.

The substantiation of the measure is based on increase of input of organic matter into soil with plant residues resulting in the increase of carbon stock in soil. Impact of the measure is accounted using Tier 1 method, assuming high carbon input in soil ensuring retaining of existing carbon stock in cropland soils.

Long term effect of the measure requires continuous investments, assuming that this measure is associated with additional costs, which farmers would normally avoid. Summary of the proposed effect of the measure is provided in Table 2.14. This measure will contribute to increase of carbon stock in soil, therefore, alternate scenario would lead to retaining of existing carbon stock in soil, while implementation of the measure will increase carbon stock.

Table 2.14 Summary of the proposed effect of the measure

No.	Parameter and units	Value
1.	**Affected area, kha**	17.5
2.	**Duration of implementation, years**	5
3.	**Duration of impact, years**	20
4.	**Annual GHG reduction potential per area unit, tons CO_2 eq. $year^{-1}$ ha^{-1}**	1.32
5.	**Total GHG reduction potential per area unit, tons CO_2 eq. ha^{-1}**	26.44
6.	**Total GHG reduction potential, kt CO_2 eq.**	462

Green fallow before winter crops. Similarly, to the measure Undergrowth plants sown with cereals this measure has been implemented already within the scope of Agricultural practice beneficial for the climate and the environment/greening. The total area which will be affected by this measure until 2027 is not yet defined; therefore, the potential effect is not estimated. It is assumed in the modelling that the measure will be implemented in the same field every 3rd year.

The substantiation of the measure is based on increase or retaining of input of organic matter into soil with plant residues due to additional input with "green manure" before sowing of cereals resulting in the increase of carbon stock in soil.

Long term effect of the measure requires continuous investments, assuming that this measure is associated with additional costs, which farmers would normally avoid. Summary of the proposed effect of the measure is provided in Table 2.15. This measure will contribute to increase of carbon stock in soil, therefore, alternate scenario would lead to retaining of existing carbon stock in soil, while implementation of the measure will increase carbon stock.

Table 2.15 Summary of the proposed effect of the measure

No.	Parameter and units	Value
1.	**Affected area, kha**	10.1
2.	**Duration of implementation, years**	5
3.	**Duration of impact, years**	20

No.	Parameter and units	Value
4.	**Annual GHG reduction potential per area unit, tons CO_2 eq. $year^{-1}$ ha^{-1}**	1.32
5.	**Total GHG reduction potential per area unit, tons CO_2 eq. ha^{-1}**	26.44
6.	**Total GHG reduction potential, kt CO_2 eq.**	267

Introduction of legumes into conventional crop rotations. The measure is continuation of the measure "Growing of legumes" which is implemented within the scope of the Agricultural practice beneficial for the climate and the environment/greening. The total area which will be affected by this measure until 2027 according to the projections will be 33 kha. This is indicative value and will be updated during adoption of the measure in the policy documents. It is assumed in the modelling that the legumes will be sown in the same field every 3rd year.

The substantiation of the measure is based on increase of input of organic matter into soil with residues of legumes resulting in the increase of carbon stock in soil. It is assumed that the measure is implemented in croplands on mineral and organic soils. In both cases, additional carbon input in soil will substitute CO_2 losses from soil. Similarly, to other activities aimed at increase of carbon stock in croplands, this measure will increase removals ensuring increase of carbon stock in soil.

Long term effect of the measure requires continuous investments, assuming that this measure is associated with additional costs, which farmers would normally avoid. Summary of the proposed effect of the measure is provided in Table 2.16. This measure will contribute to increase of carbon stock in soil, assuming that the measure is not implemented, would lead to retaining or reduction of existing carbon stock in soil, while implementation of the measure will increase carbon stock.

Table 2.16 Summary of the proposed effect of the measure

No.	Parameter and units	Value
1.	**Affected area, kha**	33.29
2.	**Duration of implementation, years**	5
3.	**Duration of impact, years**	20
4.	**Annual GHG reduction potential per area unit, tons CO_2 eq. $year^{-1}$ ha^{-1}**	1.32
5.	**Total GHG reduction potential per area unit, tons CO_2 eq. ha^{-1}**	26.44
6.	**Total GHG reduction potential, kt CO_2 eq.**	880.06

Cumulative effect of the productivity targeted measures. There are several measures implemented in agriculture sector indirectly affecting LULUCF sector, like breeding of new crops, improvement of crop rotations, more accurate use of fertilizers, better soil scarification technologies and others, which results in an increase of productivity and bigger inputs of carbon into soil by increased biomass of plant residues. These measures create cumulative effect, which cannot be easily predicted and expressed in monetary terms; however, they can be monitored as increase of production per area unit and verified by the national soil monitoring programs.

The substantiation of the cumulative effect of productivity targeted measures is based on increase of input of organic matter into soil with plant residues resulting in the increase of the soil carbon stock. It is assumed that the measure is implemented in croplands on mineral soils, while in organic soils management activities are reduced.

Reconstruction of drainage systems in forest land. The measure is continuation of the action "Development and adaptation of drainage systems in forest land" which is implemented within the scope of the Rural Development Programme for Latvia 2014-2020. The area which will be affected by this measure until 2027 is about 80.1 kha. This is indicative value and will be updated during adoption of the measure in the policy documents. It is assumed in calculation that age distribution of forest stands in areas with reconstructed drainage systems corresponds to average age distribution of forests on drained soils.

The substantiation of the measure is based on comparison of growing stock in forest stands growing on naturally wet and drained soils (Figure 2.37) assuming that reconstruction of drainage system leads to development of growing stock characteristic for drained soils and scenario, assuming that the measure is not implemented, leads to formation of stands with the growing stock characteristic for naturally wet soils. The difference appears after regeneration of forest stands and in young stands (1st age class), respectively if drainage system is reconstructed in middle age stand, no difference is predicted. It is assumed that the measure is implemented in croplands on mineral and organic soils. Soil carbon stock changes in mineral soils are not considered; in organic soils the GHG emission factors applied in the Latvia's 2024 GHG inventory are used in calculation.

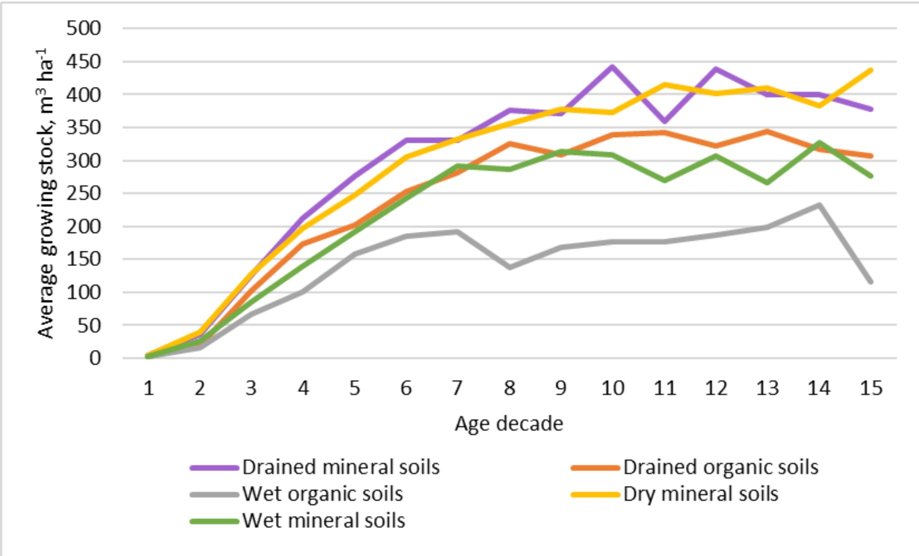

Figure 2.37 Growing stock depending on growth conditions

Growth models, country specific biomass expansion factors and emission factors for organic soils will be used in estimation of the carbon stock changes.

The average annual impact of the measure on CO_2 removals is 1.7 tons CO_2 ha^{-1} and the average impact during the rotation period is 99164 tons CO_2 ha^{-1}. Summary of the impact of the measure is provided in Table 2.17.

Table 2.17 Summary of the impact of the measure

Parameter	Measurement unit	Value
Implementation of the measure	kha	80.1
Total GHG reduction potential in 2030	kt CO_2 eq.	284
Average annual GHG reduction potential per area unit till 2050	kt CO_2 eq. year^{-1}	130

Afforestation of nutrient-poor soils in grassland and cropland. The measure is continuation of the action "Afforestation and improvement of stand quality in naturally afforested areas" which is implemented within the scope of the Rural Development Programme for Latvia 2014-2020. The total area which will be affected by this measure until 2027 is 10.3 ha, including 7% of organic soils according to the average share of organic soils in the Latvia's 2024 GHG inventory. This is indicative value and will be updated during adoption of the measure in the policy documents.

Growth models, country specific biomass expansion factors and emission factors for organic soils will be used in estimation of the carbon stock changes. Reduction of GHG emissions due to afforestation of organic soils is calculated as difference of the emission factors applied in the Latvia's 2024 GHG inventory (chapter 6.4 FOREST LAND (CRF CRT 4.A)) in grassland and forest land. Carbon stock changes in mineral soil are not considered in the calculation due to high uncertainty of the effect of afforestation on the soil carbon stock changes.

Summary of the impact of the measure is provided in Table 2.18. Total reduction impact of the measure will be nearly 4 million tons of CO_2 or 0.05 million tons of CO_2 in average annually.

Table 2.18 Summary of the impact of the measure

Parameter	Measurement unit	Value
Implementation of the measure	kha	10.8
Total GHG reduction potential in 2030	kt CO_2 eq.	188
Average annual GHG reduction potential per area unit till 2050	kt CO_2 eq. year^{-1}	70
	tons CO_2 eq. year^{-1} ha^{-1}	6.5

Pre-commercial thinning. The measure is continuation of the action "Improvement of ecological value and sustainability of forest ecosystems" which is implemented within the scope of the Rural Development Programme for Latvia 2014-2020. The total area proposed for implementation of this measure until 2027 is 80.5 kha.

Growth models and country specific biomass expansion factors will be used in estimation of the carbon stock changes. Carbon stock changes in mineral soil due to increase of removals with litter and increase of dimensions of dead wood are not considered in the calculation due to limited information.

The average impact of the measure is additional increment of 1.4 m^3 ha^{-1} stem wood or additional removals of 1.9 tons CO_2 ha^{-1} annually resulting in net additional removals of 146 tons CO_2 ha^{-1} per rotation. Summary of the impact of the measure is provided in Table 2.19.

Table 2.19 Summary of the impact of the measure

Parameter	Measurement unit	Value
Implementation of the measure	kha	80.55
Total GHG reduction potential in 2030	kt CO_2 eq.	241
Average annual GHG reduction potential per area unit till 2050	kt CO_2 eq. year^{-1}	65
	tons CO_2 eq. year^{-1} ha^{-1}	0.8

Regeneration of forest stands suffered by natural disturbances. The measure is continuation of the action "Regeneration of forest stands after natural disturbances" which is implemented within the scope of the Rural Development Programme for Latvia 2014-2020. The total area which will be affected by this measure until 2027 is not stated. This is indicative value and will be updated during adoption of the measure in the policy documents.

The substantiation of the measure is based on comparison of growth rate of naturally and artificially regenerated forest stands. Regeneration with spruce, birch or pine is considered in the calculation. Growth models and country specific biomass expansion factors will be used in estimation of the carbon stock changes. Carbon stock changes in mineral soil due to increase of removals with litter and increase of dimensions of dead wood are not considered in the calculation.

Summary of the impact of the measure is provided in Table 2.20. Duration of the impact of the activity equals to the forest rotation; however, most of the impact will be reached during the first 50 years.

Table 2.20 Summary of the impact of the measure

Parameter	Measurement unit	Value
Implementation of the measure	kha	5.0
Total GHG reduction potential in 2030	kt CO_2 eq.	30
Average annual GHG reduction potential per area unit	kt CO_2 eq. year^{-1}	5.1
	tons CO_2 eq. year^{-1} ha^{-1}	0.8

Encourage recultivation of historically used peat extraction sites by selecting the most appropriate type of recultivation. Abandoned peat extraction sites are considerable source of GHG emissions. Afforestation, establishment of perennial energy crops or extraction of remaining peat layer with following flooding or rewetting of areas, where growing of perennial crops for biomass production is not possible, may lead to significant reduction of GHG emissions.

The area, which will be affected by this measure for 7 years period between 2023 and 2030, is 12 kha including 4.5 kha of afforested areas. The emission reduction is calculated for afforested areas.

The emission reduction potential is ensured by accumulation of CO_2 in living and dead biomass and reduction of GHG emissions from soil. The projection of the GHG emission reduction is based on the results of the LIFE REstore project[111], assuming that GHG emissions in afforested areas reduce to values characteristic for drained nutrient-poor coniferous forests. No GHG reduction is considered in flooded lands, because of lack of scientific evidence of the emission reduction in rewetted areas[112]. According to LIFE REstore project results additional CH_4 and N_2O emissions from rewetted areas compensates CO_2 removals, transferring rewetted areas into significant sources of GHG emissions.

Soil GHG emission factors applied in the calculation are provided in Table 2.21. Average annual GHG reduction potential is 4.9 tons CO_2 eq. ha^{-1} in 35 years period. Net GHG emissions reduction in afforested lands in this period is 11.3 tons CO_2 eq. ha^{-1}.

[111] LIFE REstore project . Available: https://restore.daba.gov.lv/public/lat/optimizacijas_modelis1/ *(in Latvian)*

[112] Butlers, A., & Lazdins, A. (2022). Case study on greenhouse gas (GHG) fluxes from flooded former peat extraction fields in central part of Latvia. Research for rural development, 44–49. Available. https://doi.org/10.22616/rrd.28.2022.006

Table 2.21 Soil GHG emission factors according to LIFE REStore project[113]

GHG	Forest with optimal water regime	Bare ground abandoned peat extraction field	Overgrown abandoned peat extraction field	Peat extraction field
CO_2	3.51	6.78	4.8	3.99
DOC	1.14	1.14	0.88	1.14
CH_4	0.55	0.67	3.33	0.26
CH_4 from ditches	0.14	0.27	0	0.68
N_2O	-0.02	0.02	0.1	0.21
Total emissions	5. 3	8.88	9.11	6.27

The GHG emission reduction potential is estimated considering that half of the degraded peatlands can be afforested. In practice this measure requires significant investments in regulation of water regime. Insufficient funding in modernization of drainage systems may result in significantly smaller GHG mitigation effect.

Summary of impact of the measures. The measures, which are proposed for implementation between 2023 and 2027 will result in reduction of GHG emissions by 17 mill. tons of CO_2 eq. until 2050 (Table 2.22); however, some of the measures are not yet quantified or they will be implemented on demand, e.g., reconstruction of forests after natural disturbances. The projected GHG emissions' reduction in 2023-2030 due to implementation of the existing measures will reach 4.8 mill. tons of CO_2 eq. Implementation of the measures will increase forest area by 14.5 kha in 2027. Average annual contribution to GHG mitigation will reach 962 kt CO_2 eq. yr^{-1} in 2030 and will remain 664 kt CO_2 eq. yr^{-1} in 2050. It is also assumed that the measures aimed at increase of soil carbon stock in cropland and grassland will be continued to avoid release of the stored CO_2. Avoided emissions according to initial projections are 5539 kt CO_2 eq. yr^{-1} and additional CO_2 removals – 12379 kt CO_2 eq. yr^{-1} in 2050 (Table 2.22).

Table 2.22 Projected GHG emission reduction in WEM scenario

Measures	Type of impact	Land use category	Projection of GHG emission reduction, kt CO_2 eq.					
			2025	2030	2035	2040	2045	2050
Establishment of orchards	**Avoids emissions**	**Cropland**	80	401	734	1068	1402	1736
Green fallow before winter crops	**Avoids emissions**	**Cropland**	NE	NE	NE	NE	NE	NE
Introduction of legumes into conventional crop rotations	**Avoids emissions**	**Cropland**	53	264	484	704	871	880
Undergrowth plants sown with winter crops	**Avoids emissions**	**Cropland**	NE	NE	NE	NE	NE	NE
Reconstruction of drainage systems in cropland and grassland	**Reduces emissions**	**Forest land**	318	1590	2915	4240	5247	5300

[113] Priede, A., & Gancone, A. (Eds.). (2019). Sustainable and responsible after-use of peat extraction areas. Baltijas Krasti.

Measures	Type of impact	Land use category	Projection of GHG emission reduction, kt CO_2 eq.					
			2025	2030	2035	2040	2045	2050
Afforestation	**Reduces emissions**	**Forest land**	92	460	843	1226	1609	1992
Forest thinning	**Reduces emissions**	**Forest land**	135	676	1240	1668	1691	1691
Regeneration of stands affected by natural disturbances	**Avoids emissions**	**Forest land**	NE	NE	NE	NE	NE	NE
Reconstruction of drainage systems in forest land	**Avoids emissions**	**Forest land**	169	843	1545	2248	2950	3653
Restoration of peat extraction sites	**Avoids emissions**	**Forest land**	123	616	1129	1642	2155	2668
Total GHG emission reduction			970	4849	8890	12796	15925	17919

The effect of the existing mitigation measures will reach maximum in 2027 and will reduce starting from 2037, according to the projection; however, due to the measures implemented in forest land the effect will be long lasting and will continue also after 2050 (Figure 2.38). It is also considered in the assessment that the measures contributing to increase or retaining high soil carbon stock in agricultural soils are continued also after 2030 ensuring that the achieved effect is not lost.

The most significant effect is ensured by reconstruction of drainage systems in forest land and farmlands; however, in case of farmlands it is associated with significant uncertainty due to different starting point in the soil carbon stock and unpredictable management decisions. Similarly, restoration of peat extraction sites may be associated with measures leading to increase of emissions, e.g., flooding or rewetting to implement biodiversity targets or to afforestation and cropping systems ensuring reduction of GHG emissions in long-term. The measures with the highest accuracy of projections – afforestation, pre-commercial thinning and reconstruction of drainage systems in forest land contributes to 41% of the proposed mitigation effect (Figure 2.39). The effect of other measures is certainly positive but needs more accurate assessment methods.

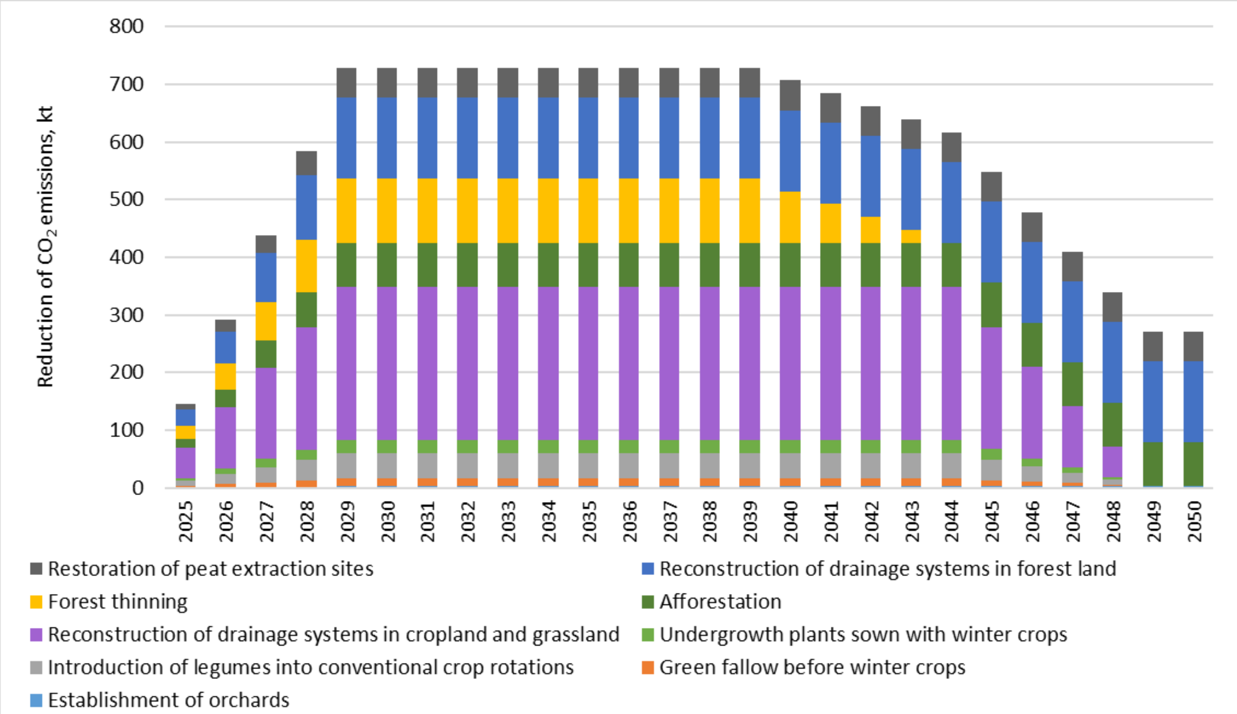

Figure 2.38 Mitigation of the effect of proposed measures

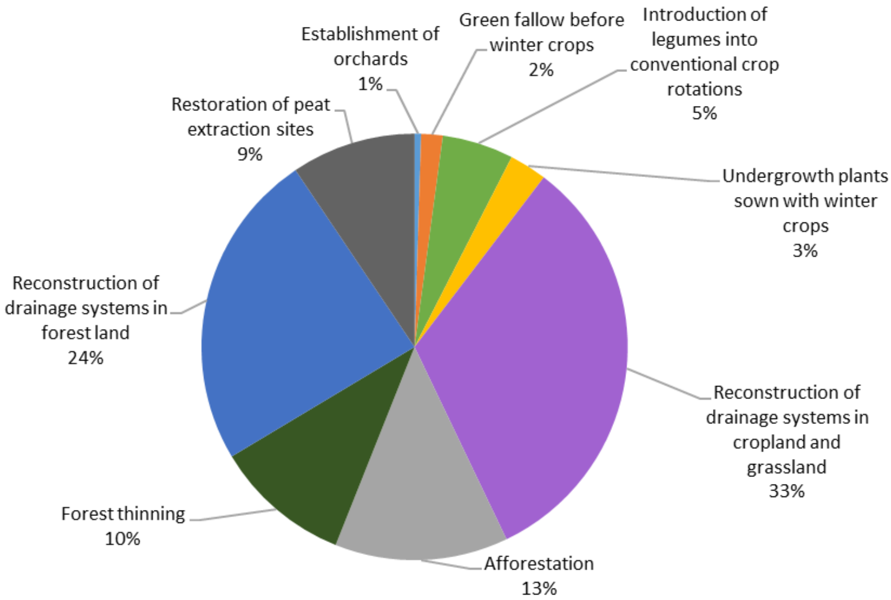

Figure 2.39 Summary of effect of the measures

2.4.6.1. Expired Measures which have an effect, or is expected to continue to have an effect on GHG emissions

Since NC8/BR5, these measures are expired (completed) which have a long-term impact on GHG emissions projections.

Development and adaption of drainage systems in cropland and grassland (until 2022). The measure is aimed at restoration of existing drainage systems or there is increased risk of floods or drainage systems soon will reach end of life. After reconstruction of drainage systems affected fields are returned to a conventional production system with considerable input of organic material in soil due to higher yields and crop rotations, or high yields are retained due to preventive reconstruction of drainage systems.

Drainage in forest. The scope of the measure was to maintain existing forest drainage systems, particularly, to secure successful forest regeneration after final felling. Mature stands reaching final felling age and recently regenerated forest stands were prioritized in this activity to reach maximum economic and GHG emission reduction effect. In Latvia, maintaining forest drainage systems plays an essential role in supporting forest regeneration and contributing to GHG mitigation. This measure focuses on preserving existing drainage infrastructure, which is particularly critical following final felling to ensure successful regeneration and development of young stands. By prioritizing mature stands at felling age and newly regenerated areas, the measure aims to achieve both maximum economic returns and GHG reduction impact. Effective drainage management in forests prevents waterlogging, which can hinder tree growth and soil aeration, while promoting a healthy environment for young trees. Properly drained soils enable faster root development and enhance the survival rate of young trees, which will continue to absorb and store carbon throughout their lifecycle. This approach helps maintain forest productivity and fosters long-term carbon sequestration. Additionally, by supporting healthy forest regrowth, the measure aligns with Latvia's climate commitments, enhancing the resilience of forest ecosystems and ensuring that harvested areas can rapidly return to active carbon storage roles.

Afforestation. Support to afforestation of low valued farmlands. The measure ensures increase of carbon stock in living and dead biomass, and HWP in long term. Soil carbon stock changes and GHG emissions from soil are not considered due to lack of scientific substantiation of the GHG emission reduction. Afforestation of low-value farmlands is a strategic measure to enhance carbon stocks and support long-term GHG mitigation. By converting underutilized agricultural lands into forested areas, this initiative boosts carbon sequestration in both living and dead biomass, as well as in harvested wood products (HWP) over time. The establishment of new forests increases the overall carbon stock in vegetation, contributing positively to Latvia’s climate objectives by locking carbon in growing trees and eventually in wood products with extended lifespans. While changes in soil carbon stocks and soil-based GHG emissions are not factored into the emission reduction calculations due to limited scientific substantiation, the above-ground benefits are well-documented. New forest stands provide additional environmental benefits, such as biodiversity enhancement, improved soil structure, and increased resilience against erosion. This measure aligns with Latvia’s efforts to promote sustainable land use and expand its forest cover, ensuring long-term carbon sequestration and support for local ecosystems on previously low-value agricultural land.

Forest thinning. Support to pre-commercial thinning of forest stands. According to the study results (the research programme on impact of forest management measures on GHG emissions and CO_2 removals 2011-2015) early thinning in coniferous stands, as it is done now according to national regulations, contributes to additional increment during 20 years period; respectively, growing stock in 40-60 years old coniferous stands and research trials is by 15-25% higher than in non-thinned stands. Private forest owners are not motivated to implement early thinning due to the fact that is not resulting in direct incomes, therefore, this measure is oftenly avoided to save money. Support to forest thinning will result in rapid and significant increase of carbon stock.

Forest regeneration. The measure supports regeneration of forests after natural disturbances, like forest fires and strong storms, as well as reconstruction of diseased valueless forest stands. The measure affects carbon stock in living biomass, dead wood, litter and soil carbon pools; respectively, it is aimed to increase CO_2 removals. The regeneration of forest stands following natural disturbances—such as forest fires, strong storms, and the removal of diseased or low-value trees—is a crucial measure for restoring carbon stocks and enhancing GHG mitigation. By promoting forest recovery in affected areas, this initiative aims to increase carbon sequestration across multiple carbon pools, including living biomass, dead wood, litter, and soil. The regeneration efforts ensure that disturbed or degraded forests can quickly return to active carbon absorption, replacing lost biomass with healthy, growing trees that sequester CO_2 over time. Restoration activities prioritize replanting and nurturing resilient tree species that can withstand future environmental stressors, reinforcing Latvia's forest resilience. By focusing on areas impacted by natural disturbances, this measure supports ecosystem recovery, maintains biodiversity, and prevents soil erosion. It aligns with Latvia's climate commitments by restoring critical carbon sinks, thereby enhancing CO_2 removals and supporting sustainable forest management for long-term climate benefits.

2.4.6.2. Co-benefits from Mitigation Measures

Latvia's mitigation actions in the LULUCF sector yield significant adaptation and socio-economic co-benefits, in alignment with Article 13 of the Paris Agreement. These measures enhance the resilience of Latvia's ecosystems and rural economies to climate change impacts while also contributing to reducing GHG emissions.

Improved Water Management and Flood Mitigation

Mitigation measures in the LULUCF sector significantly support adaptation efforts aimed at improving water management and flood mitigation. These mitigation actions help to stabilize soil and enhance its structure, which plays a crucial role in maintaining natural water flow and reducing surface runoff. Increasing forest cover on less valuable agricultural lands creates natural barriers that slow down water flow during heavy rainfall, thereby reducing the risk of floods in vulnerable areas.

Carbon Sequestration, Soil Health & Biodiversity

Several mitigation measures in the LULUCF sector significantly benefit adaptation actions, particularly in improving soil health and increasing carbon sequestration. Additionally, the Targeted Afforestation Program increases forest cover, which not only sequesters carbon but stabilizes the soil, reducing erosion and improving its fertility. These improvements in soil structure and health, in turn, support the resilience of agricultural systems, making them more adaptable to changing climatic conditions. Moreover, these actions contribute to biodiversity by restoring natural habitats and supporting diverse ecosystems, essential for long-term sustainability and resilience in the land use and forestry sector.

Economic and Health Benefits of Green Space

Latvia's LULUCF mitigation measures create and enhance natural spaces that are attractive for recreation and ecotourism. These natural areas offer opportunities for outdoor activities that promote population health and well-being and can lead to increased tourism, attracting both domestic and international visitors. This, in turn, generates income for local communities, supports the rural economy, and can provide jobs in tourism-related industries such as hospitality, guiding services, and local goods. Mitigation measures like urban afforestation and green infrastructure development play a vital role in enhancing biophilia—the innate human connection to nature—within urban settings. Integrating more green spaces has tangible health benefits, such as reducing urban heat island effects, improving air quality, and providing opportunities for physical exercise. In addition, these spaces can serve as educational resources, fostering a greater appreciation for nature and encouraging sustainable behaviours among the urban population. Establishing tree lines and forested buffers around urban areas can provide residents immediate access to nature, promoting outdoor activities and social interaction. In rural areas, preserving natural landscapes through sustainable forest management practices ensures that local communities can continue enjoying their natural environment's cultural and health benefits.

These specific measures in the LULUCF sector exemplify Latvia's commitment to enhancing ecosystem resilience, supporting rural economies, and achieving significant GHG emission reductions, aligning with the objectives of the Paris Agreement.

2.4.7. Waste management

The most important document that describes the Latvian progress and planned policies on waste management is "**Waste management plan 2021 - 2028**"[114], approved by the CoM with Order No 45 (22nd January 2021). The waste management system is one of the most important directions of the EU and Latvian legislation on environmental protection. In Latvia, this is governed by more than 40 laws and regulations, including the *Waste Management Law*, the *Law on Regulators of Public Utilities*, the *Municipalities Law* and the *Natural Resources Tax Law*. CoM Regulations, which influence GHG emissions within the waste sector:

- CoM Regulation No. 1032 (27th December 2011) "Regulations Regarding the Construction of Landfill Sites, the Management, Closure and Re-cultivation of Landfill Sites and Waste Dumps";
- CoM Regulation No. 712 (26th October 2021) "Regulations Regarding Separate Waste Collection, Preparation for Re-use, Recycling and Material Recovery".

Main measures in solid waste sector:

1. Increase biological waste treatment in Latvia waste management companies (WEM scenario):
   - polygon "Getliņi" - 100 000 t/year;
   - polygon "Ķīvītes" - 17 932 t/ year;
   - polygon "Daibe" - 20 854 t/ year;
   - polygon "Cinīši" - 18 500 t/ year;
   - polygon "Janvāri" – 16 500 t/ year;
   - polygon "Brakšķi" – 19 000 t/ year.

2. Public awareness and capacity building (WAM scenario):
   a) the population reached is at least 20 000;
   b) persons who have changed their behaviour or habits under the influence of the project, 10 000.

In order to promote recycling and reuse of natural resources tax law sets the rate for waste disposal (Table 2.23).

[114] Waste management plan 2021–2028. Available: https://likumi.lv/ta/id/320476-par-atkritumu-apsaimniekosanas-valsts-planu-20212028-gadam *(in Latvian)*

Table 2.23 The tax rates for waste disposal from 1st January 2017

No.	Waste type	Unit	2017	2018	2019	2020	2021	2022	2023	2024
1.	Municipal and industrial waste, which are not hazardous	EUR/t	25.00	35.00	43.00	50.00	65.00	80.00	95.00	110.00
2.	Hazardous waste (also industrial hazardous waste)	EUR/t	45.00	50.00	55.00	60.00	70.00	85.00	100.00	115.00

Main PaMs, regulating **wastewater handling sector**, are listed below:

- Urban Wastewater Directive 271/91/EEC (UWWTD) requires to implement at least secondary treatment (which means "well managed biological treatment" in the terms of 2006 IPCC Guidelines) in all agglomerations, larger than 2000 population equivalents (p.e.) not later than 31st December 2015. Although there is no requirement for 100% connection rate for population, living within the border of agglomeration, total number of population living in these agglomerations constitutes a major proportion of national population. Full implementation of UWWTD means that up to 75% or even more of national population will be served by well managed biological treatment of urban wastewater and thus be very small or even not at all source of CH_4 emissions. However, UWWTD requires, that all agglomerations, larger than 10 000 p.e., must be served by more stringent treatment (significantly decreasing in the effluent content of total nitrogen and/or total phosphorus as well) no later than 31st December 2011. This requirement is aimed at protection of water environment from eutrophication;
- "Investment Plan of Wastewater Management for period 2021–2027", adopted in 2020 defines most important directions of development of sector, including renovation and coverage increase of sewage collection networks, increase of treatment quality in urban wastewater treatment plants, modernization of management of sewage sludge, measures to improve energy effectiveness in the wastewater treatment sector and management of decentralized collecting systems;
- "Sewage Sludge Management Plan 2024–2027", adopted in 2024 (with decree of CoM, 28th March 2024), aims to define measures to manage sewage sludge in a sustainable way and in accordance with circular economy, including dewatering the most part of sewage sludge produced. According to Plan, it is planned to establish 27 regional centres of sludge processing, ensuring dewatering of sludge (to around 18% of dry solid content) and appropriate reuse or disposal of it, while viewing sewage sludge as resource instead of waste. It is expected to significantly decrease amount of sewage sludge stored anaerobically, thus decreasing emissions of CH_4 from sewage sludge handling (WEM scenario).

Co-benefits from Mitigation Measures

Latvia's mitigation efforts in the Waste sector present significant adaptation and socio-economic co-benefits, aligning with Article 13 of the Paris Agreement (Decision 18/CMA.1, para 84). These measures enhance the resilience of Latvia's waste sector and contribute directly to reducing GHG emissions while supporting economic growth and job creation.

Enhanced Waste Management and Climate Resilience

Mitigation measures in the waste sector, such as increasing the processing of biodegradable waste and improving wastewater treatment plant operations, play a crucial role in supporting adaptation efforts aimed at enhancing climate resilience. By diverting organic waste from landfills, this measure also reduces the burden on waste management systems, making them more resilient to climate-related disruptions such as increased rainfall or flooding. These measures align with broader adaptation goals, such as improving urban infrastructure and minimizing the impact of climate risks on human health and the environment.

Economic Benefits and Public Awareness

Implementing public awareness and capacity-building measures in the waste sector fosters economic resilience by encouraging more sustainable waste practices among citizens and businesses. Increased public awareness around waste reduction and recycling contributes to a circular economy, reducing reliance on raw materials and creating new economic opportunities in recycling and waste processing industries. These initiatives also support adaptation by promoting the sustainable use of resources, reducing waste generation, and enhancing the efficiency of waste management systems. The development of separate textile waste collection systems, for example, reduces landfill burden and creates opportunities for textile recycling, contributing to economic growth and environmental sustainability.

These specific measures in the waste sector illustrate Latvia's commitment to improving climate resilience and achieving significant GHG emission reductions.

2.4.8. Cross-sectorial

Latvia is implementing cross-sectorial climate change mitigation PaMs that affect several sectors of the national economy simultaneously. Such cross-sectorial policies include implementation of the EU ETS, applying of fiscal instruments on CO_2 emissions, green procurement.

The cross-sectorial measures described below are included in the WEM scenario.

European Union emission allowances trading system

The EU ETS, established by the ETS Directive, is operating since 1st January 2005. The fourth trading period, which covers 2021-2030, is divided into two consecutive periods. The first sub-period of 2021-2025 is under implementation according to the Directive 2018/410/EU of the European Parliament and of the Council of 14th March 2018 amending the ETS Directive which established a scheme for GHG emission allowance trading within the Community.

The general framework for the stationary installations, by transposing the provisions of the ETS Directive, is stated by the CoM Regulation No. 769 (13th November 2012) "Regulations regarding Participation of Stationary Technological Installations in the Emission Allowance

Trading Scheme of the EU"[115]. The national regulation is regularly updated in line with EU ETS policy current conditions.

The Latvia's National Emissions Allowances Allocation Plan for 2021-2025 is approved by the Ordinance of the CoM No. 335 (18th May 2021, amended 18th April 2023) "On Emissions Allowances Allocation for 2021-2025: List of installations and allowances"[116]. Actual amendments in the Allocation Plan have been included by the MoCE Decisions on Allocation of Emission Allowances to Operators of EU ETS 2021-2025 sub-period. In 2022 53 stationary installations (owned by 37 legal operators) and 2 avio operators participated in EU ETS.

The Latvia's National Emissions Allowances Allocation Plan for 2026-2030 is approved by the new Ordinance of the CoM No. 776 (24th September 2024) "On Emissions Allowances Allocation for 2026-2030: List of installations and allowances"[117]. The List includes 46 stationary operators.

Emissions taxation

The procedure of emissions taxation is prescribed by the **Natural Resources Tax Law[118].** The policy is to promote the internalization of external costs. As the general principle, the household sector are not taxpayers of emission taxes.

The CO_2 emissions taxation has been introduced from the 1st July 2005 and has been gradually raised. In 2020, tax rate per ton of CO_2 emission was 9 EUR. This rate has been raised up to 12 EUR, in 2021, and 15 EUR, from the 1st January 2022, per ton of CO_2 emissions. The subject of CO_2 emission taxation is such CO_2 emitting activities (installations) which corresponds to EU ETS activities however the amount of the activity (installation) is below the threshold defined for inclusion in EU ETS. The tax shall not be paid for the emissions of CO_2 which emerges (i) while using RES, and (ii) from the installations participating in EU ETS. Until 31st December 2020 the tax exemption was applied also to utilisation of local fuel – peat for energy production. In terms of phasing out harmful subsidies, the tax exemption regarding utilising peat in combusting installations was cancelled.

Taxation on air polluting emissions creates synergy with CO_2 taxation. The taxable are emissions of PM (tax rate on 01.01.2024 - 135 EUR/ton), CO (7.83 EUR/ton), NH_3, H_2S and other non-organic compounds (90 EUR/ton), SO_2 and NO_x (160 EUR/ton), volatile organic compounds and other hydrocarbons C_nH_m (85.37 EUR/ton), metals (Cd, Ni, Sn, Hg, Pb, Zn, Cr, As, Se, Cu) and their compounds recalculated for the relevant metal, V_2O_5 recalculated to vanadium (1138.30 EUR /ton). The subject of air polluting emissions taxation is person who has a duty to receive a polluting activity permit or certificate. Regarding stationary combustion installations, the pollution activity permit or certificate should be received for installations with capacity 200 kW and above (if residual fuel oil is utilised – all installations regardless of the capacity).

Green Public Procurement

Public Procurement Law[119] states the special rules with respect to energy efficiency (Section 55). Technical specifications shall additionally contain technical descriptions which include, among others, such requirements of the contracting authority in relation to the product or

[115] Cabinet of Ministers Regulation No 769 (2012): consolidated version. Available: https://likumi.lv/ta/id/253119 *(in Latvian)*
[116] Cabinet of Ministers Ordinance No 335 (2021). Available:: https://likumi.lv/ta/id/323330 *(in Latvian)*
[117] Cabinet of Ministers Ordinance No 776 (2024). Available: https://likumi.lv/ta/id/355162 *(in Latvian)*
[118] Natural Resources Tax Law. Available: http://likumi.lv/doc.php?id=124707 *(in Latvian)*
[119] Public Procurement Law. Available: https://likumi.lv/doc.php?id=287760 *(in Latvian)*

service as the energy efficiency, the requirements regarding reduction of GHG emissions and adaptation to climate change, other environmental protection requirements (Section 20.4).

Pursuant to the Public Procurement Law, the minimum energy efficiency requirements for goods procured by state central administration institutions are stated: (1) correspondence to one of the highest two energy efficiency classes, available in the market (if EU labelling regulation applies); (2) correspondence to eco-design requirements (if EU eco-design regulation applies)[120].

The Section 19 states the general framework for Green Public Procurement (GPP) detailed by the CoM Regulation No. 353 (20th June 2017)[121]. Regarding energy consumption, the GPP Regulation states mandatory GPP criteria for:

- imaging (printing) equipment;
- computer engineering (hardware), ICT infrastructure, services of data centers;
- in-door lighting;
- street lighting;
- traffic lights;
- construction of new buildings or renovation of existing ones, applies for, so called, the third group of buildings (included by the Amendments of July 2023);
- purchase of cars and light duty vehicles (included by the Amendments of July 2023).

The third group of buildings includes**:** (1) buildings with more than six above-ground floors; (2) buildings with more than one underground floor; (3) public buildings with total area above 1000 m^2, as well as certain types of other buildings. Energy efficiency related GPP criteria are stated for such particular types of buildings, if they fit into the third group of buildings, as museum, library, audience hall, sport building, office building, education and science building, hotel, health care building, public catering building, commercial trade building, residential building. For these buildings, the GPP Regulation provides for higher energy efficiency class as required by the Regulation on the energy certification of buildings.

In its turn, the Section 54 of the Public Procurement Law states the special rules for procurement in the field of road transport.

In September 2021, the provisions of the **amending Directive 2019/1161/EU** regarding the procurement targets for the share of clean vehicles have been transposed[122]. The Directive defines a "clean vehicle" as follows:

- clean light-duty vehicle: any car or van meeting the following emission thresholds:
  - until 31st December 2025: no more than 50g/km CO_2 and up to 80% of applicable real driving emission (RDE) limits for NO_x and PN;
  - from 1st January 2026: only zero-emission vehicles.
- clean heavy-duty vehicle: any truck or bus using one of the following alternative fuels: hydrogen, battery electric (including plug-in hybrids), natural gas (both CNG and LNG,

[120] Cabinet of Ministers Regulation No. 180 (2017) "Requirements regarding Energy Efficiency to be Applied in the Goods' and Services' Public Procurements of State Direct Administration Institutions". Available: https://likumi.lv/doc.php?id=289757 *(in Latvian)*
[121] Cabinet of Ministers Regulation No 353 (2017) "Requirements of Green Public Procurement and the Procedures They shall be Applied". Available: https://likumi.lv/ta/id/291867 *(in Latvian)*
[122] Amendments to the Public Procurement Law (https://likumi.lv/ta/id/326070) and Amendments to the Law on the Procurement of Public Service Providers (https://m.likumi.lv/ta/id/326072), both Amendments adopted 2nd September and in force 14th September 2022 *(in Latvian)*

including biomethane), liquid biofuels, synthetic and paraffinic fuels, liquefied petroleum gas (LNG).

Table 2.24 The minimum (at least) share of clean vehicles in the total number of particular vehicles covered by the public procurement contracts in Latvia

	September 2021 - 2025	2026 - 2030
share of clean light duty vehicles (M1, M2 and N1 categories)	22%	22%
share of clean trucks (N2 and N3 categories)	8%	9%
share of clean urban buses[123]	35%	50%

Pursuant to the Public Procurement Law, the minimum energy efficiency requirements for tyres procured by state central administration institutions are stated. Namely, one of the following requirements shall be applied: (1) the tyre shall correspond to the highest fuel efficiency class, or (2) the tyre shall correspond to the highest class regarding noise or road adherence, if grounded by safety or public health considerations[124].

Expired Measures which have an effect, or is expected to continue to have an effect on GHG emissions

The Cross-sectorial PaMs are well-established. The cross-sectorial PaMs, included in the NC8/BR5, have been strengthened for the period 2023-2030. No expired (completed measures) are to be reported.

2.4.9. Assessment of the economic and social impacts

Strategies and actions aimed at addressing climate change (as known as response measures) frequently have diverse impacts on the societies and economies of countries.

To ensure that potentially adverse social, environmental and economic impacts of EU's new policy initiatives on various stakeholders, including developing-country parties, are identified and minimised, the EC has established an impact assessment of new policy initiatives[125].

The Better Regulation Guidelines set out the principles that the EC follows when preparing new initiatives and proposals, include detailed instructions for evaluating the possible effects of EU policy measures on developing nations. When managing and evaluating existing legislation, the guidelines apply to each phase of the law-making cycle. The Guidelines are accompanied by a toolbox which provides complementary advice[126].

To ensure that all relevant possible impacts are taken into account, Latvia has established processes that assess the economic and social consequences of climate PaMs in the early stages of the policy-making process.

The assessment relates both for the (1) development of new policy initiatives and (2) new legislative proposals at all levels – laws, governmental regulations, and orders. Thus, an impact assessment system has been established in Latvia in which all proposals are examined before

[123] Buses (vehicle category M3) – half of the target to be fulfilled by procuring zero-emission buses.
[124] Cabinet of Ministers Regulation No. 180 (2017). Available: https://likumi.lv/doc.php?id=289757 *(in Latvian)*
[125]Impact assesments. Available: https://commission.europa.eu/law/law-making-process/planning-and-proposing-law/impact-assessments_en
[126]"Better regulation" toolbox, Tool 34. Available: https://ec.europa.eu/info/law/law-making-process/planning-and-proposinglaw/better-regulation-why-and-how/better-regulation-guidelines-and-toolbox_en

any legislation or policy is passed. It is based on an integrated approach which analyzes both benefits and costs, and addresses all significant economic, social, and environmental impacts, including impacts on relevant stakeholders, of possible new initiatives. The stakeholders can submit their proposals during the public consultation procedure, and highly relevant stakeholders can submit the point of view also later, during the inter-institutional harmonisation procedure.

Within the elaboration of NECP 2021-2030, the EC recommendations have been carefully considered, including such socially important issues as the promotion of self-production-consumption (prosumers) and renewable energy communities, greening of fiscal policies, impact of air quality (synergy and necessary compromises), mitigation of energy poverty, including clear quantified targets to reduce energy poverty. Regarding economical and social consequences of response measures to other countries, Latvia strive to implement its climate PaMs in such a way that the social, environmental and economic impacts on other countries, and on developing countries in particular, do not appear at all or the impacts are very minimised and are negligible. Latvia takes into account up-to-date knowledge on and understanding of the possible impacts of PaMs based on available actual scientific studies and R&D information.

Latvia takes measures aiming to reduce GHG emissions through energy savings and increase of using sustainable RES. Ensuring the use of combustible RES conforming sustainability criteria provides non-compromising high GHG emissions sequestration areas and avoids adverse impacts on biodiversity and related social-type conflicts.

2.5. Summary of GHG emissions and removals

Summary information on GHG emissions and removals is provided in Chapter 1 “National Inventory Document”.

Full information on GHG emissions and removals is found in separate NID which were submitted to UNFCCC in 16th December 2024 and also in CRT Table 6.

2.6. Projections of GHG emissions and removals

The scenarios underlying emissions projections in the 2024 submission have incorporated new insights regarding economic and demographic developments, sector developments, fossil fuel prices, the CO_2 price and policies when compared with the projections reported in NC8/BR5[127] (2022).

GHG emissions in Latvia are projected for the years 2025, 2030, 2035, 2040, 2045 and 2050. Emission projections include and provide information about the implementation of PaMs which are defined in policy documents developed by the government of Latvia until 31st December 2023. These projections correspond to the “scenario with existing measures”. In addition to WEM scenario, emissions projections with planned additional measures are only described in the approved government documents, but legal regulations and implementation mechanisms have not yet been elaborated. Additional assumption scenarios are made to perform sensitivity analysis.

Latvia has not reported projections “without measures” scenario, because it is not mandatory and may concern additional resources to prepare.

In the case of the Energy sector, parameters such as GDP growth, number of population, VA growth are changed to determine sensitivity analysis. In the Agriculture sector different

[127]NC8/BR5 report. Available: https://unfccc.int/NC8

assumptions about milk yield change emissions projections. In the LULUCF sector different levels of implemented measures are used to perform sensitivity analysis but in the Waste sector macroeconomic projections and amount of disposed waste are changed to make sensitivity analysis.

Key assumptions used in the projections

The GHG emission projections of Latvia are based on the long-term macroeconomic projection. MoE developed macroeconomic projections until 2050. According to these projections it is expected that GDP, similar to private consumption, will increase during 2023-2050. Population in Latvia is expected to continue to decrease by 24.5% from 2.250 to 1.698 million in the period from 2005 to 2050.

The main macroeconomic parameters are shown in the Table 2.25.

Table 2.25 The main macroeconomic parameters applied for projecting GHG emissions

	1990	1995	2000	2005	2010	2015	2020	2022	2025	2030	2035	2040	2045	2050
Population, thousand	2668.14	2500.58	2381.72	2249.72	2120.50	1986.10	1907.68	1875.76	1831.92	1770.42	1728.06	1706.01	1698.63	1698.07
GDP, constant prices, MEUR (2015)	NE	11131.27	14350.96	21240.50	20724.31	24572.13	26228.01	28820.74	31040.62	34880.38	39080.43	43317.31	47157.40	50419.21
Total primary energy consumption, ktoe	7979.00	4583.00	3914.00	4586.00	4648.00	4382.00	4380.00	4447.07	4276.22	4159.36	4045.21	3871.46	3717.34	3606.70
			1996-2000	**2001-2005**	**2006-2010**	**2011-2015**	**2016-2020**	**2021-2022**	**2023-2025**	**2026-2030**	**2031-2035**	**2036-2040**	**2041-2045**	**2046-2050**
GDP growth, annual changes per period, %	-	-	5.2	8.2	-0.5	3.5	1.3	4.8	2.5	2.4	2.3	2.1	1.7	1.4

More information regarding key parameter values applied for calculation of GHG emission projections is presented in the CTF Table 11.

In 2030, total GHG emissions (without LULUCF, with indirect CO_2 emissions) are projected to decrease by 66.2% and in 2050 by 77.5%, compared to 1990. In 2030, total GHG emissions (with LULUCF and indirect CO_2 emissions) are projected to decrease by 14.2% and in 2050 by 27.6%, compared to 1990 in WEM scenario (Table 2.26).

Energy sector (without Transport sector) has the largest projected decrease of GHG emissions in 2030 and 2050 compared to 1990, 85.7% (2030) and 92.0% (2050) respectively. In Transport sector the projected GHG emissions in 2030 are projected to be a little bit higher than in 1990 (+0.03%), but in 2050 emissions are below 1990 level (-57.5%). In IPPU sector emissions are projected 23.3% increase in 2030 and 22.0% increase in 2050 compared to 1990. Agriculture sector is also the sector having large projected decrease of GHG emissions in 2030 and 2050 compared to 1990, 56.4% (2030) and 57.2% (2050) respectively. In Waste sector the projected decrease of GHG emissions constitute to 48.7% (2030) and 63.2% (2050), compared to 1990.

In 2030, total GHG emissions (without LULUCF, with indirect CO_2 emissions) are projected to decrease by 13.0% and in 2050 by 42.0%, compared to 2022. In 2030, total GHG emissions (with LULUCF and indirect CO_2 emissions) are projected to decrease by 22.2% and in 2050 by 34.3%, compared to 2022.

Energy sector (without Transport sector) is projected to decrease by 28.1% in 2030 and by 59.6% in 2050, compared to 2022. Transport sector is projected to decrease by 3.3% in 2030 and by 58.9% in 2050, compared to 2022. IPPU emissions are projected to decrease by 5.9% in 2030 and by 6.8% in 2050, compared to 2022. Agriculture emissions are projected to decrease by 2.6% in 2030 and by 4.4% in 2050, compared to 2022. Waste management sector is projected to decrease by 29.8% in 2030 and by 49.7% in 2050, compared to 2022.

Table 2.26 Historical and projected total GHG emissions per sector under WEM scenario, kt CO_2 eq.

Sector	1990	1995	2000	2005	2010	2015	2020	2022	2025	2030	2035	2040	2045	2050
Energy excluding transport	16492.38	7525.25	5224.86	5066.23	5256.45	4047.13	3687.96	3277.17	2673.62	2357.30	1817.41	1312.98	1180.38	1325.25
Transport	3037.19	2103.72	2213.16	3109.57	3275.68	3148.19	3108.11	3141.70	3296.35	3037.99	2452.60	1939.89	1558.06	1291.13
IPPU	655.40	225.71	283.32	366.93	751.60	788.38	865.93	858.47	844.14	807.80	796.64	797.64	799.66	799.90
Agriculture	5030.48	2030.45	1680.55	1790.84	1870.07	2151.47	2250.41	2253.83	2216.88	2194.13	2156.05	2154.99	2154.58	2154.16
LULUCF	-12390.09	-14838.26	-11851.13	-5905.33	-1894.77	362.90	758.29	4944.16	2146.72	2909.77	2733.04	3794.25	3719.97	4032.18
Waste	805.03	702.50	764.59	686.51	717.26	619.23	578.99	588.61	521.40	413.32	351.96	317.46	302.12	296.24
Indirect CO_2	41.00	32.49	25.16	21.60	16.44	17.13	13.13	11.24	7.17	6.00	5.58	3.68	3.32	4.45
Gas	**1990**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**	**2022**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**
CO_2 emissions without net CO_2 from LULUCF	19661.60	9133.94	7081.63	7810.76	8554.52	7262.43	6997.99	6619.72	6266.28	5745.99	4652.69	3676.77	3193.53	3098.22
CO_2 emissions with net CO_2 from LULUCF	6262.65	-6737.58	-5819.73	897.63	5601.43	6414.81	6348.63	10105.10	6626.61	6882.97	5660.03	5798.16	5241.97	5457.19
CH_4 emissions without CH_4 from LULUCF	4060.56	2443.01	2107.92	2091.40	2002.96	1967.09	1898.05	1893.19	1715.64	1584.61	1507.15	1453.24	1428.95	1413.62
CH_4 emissions with CH_4 from LULUCF	4583.85	2967.69	2642.75	2584.62	2539.17	2648.09	2743.12	2782.41	2818.36	2697.48	2613.34	2551.95	2527.25	2515.77
N_2O emissions without N_2O from LULUCF	2298.32	994.27	914.16	1012.78	1089.66	1262.58	1339.80	1344.30	1340.27	1311.40	1276.74	1269.56	1258.69	1248.54
N_2O emissions with N_2O from LULUCF	2783.89	1502.84	1429.57	1527.36	1611.77	1792.10	1902.36	1913.86	2023.93	1971.32	1896.25	1843.71	1831.93	1819.60
HFCs	NO,NA	16.25	61.85	101.24	216.35	251.86	243.26	250.30	217.44	155.83	125.38	110.67	100.93	93.59
SF_6	NO, NA	0.18	0.91	3.89	7.58	10.43	12.30	12.27	12.76	12.71	12.71	12.71	12.71	12.71
NF_3	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
PFCs	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

Sector	1990	1995	2000	2005	2010	2015	2020	2022	2025	2030	2035	2040	2045	2050
Indirect CO_2	41.00	32.49	25.16	21.60	16.44	17.13	13.13	11.24	7.17	6.00	5.58	3.68	3.32	4.45
Total (without LULUCF)	26020.48	12587.64	10166.47	11020.07	11871.07	10754.39	10491.40	10119.77	9552.39	8810.54	7574.67	6522.96	5994.81	5866.69
Total (with LULUCF)	13630.39	-2250.62	-1684.65	5114.74	9976.30	11117.29	11249.69	15063.94	11699.11	11720.32	10307.71	10317.20	9714.78	9898.86
Total (without LULUCF, with Indirect CO_2)	26061.47	12620.13	10191.63	11041.68	11887.50	10771.52	10504.53	10131.01	9559.56	8816.54	7580.25	6526.63	5998.13	5871.14
Total (with LULUCF, with Indirect CO_2)	13671.39	-2218.13	-1659.49	5136.35	9992.74	11134.42	11262.82	15075.18	11706.28	11726.31	10313.29	10320.88	9718.10	9903.31

The projections presented in Table 2.26 under WEM scenario include the impact of all the Latvia's implemented and adopted PaMs. These policies and measures and their projected CO_2 eq. savings are detailed in Annex 3 (CTF Table 7).

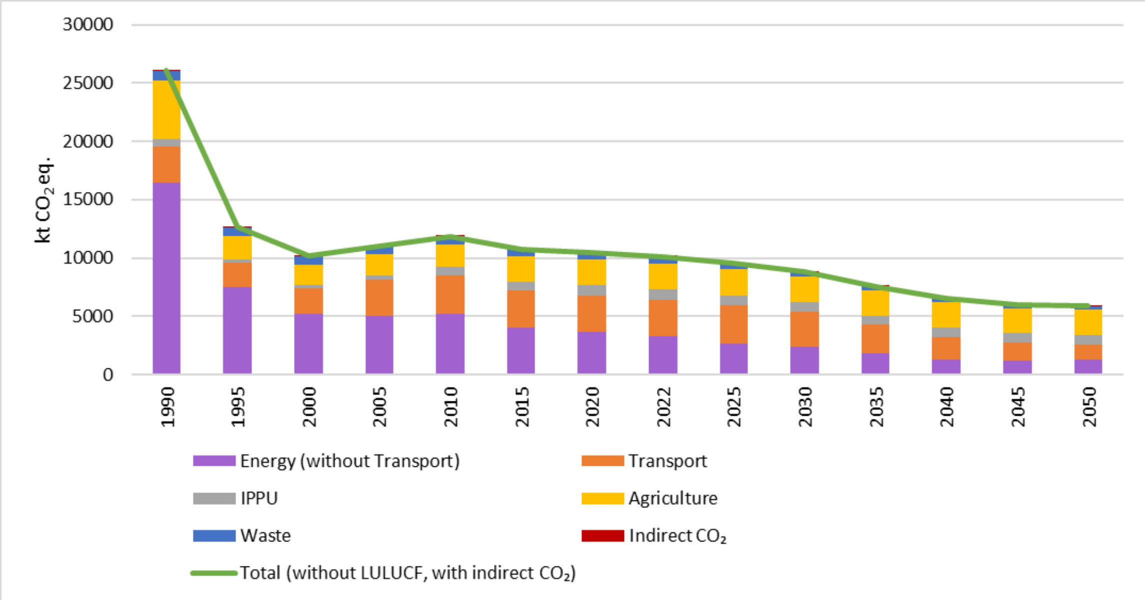

Figure 2.40 Historical and projected GHG emissions per sector in the WEM scenario (without LULUCF, with indirect CO_2), kt CO_2 eq.

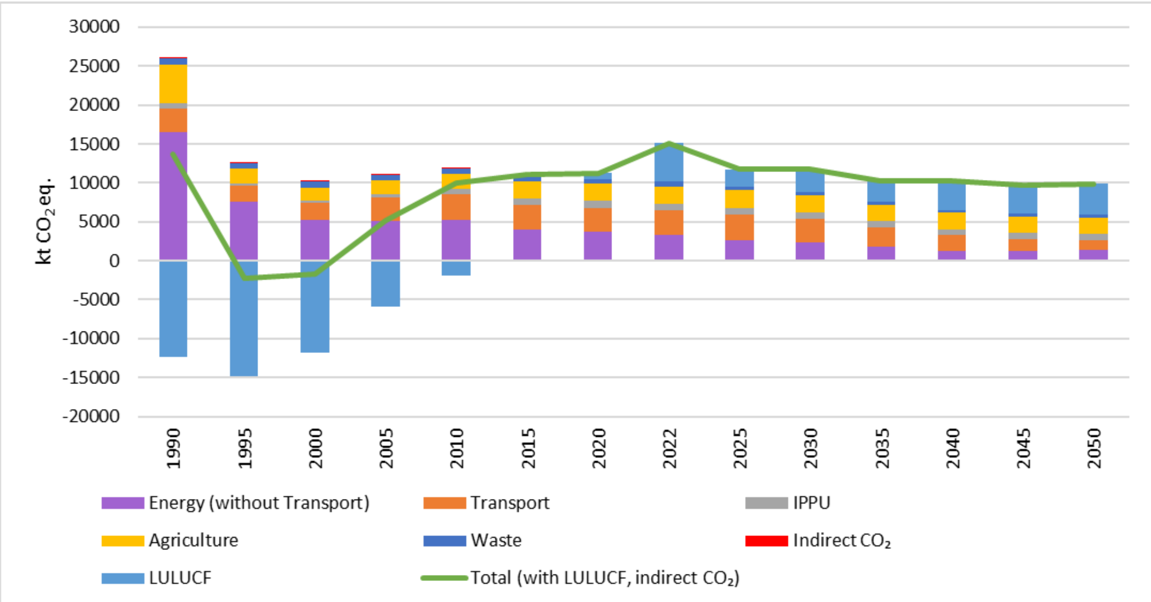

Figure 2.41 Historical and projected GHG emissions per sector in the WEM scenario (with LULUCF, indirect CO_2), kt CO_2 eq.

The Energy sector including Transport will account for the largest share amounting to 61.2% of the total projected GHG emissions in 2030, followed by Agriculture sector with 24.9% and Industrial processes and product use sector with 9.2% share. In 2050 shares of Agriculture IPPU and Waste management sectors increase in total GHG emissions, increasing share by 12.0%, 4.5% and 0.4% respectively. At the same time contribution of Energy sectors decrease.

Compared to 1990, CO_2 emissions (without LULUCF and indirect CO_2) are projected to decrease by 70.8% in 2030 and by 84.2% in 2050. CH_4 emissions are projected to decrease by 61.0% in 2030 and by 65.2% in 2050, compared to 1990. N_2O emissions are projected to decrease by 42.9% in 2030 and by 45.7% in 2050. CO_2 emissions (without LULUCF and indirect CO_2) are projected to decrease by 13.2% in 2030 and by 53.2% in 2050, compared to 2022. CH_4 emissions are projected to decrease by 16.3% in 2030 and by 25.3% in 2050, compared to 2022. N_2O emissions are projected to decrease by 2.4% in 2030 and by 7.1% in 2050, compared to 2022. HFCs emissions are projected to decrease by 37.7% in 2030 and by 62.6% in 2050, compared to 2022. SF_6 emissions are projected to increase by 3.6% in 2030 and also in 2050, compared to 2022. CO_2 accounts for 65.2% of the total GHG emissions in 2030. CH_4 and N_2O emissions contribute respectively 18.0% and 14.9% in 2030 GHG emissions projection, the rest 1.9% is contributed by F-gases (Table 2.26 and Figure 2.42).

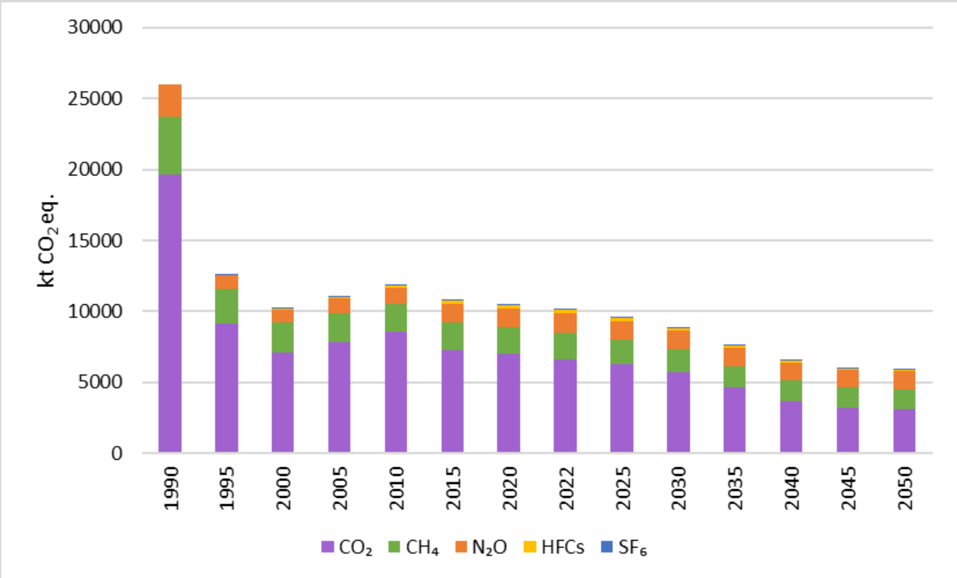

Figure 2.42 Historical and projected GHG emissions per gas in the WEM scenario, kt CO_2 eq.

In 2030 the indicator ((GHG emissions per GPD unit)) value is significantly (77.9%) lower than in 1995 and 28.6% lower compared to 2022 (Figure 2.43).

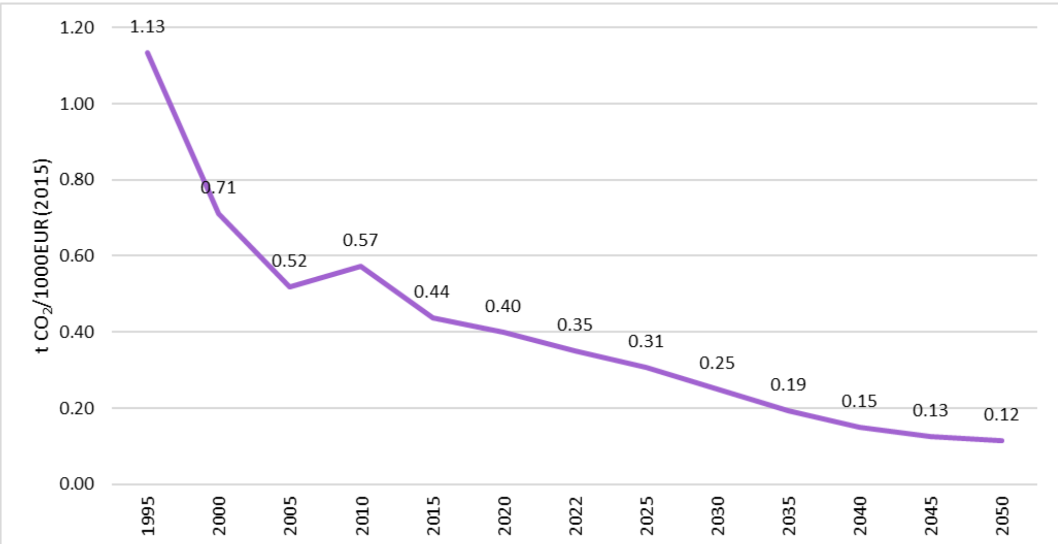

Figure 2.43 Historical and projected development of GHG intensity indicator

In addition to WEM scenario, there are also projected emissions with planned additional measures which are described in the approved government policies documents, however the implementing procedures and mechanisms of which are not yet set.

The additional GHG emission mitigation measures under the WAM scenario allow a reduction of the projected emissions. Thus, in 2030, under the WAM scenario total GHG emissions (without LULUCF, with indirect CO_2 emissions) are 2.3% lower and in 2050 29.7% lower than in the respective years under the WEM scenario.

In 2030, total GHG emissions (without LULUCF, with indirect CO_2 emissions) are projected to decrease by 66.9% and in 2050 by 84.2%, compared to 1990. In 2030, total GHG emissions (with LULUCF and indirect CO_2 emissions) are projected to decrease by 15.7% and in 2050 by 40.3%, compared to 1990 in WAM scenario (Table 2.27**Table 2.26**). Compared to 2022, in 2030, total GHG emissions (without LULUCF, with indirect CO_2 emissions) are projected to decrease by 14.9% and in 2050 by 59.3%. In 2030, total GHG emissions (with LULUCF and indirect CO_2 emissions) are projected to decrease by 23.5% and in 2050 by 45.9%, compared to 2022.

Table 2.27 Historical and projected total GHG emissions per sector under WAM scenario, kt CO_2 eq.

Sector	1990	1995	2000	2005	2010	2015	2020	2022	2025	2030	2035	2040	2045	2050
Energy excluding transport	16492.38	7525.25	5224.86	5066.23	5256.45	4047.13	3687.96	3277.17	2675.56	2319.40	1819.35	1192.06	890.62	831.18
Transport	3037.19	2103.72	2213.16	3109.57	3275.68	3148.19	3108.11	3141.70	3188.07	2877.46	2056.01	675.52	190.44	111.92
IPPU	655.40	225.71	283.32	366.93	751.60	788.38	865.93	858.47	844.14	807.80	796.64	797.64	799.66	799.90
Agriculture	5030.48	2030.45	1680.55	1790.84	1870.07	2151.47	2250.41	2253.83	2216.88	2194.13	2156.05	2154.99	2154.58	2154.16
LULUCF	-12390.09	-14838.26	-11851.13	-5905.33	-1894.77	362.90	758.29	4944.16	2146.72	2909.77	2733.04	3794.25	3719.97	4032.18
Waste	805.03	702.50	764.59	686.51	717.26	619.23	578.99	588.61	521.40	413.01	334.25	271.87	240.19	226.24
Indirect CO_2	41.00	32.49	25.16	21.60	16.44	17.13	13.13	11.24	7.06	6.34	6.66	3.72	3.37	3.30
Gas	**1990**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**	**2022**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**
CO_2 emissions without net CO_2 from LULUCF	19661.60	9133.94	7081.63	7810.76	8554.52	7262.43	6997.99	6619.72	6162.89	5562.75	4278.16	2287.07	1525.66	1419.90
CO_2 emissions with net CO_2 from LULUCF	6262.65	-6737.58	-5819.73	897.63	5601.43	6414.81	6348.63	10105.10	6523.22	6699.72	5285.51	4408.46	3574.09	3778.86
CH_4 emissions without CH_4 from LULUCF	4060.56	2443.01	2107.92	2091.40	2002.96	1967.09	1898.05	1893.19	1712.44	1573.78	1478.46	1412.46	1373.90	1342.13
CH_4 emissions with CH_4 from LULUCF	4583.85	2967.69	2642.75	2584.62	2539.17	2648.09	2743.12	2782.41	2815.15	2686.65	2584.66	2511.16	2472.20	2444.28
N_2O emissions without N_2O from LULUCF	2298.32	994.27	914.16	1012.78	1089.66	1262.58	1339.80	1344.30	1340.53	1306.73	1267.59	1269.17	1262.29	1255.07
N_2O emissions with N_2O from LULUCF	2783.89	1502.84	1429.57	1527.36	1611.77	1792.10	1902.36	1913.86	2024.19	1966.66	1887.10	1843.32	1835.53	1826.13
HFCs	NO,NA	16.25	61.85	101.24	216.35	251.86	243.26	250.30	217.44	155.83	125.38	110.67	100.93	93.59
SF_6	NO, NA	0.18	0.91	3.89	7.58	10.43	12.30	12.27	12.76	12.71	12.71	12.71	12.71	12.71
NF_3	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
PFCs	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Indirect CO_2	41.00	32.49	25.16	21.60	16.44	17.13	13.13	11.24	7.06	6.34	6.66	3.72	3.37	3.30

Sector	1990	1995	2000	2005	2010	2015	2020	2022	2025	2030	2035	2040	2045	2050
Total (without LULUCF)	26020.48	12587.64	10166.47	11020.07	11871.07	10754.39	10491.40	10119.77	9446.05	8611.80	7162.31	5092.08	4275.49	4123.40
Total (with LULUCF)	13630.39	-2250.62	-1684.65	5114.74	9976.30	11117.29	11249.69	15063.94	11592.77	11521.57	9895.35	8886.33	7995.46	8155.58
Total (without LULUCF, with Indirect CO_2)	26061.47	12620.13	10191.63	11041.68	11887.50	10771.52	10504.53	10131.01	9453.12	8618.14	7168.97	5095.80	4278.86	4126.70
Total (with LULUCF, with Indirect CO_2)	13671.39	-2218.13	-1659.49	5136.35	9992.74	11134.42	11262.82	15075.18	11599.83	11527.91	9902.01	8890.05	7998.83	8158.88

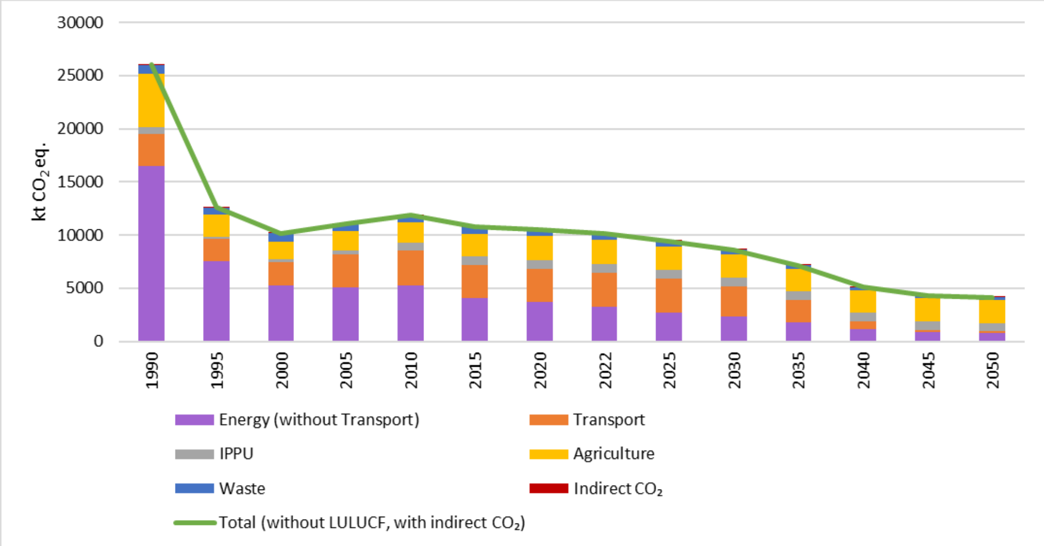

Figure 2.44 Historical and projected GHG emissions per sector in the WAM scenario (without LULUCF, with indirect CO_2), kt CO_2 eq.

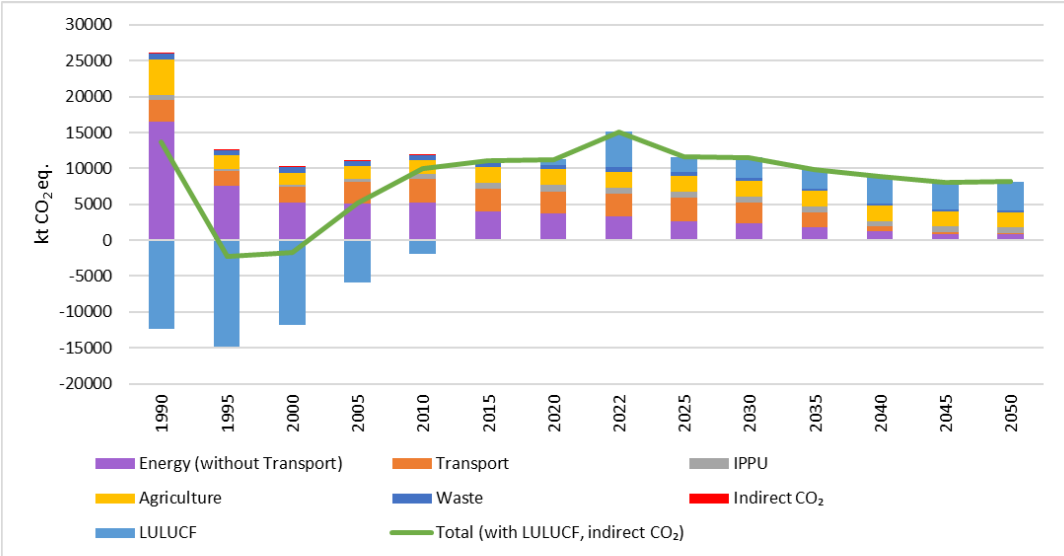

Figure 2.45 Historical and projected GHG emissions per sector in the WAM scenario (with LULUCF, indirect CO_2), kt CO_2 eq.

Precursor gases and SO_2

Emissions for 2022 are taken from Latvia's 2024 GHG inventory, submitted to the UNFCCC on 16th December 2024 but projections for air pollutants are from 2023 submission under CLRTAP. CO emissions are not mandatory to report under CLRTAP, therefore in BTR1 projected CO emissions are also not reported. Some inconsistencies with the projections for GHG may therefore occur.

Table 2.28 Projections of NO_x, NMVOC and SO_2 emissions by sector (kt)

	2022	2025	2030	2040	2050
Total NO_x	**32.38**	**31.81**	**29.12**	**23.97**	**22.41**
- **Energy**	25.85	24.89	22.22	16.98	15.35
- **IPPU**	2.06	2.08	2.16	2.29	2.36
- **Agriculture**	4.38	4.79	4.68	4.64	4.64
- **LULUCF**	0.08	0.05	0.05	0.05	0.05

	2022	2025	2030	2040	2050
- **Waste**	0.003	0.004	0.004	0.004	0.004
Total NMVOC	**32.20**	**34.51**	**33.42**	**34.52**	**32.97**
- **Energy**	12.13	11.84	10.93	11.75	9.89
- **IPPU**	12.74	14.97	15.10	15.67	16.07
- **Agriculture**	7.08	7.49	7.23	6.99	6.92
- **LULUCF**	NA	NA	NA	NA	NA
- **Waste**	0.25	0.21	0.16	0.11	0.09
Total SO_2	**3.75**	**3.92**	**3.78**	**4.14**	**3.75**
- **Energy**	3.63	3.76	3.62	3.97	3.58
- **IPPU**	0.13	0.14	0.15	0.16	0.16
- **Agriculture**	NO	NA	NA	NA	NA
- **LULUCF**	NA	NA	NA	NA	NA
- **Waste**	0.0005	0.0006	0.0006	0.0006	0.0006

Comparison of projections between NC8/BR5 and BTR1

In NC8/BR5 reference year was 2020 and projections were calculated up to 2040. Some of the main assumptions and results of the NC8/BR5 and BTR1 projections are presented in Table 2.29.

Table 2.29 Comparison of projections between NC8/BR5 and BTR1

	2025	2030	2035	2040
NC8/BR5 Population, thousand people	1849.68	1799.00	1760.97	1738.07
BTR1 Population, thousand people	1831.92	1770.42	1728.06	1706.01
Difference between NC8/BR5 and BTR1	-17.76	-28.58	-32.91	-32.06
NC8/BR5 Annual GDP growth rates, per cent	3.8	2.4	2.2	2
BTR1 Annual GDP growth rates, per cent	2.5	2.4	2.3	2.1
Difference between NC8/BR5 and BTR1	-1.3	0.0	0.1	0.1
NC8/BR5 WEM total emissions (without LULUCF, with indirect CO_2), kt CO_2 eq.	10591	10186	9493	8370
BTR1 WEM total emissions (without LULUCF, with indirect CO_2), kt CO_2 eq.	9560	8817	7580	6527
Difference between NC8/BR5 and BTR1	-1032	-1370	-1913	-1844
NC8/BR5 WAM total emissions (without LULUCF, with indirect CO_2), kt CO_2 eq.	10335	9763	8937	7809
BTR1 WAM total emissions (without LULUCF, with indirect CO_2), kt CO_2 eq.	9453	8618	7169	5096
Difference between NC8/BR5 and BTR1	-882	-1145	-1768	-2713

The difference in GHG projections in the WEM scenario between the NC8/BR5 and BTR1 is due to three main reasons. First of all, projections of emissions in NC8/BR5 were calculated using global warming potentials (GWP) provided in IPCC Fourth Assessment Report (AR4) but in BTR1 emissions are calculated using GWP from IPCC Fifth Assessment Report (AR5). Secondly, GHG emission projections in the BTR1 report are calculated based on projections of macroeconomic indicators (GDP growth, population, private consumption, projections for fossil fuel). The number of inhabitants and GDP growth in the last calculated projections is a bit higher. Thirdly, as can be seen in chapter 2.4 “Mitigation policies and measures” PaMs have been expanded and slightly changed in certain sectors.

2.6.1. Energy

Energy sector development is strongly influenced by the measures to reduce GHG emissions aimed at improving energy efficiency and increasing RES share in energy production. The changes affect both energy supply and demand side. Part of these changes are due to implementation of policy measures, while others are due to technological developments and changes in the energy and fuel markets.

Future energy final consumption is determined not only by the planned energy efficiency measures, but also by the projected economic development trends. As a relatively significant increase in private consumption is forecasted, it is projected the living space per capita and thus the total heated area in the residential sector will increase. The total area of buildings in the service sector is also expected to increase. On the other hand, the WEM scenario includes the implementation of building renovation support programmes and higher energy efficiency requirements for the construction of new buildings.

In the medium term (2023-2027), the economic baseline scenario projects GDP growth of an average of 2.8% annually, a prerequisite for that is the benefits of economic competitiveness based on technological improvements, production efficiency and innovation. In the long term (from 2028 to 2050), the annual growth rates of the economy will be slower and limited up to 2%. On average, manufacturing industry maintains a faster growth rate both in the medium and long term compared with the average of national economy, growth will be synchronously linked to the use of the latest state-of-art technological processes, digitalisation, process optimisation, etc. Consequently, long-term energy consumption in industry will be determined by two trends. On the one hand, industrial production output will increase resulting in increase of energy consumption as well, at the same time the use of more efficient technologies and the implementation of energy efficiency improvement programmes will provide possible offset of the consumption increase.

In both the below scenarios (WEM and WAM) the same indicators of macroeconomic projection are used for calculation of GHG emissions. In addition to macroeconomic parameters, assumptions on fossil fuel price projections and CO_2 price projections (ETS) were used to calculate projections in energy sector scenarios (WEM and WAM).

FEC has been calculated based on the forecasts of macroeconomic indicators (GDP, VA by branches, private consumption, the number of population, etc.). Parameters, characterizing each separate sector of FEC, are used additionally to calculate FEC in the relevant sector, e.g. the total floor area of dwellings in residential sector, the number of households, number of vehicles, number of vehicle kilometers travelled, etc.

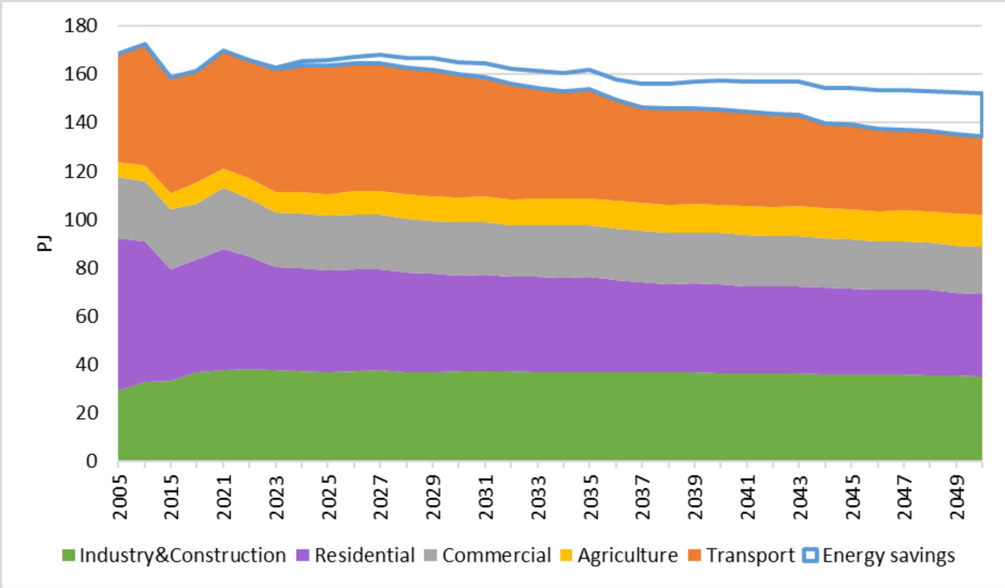

Figure 2.46 FEC development in sectors under WEM scenario, PJ

Both the assumption about the economic growth rate and change in population number and PaMs included in WEM scenario result the FEC (without non-energy use and included international aviation) in 2030 will be per 3.5% lower, compared to 2022. As seen in Figure 2.46, the implemented energy efficiency policy allows to save about 5.2 PJ in energy end-use in 2030 (meaning that without implementation of energy efficiency measures the FEC in 2030 will be per 5.2 PJ higher). Energy efficiency measures mainly focus on energy efficiency improvements in buildings (both residential and public buildings), but also in Industry and Transport sector energy efficiency is improved as well.

The calculated FEC projections anticipate that in 2030 Transport, Residential and Industry will be the main FEC sectors consuming respectively 31.8%, 24.9% and 23.1% of total FEC. In its turn, services/tertiary sector will consume 13.7% of total FEC. The rest will be consumed in Agriculture sector.

The main characteristics of Gross Primary Energy Consumption (GPEC) in the WEM scenario (Figure 2.47) are as follows:

- calculated GPEC in 2030 is about 5.4% lower, compared to 2022. This GPEC decrease is caused by final energy consumption decrease in residential, services and commercial sector and industry sectors, as well as by fossil fuels substitution with RES (wind and solar) for electricity generation, as well as decrease in energy losses in energy transmission and distribution system
- WEM scenario does not result in the substantial change of the primary energy resource's structure. The most significant change is the replacement of natural gas in electricity production (CHP) with renewables (wind and solar). As a result, the share of natural gas will decrease by about 6.0 percent points, in turn, consumption of renewables (wind and solar) will increase by about 8.0 percent points.

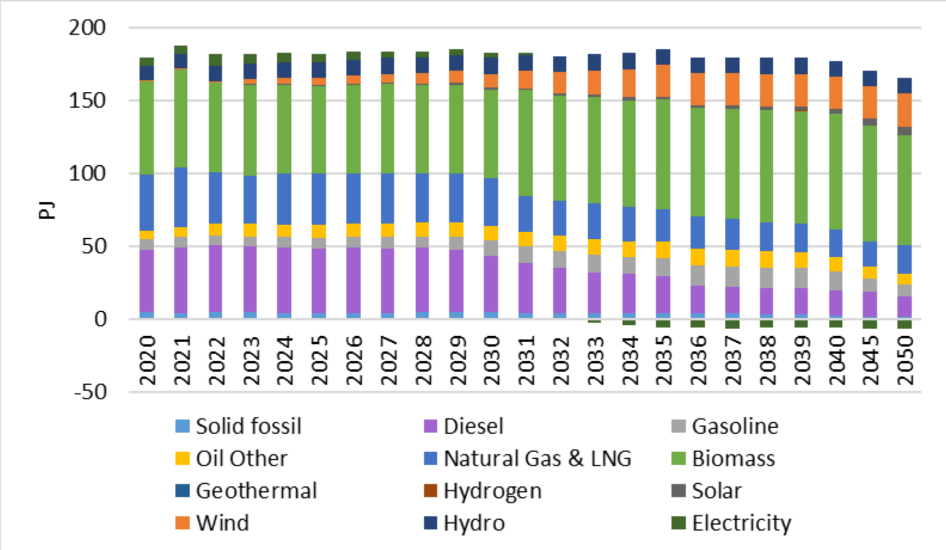

Figure 2.47 GPEC by fuels under the WEM scenario, PJ

The total projected GHG emissions under WEM scenario in Energy sector will decrease by 15.9% in 2030 and by 59.2% in 2050 compared to 2022. Compared to 1990, emissions will decrease by 72.4% in 2030 and by 86.6% in 2050. All emissions from the Energy sector are represented in Table 2.30.

The implementation of the WEM scenario's measures (see the full list in CTF Table 5) will result in 2030 in GHG emission reduction per at least 751 kt CO_2 eq. (the total impact of PaMs for which the evaluations are performed).

Table 2.30 Historical and projected GHG emissions by Energy sector, kt CO_2 eq.

Energy	1990	2022	2025	2030	2035	2040	2045	2050
WEM scenario	19529.57	6418.86	5969.97	5395.29	4270.01	3252.87	2738.44	2616.38
WAM scenario	19529.57	6418.86	5863.63	5196.86	3875.36	1867.58	1081.05	943.10

The transport sector contributes most to total Energy emissions (56.3%), followed by other sectors (tertiary and residential - 23.3%) and energy industries (12.8%). The distribution of Energy by sectors is represented in Figure 2.48 and Table 2.31.

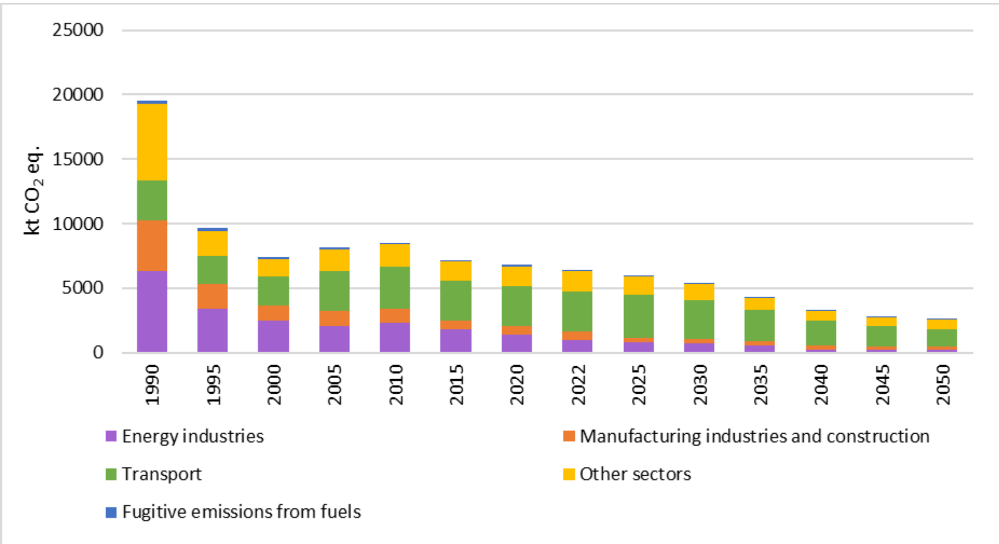

Figure 2.48 Historical and projected GHG emissions by Energy sector in WEM scenario, kt CO_2 eq.

Table 2.31 Projected GHG emissions under the WEM scenario

Sector, kt CO_2 eq.	1990	2022	2025	2030	2035	2040	2045	2050
Energy industries	6317.03	999.03	771.43	690.17	530.32	196.93	210.10	225.72
Manufacturing industries and construction	3965.32	601.93	393.94	361.66	337.06	313.38	295.30	280.55
Transport	3037.19	3141.70	3296.35	3037.99	2452.60	1939.89	1558.06	1291.13
Other sectors[128]	5932.72	1577.75	1450.75	1258.96	906.80	778.34	652.62	786.30
Fugutive emissions	277.30	98.45	57.50	46.51	43.23	24.33	22.38	32.68

The WAM scenario envisages additional measures to reduce GHG emissions in several directions. In the transport sector, the measures are planned for the electrifying of public transport and improving its electricity infrastructure, which include both road transport and railway. Additional measures are planned for the renovation of buildings, both residential and public ones, as well as setting energy consumption reduction targets for the public sector (public bodies). The third direction of measures envisages energy efficiency improvement and increasing the use of RES in the industry and tertiary sectors enterprises by applying the economic and regulatory instruments.

As a result of the additionally implemented energy efficiency improvement measures in households, tertiary and industry sectors, energy consumption in the WAM scenario in 2030 is per 6 PJ lower than in the WEM scenario. Consequently, the GPEC in the WAM scenario is about 3.3 % lower than that in the WEM scenario. The measures of the WAM scenario most affect the structure of fuel consumption in the transport sector. The share of fossil fuel consumption in GPEC in 2030 decreases by 0.6 percentage points compared to the WEM scenario, while the share of biofuels increases. In the WAM scenario, electricity consumption in the transport sector in 2030 is about 8.0% higher than in the WEM scenario.

The total projected GHG emissions under WAM scenario in Energy sector are projected to decrease by 19.0% in 2030 and by 85.3% in 2050 compared to 2022. Compared to 1990, emissions will decrease by 73.4% in 2030 and by 95.2% in 2050 (Figure 2.49 and Table 2.32).

Under WAM scenario the GHG emissions volume in 2030 and 2050 is respectively lower by 3.7% and 64.0% compared to WEM scenario.

[128] GHG emissions (historical and projected) of the categories "1.A.5. Other" have been reported in the "1.A.4.a. Commercial/Institutional" category.

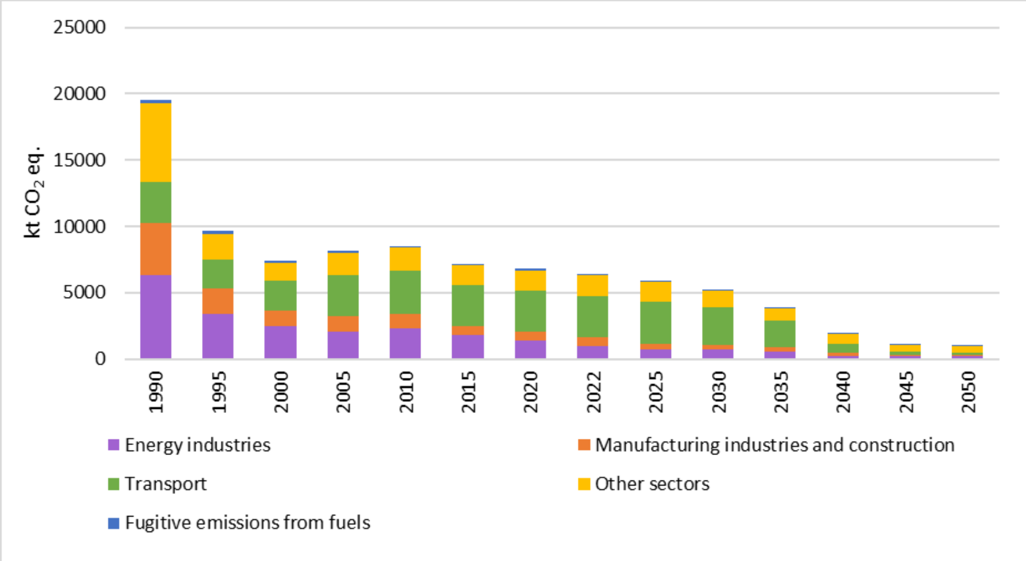

Figure 2.49 Historical and projected GHG emissions by Energy sector in WAM scenario, kt CO_2 eq.

Table 2.32 Projected GHG emissions under the WAM scenario

Sector, kt CO_2 eq.	1990	2022	2025	2030	2035	2040	2045	2050
Energy industries	6317.03	999.03	751.07	685.55	518.18	195.73	181.11	201.77
Manufacturing industries and construction	3965.32	601.93	398.74	342.49	329.60	284.92	155.68	132.72
Transport	3037.19	3141.70	3188.07	2877.46	2056.01	675.52	190.44	111.92
Other sectors[129]	5932.72	1577.75	1468.93	1246.70	930.37	691.98	539.70	483.42
Fugutive emissions	277.30	98.45	56.82	44.66	41.21	19.43	14.12	13.27

Energy (without Transport)

The total projected GHG emissions under WEM scenario in Energy (without Transport) sector decrease by 28.1% by 2030 and continues to fall by 2040, in 2050 they are about 59.6% less than in 2022. Compared to 1990, emissions will decrease by 85.7% in 2030 and by 92.0% in 2050. In 2030, CO_2 emissions will account for 85.0% of total Energy (without Transport), CH_4 emissions, emitted mainly due to biomass incomplete combustion processes in small combustion equipment in residential and tertiary sector, will contribute around 9.9% and N_2O emissions will account of emissions 5.1% (Table 2.33).

[129] GHG emissions (historical and projected) of the categories "1.A.5. Other" have been reported in the "1.A.4.a. Commercial/Institutional" category.

Table 2.33 Historical and projected Energy sector (without Transport) GHG emissions by gas in WEM scenario, kt CO_2 eq.

Energy (without Transport)	1990	2022	2025	2030	2035	2040	2045	2050
Total emissions	16492.38	3277.17	2673.62	2357.30	1817.41	1312.98	1180.38	1325.25
CO_2	15704.95	2840.47	2303.82	2003.75	1461.13	966.44	843.82	999.64
CH_4	589.03	296.14	242.42	233.75	247.36	236.02	231.49	225.77
N_2O	198.40	140.55	127.37	119.80	108.91	110.52	105.08	99.85

As the district heating system to supply heat energy is widely developed in Latvia, energy consumption and thus GHG emissions in the energy industry sector are significantly affected due to this factor. Until 2030, there will be no significant changes in the type of fuel utilised in district heat production. However, after 2030, the use of RES, especially biomass and to a lesser extent heat pumps, in district heat production, will increase.

It is projected, electricity consumption will increase both by 2030 and beyond due to the substitution of fuels with electricity (mainly in transport and residential sectors) as well as due to the increase of electricity consumption in industrial production.

The WEM scenario projects two key trends until 2030: (1) electricity import will decrease, and (2) amount of electricity produced utilizing RES will increase. Electricity production from wind and solar energy is increasing. This trend continues also after 2030. Simultaneously, the amount of electricity produced from natural gas in CHP plants is decreasing.

Electricity, district heating and industrial energy use is strongly affected by the EU ETS CO_2 allowance price, which makes the use of fossil fuel less and less feasible and cuts emissions in these sectors efficiently.

As a result of the expected changes in the energy industry, the projected GHG emissions in 2030 are 30.9 % lower than in 2022.

Despite the projected long-term development trends for the growth of national economy and the government statements concerning encouragement of development and export capacity of various manufacturing branches, the planned measures to increase energy efficiency and the replacement of fossil fuels with RES in industrial enterprises will allow GHG emissions to decrease by about 39 % in 2030 compared to 2022.

In its turn, the existing and approved energy efficiency improvement measures in the residential and tertiary sectors will essentially affect FEC in these sectors. Correspondingly, the total FEC in "other sectors" will decrease in 2030 compared to 2022 under the WEM scenario by 8.5 %. It is projected that the major contributor to FEC decrease will be the residential sector (14.4%). In turn, GHG emissions in 2030 will decrease by 20.2 % in WEM scenario against 2022.

In the WAM scenario, energy industry's GHG emissions are 0.7% lower in 2030 than in the WEM scenario. Emission reductions are mainly due to the implementation of energy efficiency improvement measures in buildings (residential and public) connected to DHS.

Additional measures taken in the industrial sector to improve energy efficiency and replace fossil fuels with RES reduce emissions in the WAM scenario by 5.3% compared to the WEM scenario in 2030.

Planned additional energy efficiency improvement measures in households and the service sector reduce GHG emissions in 2030 in the WAM scenario by 1% compared to the WEM scenario.

Transport

GHG emissions of inland transportation comprise road transport, railway, domestic navigation and domestic aviation. GHG emissions of international aviation and navigation have been reported under International bunkers.

Since the number of passenger cars per 1000 inhabitants in Latvia is still lower than the EU average, then, taking into account the projected increase in private consumption and GDP growth, in the period 2022-2030 the growth of total passenger-kilometres by 9.4% (private cars by 11.6%) and total freight tonne-kilometres by 8.2% are predicted.

The total projected GHG emissions under WEM scenario in inland transportation will decrease by 3.3% in 2030 compared to 2022 (Table 2.34). The emission reductions will be achieved by domestic and EU-wide policy measures, including promoting the use of biofuels, improving vehicle technology and renewing the vehicle fleet. CO_2 accounts for almost 98.8% of the total GHG emissions in 2030, the share of CO_2 emissions in 2030 GHG emission projection will be the same as in 2022.

Table 2.34 Historical and projected Transport GHG emissions by gas in WEM scenario, kt CO_2 eq.

Transport	1990	2022	2025	2030	2035	2040	2045	2050
Total emissions	3037.19	3141.70	3296.35	3037.99	2452.60	1939.89	1558.06	1291.13
CO_2	2940.21	3103.58	3255.45	3000.45	2421.17	1913.11	1535.17	1270.92
CH_4	23.90	3.37	3.18	3.03	4.21	4.42	4.08	4.55
N_2O	73.08	34.75	37.72	34.52	27.22	22.37	18.81	15.66

Most GHG emissions in the Transport sector are caused by road transport, which accounts for 96.8% of the total emissions in 2030 (Figure 2.50). Thus, the main emission impacting factor in the road transport is the penetration rate of new technologies (electric (PHV and BEV), CNG and LNG) with higher demands for emission limits and replacing the stock of the existing vehicles. This trend is already included in the emission projections under the WEM scenario. The planned support measures for the development of infrastructure ((EV) Charging infrastructure development) for the use of new technologies are important in this context.

GHG emissions in the rail transport account for about 2.6% of the total projected emissions in the Transport sector in 2030. The WEM GHG projection scenarios do not envisage transition from diesel fuel to electric energy in rail freight and passenger transport. The scenario envisages replacing existing electric trains with more modern and efficient ones.

Domestic navigation and aviation account for a very small share of total emissions.

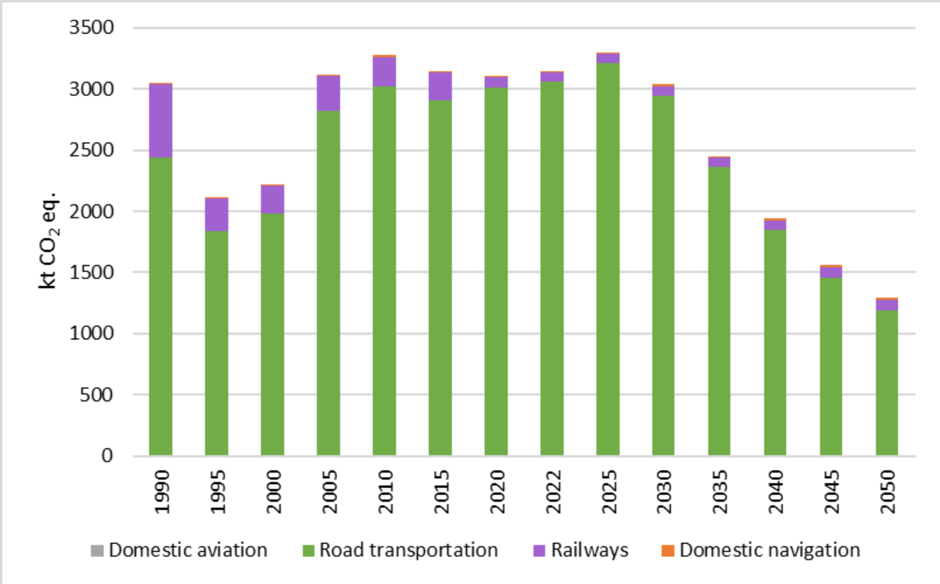

Figure 2.50 GHG emission projections by Transport sector under WEM scenario, kt CO_2 eq.

Under WAM scenario the GHG emission volume in 2030 and 2050 is respectively lower by 5.3% and 91.3% compared to WEM scenario (Figure 2.51). The reduction of GHG emissions in the WAM scenario is determined by the interaction of several measures. On the one hand, the use of public transport (mainly railway) is stimulated, thus reducing the use of private cars, and on the other hand the use of fossil fuels is replaced with electricity. This applies to both public transport (road and railway) and private cars. In addition, the consumption of modern biofuels in road transport has also increased.

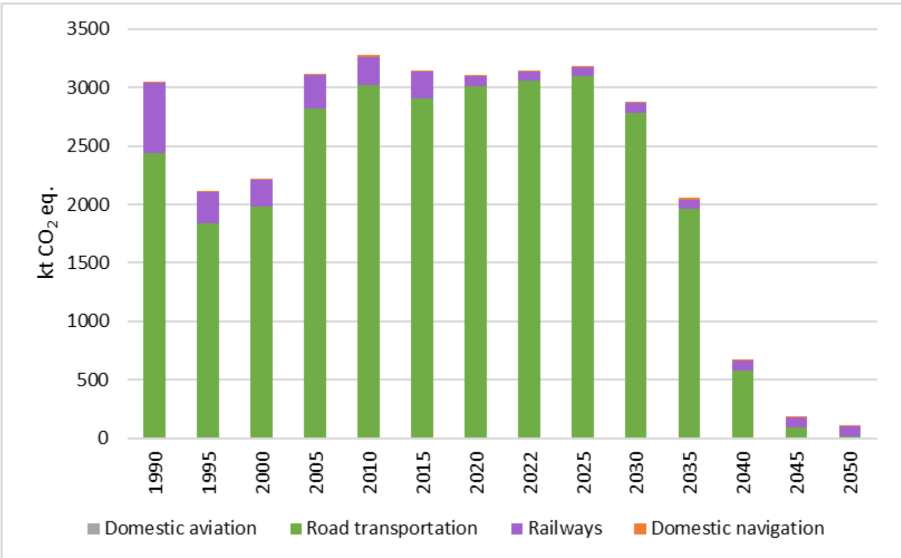

Figure 2.51 GHG emission projections by Transport sector under WAM scenario, kt CO_2 eq.

2.6.2. Industrial processes and product use

GHG emissions from the use of raw materials in technological equipment and which are not directly related to the combustion of fuel are accounted under IPPU, including emissions from solvent use and F-gases. The macroeconomic projections envisage growth of the manufacturing sector by 2030. As the largest part of emissions from IPPU appear in the mineral industry (cement production), then the growth of the construction sector and cement production are the main driving forces for GHG emission projection. In cement production emissions will increase by 6.5% in 2030 and by 16.3% in 2050, compared to 2022.

The total projected GHG emissions under WEM scenario in IPPU will decrease by 5.9% in 2030 and by 6.8% in 2050 compared to 2022. Compared to 1990, emissions will increase by 23.3% in 2030 and by 22.0% in 2050 (Table 2.35**Table 2.35**).

Table 2.35 Historical and projected IPPU emissions according to WEM and WAM scenarios, kt CO_2 eq.

IPPU	1990	2022	2025	2030	2035	2040	2045	2050
WEM scenario	655.40	858.47	844.14	807.80	796.64	797.64	799.66	799.90
WAM scenario	655.40	858.47	844.14	807.80	796.64	797.64	799.66	799.90

CO_2 is projected to be 78.7% of the total IPPU GHG emissions in 2030, F-gases emissions contribute 20.9% in 2030 GHG emissions projection, the rest is contributed by N_2O (Table 2.36).

Table 2.36 Historical and projected IPPU GHG emissions by gas under WEM scenario, kt CO_2 eq.

	1990	2022	2025	2030	2035	2040	2045	2050
Total emissions	655.40	858.47	844.14	807.80	796.64	797.64	799.66	799.90
CO_2	651.02	592.26	610.31	635.75	655.13	670.88	682.66	690.23
CH_4	0.08	NO,NA	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
N_2O	4.30	3.64	3.62	3.50	3.42	3.38	3.36	3.36
HFCs	NO,NA	250.30	217.44	155.83	125.38	110.67	100.93	93.59
SF_6	NO, NA	12.27	12.76	12.71	12.71	12.71	12.71	12.71

As it is seen in Table 2.35 WEM and WAM scenario is the same. The distribution of IPPU by sectors is represented in Figure 2.52 and Table 2.37.

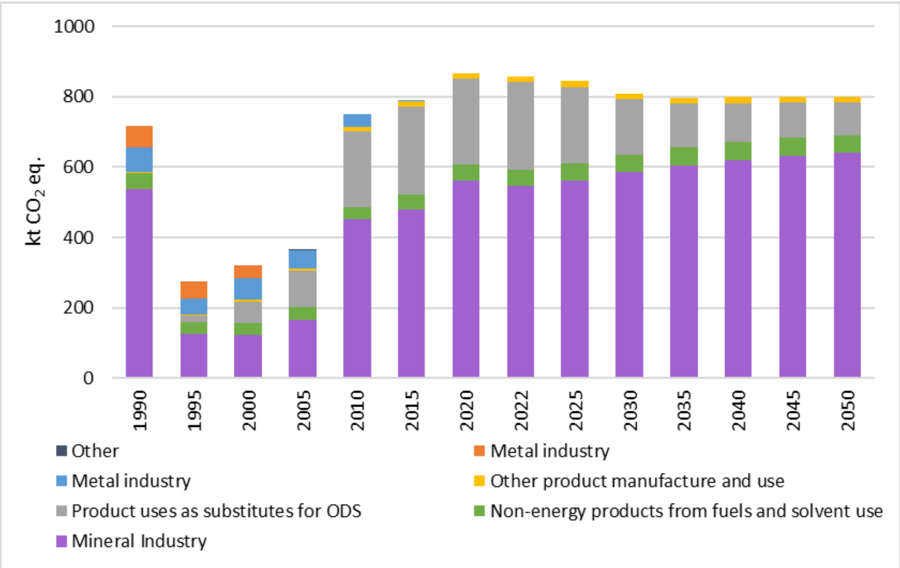

Figure 2.52 Historical and projected GHG emissions by IPPU sector, kt CO_2 eq.

Table 2.37 Total emissions in IPPU sector under the WEM and WAM scenario

IPPU, kt CO_2 eq.	1990	2022	2025	2030	2035	2040	2045	2050
Mineral Industry	537.24	547.49	561.20	585.27	603.91	619.90	631.65	639.23
Chemical industry	NO	NO	NO	NO	NO	NO	NO	NO
Metal industry	69.63	NO	NO	NO	NO	NO	NO	NO
Non-energy products	44.23	44.77	49.11	50.48	51.22	50.98	51.01	51.00

IPPU, kt CO_2 eq.	1990	2022	2025	2030	2035	2040	2045	2050
from fuels and solvent use								
Electronics industry	NO	NO	NO	NO	NO	NO	NO	NO
Product uses as substitutes for ODS	NO	250.30	217.44	155.83	125.38	110.67	100.93	93.59
Other product manufacture and use	4.30	15.91	16.39	16.22	16.13	16.09	16.07	16.07
Other	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA

GHG emissions in IPPU under the WEM scenario are projected taking into account that the production processes of enterprises will comply with the requirements provided for in the Law “On Pollution”. In compliance with the requirements of this law enterprises have to organise the production process by implementing the best and most modern technologies providing for the lowest level of GHG emissions.

Currently emissions from refrigeration and air conditioning equipment constitute the mayor part of total F-gas emissions (92.7% in 2022) and it is expected that emissions from these appliances will constitute the biggest share from F-gas emissions in the future. It is projected that the trend of F-gas emissions will decrease not as a straight line, but with some fluctuations. Fluctuations in F-gas emissions can be observed because of floating F-gas amounts used in the past. It is expected that emissions will gradually decrease due to prohibitions regarding placing on the market certain F-gases according to EC regulation on F-gases (517/2014) as well as according to prohibition to use mobile air-conditioning systems designed to contain F-gases with a GWP higher than 150 from a certain date.

CO_2 emission projections in the Solvent use sector are based on two parts. For domestic solvent use subsector projections are based on number of inhabitant development scenario and private consumption development scenario. Emissions from other subsectors are based on GDP development scenario. The total projected CO_2 emissions in the Solvent use sector under the WEM and WAM scenario are projected to increase by 7.1% in 2030 and by 24.1% in 2050 compared to 2022 (Table 2.38).

Table 2.38 Emissions in Solvent use sector per WEM and WAM scenario, kt CO_2 eq.

Solvent use	1990	2022	2025	2030	2035	2040	2045	2050
WEM scenario	20.97	25.07	25.74	26.85	28.00	29.16	30.22	31.12
WAM scenario	20.97	25.07	25.74	26.85	28.00	29.16	30.22	31.12

2.6.3. Agriculture

GHG emission projections from Agriculture sector in WEM and WAM scenario are based on projected livestock population, main harvested crops and area harvested, used lime materials, consumption of inorganic and organic N fertilizers.

It is projected that there will be a decreasing trend of total GHG emissions in the Agriculture sector during the period 2023-2050. The total projected GHG emissions under WEM and WAM scenario in Agriculture sector will decrease by 2.6% in 2030 and by 4.4% in 2050 compared to 2022. The decrease of emissions is related to manure management where it is expected that emission will decrease by 14.0% in 2030 and by 21.2% in 2050 compared to 2022. It is projected that emissions from agricultural soils will increase by 0.4% in 2030 and will decrease by 1.2% in 2050, compared to 2022. The increase in GHG emissions until 2030 is related to activity data projections: increase in the use of N mineral fertilizers, in plant productivity and increase in cow productivity (increase in the use of manure). It is projected that emissions from Enteric fermentation will decrease by 6.5% in 2030 and by 10.9% in 2050, compared to 2022. It is projected that there will be an increase of emissions from liming and urea application during 2022-2050. Compared to 1990, emissions will decrease by 56.4% in 2030 and by 57.2% in 2050.

All emissions from Agriculture sector are represented in Table 2.39.

Table 2.39 Historical and projected Agriculture emissions according to WEM and WAM scenarios, kt CO_2 eq.

Agriculture	1990	2022	2025	2030	2035	2040	2045	2050
WEM scenario	5030.48	2253.83	2216.88	2194.13	2156.05	2154.99	2154.58	2154.16
WAM scenario	5030.48	2253.83	2216.88	2194.13	2156.05	2154.99	2154.58	2154.16

N_2O accounts for 50.7% of the total Agriculture GHG emissions in 2030. CH_4 and CO_2 emissions contribute respectively 44.4% and 4.8% in 2030 GHG emissions projection. The distribution of GHG in Agriculture sector can see in Table 2.40.

Table 2.40 Historical and projected total GHG emissions in Agriculture sector by gas under WEM and WAM scenario, kt CO_2 eq.

	1990	2022	2025	2030	2035	2040	2045	2050
Total emissions	5030.48	2253.83	2216.88	2194.13	2156.05	2154.99	2154.58	2154.16
CO_2	364.84	83.40	96.69	106.04	115.25	126.34	131.89	137.44
CH_4	2700.72	1055.49	991.54	975.22	943.03	934.43	930.19	925.96
N_2O	1964.91	1114.94	1128.66	1112.87	1097.77	1094.22	1092.49	1090.77

The largest contributing subsectors are agricultural soils and enteric fermentation. Emissions from agricultural soils will be 48.0% and 40.3% of total Agriculture sector in WEM scenario, respectively in 2030.

As it is seen in Figure 2.53 WEM and WAM scenario is the same. The distribution of Agriculture by sectors is represented in Figure 2.53 and Table 2.41.

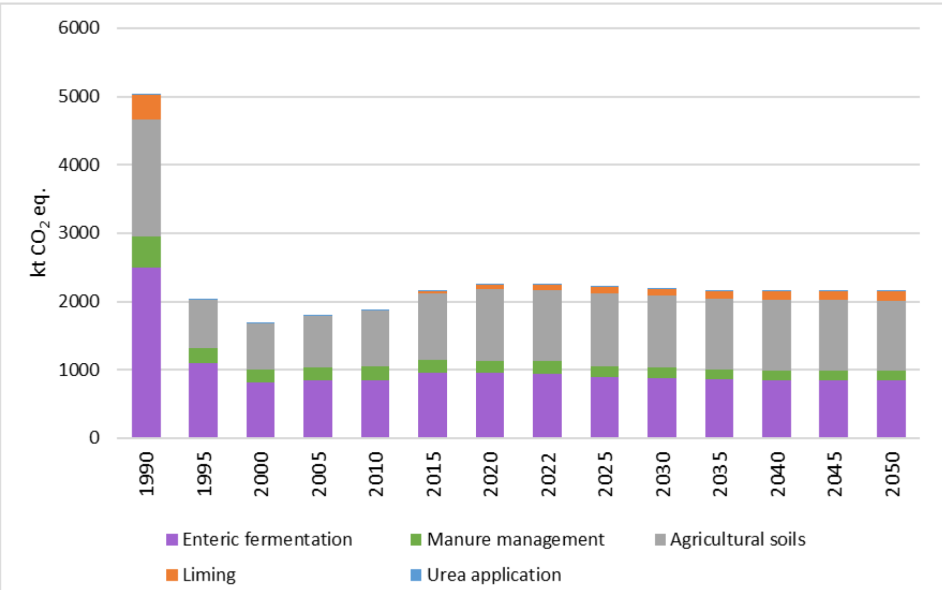

Figure 2.53 Historical and projected GHG emissions by Agriculture sector in WEM and WAM scenario, kt CO_2 eq.

Table 2.41 Projected GHG emissions from Agriculture sector in WEM and WAM scenario

Agriculture, kt CO_2 eq.	1990	2022	2025	2030	2035	2040	2045	2050
Enteric fermentation	2488.13	946.57	897.33	884.63	855.02	849.00	845.99	842.98
Manure management	464.11	175.25	156.70	150.70	146.40	142.10	140.07	138.04
Agricultural soils	1713.40	1048.60	1066.16	1052.77	1039.38	1037.55	1036.63	1035.71
Liming	357.13	77.88	87.59	96.94	106.15	117.24	122.79	128.33
Urea application	7.71	5.52	9.10	9.10	9.10	9.10	9.10	9.10

An important parameter that causes the large amount of enteric fermentation CH_4 emission is the population of ruminant livestock. More than 90% of CH_4 emissions by enteric fermentation is from the cattle. It is projected that population of dairy cows will decrease by 11.6% in 2030 compared to 2022 and by 18.8% in 2050 compared to 2022. However, projections show that in 2030 the average annual milk yield per dairy cow will increase by 17.3% and by 33.5% in 2050 compared to milk yield level in 2022.

A rapid increase of dairy cows productivity will lead to an increase of gross energy (GE) intake and, consequently, to higher enteric fermentation CH_4 emission per dairy cow. For the purposes of Latvia's 2024 GHG inventory and projections GE for dairy cattle is calculated on the basis of milk yields, therefore average milk yield per cow is one of key indicators for calculation of CH_4 emissions.

Detailed information of historical livestock number provided by CSB and projected livestock numbers and along with dairy cow productivity is included in Table 2.42.

Table 2.42 Historical and projected livestock number, thousand, and milk yield per dairy cow, kg

Type of livestock	1990	2022	2025	2030	2035	2040	2045	2050
Dairy Cattle	535.1	127.8	121.9	115.5	109.5	107.8	107.0	106.1
Milk yield	3437.0	7492.0	8104.0	8790.0	9322.0	9661.0	9830	10000.0
Cattle	904.2	263.6	249.3	241.4	234.0	232.8	232.1	231.5
Sheep	164.6	87.3	90.3	90.3	90.3	90.3	90.3	90.3
Goats	5.4	17.7	11.2	11.0	10.8	10.6	10.5	10.4
Horses	30.9	8.7	8.4	8.4	8.4	8.4	8.4	8.4
Swine	1401.1	307.9	266.4	267.5	263.2	258.7	256.5	254.2
Poultry	10321.1	5744.3	5885.9	5896.4	5904.8	5914.0	5918.6	5923.2

The main activity data for calculation of CH_4 emission from manure management is livestock population, mainly cattle, swine and poultry, and animal manure management systems (MMS) distribution. It is expected that agricultural production levels of dairy farming and swine production will be intensified with the aim to improve production efficiency. This will lead to livestock concentration in big farms with preference to slurry or liquid manure management system (Table 2.43). Manure management CH_4 emission factors for slurry-based systems are noticeably higher due to high methane conversion factor comparing to solid manure storage, pasture or anaerobic digesters that are also typical manure management systems for Latvia.

Table 2.43 Historical and projected manure management systems distribution (share) for dairy cattle and swine

MMS	1990	2022	2025	2030	2035	2040	2045	2050
Dairy cattle								
Liquid	0.360	0.437	0.533	0.588	0.637	0.637	0.637	0.637
Solid	0.441	0.383	0.312	0.261	0.217	0.217	0.217	0.217
Pasture	0.061	0.059	0.043	0.037	0.030	0.030	0.030	0.030
Anaerobic digesters	0.138	0.121	0.112	0.114	0.116	0.116	0.116	0.116
Swine								
Liquid	0.563	0.643	0.661	0.674	0.679	0.679	0.679	0.680
Solid	0.074	0.048	0.030	0.017	0.012	0.012	0.012	0.010
Pasture	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Anaerobic digesters	0.363	0.309	0.309	0.309	0.309	0.309	0.309	0.310

The main activity data for calculation of projected N_2O emission from agricultural soils are the used amount of synthetics and organic nitrogen fertilizers, an area of harvested crops and the yield. The calculated amounts of mineral nitrogen fertilizers are linked to a planned significant increase of yields. Projected activity data for calculation of N_2O emissions from agricultural soils are included in Table 2.44.

Table 2.44 Historical and projected activity data for estimation of GHG emissions from agricultural soils

Activity data	1990	2022	2025	2030	2035	2040	2045	2050
Used N with synthetic fertilizers, kt	131.4	82.3	87.6	86.3	86.5	86.6	86.8	86.9
Used N with manure, kt	51.2	12.9	11.5	10.9	10.5	10.4	10.3	10.2
Organic soils, ha	195.1	168.6	159.6	159.6	159.6	159.6	159.6	159.6
Wheat yield, t ha^{-1}	2.6	4.7	4.5	4.6	4.8	4.9	5.0	5.1
Barley yield, t ha^{-1}	2.3	3.6	3.2	3.2	3.3	3.4	3.5	3.6
Rye yield, t ha^{-1}	2.5	3.7	3.8	3.9	4.0	4.1	4.2	4.3
Oats yield, t ha^{-1}	2.1	2.7	2.4	2.5	2.5	2.6	2.6	2.7
Wheat sown area, ths. ha	141.5	539.0	594.6	582.7	588.0	592.5	597.0	601.5
Barley sown area, ths. ha	306.9	77.2	71.0	65.4	60.5	56.6	52.7	48.8
Rye sown area, ths. ha	130.7	35.3	34.4	34.4	34.4	34.4	34.4	34.4
Oats sown area, ths. ha	82.4	83.4	92.4	94.8	96.8	98.3	99.9	101.4

2.6.4. Land use, Land use change and forestry

The total projected GHG emissions under WEM scenario in LULUCF will be 2909.77 kt CO_2 eq. and 4032.18 kt CO_2 eq. in 2030 and 2050. All emissions from the LULUCF sector are represented in Table 2.45.

Table 2.45 Historical and projected LULUCF emissions according to WEM and WAM scenarios, kt CO_2 eq.

LULUCF	1990	2022	2025	2030	2035	2040	2045	2050
WEM scenario	-12390.09	4944.16	2146.72	2909.77	2733.04	3794.25	3719.97	4032.18
WAM scenario	-12390.09	4944.16	2146.72	2909.77	2733.04	3794.25	3719.97	4032.18

CO_2 accounts for 39.1% of the total GHG emissions in 2030. CH_4 and N_2O emissions contribute respectively 38.2% and 22.7% in 2030 GHG emissions projection. The distribution of GHG gases in LULUCF sector is in Table 2.46.

Table 2.46 Historical and projected total GHG emissions in LULUCF sector by gas under WEM and WAM scenario, kt CO_2 eq.

	1990	2022	2025	2030	2035	2040	2045	2050
Total emissions	-12390.09	4944.16	2146.72	2909.77	2733.04	3794.25	3719.97	4032.18
CO_2	-13398.95	3485.39	360.33	1136.98	1007.35	2121.39	2048.43	2358.96
CH_4	523.29	889.22	1102.72	1112.87	1106.19	1098.71	1098.30	1102.16
N_2O	485.57	569.56	683.66	659.93	619.51	574.15	573.24	571.06

In 2030 the largest contributing subsectors are cropland, then wetlands and settlements. Increase of the GHG emissions in LULUCF sector is associated with reduction of net removals in living biomass in forest land due to increase of harvest rate and ageing of forests resulting in decreasing increments and increasing natural mortality. The increase of mature deciduous trees stands is the main reason to project high and stable level of GHG emissions until 2035. Another reason for increased emissions is intensification of agricultural production resulting in conversion of grasslands into croplands.

As it is seen in Table 2.45**Table 2.35** WEM and WAM scenario is the same. The distribution of LULUCF by sectors is represented in Figure 2.54 and Table 2.47**Figure 2.54**. The peak of emissions in 2022 is associated with aggression of Russian Federation in Ukraine and rapid changes in timber and forest biofuel market, which caused temporal increase of wood demand and, as a consequence, price and harvest rate, particularly in low valued deciduous forest stands, which were previously set aside for decades by the landowners. In Latvia, projected emissions in the LULUCF sector are expected to rise by 2050 compared to 2030, driven by key factors related to forest age, carbon pool dynamics in HWP, and emissions from organic soils in farmlands. As forests age, their carbon sequestration potential diminishes, leading to a gradual decline in net CO_2 removals. Mature forests reach a point where carbon uptake and emissions from decomposition balance out, contributing less to long-term carbon storage and effectively reducing the overall capacity of Latvia’s forests as carbon sinks. Additionally, a balanced input and output in the HWP carbon pool indicates a state where carbon storage in wood products stabilizes, without significant net increases. Consequently, the role of HWPs as a carbon sink is less pronounced, contributing minimally to emissions reduction in the LULUCF sector by 2050, if no additional measures increasing efficiency of the wood use, e.g., reduction of output of low-grade residues and export of pulp wood are implemented. Persistent emissions from organic soils in agricultural lands further exacerbate this trend, as soil management practices continue to release CO_2, offsetting gains made through other land-use measures.

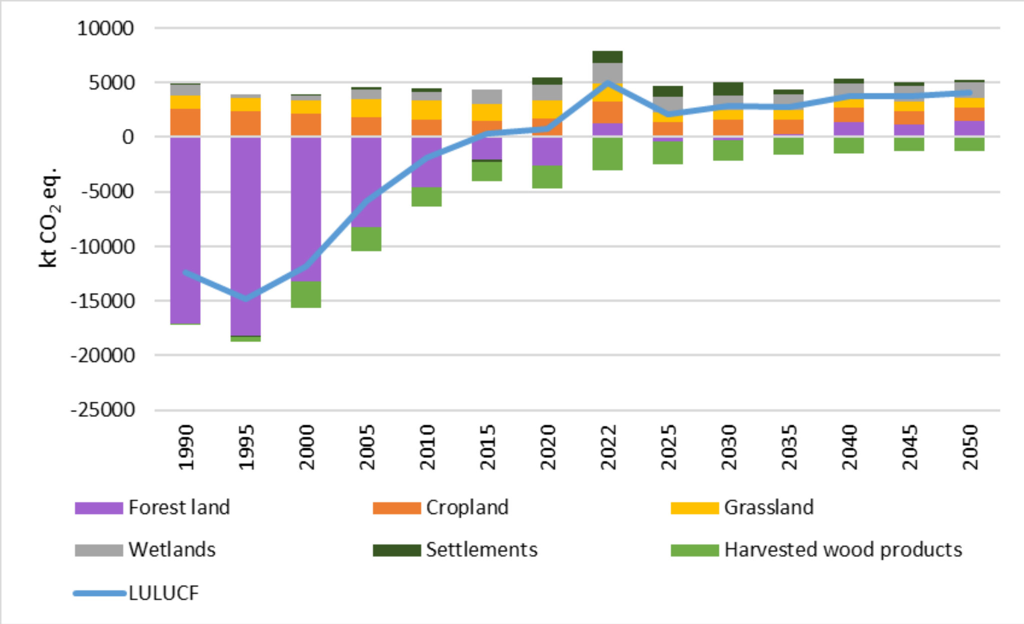

Figure 2.54 Historical and projected GHG emissions by LULUCF sector in WEM scenario, kt CO_2 eq.

Table 2.47 Total GHG in LULUCF sector under the WEM scenario

LULUCF, kt CO_2 eq.	1990	2022	2025	2030	2035	2040	2045	2050
Forest land	-17024.37	1287.54	-421.14	-280.76	311.16	1427.94	1150.28	1498.52
Cropland	2590.87	1964.16	1407.99	1614.84	1299.23	1250.61	1240.42	1220.35
Grassland	1163.36	1710.93	832.52	824.80	824.78	824.77	824.75	824.75
Wetlands	1019.02	1787.58	1456.39	1417.66	1466.69	1456.71	1456.79	1456.76
Settlements	27.14	1192.72	981.79	1209.67	489.98	350.00	322.65	287.33
Harvested wood products	-166.11	-3001.51	-2110.84	-1876.42	-1658.80	-1515.78	-1274.92	-1255.53

The impact of the existing climate change mitigation measures included in CAP for the period between 2023 and 2027 will reach maximum after 2030. Slight decrease of the mitigation effect is expected after 2037 due to reaching steady carbon stock in areas where measures aimed at increase of carbon stock in soil in cropland are implemented. Effect of the measures to be implemented in forest land and wetlands continues after 2050.

Reduction of the net removals in the LULUCF sector continues the trend of the approaching to equality between increment and carbon loss in forest ecosystem. Increase of the GHG emissions in LULUCF sector is associated with reduction of net removals in living biomass in forest land due to ageing of forests, resulting in decreasing increments and increasing natural mortality, while the projected harvest rate is about 65% of the increment.

2.6.5. Waste management

The total GHG emissions under WEM scenario in Waste management are projected to decrease corresponding by 29.8% and 49.7% in 2030 and 2050 compared to 2022. The total GHG emissions under WEM scenario in Waste management are projected to decrease by 48.7% in 2030 and by 63.2% in 2050 compared to 1990. All emissions from the Waste management sector are represented in Table 2.48**Table 2.48Table 2.48**.

Table 2.48 Historical and projected Waste management emissions according to WEM and WAM scenarios, kt CO_2 eq.

Waste management	1990	2022	2025	2030	2035	2040	2045	2050
WEM scenario	805.03	588.61	521.40	413.32	351.96	317.46	302.12	296.24
WAM scenario	805.03	588.61	521.40	413.01	334.25	271.87	240.19	226.24

CH_4 accounts for 90.2% of the total Waste management GHG emissions in 2030 and N_2O emissions contribute 9.8% in 2030 GHG emissions projection (Table 2.49).

Table 2.49 Historical and projected total GHG emissions in Waste management sector by gas under WEM scenario, kt CO_2 eq.

	1990	2022	2025	2030	2035	2040	2045	2050
Total emissions	805.03	588.61	521.40	413.32	351.96	317.46	302.12	296.24
CO_2	0.57	NO	NO	NO	NO	NO	NO	NO
CH_4	746.84	538.19	478.50	372.62	312.54	278.38	263.18	257.33
N_2O	57.62	50.42	42.90	40.70	39.42	39.07	38.94	38.91

The distribution of Waste management by sectors is represented in Figure 2.55.

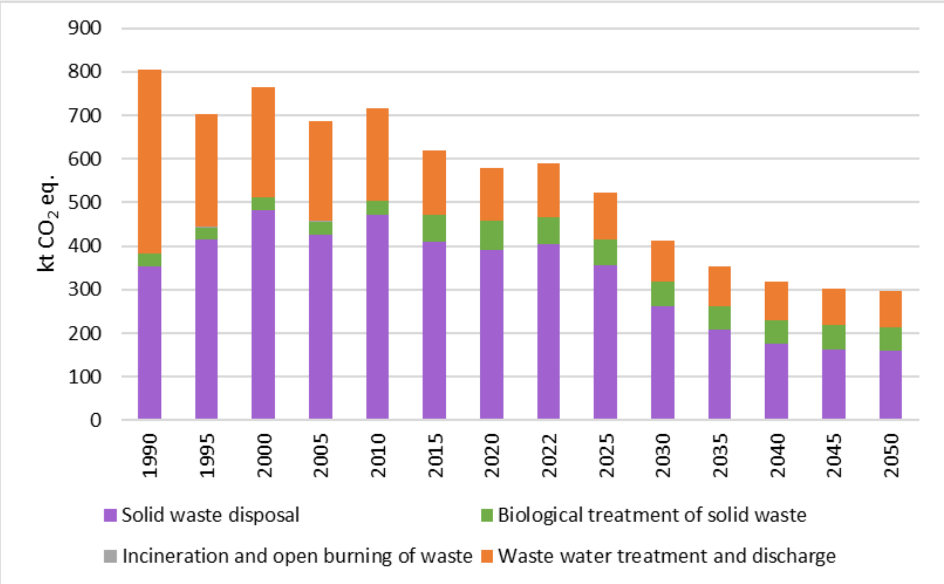

Figure 2.55 Historical and projected GHG emissions by Waste management sector in WEM scenario, kt CO_2 eq.

Table 2.50 Total emissions in Waste management sector under the WEM scenario

Waste management, kt CO_2 eq.	1990	2022	2025	2030	2035	2040	2045	2050
Solid Waste Disposal	352.52	404.53	356.03	262.41	207.44	176.24	163.38	159.60
Biological Treatment of Solid Waste	29.31	62.17	59.86	56.35	54.59	54.59	54.59	54.59
Incineration and Open Burning of the Waste	0.58	NO	NO	NO	NO	NO	NO	NO
Waste Water Treatment and Discharge	422.62	121.91	105.51	94.56	89.92	86.62	84.16	82.05

From year 2022 waste incineration without energy recovery do not occur in Latvia and there are no plans to develop such activity.

SWD is the most essential GHG emission source in the waste sector (68.7% from total in 2022). It is projected that SWD will be the largest sector of Waste management in 2030 too. (63.5% in 2030). Under the WEM scenario the decrease of the volume of biodegradable waste within the total volume of disposed waste is taken into account. Projected amounts of biodegradable waste are indicated in the Waste Management State Plan 2021-2028, requirements set in the Waste Framework Directive (2008/98/EC) on recycling and disposal of municipal waste.

Wastewater treatment and discharge is the second largest subsector of Waste management (20.7% in 2022 and 22.9% in 2030). According to projections, GHG emissions from Wastewater Handling are projected to decrease from 121.91 in 2022 to 94.56 kt CO_2 eq. in 2030 and to 82.05 kt CO_2 eq. in 2050. In the projection period, significant driving force is decrease of national population, however share of national population, served by well managed biological treatment of waste water, is not expected to exceed threshold of 85% from national population (especially taking into account that requirements of Urban Wastewater Treatment Directive already have been fully implemented in Latvia on 31st December of 2015); nearly 15% of national population is expected to remain being served by septic tanks or latrines (in rural areas, where centralized collection of domestic waste water is not justified economically). Emissions from sewage sludge is expected to keep its role as significant source of emissions, however rate of sludge treated anaerobically is expected to decrease over the time, while leakage emissions from recovery of CH_4 from digestion of sewage sludge will remain unsignificant.

It is projected that biological treatment of solid waste will produce 56.35 kt CO_2 eq. in 2030 and will contribute 13.6% of total GHG emissions in Waste management sector.

WAM scenario is based on assumption that waste disposal will be 10% from generated Municipal solid waste in year 2035 (Requirements in Waste Framework Directive, which implementation is set in Waste Management plan 2021-2028) and it shows more decrease of GHG emissions in the Waste management sector (Figure 2.56 and Table 2.51).

Under WAM scenario GHG emissions are projected to be 0.1% lower in 2030 and 30.9% lower in 2050 than in the WEM scenario.

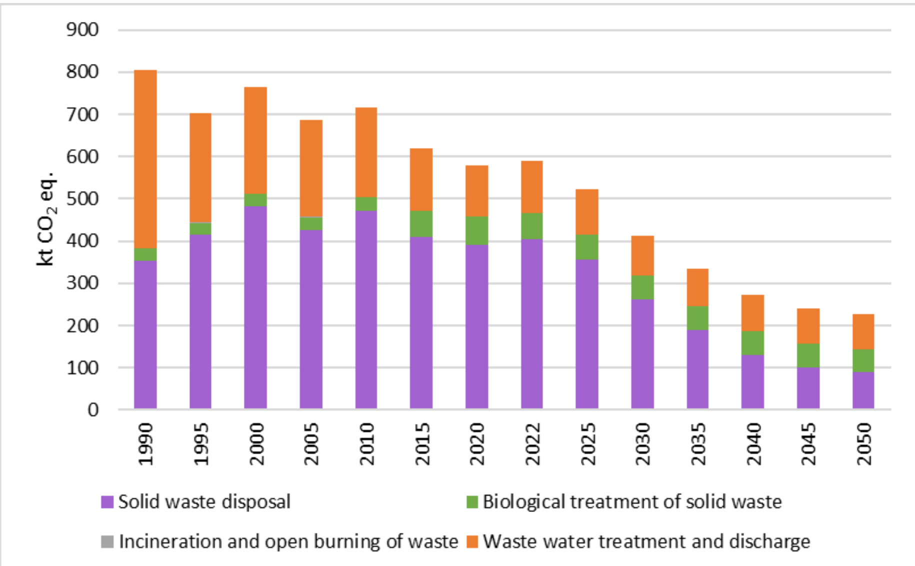

Figure 2.56 Historical and projected GHG emissions by Waste management sector in WAM scenario, kt CO_2 eq.

Table 2.51 Total emissions in Waste management sector under the WAM scenario

Waste management, kt CO_2 eq.	1990	2022	2025	2030	2035	2040	2045	2050
Solid Waste Disposal	352.52	404.53	356.03	262.09	189.74	130.66	101.45	89.60
Biological Treatment of Solid Waste	29.31	62.17	59.86	56.35	54.59	54.59	54.59	54.59
Incineration and Open Burning of the Waste	0.58	NO	NO	NO	NO	NO	NO	NO
Waste Water Treatment and Discharge	422.62	121.91	105.51	94.56	89.92	86.62	84.16	82.05

The total projected GHG emissions under WAM scenario in Waste management sector will decrease by 29.8% in 2030 and by 61.6% in 2050, compared to 2022. Projections of WAM scenario shows significant decrease of emissions from SWD subsector during period of projections, however this subsector will remain the main source of GHG emissions in the Waste management sector.

2.6.6. International bunkers

GHG emissions projections in International bunkering in the WEM scenario foresee emission increase in aviation and navigation. Emission increase in aviation is caused by the increase of number of both flights and served passengers in the Riga International Airport. The main reason for this is the recovery of the aviation sector following the crisis caused by the Covid-19 pandemic. Fuel consumption and emissions in international navigation are influenced by the competitiveness of Latvian ports in the international transport market and connections with further freight routes.

Table 2.52 Historical and projected GHG emissions in International bunkers according to WEM scenario, kt CO_2 eq.

International bunkers	1990	2022	2025	2030	2035	2040	2045	2050
Aviation	222.81	437.90	444.19	470.41	484.56	496.19	500.48	504.85
Navigation	1565.78	377.27	598.50	611.10	623.72	634.56	641.74	645.14
Total in WEM scenario	1788.60	815.17	1042.70	1081.51	1108.28	1130.74	1142.22	1149.99

2.6.7. Sensitivity analysis

To see the impact on changes of assumptions, alternative scenario (WEM_HD) has been made of using "optimistic scenario".

The main macroeconomic parameters of "optimistic scenario" are shown in Table 2.53.

Table 2.53 Macroeconomic parameters of "optimistic scenario"

	2020	2022	2030	2040	2050
Number of inhabitants, thousand	1908	1876	1807	1774	1777
GDP at constant (2015) prices, MEUR	26228	28821	39000	50900	62900
Private consumption at constant (2015) prices, MEUR	15400	17771	24900	33400	40200

In this “optimistic scenario”, GDP and private consumption growth rates are higher than in the base macroeconomics development scenario and population decline is slightly slower.

2.6.7.1. Energy

As underlined above, assumptions on the future change of macroeconomic’s indices are one of the most important factors when projecting GHG emissions. To evaluate the impact of macroeconomic’s indices on GHG emissions volume in the Energy sector, the GHG emissions are calculated for the alternative scenario (WEM_HD), for constructing of which the indices (GDP, number of population, VA) of the “optimistic scenario”, developed by the MoE, are used.

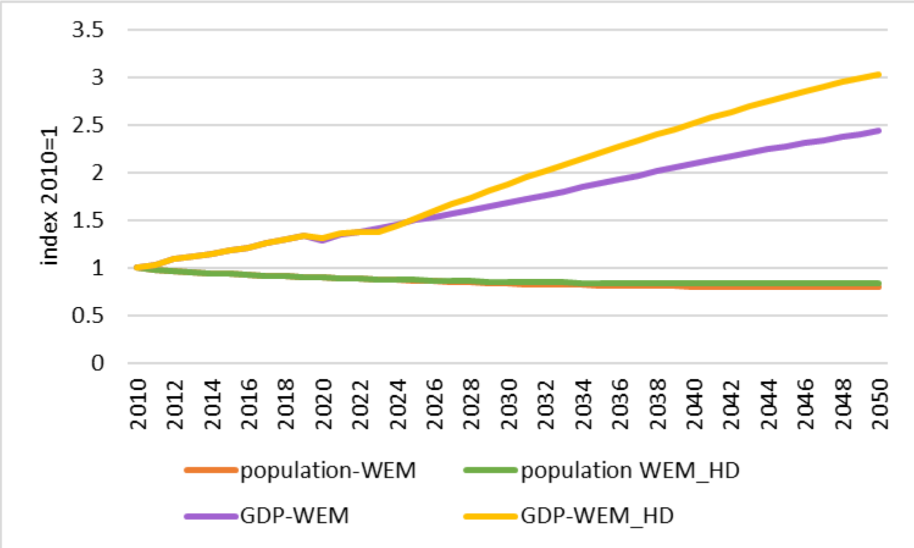

Figure 2.57 Comparison of macroeconomic’s indices used in the modelled WEM and alternative (WEM_HD) scenarios

The alternative scenario (WEM_HD) assumes in 2030 the higher GDP per about 11.8% and higher number of population (per about 2.1%) against the WEM scenario level at 2030. At the end of the period (2050), this gap in the WEM_HD scenario against the WEM scenario increases, respectively GDP by 24.7% and population by 4.6%. A faster increase in GDP is based on the assumption of a more rapid use of innovative technologies and a more rapid growth in production productivity. The projected higher GDP growth rates and higher population in the WEM_HD scenario affect parameters such as floor area in residential sector, passenger kilometres and freight transportation (tkm) in transport, VA in manufacturing and other parameters. As shown by the figure below, the assumptions on more rapid GDP growth rate and on stabilisation of population number result in 2030 in the increase of calculated FEC per 5.9% against the WEM scenario level at 2030. This increase of FEC varies in different sectors, being in 2030 in the range 3-9% against WEM scenario levels. The highest impact is seen in the residential, in which the higher number of population in the WEM_HD scenario causes per 8.7% higher FEC in 2030 against the WEM scenario level. High impact is seen also in manufacturing and transport sector in which in 2030 FEC in the alternative WEM_HD scenario increases per 6.2% and 5.3% respectively against the WEM scenario level.

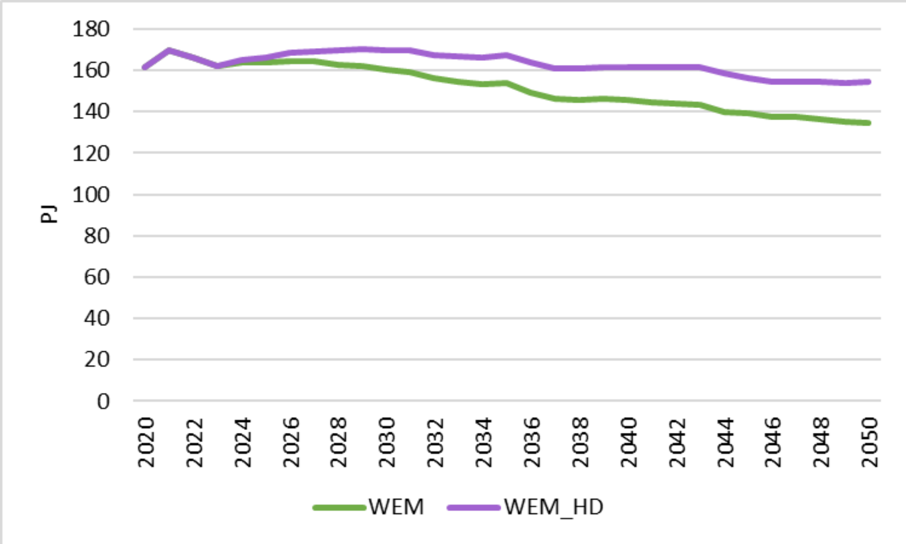

Figure 2.58 Comparison of calculated final energy consumption projections in the modelled WEM and alternative (WEM_HD) scenario, PJ

In its turn, higher energy end-use volume results in higher GHG emissions in the case the additional PaMs aimed to decrease GHG emissions are not implemented. Calculated GHG emission projections in 2030 in the alternative (WEM_HD) scenario is about 4.3% or per 274 kt CO_2 eq. higher, compared to WEM scenario. The highest impacts on GHG emission increase in the WEM_HD scenario are provided by commercial sector (5.8%), transport (5.1%) residential (4.6%) and manufacturing industry (3.5%).

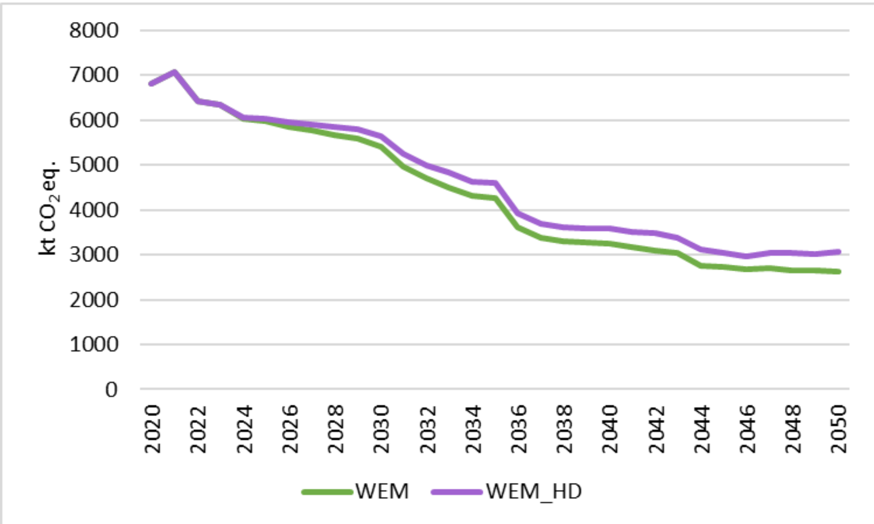

Figure 2.59 Comparison of calculated GHG emissions projections in the modelled WEM and alternative (WEM_HD) scenarios, kt CO_2 eq.

2.6.7.2. Agriculture

The sensitivity analysis is used to determine how different projection approaches of milk yield can impact the total emissions outcome under a given set of assumptions. Then specified activity data are included in GHG emission calculation algorithms according to 2006 IPCC Guidelines.

Sensitivity analysis has been carried out with the aim of assessing the impact of dairy cow productivity forecasts. In the sensitivity analysis, milk yield is predicted with a logarithmic function by setting the milk yield target value of 10 tonnes from one dairy cow in 2050. The milk target value is based on expert judgment, assuming findings that the intensity and size of farms will increase. In addition to assessing the impact of economic factors, projections of milk yield should include information on the average herd size, the proportion cow breeds, the number of organic dairy farms, feeding strategies and other biological features. In the sensitivity analysis version of the milk yield, milk yield projection is based on the milk yield models approved and used in animal sciences.

Results of a sensitivity analysis are included in Figure 2.60 which shows that Agriculture emissions will be 2150.2 kt CO_2 eq. in 2030. Total emissions could be by 2.0% lower than in the WEM scenario.

All other parameters of projections for both scenarios are similar to inputs for the WEM scenario projections.

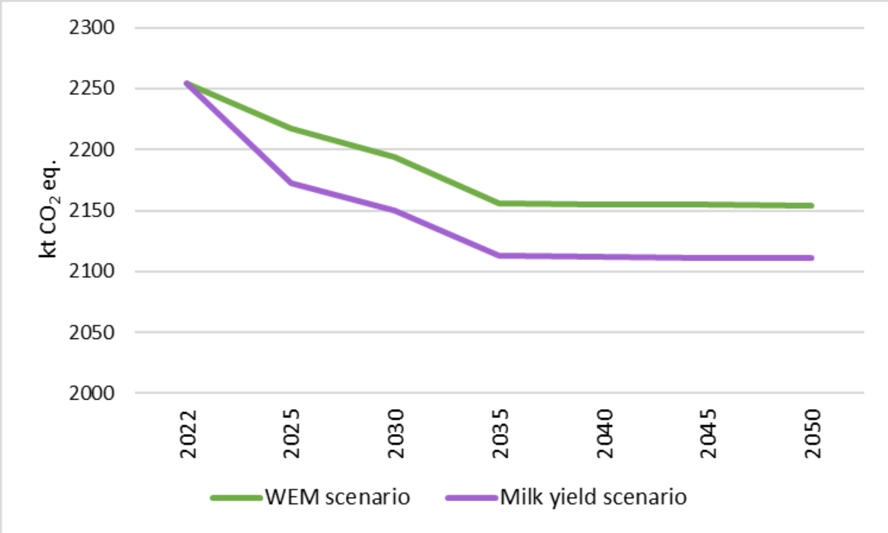

Figure 2.60 Sensitivity analysis of GHG emission projections for Agriculture sector, kt CO_2 eq.

2.6.7.3. Land Use, Land Use Change and Forestry

Results of sensitivity analysis considering different levels of implementation of the climate change measures (measures not implemented, measures implemented to 50% extend, measures implemented to 100% extend and to 200% extend) is provided in Figure 2.61. According to this estimate the reduced implementation of the measures leads to significantly higher emissions during the whole accounting period, while increase of the implementation rate, e.g., twice significantly increase the GHG mitigation effect; however, the difference between scenarios decrease with time, because the carbon stock in soil in cropland reach steady stage and the afforested area is too small to have significant effect on the GHG emissions.

The total GHG emissions in LULUCF sector stabilizes at a level of 4-5 mill. tonnes, which corresponds to GHG emissions from managed organic soils in cropland and grassland, and peat extraction for use in agriculture, assuming the instant oxidation method. Further reduction of GHG emissions can be reached by afforestation of organic soils in cropland and grassland.

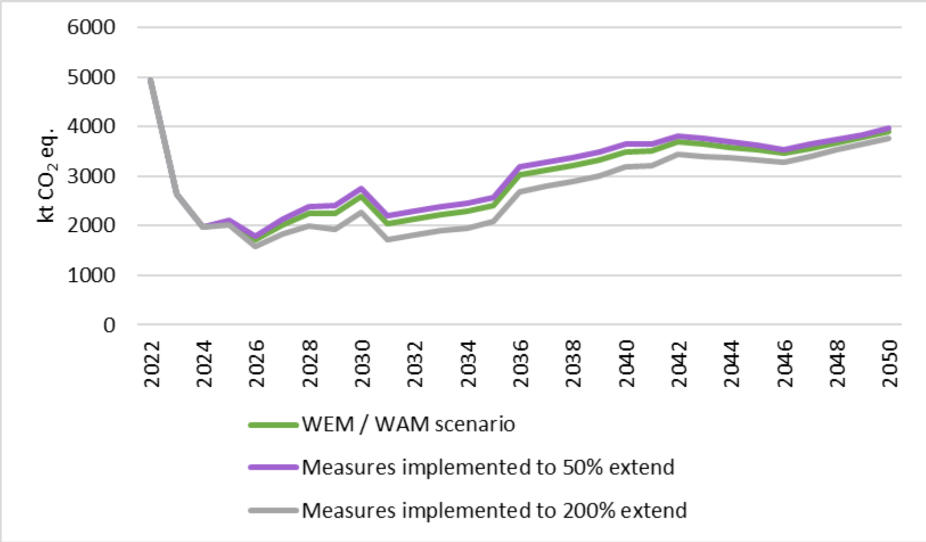

Figure 2.61 Sensitivity analysis in LULUCF sector, kt CO_2 yr

2.6.7.4. Waste management

2.6.7.4.1. SOLID WASTE DISPOSAL

One of the main parameters determining GHG emissions in the Solid waste disposal sector is disposed amount. In sensitivity analysis for CH_4 calculations from SWD – the of amount of disposed waste by 10% of each year from 2029 to 2039 is decreased, compared to WEM scenario.

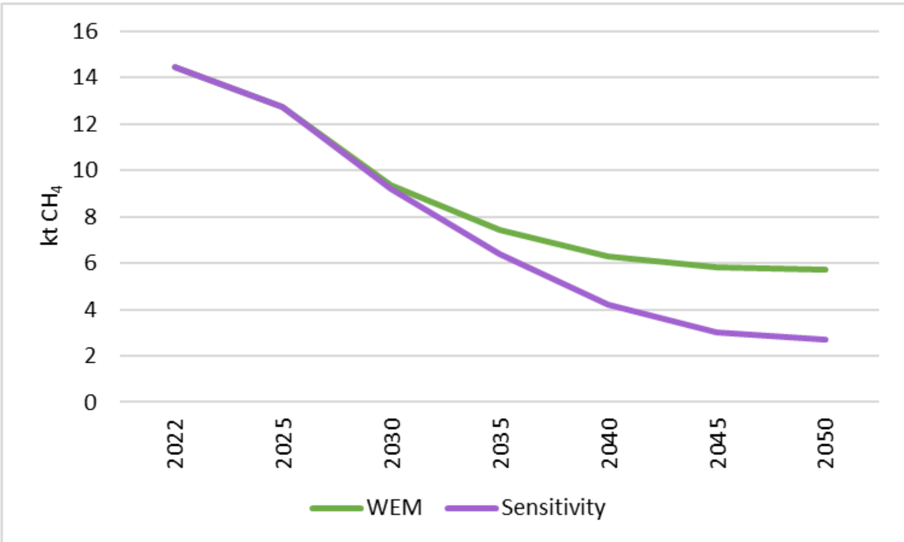

Figure 2.62 Results of solid waste disposl sensitivity analysis in WEM scenario compared to alternative scenario, kt CO_2 eq.

The result of sensitivity analysis shows that decrease of disposed waste amount by 10% each year from 2029-2039 gives reduction of CH_4 emissions:

- year 2035 by 14%;
- year 2040 by 33%;
- year 2045 by 48%;
- year 2050 by 53%.

The main driving force of GHG emissions from the wastewater handling sector is number of national population. However, significant factor, impacting amount of GHG emissions in wastewater handling sector, is protein consumption. For WEM scenario, it was assumed that protein consumption will stay at level average level of all historic inventory period (35 kg/pers/year), while within sensitivity analysis the maximum historical protein consumption value was used – 40 kg/pers/year (Latvian historic maximum, 1992).

Results of sensitivity analysis are aggregated in Figure 2.63.

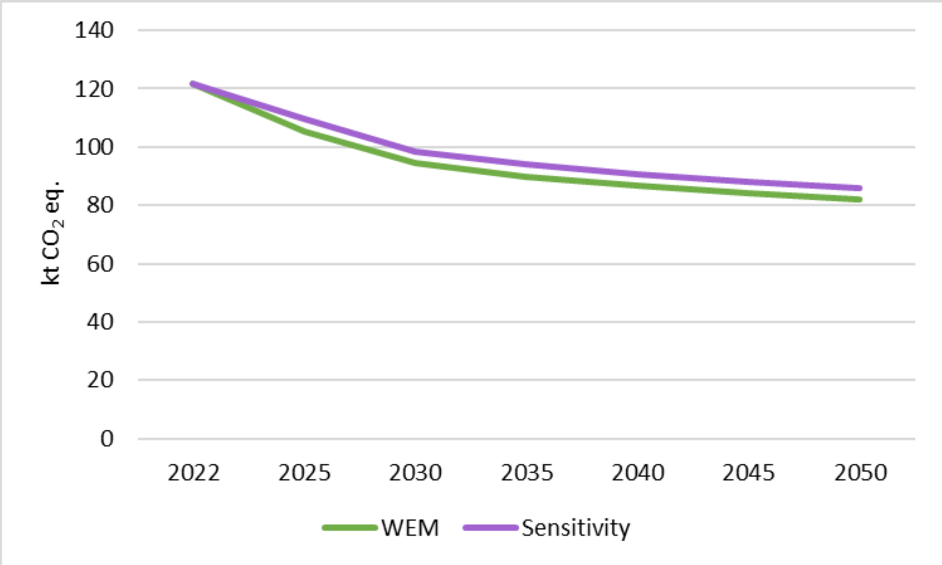

Figure 2.63 Comparison of calculated GHG emissions projections in the modelled WEM and alternative (WEM_HD) scenarios for Wastewater Handling sector, kt CO_2 eq.

WEM sensitivity scenario is a scenario with maximum protein consumption.

The results of analysis (Figure 2.63) show that assumed, maximum protein consumption, in comparison with WEM scenario, cause an increase of GHG emissions in the wastewater handling sector from 108.7 to 113.0 kt CO_2 eq. in 2023 and from 94.6 to 98.6 kt CO_2 eq. in 2030.

2.6.8. Models and methodology

Summarized information on the implemented Models and Methodologies can be found in Annex 6.

2.6.8.1. Energy

To model the complex development of the Latvian energy system and perform calculation of GHG projections there is used internationally widely applied partial equilibrium, bottom-up, dynamic, linear programming optimisation model TIMES code for the energy-environmental system optimisation which we have been adapted to Latvia's circumstances since 2022 by creating the TIMES-Latvia country model and applying it for the national level studies. Previously (before 2022) GHG emission projections for Energy were calculated using MARKAL-Latvia model, which is also of the MARKAL/TIMES model platform.

The TIMES-Latvia model is driven by useful energy demands, expressed in energy units or energy demands expressed as energy services in other units (e.g., lumen hours for lighting). The model integrates the end-use sectors and the supply side, holding descriptions of different energy sources and carriers that pass through the energy system's stages – transformation and distribution processes, energy end-use processes in all economic sectors, including a set of technological and energy efficiency options as well as associated emissions. The model is based on the minimization of the long-term discounted cost of all modelled energy-environmental system. The system's cost includes investment and operation and maintenance costs for all technologies, plus costs of all fuels, minus the revenue from exported fuels, minus the salvage value of all residual technologies at the end of the modelled horizon. The model covers time horizon 2000 to 2060, inclusive.

In the TIMES-Latvia model the energy demand is divided in five main sectors – industry, residential, agriculture, commercial & service and transport – and further divided in subgroups or subsectors, e.g., energy consumption in the residential sector is divided into space heating and hot water in single or multifamily houses, the use of particular electrical appliances. The projections are calculated for each of these subsectors by linking directly or indirectly via elasticities and/or other indicators (e.g., energy intensities or specific consumption and changes in them, the number of households, persons per households, household area, etc.) to the economic development scenario (GDP, VA, private consumption, population). In 2000, 2005, 2010, 2015 and 2020, the actual installed capacities and activity levels of technologies are imposed, thus providing that the model results exactly represent the real system being modelled.

TIMES-Latvia determines future investments and activity of technologies at each time period, while ensuring demands, emission caps and sets of other different constraints.

Projection on prices of energy resources, as well as useful energy demand (energy service demand) or other secondary parameters, like the area of heated premises of buildings or mileage of cars that reflects the required amount of energy are needed as the input data in TIMES-Latvia model. Consumption of electricity and district heating is calculated internally within the model.

The model structure is adapted, so that emissions can be calculated not only by the type of fuel, but also by sector and corresponding type of technologies.

Demand for energy is directly linked with economic development, thus, the projected changes of consumption of useful energy are related to the long-term macroeconomic projections. For the purpose of developing energy demand scenario, the long-term macroeconomic projection up to year 2050 developed by the MoE, has been used. This projection has been applied in projecting electricity consumption, heat consumption, as well as fuel consumption in individual sectors.

Price projection of imported energy resources (oil products, natural gas, coal) have been developed based upon information from EC ("Recommended parameters for reporting on GHG projections in 2023"). These projections have been adjusted considering the Latvia's current fuel prices and the interrelationships between the prices of different fuels. Prices of local energy resources depend on the geographic location of usage; therefore, the price may differ. Projection of average prices of these fuels have been developed based upon available statistics, various studies, considering the projection price trends of imported energy resources. Solid biomass (wood) is split to four price groups with different available amounts of sources. Actual prices of energy resources are projected without considering taxes. All implemented taxes in Latvia are further added in the model.

2.6.8.2. Industrial processes and product use

2.6.8.2.1. INDUSTRIAL PROCESSES

GHG emission projections in the industrial processes are calculated using top-down accounting model. The model includes both the projection of activity data and GHG emission calculation. For calculation of GHG emissions the historical emission factors of the latest submitted inventory are applied and these factors are constant for all projected time period. In its turn, the necessary activity data are projected based on the historical data and the macro-economic parameters characterising the development of particular branch of industry sector (VA or industrial production index).

2.6.8.2.2. F-GASES

F-gas projection calculation is based on MS Excel top-down model. The structure and emission calculation is performed according to 2006 IPCC Guidelines and adjusted for projection estimation.

The use of F-gases is projected taking into account:

- number of inhabitants, households and the number of freezing equipment (refrigerators and freezers) used;
- the development of the service sector and the amount of stationary refrigeration used in it;
- changes in the number of vehicles in road transport which determines the amount of the used air conditioning systems in motor vehicles;
- the projection of F-gases under the WEM scenario is based on the assessed impacts of the EC regulation on F-gases (517/2014) and the EC directive on emissions from air conditioning systems in motor vehicles (2006/40/EC) (MAC Directive).

2.6.8.2.3. SOLVENT USE

CO_2 emission projections in the solvent use sector are based on population growth scenarios, GDP growth projections compared to the previous year, and changes in private consumption from the previous year. The structure and emission calculations are carried out in accordance with the EMEP/EEA 2023 guidelines and 2006 IPCC Guidelines.

2.6.8.3. Agriculture

Projections under WEM scenario are based on primary activity data provided by MoA in collaboration with LBTU. Econometric scenario-based model *Latvian Agricultural Sector Analysis Model* (LASAM) is used for the activity data generation of Latvian agriculture. LASAM provides an outlook for animal farming, producing projections in dairy, beef, sheep, goat, pig, poultry and horse farming and crop farming based on regression analysis principles. LASAM estimates a projection of the utilised agricultural area (UAA) and the structure of UAA, allow calculating the use of fertilisers in the agriculture sector. The source data for the calculations within the model are gathered from CSB, EUROSTAT, domestic use balance sheets and Farm Accountancy Data Network (FADN). The exogenous price projections until 2025 are gathered from the DG AGRI of the EC and Food and Agriculture Organization of the United Nations, further projected by the team of LBTU. The macroeconomic projections are integrated from the projected values of MoE.

Secondary data projections including manure management system distribution, nitrogen excretion of livestock, use of organic fertilizer nitrogen and nitrogen content in crop residues are done by LBTU experts based on results of pre-defined project "Development of the National System for Greenhouse Gas Inventory and Reporting on Policies, Measures and Projections" under 2009–2014 EEA Grants Programme National Climate Policy. Methodological approach used for manure management distribution projections are available in the scientific literature[130]. Projections of managed organic soils are provided by LSFRI "Silava".

Projections of GHG emissions from the Agriculture sector in Latvia are estimated according to the 2006 IPCC Guidelines.

2.6.8.4. Land Use, Land Use Change and Forestry

The main data source for land use and carbon stock changes is NFI. Other data sources and research data are used as supplementary information, for quality assurance purposes, as well as to provide activity data for those sources which are not covered by the NFI programme and other sources of statistical data.

The NFI and research data are used to estimate time series for area, gross increment, mortality and harvest.

The activity data for calculation of emissions due to incineration of harvesting residues in felled area was based on the study until 2010. Now a questionnaire for private forest owners on utilization of harvesting residues is used[131]. According to this questionnaire in 2005-2009 about 7.0% of residues are left for incineration and in 2010-2020 – 4.1% of the residues are incinerated. In case of on-site incineration of harvesting residues during commercial harvesting, all emissions also are applied to the forest land remaining forest land category.

Area of organic soils in cropland and grassland is reported according to the results of research project implemented by Lazdiņš et al. in 2016[132]. Area of cropland and grassland in LULUCF reporting is synchronized with Agriculture reporting, including recalculation of cultivated organic soils.

Methodologies for calculating GHG emission projections for LULUCF are based on the Latvia's 2024 GHG inventory, e.g., emission factors for organic soils, carbon stocks at steady stage if forest floor vegetation and living biomass in cropland and grassland is harmonized with Latvia's 2024 GHG inventory. The potential effect of land use changes is not considered in the calculation except land use changes associated with implementation of the measures.

The calculation to GHG emissions and carbon stock changes is done in AGM and Emissions projection & inventory model (EPIM) model. which primary function is to integrate data from different land uses and conversion of the NFI data to carbon stock changes.

2.6.8.4.1. FOREST LAND

Calculations of carbon stock changes and GHG emissions in forest land are based on activity data provided by the NFI (area, living biomass and dead wood) and Level I forest monitoring data (soil organic carbon). Area of organic soils in the forest land is reported according to

[130]Priekulis J., Aboltins A.., Laurs A., Melece L. Research in manure management in Latvia/14th International scientific conference "Engineering for rural development" : proceedings, Jelgava, Latvia, May 20 - 22, 2015 Latvia University of Life Sciences and Technologies. Faculty of Engineering. - Jelgava, 2015. - Vol.14, p.88-93. Available: http://tf.llu.lv/conference/proceedings2015/Papers/015_Laurs.pdf

[131]Lazdiņš, A., & Lazdiņa, D. (2013). Meža ugunsgrēku un mežizstrādes atlieku dedzināšanas radītās siltumnīcefekta gāzu emisijas Latvijā (Greenhouse gas emissions in Latvia due to incineration of harvesting residues and forest fires). Referātu Tēzes, 133–137.

[132]Lazdiņš, A., Bārdule, A., Butlers, A., Lupiķis, A., Okmanis, M., Bebre, I., Sarkanābols, T., & Petaja, G. (2016). Aramzemes un ilggadīgo zālāju apsaimniekošanas radīto siltumnīcefekta gāzu (SEG) emisiju un oglekļa dioksīda (CO_2) piesaistes uzskaites sistēmas pilnveidošana un atbilstošu metodisko risinājumu izstrādāšana (2016. Gada starpziņojums) (101115/S109; p. 33). Available: https://drive.google.com/open?id=0Bxv4jQ_04jXZRExSMWhPMWhDNDg

structure of distribution of the forest stand types. National statistics data (CSB, State Forest service) are used to estimate commercial felling and forest wildfires related emissions and removals. The calculation of GHG emissions and CO_2 removals in historical forest land is based mainly on research report “Elaboration of the model for calculation of the CO_2 removals and GHG emissions due to forest management”[133] and factors and coefficients elaborated within the scope of the research program on impact of forest management on GHG emissions and CO_2 removals[134]. CO_2 emission factors for drained organic soils are based on the study results[135].

Changes of organic carbon in litter and soil organic matter in naturally dry and wet soils are assumed to be zero according to research data on carbon stock in forest soil in 2006 and 2012[136] and Yasso modelling results[137]. Carbon stock changes are reported separately on naturally dry and wet mineral and organic soils and drained mineral and organic soils. Conversion of forest stands with drained organic soil to wet soil is accounted as rewetting.

Forest growth projections due to implementation of thinning, reconstruction of drainage system or afforestation measures are calculated using AGM model[138]. Similarly, forest growth projections under WEM are calculated using AGM model assuming continuation of existing forestry practices (average during previous 5 years) and availability driven harvesting projections assuming constant intensity of harvests, i.e., proportion of extracted and legally available wood is not changing with time.

2.6.8.4.2. CROPLAND

Area of cropland is estimated using remote sensing-based research data on the base of the NFI. Carbon stock change in living and dead woody biomass is based on activity data provided by the NFI. Area of organic soils in cropland remaining cropland is reported according to the results of research results[139]. Area of organic soil in land converted to cropland is calculated using different approach than in cropland remaining cropland - the values characteristic for initial land use are applied. Respectively, if share of organic soil in forest land remaining forest in 1990 is 22%, it is considered, that area of organic soil in forest land converted to cropland in 1990 is 22%[140]. CO_2 emissions from drained organic soils are reported using research data[141], while N_2O and CH_4 – using Tier 1 emission factors for temperate moist and cool climate zone according to IPCC Wetlands supplement. Changes in carbon stock in mineral soils due to land use changes or management changes are calculate using Tier 1 method, comparing different carbon input and soil scarification rates.

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[133]Lazdiņš, A. (2012). Forest data national modelling tool in Latvia.

[134]Lazdiņš, A., Liepiņš, K., Lazdiņa, D., Jansons, Ā., Bārdule, A., & Lupiķis, A. (2013). Mežsaimniecisko darbību ietekmes uz siltumnīcefekta gāzu emisijām un CO_2 piesaisti novērtējums (pārskats par 2013. Gada darba uzdevumu izpildi) (5.5-5.1/001Y/110/08/8; p. 91).

[135]Lupiķis, A., & Lazdiņš, A. (2015). Soil carbon balance on drained and afforested transitional bog in forest research station Vesetnieki in Latvia. 17, 955. Available: http://adsabs.harvard.edu/abs/2015EGUGA..17..955; Lupiķis, A., Lazdiņš, A., Okmanis, M., Butlers, A., Saule, Z., Saule, L., Martinsone, K., Saule, G., Purviņa, D., Bārdule, A., & Skranda, I. (2017). Empīrisku datu ieguve meža meliorācijas ietekmes uz CO2 emisijām no organiskajām augsnēm novērtēšanai (Elaboration of measurement data for evaluation of impact of amelioration systems on GH emissions from organic soils) (2015/13, līguma 1.13 punkts; p. 43). LVMI Silava.

[136] Lazdiņš, A., Čugunovs, M., Zariņš, J., & Lūkins, M. (2013). Atbalsts klimata pētījumu programmai (Pārksats par projekta 2013. Gada darba uzdevumu izpildi) (p. 64).

[137]Bārdulis, A., Lupiķis, A., & Stola, J. (2017). Carbon balance in forest mineral soils in Latvia modelled with Yasso07 soil carbon model. Research for Rural Development, 1, 28–34.

[138] Lazdiņš, A., Šņepsts, G., Petaja, G., & Kārkliņa, I. (2019). Verification of applicability of forest growth model AGM in elaboration of forestry projections for National Forest reference level. Rural Development, 289–294. Available: https://doi.org/10.15544/RD.2019.065

[139]Petaja, G., Okmanis, M., Polmanis, K., Stola, J., Spalva, G., & Jansons, J. (2018). Evaluation of greenhouse gas emissions and area of organic soils in cropland and grassland in Latvia – integrated National Forest inventory data and soil maps approach. Agronomy Research, 16(4), 1809–1823. Available: https://doi.org/10.15159/ar.18.183

[140]Lazdiņš, A., Bārdule, A., & Stola, J. (2013). Preliminary results of evaluation of area of organic soils in arable lands in Latvia. Abstracts of International Baltic Sea Regional Scientific Conference, 79–80.

[141]Licite, I., & Lupikis, A. (2020). Impact of land use practices on greenhouse gas emissions from agriculture land on organic soils. Engineering for Rural Development, 1823–1830. Available: https://doi.org/10.22616/ERDev.2020.19.TF492

2.6.8.4.3. GRASSLAND

Area of grassland is estimated using remote sensing-based research data on the base of the NFI. Area of organic soils in grassland is reported according to the results of research project implemented in 2016. Figures of carbon stock change in living and dead woody biomass is based on activity data provided by the NFI. Mortality rate are taken directly from forest land assuming that mortality in grassland is equal to average mortality (in percent of increment of living biomass) in forest land in a particular year. CO_2 emissions from drained organic soils are reported using research data[142], while N_2O and CH_4 – using Tier 1 emission factors for temperate moist and cool climate zone according to IPCC Wetlands supplement. Changes in carbon stock in mineral soils due to land use changes to forest land are not considered assuming that mineral soils are not a source of GHG emissions.

2.6.8.4.4. WETLANDS

Total area of managed wetlands is reported according to the research results, including 3 kha of peatlands drained for peat extraction in 2020[143]. GHG emissions from soil are calculated using research results[144], except CH_4 emissions from drainage ditches. For this category Tier 1 emission factor is applied. Instant oxidation method is applied to peat used in horticulture, while higher tier method is under development.

2.6.8.4.5. SETTLEMENTS

The total area of settlements is estimated according to the information provided by the NFI. According to the expert judgement, increase of area of settlements during last 20 years took place due to conversion of forest land. Increase of area of settlements (deforestation) is generally associated with road construction. All roads, including forest roads are reported in the settlements category; therefore, the deforested area is considerably higher than official statistics, where forest roads are not accounted as deforested area. Area of land converted to settlements is estimated by evaluation of vegetation index of the permanent and temporal NFI points (23 thousand plots across the country) in series of satellite images produced in 1990, 1995 and 2000. Final land use was considered according to empiric data obtained during field visits (2004-2022) and using interpolation method published recently[145]. CO_2 removals in living and dead biomass in settlements are accounted using the NFI data. GHG emissions from drained organic soils are reported using Tier 1 emission factors for cropland in temperate moist and cool climate zone according to IPCC Wetlands supplement.

2.6.8.5. Waste management

2.6.8.5.1. SOLID WASTE DISPOSAL

Two separate calculations from IPCC Waste Model according the 2006 IPCC Guidelines were used. One for unmanaged sites (closed dumpsites) and other for managed (landfills since 2002). For unmanaged sites calculation method for bulk waste was used. According to Ltd

[142]Licite, I., & Lupikis, A. (2020). Impact of land use practices on greenhouse gas emissions from agriculture land on organic soils. Engineering for Rural Development, 1823–1830. Available: https://doi.org/10.22616/ERDev.2020.19.TF492
[143] Lazdiņš, A., Butlers, A., & Lupiķis, A. (2019). Contribution of LIFE REstore project to improvement of activity data for accounting greenhouse gas emissions due to management of wetlands. Sustainable and Responsible Management and Re-Use of Degraded Peatlands in Latvia, 23.
[144]Lazdiņš, A., & Lupiķis, A. (2019). LIFE REstore project contribution to the greenhouse gas emission accounts in Latvia. In A. Priede & A. Gancone (Eds.), Sustainable and responsible after-use of peat extraction areas (pp. 21–52). Baltijas Krasti.
[145]Krumšteds, L. L., Ivanovs, J., Jansons, J., & Lazdiņš, A. (2019). Development of Latvian land use and land use change matrix using geospatial data of National Forest inventory. Agronomy Research, 17. Available: https://doi.org/10.15159/AR.19.195

Virsma research 2011 – degradable organic carbon (DOC) factor 0.17 for these calculations was used. Other factors are default from 2006 IPCC guidelines.

For managed sites method "waste by composition" in 2006 IPCC Waste Model was used. DOC and k values and other factors are taken from 2006 IPCC Guidelines. Waste composition is taken from Ltd Virsma research 2011 (Table 2.54). This waste composition is applied till year 2015.

Direct information from operators about collected CH_4 in waste polygons is used for emission projections.

Table 2.54 Average waste composition in landfills in Latvia (%)

	Paper	Plastics	Organic (food, hygiene waste, other organics)	Wood	Textile, rubber	Minerals (ceramics)	Glass	Metals
Average in Country	6.40	8.54	47.90	2.11	3.35	8.69	20.64	2.36

Data about waste composition are reported in annual waste polygon reports. These reports are provided to state institutions each year.

Disposed waste composition average in 2022:

1. food – 17.8%;
2. garden – 18.3%;
3. paper – 9.4%;
4. wood – 2.6%;
5. textile – 2.8%;
6. nappies – 0.1%;
7. plastic, other inert – 49.0%.

Estimation is done for two types of waste streams:

- disposed waste in disposal cells after sorting (data collected from waste polygon reports);
- direct disposed waste (without sorting) according to European Waste Catalogue (EWC) code (estimation for each EWC code is expert judgment).

2.6.8.5.2. COMPOSTING

Projected CH_4 and N_2O emissions from composting are calculated according to 2006 IPCC Guidelines. Emission factors are multiplied with composted waste amounts. Composted waste amount in households is projected according to changes in population, but industrially composted amounts are projected according to disposal waste amount changes and biological treatment capacities.

2.6.8.5.3. WASTE WATER HANDLING

Following approaches were used for projections of activity data to estimate GHG emission projections from waste water handling sector:

- for CH_4 emissions from domestic/commercial wastewater handling subsector:

    - projections of national population;
    - expected distribution of national population by type and level of treatment, based on historical trends and requirements of UWWTD;
    - projections of sewage sludge production based on its correlation with average annual amount of sewage sludge produced by a person and historical trend of share of anaerobic sludge.
- for N_2O emissions from domestic/commercial wastewater handling subsector:
    - projections of national population;
    - expected rate of national population served by modern centralized treatment plants, based on historical trends and requirements of UWWTD;
    - constant consumption of protein by average person was assumed.
- for CH_4 and N_2O emissions from industrial wastewater handling subsector projections of emissions were extrapolated from the historical emission trends of this subsector.

Based on projected activity data emission projections were calculated according to 2006 IPCC Guidelines. Country-specific emission factors were used to calculate CH_4 emissions, but for emissions of N_2O default IPCC emission factors were used. Emissions factors used for projections are the same as in Latvia's 2024 GHG inventory.

2.6.8.6. Changes compared to previous report

The models used for the preparation of the projections of the BTR1 are the same as those used for the NC8/BR5.

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 to 2.6, above. Hence, no additional information is provided here.

3. CLIMATE CHANGE IMPACTS AND ADAPTATION

3.1. National circumstances, institutional arrangements and legal frameworks

National circumstances

Latvia is situated on the edge of the Eastern European Plain near the Baltic Sea between 55°40' and 58°05' Northern latitude and between 20°58' and 28°14' Eastern longitude. The total length of the border of Latvia amounts to 1 387 km on land (with Estonia, Lithuania, Belarus and Russia) and 498 km along long maritime border with Sweden.

The territory covers an area of 64 594 km^2 in total. Its length in the North – South direction is 210 km, and the width in the West – East direction – 450 km. Latvia is a typical lowland country, and its terrain is characterized by flat, low areas and hilly elevations. The average height above sea level is 87 m and the highest peak is Gaiziņkalns (311.6 m above sea level). There are more than 3 000 lakes and 12 000 rivers in Latvia.

Latvia is located in the temperate climate zone; relatively flat terrain, the proximity to the sea and air masses from the Atlantic Ocean influence climate in the country. The climate is mild and humid with four explicit seasons.

The range of air temperature in Latvia in 2023 was 60.8 °C, and a number of warm and cold spells were observed. The lowest air temperature -26.4 °C was observed in Zosēni (Vidzeme Upland) on 10th March, but maximal air temperature +34.4 °C was observed on 16th August in Bauska (central Latvia), setting a new national daily maximum temperature record for August 16th, which also is the highest observed national maximum air temperature since 2014 when on 4th August +37.8 °C was recorded in Ventspils (West Latvia).

During the year 2023, several rapid temperature fluctuations were observed. The most rapid fluctuations occurred in the beginning of the year when on 1st January daily mean air temperature was +5.4 °C, then it dropped to −13.2 °C by 6th January and increased to +4.3 °C again by 14th January. Therefore, the mean air temperature dropped by 18.6 °C over a span of 6 days and subsequently increased by 17.5 °C within 8 days. Other significant fluctuations occurred during March (within 5 days temperature increased by 13.4 °C), August (within 3 days it decreased by 8.9 °C), and October (within 6 days it dropped by 10.9 °C and, after a few days, over a span of 5 days dropped again by 11.4 °C).

Annual precipitation amount exceeded the 1991−2020 normal despite a drought in May and June, when May became the 1st and June the 2nd driest month on record.

During the latter half of the summer, a series of robust thunderstorms transpired, culminating in an instance where annual peak wind gusts reached 32.6 m/s.

Annual mean air temperature in Latvia was +7.8 °C, which is 1.0 °C above the 1991−2020 normal, therefore 2023 was the 3rd warmest on record (since 1924), tying the rank with 2015, and the 11th consecutive warmer-than-normal year (Figure 3.1**Figure 3.1**).

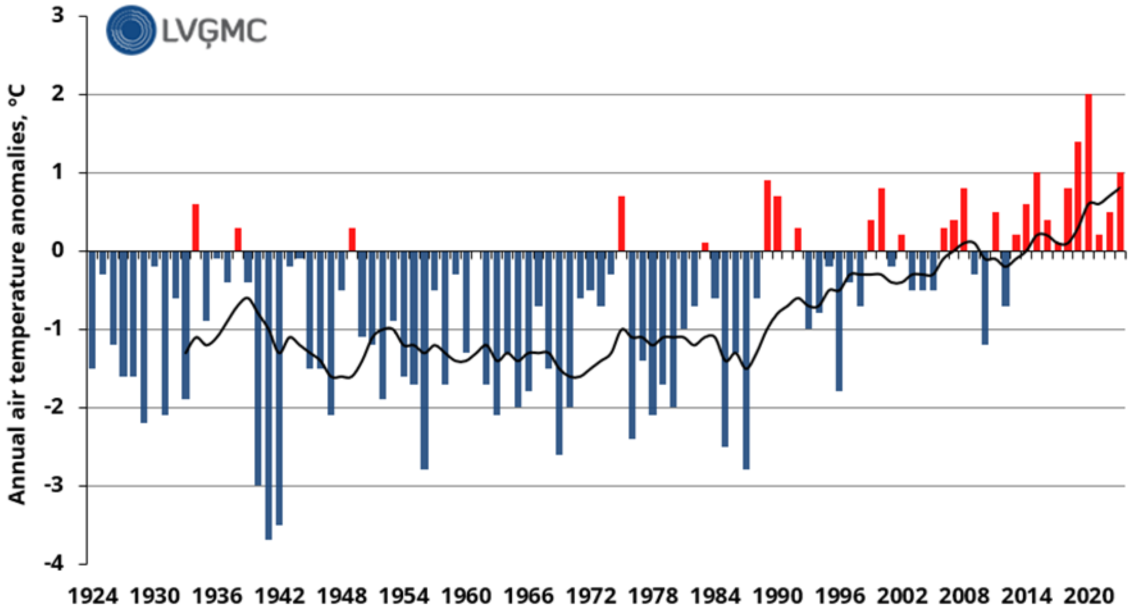

Figure 3.1 Annual air temperature anomalies in Latvia (1924-2022) relative to 1991 2020 normal, °C (The black line represents the 10-year moving mean) (LEGMC)

Total amount of precipitation in 2023 in Latvia was 761.1 mm, and it was 11% wetter than normal. The highest annual precipitation amount was observed in Rucava (South-West Latvia) – 1065.1 mm, but the lowest precipitation amount was measured in Bauska (central Latvia) – 524.2 mm. Precipitation anomalies ranged from 19% below the normal in Jelgava (central Latvia) up to 40% above the normal in Daugavpils (South-East Latvia).

During the year there were 46 days when peak wind gusts reached 20 m/s, the lowest threshold for wind speed warnings. On 9 of those days peak wind gusts exceeded 25 m/s but on 2 days – 30 m/s. The annual peak wind gusts 32.6 m/s were observed during a storm on 7th August in Dobele (central Latvia).

Institutional arrangements and legal frameworks

Due to structural re-organization since 1st January 2023 MoCE is made and therefore MoCE is the single national entity with overall responsibility for the adaptation to climate change issues.

In Latvia LEGMC is the Latvian National Hydrometeorological and Climate Service and is responsible institution for developing of climate monitoring, modelling, projections and scenarios.

LEGMC performs climate monitoring by continuous climate change data collection, as well as monitoring extreme events, data storage and analyses of long-term observation results.

LEGMC prepares reports and provides information to the public, to the State and local governments, and to international organizations. It also provides services for customers, including national aviation authorities, Latvian National Armed Forces, civil protection authorities and energy companies. Climate change information is presented in various formats, tailored to the user needs. LEGMC continuously monitor the actual meteorological and hydrological conditions and keep track of these changes to produce weather forecasts for the short term (the next few hours) as well as for the longer term (up to six weeks in advance and seasonally). Long-term monitoring data are used to analyse climate and historical hydrological conditions, which also form the basis for assessing future changes in climate and hydrological conditions.

Latvia has developed Climate Law which is currently under discussion in Saeima. The Law will also include a section on adaptation to climate change, which regulates the development of an adaptation strategy, the integration of climate change adaptation policy objectives and measures into sectoral policies, as well as the assessment of climate risks and vulnerabilities.

National legislation - CoM Regulation No. 675 (25th October 2022) - establishing procedures for the preparation and reporting of national adaptation measures and information on monitoring of climate change indicators and climate change impact indicators was adopted on 25th October 2022.

Since 2019, the Latvian National Plan for Adaptation to Climate Change until 2030 (NAP2030) has been in force with more than 80 adaptation measures and 5 Strategic goals to address climate change risks.

The strategic goals and adaptation measures of NAP2030 are in line with the Paris Agreement on Climate Change, the Sustainable Development Goals and Sendai Framework for Disaster Risk Reduction.

Responsible authorities for implementing adaptation measures also include the MoA, Ministry of Welfare, MoE, Ministry of the Interior, MoF and other ministries. The task of each responsible ministry is to coordinate the activities of the NAP2030 which belong to their area of responsibility. In implementing NAP2030 adaptation measures, local governments and research institutions are involved.

Latvia is actively integrating climate change adaptation policy and measures into decision making process and territorial development planning and spatial planning procedures. The importance of preventive measures is underlined. Further development of current legislation, e.g., construction standards, land-use guidelines etc., shall take into consideration climate change related impacts. Apart from that, Latvia integrates climate change adaptation goals into sectoral policies, plans and programs, for example, references to NAP are included in "Strategy of Latvia for the Achievement of Climate Neutrality by 2050", NDP 2027, "Latvian National Plan of Civil Protection" etc. Climate change adaptation aspects are also included in the Environmental Policy Guidelines for 2021-2027 (EPG2027) approved by CoM on 31st August 2022.

38 cities and counties have developed Sustainable Development Strategies that set targets for mitigation and adaptation to climate change. 14 cities and counties have developed Sustainable Energy and Climate Action Plans. These plans are consistent with National plans and strategies.

In Latvia 23 municipalities/cities are involved in Covenant of Mayors and part of them have developed their climate change adaptation strategies or included climate change adaptation parts in Energy and climate action plans until 2030. Recently two planning regions joined to EU Mission "Adaptation to climate change".

Risk and vulnerability assessments were carried out by research institutions under EEA and Norway Grants pre-defined project. Climate change risk and vulnerability assessments of specific sectors (biodiversity and ecosystem services; forestry and agriculture; tourism and landscape planning; health and welfare; building and infrastructure planning; civil protection and emergency planning) were made in 2016-2017. Currently new assessments are under development and Latvia is planning to carry out new risk and vulnerability assessments in all relevant sectors by 2026.

Under the United Arab Emirates Framework for Global Climate Resilience[146], specific targets in relation to the dimensions of the iterative adaptation cycle have been adopted, and the EU (including Latvia) is committed to implementing the Global Goal on Adaptation and its framework.

3.2. Impacts, risks and vulnerabilities

In Latvia assessments[147] have been carried out on primary and secondary impacts of climate change, risks and vulnerability, which include also cost – benefit analysis for adaptation measures, indicators and draft for the monitoring system. The analysed sectors are as follows:

- biodiversity and ecosystem services;
- forestry and agriculture;
- tourism and landscape planning;
- health and welfare;
- building and infrastructure planning;
- civil protection and emergency planning.

Assessments include consideration of:

- historical climate change impacts from 1961 and future scenarios until 2100;
- risk and vulnerability assessment;
- identification of adaptation measures and cost–benefit analysis;
- identification of adaptation indicators;
- engagement of stakeholders, determination of their responsibilities.

Climate change in Latvia affects both its natural capital (species, habitats, ecosystems), as well as the health, welfare and safety and economic activities of the population. NAP 2030 based on climate change risk and vulnerability assessments, identifies risks and measures in such vulnerable sectors as health and welfare, agriculture and forestry, civil protection and disaster management, buildings and infrastructure, biodiversity and ecosystem services etc. Main risks in sectors are summarized in Figure 3.2, but overall, the most significant risks caused by climate change in Latvia with a higher probability of occurrence are as follows:

- changes in seasons, including the vegetation period growing season;
- fire hazard;
- proliferation of pests and pathogens, tree diseases, expulsion of local species, entering of new species;
- spread of diseases of the respiratory system;
- spread of infectious diseases, heat strokes;
- flood caused by precipitation, wind surges;
- occurrence of disturbances in electricity supply;
- increased run-off, hydropower variations;
- reduction of frost, black frost, drying of soil;
- eutrophication;
- damages to infrastructures, overheating of equipment;
- decreased run-off during summer.

[146] Decision 2/CMA.5, Global goal on adaptation. Available: https://unfccc.int/documents/637073
[147] Researches on risk and vulnerability assessment and identification of adaptation measures. Available: https://www.varam.gov.lv/lv/petijumi-par-risku-un-ievainojamibas-novertesanu-un-pielagosanas-pasakumu-identificesanu *(in Latvian)*

Building and infrastructure planning:

Building

- Increase in damages caused to buildings by flood along the seaside and river estuaries in cities
- Increase in damage caused to buildings by precipitation flood
- Increase in overload on the roofs of buildings due to snow cover
- Damages of the foundations of buildings and ground due to groundwater level fluctuations
- Indoor overheating growth

Transport infrastructure

- Increase in damages caused to ports, roads by flood along the seaside and river estuaries in cities
- Increase in damage on roads due to floods caused by heavy rainfall (along with road freezing period decrease)
- Increased melting of asphalt and other road surface damages
- Increased bending of rails, material deterioration and instability of embankments due to heat

Energy

- Electricity transmission and distribution network damages due to wind gusts
- Indoor overheating and growth of electricity demand in summer
- Energy demand decrease in winter

Tourism and landscape planning:

- Risk of changing the length and characteristics of winter tourism season
- Flood risk (rising water levels in rivers and lakes)
- Coastal flooding and erosion risk along the coastline of the Baltic Sea and the Gulf of Riga
- Risk of the change of the length of the summer tourism season

Civil protection and disaster management planning

- Flooding and ice buildup
- Flood caused by heavy rainfalls
- Storms and wind surges at the sea
- Forest and peat fires

Health and welfare:

- Increased spread of acute intestinal infections, outbreak of such infections
- Increased spread of chronic diseases (CVD, diabets, etc.) and increased mortality
- Increased spread of illnesses and/or infectious diseases caused by carriers of diseases become endemic
- Increased morbidity and mortality rates caused by diseases of respiratory system in particular for various risk groups
- Increased frequency of heat strokes
- Internal migration, migration of foreign population to Latvia
- Housing availability and provision

Biodiversity and ecosystem services:

- Eutrophication of watercourses and water abodies
- Ecologically sensitive species are taken over by ecologically plastic species
- Spread of expansive and invasive foreign species non-characteristic to Latvia, infectious diseases and harmful organisms of plants
- Opportunities for entry of new species
- Increase in water temperature and longer stratification period, decrease in the amount of dissolved oxygen at the ground layers
- Storm surges along the coastline, rising water levels in rivers and lakes

Agriculture, Forestry and Fishery:

Agriculture

- Destruction of crop fields, plantations due to black frost
- Spread of crop diseases, harmful organisms (including new) and spread of pests, animal parasites (including new species)
- Spread of previously non-characteristic disease agents and carriers, including spread of invasive foreign insect species
- Drying and faster drying of soil/plants
- Flooding of agricultural land under intense precipitation condition
- Risk of long-term heat waves

Forestry

- Spread of tree diseases (including new)
- Spread of tree pests (including new)
- Risk of frost damage (including frost hardiness loss)
- Hindered forest exploitation due to lack of winter freeze
- Risk of storms
- Risk of fire
- Risk of tree damage due to freezing precipitation, windthrows and snow breaks
- Faster drying of soil/plants

Fishery

- Increase in water temperature in water bodies, eutrophication
- Ecologically sensitive species are taken over by ecologically plastic species
- Opportunities for entry of new species (including invasive species)
- Flood risk in open-type fish-breeding farms

Figure 3.2 Main climate change related risks in Latvia (NAP 2030)

Climate change impacts and risks of different sectors

Construction and infrastructure

According to risk and vulnerability assessment, buildings and infrastructure in Latvia are exposed to different **climate change impacts.** According to climate change scenarios assessments, likelihood of key hazards (especially related to air temperature, water level rising, changing wind and precipitation patterns), is high. Most significant changes are related to extreme values of climate variables, indicating that in the future Latvia will more often face weather conditions uncharacteristic and extreme for its territory. Exposure of buildings to key hazards is likely to increase. In Latvia, several impacts of climate change (including extreme climate events) are important for buildings:

- increase in average annual air temperature, increase in the frequency and duration of heat waves, extension of the meteorological summer, increase in the maximum value of the daily maximum temperature;
- decrease of the frost days and the number of days without thaw;

- increase in precipitation and increase in the maximum amount of precipitation per day, increase in the number of days with very heavy precipitation, increase in the maximum amount of precipitation per five days, increase in snowfall above normal;
- long-term average sea level rise and development of coastal erosion, as well as groundwater level fluctuations affected by changes in precipitation and sea level, and changes in river run-off patterns.

The most significant risks are showed in Figure 3.2. According to risk and vulnerability assessments climate change **risks** to construction sector in Latvia have the following consequences: damage to buildings on the sea coast and estuaries (due to coastal erosion and flooding); damage to buildings in estuaries; the need for repair of buildings or irreparable damage; declining value of buildings and increase of insurance prices; damage to buildings in cities with insufficient sewerage capacity, damage to buildings in floodplains of waterways; damage to building structures (increased microcracking due to load, moisture damage); roof collapse; mould; the threat to the stability of the structures of buildings and their foundations (the greatest threat is to old buildings, the stability and waterproofing of the foundations); increase in demand for indoor cooling; investments for installation of room cooling and ventilation; increase in electricity consumption and costs in summer, etc.

<u>Civil protection and emergency management</u>

According to risk and vulnerability assessments civil protection and emergency management is exposed to different **climate change impacts**: changing temperature, heat waves, drought, heavy precipitation, flood, changing participation patterns, and especially extreme weather events.

In Latvia, the following impacts of climate change and extreme weather events are the most important for civil protection and disaster management planning:

- increase in the number of summer days, tropical nights, duration and frequency of heat waves, continuous increase in the frequency and duration of droughts;
- increase in maximum wind gusts;
- increase in the number of days with very heavy precipitation, an increase in the maximum daily precipitation and a decrease in the amount of annual precipitation in the form of snow.

Sea level rise, change of river runoff regime from the current peak in spring to high runoff also in autumn facilitated by the changes on the amount of precipitation, drought in summer.

According to climate change scenarios assessment, likelihood of key hazards (especially related to air temperature, changing precipitation patterns and weather extremes), is high. Most significant changes are related to extreme values of climate variables, indicating that in the future Latvia will more often face weather conditions uncharacteristic and extreme for its territory. Exposure of to civil protection to key hazards are likely to increase.

Risks (Figure 3.2) caused by climate change in civil protection and disaster management planning, which have a relatively very high or high level of probability and the most negative consequences in Latvia are:

- forest and peat bog fires - risks with medium consequences currently, but with a very high probability will increase in the future;
- storms and storm surges - risks with severe consequences that may increase in the future (medium probability). The analysis of long-term trends shows very significant declining trends in the number of stormy days in most parts of Latvia. At the same

time, we need to take into account overall trends of increase of frequency and recurrence of extreme events over time;
- heavy rainfall and floods caused by it - risks with relatively lower consequences, which will increase (high probability);
- floods caused by spring floods and ice jams - risks with relatively lower consequences and a medium probability of occurrence, however, this risk is expected to decrease over time in both the probability of occurrence and the consequences.

It should be noted that compared to today and in view of the projected future trends in climate change in Latvia, it is expected that both the probability of the occurrence and the consequences of spring flood risk will decrease in the future, but the consequences for all other risks will only increase. In general, net economic losses in 2100, due to the 4 mentioned main risks, will double compared to the current situation.

In the field of civil protection and emergency management, extreme weather and climate events are of crucial importance and in future the exposure of civil protection to key hazards is likely to increase, especially due to weather extremes. The rare extreme events are those that have the greatest impact and cause the greatest damage to human welfare.

<u>Health and welfare</u>

According to risk and vulnerability assessments health and well-being is exposed to different **climate change impacts**: changing temperature, heat waves, flood and extreme weather events.

Impacts of climate change (including extreme ones) that are important for health and well-being in Latvia are the following:

- increase in the average temperature, as a result of which the spring / summer / autumn seasons could be extended, while the duration of winter will decrease;
- increase in the total annual amount of precipitation, increase in the frequency of heavy rains, increase in the water temperature of rivers, lakes and other water bodies;
- increase in the frequency and duration of heat waves.

According to climate change scenarios assessment, likelihood of key hazards (especially related to air temperature and weather extremes), is high. Most significant changes are related to extreme values of climate variables, indicating that in the future Latvia will more often face weather conditions uncharacteristic and extreme for its territory. Exposure of health sector to key hazards is likely to increase.
The most significant **risk** factors with the comparatively highest level of risk and the highest probability of occurrence are “increased risk of heat stroke” and “risk of exacerbation of chronic diseases (cardiovascular diseases, diabetes, etc.) and possible increase in number of deaths” (Figure 3.2). Regarding risks to human health, the most negative impacts in the context of climate change are expected from the cardiovascular diseases.

In Latvia, impacts of climate change will potentially be felt most by vulnerable groups in society (families with young children, the elderly, people with chronic diseases (including physical and mental health problems), people with disabilities, poor and low-income people, people living in remote areas far from economically active regional centres, etc.).

Extreme weather events can also affect the health of people and households that are not at risk of poverty or social exclusivity. Impacts on health caused by the negative effects of climate change can affect the productivity of economically active household members, their ability to participate in the labour market.

Climate change has a major impact on people's physical and mental health and on socio-economic welfare. Impact effects can occur both directly (for example, flood or heat waves caused injuries, death cases, material damage), and indirectly, and can be identified only from long-term observations (e.g., physical and mental disorders, changes in social behaviour).

The impact on different social groups in Latvia may vary, depending on the specific geographic location and the ability of people to overcome the risks of climate change. High population in large cities (particularly in capital city Rīga) creates a high load on the environment, infrastructure, health and social care. Moreover, the high concentration of people at certain locations causes potentially greater losses, especially in the event of extreme climate change. The effect of "urban heat islands" caused by the urban environment and increasing due to climate change, should be considered. In contrast, the effects of climate change on rural areas may be associated with the lack of access to the necessary assistance and services, as well as with overall coping with climate risks. In Latvia, climate change will most likely affect groups of people already at risk of exclusion (families with young children, elderly people, people with chronic diseases, people with disabilities, poor people, etc.). Without the necessary support and assistance, their socioeconomic situation may deteriorate significantly, which in general can further increase social inequality in the country. Thus, climate change can be a threat to the basic value and productivity of the human capital in Latvia.

<u>Biodiversity and ecosystem services</u>

According to risk and vulnerability assessments, biodiversity and ecosystem services in Latvia is exposed to different **climate change impacts**, especially related to changing temperature, water and solid mass related.

The most significant impacts of climate change that may affect biodiversity and ecosystem services in Latvia are the following:

- increase in air temperature, increase in the minimum air temperature in winter;
- earlier onset of the spring, extension of the summer season;
- increase in water temperature and water level, increase in the frequency of surface water level fluctuations;
- changes in precipitation (increase in certain seasons), greater probability of more frequent and longer periods of drought, decrease of snow cover;
- increased frequency of extreme weather events and weather contrast.

Biodiversity and ecosystem services in Latvia in the context of climate change will be potentially affected by the several major **risks** (Figure 3.2). The highest probability of occurrence and the most explicit consequences are "the risk of contamination and eutrophication in water courses and water bodies" and "the risk of increase in water temperature and a longer stratification period, as well as a decrease in the volume of dissolved oxygen in the bottom layer", which will directly affect ecosystem services related to water courses and water bodies and their biological resources. In general, future climate change will have an impact on the direct provision of ecosystem services (such as uncultivated freshwater/marine plant and animal food) and regulatory ecosystem services (such as lifecycle maintenance, conservation of habitats and gene pools).

Climate change has additional impacts on already endangered biodiversity. At present, there is a risk that Latvia's natural biodiversity will decrease in the future. Biodiversity has a direct link to human welfare. As a result of destruction of species, habitats and ecosystems people will lose the opportunity to use their qualities and thus lose essential ecosystem services (e.g., bogs, besides biodiversity, are not only moisture regulators but also organic carbon sinks). The reduction of biodiversity and ecosystem services because of climate change and anthropogenic impacts interactions can threaten the maintenance and sustainable development of the natural capital of Latvia. The impact of climate change on biodiversity in Latvia is currently difficult to assess due to lack of data, although the process of mapping and evaluating the quality of biotopes of EU importance in whole of Latvia is completed. It is necessary to intensify research on new species in Latvia, to monitor invasive and aggressive alien species, as well as those species that are on the border of the distribution area in Latvia. It is also important to intensify the monitoring of plant pests, which are characteristic of warmer climate regions, as they can have a direct impact on biodiversity. The decline of biodiversity and ecosystem services because of climate change and anthropogenic interactions poses a threat to the preservation and sustainable development of Latvia's natural capital.

Biodiversity is also affected by landscape simplification (monocultures - continuous forest plantations with one type of species, agricultural lands with large areas of continuous crops). Ecosystems become less stable, contributing to the spread of invasive or alien species and pests. The more diverse the ecosystem, the more stable it is and the ability to adapt more quickly to climate change and can provide a wider range of ecosystem services.

<u>Agriculture and forestry</u>

According to risk and vulnerability assessments, agriculture is exposed to different **climate change** i**mpacts**: changing temperature, heat waves, drought, heavy precipitation, flood, changing participation patterns, extreme weather events.
More specifically, according to risk and vulnerability assessments, agriculture is more exposed to:

- increase in average air temperature in winters and decrease in the duration of the meteorological winter, increase in average air temperature in summers and an increase in the duration of meteorological summer, an increase in the probability of more frequent and longer periods of drought in the summers; increase in number of days with very high temperatures in summer;
- increase in total annual precipitation, changes in the amount of precipitation in the summer months, increase in the probability of sudden and severe thunderstorms in summer;
- greater uncertainty of snow cover thickness, decrease in the number of days with frozen soil, formation of air mass contact bands, creating suitable conditions for freezing rain; increase in wind gusts in some regions of Latvia.

Likelihood of key hazards (especially related to air temperature and changing precipitation patterns), is high. Most significant changes are related to extreme values of climate variables, indicating that in the future Latvia will more often face weather conditions uncharacteristic and extreme for its territory. Exposure of agriculture and food production to key hazards is likely to increase.

The most significant identified **risks** in agriculture are the risk of freezing of crops and plantations, the risk of crop and animal diseases and pests, the risk of crop and crop loss due to rainfall at harvest, the risk of faster soil drying and prolonged heat waves (Figure 3.2).

The risks are mainly of economic impact. The social impact arises indirectly from the economic risks: as the yield of certain crops decreases, the well-being of farm owners decreases, as does the farm's ability to employ workers, thus leaving a socio-economic impact on the region in which the farm is located. The impact of these risks is particularly significant in cases where several farms in the same region are affected (for example, herds affected by animal diseases).

Climate change in forestry can cause potential losses on average from 25% to 50% for tree growth or for wood stock and/or timber assortment value. Besides, in agriculture, climate change can lead to an average of 10-20% loss of the yield. The research also identifies the potential benefits in the context of climate change, such as increased productivity of crops, the possibility of choosing serotinous, but more efficient and/or higher quality varieties, the possibility to start growing crops, which demand a little longer vegetation period, the possibility to cut perennial grasslands several times, thus increasing the availability of fresh fodder, the possibility to grow high-quality seedlings in shorter period of time, practised so far in covered areas, and others.

<u>Tourism and landscape planning</u>

According to risk and vulnerability assessments, tourism in Latvia is exposed to different **climate change impacts**, especially related to temperature, wind and water.

Climate change can influence the development of tourism in Latvia both as a deterrent and as a developing factor. Climate change can impact the visual quality, aesthetic, ecological, economic, scientific, historical, and recreational value of landscapes, which in turn can change tourist behaviour and habits and affect the economy of a particular place, region or country.

Impacts of climate change, which in Latvia can significantly affect the tourism industry and landscape planning, are the following:

- increase in the annual average air temperature, increase in the average air temperature in the winter season, increase in the minimum value of the daily maximum temperature, increase in the average air temperature in the summer months;
- decrease in the number of frost days, increase in the number of days without thaws, decrease in the average number of days with snow cover, decrease in the average snow cover thickness in the winter months, shortening of the ice period, increase in the number of summer days, increase in the number of tropical nights;
- increase in the number of days of the vegetation period;
- increase in the annual precipitation, continuous increase in the duration of the precipitation period, increase in the number of days with heavy and very heavy precipitation, increase in the maximum daily precipitation;
- increase in maximum wind gusts on the seacoast, increase in the number of days with the maximum wind speed.

Risk and vulnerability assessments have shown that the **risks** posed by climate change for tourism in Latvia are: the risk of changing the length and characteristics of the winter tourism season; flood risk (rising water levels in rivers and lakes); risk of flooding and coastal erosion of the Baltic Sea and the Gulf of Riga, risk of changes of the length of the summer tourist season (Figure 3.2).

The identified risks for the tourism industry have the following consequences: shortening of the visibility period of winter landscapes; reduction of winter tourism (activities, events); increase in the cost for providing artificial snow; decrease in the number of winter tourists; losses for Latvian tourism entrepreneurs; degradation or destruction of forestry, agricultural, natural objects and urban landscape elements; degradation or destruction of natural and cultural-historical values; changes in the visual quality and value of the landscape; degradation or destruction of tourism infrastructure; a decrease or increase in the flow of tourists in the affected areas.

The research also identifies potential benefits in the context of climate change, such as the longer period of the visibility of the summer landscape and the diversification and increase in summer tourism offerings (activities, events), the benefits of outbound winter tourism offerings to companies.

The economic impact of climate change

Table 3.1 Assessment of ex-post economic costs of climate change

Climate change impact	Ex-post economic costs
Annual compensations paid by Latvian insurers for property damage (incl. natural disasters, 2020-2023	Compensations paid by Latvian insurers for property damage (incl. natural disasters) consists of more than 309 million EUR in the period. The biggest compensation amount is paid in 2023 of 103 554 756 EUR[148]
Compensations paid to Latvian farmers for damage caused by the adverse weather conditions (including compensation for damage caused by floods and droughts, combating infectious diseases, compensation for animals fallen from midges' bites, etc.), 2022-2023	256 160 EUR in 2022 and 114 386 EUR in 2023[149]
Funds from the State budget for unforeseen events, allocated to municipalities 2018-2023	
Flood damage compensations	3 277 737 EUR, total in the period
Heavy rainfall damage compensations	264 091 EUR, total in the period
Storm damage compensations	32 316 EUR, total in the period

Table 3.2 Sectoral estimates of the economic impacts of climate change related most relevant risks in Latvia (net impact, including losses and benefits

Sector	Economic Impact
Civil protection and emergency assistance	Losses Currently: ~ 11 million EUR/year In 2100: ~ 20 million EUR/year
Tourism and landscape	By 2100, losses due to flood risk 29 -52 million EUR/year; due to changes in winter tourism season- 3.4 million EUR and 15-20 million EUR due to coastal flooding and erosion risk.
Health and welfare	Losses In 2016-2100: ~26 million EUR/year
Built environment, costs due to floods	Losses From 2040 to 2070: about 1.5 million EUR/year, 2070-2100: up to 3 -3.2 million EUR/year
Agriculture	Potential average loss of 10-20% of the yield
Forestry	Direct damage caused by storms to forest owners About 164 million EUR, total in the last decade Damage caused by dendrophagous insects to forest owners About 36 million EUR, total in the last decade
Biodiversity and ecosystem services	Benefit of ~295 million EUR in 2100

[148] Market data. Available: https://www.laa.lv/market-data/ *(in Latvian)*
[149] Budget. Available: https://www.fm.gov.lv/lv/budzets2022 *(in Latvian)*

NAP 2030

To address climate change risks NAP2030 was adopted setting out adaptation priority – to reduce vulnerability of people, economy, infrastructure, construction, and environment to the impacts of climate change and to promote the use of opportunities created by climate change. To meet this aim, the NAP has more than 80 concrete adaptation measures and 5 Strategic goals/objectives (SO) to address climate change risks:

1. human life, health and welfare, regardless of gender, age and social background, are protected from the adverse effects of climate change;
2. national economy has the capacity to adapt to the adverse effects of climate change and seize the opportunities derived from climate change;
3. infrastructure and construction are climate-resilient and planned according to possible climate risks;
4. nature, cultural and historical values of Latvia have been preserved, and the negative impact of climate change thereupon has been reduced;
5. information based on scientific argumentation is provided, including monitoring and projections that promote integration of the aspects of adaptation to climate change in sectoral policy and territorial development planning documents, and public awareness.

The NAP 2030 defines the following principles for the development and implementation of Latvia's climate change adaptation policy:

- principle of scientific justification – the latest scientific achievements in climate change impact assessment, vulnerability and risk assessment, adaptation policies are used and regularly reviewed. This principle implies that the strategy is based on the latest scientific research and evidence-based results on the expected climate change in Latvia and its potential impact in specific areas and creates the basis where the Latvia's climate change adapting policy facilitates further development of the scientific capacity in Latvia. The principle of scientific justification must be respected in ensuring the qualitative and representative climate and adaptation monitoring, forecasting, modelling and assessment to be used for decision making in Latvia;
- principle of preventive action – prevention of existing impacts, vulnerabilities and risks related to climate change is aimed at preventing potential future losses, considering that today's investments can offset much greater losses in the event of a future risk, as well as allows to use the potential benefits. The development of the strategy considers potential scenarios for future climate development and the associated risks and benefits;
- principle of cross-sectoral efficiency – priority for adaptation strategy is based on current programmes and a wide range of policy instruments and provides additional benefits for mitigating climate change and achieving sustainable development objectives. Planned actions and measures in different sectors and fields are coordinated with each other, ensuring synergies in funding and providing other resources for the implementation of priority measures;
- integration in policy planning and decision making – an assessment of climate change impacts, risks, vulnerabilities, and appropriate adaptation measures become an integral part of the planning and decision-making process in all relevant areas and levels of activity. Emphasis is placed on actions aimed at integration of adapting aspects of climate change, such as territorial development, spatial and policy planning;

- principle of the protection of the most vulnerable groups – adaptation measures are developed to meet the individual needs of people, including the most vulnerable groups of the society. One of the strategic goals is to protect human life and health from the negative consequences of climate change.

To achieve the overarching goal, 5 strategic objectives (SO) are followed by directions of action (DA) (Figure 3.3). For each direction of action, priority measures have been developed.

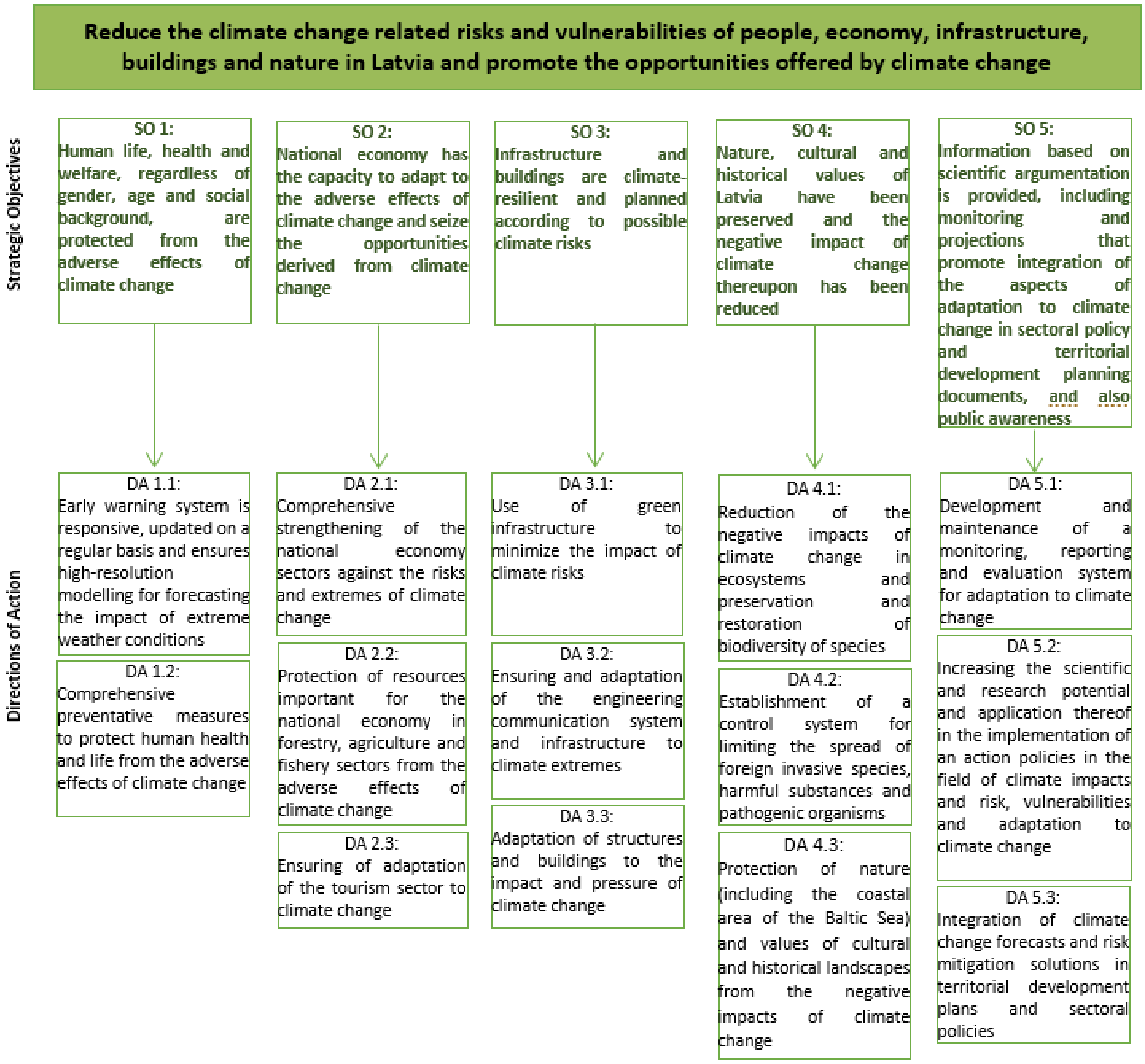

Figure 3.3 Layout of overarching goal, strategic objectives and directions of actions of NAP 2030

Strategic objective SO1 "Human life, health and welfare, regardless of gender, age and social background, are protected from the adverse effects of climate change" is achieved by actions in two areas:

- in the area of health and welfare, additional assistance should be provided to vulnerable groups of society (elderly people, children, people needing social care etc.) and to reduce the load on the health care system. The implementation of various preventive measures will reduce the load on the health care system that can be caused by extreme climatic events or factors;
- the task of the Civil Protection and Early Warning System is to protect people's health, life and safety in Latvia, in this case, by timely forecasting, warning and response to extreme climate events. It should be emphasized that the risk assessment of the

hydrometeorological phenomena is based on the results of a high-resolution numerical model adapted to the territory of Latvia.

Strategic objective SO2 "National economy has the capacity to adapt to the adverse effects of climate change and seize the opportunities derived from climate change" is aimed at preserving economic resources and promoting competitiveness because of the negative impacts of climate change and increasing the benefits from opportunities that climate change can bring to the Latvian economy (warmer and wetter climate, longer vegetation period, etc.). The directions of action are focused on preservation of resources and promotion of competitiveness in sectors important for the Latvian economy – agriculture, forestry, and tourism. The creation of effective financial instruments for compensation of losses, as well as the development and introduction of new products and technologies for the promotion of the provided opportunities relates to the economy as a whole.

Strategic objective SO3 "Infrastructure and buildings are climate-resilient and planned according to possible climate risks" is aimed at ensuring climate-resilient conditions in a changing climate, especially extreme. The directions of action are directed towards the use of the green infrastructure, timely and regular review of construction standards, and providing the climate-proofing of buildings, constructions, and engineering communications.

Strategic objective SO4 "Nature, cultural and historical values of Latvia have been preserved and the negative impact of climate change thereupon has been reduced" aims to preserve as much as possible the biological diversity of species that is threatened by various risks due to climate change, including invasive alien species and various pathogens, and to preserve as much as possible or at least not undermine the state of the ecosystems. The strategic objective also includes safeguarding cultural and historical values from the negative impacts of climate change. Directions of action are aimed at preserving biodiversity, protecting ecosystems, protecting nature and cultural heritage, protecting the Baltic Sea coast as a unique natural and cultural heritage site, and introducing and maintaining control systems for invasive alien species, pests and pathogens.

Strategic objective SO5 "Information based on scientific argumentation is provided, including monitoring and projections that promote integration of the aspects of adaptation to climate change in sectoral policy and territorial development planning documents, and also public awareness" is a horizontal objective related both to all six areas, described above in strategic objectives above. A policy must be built on knowledge, information, and awareness. This, in turn, requires investments in science and research, climate change and adaptation monitoring, data collection and processing, forecasting and modelling tools and instruments. The public needs to be aware of the impact and risks of climate change, including specific target groups such as entrepreneurs, travellers, etc., while emphasizing the responsibility of each person for the adaptation needs to climate change. This objective includes directions of action for strengthening the science and research capacity, developing a monitoring system, forecasting and modelling, making the necessary changes to spatial planning and other development planning documents and regulatory acts, as well as drafting national legislation for provision of hydrometeorological and climatic information as well as climate change data and adaptation indicators, effective adaptation measures application in all areas of national economy.

The List of Priority Measures is structured around measures in line with the five strategic objectives and the eighteen directions of action that were prioritized in the process of multicriteria analysis according to the following criteria: (1) the technical feasibility of a measure, (2) the compatibility of the cost of a measure with budgetary possibilities, (3) the organizational feasibility of the measure, (4) the multiplier effect of the measure, positive synergy with possible solutions of other problems. Below is an overview of measures with high and/or moderate priorities (Table 3.3).

Table 3.3 Overview of measures with high and/or moderate priorities

SO 1: - " Human life, health and welfare, regardless of gender, age and social background, are protected from the adverse effects of climate change "
DA 1.1: - Early warning system is responsive, updated on a regular basis and ensures high-resolution modelling for forecasting the impact of extreme weather conditions
Measures: 1. **Improve forecasting and early warning systems to warn of extreme weather events (2024)** 2. **Improve the national early warning system by launching and maintaining the cell broadcast service (i.e., mobile communications network) or another notification solution to ensure that the population is promptly informed of natural disasters and also, to the extent possible, of extreme weather events (2024)**
DA 1.2: - Comprehensive preventative measures to protect human health and life from the adverse effects of climate change
Measures: 1. **Promote accessibility of drinking water in public places for free (stations, bus terminals, bathing sites, parks, stores) and State and local government institutions (2024)** 2. **Provide the public with information on the effects of heat on human health and recommendations for protecting health during heat waves (2021)** 3. **Ensure additional prevention and awareness-raising measures on the impacts of and adaptation to climate change at educational institutions, social care institutions, and organise the training of the providers of childcare services and employees at children's camps, library employees (2021)** 4. **Conduct studies on correlation between the spread and activity of infectious disease carriers, infection status and population morbidity rates and changes in climate parameters (2027)** 5. **Upon informing the public, provide information on possible changes in infectious disease carriers caused by climate change in Latvia, symptoms of new diseases and preventive measures, particularly in high-risk areas (2024)** 6. **Prepare educational information on climate change, the impact thereof (including risks, potential losses) and adaptation thereto (2021)** 7. **Review the legal framework and improve the implementation thereof with regard to the necessity to install and maintain air cooling systems in public spaces, as a priority – in health care institutions, social care and social rehabilitation institutions, kindergartens, trains stations (where relevant) (2024)** 8. **Promote the formation of green spaces to create shadow areas in the urban environment (2030)** 9. **Improve the civil protection training course by including climate change issues and possible actions to adapt to the adverse effects of climate change (2021** 10. **Inform the public, especially chronic disease patients, of preventive healthcare measures before and during heat waves (2030)** 11. **Ensure drawing up of recommendations for social care institutions and social workers on preventive healthcare measures during heat waves (2030)** 12. **Perform periodic analyses of the total number of deaths, hospitalised people and people who received emergency medical aid throughout the year, split up over the days, seeking a link to the registered air temperature (2030)**
SO2: - " National economy has the capacity to adapt to the adverse effects of climate change and seize the opportunities derived from climate change "
DA 2.1. Comprehensive strengthening of the national economy sectors against the risks and extremes of climate change
Measures: 1. **Coordinate the improvement of the legal framework to reinforce the insurance market and expansion of services to reduce losses caused by climate change in all potentially affected sectors of national economy (2024)** 2. **Organise training for insurance companies on risks related to climate change (2021)**

3. **Improve the legal framework to promote investments, taking into account climate change risks and the necessity for the reduction of GHG emissions and preservation and increase of carbon dioxide removals (2022)**
4. **Organise training for the banking sector on green investments (including investments that ensure climate resilience), advantages thereof (2021)**
5. **Attract financing and assess the possibility of building and maintaining an information system (including integrated information on climate change indexes, satellite data on topography and precipitation, soil maps, mapping of EU protected habitats and distribution of specially protected nature territories, flood zones, provision of ecosystem services, etc.) that would help to take a decision on the type of land use, including taking into account the climate change scenarios of Latvia (2030)**

DA 2.2: Protection of resources important for the national economy in forestry, agriculture and fishery sectors from the adverse effects of climate change

Measures:

Agriculture

1. **Promote in practice the diversity of species and varieties of cultivated crops to reduce the risks caused by climate change (2027)**
2. **Implement the supervision and monitoring of harmful organisms and develop the supervision and monitoring of zoonotic agents and carriers of animal diseases, taking into account the risks of climate change (2027)**
3. **Restore and adapt land amelioration systems, including in populated areas, to prevent floods caused by climate change (increase in extreme rainfalls). If necessary, restore the natural sections crossing of watercourses to reduce the consequences of floods and stabilise ecosystems (2027)**
4. **Ensure that farmers are informed of insurance possibilities and advantages to receive compensation for losses caused by extreme weather events (also due to climate change) (2024)**
5. **Conduct studies on the role of the variable fauna of insects affected by climate change in the transmission of zoonoses and exotic diseases of animals and the dynamics of the risk of prevalence thereof in Latvia (2021)**
6. **Conduct studies on the carriers of infectious diseases facilitated by climate change and their tendency to spread to better understand the epidemiology, emergence, prevalence and burden of infectious diseases, and to further investigate how resistance develops and spreads, to improve early detection of infectious diseases and resistance development in the field of animal health (2027)**
7. **Conduct studies on the preservation of the existing constructed wetlands and creation of new constructed wetlands, and promote the creation and maintenance of constructed wetlands, particularly in areas where agricultural land dominates (2024)**

Forestry

1. **Improve the legal framework to promote the breeding of high-quality planting stock for the creation of lower density young stands (restoration of a forest with planting or seeding), thus increasing the resistance of the forest to climate change impacts and increasing its productivity (2024)**
2. **Improve the legal framework to promote the afforestation of unused, productive agricultural land (ensuring that EU protected habitats are not subject to afforestation) with species compliant with soil and growing type, creating wind-resistant stands (2025)**
3. **Consider the necessity of introducing specific conditions to promote the care for young stands (tree height 4–6 m) to ensure stability against various risks caused by climate change (2025)**
4. **Promote the development of the network of forest roads to ensure effective management of forest lands and management of other types of land under unfavourable climate conditions and also prompt response in emergency situations (fire, including peat fire). Create additional forest fire-fighting infrastructure in high-risk areas by carrying out a thorough assessment of the necessity thereof (2027)**
5. **Restore and adapt forest amelioration systems to prevent the negative impacts of climate change as much as possible (2027)**
6. **Promote the use of access equipment with lower pressure on soil to protect soil in forests during winters under frost-free conditions (2027)**
7. **Develop scientifically valid guidelines for forest management to promote the climate resilience thereof (2028)**

8. **Ensure the harmonisation of measures provided for in the new policy planning document for the forestry sector and the necessity to adapt to climate changes (2022)** 9. **Conduct studies on the impact of risks caused by climate change on ecological, social and economic functions of forests (2024)** **Fishery** 1. **Identify natural water fish species and fish species reared in aquaculture in Latvia that are endangered due to climate change (2024)** 2. **Review the Guidelines for Artificial Reproduction of Fish Resources and determine therein larger reproduction volumes for natural water species affected by climate change, if necessary (2024)** 3. **Inform the involved parties of the possible climate risks and possibilities of adaptation in the fishery sector (2024)** 4. **Elaborate a list of invasive water biological resources species that have entered Latvia as a result of the impacts of climate change (2020)**
DA 2.3: Ensuring of adaptation of the tourism sector to climate change
Measures: 1. **Promote adaptation of cultural monuments and natural monuments of national significance to the impacts of climate change (2024)** 2. **Provide educational information to tourism companies on climate, climate change and possibilities of entrepreneurship adaptation (2020)** 3. **Provide warning and safety measures of coastline visitors at potential mud slide, landslide and flooding risk locations (2024)** 4. **Ensure adjustment of tourism infrastructure to changes in sea dunes and bluffs caused by erosion and ensure appropriate access to the beach (2024)** 5. **Supplement the official tourism portal of Latvia http://www.latvia.travel with information useful for tourists on the climate of Latvia, for example, information on the water level in rivers used for water tourism, more complete information on the climate of Latvia in all seasons (2021)**
SO 3: Infrastructure and buildings are climate-resilient and planned according to possible climate risks
DA 3.1: Use of green infrastructure to minimise the impact of climate risks
Measures: 1. **Identify primarily important places in cities and other densely populated areas where green infrastructure can provide the greatest benefit and promote adaptation to climate change (2024)** 2. **Upon developing or recovering urban areas, devise and implement solutions of green infrastructure that promote adaptation to climate change (independently)**
DA 3.2. Ensuring and adaptation of the engineering communication system and infrastructure to climate extremes
Measures: 1. **Assess and plan the necessity for additional capacity for the collection of rainwater in cities, including the performance of maximum precipitation estimates for various probabilities under the impact of climate change to protect buildings and structures from rainwater load (foundation wash-out, etc.) (2024)** 2. **Improve rainwater systems and culverts in cities by supplementing them with the elements of green infrastructure, defining the necessary capacity in advance, considering climate change, and promote sustainable water management and use of rainwater in places where water is not required in the quality of drinking water (2030)** 3. **Develop guidelines for the integration of changes in rainwater run-off due to climate change in the planning and design of road construction, and adaptation of existing road structures (2024)** 4. **Develop guidelines for ports and berths on adaptation to potential floods from the sea and other hazard caused by climate change according to the latest scenarios of climate change (2024)** 5. **Identify the most sensitive electronic communications infrastructure that requires adaptation to climate change and risks related thereto (2022)** 6. **Ensure adaptation of the current transport (roads, railways, airports, ports) and electronic communications infrastructure to climate change (2024)** 7. **Review laws and regulations governing the field of transport (roads, railways, airports, ports) and electronic communications infrastructure according to climate change forecasts (2021)** 8. **Restore the values of meteorological and hydrological characteristics included in the design calculations of land amelioration systems and hydrotechnical structures (run-off layers typical for**

seasons with a certain likelihood of recurrence, drainage modules, annual average run-off layer, etc.) (2025)
DA 3.3: Adaptation of structures and buildings to the impact and pressure of climate change
Measures: 1. Promote the use of materials and technologies, including introduction of green infrastructure solutions, in the buildings of the public sector and largest companies that prevent heat accumulation at the buildings to reduce the necessity to install and use conditioning systems (2024) 2. Clarify the values of precipitation loads in the construction standards for the types of existing buildings to improve the accuracy of planning and reduce potential hazard (2021) 3. Identify the most sensitive State and local government buildings that require adaptation to climate change and risks related thereto (2020) 4. Develop guidelines for the improvement of existing building structures to reduce threats related to climate change, including extremes (2021) 5. When changing Latvian construction standards, their requirements are to be adjusted to the current climate change scenarios and regulatory framework reducing the risks caused by climate change must be included therein (2023)
SO 4: Nature, cultural and historical values of Latvia have been preserved and the negative impact of climate change thereupon has been reduced
DA 4.1: Reduction of the negative impacts of climate change in ecosystems and preservation and restoration of biodiversity of species
Measures: 1. Integrate the aspects of adaptation of climate change into all appropriate natural and environmental protection campaigns/projects (2030) 2. Integrate climate change impacts, scenarios and adaptation measures into the Habitat Management Guidelines (2020) 3. Develop a study on climate-sensitive wild species for the survival of which certain micro-climatic conditions are required in Latvia (2030) 4. In improving laws and regulations which provide for SPNT management, it is necessary to include there the norms regarding compliance with adaptation to climate change, including to maintain habitats and species which are sensitive to climate change and are characteristic to Latvia in an optimal condition (2024) 5. Develop a study on the dismantling of mechanical obstacles in rivers (where possible) to increase the current natural flow of rivers to reduce the negative impacts of climate change (2022) 6. Adjust the quality assessment of surface water bodies (including the monitoring of cyanobacteria and chlorophyll) by increasing the monitoring frequency during the summer season, considering increase in water temperature due to climate change (2024) 7. Develop a study by providing proposals for the implementation of measures to maintain biodiversity at the level of landscapes, considering the impacts of climate change. (2030)
DA 4.2: Establishment of a control system for limiting the spread of foreign invasive species, harmful substances and pathogenic organisms
Measures: 1. Consider climate change impacts when updating the list of invasive species (2024) 2. Improve control and preventive measures for invasive species, considering climate change (2024)
DA 4.3: Protection of nature (including the coastal area of the Baltic Sea) and values of cultural and historical landscapes from the negative impacts of climate change
Measures: 1. Integrate the aspects of adaptation to climate change in SPNT nature conservation plans and national, regional and local development planning documents focused on sustainable use and management of coastal areas (2027) 2. Promote the implementation of measures for maintaining the stability of the grey infrastructure against risks caused by climate change (flood, flood from the sea, bathing sites of the sea and the Gulf of Riga, inland bathing sites endangered by coastal erosion) (2024) 3. Assess what measures to reduce the coastal erosion of the Baltic Sea and to reinforce the coastal areas are valid and ensure the implementation of such measures to reinforce the coastal areas where this is of priority importance and valid, considering climate change scenarios (2030) 4. Develop a methodology for the detailed study of landscapes, to conduct research and to determine landscape areas and places that are sensitive to climate change (2024)

5. **Develop guidelines for maintaining and preserving landscape territories that are sensitive to climate change (2026)**
SO5: Information based on scientific argumentation is provided, including monitoring and projections that promote integration of the aspects of adaptation to climate change in sectoral policy and territorial development planning documents, and also public awareness
DA 5.1: Development and maintenance of a monitoring, reporting and evaluation system for adaptation to climate change
Measures: 1. **Improve and maintain the database of climate change analysis and forecasting, ensure public access thereto (2030)** 2. **Create and maintain a single database on losses caused by disasters, including weather conditions facilitated by climate change (2030)** 3. **Assess the methods for monitoring coastal erosion and develop a permanent monitoring methodology suitable for Latvia (2024)** 4. **Resume and ensure continuous monitoring, assessment of geological processes of coast areas and modelling of coastal erosion (2030** 5. **Assess the existing legal framework, and improve it, if necessary, for cooperation between authorities to ensure the operation of the climate change monitoring system, including the collection of data necessary for the operation of the system (2021)**
DA 5.2 Increasing the scientific and research potential and application thereof in the implementation of an action policies in the field of climate impacts and risk, vulnerabilities and adaptation to climate change
Measures: 1. **Ensure the implementation of research work that aims at studying the vulnerabilities of the population, national economy, infrastructure, buildings and nature of Latvia to climate change impacts, developing adaptation to climate change solutions and climate-resilient development, and promoting the use of opportunities derived from climate change (continuously)** 2. **Strengthen international cooperation in science and research on climate change impacts, risks and vulnerabilities, adaptation to climate change (continuously)** 3. **Update and publish future climate change scenarios developed by Latvia, supplementing the scenarios developed so far with indicators that have not been reviewed up to now and updating the data used, considering the latest IPCC reports (including action direction 6) (2024)**
DA 5.3.: Integration of climate change forecasts and risk mitigation solutions in territorial development plans and sectoral policies
Measures: **1.** **Integrate the aspects of climate change, issues related to reducing the impacts thereof and adjustment to climate change in the development and updating of territorial development planning and sectoral policy documents of all levels (2025)** **2.** **In developing local government development programmes, ensure the inclusion of detailed actions and necessary measures for adaptation to climate change (2025)** **3.** **Develop forecasts of floods from the sea for all cities, the administrative territories of which are bordering the sea (2024)** **4.** **Develop or update flood risk management plans for coastal cities of Latvia by previously assessing for which cities such plans are necessary (2024)** **5.** **Organise training for local governments on climate change risks and inclusion of their impacts in territorial planning, taking of decisions by local governments (2022)** **6.** **Ensure that climate-resilient development aspects are considered when developing urban spatial plans (street/zone level) (2027)** **7.** **Carry out expert training on integrated aspects of climate change mitigation and adaptation to climate change in sectoral and regional policies and activities (2024)**

Evaluation of implementation of adaptation measures of NAP is planned in the midterm and at the end of the planning document period. The midterm evaluation report of implementation is to be prepared and submitted to CoM by 31st December 2026 (information about period 2020-2025). The final report – by 31st December 2031 (information about period 2026-2030).

Funding for identified priority measures is to be provided within the framework of state, local government, and external funding, depending on the content of the measure. NAP2030 recommends that municipalities, when preparing and updating development programmes and other development planning documents, including spatial planning documents, consider the need for adaptation to climate change and develop and incorporate appropriate targeted measures, as well as further assess climate risk and adaptation aspects in the already planned measures also, generally considering adaptation as one of the horizontal actions. No additional funding for adaptation to climate change is planned in the current budget framework and using EU funding. Adaptation measures are largely related to the activities already underway (e.g., civil protection, flood control, building climatology, construction standards, etc.), and NAP2030 provides a common view, coordination and effective operation.

3.3. Adaptation priorities and barriers

Domestic priorities are the implementation of the NAP 2030 and the integration of adaptation aspects into other national level strategies and plans and sectoral policy documents.

The decision-making process on climate change adaptation requires larger administrative capacity and coordination of action among various stakeholders (governmental, scientific institutions, local authorities, different enterprises among others). Another challenge is to involve the private sector – not only public, but also private actors should implement adaptation measures, because individuals are often confronted with climate change risks.

The incentives are often not sufficient to reach the desired level of adaptation. One of the most significant barriers is the available financing to adaptation measures.

3.4. Adaptation strategies, policies, plans, goals and actions to integrate adaptation into national policies and strategies

Latvia is actively integrating climate change adaptation policy and measures into decision making process and territorial development planning and spatial planning procedures. The importance of preventive measures is underlined. Further development of current legislation, e.g., construction standards, land-use guidelines etc., shall take into consideration climate change related impacts. Apart from that, Latvia integrates climate change adaptation goals into sectoral policies, plans and programs, for example, references to NAP2030 are included in "Strategy of Latvia for the Achievement of Climate Neutrality by 2050", NECP 2021-2030, NDP 2027, "Latvian National Plan of Civil Protection" etc. Climate change adaptation aspects are also included in the Environmental Policy Guidelines for 2021-2027 (EPG2027) approved by CoM on 31st August 2022.

Latvia actively works on integrating climate change adaptation into sectoral policies, plans and programs, for example, references to NAP2030 are included in 'Strategy of Latvia for the Achievement of Climate Neutrality by 2050', NECP 2021–2030, NDP 2027, 'Latvian National Plan of Civil Protection' etc.

The Cultural Policy Guidelines 2022-2027 "Culture State"[150] aim at a sustainable and accessible culture for human growth and the development of a national state.

The formulation of the objectives of the Guidelines considers the climate change aspect, stating that every sub-sector of culture can contribute to the country's progress towards climate neutrality and climate resilience by implementing activities that raise public awareness and adaptation of climate change.

[150] https://likumi.lv/ta/id/330444-kulturpolitikas-pamatnostadnes-2021-2027-gadam-kulturvalsts

Latvian Architecture Strategy 2022-2027, developed by the National Architectural Council in cooperation with the Latvian Architects Union and industry professionals.

National Library of Latvia (NLL) Emergency rescue plan preparing the NLL for disaster risks that may arise from climate change, ensuring the preservation of the stock in a preventive manner, adapting to the changes in roaming areas, and creating a culture of preparedness for crisis situations (in the development phase).

Adaptation and contribution to climate change are included in the draft Archives Strategy and in the draft Culture Monuments Protection Strategy 2023-2027.

A draft operational strategy for the State Revenue Service for the period 2023-2026 has now been developed. One of the priorities is sustainability: Investing in the future of society to adapt to global change under the objective of "Optimised resource management and mitigation of adverse environmental and climate impacts". A number of climate change adaptation measures are scheduled to be implemented by 2026.

A National Regional and Local Road Construction Strategy has been developed by 2027: the Road Maintenance Programme and the Road Construction Strategy include measures to reduce the proportion of roads in poor condition, which is one of the key factors for climate impacts in relation to road infrastructure.

The EPG2027 is a medium-term policy planning document for the environmental protection sector. It is developed in accordance with the NDP 2027 and the strategic objectives of the European Green Deal.

EPG2027 have two directions of action related to Climate change adaptation and promotion of resilience:

- 4th Course of action: Reduce the vulnerability of Latvia's people, economy, infrastructure, buildings and nature to the effects of climate change;
- 22nd Course of action: Adaptation to climate change and flood risk management.

Several measures related to Climate change adaptation and promotion of resilience are included in EPG2027:

- improve the stormwater management system in cities and towns by developing local governments' climate change adaptation strategies;
- develop and implement risk assessment-based local government adaptation strategies to climate change;
- develop strategies, plans or guidelines for adaptation of economic sectors to climate change based on risk assessments;
- assess the impact of state budget planning on mitigating and adapting to climate change;
- conduct an assessment of current practices and develop proposals to integrate aspects of climate change mitigation and adaptation into economic sectors.

Regional Policy Guidelines for 2021-2027 (approved by Cabinet Order No. 587 of 26th November 2019).

There is established an expert group on adaptation and inter-institutional working group on adaptation. Both groups actively contributed to the development of the NAP2030. Experts from agencies, scientific institutions, ministries, municipalities, business and NGOs participated in workshops and conferences regarding climate change scenarios, risk and vulnerability assessment, discussions on indicators and adaptation monitoring system, flood risk warning system, spatial and coastal zone planning. Publications and information with explanations of results and outcomes from projects and documents were published and promoted in the media.

In the education system of primary and secondary schools in Latvia, environmental science is mainly run as an interdisciplinary theme and is integrated within the content of various courses as biology, geography, chemistry, natural science and physics. New disciplines' standard projects foreseen that forseen environmental science and sustainable development issues are included in school studies.

3.5. Progress on implementation of adaptation

Reporting on the implementation of the NAP2030 by the MoCE to the CoM is planned as an informative mid-term report by 31st December 2026 on the progress of the implementation of the NAP2030 and by 31st December 2031 an informative final report on the implementation of the NAP2030.

For the preparation of informative reports on the implementation of the NAP2030, all responsible authorities and authorities with a shared responsibility that are involved in the implementation of the Plan will have to provide information respectively by 1st June 2026 and by 1st June 2031.

EPG2027 was developed and approved by the CoM on the 31st August 2022 where also is envisaged adaptation goal implementation evaluation.

MoCE, in cooperation with the responsible and co-responsible authorities, shall prepare an informative report regarding the implementation of the directions of actions and measures referred to in the guidelines:

- for the years 2021, 2022, 2023 and 2024, by 1st October 2025;

- for 2025, 2026 and 2027 until 1st July 2028.

National legislation CoM Regulation No. 675 (25th October 2022) establishing procedures for the preparation and reporting of national adaptation measures and information on monitoring of climate change indicators and climate change impact indicators was adopted on 25th October 2022.

Latvia has developed a new legislative act-Climate Law which is currently under discussion in Saeima. The Law will include a section on adaptation to climate change, which regulates the development of an adaptation strategy, the integration of climate change adaptation policy objectives and measures into sectoral policies, as well as the assessment of climate risks and vulnerabilities. Climate Law will also strengthen the institutional framework for climate change monitoring.

3.6. Monitoring and evaluation of adaptation actions and processes

<u>Climate change modelling, projections and scenarios</u>

Monitoring of climate change and climate change adaptation system in Latvia consists of two parts. The first is based on climate change analysis, while the second is based on a sectoral vulnerability assessment:

1. **climate change monitoring** is carried out by summarizing and analysing selected meteorological parameters and climate indexes, their changes over time and trends.
2. **climate change impact monitoring** database maintains the selected climate change impact indicators, to monitor sector's vulnerability to observed climate change.

LEGMC is the Latvian National Hydrometeorological and Climate Service and is responsible institution for developing of climate change monitoring, modelling, projections, and scenarios.

LEGMC performs climate monitoring by continuous climate change data collection, as well as monitoring extreme events, data storage and analyses of long-term observation results. LEGMC ensures implementation of the “State Environmental Monitoring Programme 2015–2020” which consists of four parts: 1) air and climate change monitoring, 2) water (surface and groundwater) monitoring, 3) land (incl. coastal zone erosion) monitoring, and 4) biodiversity monitoring. LEGMC observation network is established and connected with interactive map where data from meteorological observations is provided. Regarding flood risks in Latvia, LEGMC has developed flood risk management plans and early flood warning systems for all river basin districts of Latvia. Flood risk information system and maps are published online[151,152].

LEGMC prepares reports and provides information to the public, to the State and local governments, and to international organizations. It also provides services for customers, including national aviation authorities, Latvian National Armed Forces, civil protection authorities and energy companies. Climate change information is presented in various formats, tailored to the user needs. LEGMC regularly publishes 10-day weather data, summarizing the recent climatic events and putting them in context of climate change. LEGMC also actively publishes information on social networks, regarding climate monitoring, projections, and advances in the climate change research. Information regarding specialized climate indices is prepared for various stakeholders, for example standard precipitation index (SPI) for agriculture and insurance companies.

LEGMC experts have also conceptually designed a system for monitoring adaptation to climate change on a national scale. Such monitoring system is essential for further development of national political strategies, since it consists of data and indicators that measure vulnerability of different economic sectors (e.g., health and welfare, agriculture, forestry, civil engineering) due to climate change.

Regarding climate modelling, projections, and climate change scenarios, LEGMC has performed a detailed analysis of long-term historical climate data and developed future change scenarios (until year 2100)[153]. Multiple climate models are adapted to the territory of Latvia by bias correction and statistical downscaling methods. Past and future climate change analysis has been carried out as part of the framework of the Norwegian financial instrument 2014–2021 program "Climate change Mitigation, Adaptation and Environment”, based on the available LEGMC meteorological observation station data, for the latest “SSP” (Shared Socioeconomic Pathway) climate model scenarios defined in the Sixth Assessment Report of the United Nations Intergovernmental Panel on Climate Change (IPCC 6th Assessment Report)[154].

For wider public the visualization of the climate change scenarios is available online in the Climate Change Analysis Tool: https://klimats.meteo.lv/klimats_latvija/klimata_riks/. The Climate Change Analysis Tool allows users to explore current and projected future climate change in Latvia in the form of maps and graphs. Visualisations display both annual and seasonal 30-year average values of the selected climate indices for Latvia and all

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[151] Flood risk and flood threat maps of Latvia. Available: https://videscentrs.lvgmc.lv/iebuvets/pludu-riska-un-pludu-draudu-kartes *(in Latvian)*

[152] Flood Risk Information System. Available: https://videscentrs.lvgmc.lv/iebuvets/hidrologiskas-prognozes *(in Latvian)*

[153] Climate change tool. Available: https://klimats.meteo.lv/klimats_latvija/klimata_riks/

[154] Climate change in Latvia. Available: https://klimats.meteo.lv/data/climate_change_data_viewer/report_downloads/LVGMC-klimata-parmainas-2024.pdf *(in Latvian)*

municipalities. A summary report of these results is available, and all data is available to download for further scientific research.

Observed patterns of climate change

Recently the LEGMC have carried out several studies of climate change. In the report "Past and future climate change in Latvia" LEGMC has analysed past climate change in Latvia and developed climate change scenarios for Latvia for the period until the year 2100. LEGMC report that changes in climate indices have been observed so far in Latvia, with the air temperature in the previous climate normal period (1991–2020) being 1.2 °C higher than in the climate reference period (1961–1990). Climate models predict that air temperature in Latvia will continue to rise during the 21st century, and during the 2071–2100 period it will be 2.8 °C higher than the reference period in the event of minor (+8.4 [±0.8] °C), 3.7 °C – medium (+9.3 [±1.0] °C), and 4.9 °C – significant (+10.5 [±1.0] °C) climate change.

The manifestations of climate change in the territory of Latvia so far have marked an increase in the total amount of atmospheric precipitation, and such a trend is also predicted until 2100. The only season in which a reduction in precipitation is predicted (in a scenario of significant climate change by 4.0% compared to the reference period) or a small increase (in the case of moderate and minor climate change) is the wettest season to date – summer. In turn, the largest increase in precipitation is predicted in winter, when in the event of significant climate change, precipitation will increase by as much as 62.3% compared to the reference period.

With the increase in the average air temperature and the change in the amount of precipitation, changes were also observed in snow cover thickness, which in the climate reference period with 7 cm was 3 cm thicker than in the 1991–2020 period. The trend of decreasing snow cover is also predicted in the future – at the end of the century snow on average in Latvia will be 3 [±1] cm in the event of minor climate change, 2 [±1] cm – medium and 1 [±1] cm in case of significant climate change.

In recent decades, the average wind speed in Latvia has decreased, and climate models predict that at the end of the 21st century the average wind speed in Latvia will be similar to that observed in the period from 1971 to 2000 (3.5 m/s). It can be territorially observed that the differences between coastal (especially the Baltic high seacoast) and inland regions will become larger during this century, with the average annual wind reaching up to 4.7–4.9 m/s and the number of stormy days up to 17 days on the Baltic coast at the end of the century.

By 2100, the sea level in Latvia will rise to 53.2 [±17.5] cm in the scenario of minor climate change, 62.9 [±18.0] cm – medium, and 70.9 [±19.4] cm in case of significant climate change.

Table 3.4 summarizes the observed and projected changes in the Latvian climate based on the recently developed reports.

Table 3.4 Previous and future changes (according to the SSP1-2.6 and SSP2-4.5 and SSP3-7.0 scenarios) in climate variables in relation to the long-term mean climate variable values in the past

Climate variables	Previous changes (1991–2020 with respect to 1961–1990)	Future changes (2071–2100 with respect to 1961–1990)
Maximum air temperature	Annual mean value of maximum air temperature has increased by 1.1 °C, while maximum and minimum value – by 1.4 °C and 1.5 °C respectively	Annual mean maximum air temperature, according to minor, medium and significant climate change scenarios, can increase by 2.8–5.0 °C, while a more rapid increase for extreme values is projected – maximum values of annual maximum air temperature by 3.2–6.4 °C, and minimum value of annual maximum air temperature can increase by 4.5–8.4 °C
Mean air temperature	Annual mean and maximum value of mean air temperature have increased by 1.2 °C, while minimum value has increased by 1.8 °C	Until the end of century, annual mean air temperature can increase by 2.8–4.9 °C, while annual maximum value – by 2.9–5.5 °C. Annual minimum value of mean air temperature is projected to increase by 5.7–9.9 °C
Minimum air temperature	Annual mean and maximum value of minimum air temperature have increased by 0.9 °C and 0.8 °C respectively, while minimum value – by 2.1 °C	Most significant increase is projected for minimum values of annual minimum air temperature: 8.0–12.5 °C, while for annual mean values a 2.9–5.1 °C increase is predicted and for maximum values an increase of 2.6–5.2 °C
Summer days	Due to observed climate change summer days have increased by 5 days	By the end of 21st century, the projected increase of summer days on average is 19 to 44 days

Climate variables	Previous changes (1991–2020 with respect to 1961–1990)	Future changes (2071–2100 with respect to 1961–1990)
Tropical nights	Latvia has always had a small number of tropical nights, so no valid conclusions about the trends in changes of the number of such nights can be made, however, an increase in the frequency of such nights has been observed during the last couple of decades	The number of tropical nights by year 2100 can increase by 19 to 44 nights
Heatwave length	During the observed period, the average length of heatwaves has increased by 5 days	Average heatwave length is expected to increase by 14–34 days by the end of the century.
Growing season length	The general increase in air temperatures has also affected the length of the growing season – by an average of 3 additional days since 1961	It is expected that by 2100 the increase of air temperatures will affect the duration of the growing season – the scenarios climate models project an extension of the growing season by 3027 to 6649 days
Frost days	During the observed period, the average number of frost days in Latvia has decreased by 12 days	The number of frost days may decrease by an average of 38 to 70 days
Ice days	Similar to frost days, the average number of ice days in Latvia has decreased on average by 14 days	By 2100, the number of ice days will probably decrease by 28 to 43 days
Coldwave length	During the observed period, the average length of coldwaves has decreased by 4 days	Average coldwave length is expected to decrease by 5–6 days by the end of the century
Diurnal temperature range	Diurnal temperature range has increased by 0.2 °C since 1961	Mean annual diurnal temperature range is expected to decrease by 0.1–0.2 °C by 2100, in large part due to the winter season, when the diurnal temperature range will decrease by 1.1–1.6 °C

Climate variables	Previous changes (1991–2020 with respect to 1961–1990)	Future changes (2071–2100 with respect to 1961–1990)
Precipitation totals	Past climate change has resulted in the increase of annual precipitation amount in Latvia by an average of 4.4%, or about 28.6 mm	By the end of the century, an increase of 18.2–24.1% (about 119.7–158.2 mm) in annual precipitation amount is projected
Highest 1-day precipitation amount	On average, the annual maximum one-day precipitation amount in Latvia has increased by 1.8 mm	Climate model projections for this index are still under review
Highest 5-day precipitation amount	Since 1961, the maximum 5-day precipitation amount on average has increased by 2.8 mm	Climate model projections for this index are still under review
Simple daily intensity index	At the end of the discussed period, the simple daily intensity index is higher by 0.3 mm/wet days than at the beginning of the period	The scenarios project an increase of the intensity of precipitation – by about 0.4–0.7 mm/wet days
Heavy precipitation days	Within the discussed period, the average number of days with heavy precipitation has increased by 3 days	By the year 2100, the number of days with heavy precipitation will increase by an average of 4 to 8 days
Very heavy precipitation days	Very heavy precipitation days in Latvia are observed very rarely, and so far, there has been no change in the number of such days	Climate model projections for this index are still under review
Average snow cover thickness	Average snow cover in Latvia since 1961 has reduced by 3 cm	By the end of century average snow cover is projected to decrease by 4 to 6 cm, that is more than 50% of 1961-1990 average thickness (7 cm)
Number of days with snow cover	Number of days with snow cover has decreased by 23 days	Due to technical nature of snow cover climate models, there are no developed projections for this variable
Annual-mean wind speed	Since 1966, average wind speed in Latvia has decreased by 0.5 m/s	In the future projections show uncertainty, with mean wind speed increasing by 0.1 m/s in a minor climate change scenario, but in

Climate variables	Previous changes (1991–2020 with respect to 1961–1990)	Future changes (2071–2100 with respect to 1961–1990)
		significant climate change – decreasing by 0.1 m/s
Stormy days	Stormy days in Latvia are observed very rarely, and up to recently, the number of such days on average in Latvia has decreased by 1 day	Only small changes in the mean number of stormy days are projected for Latvia, so no valid conclusions about changes in numbers of stormy days can be made
Calm days	Due to the decrease in mean wind speed, the number of calm days has increased by 19 days	Most climate models project increase in the number of calm days in Latvia on average by 20 to 38 days

3.7. Information related to averting, minimizing and addressing loss and damage associated with climate change impacts

Summary of observed and prognosed climate changes in Latvia:

- between 1961 and 2020 the average air temperature in Latvia increased by 1.2 ˚C on average (largest increase of 2.0 °C is observed in the winter season). By 2100, the average air temperature could rise by 2.8 ˚C to 4.9 ˚ C.
- the number of frost days between 1961 and 2020 has decreased by about 12 days, when comparing the periods of 1961–1990 and 1991–2020. By the end of the century, the number of frost days will decrease by 38–70 days.
- the number of ice days between 1961 and 2023 in Latvia varies between 9–99. When comparing the periods of 1961–1990 and 1991–2020, the number of ice days has decreased by 14 days. The number of ice days will decrease to only 42–45 days in 2011–2040 and about 19–34 by 2100.
- since 1961, precipitation in Latvia has increased by 4.4% or 28.6 mm. By the end of the century, it will increase by 18.2–24.1% or about 119.7–158.2 mm. The most significant increase is expected during winter (in a significant climate change scenario – an 62.3% increase), while in the summer precipitation will decrease in some parts of Latvia.
- the average vegetation period in Latvia has been 163–245 days. As a result of the rise in average air temperature, it will extend by an average of 1 to 2 months by 2100.
- since 1961, the number of days with snow cover in Latvia has decreased by 23 days. By 2100, average snow cover thickness in Latvia can be expected to shrine by at least 50%.

Under the impact of recent climate change a uniform increase in air temperature, expressed in mean, minimum and maximum air temperature values is observed. During the period 1961–2020 annual mean air temperature has increased by 1.2 °C, annual minimum temperature by 0.9 °C, but annual maximum temperature by 1.1 °C.

Most of the changes have been observed in winter and spring seasons. The number of frost days (days when daily minimum temperature is below 0.0 °C) in the period from 1961 to 2020 ranges from 86 days in the coastal area of the Baltic Sea to 160 days in Alūksne and Vidzeme upland areas, and during this period the average number of such days in Latvia has decreased by 12 days. The average number of ice days (days when daily maximum temperature is below 0.0 °C) in Latvia has decreased on average by 14 days, in some locations – by an average of 12–17 days, and average cold wave length (days when daily minimum temperature is below –20.0 C for at least 2 consecutive days) has also decreased by 4 days.

Changes are also observed in the climate index values characterizing extreme hot weather conditions. An increase of frequency in tropical nights (daily minimum temperature is above +20.0 °C) and the length of heatwaves (days when daily maximum temperature is above +27.0 C for at least two consecutive days) has been observed in the last couple of decades. The general increase in air temperatures has also affected the length of the growing season – since 1961 by an average of 3 days and in West Latvia by up to 17 days.

In the period from 1961 to 2020 an increase in annual precipitation also has been observed by an average of 4.4% or 28.6 mm. Similar to changes in air temperature, the most significant increase in the amount of precipitation has been observed during the winter season; an increase is observed also during the spring and summer seasons, while in the autumn season there has been a slight reduction in the amount of precipitation. Precipitation intensity has also increased by an average of 0.3 mm/wet day, which in turn has increased both the intensity and frequency of extreme precipitation events.

Changes in climate parameters and indices over time affect not only natural capital (species, habitats, ecosystems) but also health, well-being, safety and economic activities of the population. The most significant risks identified in Latvia are seasonal changes (including changes in vegetation period); wildfires; increased spreading of pests and pathogens, tree diseases, displacement of local species, invasion of new species; prevalence of respiratory diseases; infectious diseases; heat strokes; floods caused by intensive precipitation; storm surges; power disturbances; runoff increase, hydropower oscillations; decrease of frost occurrence and intensity, frost without consistent snow cover; drought; eutrophication; infrastructure damage, equipment overheating; reduction in water runoff during the summer season.

Projected increases in the precipitation and its intensity might increase the frequency of hazards such as heavy precipitation events and flooding. However, as there remain seasons with small or no precipitation increase, droughts remain a possibility in Latvia.

In the long-term period, average wind speed curve is trending slightly downwards and, although climate models show uncertainty, they predict that mean wind speed will stay constant up to the end of the 21st century. The number of stormy days in Latvia (days when the average wind speed is above 10.8 m/s) are also projected to remain mostly constant, with only a slight increase. This means that climate hazards, such as cyclonic storms or convective storms will be observed in the future.

Most significant climate change are related to extreme values of climate variables, indicating that in the future Latvia will more often face weather conditions uncharacteristic and extreme for its territory. Events, such as heavy precipitation and floods, heatwaves or uncharacteristically strong storms will be observed in the future.

Changes in temperature, wind and precipitation patterns can have both direct and cascading effects. For example, due to the increased air temperature the ice cover in the Baltic Sea in winters has decreased, which affects all species vulnerable to decreasing ice cover. In addition, as the ice cover area and the length of the ice season decreases, larger coastal areas are exposed to coastal erosion during the intense storm season. This is accompanied by rising water levels because of climate change. In future key hazards are expected to affect not only natural capital, but also human health, safety, well-being and economics.

In the frame of the pre-defined project “Integration of climate change policy in sectoral and regional policies” funded under the Norwegian Financial Mechanism 2014–2021 Programme “Climate Change Mitigation, Adaptation and Environment”, MoCE in cooperation with the association "Baltic Shores" conducted a study "Development of a set of possible solutions to reduce seashore erosion". The aim of the study is to develop a set of possible solutions to reduce seashore erosion to provide support for the planning and management of the development of marine coastal areas, as well as to limit the effects of seashore erosion due to climate change.

As part of the study, the following tasks were performed:

The distribution of Latvian coastal erosion risk classes for the entire territory of Latvia has been developed. In the development and analysis of risk classes, the location of endangered objects has been determined within the boundaries of erosion risk classes by municipality. The most suitable solutions for the reduction of coastal erosion of the Latvian coastline have been defined and described, methodological material or "road maps" have been developed for municipalities, enterprises and residents of three pilot municipalities (South Kurzeme, Talsi and Limbaži counties) for strengthening the sea coast and reducing erosion, describing the measures corresponding to each risk class of coastal erosion to strengthen the seashore and reduce erosion. Recommendations have been developed for the protection and/or adaptation of coastal endangered objects (especially critical ones) and recommended solutions for maintaining the resilience of tourism infrastructure and bathing areas to the risks of climate change. Recommendations have been developed for continuous monitoring of coastal erosion and further studies for the protection of the seashore, as well as the main results of the study, insights, conclusions and proposals for further action have been compiled.

3.8. Cooperation, good practices, experience and lessons learned

Latvia is a member of IPCC, WMO, EUMETSAT, NORDMET, ECMWF, HELCOM. Latvia cooperates with Union Member States, international cooperation, and with regional and international organisations to share information and to strengthen science, institutions and adaptive knowledge through participation in scientific organizations and projects. In addition, Representatives from Latvia participate as project partners in EU Horizon 2020 projects, LIFE 2014-2020 programme sub-programme Action Climate and Interreg programmes projects where both environmental quality and climate change are tackled from aspects of environmental and urban environmental quality as well as climate change adaptation.

To enhance adaptation action an international cooperation is mostly related to international initiatives, programmes and projects, such as “Integration of climate change adaptation into the work of local authorities”/ LIFE LOCAL ADAPT (LIFE15 CCA/DE/000133), “Common methodology for the development of Sustainable Energy and Climate Action Plans”/LIFE Adaptate (LIFE16 CCA/ES/000049). Norwegian Financial Instrument (NFI) pre-defined project (PDP) “Integration of climate change policy into sectoral and regional policies” is under implementation, where climate change adaption related activities are included.

Planning regions and municipalities implement different projects, including projects regarding climate issues which promote the creation of networks that are used as platforms for regular information exchange and sharing best practices. Regular experience and good practice exchange workshops take place between planning regions and municipalities.

Publications and information with explanations of results and outcomes from projects and documents were published and promoted in the media. Furthermore, a consistent exchange of information and experience is being practiced between planning regions and municipalities.

In Latvia several municipalities/cities have developed their climate change adaptation strategies on a voluntary basis. Within Covenant of Mayors, 23 municipalities/cities have committed to develop Sustainable Energy (and Climate) Action Plan (SECAP). Action plan describes the steps towards its 2020 or 2030 targets. Part of municipalities have developed their climate change adaptation strategies or included climate change adaptation parts in SECAPs or sustainable development programs. The main task for local governments is to assess which climate change risks are already causing and, in the future, will cause the greatest threat to the residents of the region, entrepreneurs and infrastructure.

Planning regions and municipalities actively engage in international initiatives and projects. Latvian municipalities are being active taking part in the initiative “Covenant of Mayors Europe” activities. Recently two planning regions joined the EU Mission "Adaptation to climate change”.

Local authorities seek to involve entrepreneurs in the implementation of adaptation measures. Municipalities are also taking educational measures for entrepreneurs on integrated aspects of climate change mitigation and adaptation to climate change in sectoral and regional policies and activities.

On 4th November 2020, the Ministry of Environmental Protection and Regional Development of the Republic of Latvia concluded an agreement on the implementation of the pre-defined project No. NFI/INP/01 “Integration of climate change policy in sectoral and regional policies”.

The aim of the pre-defined project is to improve the consistency and relevance of climate change policy planning at the national level as well as to increase its integration into sectoral and regional policies.

The project was implemented in partnership with the CSB, LEGMC and the Norwegian Environment Agency.

Achieved results within the project:

- a developed framework for the collection and provision of regional data to improve the planning and implementation of climate change policy at the regional level;
- a developed electronic database on ozone depleting substances and F-gases to improve reporting and policy planning;
- renewed and improved Latvian climate change scenarios up to 2100 considering the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (AR6) in order to ensure policy planning in accordance with the latest forecasts;
- improved national warning system, including updated existing warnings and at least five new warnings developed on hydro-meteorological phenomena;
- obtaining the latest data on coastal erosion in Latvia in order to adjust coastal planning, and a set of the most appropriate solutions to prevent coastal erosion developed, taking the current climate change scenarios into account;
- new regulatory recommendations developed in order to integrate climate change adaptation aspects into at least 6 sectoral and regional policies;
- at least 100 experts trained on integrated aspects of climate change mitigation and adaptation in sectoral and regional policies and activities.

3.9. Any other information related to climate change impacts and adaptation under Article 7 of the Paris Agreement

There is no additional information to the report.

4. SUPPORT PROVIDED AND MOBILIZED

This section includes information on the provision of financial, technological and capacity-building support to developing countries by Latvia.

4.1. National circumstances and institutional arrangements

In the years 2021 and 2022 the Ministry of Environmental Protection and Regional Development[155] public authority to manage and coordinate implementation of provisions of the international climate finance and the financial support to developing countries in the framework of the UNFCCC.

According to the UNFCCC classification Latvia is Annex I party country with Economy in Transition (EIT) according to UNFCCC classification. Therefore, the provisions of UNFCCC Article 4.3, 4.4 and 4.5 are not applicable. Regardless of the above-mentioned circumstances, Latvia has decided to provide support to developing countries on voluntary basis for the years 2021 and 2022 through bilateral channel activities, and to report as EU Member state on provision of financial support to developing countries according to Governance Regulation.

It should be emphasized that Latvia due to strict budgetary constraints have limited opportunities to participate in the financing of climate change and to support developing countries.

4.2. Underlying assumptions, definitions and methodologies

Latvia provides state budget financial resources as public financial resources to support developing countries making that available as bilateral support.

State budget programme "Development cooperation projects and international assistance" (hereinafter "Grant Programme") is providing annual calls for bilateral granted project proposals covering regions and countries in accordance with the Development Cooperation Policy Guidelines for 2021–2027. The Grant Programme is used to support development of sustainable development goals (SDGs) in developing countries as a capacity building, knowledge transfer and limited technology transfer as pilot test activities in project partner countries in different areas including climate change.

Additional contributions from the state budget (budgets of individual state authorities) also were provided as voluntary contributions as grant support through bilateral channel.

Currently, **the policy for support to developing countries for implementation of climate measures** for period 2025-2030 is under development. The document will determine the projected financial support, source of finance, types, mechanisms and tools of support for the period 2025-2030.

Detailed information is summarized in Annex 4.

4.3. Information on financial support provided and mobilized under Article 9 of the Paris Agreement

Grants provided at the national level have a direct and indirect impact on climate change trends with cross-cutting type of support and some sectoral related projects in Water and sanitation,

[155] Since 1st January 2023 - Ministry of Climate and Energy (MoCE)

and Agriculture and Food safety. Granted amounts and voluntary contribution are provided as bilateral support according to Official Development Assistance activities (ODA).

In 2021 in total five bilateral granted projects were implemented with total amount of 109,401.76 EUR or 128,707.95 USD such, as:

- 1 capacity building project as cross-cutting type of support in water and sanitation sector,
- 1 capacity building project as cross-cutting type of support in industry sector,
- 1 capacity building project as cross-cutting type of support in rural development
- 2 capacity building projects as cross-cutting type of support in cross-cutting sector in public digitalized access to the municipal and state information, and improvement of public services.
- 1 voluntary contribution as adaptation measure.

Information on the bilateral support is provided in the CTF Support Table III.1 and Table III.3. and Annex 4.

In 2022 in total five bilateral granted projects were implemented with total amount of 117,123.53 EUR or 123,287.93 USD such, as:

- 1 capacity building project as mitigation type of support in forestry sectors,
- 1 capacity building project in cross-cutting support in industrial sector,
- 1 project combining capacity building and technology and knowledge transfer as cross-cutting type of support in Water and sanitation sector,
- 2 projects combining capacity building and technology and knowledge transfer as cross-cutting type of support in agriculture and food safety sector.

Information on the bilateral support is provided in the CTF Support Table III.1 and Annex 4.

As Latvia is a EU member state and belongs to the common euro zone, **exchange rate for year 2021 and 2022 between EUR and USD** are used separately as average statistical data provided by the Latvian Bank (Latvijas Banka), respectively, rate between EUR/USD in year 2021 equals to **1.182 (1 USD equels to 0.85 EUR)** and year 2022 equals to **1.053 (1 USD equels to 0.95 EUR)**.

The information about exchange rate is available on in the Latvian Bank website[156].

For the years 2021 and 2022 multilateral actions have not been provided and private mobilized support is not specifically determined. Information is provided in the CTF Support Table III.2 and Annex 4.

Additional public and private mobilized finance and investment will be pivotal to achieving long-term transformation of developing countries into low-carbon, sustainable, and climate-resilient economies.

Consequently, more motivating and supportive financial tools should be developed at the national and international level to facilitate the engagement of the public and private sector to mobilize financial resources.

[156] Exchange rate. Available: https://www.bank.lv/statistika/dati-statistika/valutu-kursi/ecb-kursu-videja-vertiba?view=graph&layout=currencyconverter

4.4. Information on support for technology development and transfer provided under Article 10 of the Paris Agreement

As referred to the section 4.3. technology support and knowledge transfer were provided to Uzbekistan in 2022 in the following 3 grant based bilateral projects:

- *Creation of a geographic information system for the management of water supply and sewerage of the pilot territory using the Latvian experience in the field of digitalization*. The aim of the project was to implement a pilot project in the Republic of Uzbekistan in the digitization and implementation of the management system of water supply and sewerage networks, using geographic information system technologies based on the experience approved in Latvia.
- *Improving plant protection system and laboratory capacity to boost food exports in Uzbekistan.* The project aimed to improve the control system of plant protection and fertilizers as well as laboratory capacity, especially in the field of plant protection agent residue determination and in the field of soil agrochemical research. During the project, capacity of Quarantine Agency of Uzbekistan will be evaluated and increased.
- *Strengthening the phytosanitary system and laboratory capacity for the development of the fruit sector in Uzbekistan*. The project planned to strengthen the capacity of the Uzbek phytosanitary system and laboratory capacity, notably for the finding especially dangerous organisms, sample collection and laboratory identification. As a result of the project, by sharing Latvia's expertise Uzbek system was provided with the practical support and knowledge in the detection, containment and control of the organism: so, called a full cycle process.

More information can be found in the CTF Support Table III.1 and Annex 4.

4.5. Information on capacity-building support provided under Article 11 of the Paris Agreement

As referred to section 4.3. capacity building support resulted in 5 projects in 2021 and 5 projects in 2022. The identified projects have direct and indirect impact on climate change having mostly cross-cutting type of support and some sectoral impacts in mitigation trend such as Agriculture and Forestry.

The major capacity building support was provided to Uzbekistan, Moldova, Kazakhstan, Cameroon, Guinea, Congo, Vietnam and Ghana.

More information can be found in the CTF Support Table III.1 and Annex 4.

5. IMPROVEMENTS IN REPORTING

Since the NC8/BR5 improvements affecting the emission time series were introduced in Latvia's 2024 GHG inventory due to activity data improvement and emission factor changes. More information about recalculation results is provided in Latvia's 2024 GHG inventory which was submitted to the UNFCCC secretariat on 16th December 2024, Chapter 10 Recalculations and improvements. The main improvements in BTR1 compared to NC8/BR5 are outlined in Table 5.1.

Table 5.1 Main improvements in BTR1 compared to NC8/BR5

Sector	Improvements in BTR1 compared to NC8/BR5
Energy	Recalculations have been done after Landfill gas consumption corrections. Slightly precised data on natural gas CH_4 emissions and activity data in distribution network according to minor corrections sent by JSC "Gaso".
Transport	Distribution of vehicles fleet by sub-classes and average milage was corrected according to additional statistical information of the Road Traffic Safety Directorate of Latvia. Changes were made because of the switch form older to the latest COPERT versions. Recalculations have been done due to the correction of jet fuel consumption.
IPPU	Recalculations on F-gases were done due to updated average share of vehicles equipped with MAC systems, due to updated percentage of households having refrigerators and also due to updated percentage of residual charge of HFC in equipment being disposed and recovery efficiency at disposal. Recalculations were done in Solvent use sector due to adding emissions from Aircraft de-icing. Changes in activity data are done due to updates of national F-gas database and Chemical database, also in sectors of Lubricant and Urea use.
Agriculture	Nitrogen, that is lost due to volatilisation of NH_3 and NO_x, was corrected due to improvement of calculations including new information on emission mitigation measures. Recalculations were done due to implementation of recalculated numbers of organic soils area for calculations of N_2O emissions from cultivation of organic soils.

Sector	Improvements in BTR1 compared to NC8/BR5
LULUCF	The main reason for recalculation of activity data (area) is delayed accumulation of land use changes data (addition 20% of NFI sample plots are surveyed annually, acquired cumulative data are extrapolated to whole country area) till final recalculation of NFI data at the end of every 5 years period (completed NFI cycle with 100% sample plots surveyed). Recalculations are done due to continuous improvement of activity data, implementation of national CH_4 EF for drainage ditches. Recalculation of GHG emissions due to forest wildfires for 2021 was done due to implementation of improved activity data (area of wildfires in forest land). Recalculations for 1990-2021 are done due to correction of an error in sign of values when reporting carbon stock change in organic soil in wetlands converted to grassland category.
Waste	Changes in calculations are done due to updated activity dataand due to reevaluation of MCF factors. The disposed waste composition in managed sites for 2016-2020 was estimated and applied in the IPCC model. New estimation of recovered CH_4 amount was applied.

ANNEX

Annex 1 National Inventory Document

Full national inventory document is submitted to UNFCCC in https://unfccc.int/ghg-inventories-annex-i-parties/2024 and https://unfccc.int/first-biennial-transparency-reports.

Annex 2 Common reporting tables for greenhouse gas emissions and removals

Full common reporting tables are submitted to UNFCCC in https://unfccc.int/ghg-inventories-annex-i-parties/2024 and https://unfccc.int/first-biennial-transparency-reports.

Annex 3 Common tabular formats for information necessary to track progress

TABLE 1

Structured summary: Description of selected indicators

Indicator(s) selected to track progress[a]	Description
Annual total net GHG emissions	Annual total net GHG emissions consistent with the scope of the NDC in CO_2eq.
Information for the reference point(s), level(s), baseline(s), base year(s) or starting point(s), as appropriate[b]	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_2eq.
Updates in accordance with any recalculation of the GHG inventory, as appropriate[b]	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 NDC[c]	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.

Notes: (1) Pursuant to para. 79 of the MPGs, each Party shall report the information referred to in paras. 65–78 of the MPGs in a narrative and common tabular format, as applicable. (2) A Party may amend the reporting format (e.g. Excel file) to remove specific rows in this table if the information to be provided in those rows is not applicable to the Party's NDC under Article 4 of the Paris Agreement, in accordance with the MPGs. (3) The Party could add rows for each additional selected indicator and related information.

[a] Each Party shall identify the indicator(s) that it has selected to track progress of its NDC (para. 65 of the MPGs).

[b] Each Party shall provide the information for each selected indicator for the reference point(s), level(s), baseline(s), base year(s) or starting point(s), and shall update the information in accordance with any recalculation of the GHG inventory, as appropriate (para. 67 of the MPGs).

[c] Each Party shall describe for each indicator identified how it is related to its NDC (para. 76(a) of the MPGs).

TABLE 2

Structured summary: Definitions needed to understand the NDC

	Definitions[a]
Definition needed to understand each indicator:	
Annual total net GHG emissions	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.
Any sector or category defined differently than in the national inventory report:	NA
Definition needed to understand mitigation co-benefits of adaptation actions and/or economic diversification plans:	NA
Any other relevant definitions	NA

Notes: (1) Pursuant to para. 79 of the MPGs, each Party shall report the information referred to in paras. 65–78 of the MPGs in a narrative and common tabular format, as applicable. (2) A Party may amend the reporting format (e.g. Excel file) to remove specific rows in this table if the information to be provided in those rows is not applicable to the Party's NDC under Article 4 of the Paris Agreement, in accordance with the MPGs. (3) The Party could add rows for each additional sector, category, mitigation co-benefits of adaptation actions and/or economic diversification plans, indicator and any other relevant definitions.

[a] Each Party shall provide any definitions needed to understand its NDC under Article 4, including those related to each indicator identified in para. 65 of the MPGs, those related to any sectors or categories defined differently than in the national inventory report, or the mitigation co-benefits of adaptation actions and/or economic diversification plans (para. 73 of the MPGs).

TABLE 3

Structured summary: Methodologies and accounting approaches – consistency with Article 4, paragraphs 13 and 14, of the Paris Agreement and with decision 4/CMA.1

Reporting requirement	Description or reference to the relevant section of the BTR
For the first NDC under Article 4:[a]	
Accounting approach, including how it is consistent with Article 4, paragraphs 13–14, of the Paris Agreement (para. 71 of the MPGs)	
For the second and subsequent NDC under Article 4, and optionally for the first NDC under Article 4:[b]	
Information on how the accounting approach used is consistent with paragraphs 13–17 and annex II of decision 4/CMA.1 (para. 72 of the MPGs)	The European Union accounts for anthropogenic emissions and removals corresponding to its NDC consistent with paragraphs 13–17 and annex II of decision 4/CMA.1, as detailed below.
Explain how the accounting for anthropogenic emissions and removals is in accordance with methodologies and common metrics assessed by the IPCC and in accordance with decision 18/CMA.1 (para. 1(a) of annex II to decision 4/CMA.1)	The accounting for anthropogenic emissions and removals is based on the data contained in the EU GHG inventory, which is compiled in accordance with the 2006 IPCC Guidelines. The accounting for emissions from international aviation and navigation in the scope of the NDC is based on activity data, emission factors and methods which are in line with the IPCC guidelines. The accounting approach is also in accordance with decision 18/CMA.1 because the EU GHG inventory conforms with the provisions of chapter II of the Annex to decision 18/CMA.1.
Explain how consistency has been maintained between any GHG data and estimation methodologies used for accounting and the Party's GHG inventory, pursuant to Article 13, paragraph 7(a), of the Paris Agreement, if applicable (para. 2(b) of annex II to decision 4/CMA.1)	The GHG data used for accounting is based on the GHG inventory of the EU. The methodology used for accounting consists of a balancing of GHG emissions and removals, which is consistent with the methodologies used in the GHG inventory of the EU.
Explain how overestimation or underestimation has been avoided for any projected emissions and removals used for accounting (para. 2(c) of annex II to decision 4/CMA.1)	Not applicable. Projected emissions and removals are not used for accounting.
For each NDC under Article 4:[b]	
Accounting for anthropogenic emissions and removals in accordance with methodologies and common metrics assessed by the IPCC and adopted by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (para. 12(a) of decision 4/CMA.1 and para 1 of its annex II):	
Each methodology and/or accounting approach used to assess the implementation and achievement of the target(s), as applicable (para. 74(a) of the MPGs)	The methodology used to assess the implementation and achievement consists of a comparison of the reduction of net GHG emissions from the GHG inventory national total, including a share of GHG inventory international aviation and navigation emissions in line with the NDC scope, with the NDC target. The EU will account for its cooperation with other Parties in a manner consistent with guidance adopted by the CMA.
Each methodology and/or accounting approach used for the construction of any baseline, to the extent possible (para. 74(b) of the MPGs)	Progress is tracked by comparing annual net emissions with net emissions in the base year. No baseline is constructed.

Reporting requirement	Description or reference to the relevant section of the BTR
If the methodology or accounting approach used for the indicator(s) in table 1 differ from those used to assess the implementation and achievement the target, describe each methodology or accounting approach used to generate the information generated for each indicator in table 4 (para. 74(c) of the MPGs)	Progress is tracked by comparing annual net emissions with net emissions in the base year. No baseline is constructed.
Any conditions and assumptions relevant to the achievement of the NDC under Article 4, as applicable and available (para. 75(i) of the MPGs)	Not applicable. The NDC is unconditional.
Key parameters, assumptions, definitions, data sources and models used, as applicable and available (para. 75(a) of the MPGs)	Net GHG emissions are the key parameter used for tracking progress in implementing and achieving the NDC. The GHG inventory of the EU is the data source used. Details on assumptions, definitions and models used for determining net GHG emissions can be found in the National Inventory Document of the EU.
IPCC Guidelines used, as applicable and available (para. 75(b) of the MPGs)	2006 IPCC Guidelines; and 2019 refinement to the 2006 IPCC Guidelines for some source categories.
Report the metrics used, as applicable and available (para. 75(c) of the MPGs)	100-year time-horizon global warming potential (GWP) values from the IPCC Fifth Assessment Report.
For Parties whose NDC cannot be accounted for using methodologies covered by IPCC guidelines, provide information on their own methodology used, including for NDCs, pursuant to Article 4, paragraph 6, of the Paris Agreement, if applicable (para. 1(b) of annex II to decision 4/CMA.1)	Not applicable.
Provide information on methodologies used to track progress arising from the implementation of policies and measures, as appropriate (para. 1(d) of annex II to decision 4/CMA.1)	Progress arising from the implementation of policies and measures is expressed in a reduction of GHG emissions or increase of GHG removals. The methodology used to assess such progress is based on the estimation of GHG emissions and removals in the GHG inventory of the EU and on data on international aviation and navigation monitored in the Joint Research Centre's Integrated Database of the European Energy System (JRC-IDEES).
Where applicable to its NDC, any sector-, category or activity-specific assumptions, methodologies and approaches consistent with IPCC guidance, taking into account any relevant decision under the Convention, as applicable (para. 75(d) of the MPGs):	
For Parties that address emissions and subsequent removals from natural disturbances on managed lands, provide detailed information on the approach used and how it is consistent with relevant IPCC guidance, as appropriate, or indicate the relevant section of the national GHG inventory report containing that information (para. 1(e) of annex II to decision 4/CMA.1, para. 75(d)(i) of the MPGs)	Not applicable. To determine emissions and removals in the scope of the NDC, the EU does not disaggregate emissions and removals on managed land into those considered to result from human activities and those considered to result from natural disturbances.
For Parties that account for emissions and removals from harvested wood products, provide detailed information on which IPCC approach has been used to estimate emissions and removals (para. 1(f) of annex II to decision 4/CMA.1, para. 75(d)(ii) of the MPGs)	The EU accounts for emissions and removals from harvested wood products as an integral part of net GHG emissions and removals in the scope of the NDC. GHG emissions and removals from harvested wood products are determined in accordance with the production approach, as defined in Annex 12.A.1 to Volume 4 of the 2006 IPCC Guidelines for National GHG Inventories.

Reporting requirement	Description or reference to the relevant section of the BTR
For Parties that address the effects of age-class structure in forests, provide detailed information on the approach used and how this is consistent with relevant IPCC guidance, as appropriate (para. 1(g) of annex II to decision 4/CMA.1, para. 75(d)(iii) of the MPGs)	The EU does not address the effects of age-class structure in forests in the accounting approach for its NDC.
How the Party has drawn on existing methods and guidance established under the Convention and its related legal instruments, as appropriate, if applicable (para. 1(c) of annex II to decision 4/CMA.1)	The EU has drawn on existing methods and guidance established under the Convention by using an NDC target which is an advancement of the quantified economy-wide emission reduction target for 2020, which was communicated and tracked under the Convention.
Any methodologies used to account for mitigation benefits of adaptation actions and/or economic diversification plans (para. 75(e) of the MPGs)	The NDC does not consist of mitigation co-benefits of adaptation actions and/or economic diversification plans. Hence these co-benefits were not accounted for, and no related methodologies were used.
Describe how double counting of net GHG emission reductions has been avoided, including in accordance with guidance developed related to Article 6 if relevant (para. 76(d) of the MPGs)	GHG emissions and removals from the EU's GHG inventory, complemented with JRC-IDEES data, are used for tracking the net GHG emission reductions. Emissions and removals are reported in line with IPCC guidelines, with the aim of neither over- nor underestimating GHG emissions. GHG emissions and removals are reported by the EU and its Member States in their respective GHG inventories. For tracking progress towards implementing and achieving the EU NDC, only those net GHG emission reductions are counted which are reported at EU level. For cooperative approaches under Article 6, corresponding adjustments are made in a manner consistent with guidance adopted by the CMA.
Any other methodologies related to the NDC under Article 4 (para. 75(h) of the MPGs)	Not applicable.
Ensuring methodological consistency, including on baselines, between the communication and implementation of NDCs (para. 12(b) of the decision 4/CMA.1 and para 1 of its annex II)):	
Explain how consistency has been maintained in scope and coverage, definitions, data sources, metrics, assumptions and methodological approaches including on baselines, between the communication and implementation of NDCs (para. 2(a) of annex II to decision 4/CMA.1)	The scope, coverage, definitions, data sources, metrics and approaches are consistent between the communicated NDC and its implementation, as described in the BTR.
Explain how consistency has been maintained between any GHG data and estimation methodologies used for accounting and the Party's GHG inventory, pursuant to Article 13, paragraph 7(a), of the Paris Agreement, if applicable (para. 2(b) of annex II to decision 4/CMA.1) and explain methodological inconsistencies with the Party's most recent national inventory report, if applicable (para. 76(c) of the MPGs)	The GHG inventory of the EU is the primary source for the GHG data used for accounting. The share of GHG inventory emissions from international aviation and navigation in the scope of the NDC have been determined separately based on JRC-IDEES data, using emission factors and methodologies consistent with IPCC guidance. There are no methodological inconsistencies with the most recent national inventory report.
For Parties that apply technical changes to update reference points, reference levels or projections, the changes should reflect either of the following (para. 2(d) of annex II to decision 4/CMA.1):	
Technical changes related to technical corrections to the Party's inventory (para. 2(d)(i) of annex II to decision 4/CMA.1)	No technical changes related to technical corrections to the GHG inventory were applied to update reference points, reference levels or projections.
Technical changes related to improvements in accuracy that maintain methodological consistency (para. 2(d)(ii) of annex II to decision 4/CMA.1)	No technical changes related to improvements in accuracy were applied to update reference points, reference levels or projections.

Reporting requirement	Description or reference to the relevant section of the BTR
Explain how any methodological changes and technical updates made during the implementation of their NDC were transparently reported (para. 2(e) of annex II to decision 4/CMA.1)	Methodological changes and technical updates are reported in the chapter entitled 'recalculations and improvements' of the National Inventory Document of the EU. GHG emissions from international aviation and navigation in the scope of the EU NDC are reported for the first time in this BTR (see Annex to the BTR).
Striving to include all categories of anthropogenic emissions or removals in the NDC and, once a source, sink or activity is included, continuing to include it (para. 12 (c) of decision 4/CMA.1 and para. 3 of annex II to decision 4/CMA.1):	
Explain how all categories of anthropogenic emissions and removals corresponding to their NDC were accounted for (para. 3(a) of annex II to decision 4/CMA.1)	The indicator used for tracking progress towards implementing and achieving the NDC target comprises all categories of anthropogenic emissions and removals corresponding to the NDC.
Explain how Party is striving to include all categories of anthropogenic emissions and removals in its NDC, and, once a source, sink or activity is included, continue to include it (para. 3(b) of annex II to decision 4/CMA.1)	The scope of the NDC of the EU covers all categories of emissions and removals reported in the GHG inventory, in line with IPCC guidelines. Member States report some specific source categories as 'not estimated' when the estimates would be insignificant as defined in paragraph 32 of the annex to decision 18/CMA.1. Information on these categories is provided in Common Reporting Table 9 of the respective Member States' GHG inventory submission. Besides including all sectors listed in decision 18/CMA.1, a share of emissions from international aviation and navigation are also included in the NDC scope.
Provide an explanation of why any categories of anthropogenic emissions or removals are excluded (para. 12 (c) of decision 4/CMA.1 and para. 4 of annex II to decision 4/CMA.1)	All categories of anthropogenic emissions and removals contained in the national total of the EU GHG inventory are included in the NDC.
Each Party that participates in cooperative approaches that involve the use of ITMOs towards an NDC under Article 4, or authorizes the use of mitigation outcomes for international mitigation purposes other than achievement of its NDC	
Provide information on any methodologies associated with any cooperative approaches that involve the use of ITMOs towards an NDC under Article 4 (para. 75(f) of the MPGs)	The EU will account and report for its cooperation with other Parties in a manner consistent with the guidance adopted by CMA1 and any further guidance agreed by the CMA, when applicable.
Provide information on how each cooperative approach promotes sustainable development, consistent with decisions adopted by the CMA on Article 6 (para. 77(d)(iv) of the MPGs)	The EU will account and report for its cooperation with other Parties in a manner consistent with the guidance adopted by CMA1 and any further guidance agreed by the CMA, when applicable.
Provide information on how each cooperative approach ensures environmental integrity consistent with decisions adopted by the CMA on Article 6 (para. 77(d)(iv) of the MPGs)	The EU will account and report for its cooperation with other Parties in a manner consistent with the guidance adopted by CMA1 and any further guidance agreed by the CMA, when applicable.
Provide information on how each cooperative approach ensures transparency, including in governance, consistent with decisions adopted by the CMA on Article 6 (para. 77(d)(iv) of the MPGs)	The EU will account and report for its cooperation with other Parties in a manner consistent with the guidance adopted by CMA1 and any further guidance agreed by the CMA, when applicable.
Provide information on how each cooperative approach applies robust accounting to ensure, inter alia, the avoidance of double counting, consistent with decisions adopted by the CMA on Article 6 (para. 77(d)(iv) of the MPGs)	The EU will account and report for its cooperation with other Parties in a manner consistent with the guidance adopted by CMA1 and any further guidance agreed by the CMA, when applicable, when applicable.
Any other information consistent with decisions adopted by the CMA on reporting under Article 6 (para. 77(d)(iii) of the MPGs)	The EU will account and report for its cooperation with other Parties in a manner consistent with the guidance adopted by CMA1 and any further guidance agreed by the CMA, when applicable.

Notes: (1) Pursuant to para. 79 of the MPGs, each Party shall report the information referred to in paras. 65–78 of the MPGs in a narrative and common tabular format, as applicable. (2) A Party may amend the reporting format (e.g. Excel file) to remove specific rows in this table if the information to be provided in those rows is not applicable to the Party's NDC under Article 4 of the Paris Agreement, in accordance with the MPGs.

[a] For the first NDC under Article 4, each Party shall clearly indicate and report its accounting approach, including how it is consistent with Article 4, paras. 13–14, of the Paris Agreement (para. 71 of the MPGs)

[b] For the second and subsequent NDC under Article 4, each Party shall provide information referred to in chapter III.B and C of the MPGs consistent with decision 4/CMA.1. Each Party shall clearly indicate how its reporting is consistent with decision 4/CMA.1 (para. 72 of the MPGs). Each Party may choose to provide information on accounting of its first NDC consistent with decision 4/CMA.1 (para. 71 of the MPGs).

TABLE 4

Structured summary: Tracking progress made in implementing and achieving the NDC under Article 4 of the Paris Agreement [a]

	Unit, as applicable	Reference point(s), level(s), baseline(s), base year(s) or starting point(s), as appropriate (paras. 67 and 77(a)(i) of the MPGs)	Implementation period of the NDC covering information for previous reporting years, as applicable, and the most recent year, including the end year or end of period (paras. 68 and 77(a)(ii–iii) of the MPGs)		Target level[b]	Target year or period	Progress made towards the NDC, as determined by comparing the most recent information for each selected indicator, including for the end year or end of period, with the reference point(s), level(s), baseline(s), base year(s) or starting point(s) (paras. 69–70 of the MPGs)
		1990	2021	2022			
Indicator(s) selected to track progress of the NDC or portion of NDC under Article 4 of the Paris Agreement (paras. 65 and 77(a) of the MPGs):							
Annual total net GHG emissions	kt CO_2 equivalent [(1)]	4 699 405.00	3 272 650.00	3 205 223.00	2 114 732.00 (-55%) [(4)]	2030	The most recent level of the indicator is 31.8 % below the base year level.
Where applicable, total GHG emissions and removals consistent with the coverage of the NDC (para. 77(b) of the MPGs)	kt CO_2 equivalent		3 272 650.00	3 205 223.00			
Contribution from the LULUCF sector for each year of the target period or target year, if not included in the inventory time series of total net GHG emissions and removals, as applicable (para. 77(c) of the MPGs)	kt CO_2 equivalent		NA	NA			
Each Party that participates in cooperative approaches that involve the use of ITMOs towards an NDC under Article 4 of the Paris Agreement, or authorizes the use of mitigation outcomes for international mitigation purposes other than achievement of the NDC, shall provide (para. 77(d) of the MPGs):							
If applicable, an indicative multi-year emissions trajectory, trajectories or budget for its NDC implementation period (para. 7(a)(i), annex to decision 2/CMA.3)	kt CO_2 equivalent		[(2)]	[(2)]			
If applicable, multi-year emissions trajectory, trajectories or budget for its NDC implementation period that is consistent with the NDC (para. 7(b), annex to decision 2/CMA.3)	NA		NA	NA			

	Unit, as applicable	Reference point(s), level(s), baseline(s), base year(s) or starting point(s), as appropriate (paras. 67 and 77(a)(i) of the MPGs)	Implementation period of the NDC covering information for previous reporting years, as applicable, and the most recent year, including the end year or end of period (paras. 68 and 77(a)(ii–iii) of the MPGs)		Target level[b]	Target year or period	Progress made towards the NDC, as determined by comparing the most recent information for each selected indicator, including for the end year or end of period, with the reference point(s), level(s), baseline(s), base year(s) or starting point(s) (paras. 69–70 of the MPGs)
		1990	2021	2022			
Annual anthropogenic emissions by sources and removals by sinks covered by its NDC or, where applicable, from the emission or sink categories as identified by the host Party pursuant to paragraph 10 of annex to decision 2/CMA.3 (para. 23(a), annex to decision 2/CMA.3) (as part of para. 77 (d)(i) of the MPGs)	kt CO_2 equivalent		3 272 650.00	3 205 223.00			
Annual anthropogenic emissions by sources and removals by sinks covered by its NDC or, where applicable, from the portion of its NDC in accordance with paragraph 10, annex to decision 2/CMA.3 (para. 23(b), annex to decision 2/CMA.3)	kt CO_2 equivalent		3 272 650.00	3 205 223.00			
If applicable, annual level of the relevant non-GHG indicator that is being used by the Party to track progress towards the implementation and achievement of its NDC and was selected pursuant to paragraph 65, annex to decision 18/CMA.1 (para. 23(i), annex, decision 2/CMA.3)	NA		NA	NA			
Annual quantity of ITMOs first transferred (para. 23(c), annex to decision 2/CMA.3) (para. 77(d)(ii) of the MPGs)	kt CO_2 equivalent		(2)	(2)			
Annual quantity of mitigation outcomes authorized for use for other international mitigation purposes and entities authorized to use such mitigation outcomes, as appropriate (para. 23(d), annex to decision 2/CMA.3) (para. 77(d)(ii) of the MPGs)	NA		NA	NA			
Annual quantity of ITMOs used towards achievement of the NDC (para. 23(e), annex to decision 2/CMA.3) (para. 77(d)(ii) of the MPGs)	kt CO_2 equivalent		(2)	(2)			
Net annual quantity of ITMOs resulting from paras. 23(c)-(e), annex to decision 2/CMA.3 (para. 23(f), annex to decision 2/CMA.3)	kt CO_2 equivalent		(2)	(2)			

	Unit, as applicable	Reference point(s), level(s), baseline(s), base year(s) or starting point(s), as appropriate (paras. 67 and 77(a)(i) of the MPGs)	Implementation period of the NDC covering information for previous reporting years, as applicable, and the most recent year, including the end year or end of period (paras. 68 and 77(a)(ii–iii) of the MPGs)		Target level[b]	Target year or period	Progress made towards the NDC, as determined by comparing the most recent information for each selected indicator, including for the end year or end of period, with the reference point(s), level(s), baseline(s), base year(s) or starting point(s) (paras. 69–70 of the MPGs)
		1990	2021	2022			
If applicable, the cumulative amount of ITMOs, divided by the number of elapsed years in the NDC implementation period (para. 7(a)(ii), annex to decision 2/CMA.3)	NA		NA	NA			
Total quantitative corresponding adjustments used to calculate the emissions balance referred to in para. 23(k)(i), annex to decision 2/CMA.3, in accordance with the Party's method for applying corresponding adjustments consistent with section III.B, annex to decision 2/CMA.3 (Application of corresponding adjustments) (para. 23(g), annex to decision 2/CMA.3)	kt CO_2 equivalent		(2)	(2)			
The cumulative information in respect of the annual information in para. 23(f), annex to decision 2/CMA.3, as applicable (para. 23(h), annex to decision 2/CMA.3)	kt CO_2 equivalent		(2)	(2)			
For metrics in tonnes of CO_2 eq. or non-GHG, an annual emissions balance consistent with chapter III.B (Application of corresponding adjustment), annex, decision 2/CMA.3 (para. 23(k)(i), annex to decision 2/CMA.3) (as part of para. 77 (d)(ii) of the MPGs)	kt CO_2 equivalent		(2)	(2)			
For metrics in non-GHG, for each non-GHG metric determined by participating Parties, annual adjustments resulting in an annual adjusted indicator, consistent with para. 9 of chapter III.B (Corresponding adjustments), annex to decision 2/CMA.3, and future guidance to be adopted by the CMA (para. 23(k)(ii), annex to decision 2/CMA.3)	NA		NA	NA			
Any other information consistent with decisions adopted by the CMA on reporting under Article 6 (para. 77(d)(iii) of the MPGs)	NA		(3)	(3)			

Notes: (1) Pursuant to para. 79 of the MPGs, each Party shall report the information referred to in paras. 65–78 of the MPGs in a narrative and common tabular format, as applicable. (2) A Party may amend the reporting format (e.g. Excel file) to remove specific rows in this table if the information to be provided in those rows is not applicable to the Party's NDC under Article 4 of the Paris Agreement, in accordance with the MPGs. (3) The Party could add rows for each additional selected indicator.

a This table could be used for each NDC target in case Party's NDC has multiple targets.

b Parties may provide information on conditional targets in a documentation box with references to the relevant page in their biennial transparency report.

Custom footnotes:

(1) Net GHG emissions in the scope of the NDC
(2) To be reported in subsequent BTR
(3) The EU will account and report for its cooperation with other Parties in a manner consistent with the guidance adopted by CMA1 and any further guidance agreed by the CMA in a subsequent BTR or initial report, when applicable.
(4) The target level is 55% below the reference level. 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.

APPENDIX

Description of a Party's nationally determined contribution under Article 4 of the Paris Agreement, including updates[a]

	Description
Target(s) and description, including target type(s), as applicableb, c	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(s) or period(s), and whether they are single-year or multi-year target(s), as applicable	Single year target, 2030.
Reference point(s), level(s), baseline(s), base year(s) or starting point(s), and their respective value(s), as applicable	Base year: 1990. Net greenhouse gas emissions level in 1990: 4 699 405 kt CO_2 eq.
Time frame(s) and/or periods for implementation, as applicable	2021-2030
Scope and coverage, including, as relevant, sectors, categories, activities, sources and sinks, pools and gases, as applicable	Geographical scope: EU Member States (Belgium, Bulgaria, Czechia, Denmark, Germany, Estonia, Ireland, Greece, Spain, France, Croatia, Italy, Cyprus, Latvia, Lithuania, Luxembourg, Hungary, Malta, 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 covered, 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 2024-26 from flights between the EU Member States and departing flights to Norway, Iceland, Switzerland and United Kingdom. International Navigation: Waterborne 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:

	Description
	Carbon Dioxide (CO_2) Methane (CH_4) Nitrous Oxide (N_2O) Hydrofluorocarbons (HFCs) Perfluorocarbons (PFCs) Sulphur hexafluoride (SF_6) Nitrogen trifluoride (NF_3) The included LULUCF categories and pools are as defined in decision 5/CMA.3.
Intention to use cooperative approaches that involve the use of ITMOs under Article 6 towards NDCs under Article 4 of the Paris Agreement, as applicable	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 its 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[d]	The information on the NDC scope contains clarifications/further details compared to the information provided in the updated NDC of the EU.

Notes: This table is to be used by Parties on a voluntary basis.

[a] Each Party shall provide a description of its NDC under Article 4, against which progress will be tracked. The information provided shall include required information, as applicable, including any updates to information previously provided (para. 64 of the MPGs).

[b] For example: economy-wide absolute emission reduction, emission intensity reduction, emission reduction below a projected baseline, mitigation co-benefits of adaptation actions or economic diversification plans, policies and measures, and other (para. 64(a) of the MPGs).

[c] Parties with both unconditional and conditional targets in their NDC may add a row to the table to describe conditional targets.

[d] For example: recalculation of previously reported inventory data, or greater detail on methodologies or use of cooperative approaches (para. 64(g) of the MPGs).

TABLE 5

Mitigation policies and measures, actions and plans, including those with mitigation co-benefits resulting from adaptation actions and economic diversification plans, related to implementing and achieving a nationally determined contribution under Article 4 of the Paris Agreement [a, b]

Name[c]	Description[d, e, f]	Objectives	Type of instrument [g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
Energy Efficiency Requirements for District Heating (DH) Systems **(PaM no.1)**	The minimum energy efficiency requirements are defined for DH technologies: (1) heat production boilers; (2) combined heat-power production units; (3) solar heat collectors; (4) heat pumps; (5) annual maximum heat losses in DH pipeline network. Cost information NE Information on non-GHG benefits Economic benefits. Environmental benefits - air emissions decrease. Reduction of energy dependency from third countries. Improved Public Health Interaction with other mitigation actions Interaction with the PaM "Investment Support	Efficiency improvement in energy transformation sector (Energy Supply); Reduction of losses (Energy Supply)	Regulatory	Implemented	Energy	CO_2	2018	National Government: Ministry of Economics	NE	NE	NE	NE	NE	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	Programme for District Heating (DH) Systems: 2017-2024" Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050. The PaM promotes establishing state-of-art DH infrastructure with long-term technical lifetime thus having long-term positive impact on GHG emission trend.														
Energy Performance of Buildings **(PaM no.2)**	Law on the Energy Performance of Buildings provides the legal framework of setting the mandatory minimum energy performance requirements, the mandatory energy efficiency certification of buildings, verification	Energy efficiency improvements of buildings (Energy Consumption reduction): residential, public and commercial sectors	Regulatory	Implemented	Energy	CO_2	2013	National Government: Ministry of Economics	NE	2.90	5.80	8.70	11.90	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	of buildings heating and air conditioning systems, energy consumption management of buildings, mandatory individual heat consumption metering if supplied from district heating system or common heat supply source. The governmental regulations include: (i) the regulation on the energy certification of buildings (energy efficiency classes and related energy performance indicators (EPI) for both heat energy consumption for heating and total non-renewable primary energy consumption); (ii) the regulation on the minimal requirements for existing, in exploitation, buildings (both residential and non-residential ones), (iii) the Latvian Construction Standard LBN 002-19 "Thermotechnics of														

Name[c]	Description[d, e, f]	Objectives	Type of instrument [g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	Building Envelopes" incorporates directly the EPI for heating (in kWh per m^2 annually) for new buildings and buildings ongoing reconstruction. The given PaM has impact on district heat consumption as high share of residential multi-apartment and public buildings are connected to the district heating systems. Cost information 39.5 EUR/t CO_2 Information on non-GHG benefits Economic benefits, Environmental benefits - air emissions decrease. Improved Public Health. Interaction with other mitigation actions Investment support programmes to increase energy efficiency of buildings: the PaMs No 16, No 17, No 18, No 19														

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050. The energy performance of buildings regulation affects and determines the infrastructure of future buildings.														
Informing Energy Consumers of Residential Sector **(PaM no.3)**	Wide scope of methods are applied to inform and consult societies of the flats' owners regarding available funding, the best practices and benefits of energy efficiency increase of multi-apartment buildings. The programme consults also on the good practice of maintaining the apartment building after renovation. In recent years the "Let's live warmer!"	Efficiency improvements of buildings (Energy Consumption reduction): Residential sector	Information	Implemented	Energy	CO_2	2010	National Government: Ministry of Economics	NE	NE	NE	NE	NE	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	has extended the activities to the target group of single-family and two-apartment buildings as well. The given PAM has an impact on district heat consumption due to high share of multi-apartment buildings are connected to district heating systems. Cost information NE Information on non-GHG benefits Economic benefits. Social benefits: good maintenance of buildings. Improved Public Health. Interaction with other mitigation actions Interaction with the PaM No 16 "Investment Support Programmes to Increase Energy Efficiency in Apartment Buildings" and PaM No 37 "Further increase of energy efficiency of multi-apartment buildings"														

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050														
Energy Labeling of Appliances **(PaM no.4)**	The national legislative framework by transposition of the Ecodesign Directive 2009/125/EC and the Directive on Labelling and Standard Product Information of Energy Related Products (2010/30/EU) has been implemented in Latvia in due time. The provisions, stated by the Energy Labelling Regulation 2017/1369/EU, new Ecodesign Regulation 2024/1781/EU and particular Commission Regulations on ecodesign and labelling of particular	Efficiency improvement of appliances (Energy Consumption reduction)	Regulatory, Information	Implemented	Energy	CO_2	2011	National Government: Ministry of Economics,Consumer Rights Protection Centre Republic of Latvia	NE	NE	NE	NE	NE	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	appliances, are implemented directly by the responsible parties. Cost information NE Information on non-GHG benefits Economic benefits Interaction with other mitigation actions No interaction with other measures Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050														
Biofuel Blend Obligation **(PaM no.5)**	The PaM ensures growth of the renewable energy share in transport sector. Until 31.12.2019 bioethanol blend, 4.5-5% (volume) of total volume, had	Increase in renewable energy; Low carbon fuels (Transport)	Regulatory	Implemented	Transport	CO_2	2010	National Government: Ministry of Economics,Consumer Rights Protection Centre Republic of Latvia,State	136.00	146.00	139.00	100.00	76.00	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	been mandatory for the gasoline of "95" trademark and biodiesel blend, at least 4.5% (volume) of total volume, had been mandatory for the diesel fuel. From the 1st January 2020 the mandatory volumes of blend are increased: (1) at least 9.5% (volume) bioethanol blend for the gasoline of „95" trademark, (2) at least 6.5% (volume) biodiesel blend for the diesel fuel. Exemption of the blend is done for diesels utilised in winter climate conditions, 1st November - 1st April. In the period 1st July 2022 - 31st December 2023 the biofuel blend was voluntary to mitigate sharp increase in transport fuel price. Cost information NE Information on non-GHG benefits Increased Transport Resilience and Accessibility.							Construction Control Bureau of Latvia (conformity assessment)							

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	Interaction with other mitigation actions No interaction with other measures Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050														
Excise Tax – Transport sector **(PaM no.6)**	The procedure is established by the Law "On Excise Duties": duty for gasoline, diesel fuel (gas oil) and LPG (Articles 5,14 & 18) and for natural gas (Articles 6.1 & 15.1). The implementation has started 1993, afterwards was linked with EU policy. To promote natural gas utilising vehicles, the reduced rate for natural gas is stated for the period 1st January 2021 - 31st	Efficiency improvements of vehicles; Demand management (consumption reduction); Low carbon fuels (Transport)	Fiscal	Implemented	Transport	CO_2	1993	National Government: Ministry of Finance	NE	NE	NE	NE	NE	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	December 2025. Also, unlead gasoline with 70-85% (volume) of bioethanol blend and pure biodiesel has reduced rate of duty. Cost information NE Information on non-GHG benefits Environmental benefits: air pollutants reduction Interaction with other mitigation actions No interaction with other measures Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050														
Annual taxation of vehicle: cars and	Annual operation tax, based on the specific CO_2 emissions, grams per km (plus fixed	Efficiency improvements of vehicles; Low carbon	Fiscal	Implemented	Transport	CO_2	2017	National Government:	NE	NE	NE	NE	NE	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
light duty vehicles taxation based on specific CO_2 emissions **(PaM no.7)**	supplement for those engines capacity of which exceeds 3500 cm^3), is being calculated for the cars firstly registered from 01.01.2009 and for the light duty vehicles (LDV) firstly registered from 01.01.2012. For the cars and LDV with the specific CO_2 emissions up to 50 grams per km zero tax rate is applied. For the older cars and LDV the tax is differentiated based on engine capacity, maximal power of engine and the gross weight of the car. In turn, for buses and heavy DV with gross weight above 3500 kg the annual operational tax is based on EURO class. For light buses (≤3500 kg) annual operational tax continues to base on the gross weight. Cost information NE Information on non-GHG benefits Environmental	fuels/electric cars (Transport)						Ministry of Finance							

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	benefits: air pollutants reduction Interaction with other mitigation actions Interaction with the PaM No 8 "New Passenger Cars Labelling on Fuel Economy Rating" Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050														
New Passenger Cars Labelling on Fuel Economy Rating **(PaM no.8)**	The labelling of new cars regarding fuel consumption (litres per 100 km or km per litre) and CO_2 emissions (grams per km) Cost information NE Information on non-GHG benefits Environmental	Efficient new vehicles	Regulatory, Information	Implemented	Transport	CO_2	2003	National Government: Ministry of Economics,Consumer Rights Protection Centre Republic of Latvia	NE	4.00	8.00	16.00	49.00	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	benefits: air pollutants reduction Interaction with other mitigation actions Interaction with the PaM No 7 "Annual taxation of vehicle: cars and light duty vehicles taxation based on specific CO_2 emissions" Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050														
Taxation of Electricity **(PaM no.9)**	The procedure is prescribed by the Electricity Tax Law. The rate is 1.01 EUR/MWh. Tax shall apply to entities who are engaged in the generation, distribution, supply, selling of electricity as well as purchasing	Efficiency improvement in services/tertiary and industry sectors (Energy Consumption reduction)	Fiscal	Implemented	Energy	CO_2	2007	National Government: Ministry of Finance	NE	NE	NE	NE	NE	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	electricity in spot exchange. The following end-use exemptions are in force: (i) carriage of goods and public carriage of passengers, including on rail transport and public transport in towns, (ii) household users, (iii street lighting services. The exemption is made also for the autonomous producers up to 2 MW capacity if they correspond to certain criteria. Cost information NE Information on non-GHG benefits NE Interaction with other mitigation actions No interaction with other measures Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM														

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	contributes to the targets set out in the national Long term strategy for climate neutrality 2050														
Taxation of CO_2 emissions **(PaM no.10)**	The procedure is prescribed by the Natural Resources Tax Law. The implementation of the given PaM started in 2005 as the national policy to start to internalise the external costs related to GHG emissions, afterwards this policy was linked with EU GHG policies. The subject of CO_2 emissions taxation is such CO_2 emitting activities (installations) which correspond to EU ETS activities however the amount of the activity (installation) is below the threshold defined for inclusion in EU ETS. The tax shall not be paid for the CO_2 emissions which emerges (i) from the installations participating in the EU ETS, and (ii) while using renewable	Efficiency improvement in energy transformation sector (Energy Supply); Efficiency improvement in services/tertiary and industry sectors (Energy Supply; Energy Consumption reduction). Increase in renewable energy (Energy Supply)	Fiscal	Implemented	Energy	CO_2	2005	National Government: Ministry of Finance	NE	NE	NE	NE	NE	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	energy sources. The current (from the 01.01.2022) tax rate is 15 EUR per ton of CO_2 emissions. Cost information NE Information on non-GHG benefits NE Interaction with other mitigation actions No interaction with other measures Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050														
Systematic inspection of the technical conditions of motor vehicles	Mandatory annual technical inspections ensure that only those motor vehicles that comply with technical and environmental requirements are being allowed to take	Efficiency improvements of vehicles (Transport)	Regulatory	Implemented	Transport	CO_2	1996	National Government: Ministry of Transport,State JSC "Road Traffic Safety Directorate"	NE	3.00	4.00	4.00	4.00	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
(PaM no.11)	part in road transport. PaM has started as the national policy, afterwards has transposed EU Directive requirements. Cost information NE Information on non-GHG benefits Environmental benefits: air pollutants reduction Interaction with other mitigation actions No interaction with other measures Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050														
Development of zero-	Investment co-financing is provided by the EU funding.	Modal shift to public transport;	Economic instrument	Implemented	Transport	CO_2	2023	National Government: Ministry of	NA	4.00	5.00	5.00	5.00	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
emission public transport (PT) **(PaM no.12)**	The PaM develops more effective urban transport infrastructure and promotes the use of PT. Latvia's Recovery and Resilience Plan (RRP) investment in 2022-2026 provides for modern zero-emission public transport, particularly electric buses, in Riga metropolitan area. Outside Riga area, the RRP, with focus on the consequences of 2021 administrative territorial reform, provides support for electrical school buses. In its turn, the Latvia's Territorial Plan of Just Transition Fund (as part of Latvia's EU Cohesion Policy Programme for 2021-2027 programming period) provides the support for the purchase of zero emission buses to provide municipal services in Latvia municipalities. The installation of necessary charging	Electric vehicles (Transport)						Smart Administration and Regional Development,Local municipalities							

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	points is included in these measures as well. Cost information 344.0 EUR/t CO_2 Information on non-GHG benefits Environmental benefits: air pollutants reduction. Social benefits: (1) user convenient PT vehicles, (2) improved availability and performance of municipal services. Increased Transport Resilience and Accessibility. Interaction with other mitigation actions Interaction with the PaM No 29 "Promotion of multi-modality of public transport" Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the														

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	national Long term strategy for climate neutrality 2050														
Investment Support Programme for District Heating (DH) Systems: 2017-2024 **(PaM no.13)**	In EU funds 2014-2020 programming period the increasing efficiency and RES share in DH systems is co-financed within the framework of the national Operational Programme "Growth and Employment". Activities supported: (i) new RES-heat production facilities (both additional RES capacities to supply new DH customers and replacement of existing fossil fuel capacities), (ii) reconstruction/renovation for increase of energy efficiency of existing heat production facilities utilising RES, (iii) construction of heat accumulation units, (iv) construction (expanding) and reconstruction of DH transmission and distribution pipeline networks, as well as (v) reconstruction of CHP facilities to heat	Increase in renewable energy in heating and cooling sector (Energy Supply); Efficiency improvement in energy transformation sector (Energy Supply); Reduction of losses (Energy Supply)	Economic instrument	Implemented	Energy	CO_2	2017	National Government: Ministry of Economics	NE	76.00	74.00	72.00	70.00	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	only plant utilising RES. Cost information 7.8 EUR/tCO_2 Information on non-GHG benefits Economic benefits Interaction with other mitigation actions Interaction with the PaM No 1 "Energy Efficiency Requirements for District Heating Systems" Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050. The investments to establish state-of-art DH infrastructure have a long lifetime and thus have the long-term impact on														

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	GHG emission reduction														
Investment Support Programme for Solar (PV) Energy: 2025 - 2030 **(PaM no.14)**	Latvia's EU Cohesion Policy Programme for 2021-2027 programming period plans the support in the form of financial instrument for the implementation of solar PV technologies, related storage equipment and smart solutions to ensure the overall system operation. Wide range of beneficiaries envisaged – companies, municipal capital companies, cooperatives, energy communities, households. Cost information 27.4 EUR/t CO_2 Information on non-GHG benefits Social benefits. Increased Energy Security. Economic Resilienc Interaction with other mitigation actions No interaction with other measures	Increase in renewable energy sources in the electricity sector (Energy Supply)	Economic instrument	Implemented	Energy	CO_2	2024	National Government: Ministry of Climate and Energy	NA	3.00	5.00	5.00	5.00	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050														
Investment Support for energy efficiency improvement and transfer to RES in manufacturing industry and commercial sector **(PaM no.15)**	Investment co-financing is provided by the EU funding. Activities relate to improvement of energy efficiency of building's limiting constructions and engineering systems, improvement of energy efficiency of production and auxiliary equipment and technologies, installation of efficient lighting, use of efficient RES equipment for production of heat and electricity for self-consumption. For the 2015-2023 period the project should aim to achieve energy	Increase in renewable energy (Energy Supply); Efficiency improvements of buildings (Energy Consumption reduction); Efficiency improvement in industrial end-use sectors (Energy Consumption reduction)	Economic instrument	Implemented	Energy	CO_2	2015	National Government: Ministry of Economics,National Government: Ministry of Agriculture,State-owned JSC "Development Finance Institution ALTUM"	NE	8.30	14.00	14.00	14.00	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	efficiency improvement of at least 15%. For the period 2023-2029 (investments of Latvia's Recovery and Resilience Plan 2022-2026 and Latvia's EU Cohesion Policy Programme of 2021-2027 programming period) the energy efficiency project shall aim to achieve at least 30% primary energy saving. The measure is implemented in the form of combined financial instrument - loan with a capital rebate (grant). In 2023-2029 period the commercial sector entities are eligible as well. Cost information 12.9 EUR/t CO_2 Information on non-GHG benefits Economic benefits. Economic Resilience. Increased Energy Security. Interaction with other mitigation actions Interaction with the PaM No 24														

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	"Energy Management System in Industry and Commercial sector" and the PaM No 36 "Energy Management Obligation in Large Energy Consuming Entities" Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050														
Investment Support to Increase Energy Efficiency in Apartment Buildings **(PaM no.16)**	The measure is co-financed by the EU funding: (1) National Operational Programme “Growth and Employment” for 2016-2023 period, (2) Latvia’s Recovery and Resilience Plan (RRP), 2022-2026 and (3) Latvia’s Cohesion Policy Programme for 2021-2027 programming period,	Efficiency improvements of buildings (Energy Consumption reduction); Demand management (Energy Consumption reduction)	Economic instrument	Implemented	Energy	CO_2	2016	National Government: Ministry of Economics,State-owned JSC "Development Finance Institution ALTUM"	NE	32.00	46.00	45.00	44.00	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	up to 2029. Activities relate to energy efficiency increase of building envelope, reconstruction of engineering systems (heat supply, hot water supply, installation of recuperation system), smart energy control and management. The renovation can be combined with the installation of RES microgeneration technologies. The financial assistance is provided in the form of a combined financial instrument: a loan issued by the state-owned JSC “Development Finance Institution ALTUM”, a guarantee for the loan issued by the commercial financial institution, a subsidy (grant). The grant is up to 49% of the project eligible costs. The given PaM has the impact on district heat consumption as Latvia has high relative share of multi-apartment														

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	buildings supplied by district heating systems. Cost information 32.5 EUR/t CO_2 Information on non-GHG benefits Economic benefits. Social benefits. Improved Public Health. Interaction with other mitigation actions Interaction with the PaMs No 2 "Energy Performance of Buildings" and No 3 "Informing Energy Consumers of Residential Sector". Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050. Building renovation measures have a long technical lifetime and														

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	thus have long term impact until 2050														
Investment Support to Increase Energy Efficiency in Public (State Central Government) Buildings **(PaM no.17)**	The measure is financed by the EU funding. The relevant programmes are (1) National Operational Programme "Growth and Employment" for 2016-2023 period, (2) Latvia's Recovery and Resilience Plan (RRP), 2022-2026, and (3) Latvia's Cohesion Policy Programme for 2021-2027 programming period, up to 2029. Activities relate to renovation of buildings and their engineering systems, installation of smart energy control and management equipment, installation of RES utilising energy production equipment for self-consumption. In 2023-2029 period the support is provided to renovate the buildings of state direct administration institutions; state founded Latvian universities;	Efficiency improvements of buildings (Energy Consumption reduction); Demand management (Energy Consumption reduction)	Economic instrument	Implemented	Energy	CO_2	2016	National Government: Ministry of Economics,Relevant institutions owning the buildings	NE	10.00	14.00	13.00	13.00	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	vocational education institutions and colleges; the buildings in which the culture sector functions are performed. The given PaM has impact on district heat consumption as Latvia has high share of public buildings supplied by district heating systems. Cost information 49.7 EUR/t CO_2 Information on non-GHG benefits Economic benefits. Social benefiits: better performance of widely visited public buildings. Improved Public Health. Interaction with other mitigation actions Interaction with the PaMs No 2 "Energy Performance of Buildings" Influences emissions from international transport No Information on how this measure modifies longer-term														

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050. Building renovation measures have a long technical lifetime and thus have long term impact until 2050														
Investment Support Programme to Increase Energy Efficiency in Municipal Buildings **(PaM no.18)**	The measure is financed by the EU funding. The relevant programmes are (1) National Operational Programme “Growth and Employment” for 2016-2023 period, (2) Latvia’s Recovery and Resilience Plan (RRP) 2022-2026, and (3) Latvia’s Cohesion Policy Programme (CPP) for 2021-2027 programming period, up to 2029. The beneficiaries are municipalities, municipal capital companies, public-private capital companies providing public services. Activities relate to energy efficient renovation of buildings and their	Efficiency improvements of buildings (Energy Consumption reduction); Demand management (Energy Consumption reduction)	Economic instrument	Implemented	Energy	CO_2	2016	National Government: Ministry of Smart Administration and Regional Development,Local municipalities	NE	5.00	9.00	9.00	9.00	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	engineering systems, installation of smart energy control and management equipment, installation of RES utilising energy production technologies for self-consumption. The given PaM has impact on district heat consumption as Latvia has high share of municipal buildings supplied by district heating systems. Cost information 49.7 EUR/t CO_2 Information on non-GHG benefits Economic benefits. Social benefits: better performance of widely visited public buildings. Improved Public Health. Interaction with other mitigation actions Interaction with the PaMs No 2 "Energy Performance of Buildings"														

Name[c]	Description[d, e, f]	Objectives	Type of instrument [g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050. Building renovation measures have a long technical lifetime and thus have long term impact until 2050														
National EAAI: Investment Support Programmes to reduce GHG emissions in public sector **(PaM no.19)**	Financing: the revenues due to the auctioning of Latvia's allocated EU ETS emission allowances. The particular EAAI programmes in public sector are: (1) energy efficiency improvement of the public buildings having the status of national significance architecture monuments: 1st Call projects implemented 2016-2022; 2nd Call projects on-going implementation up	Efficiency improvements of buildings (Energy Consumption reduction); Demand management (Energy Consumption reduction)	Economic instrument	Implemented	Energy	CO_2	2016	Local municipalities, National Government: Ministry of Climate and Energy	NE	2.00	2.00	2.00	2.00	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	to Febr 2028, annual specific heat energy consumption for heating after implementation should not be higher than 75 -90 kWh/m^2, (2) low energy buildings (projects implemented 2016-2019); (3) new energy self-sufficient buildings (two demonstration projects implemented 2019-2021). The EAAI supports also the implementation of smart urban technologies, particularly efficient public areas lighting (three subsequent calls, projects implementation 2019-2027). Cost information 89.5 EUR/t CO_2 Information on non-GHG benefits Social benefits. The supported projects have high demonstration value Interaction with other mitigation actions No														

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	interaction with other measures Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050														
Implementation of the EU Emissions Trading Scheme **(PaM no.20)**	Limitation of the amount of emission allowances allocated for EU ETS operators. The fourth trading period covers 2021-2030 and is divided into two consecutive periods. The first sub-period of 2021-2025 is under implementation according the Directive 2018/410/EU amending the Directive 2003/87/EC which established the EU ETS scheme. The Latvia's National Emissions Allowances Allocation Plan for	Limitation of amount of emission allowances allocated for EU ETS operators.	Regulatory	Implemented	Energy	CO_2	2005	National Government: Ministry of Climate and Energy	NE	NE	NE	NE	NE	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	2021-2025 is approved by the Cabinet of Ministers, actual amendments in the Allocation Plan are included by the Ministry of Climate and Energy Decisions. Cost information NE Information on non-GHG benefits NE Interaction with other mitigation actions Interaction with the PaM No 13 "Investment Support Programme for District Heating Systems" Influences emissions from international transport Yes Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050														

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
Electrification of Latvian railway network **(PaM no.21)**	The policy of zero-emission transport development, including railway as the central element, is included in the National Development Plan for 2021-2027 and National Energy and Climate Plan for 2021-2030. Latvia's Recovery and Resilience Plan, 2022-2026, invests for the complex improvement of electrification of railway system in Riga metropolitan area. The investment to modernise and increase the electrified railway area is provided also by Latvia's EU Cohesion Policy Programme for 2021-2027 programming period, up to 2029. Zero-emission railway infrastructure length to be increased by 45 km, the modernisation of 245 km of existing electrified lines to be provided in 2030. The infrastructure for the operation of	Modal shift to public transport: Electric vehicles (trains)	Economic instrument, Planning	Implemented	Transport	CO_2	2023	National Government: Ministry of Transport,State JSC "Latvian railway" (Latvijas dzelzceļš)	NA	4.00	9.00	14.00	14.00	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	modern electric trains will be ensured. In 2024-2026 the 32 new EMU trains will be put in operation gradually, financing for purchase provided by EU funding. New modern EMUs replace worn-out previous-generation EMUs and allows for more frequent traffic schedule performed by user-convenient vehicles Cost information NE Information on non-GHG benefits Social benefits. Increased Transport Resilience and Accessibility. Interaction with other mitigation actions Interaction with the PaM 30 "New battery electric trains" Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG														

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050														
Fuel Taxation - fuels utilised for energy production (PaM no.22)	Natural gas (the dominating fossil fuel in energy production) - the procedure of taxation has been established in 2010 by the Law "On Excise Duties", Articles 6.1 & 15.1, starting from the 1st January 2014 the differentiated rates for natural gas taxation are applied, the reduced rate promotes the industrial production and the particular activities of agriculture sector. Mineral oils - the procedure is established by the Law "On Excise Duties", Articles 5 & 14. Coal, coke and lignite (brown coal) - the procedure is established by the Natural Resources Tax Law, Article 23.1 and Annex 9.	Increase in renewable energy (Energy Supply); Efficiency improvement in the energy transformation sector (Energy Supply); Efficiency improvements of buildings (Energy Consumption reduction); Efficiency improvement in industrial end-use sectors (Energy Consumption reduction)	Fiscal	Implemented	Energy	CO_2	2010	National Government: Ministry of Finance	NE	NE	NE	NE	NE	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	Cost information NE Information on non-GHG benefits NE Interaction with other mitigation actions No interaction with other measures Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050														
Green Public Procurement **(PaM no.23)**	Public Procurement Law states the special rules with respect to energy efficiency (Section 55) and for procurement in the field of road transport (Section 54). Technical specifications, among others, should include the environmental protection	Low carbon fuels/electric cars (Transport); Efficiency improvement in end-use sectors (Energy Consumption reduction)	Regulatory	Implemented	Energy,Transport	CO_2	2016	National Government: Ministry of Economics,National Government: Ministry of Climate and Energy	NE	10.00	35.00	35.00	35.00	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	requirements, the provisions regarding reduction of GHG emissions, energy efficiency provisions in relation to the product or service (Section 20.4). Section 19 states the framework of Green Public Procurement (GPP). The Governmental Regulation on GPP relates also to energy consuming goods and services, the latest Amendments (July 2023) of the Regulation have stated GPP criteria as mandatory for the new construction and renovation of certain large-scale buildings, among them public buildings with total area above 1000 m^2: for certain use-types of these public buildings the GPP provides for higher energy efficiency as required by the buildings energy certification regulation. In September 2021 the provisions of the amending Directive														

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	2019/1161/EU regarding the procurement targets for the share of clean vehicles have been transposed. The latest Amendments (July 2023) of the GPP Regulation states the GPP criteria as mandatory for cars and light duty vehicles. Cost information 343.8 EUR/t CO_2 Information on non-GHG benefits Environmental benefits: air pollutants reduction Interaction with other mitigation actions Interaction with the PaM No 12 ''Development of zero-emission public transport'' Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the														

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	targets set out in the national Long term strategy for climate neutrality 2050														
Energy Management System (EMS) in Industry and Commercial Sector (mandatory) **(PaM no.24)**	It is mandatory EMS or Energy Audits in (1) Large Enterprises (transposition of Energy Efficiency Directive 2018/2002/EU); (2) Large Electricity Consumers (LEC, national measure, the electricity end-user is considered as a LEC if its own annual electricity consumption is above 500 MWh in two subsequent years). The large enterprises and the LECs shall provide annual reports on implemented energy saving measures and reached energy savings. At least three energy efficiency measures (or all, if only one or two measures stated) stated by the first and the following energy audit or EMS, which have the highest energy savings or the highest economical	Efficiency improvement in industry and services/ tertiary sectors (Energy Consumption reduction); Demand management (Energy Consumption reduction)	Regulatory	Implemented	Energy	CO_2	2017	National Government: Ministry of Climate and Energy	NE	65.00	55.00	50.00	45.00	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	return, shall be implemented both by large enterprises (up to the 1st April 2020 for the 1st audit/EMS period) and by LECs (up to the 1st April 2022, for the 1st audit/EMS period). Cost information NE Information on non-GHG benefits Economic benefits. Interaction with other mitigation actions Interaction with the PaM No 15 ''Investment Support for energy efficiency improvement and transfer to RES in manufacturing industry and commercial sector'' Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term														

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	strategy for climate neutrality 2050														
Energy Management System (EMS) in Public Sector (mandatory) **(PaM no.25)**	The Amendments (14th July 2022) on the Energy Efficiency Law expand the EMS duty to all municipalities and also to derived public persons. The current regulation provides for: (1) mandatory EMS in those state administration institutions and derived public persons which have in ownership or possession the buildings with total heated area 10000 m^2 and above); (2) mandatory EMS in all municipalities. Annual report on implemented energy efficiency measures and reached energy savings shall be submitted. Cost information NE Information on non-GHG benefits Economic benefits. Interaction with other mitigation actions Interaction	Efficiency improvements of buildings (Energy Consumption reduction); Efficiency improvement in municipal end-use sector (Energy Consumption reduction); Demand management (Energy Consumption reduction)	Regulatory	Implemented	Energy	CO_2	2017	Local municipalities, National Government: Ministry of Climate and Energy,Other ministries	NE	2.00	3.00	3.00	3.00	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument [g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	with the PaM No 17 "Investment Support to Increase Energy Efficiency in Public (State Central Government) Buildings", PaM No 18 '' Investment Support for energy efficiency improvement in municipal buildings" and the PaM No 19 "National EAAI: Investment Support Programmes to reduce GHG emissions in public sector". Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050														
Electric Vehicles (EV) Charging Infrastruct	EV Charging Infrastructure Development in Public Areas is supported by the	Electric vehicles	Economic instrument, Planning	Implemented	Transport	CO_2	2022	National Government: Ministry of Economics,Po	NA	NE	NE	NE	NE	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
ure Development **(PaM no.26)**	Latvia's Plan of EU Recovery and Resilience Facility. Power distribution system operator SJSC "Sadales tīkls" in cooperation with the customers are installing (up to 31st May 2026) 2060 grid connection points for installation of new publicly available EV charging points and/or solar PV micro-generation equipment throughout Latvia. The infrastructure from the power distribution network to the metering substation is designed and built by DSO "Sadales tīkls" (RRF Plan funding), the customers - municipality, state or municipal institution, state or municipal capital company, public-private company, EV charging point operator – are financing the installation of charging point and related equipment and connection from							wer DSO SJSC "Sadales tīkls"							

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	the substation. The charging point is up to 22 kW [32 A, 0,4 kV]. Cost information NE Information on non-GHG benefits Environmental benefits: air pollutants reduction Interaction with other mitigation actions Well-developed EV charging infrastructure is the pre-condition for the rapid increase of the number of electric vehicles, the PaMs No 28 and No 31 Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050														

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
RES Technologies in Residential buildings **(PaM no.27)**	The measure includes two programmes, financed respectively by the national EAAI and the State Energy Efficiency Fund. These programmes support both RES-heat (wood pellets technologies, heat pumps, solar heat panels) and RES-electricity technologies. The first programme is available for all households and provide grant to partially cover the purchase cost of RES technologies. The second programme is focused to families with child for which the technical assistance grant and investment co-financing grant is available. The second programme supports also energy efficiency improvement of building and its engineering systems. Cost information 80.8 EUR/t CO_2	Increase in renewable energy (Energy supply); Efficiency improvements of buildings (Energy Consumption reduction)	Economic instrument	Implemented	Energy	CO_2	2022	National Government: Ministry of Economics,National Government: Ministry of Climate and Energy	NA	6.00	12.00	12.00	12.00	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	Information on non-GHG benefits Social benefits. Increased Energy Security. Economic Resilience. Interaction with other mitigation actions No interaction with other measures Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050. The installation of RES utilizing technologies, considering the technical lifetime of them, has a long-term positive impact on GHG emission trend.														
Electric Vehicles (EV) purchase support	Two target groups are supported: natural persons (national EAAI instrument) and	Electric cars	Economic instrument	Implemented	Transport	CO_2	2022	National Government: Ministry of Economics,National	NA	3.00	8.00	8.00	8.00	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
(PaM no.28)	merchants (Latvia's Recovery and Resilience Plan). Fixed grant for natural persons is provided for purchase of M1 and N1 category EV: (1) zero-emission battery EV, both new and exploited ones, and (2) new plug-in hybrid EV having GHG emissions up to 50 g per km. It is also provided support for the scrapping of an existing vehicle by handing it over to a treatment company. Also the trader - EV seller - shall offer the customer an additional incentive in certain financial amount. In its turn, to facilitate the purchase of new M1 and N1 category BEV in the commercial and industry sectors, the combined financial instrument consisting of the loan guarantee and the capital rebate (grant) for a reduction of the principal amount of the lease from							Government: Ministry of Climate and Energy,State-owned JSC "Development Finance Institution ALTUM"							

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	another financier is provided. Cost information 418.5 EUR/t CO_2 Information on non-GHG benefits Improved Air Quality and Public Health. Interaction with other mitigation actions Interaction with the PaM No 26 "Electric vehicles charging infrastructure development" Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050														
Promotion of multi-modality of public	The National Development Plan 2021-2027 and National Energy and Climate Plan 2021-2030 state the	Modal shift to public transport	Economic instrument, Planning	Implemented	Transport	CO_2	2024	National Government: Ministry of Transport,Local municipalities	NA	NE	15.00	18.00	18.00	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
transport (PT) **(PaM no.29)**	establishment of the multi-modal PT system having the rail transport as the central element. Passenger-convenient connecting points between rail and buses transport modes, as well as private electric mobility (including EV charging points) and micromobility modes, have to be ensured. The investment for the development of multi-modal mobility points and Park&Ride infrastructure, is included in the Latvia's EU Cohesion Policy Programme for 2021-2027 programming period, the Specific Objective "To promote the sustainable and diverse mobility in cities/towns", at least 25 multi-modal railway – public transport connection points shall be constructed up to 31.12.2029. In its turn, Latvia's Recovery and														

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	Resilience Plan provides investment for the improving PT access infrastructure of particular railway stations in Riga area by creating eight smart digitalized multi-modal points. Cost information NE Information on non-GHG benefits Social benefits. Increased Transport Resilience and Accessibility. Interaction with other mitigation actions Interaction with the PaM 30 "New battery-EMU trains" and PaM No 32 "Electrifying of public transport and improving its electricity infrastructure" Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the														

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	national Long term strategy for climate neutrality 2050"														
New battery - EMU trains **(PaM no.30)**	"National Energy and Climate Plan 2021-2030 (NECP 2030) states the railway as the central element of public transport system. Updated NECP 2030 provides for the purchase and operation of 9 battery-EMUs, financing to be provided by the Latvia's EU Cohesion Policy Programme for 2021-2027 programming period and state budget. BEMUs will be put into operation gradually after 2027. The operation of BEMUs will replace worn-out diesel trains. Cost information NE Information on non-GHG benefits Environmental benefits: reduction of air pollutants. Social benefits Interaction with other mitigation	Modal shift to public transport; Electric vehicles (trains)	Economic instrument, Planning	Planned	Transport	CO_2	2028	National Government: Ministry of Transport,State JSC "Latvian railway" (Latvijas dzelzceļš)	NA	NE	1.60	1.70	1.70	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	actions Interaction with the PaMs No 21 “Electrification on railway network” and No 29 “Promotion of multi-modality of public transport”. Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050"														
Further increase of the number of battery electric cars **(PaM no.31)**	"The measure supports the increase of the number of battery electric cars beyond the implemented measure No 28 “Electric vehicles purchase support”. The increase relates to all users – natural persons, merchants, state and municipal institutions. Updated National Energy and Climate Plan 2021-2030 (NECP 2030)	Electric cars	Economic instrument	Planned	Transport	CO_2	2025	National Government: Ministry of Economics,Local municipalities, National Government: Ministry of Climate and Energy,State-owned JSC "Development Finance Institution ALTUM"	NA	NE	12.00	49.00	49.00	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	provides to use diverse funding to support the electric vehicles purchasing – EU funds, EAAI, Modernisation Fund. NECP 2030 provides to develop also new financing instruments, e.g., soft loan and loan guarantee programme for natural persons. NECP 2030 states to consider the amendments to the licensing of commercial transport, setting the obligation for the use of EVs, as well as the provisions of national regulation and support programmes to motivate the writing-off old fossil fuel vehicles. The measure is based on the well-developed EV charging infrastructure. NECP 2030 envisages having at least 20 thousand electric cars in 2030 which is around tripled existing number of July 2024.														

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	Cost information 439.4 EUR/t CO_2 Information on non-GHG benefits Environmental benefits: reduction of air pollutants. Interaction with other mitigation actions Interaction with the PaM No 26 "Electric vehicles charging infrastructure development" Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050														
Electrifying of public transport and improving its electricity	The measure supports the further increase of the number of user convenient electric vehicles in public transport, beyond the implemented	Modal shift to public transport; Electric vehicles	Economic instrument, Planning	Planned	Transport	CO_2	2026	National Government: Ministry of Finance,National Government: Ministry of Smart	NA	2.00	6.00	6.00	6.00	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
infrastructure **(PaM no.32)**	measure No 12 “Development of zero emission public transport”. Updated National Energy and Climate Plan 2021-2030 (NECP2030) provides to use EU funding and municipalities’ budgets to purchase new zero emission public transport vehicles and their charging infrastructure. NECP 2030 plans to have in 2030 265 new electric buses in Latvia as well as 100 new trolleybuses and 24 new low-floor trams in Riga city. Cost information 343.8 EUR/t CO_2 Information on non-GHG benefits Social benefits. Improved Air Quality and Public Health. Increased Transport Resilience and Accessibility. Interaction with other mitigation actions Interaction with the PaM No 29 "Promotion of multi-							Administration and Regional Development,Local municipalities							

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	modality of public transport" Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050														
Mandatory energy consumption reduction target and energy consumption monitoring for public bodies **(PaM no.33)**	The Updated National Energy and Climate Plan 2021-2030 (NECP 2030) states to set the mandatory target for public sector institutions -1.9% energy consumption reduction annually. The energy coverage includes electricity, heat energy, natural gas and other fuels, transport fuels. The obligation relates to energy consumed in the buildings owned or in possession by state and municipalities, energy consumed by	Energy Consumption reduction: Efficiency improvements of buildings, Efficiency improvement in public end-uses, Demand management	Regulatory	Planned	Energy	CO_2	2026	National Government: Ministry of Climate and Energy	NA	NE	10.00	10.00	10.00	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	state and municipal authorities and state and municipal capital companies. Thus, the target is set in accordance with Article 5 of the new Energy Efficiency Directive 2023/1791/EU - the total final energy consumption of all public bodies combined shall be reduced by at least 1.9% each year, when compared to 2021. To support the implementation of the PaM, the NECP 2030 states for the mandatory implementation of Energy Management Systems in all public sector, including public capital companies, and provides to increase the financial support and provide knowledge support for energy efficiency improvement in municipalities' end-uses. Cost information NE Information on non-GHG benefits Social														

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	benefits: renovation and better performance of widely visited public buildings. Improved Air Quality and Public Health. Interaction with other mitigation actions Interaction with the PaM No 25 “Energy Management Systems in Public Sector”; and PaM No 34 "Financial and knowledge support to municipalities for the implementation of energy efficiency measures” Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050														
Financial and	The measure further increases the	Energy Consumption	Economic instrument,	Planned	Energy	CO_2	2026	National Government:	NA	NE	NE	NE	NE	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
knowledge support to municipalities for the implementation of energy efficiency measures **(PaM no.34)**	financial support for municipalities, beyond the amount of support provided by the implemented PaM No 18 “Investment Support to Increase Energy Efficiency in Municipal Buildings”. Activities relate to energy efficient renovation of buildings and their engineering systems, installation of smart energy control and management equipment, installation of RES utilising energy production technologies. The financial support is combined with the providing adequate knowledge support – energy managers in municipalities (partial covering of staff cost or outsourcing cost), aid in preparation of technical documentation of the projects, support in ICT solutions for energy consumption monitoring and demand management, etc.	reduction: Efficiency improvements of buildings, Efficiency improvement in public end-uses, Demand management	Information, Planning					Ministry of Smart Administration and Regional Development,Local municipalities, National Government: Ministry of Climate and Energy							

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	Cost information NE Information on non-GHG benefits Improved Air Quality and Public Health. Social benefits: better performance of widely visited public buildings Interaction with other mitigation actions Interaction with the PaM No 33 "Mandatory energy consumption reduction target and energy consumption monitoring for public bodies" Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050														
Further increase of RES capacities	The PaM, stated by Updated National energy and climate plan 2021-2030	Increase in renewable energy (Energy	Regulatory, Economic instrument	Planned	Energy	CO_2	2026	National Government: Ministry of Economics,Nati	NA	NE	14.00	14.00	14.00	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
and energy efficiency in industry and service sector **(PaM no.35)**	(NECP 2030), relates to industrial production entities, commercial services providers, municipalities (both municipal institutions and municipal capital companies). The PaM further increases the financial support volume beyond the support provided by the implemented PaMs. The financial support is planned for installation of new renewable energy production capacities and modernisation of existing ones with the focus on zero emission technologies, installation of energy efficient production technologies and auxiliary equipment, replacement of building's inner and outer engineering systems and networks. It would be determined that renovated industrial buildings shall correspond to the nearly zero emission ones and that at least	Supply); Efficiency improvements of buildings (Energy Consumption reduction); Efficiency improvement in industrial end-use sectors (Energy Consumption reduction)						onal Government: Ministry of Climate and Energy							

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	50% of the energy consumed shall be provided by RES, as well as to state the obligation to install solar energy equipment in the construction of new commercial buildings of a certain capacity and renovation of existing ones. As a result, NECP 2030 envisages to have significant renewable energy production capacity increase in the noted sectors. Cost information 29.3 EUR/t CO_2 Information on non-GHG benefits Environmental benefits - air pollutants decrease. Economic benefits Interaction with other mitigation actions Interaction with the PaM 36 “Energy Management Obligations in Large Energy Consuming Entities"														

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050. Building renovation measures have a long technical lifetime and thus have long term impact until 2050. Measures improving energy efficiency of production technologies have a direct impact on the GHG emission trend in a medium period at least.														
Energy Management Obligation in Large Energy Consuming Entities **(PaM no.36)**	The PaM expands the coverage of the enterprises for which the energy audit is mandatory. The Updated National Energy and Climate Plan 2021-2030 states to set mandatory Energy Management Obligation –Energy	Efficiency improvement in industry and services/ tertiary sectors (Energy Consumption reduction); Demand management (Energy	Regulatory	Planned	Energy	CO_2	2025	State Construction Control Bureau of Latvia (conformity assessment),National Government: Ministry of Climate and Energy	NA	NE	33.00	33.00	33.00	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	Audit or Energy Management System or Supplemented Environmental Management System – and implementation of energy efficiency improving measures in large energy consuming entities with the annual energy consumption of 1.7 – 2.8 GWh. Thus, the measure transposes the requirements of the new Energy Efficiency Directive's 2023/1791/EU Article 10.2 Cost information NE Information on non-GHG benefits NE Interaction with other mitigation actions Interaction with the PaM No 15 "Investment Support for energy efficiency improvement and transfer to RES in manufacturing industry and commercial sector'' and PaM No 35 "Further increase of RES capacities and	Consumption reduction)													

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	energy efficiency in industry and service sector” Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050														
Further increase of energy efficiency of multi-apartment buildings **(PaM no.37)**	The PaM further increases the financial support volume, beyond the support provided by the PaM No 16 “Investment Support to Increase Energy Efficiency in Multi-Apartment Buildings”. It is planned by the Updated National Energy and Climate Plan 2021-2030 to provide in addition approximately the same financing volume as provided by the PaM No 16. The activities relate	Efficiency improvements of buildings (Energy Consumption reduction); Demand management (Energy Consumption reduction)	Economic instrument	Planned	Energy	CO_2	2026	National Government: Ministry of Economics,State-owned JSC "Development Finance Institution ALTUM"	NA	NE	20.00	26.00	26.00	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	to energy efficiency increase of building envelope, reconstruction of engineering systems, smart energy consumption control and management. Additional funding envisaged by both national and EU funding. Cost information 36.5 EUR/t CO_2 Information on non-GHG benefits Economic benefits. Social benefits. Improved Public Health. Interaction with other mitigation actions Interaction with the PaMs No 2 "Energy Performance of Buildings" and No 3 "Informing Energy Consumers of Residential Sector". Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and														

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050														
Increase biological waste treatment **(PaM no.38)**	In 6 waste polygons increase biological waste recycling in treatment facilities till 192 786 tonnes/year Cost information NE Information on non-GHG benefits Enhanced Waste Management and Climate Resilience, Economic Benefits and Public Awareness Interaction with other mitigation actions No interaction with other measures Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the	Reduced landfilling (Waste management /waste)	Economic instrument	Implemented	Waste management	CH_4	2022	National Government: Ministry of Climate and Energy,Waste management companies	NA	NE	36.12	75.67	98.52	114.63	114.63

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	targets set out in the national Long term strategy for climate neutrality 2050														
Public awareness and capacity building measures in waste management **(PaM no.39)**	Increase Public awareness in waste management. Public information and capacity building measures implemented: a) the population reached is at least 20,000 b) persons who have changed their behavior or habits under the influence of the project, 10,000 Cost information 0.674 millions EURO Information on non-GHG benefits Economic Benefits, Public Awareness Interaction with other mitigation actions No interaction with other measures Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG	Reduced landfilling (Waste management /waste)	Information	Planned	Waste management	CH_4	2027	National Government: Ministry of Climate and Energy	NA	NE	4.84	5.00	9.33	11.56	11.56

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050														
Strategy of Sewage Sludge Management **(PaM no.40)**	The strategy aims to ensure management of sewage sludge in appropriate way. Strategy includes plan of dewatering vast majority of sewage sludge thus decreasing CH_4 emissions from sewage sludge stored anaerobically Cost information 72 542 130 EURO Information on non-GHG benefits Economic and social benefits (circular economy, form waste to resource) Interaction with other mitigation actions No interaction with other measures Influences emissions from international transport No	Reduced sewage sludge (Waste management /waste)	Regulatory, Planning	Adopted	Waste management	CH_4	2024	National Government: Ministry of Climate and Energy	NA	NE	NE	NE	NE	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument [g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050														
Support for fertilisation planning **(PaM no.41)**	The main aim of measure is to expand arable land and increase number of medium-sized crop and livestock farms were fertilisation planning and practical implementation that is based on knowledge about agrochemical properties of soil have not been done previously. Ecosheme: TM4.5 Agricultural practices to reduce nitrogen and ammonia emissions and pollution: The aim of the activity is to promote the accurate and efficient use of fertilisers (organic fertilisers and mineral fertilisers)	Reduction of fertilizer/manure use on cropland (Agriculture)	Economic instrument, Voluntary/ negotiated agreements	Implemented	Agriculture	N_2O	2023	National Government: Ministry of Agriculture	NA	47.90	47.90	NE	NE	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument [g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	and PPPs in order to reduce the risks associated with the use of fertilisers and PPPs in the long term and to reduce leakage. Cost information NE Information on non-GHG benefits Minimize harmful runoff into waterways, cost reduction Interaction with other mitigation actions No interaction with other measures Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050														
Promote inclusion of	The main aim of the measure is to expand arable land and	Other activities improving	Economic instrument, Voluntary/	Implemented	Agriculture	N_2O	2023	National Government:	NA	54.10	54.10	NE	NE	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
leguminous plants in crop rotation for nitrogen fixation **(PaM no.42)**	increase number of farms were leguminous plants are included in crop rotation thus contributing to atmospheric nitrogen fixation and reduction of application of inorganic nitrogen fertilizers. Cost information NE Information on non-GHG benefits Replenish soil nutrients and encourage a wider variety of plant and animal life, creating habitats for pollinators and beneficial insects Interaction with other mitigation actions No interaction with other measures Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM	cropland management (Agriculture)	negotiated agreements					Ministry of Agriculture							

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	contributes to the targets set out in the national Long term strategy for climate neutrality 2050														
Promote and support for precision application of inorganic nitrogen fertilisers **(PaM no.43)**	The main aim of the measure is to expand arable land and increase the number of farms were precision technologies for application of inorganic nitrogen fertilisers are used in the planning of fertiliser schemes and spreading. Ecosheme: TM4.5 Agricultural practices to reduce nitrogen and ammonia emissions and pollution: The aim of the activity is to promote the accurate and efficient use of fertilisers (organic fertilisers and mineral fertilisers) and PPPs in order to reduce the risks associated with the use of fertilisers and PPPs in the long term and to reduce leakage.	Other activities improving cropland management (Agriculture)	Economic instrument, Voluntary/ negotiated agreements	Implemented	Agriculture	N_2O	2023	National Government: Ministry of Agriculture	NA	IE(1)	IE(1)	IE(1)	IE(1)	IE(1)	IE(1)

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	Cost information NE Information on non-GHG benefits Innovation, cost reduction, minimize harmful runoff into waterways Interaction with other mitigation actions No interaction with other measures Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050														
Promote organic dairy farming (low emission dairy farming)	The main aim of the measure is to promote transition of small and medium-sized conventional dairy farms to the organic farming system, thus facilitating low	Support low emission dairy farming (Agriculture)	Economic instrument, Voluntary/ negotiated agreements	Implemented	Agriculture	CH_4, N_2O	2023	National Government: Ministry of Agriculture	NA	126.00	126.00	NE	NE	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
(PaM no.44)	emission dairy farming. Cost information NE Information on non-GHG benefits Enhanced Soil Health Water Management, support livestock health, enhancing biodiversity Interaction with other mitigation actions No interaction with other measures Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050														
Management of nitrate vulnerable territories	Restriction for nitrogen usage, reduction of nitrogen leaching. Water protection against pollution caused by nitrates from	Reduction of nitrogen leaching (Agriculture)	Regulatory	Implemented	Agriculture	N_2O	2014	National Government: Ministry of Agriculture	NE	IE[(2)]	IE[(2)]	IE[(2)]	IE[(2)]	IE[(2)]	IE[(2)]

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
(PaM no.45)	agricultural sources. Rules for management of vulnerable zones. Cost information NE Information on non-GHG benefits Enhanced Soil Health Water Management, minimize harmful runoff into waterways Interaction with other mitigation actions No interaction with other measures Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050														
Requirements for the protection of soil and	Restriction for nitrogen usage, reduction of nitrogen leaching. Reduction	Reduction of fertilizer/manure use on	Regulatory	Implemented	Agriculture	N_2O	2014	National Government: Ministry of Agriculture	NE	IE(3)	IE(3)	IE(3)	IE(3)	IE(3)	IE(3)

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
water from agricultural pollution caused by nitrates **(PaM no.46)**	of non-direct N_2O emissions Cost information NE Information on non-GHG benefits Enhanced Soil Health Water Management, minimize harmful runoff into waterways Interaction with other mitigation actions No interaction with other measures Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050	cropland (Agriculture)													
Crop fertilization plans in vulnerable zones	According to Republic of Latvia Cabinet Regulation No. 834 (2014) "Regarding to Protection of Water and Soil from	Reduction of fertilizer/manure use on cropland (Agriculture)	Regulatory	Implemented	Agriculture	N_2O	2012	National Government: Ministry of Agriculture	NE	IE[(4)]	IE[(4)]	IE[(4)]	IE[(4)]	IE[(4)]	IE[(4)]

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
(PaM no.47)	Pollution with Nitrates Caused by Agricultural Activity" in highly vulnerable zones farmers who managing the agricultural land with an area of 20 hectares and more, and grows vegetables, potatoes, fruit trees or fruit bushes in an area of three hectares and more, are required to document the field history for each field and shall keep field history documentation for at least three years and, if using fertilisers; shall prepare a crop fertilisation plan for each field not later than until the sowing or planting of a crop, for perennial sowings and plants - until the start of vegetation. Cost information NE Information on non-GHG benefits Enhanced Soil Health Water Management, minimize harmful runoff into waterways														

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	Interaction with other mitigation actions No interaction with other measures Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050														
Requirements for manure storage and spreading **(PaM no.48)**	Specify the requirements for storing of manure outside animal shed Requirements refer to farms with more than 10 AU (animal units), and 5 AU in vulnerable territories. Cost information NE Information on non-GHG benefits Minimize harmful runoff into waterways	Improved animal waste management systems (Agriculture)	Regulatory	Implemented	Agriculture	CH_4, N_2O	2014	National Government: Ministry of Agriculture	NE	NE	NE	NE	NE	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	Interaction with other mitigation actions No interaction with other measures Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050														
Maintenance of amelioration systems **(PaM no.49)**	Financial support for reconstruction or renovation of a drainage system in the development of agricultural and forestry infrastructure. The measure is implemented in extensively managed croplands on mineral soils, where high yields are not possible due to unfavorable conditions during spring time, which are caused by	Other activities improving cropland management (Agriculture)	Voluntary/ negotiated agreements	Implemented	Agriculture	N_2O	2014	National Government: Ministry of Agriculture	NE	IE[(5)]	IE[(5)]	IE[(5)]	IE[(5)]	IE[(5)]	IE[(5)]

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	wearing of existing drainage systems. This will reduce indirect N_2O emissions from N leaching and runoff from agricultural land. Cost information NE Information on non-GHG benefits Enhanced Soil Health Water Management Interaction with other mitigation actions No interaction with other measures Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050														
Promote and support for direct	The main aim of measure is to expand arable land were organic fertilisers are	Improved animal waste management	Economic instrument, Voluntary/	Implemented	Agriculture	CH_4, N_2O	2023	National Government:	NA	4.20	4.20	NE	NE	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
incorporation of organic fertilisers into the soil **(PaM no.50)**	directly incorporated into the soil thus promoting more efficient use of organic fertilisers. Cost information NE Information on non-GHG benefits Enhanced Soil Health Water Management, minimize harmful runoff into waterways, reduce costs, prevent soil erosion, innovation Interaction with other mitigation actions No interaction with other measures Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050	systems (Agriculture)	negotiated agreements					Ministry of Agriculture							

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
Maintenance and modernization of amelioration systems on agricultural land **(PaM no.51)**	The main aim of measure is to increase arable land area with improved and maintained amelioration systems, thereby reducing N leaching and run-off from agriculture Cost information NE Information on non-GHG benefits Enhanced Soil Health Water Management, minimize harmful runoff into waterways Interaction with other mitigation actions No interaction with other measures Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term	Other activities improving cropland management (Agriculture)	Economic instrument, Voluntary/ negotiated agreements	Implemented	Agriculture	CH_4, N_2O	2023	National Government: Ministry of Agriculture	NA	IE[(6)]	IE[(6)]	IE[(6)]	IE[(6)]	IE[(6)]	IE[(6)]

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	strategy for climate neutrality 2050														
Promote the production of biogas **(PaM no.52)**	The main aim of the measure is to ensure the installation of biogas production and biogas purification (biomethane production) facilities on farms that do not yet have biogas production and purification facilities. Cost information NE Information on non-GHG benefits Increase farm profitability, reduces odors Interaction with other mitigation actions No interaction with other measures Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the	Improved animal waste management systems (Agriculture)	Economic instrument, Voluntary/ negotiated agreements	Implemented	Agriculture	CH_4	2023	National Government: Ministry of Agriculture	NA	14.00	14.00	NE	NE	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	national Long term strategy for climate neutrality 2050														
Increase of land area under organic farming relative to total agricultural land **(PaM no.53)**	Farming methods with environmentally friendly influence on nature, reduction of synthetic nitrate use and leaching, increased biodiversity. The state support for organic farmers through subsidies Cost information NE Information on non-GHG benefits Improving soil health, increase carbon sequestration, enhancing biodivercity Interaction with other mitigation actions No interaction with other measures Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM	Other activities improving cropland management (Agriculture)	Economic instrument	Implemented	Agriculture	CH_4, N_2O	2023	National Government: Ministry of Agriculture	NA	NE	NE	NE	NE	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	contributes to the targets set out in the national Long term strategy for climate neutrality 2050														
Support for evolving of precision agriculture technologies in crop growing farms to reduce nitrogen use **(PaM no.54)**	The measure is associated with promoting of nitrogen fertilizer use reduction and consequently with reduction of nitrogen amount in the run-off. This will reduce N_2O emissions from use of synthetic fertilizers and indirect N_2O emissions from soils. Cost information NE Information on non-GHG benefits Enhanced Soil Health Water Management, minimize harmful runoff into waterways, reduce costs, prevent soil erosion, innovation Interaction with other mitigation actions No interaction with other measures	Other activities improving cropland management (Agriculture)	Economic instrument	Implemented	Agriculture	N_2O	2014	National Government: Ministry of Agriculture	NE	IE(7)	IE(7)	IE(7)	IE(7)	IE(7)	IE(7)

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050														
Promotion of grassland conservation **(PaM no.55)**	The intervention provides a commitment that aid applicant must ensure that grassland is maintained for at least two consecutive years, i.e. it may not be ploughed up. A stocking density on grassland shall be ensured. It contributes to the mitigation of climate change, including the reduction of GHG emissions from agricultural practices and ensures maintenance of soil carbon stocks. Cost information NE	Other activities improving cropland management (Agriculture)	Economic instrument, Voluntary/ negotiated agreements	Implemented	Agriculture	N_2O	2023	National Government: Ministry of Agriculture	NA	NE	NE	NE	NE	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	Information on non-GHG benefits Enhancing biodiversity, prevent soil erosion, creating habitats for pollinators and beneficial insects Interaction with other mitigation actions No interaction with other measures Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050														
Conservation farming practices **(PaM no.56)**	The intervention requires the aid applicant to carry out one of the respectful agricultural practices: minimal tillage (min-till), strip till or direct sowing (no-till) and has restrictions on the use of herbicides.	Other activities improving cropland management (Agriculture)	Economic instrument, Voluntary/ negotiated agreements	Implemented	Agriculture	N_2O	2023	National Government: Ministry of Agriculture	NA	NE	NE	NE	NE	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	Cost information NE Information on non-GHG benefits Enhancing soil health, enhancing biodiversity, prevent soil erosion, creating habitats for pollinators and beneficial insects Interaction with other mitigation actions No interaction with other measures Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050														
Increased welfare requirements and emissions-reducing	Support to intervention activity "extended grazing for at least 160 days", that allow to improve pasture management as well, may lead to	Improved livestock management (Agriculture)	Economic instrument, Voluntary/ negotiated agreements	Implemented	Agriculture	CH_4, N_2O	2023	National Government: Ministry of Agriculture	NA	170.00	170.00	NE	NE	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
livestock farming **(PaM no.57)**	significant reduction of GHG emissions. Cost information NE Information on non-GHG benefits Support livestock health and productivity, reduce costs, enhancing biodiversity, improve soil health Interaction with other mitigation actions No interaction with other measures Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050														
Reconstruction and development of drainage systems in	Reconstruction and maintenance of drainage systems in cropland. The measure will be implemented in	Other land use, land-use change and forestry	Economic instrument	Adopted	LULUCF	CO_2	2023	National Government: Ministry of Agriculture	NA	318.03	1590.13	1590.13	4240.35	NE	NE

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
cropland and grassland (till 2028) **(PaM no.58)**	croplands, where high yields are possible due to drainage and wearing out of the drainage systems would lead to reduction of carbon input in soil with plant residues. After reconstruction of drainage systems fields will be maintained as a conventional production system with considerable input of organic material in soil due to higher yields and crop rotations. Only CO_2 is considered due to the fact that country specific methods for accounting of reduction of CH_4 are not elaborated and use of the default IPCC values might lead to considerable overestimation of positive impact of the measure. Cost information NE Information on non-GHG benefits Improved water														

Name[c]	Description[d, e, f]	Objectives	Type of instrument [g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	management, flood mitigation Interaction with other mitigation actions No interaction with other measures Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050.														
Establishment of new orchards **(PaM no.59)**	The measure is aimed of maintenance of area of the orchards. Without financial support area of orchards would decrease resulting in reduction of carbon stock in affected areas. Cost information NE Information on non-GHG benefits Promotion of	Other land use, land-use change and forestry	Economic instrument	Adopted	LULUCF	CO_2	2023	National Government: Ministry of Agriculture	NA	4.01	14.69	28.04	41.39	54.74	68.09

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	economic resilience and opportunity for rural economic development (including diversification of agricultural activity) Interaction with other mitigation actions No interaction with other measures Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050.														
Undergrowth plants sown with winter crops **(PaM no.60)**	More efficient utilization of nutrients and increase of carbon input into soil due to prolongation of vegetation period and increased removals CO_2 in plants.	Other land use, land-use change and forestry	Economic instrument	Adopted	LULUCF	CO_2	2023	National Government: Ministry of Agriculture	NA	34.70	127.24	242.90	358.57	439.54	462.67

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	Cost information NE Information on non-GHG benefits Improving of soil health and biodiversity Interaction with other mitigation actions No interaction with other measures Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050.														
Green fallow before winter crops **(PaM no.61)**	Increased carbon stock in soil due to increase of efficient vegetation period and bigger carbon input in soil. The measure is efficient in case if fallows are used before winter crops.	Other land use, land-use change and forestry	Economic instrument	Adopted	LULUCF	CO_2	2023	National Government: Ministry of Agriculture	NA	20.00	73.33	140.00	206.66	253.33	266.66

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	Cost information NE Information on non-GHG benefits Improving of soil health Interaction with other mitigation actions No interaction with other measures Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050.														
Introduction of legumes into conventional crop rotations **(PaM no.62)**	Increase of carbon stock in soils due to increase of carbon input into soil with biomass; reduction of N_2O emissions in agriculture sector. Cost information NE Information on non-GHG benefits	Other land use, land-use change and forestry	Economic instrument	Adopted	LULUCF	CO_2	2023	National Government: Ministry of Agriculture	NA	66.00	242.02	462.03	682.05	836.06	880.06

Name[c]	Description[d, e, f]	Objectives	Type of instrument [g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	Improving of soil health, fertility Interaction with other mitigation actions No interaction with other measures Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050.														
Reconstruction of drainage systems in forest land **(PaM no.63)**	Restoration of malfunctioning drainage systems and preventive maintenance of drainage ditches, which secures continuously high removals of CO_2 in following forest generation. Cost information NE Information on non-GHG benefits Improved water	Other land use, land-use change and forestry	Economic instrument	Adopted	LULUCF	CO_2	2023	National Government: Ministry of Agriculture	NA	78.29	284.39	548.60	779.49	1001.38	1161.95

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	management, flood mitigation; Promotion of economic resilience and opportunity for rural economic development Interaction with other mitigation actions No interaction with other measures Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050.														
Afforestation of nutrient-poor soils in grassland and cropland **(PaM no.64)**	Increase of carbon stock in soil, living and dead biomass pools by afforestation of low valued croplands and grasslands. Cost information NE Information on non-GHG benefits	Other land use, land-use change and forestry	Economic instrument	Adopted	LULUCF	CO_2	2023	National Government: Ministry of Agriculture	NA	51.44	188.61	360.07	531.54	703.00	799.06

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	Creation of natural barriers that slow down water flow during heavy rainfall; Stabilization of soil, reducing erosion and improving its fertility, structure and health; Promotion of economic resilience and opportunity for rural economic development; Improved biodiversity Interaction with other mitigation actions No interaction with other measures Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050.														
Pre-commercial thinning	Support to pre-commercial thinning of forest stands.	Other land use, land-use	Economic instrument	Adopted	LULUCF	CO_2	2023	National Government:	NA	NE	241.14	884.19	1687.99	2491.79	2976.60

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
(PaM no.65)	According to the study results (the research programme on impact of forest management measures on GHG emissions and CO_2 removals 2011-2015) early thinning in coniferous stands, as it is done now according to national regulations, contributes to additional increment during 20 years period; respectively, growing stock in 40-60 years old coniferous stands and research trials is by 15-25% higher than in non-thinned stands. Private forest owners are not motivated to implement early thinning due to the fact that is is not resulting in direct incomes, therefore, this measure is oftenly avoided to save money. Support to forest thinning will result in rapid and significant increase of carbon stock. Cost information NE	change and forestry						Ministry of Agriculture							

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	Information on non-GHG benefits Promotion of economic resilience and opportunity for rural economic development Interaction with other mitigation actions No interaction with other measures Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050.														
Regeneration of forest stands suffered by natural disturbances **(PaM no.66)**	Support to reconstruction and regeneration of forest stands damaged by natural disasters like wind and fire. The measure will reduce forest regeneration period and quicker increase of all carbon	Other land use, land-use change and forestry	Economic instrument	Adopted	LULUCF	CO_2	2023	National Government: Ministry of Agriculture	NA	8.15	29.87	57.03	84.18	111.34	126.80

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	pools including the total potential of CO_2 removals by proper selection of species. Cost information NE Information on non-GHG benefits Promotion of economic resilience and opportunity for rural economic development Interaction with other mitigation actions No interaction with other measures Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050.														
Encourage recultivation of historically used	Abandoned peat extraction sites are considerable source of GHG emissions. Afforestation,	Other land use, land-use change and forestry	Economic instrument	Adopted	LULUCF	CO_2	2023	National Government: Ministry of Agriculture	NA	NE	132.30	485.10	926.10	1367.10	1808.10

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
peat extraction sites by selecting the most appropriate type of recultivation **(PaM no.67)**	establishment of perennial energy crops or extraction of remaining peat layer with following flooding or rewetting of areas, where growing of perennial crops for biomass production is not possible, may lead to significant reduction of GHG emissions. Cost information NE Information on non-GHG benefits Improved biodiversity; Restores of natural water retention capacity; Promotion of economic resilience and opportunity for rural economic development Interaction with other mitigation actions No interaction with other measures Influences emissions from international transport No Information on how this measure modifies longer-term trends in GHG														

Name[c]	Description[d, e, f]	Objectives	Type of instrument[g]	Status[h]	Sector(s) affected[i]	Gases affected	Start year of implementation	Implementing entity or entities	Estimates of GHG emission reductions (kt CO_2 eq)[j, k]						
									2020 Achieved	2025 Expected	2030 Expected	2035 Expected	2040 Expected	2045 Expected	2050 Expected
	emissions and removals The PaM contributes to the targets set out in the national Long term strategy for climate neutrality 2050.														

[a] Each Party shall provide information on actions, policies and measures that support the implementation and achievement of its NDC under Article 4 of the Paris Agreement, focusing on those that have the most significant impact on GHG emissions or removals and those impacting key categories in the national GHG inventory. This information shall be presented in narrative and tabular format (para. 80 of the MPGs).
[b] For each Party with an NDC under Article 4 of the Paris Agreement that consists of mitigation co-benefits resulting from Parties' adaptation actions and/or economic diversification plans consistent with Article 4, para. 7, information to be reported under paras. 80, 82 and 83 of the MPGs includes relevant information on policies and measures contributing to mitigation co-benefits resulting from adaptation actions or economic diversification plans (para. 84 of the MPGs).
[c] Parties may indicate whether a measure is included in the 'with measures' projections.

[d] Additional information may also be provided on the cost of the mitigation actions, non-GHG mitigation benefits, and how the mitigation action interacts with other mitigation actions, as appropriate (para. 83(a–c) of the MPGs).
[e] Parties should identify actions, policies and measures that influence GHG emissions from international transport (para. 88 of the MPGs).

[f] Parties should, to the extent possible, provide information about how actions, policies and measures are modifying longer-term trends in GHG emissions and removals (para. 89 of the MPGs).

[g] Parties shall, to the extent possible, provide information on the types of instrument: regulatory, economic instrument or other (para. 82(d) of the MPGs).

[h] Parties shall, to the extent possible, use the following descriptive terms to report on status of implementation: planned, adopted or implemented (para. 82(e) of the MPGs).

[i] Parties shall, to the extent possible, provide information on sector(s) affected: energy, transport, industrial processes and product use, agriculture, LULUCF, waste management or other (paras. 81 and 82(f) of the MPGs).
[j] Each Party shall provide, to the extent possible, estimates of expected and achieved GHG emission reductions for its actions, policies and measures in the tabular format; those developing country Parties that need flexibility in the light of their capacities with respect to this provision are instead encouraged to report this information (para. 85 of the MPGs).
[k] To the extent available, each Party shall describe the methodologies and assumptions used to estimate the GHG emission reductions or removals due to each action, policy and measure. This information may be presented in an annex to the biennial transparency report (para. 86 of the MPGs).

Custom footnotes:

(1) *This PaM GHG reduction is included in PaM "Support for fertilisation planning"*

(2) *This PaM GHG reduction is included in PaM "Support for fertilisation planning"*

(3) *This PaM GHG reduction is included in PaM "Support for fertilisation planning"*

(4) *This PaM GHG reduction is included in PaM "Support for fertilisation planning"*

(5) *This PaM GHG reduction is included in PaM "Support for fertilisation planning"*

(6) *This PaM GHG reduction is included in PaM "Support for fertilisation planning"*

(7) *This PaM GHG reduction is included in PaM "Support for fertilisation planning"*

TABLE 6

Summary of greenhouse gas emissions and removals in accordance with the common reporting table 10 emission trends – summary

According to paragraph 91 of the MPGs, each Party that submits a stand-alone national inventory report shall provide a summary of its GHG emissions and removals. This information shall be provided for those reporting years corresponding to the Party's most recent national inventory report, in a tabular format.

GREENHOUSE GAS EMISSIONS AND REMOVALS	Reference year/period for NDC (1)	Base year (2)	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
	CO₂ equivalents (kt) (3)											
CO_2 emissions without net CO_2 from LULUCF	NA	NA	19 661.60	17 919.59	14 193.53	11 921.67	10 370.18	9 133.94	9 211.66	8 679.92	8 306.02	7 717.86
CO_2 emissions with net CO_2 from LULUCF	NA	NA	6 262.65	4 087.11	-118.69	-2 180.08	-6 628.33	-6 737.58	-6 827.72	-5 593.14	-5 018.07	-1 962.27
CH_4 emissions without CH_4 from LULUCF	NA	NA	4 060.56	4 007.19	3 455.49	2 647.85	2 455.51	2 443.01	2 401.94	2 362.80	2 265.46	2 115.34
CH_4 emissions with CH_4 from LULUCF	NA	NA	4 583.85	4 523.95	4 055.33	3 166.79	2 971.05	2 967.69	2 926.63	2 888.96	2 790.66	2 670.38
N_2O emissions without N_2O from LULUCF	NA	NA	2 298.32	2 203.71	1 710.72	1 333.64	1 130.48	994.27	995.30	997.81	956.50	900.33
N_2O emissions with N_2O from LULUCF	NA	NA	2 783.89	2 708.76	2 224.27	1 840.57	1 637.64	1 502.84	1 505.47	1 508.92	1 469.28	1 416.60
HFCs	NA	NA	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	16.25	28.03	37.26	45.61	53.61
PFCs	NA	NA	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
Unspecified mix of HFCs and PFCs	NA	NA	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
SF_6	NA	NA	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	0.18	0.18	0.38	0.53	0.73
NF_3	NA	NA	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
Total (without LULUCF)	**NA**	**NA**	**26 020.48**	**24 130.49**	**19 359.74**	**15 903.17**	**13 956.17**	**12 587.64**	**12 637.11**	**12 078.17**	**11 574.12**	**10 787.86**
Total (with LULUCF)	**NA**	**NA**	**13 630.39**	**11 319.82**	**6 160.90**	**2 827.28**	**-2 019.64**	**-2 250.62**	**-2 367.41**	**-1 157.62**	**-712.00**	**2 179.06**
Total (without LULUCF, with indirect)	**NA**	**NA**	**26 061.47**	**24 169.39**	**19 395.76**	**15 937.24**	**13 989.66**	**12 620.13**	**12 668.34**	**12 107.45**	**11 601.88**	**10 814.93**

Total (with LULUCF, with indirect)	**NA**	**NA**	**13 671.39**	**11 358.72**	**6 196.92**	**2 861.35**	**-1 986.15**	**-2 218.13**	**-2 336.18**	**-1 128.33**	**-684.23**	**2 206.12**

GREENHOUSE GAS EMISSIONS AND REMOVALS	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
	CO_2 equivalents (kt) [3]											
CO_2 emissions without net CO_2 from LULUCF	7 081.63	7 496.51	7 520.42	7 726.04	7 731.20	7 810.76	8 310.11	8 637.23	8 198.06	7 456.20	8 554.52	7 811.03
CO_2 emissions with net CO_2 from LULUCF	-5 819.73	-5 868.52	-4 153.04	-3 503.51	227.18	897.63	572.86	1 382.16	564.68	2 715.77	5 601.43	4 464.06
CH_4 emissions without CH_4 from LULUCF	2 107.92	2 207.71	2 174.99	2 113.61	2 055.26	2 091.40	2 033.29	2 086.46	2 062.57	2 084.75	2 002.96	1 950.25
CH_4 emissions with CH_4 from LULUCF	2 642.75	2 709.05	2 708.98	2 630.29	2 571.10	2 584.62	2 574.50	2 587.67	2 567.17	2 610.70	2 539.17	2 501.34
N_2O emissions without N_2O from LULUCF	914.16	983.47	951.52	992.92	979.35	1 012.78	1 014.18	1 059.00	1 037.92	1 060.16	1 089.66	1 090.89
N_2O emissions with N_2O from LULUCF	1 429.57	1 496.51	1 468.66	1 509.20	1 495.87	1 527.36	1 535.56	1 575.48	1 555.00	1 578.56	1 611.77	1 611.49
HFCs	61.85	69.70	77.08	85.69	93.37	101.24	127.65	147.83	170.96	181.59	216.35	217.53
PFCs	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
Unspecified mix of HFCs and PFCs	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
SF_6	0.91	1.43	2.70	2.84	3.35	3.89	4.20	4.69	5.39	7.55	7.58	7.70
NF_3	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
Total (without LULUCF)	**10 166.47**	**10 758.82**	**10 726.71**	**10 921.10**	**10 862.54**	**11 020.07**	**11 489.42**	**11 935.20**	**11 474.90**	**10 790.25**	**11 871.07**	**11 077.41**
Total (with LULUCF)	**-1 684.65**	**-1 591.84**	**104.38**	**724.51**	**4 390.89**	**5 114.74**	**4 814.77**	**5 697.82**	**4 863.20**	**7 094.18**	**9 976.30**	**8 802.12**
Total (without LULUCF, with indirect)	**10 191.63**	**10 783.38**	**10 752.08**	**10 941.31**	**10 882.28**	**11 041.68**	**11 506.27**	**11 953.77**	**11 493.01**	**10 807.36**	**11 887.50**	**11 088.48**
Total (with LULUCF, with indirect)	**-1 659.49**	**-1 567.27**	**129.76**	**744.72**	**4 410.64**	**5 136.35**	**4 831.62**	**5 716.38**	**4 881.31**	**7 111.29**	**9 992.73**	**8 813.19**

GREENHOUSE GAS EMISSIONS AND REMOVALS	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Change from 1990 to latest reported year
	CO_2 equivalents (kt) [3]											
CO_2 emissions without net CO_2 from LULUCF	7 519.72	7 368.75	7 172.21	7 262.43	7 210.69	7 215.33	7 857.34	7 648.48	6 997.99	7 238.09	6 619.72	-66.33
CO_2 emissions with net CO_2 from LULUCF	2 812.46	3 944.27	7 611.20	6 414.81	4 499.59	3 010.21	6 060.50	4 284.97	6 348.63	8 005.73	10 105.10	61.35
CH_4 emissions without CH_4 from LULUCF	1 999.21	2 020.28	2 074.77	1 967.09	1 993.23	2 019.61	1 924.81	1 920.71	1 898.05	1 888.63	1 893.19	-53.38
CH_4 emissions with CH_4 from LULUCF	2 567.41	2 609.82	2 714.64	2 648.09	2 718.14	2 788.44	2 776.45	2 758.10	2 743.12	2 753.35	2 782.41	-39.30
N_2O emissions without N_2O from LULUCF	1 150.60	1 175.96	1 216.63	1 262.58	1 265.11	1 274.23	1 225.17	1 306.58	1 339.80	1 336.36	1 344.30	-41.51
N_2O emissions with N_2O from LULUCF	1 675.60	1 705.57	1 738.50	1 792.10	1 802.61	1 819.80	1 782.46	1 864.18	1 902.36	1 905.67	1 913.86	-31.25
HFCs	216.67	229.26	242.82	251.86	271.61	264.06	259.17	250.96	243.26	258.80	250.30	–
PFCs	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	–
Unspecified mix of HFCs and PFCs	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	–
SF_6	8.02	8.76	8.84	10.43	10.19	10.64	10.87	14.25	12.30	12.10	12.27	–
NF_3	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	–
Total (without LULUCF)	**10 894.22**	**10 803.02**	**10 715.28**	**10 754.39**	**10 750.84**	**10 783.87**	**11 277.36**	**11 140.97**	**10 491.40**	**10 733.99**	**10 119.77**	**-61.11**
Total (with LULUCF)	**7 280.16**	**8 497.69**	**12 316.00**	**11 117.29**	**9 302.15**	**7 893.15**	**10 889.45**	**9 172.45**	**11 249.69**	**12 935.65**	**15 063.94**	**10.52**
Total (without LULUCF, with indirect)	**10 906.96**	**10 818.61**	**10 735.94**	**10 771.52**	**10 768.69**	**10 803.08**	**11 289.24**	**11 153.70**	**10 504.53**	**10 746.93**	**10 131.01**	**-61.13**
Total (with LULUCF, with indirect)	**7 292.89**	**8 513.28**	**12 336.67**	**11 134.42**	**9 319.99**	**7 912.36**	**10 901.33**	**9 185.19**	**11 262.82**	**12 948.59**	**15 075.18**	**10.27**

GREENHOUSE GAS EMISSIONS AND REMOVALS	Reference year/period for NDC (1)	Base year (2)	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
	CO_2 equivalents (kt) (3)											
1. Energy	NA	NA	19 529.57	18 058.43	14 669.75	12 568.34	10 883.67	9 628.98	9 698.20	9 118.33	8 698.82	8 060.04
2. Industrial processes and product use	NA	NA	655.40	587.79	307.50	149.06	196.40	225.71	248.26	272.95	285.74	326.43
3. Agriculture	NA	NA	5 030.48	4 646.51	3 589.33	2 476.85	2 182.81	2 030.45	1 983.62	1 962.86	1 854.24	1 656.83
4. Land use, land-use change and forestry (4)	NA	NA	-12 390.09	-12 810.67	-13 198.84	-13 075.89	-15 975.81	-14 838.26	-15 004.52	-13 235.79	-12 286.11	-8 608.81
5. Waste	NA	NA	805.03	837.76	793.15	708.91	693.30	702.50	707.03	724.03	735.31	744.57
6. Other	NA	NA	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total (with LULUCF) (8)	**NA**	**NA**	**13 630.39**	**11 319.82**	**6 160.90**	**2 827.28**	**-2 019.64**	**-2 250.62**	**-2 367.41**	**-1 157.62**	**-712.00**	**2 179.06**

GREENHOUSE GAS EMISSIONS AND REMOVALS	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
	CO_2 equivalents (kt) (3)											
1. Energy	7 438.01	7 869.82	7 868.70	8 035.60	8 061.63	8 175.79	8 603.80	8 937.34	8 474.50	7 765.06	8 532.14	7 658.93
2. Industrial processes and product use	283.32	312.99	331.14	353.65	379.39	366.93	418.24	438.36	449.25	448.57	751.60	848.26
3. Agriculture	1 680.55	1 789.52	1 764.47	1 803.91	1 728.83	1 790.84	1 792.10	1 874.37	1 835.50	1 854.51	1 870.07	1 883.73
4. Land use, land-use change and forestry (4)	-11 851.13	-12 350.65	-10 622.33	-10 196.59	-6 471.65	-5 905.33	-6 674.65	-6 237.39	-6 611.70	-3 696.07	-1 894.77	-2 275.29
5. Waste	764.59	786.49	762.40	727.94	692.69	686.51	675.28	685.14	715.66	722.11	717.26	686.49
6. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total (with LULUCF) (8)	**-1 684.65**	**-1 591.84**	**104.38**	**724.51**	**4 390.89**	**5 114.74**	**4 814.77**	**5 697.82**	**4 863.20**	**7 094.18**	**9 976.30**	**8 802.12**

GREENHOUSE GAS EMISSIONS AND REMOVALS	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Change from 1990 to latest reported year
	CO_2 equivalents (kt) [3]											
1. Energy	7 344.66	7 266.20	7 091.15	7 195.32	7 269.97	7 260.28	7 701.45	7 475.05	6 796.07	7 036.79	6 418.86	-67.13
2. Industrial processes and product use	905.57	848.29	862.26	788.38	687.41	764.40	889.91	887.48	865.93	877.14	858.47	30.98
3. Agriculture	1 962.72	2 025.70	2 105.34	2 151.47	2 163.27	2 176.66	2 096.41	2 198.36	2 250.41	2 252.96	2 253.83	-55.20
4. Land use, land-use change and forestry [4]	-3 614.06	-2 305.33	1 600.72	362.90	-1 448.70	-2 890.72	-387.91	-1 968.51	758.29	2 201.66	4 944.16	-139.90
5. Waste	681.27	662.83	656.54	619.23	630.20	582.52	589.59	580.08	578.99	567.10	588.61	-26.88
6. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Total (with LULUCF) [8]	**7 280.16**	**8 497.69**	**12 316.00**	**11 117.29**	**9 302.15**	**7 893.15**	**10 889.45**	**9 172.45**	**11 249.69**	**12 935.65**	**15 063.94**	**10.52**

[1] In accordance with decision 18/CMA.1, annex, para. 57, Parties shall report a consistent annual time series starting from 1990; those developing country Parties that need flexibility in the light of their capacities with respect to this provision have the flexibility to instead report data covering, at a minimum, the reference year/period for its NDC under Article 4 of the Paris Agreement and, in addition, a consistent annual time series from at least 2020 onwards.

[2] The column "Base year" should be filled in only by those Parties with economies in transition that use a base year different from 1990 in accordance with the relevant decisions of the COP. For these Parties, this different base year is used to calculate the percentage change in the final column of this table.
[3] As per decision 18/CMA.1, annex, para. 37, Parties shall use the 100-year time-horizon GWP values from the IPCC Fifth Assessment Report, or 100-year time-horizon GWP values from a subsequent IPCC assessment report as agreed upon by the CMA, to report aggregate emissions and removals of GHGs, expressed in CO_2 eq. Parties may also use other metrics (e.g. global temperature potential) to report supplemental information on aggregate emissions and removals of GHGs, expressed in CO_2 eq. In such cases, Parties shall provide in the NID information on the values of the metrics used and the IPCC assessment report they were sourced from.

[4] Fill in net emissions/removals as reported in table Summary 1. For the purposes of reporting, the signs for removals are always negative (–) and for emissions positive (+).
[5] Parties are asked to report emissions from international aviation and international navigation and multilateral operations, as well as CO_2 emissions from biomass and CO_2 captured, under memo items. These emissions should not be included in the national total emissions from the energy sector. The Amounts of biomass used as fuel are included in the national energy consumption but the corresponding CO_2 emissions are not included in the national total as it is assumed that the biomass is produced in a sustainable manner. If the biomass is harvested at an unsustainable rate, net CO_2 emissions are accounted for as a loss of biomass stocks in the LULUCF sector.

[6] In accordance with the MPGs (chapter II), for Parties that decide to report indirect CO_2 emissions, the national totals shall be provided with and without indirect CO_2.
[7] In accordance with the MPGs (chapter II), HFC and PFC emissions should be reported for each relevant chemical. However, if it is not possible to report values for each chemical (i.e. mixtures, confidential data, lack of disaggregation), this row could be used for reporting aggregate figures for HFCs and PFCs. Note that the unit used for this row is kt CO_2 eq. and that appropriate notation keys should be entered in the cells for the individual chemicals.
[8] Includes net CO_2, CH_4 and N_2O from LULUCF.

Note: Minimum level of aggregation is needed to protect confidential business and military information, where it would identify particular entity's/entities' confidential data.

Documentation box: Parties should provide a detailed description of emission trends in chapter 2 ("Trends in greenhouse gas emissions") and, as appropriate, in the corresponding chapters 3 to 8 of the NID. Use this documentation box to provide references to relevant sections of the NID, if any additional information and further details are needed to explain the contents of this table.
The information about NID is provided in the Chapter 1.NATIONAL INVENTORY DOCUMENT and in Annex 1 and Annex 2

TABLE 7

Information on projections of greenhouse gas emissions and removals under a 'with measures' scenario [a, b]

	Most recent year in the Party's national inventory report	*Projections of GHG emissions and removals*					
	(kt CO_2 eq)[c]	*(kt CO_2 eq)*[c]					
	2022	*2025*	*2030*	*2035*	*2040*	*2045*	*2050*
Sector[d]							
Energy	3 277.17	2 673.62	2 357.30	1 817.41	1 312.98	1 180.38	1 325.25
Transport	3 141.70	3 296.35	3 037.99	2 452.60	1 939.89	1 558.06	1 291.13
Industrial processes and product use	858.47	844.14	807.80	796.64	797.64	799.66	799.90
Agriculture	2 253.83	2 216.88	2 194.13	2 156.05	2 154.99	2 154.58	2 154.16
Forestry/LULUCF	4 944.16	2 146.72	2 909.77	2 733.04	3 794.25	3 719.97	4 032.18
Waste management/waste	588.61	521.40	413.32	351.96	317.46	302.12	296.24
Indirect CO_2	11.24	7.17	6.00	5.58	3.68	3.32	4.45
Gas							
CO_2 emissions including net CO_2 from LULUCF	10 105.10	6 626.61	6 882.97	5 660.03	5 798.16	5 241.97	5 457.19
CO_2 emissions excluding net CO_2 from LULUCF	6 619.72	6 266.28	5 745.99	4 652.69	3 676.77	3 193.53	3 098.22
CH_4 emissions including CH_4 from LULUCF	2 782.41	2 818.36	2 697.48	2 613.34	2 551.95	2 527.25	2 515.77
CH_4 emissions excluding CH_4 from LULUCF	1 893.19	1 715.64	1 584.61	1 507.15	1 453.24	1 428.95	1 413.62
N_2O emissions including N_2O from LULUCF	1 913.86	2 023.93	1 971.32	1 896.25	1 843.71	1 831.93	1 819.60
N_2O emissions excluding N_2O from LULUCF	1 344.30	1 340.27	1 311.40	1 276.74	1 269.56	1 258.69	1 248.54
HFCs	250.30	217.44	155.83	125.38	110.67	100.93	93.59
PFCs	NA,NO	NO	NO	NO	NO	NO	NO
SF_6	12.27	12.76	12.71	12.71	12.71	12.71	12.71
NF_3	NA,NO	NO	NO	NO	NO	NO	NO
Indirect CO_2	11.24	7.17	6.00	5.58	3.68	3.32	4.45
Total with LULUCF	15 075.18	11 706.28	11 726.31	10 313.29	10 320.88	9 718.10	9 903.31
Total without LULUCF	10 131.01	9 559.56	8 816.54	7 580.25	6 526.63	5 998.13	5 871.14

[a] Each Party shall report projections pursuant to paras. 93–101 of the MPGs; those developing country Parties that need flexibility in the light of their capacities are instead encouraged to report such projections (para. 92 of the MPGs).
[b] Those developing country Parties that need flexibility in the light of their capacities with respect paras. 93–101 of the MPGs can instead report using a less detailed methodology or coverage (para. 102 of the MPGs).

[c] Projections shall begin from the most recent year in the Party's national report and extend at least 15 years beyond the next year ending in zero or five; those developing country Parties that need flexibility in the light of their capacities with respect to this provision have the flexibility to instead extend their projections at least to the end point of their NDC under Article 4 of the Paris Agreement (para. 95 of the MPGs).

[d] In accordance with para. 82(f) of the MPGs.

TABLE 8

Information on projections of greenhouse gas emissions and removals under a 'with additional measures' scenario [a, b]

	Most recent year in the Party's national inventory report	*Projections of GHG emissions and removals*					
	(kt CO_2 eq)[c]	*(kt CO_2 eq)*[c]					
	2022	*2025*	*2030*	*2035*	*2040*	*2045*	*2050*
Sector[d]							
Energy	3 277.17	2 675.56	2 319.40	1 819.35	1 192.06	890.62	831.18
Transport	3 141.70	3 188.07	2 877.46	2 056.01	675.52	190.44	111.92
Industrial processes and product use	858.47	844.14	807.80	796.64	797.64	799.66	799.90
Agriculture	2 253.83	2 216.88	2 194.13	2 156.05	2 154.99	2 154.58	2 154.16
Forestry/LULUCF	4 944.16	2 146.72	2 909.77	2 733.04	3 794.25	3 719.97	4 032.18
Waste management/waste	588.61	521.40	413.01	334.25	271.87	240.19	226.24
Indirect CO_2	11.24	7.06	6.34	6.66	3.72	3.37	3.30
Gas							
CO_2 emissions including net CO_2 from LULUCF	10 105.10	6 523.22	6 699.72	5 285.51	4 408.46	3 574.09	3 778.86
CO_2 emissions excluding net CO_2 from LULUCF	6 619.72	6 162.89	5 562.75	4 278.16	2 287.07	1 525.66	1 419.90
CH_4 emissions including CH_4 from LULUCF	2 782.41	2 815.15	2 686.65	2 584.66	2 511.16	2 472.20	2 444.28
CH_4 emissions excluding CH_4 from LULUCF	1 893.19	1 712.44	1 573.78	1 478.46	1 412.46	1 373.90	1 342.13
N_2O emissions including N_2O from LULUCF	1 913.86	2 024.19	1 966.66	1 887.10	1 843.32	1 835.53	1 826.13
N_2O emissions excluding N_2O from LULUCF	1 344.30	1 340.53	1 306.73	1 267.59	1 269.17	1 262.29	1 255.07
HFCs	250.30	217.44	155.83	125.38	110.67	100.93	93.59
PFCs	NA,NO	NO	NO	NO	NO	NO	NO
SF_6	12.27	12.76	12.71	12.71	12.71	12.71	12.71
NF_3	NA,NO	NO	NO	NO	NO	NO	NO
Indirect CO_2	11.24	7.06	6.34	6.66	3.72	3.37	3.30
Total with LULUCF	15 075.18	11 599.83	11 527.91	9 902.01	8 890.05	7 998.83	8 158.88
Total without LULUCF	10 131.01	9 453.12	8 618.14	7 168.97	5 095.80	4 278.86	4 126.70

[a] Each Party shall report projections pursuant to paras. 93–101 of the MPGs; those developing country Parties that need flexibility in the light of their capacities are instead encouraged to report such projections (para. 92 of the MPGs).
[b] Those developing country Parties that need flexibility in the light of their capacities with respect paras. 93–101 of the MPGs can instead report using a less detailed methodology or coverage (para. 102 of the MPGs).

[c] Projections shall begin from the most recent year in the Party's national report and extend at least 15 years beyond the next year ending in zero or five; those developing country Parties that need flexibility in the light of their capacities with respect to this provision have the flexibility to instead extend their projections at least to the end point of their NDC under Article 4 of the Paris Agreement (para. 95 of the MPGs).
[d] In accordance with para. 82(f) of the MPGs.

TABLE 10

Projections of key indicators[a, b]

Key indicator(s) [c]	Unit, as applicable	Most recent year in the Party's national inventory report, or the most recent year for which data are available	Projections of key indicators[d]					
		2022	2025	2030	2035	2040	2045	2050
Annual total net GHG emissions	kt CO_2 equivalent	15 075.18	11 599.83 [(1)]	11 527.91[(1)]	9 902.01[(1)]	8 890.05[(1)]	7 998.83[(1)]	8 158.88[(1)]

Notes: The Party could add rows for each additional key indicator.

[a] Each Party shall report projections pursuant to paras. 93–101 of the MPGs; those developing country Parties that need flexibility in the light of their capacities are instead encouraged to report such projections (para. 92 of the MPGs).
[b] Those developing country Parties that need flexibility in the light of their capacities with respect paras. 93–101 of the MPGs can instead report using a less detailed methodology or coverage (para. 102 of the MPGs).
[c] Each Party shall also provide projections of key indicators to determine progress towards its NDC under Article 4 of the Paris Agreement (para. 97 of the MPGs).

[d] Future years extended to at least 15 years beyond the next year ending in zero or five; those developing country Parties that need flexibility in the light of their capacities with respect to this provision have the flexibility to instead extend their projections at least to the end point of their NDC under Article 4 of the Paris Agreement (para. 95 of the MPGs).

Custom footnotes:

[(1)] *In this indicator "Annual total net GHG emissions" WAM scenario is used*

TABLE 11

Key underlying assumptions and parameters used for projections[a, b]

Key underlying assumptions and parameters[c]	*Unit, as applicable*	*Most recent year in the Party's national inventory report, or the most recent year for which data are available*	*Projections of underlying assumption/parameters[d]*					
		2022	*2025*	*2030*	*2035*	*2040*	*2045*	*2050*
Population	Thousands	1 875.76	1 831.92	1 770.42	1 728.06	1 706.01	1 698.63	1 698.07
GDP	Million EUR (2015)	28 820.74	31 040.62	34 880.38	39 080.43	43 317.31	47 157.40	50 419.21
EU ETS carbon price	EUR(2015)/EUA	67.60	77.04	77.04	81.10	81.10	129.75	154.08
Coal import price	EUR(2015)/GJ	8.07	5.08	4.95	4.70	4.70	4.95	4.95
Crude oil import price	EUR(2015)/GJ	13.36	10.06	11.27	12.49	12.81	13.95	15.98
Natural gas import price	EUR(2015)/GJ	30.79	10.99	7.96	7.72	7.84	7.49	7.13
Number of passenger-kilometres (all modes)	Mpkm	20 802.00	21 326.90	22 350.00	23 199.66	23 932.49	24 508.74	24 940.23
Freight transport tonnes-kilometres (all modes)	Mtkm	21 991.00	22 777.80	23 805.23	24 769.88	25 626.58	26 315.46	26 840.07
Livestock - Dairy cattle	Unit (specify)	130.60	121.90	115.50	109.50	108.37	107.23	106.10
Livestock - Non-dairy cattle	1000 head	388.30	371.20	356.90	343.50	341.53	339.57	337.60
Livestock - Sheep	1000 head	90.30	90.30	90.30	90.30	90.30	90.30	90.30
Livestock - Pig	1000 head	297.70	266.40	267.50	263.20	260.20	257.20	254.20
Livestock - Poultry	1000 head	5 878.10	5 885.90	5 896.40	5 904.80	5 910.93	5 917.07	5 923.20
Nitrogen input from application of synthetic fertilizers	kt N	88.00	87.60	86.30	86.50	86.63	86.77	86.90
Nitrogen input from application of manure	kt N	12.17	11.46	10.97	10.52	10.43	10.34	10.25
Nitrogen in crop residues returned to soils	kt N	43.09	42.14	40.91	39.72	38.96	38.20	37.44
Area of cultivated organic soils	ha	164 871.36	159 631.38	159 631.38	159 631.38	159 631.38	159 631.38	159 631.38
Municipal solid waste (MSW) generation	1000 tonnes	872.37	904.39	912.75	921.19	900.00	900.00	900.00
Municipal solid waste (MSW) going to landfills	1000 tonnes	432.75	330.00	270.00	270.00	270.00	270.00	250.00
Share of CH_4 recovery in total CH_4 generation from landfills	%	25.47	26.30	27.86	28.08	28.13	27.61	25.97
Primary energy consumption - Coal	ktoe	13.43	15.06	17.18	7.75	6.53	5.60	1.04

Key underlying assumptions and parameters[c]	*Unit, as applicable*	*Most recent year in the Party's national inventory report, or the most recent year for which data are available*	*Projections of underlying assumption/parameters[d]*					
		2022	*2025*	*2030*	*2035*	*2040*	*2045*	*2050*
Primary energy consumption - petroleum products	ktoe	1 582.59	1 555.11	1 433.49	1 120.96	928.22	781.53	681.54
Primary energy consumption - Natural gas	ktoe	694.06	512.54	409.21	379.35	211.47	189.43	283.09
Primary energy consumption - Renewables	ktoe	1 864.37	1 903.74	2 148.51	2 358.09	2 512.88	2 519.62	2 365.83
Primary energy consumption - Total	ktoe	4 447.07	4 276.22	4 159.36	4 045.21	3 871.46	3 717.34	3 606.70
Forest harvest removals for energy use	1000 m^3	3 730.14	3 497.06	3 388.43	3 207.40	3 199.54	3 176.82	3 220.72
Forest harvest removals for non-energy use	1000 m^3	15 932.60	14 937.02	14 907.92	14 842.30	14 971.04	14 667.12	15 108.05
Forest increment	1000 m^3	24 104.96	24 228.87	24 524.77	25 068.37	25 179.69	24 497.42	24 031.31
Forest land remaining forest land	1000 ha	3 052.54	3 052.54	3 052.54	3 052.54	3 052.54	3 052.54	3 052.54
Cropland converted to forest land	1000 ha	32.78	27.90	16.53	6.25	3.29	NO	NO
Grassland converted to forest land	1000 ha	90.11	88.03	83.05	64.16	37.60	10.00	NO
Wetlands converted to forest land	1000 ha	19.99	18.94	15.53	11.34	5.65	NO	NO
Settlements converted to forest land	1000 ha	22.52	16.86	9.34	6.45	3.35	NO	NO
Other land converted to forest land	1000 ha	0.35	0.35	0.35	0.35	0.18	NO	NO
Forest land converted to cropland	1000 ha	9.36	9.36	8.40	6.21	3.08	NO	NO
Forest land converted to grassland	1000 ha	44.23	35.43	21.24	12.03	5.12	NO	NO
Forest land converted to wetlands	1000 ha	27.40	30.56	35.08	29.05	24.01	12.24	NO
Forest land converted to settlements	1000 ha	30.80	28.83	23.86	15.51	5.44	NO	NO
Forest land converted to other land	1000 ha	0.24	0.40	0.68	0.96	1.13	1.13	1.13
Cropland remaining cropland	1000 ha	1 369.75	1 342.85	1 373.56	1 396.85	1 465.29	1 531.82	1 531.82
Grassland wetland settlement or other land converted to cropland	1000 ha	208.38	189.56	158.26	134.96	66.52	NO	NO
Cropland converted to wetland settlement or other land (excl. forest land)	1000 ha	433.33	265.84	72.40	28.03	10.31	NO	NO
Grassland remaining grassland	1000 ha	452.82	631.20	812.45	853.08	871.01	884.84	884.84

Key underlying assumptions and parameters[c]	*Unit, as applicable*	*Most recent year in the Party's national inventory report, or the most recent year for which data are available*	*Projections of underlying assumption/parameters*[d]					
		2022	*2025*	*2030*	*2035*	*2040*	*2045*	*2050*
Cropland; wetland; settlement or other land; converted to grassland	1000 ha	430.89	264.04	72.38	31.76	13.83	NO	NO
Grassland converted to wetland; settlement or other land	1000 ha	227.01	210.08	182.18	154.84	79.77	6.50	NO
Wetland remaining wetland	1000 ha	29.49	28.65	27.41	27.86	28.57	30.07	31.62
Settlement or other land; converted to wetland	1000 ha	2.13	2.96	4.21	3.76	3.04	1.55	0.00
Wetland converted to settlement or other land	1000 ha	2.93	2.71	2.27	1.74	0.76	NO	NO
Gains of Harvested wood products	kt C	1 135.24	1 186.85	1 184.54	1 179.32	1 189.55	1 165.40	1 200.44
Losses of Harvested wood products	kt C	571.78	611.16	672.78	726.92	776.16	817.70	858.02
Half-life: Sawn wood	years	35.00	35.00	35.00	35.00	35.00	35.00	35.00
Half-life: Wood panels	years	25.00	25.00	25.00	25.00	25.00	25.00	25.00
Half-life: Paper	years	2.00	2.00	2.00	2.00	2.00	2.00	2.00

Note: The Party could add rows for each additional key underlying assumptions and parameters.

[a] Each Party shall report projections pursuant to paras. 93–101 of the MPGs; those developing country Parties that need flexibility in the light of their capacities are instead encouraged to report such projections (para. 92 of the MPGs).
[b] Those developing country Parties that need flexibility in the light of their capacities with respect to paragraphs 93–101 of the MPGs can instead report using a less detailed methodology or coverage (para. 102 of the MPGs).
[c] Information provided by each Party in describing the methodology used to develop the projections should include key underlying assumptions and parameters used for projections (e.g. gross domestic product growth rate/level, population growth rate/level) (para. 96(a) of the MPGs).
[d] Future years extended to at least 15 years beyond the next year ending in zero or five; those developing country Parties that need flexibility in the light of their capacities with respect to this provision have the flexibility to instead extend their projections at least to the end point of their NDC under Article 4 of the Paris Agreement (para. 95 of the MPGs).

TABLE 12

Information necessary to track progress on the implementation and achievement of the domestic policies and measures implemented to address the social and economic consequences of response measures[a]

Sectors and activities associated with the response measures[b]	Social and economic consequences of the response measures[c]	Challenges in and barriers to addressing the consequences[d]	Actions to address the consequences[e]
NA	NA	NA	NA

[a] Each Party with an NDC under Article 4 that consists of adaptation actions and/or economic diversification plans resulting in mitigation co-benefits consistent with Article 4, para. 7, of the Paris Agreement shall provide the information necessary to track progress on the implementation and achievement of the domestic policies and measures

[b] In accordance with para. 78(a) of the MPGs.

[c] In accordance with para. 78(b) of the MPGs.

[d] In accordance with para. 78(c) of the MPGs.

[e] In accordance with para. 78(d) of the MPGs.

Annex 4 Common tabular formats for information on support provided and mobilized

TABLE III.1

Information on financial support provided under Article 9 of the Paris Agreement in year 2021: [a,b,c] bilateral, regional and other channels

Exchange rate used: 0.846

Recipient country or region[c, d]	*Title of the project programme, activity or other*[c, e]	*Amount (climate-specific)*[c, f]				*Status*[c]	*Channel*[c]	*Funding source*[c]	*Financial instrument*[c, g]	*Type of support*[c]	*Sector*[c]	*Subsector*[c, h]	*Contribution to capacity-building objectives*[c, h]	*Contribution to technology development and transfer objectives*[c, h]	*Additional information*[c, h, i]
		Face value		*Grant equivalent*											
		Domestic currency	*USD*	*Domestic currency*	*USD*										
Uzbekistan	Capacity building for implementing investment projects in the fields of water supply and sewerage in Uzbekistan	36151.07	42731.77	36151.07	42731.77	Disbursed	Bilateral	ODA	Grant	Cross-cutting	Water and sanitation	BTR section 4.3.	Yes	No	Capacity building for implementing investment projects in the fields of water supply and sewerage in Uzbekistan
Kazakhstan, Uzbekistan	Capacity building of industry associations serving engineering companies in Kazakhstan	10751.55	12708.69	10751.55	12708.69	Disbursed	Bilateral	ODA	Grant	Cross-cutting	Industry	BTR section 4.3.	Yes	No	Project activities included improving level of services provided by Kazakhstan engineering and

Recipient country or region[c, d]	*Title of the project programme, activity or other[c, e]*	*Amount (climate-specific)[c, f]*				*Status[c]*	*Channel[c]*	*Funding source[c]*	*Financial instrument[c, g]*	*Type of support[c]*	*Sector[c]*	*Subsector[c, h]*	*Contribution to capacity-building objectives[c, h]*	*Contribution to technology development and transfer objectives[c, h]*	*Additional information[c, h, i]*
		Face value		*Grant equivalent*											
		Domestic currency	*USD*	*Domestic currency*	*USD*										
	and Uzbekistan														technical companies by strengthening associations capacity to implement international projects, developing certification system of engineers that enhance high level professionals involvement in investment projects and micro, small and medium business involvement in projects.
Republic of Moldova	Civil society engagement in improving rural	2270.61	2683.94	2270.61	2683.94	Disbursed	Bilateral	ODA	Grant	Cross-cutting	Rural development	BTR section 4.3.	Yes	No	Co-finance the training visit of representatives of the

Recipient country or region[c, d]	Title of the project programme, activity or other[c, e]	Amount (climate-specific)[c, f]				Status[c]	Channel[c]	Funding source[c]	Financial instrument[c, g]	Type of support[c]	Sector[c]	Subsector[c, h]	Contribution to capacity-building objectives[c, h]	Contribution to technology development and transfer objectives[c, h]	Additional information[c, h, i]
		Face value		Grant equivalent											
		Domestic currency	USD	Domestic currency	USD										
	development and promotion of efficient models for sustainable local development														LEADER Programme Local Action Groups (Partnerships) to Latvia
Uzbekistan	General plan for populated areas of Uzbekistan developing a prototype for a publishing and public consultation portal	38442.86	45440.73	38442.86	45440.73	Disbursed	Bilateral	ODA	Grant	Cross-cutting	Cross-cutting	BTR section 4.3.	Yes	No	The objective of the project was to develop of a prototype portal for the publication and public consultation of general population plans of the Republic of Uzbekistan in accordance with the requirements of the construction standard of the Republic

Recipient country or region[c, d]	*Title of the project programme, activity or other[c, e]*	*Amount (climate-specific)[c, f]*				*Status[c]*	*Channel[c]*	*Funding source[c]*	*Financial instrument[c, g]*	*Type of support[c]*	*Sector[c]*	*Subsector[c, h]*	*Contribution to capacity-building objectives[c, h]*	*Contribution to technology development and transfer objectives[c, h]*	*Additional information[c, h, i]*
		Face value		*Grant equivalent*											
		Domestic currency	*USD*	*Domestic currency*	*USD*										
															of Uzbekistan adopted on 22 February 2021
Uzbekistan	Support for improving the quality of public services in rural Uzbekistan	11987.85	14170.04	11987.85	14170.04	Disbursed	Bilateral	ODA	Grant	Cross-cutting	Cross-cutting	BTR section 4.3.	Yes	No	Project goal is to improving the quality of public services in the regions of Uzbekistan

Abbreviations: ODA = official development assistance, OOF = other official flows.

Notation keys: NA = not applicable; UA = information not available at the time of reporting; NR = not reported (to indicate the voluntary character of the information).

Note: Where financial support contributes to capacity-building and/or technology development and transfer objectives, information in shaded cells is automatically populated in the relevant CTF table on information on support for technology development and transfer provided under Article 10 of the Paris Agreement (Table III.4) and/or information on capacity-building support provided under Article 11 of the Paris Agreement (Table III.5).

[a] Relevant information, in tabular format, on bilateral and regional financial support provided for the previous two reporting years without overlapping with the previous reporting periods.

[b] Parties report in a separate table for each year, namely 20XX-3 and 20XX-2, where 20XX is the reporting year.

[c] Parties provide the underlying assumptions, definitions and methodologies, as applicable, used to identify and/or report this reporting parameter in the respective section of the BTR.

[d] To the extent possible.

[e] If “other”, Parties should specify this information.

[f] The face value and, on a voluntary basis, the grant-equivalent value.

[g] Parties report, to the extent possible, the different amounts per financial instrument, if applicable and as available.

[h] As available.

[i] Report, to the extent possible, information on the project/programme and implementing agency and provide a link to any relevant documentation and as appropriate, support to activities related to averting, minimizing and addressing loss and damage associated with the adverse effects of climate change.

[j] The region should be reported if data at the country level are not available.
[k] This refers to funding for activities that have both mitigation and adaptation components. Parties report, to the extent possible, the different amounts of components, if applicable and as available.

Custom footnotes:

[(1)] *The underlying assumptions, definitions and methodologies of the information in this CTF is available at: Section of the BTR 4.1., 4.2., and 4.3.*

TABLE III.1

Information on financial support provided under Article 9 of the Paris Agreement in year 2022: [a,b,c] bilateral, regional and other channels

Exchange rate used: 0.949

Recipient country or region[c, d]	*Title of the project programme, activity or other[c, e]*	*Amount (climate-specific)[c, f]*				*Status[c]*	*Channel[c]*	*Funding source[c]*	*Financial instrument[c, g]*	*Type of support[c]*	*Sector[c]*	*Subsector[c, h]*	*Contribution to capacity-building objectives[c, h]*	*Contribution to technology development and transfer objectives[c, h]*	*Additional information[c, h, i]*
		Face value		*Grant equivalent*											
		Domestic currency	*USD*	*Domestic currency*	*USD*										
Kazakhstan, Uzbekistan	Capacity building of industry associations serving engineering companies in Kazakhstan and Uzbekistan	10668.77	11242.12	10668.77	11242.12	Disbursed	Bilateral	ODA	Grant	Cross-cutting	Industry	BTR section 4.3.	Yes	No	To improve services to engineering companies provided by associations of branch in Kazakhstan and Uzbekista by implementing certification of engineers to ensure high quality standards in implementation of investment

Recipient country or region[c, d]	Title of the project programme, activity or other[c, e]	Amount (climate-specific)[c, f]				Status[c]	Channel[c]	Funding source[c]	Financial instrument[c, g]	Type of support[c]	Sector[c]	Subsector[c, h]	Contribution to capacity-building objectives[c, h]	Contribution to technology development and transfer objectives[c, h]	Additional information[c, h, i]
		Face value		Grant equivalent											
		Domestic currency	USD	Domestic currency	USD										
															projects and development in new fields of micro, small and medium-sized enterprises
Uzbekistan	Improving plant protection system and laboratory capacity to boost food exports in Uzbekistan	53325.10	56190.83	53325.10	56190.83	Committed	Bilateral	ODA	Grant	Mitigation	Agriculture	BTR section 4.3.	Yes	Yes	Project supports to improve control system of plant protection and fertilizers as well as laboratory capacity, especially in the field of plant protection agent residue determination and in the

Recipient country or region[c, d]	*Title of the project programme, activity or other[c, e]*	*Amount (climate-specific)[c, f]*				*Status[c]*	*Channel[c]*	*Funding source[c]*	*Financial instrument[c, g]*	*Type of support[c]*	*Sector[c]*	*Subsector[c, h]*	*Contribution to capacity-building objectives[c, h]*	*Contribution to technology development and transfer objectives[c, h]*	*Additional information[c, h, i]*
		Face value		*Grant equivalent*											
		Domestic currency	*USD*	*Domestic currency*	*USD*										
															field of soil agrochemical research. During the project, capacity of Quarantine Agency of Uzbekistan will be evaluated and increased
Uzbekistan	Creation of GIS for the management of water supply and sewerage of pilot territory in the field of digitalization	37581.21	39600.85	37581.21	39600.85	Disbursed	Bilateral	ODA	Grant	Cross-cutting	Water and sanitation	BTR section 4 subpoint 4.3.	Yes	Yes	The aim of the project is to implement a pilot project in the Republic of Uzbekistan in the digitization and implementation of the management system of water supply

Recipient country or region[c, d]	Title of the project programme, activity or other[c, e]	Amount (climate-specific)[c, f]				Status[c]	Channel[c]	Funding source[c]	Financial instrument[c, g]	Type of support[c]	Sector[c]	Subsector[c, h]	Contribution to capacity-building objectives[c, h]	Contribution to technology development and transfer objectives[c, h]	Additional information[c, h, i]
		Face value		Grant equivalent											
		Domestic currency	USD	Domestic currency	USD										
															and sewerage networks, using geographic information system technologies based on the experience approved in Latvia
Uzbekistan	Strengthening the phytosanitary system and laboratory capacity for the development of the fruit sector in Uzbekistan	10067.01	10608.02	10067.01	10608.02	Disbursed	Bilateral	ODA	Grant	Cross-cutting	Agriculture	BTR section 4.3.	Yes	Yes	The project plans to strengthen the capacity of the Uzbek phytosanitary system and laboratory capacity, notably for the finding especially dangerous organisms, sample collection and

Recipient country or region[c, d]	*Title of the project programme, activity or other[c, e]*	*Amount (climate-specific)[c, f]*				*Status[c]*	*Channel[c]*	*Funding source[c]*	*Financial instrument[c, g]*	*Type of support[c]*	*Sector[c]*	*Subsector[c, h]*	*Contribution to capacity-building objectives[c, h]*	*Contribution to technology development and transfer objectives[c, h]*	*Additional information[c, h, i]*
		Face value		*Grant equivalent*											
		Domestic currency	*USD*	*Domestic currency*	*USD*										
															laboratory identification. As a result of the project, by sharing Latvia's expertise Uzbek system will be provided with practical support and knowledge in the detection, containment and control of the organism: so called a full cycle process.
Cameroon, Congo, Ghana,Guinea, Vietnam	Cameroon Guinea Congo Vietnam Ghana -	5827.28	6140.44	5827.28	6140.44	Disbursed	Bilateral	ODA	Grant	Mitigation	Forestry	BTR section 4.3.	Yes	No	The project is part of the EU Aid Volunteers initiative and

Recipient country or region[c, d]	*Title of the project programme, activity or other*[c, e]	*Amount (climate-specific)*[c, f]				*Status*[c]	*Channel*[c]	*Funding source*[c]	*Financial instrument*[c, g]	*Type of support*[c]	*Sector*[c]	*Subsector*[c, h]	*Contribution to capacity-building objectives*[c, h]	*Contribution to technology development and transfer objectives*[c, h]	*Additional information*[c, h, i]
		Face value		*Grant equivalent*											
		Domestic currency	*USD*	*Domestic currency*	*USD*										
	Project Forest														aims to send volunteers to Ghana to strengthen the activities of local organizations that support local communities to jointly protect rainforests and make their management sustainable.

Abbreviations: ODA = official development assistance, OOF = other official flows.

Notation keys: NA = not applicable; UA = information not available at the time of reporting; NR = not reported (to indicate the voluntary character of the information).
Note: Where financial support contributes to capacity-building and/or technology development and transfer objectives, information in shaded cells is automatically populated in the relevant CTF table on information on support for technology development and transfer provided under Article 10 of the Paris Agreement (Table III.4) and/or information on capacity-building support provided under Article 11 of the Paris Agreement (Table III.5).

[a] Relevant information, in tabular format, on bilateral and regional financial support provided for the previous two reporting years without overlapping with the previous reporting periods.

[b] Parties report in a separate table for each year, namely 20XX-3 and 20XX-2, where 20XX is the reporting year.

[c] Parties provide the underlying assumptions, definitions and methodologies, as applicable, used to identify and/or report this reporting parameter in the respective section of the BTR.

[d] To the extent possible.

[e] If “other”, Parties should specify this information.

[f] The face value and, on a voluntary basis, the grant-equivalent value.

[g] Parties report, to the extent possible, the different amounts per financial instrument, if applicable and as available.

[h] As available.
[i] Report, to the extent possible, information on the project/programme and implementing agency and provide a link to any relevant documentation and as appropriate, support to activities related to averting, minimizing and addressing loss and damage associated with the adverse effects of climate change.

[j] The region should be reported if data at the country level are not available.
[k] This refers to funding for activities that have both mitigation and adaptation components. Parties report, to the extent possible, the different amounts of components, if applicable and as available.

Custom footnotes:
(1) *The underlying assumptions, definitions and methodologies of the information in this CTF is available at: Section of the 4.1., 4.2., and 4.3.*

TABLE III.2

Information on financial support provided under Article 9 of the Paris Agreement in year 2021:[a,b,c] multilateral channels

Exchange rate used: 0.846

Institution[c]	*Amount[c, d]*												*Recipient[c, e, g]*	*Title of the project, programme, activity or other[c, e, g, h]*	*Status[c]*	*Channel[c]*	*Funding source[c]*	*Financial instrument[c, i]*	*Type of support[c]*	*Sector[c, g]*	*Subsector[c, g]*	*Contribution to capacity-building objectives[c, e, g]*	*Contribution to technology development and transfer objectives[c, e, g]*
	Inflows[c, e]								*Outflows[c, e]*														
	Core/general[c, e, f]				*Climate-specific[e]*				*Climate-specific[e]*														
	Face value		*Grant equivalent*		*Face value*		*Grant equivalent*		*Face value*		*Grant equivalent*												
	Domestic currency	*USD*	*Domestic currency*	*USD*	*Domestic currency*	*USD*	*Domestic currency*	*USD*	*Domestic currency*	*USD*	*Domestic currency*	*USD*											
UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA

Abbreviations: ODA = official development assistance, OOF = other official flows.

Notation keys: NA = not applicable; UA = information not available at the time of reporting; NR = not reported (to indicate the voluntary character of the information).

Note: Where financial support contributes to capacity-building and/or technology development and transfer objectives, information in shaded cells is automatically populated in relevant CTF on information on support for technology development and transfer provided under Article 10 of the Paris Agreement (table III.4) and/or information on capacity-building support provided under Article 11 of the Paris Agreement (table III.5).

[a] Relevant information, in a tabular format, for the previous two reporting years without overlapping with the previous reporting periods, on financial support provided through multilateral channels.

[b] Parties fill in a separate table for each year, namely 20XX-3 and 20XX-2, where 20XX is the reporting year.

[c] Parties provide the underlying assumptions, definitions and methodologies, as applicable, used to identify and/or report this reporting parameter in the respective section of the BTR.

[d] The face value and, on a voluntary basis, the grant-equivalent value.

[e] As applicable.

[f] This refers to support to multilateral institutions that Parties cannot specify as being climate-specific.

[g] As available.

[h] If "other", Parties should specify this information.

[i] Parties report, to the extent possible, the different amounts per financial instrument, if applicable and as available.

[j] Region should be reported when data at country level is not available.

[k] This refers to funding for activities that have both mitigation and adaptation components. Parties report, to the extent possible, the different amounts of components, if applicable and as available.

[l] Report, to the extent possible, information on the project/programme and implementing agency and provide a link to any relevant documentation and as appropriate, support to activities related to averting, minimizing and addressing loss and damage associated with the adverse effects of climate change.

Custom footnotes:

(1) *The underlying assumptions, definitions and methodologies of the information in this CTF is available at: Section of the BTR 4.3.*

TABLE III.2

Information on financial support provided under Article 9 of the Paris Agreement in year 2022: [a,b,c]multilateral channels

Exchange rate used: 0.949

Institution[c]	*Amount*[c, d]												*Recipient*[c, e, g]	*Title of the project, programme, activity or other*[c, e, g, h]	*Status*[c]	*Channel*[c]	*Funding source*[c]	*Financial instrument*[c, i]	*Type of support*[c]	*Sector*[c, g]	*Subsector*[c, g]	*Contribution to capacity-building objectives*[c, e, g]	*Contribution to technology development and transfer objectives*[c, e, g]
	Inflows[c, e]								*Outflows*[c, e]														
	Core/general[c, e, f]				*Climate-specific*[e]				*Climate-specific*[e]														
	Face value		*Grant equivalent*		*Face value*		*Grant equivalent*		*Face value*		*Grant equivalent*												
	Domestic currency	*USD*	*Domestic currency*	*USD*	*Domestic currency*	*USD*	*Domestic currency*	*USD*	*Domestic currency*	*USD*	*Domestic currency*	*USD*											
UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA

Abbreviations: ODA = official development assistance, OOF = other official flows.

Notation keys: NA = not applicable; UA = information not available at the time of reporting; NR = not reported (to indicate the voluntary character of the information).

Note: Where financial support contributes to capacity-building and/or technology development and transfer objectives, information in shaded cells is automatically populated in relevant CTF on information on support for technology development and transfer provided under Article 10 of the Paris Agreement (table III.4) and/or information on capacity-building support provided under Article 11 of the Paris Agreement (table III.5).

[a] Relevant information, in a tabular format, for the previous two reporting years without overlapping with the previous reporting periods, on financial support provided through multilateral channels.

[b] Parties fill in a separate table for each year, namely 20XX-3 and 20XX-2, where 20XX is the reporting year.

[c] Parties provide the underlying assumptions, definitions and methodologies, as applicable, used to identify and/or report this reporting parameter in the respective section of the BTR.

[d] The face value and, on a voluntary basis, the grant-equivalent value.

[e] As applicable.

[f] This refers to support to multilateral institutions that Parties cannot specify as being climate-specific.

[g] As available.

[h] If “other”, Parties should specify this information.

[i] Parties report, to the extent possible, the different amounts per financial instrument, if applicable and as available.

[j] Region should be reported when data at country level is not available.

[k] This refers to funding for activities that have both mitigation and adaptation components. Parties report, to the extent possible, the different amounts of components, if applicable and as available.

[l] Report, to the extent possible, information on the project/programme and implementing agency and provide a link to any relevant documentation and as appropriate, support to activities related to averting, minimizing and addressing loss and damage associated with the adverse effects of climate change.

Custom footnotes:

[(1)] *The underlying assumptions, definitions and methodologies of the information in this CTF is available at: Section of the BTR 4.3.*

TABLE III.3

Information on financial support mobilized through public interventions under Article 9 of the Paris Agreement in year 2021[a,b,c]

Exchange rate used: 0.846

Recipient [c]	*Title of the project programme, activity or other* [c, d]	*Channel* [c]	*Amount mobilized* [c, e]				*Amount of resources used to mobilize the support* [c]		*Type of public intervention* [c, f]	*Type of support*	*Sector* [c]	*Subsector* [c]	*Additional information* [c, i]
			Face value		*Grant equivalent*								
			Domestic currency	*USD*	*Domestic currency*	*USD*	*Domestic currency*	*USD*					
Uzbekistan	Voluntary contribution to UN Multi-Partner Human Security Trust Fund for the Aral Sea Region in Uzbekistan.	Bilateral	10020.35	11844.38	10020.35	11844.38	10020.35	11844.38	Grant	Adaptation	Climate change impact	BTR section 4.2. and 4.3.	Voluntary contribution to UN Multi-Partner Human Security Trust Fund for the Aral Sea Region in Uzbekistan

Notation keys: NA = not applicable; UA = information not available at the time of reporting; NR = not reported (to indicate the voluntary character of the information).
Note: Where financial support contributes to capacity-building and/or technology development and transfer objectives, information in shaded cells is automatically populated in relevant CTF on information on support for technology development and transfer provided under Article 10 of the Paris Agreement (Table III.4) and/or information on capacity-building support provided under Article 11 of the Paris Agreement (Table III.5).

[a] Relevant information, in textual and/or tabular format, for the previous two reporting years without overlapping with the previous reporting periods, on financial support mobilized through public interventions through bilateral, regional and multilateral channels, including the operating entities of the Financial Mechanism and entities of the Technology Mechanism, as applicable and to the extent possible.

[b] Parties fill in a separate table for each year, namely 20XX-3 and 20XX-2, where 20XX is the reporting year.

[c] Parties provide the underlying assumptions, definitions and methodologies, as applicable, used to identify and/or report this reporting parameter in the respective section of the BTR.

[d] If “other”, Parties should specify this information.

[e] The face value and, on a voluntary basis, the grant-equivalent value, if applicable.

[f] Parties report, to the extent possible, the different amounts per financial instrument, if applicable and as available

[g] Region should be reported when data at country level is not available.

[h] This refers to funding for activities that have both mitigation and adaptation components. Parties report, to the extent possible, the different amounts of components, if applicable and as available.

[i] Report, to the extent possible, information on the project/programme and implementing agency and provide a link to any relevant documentation and as appropriate, support to activities related to averting, minimizing and addressing loss and damage associated with the adverse effects of climate change.

Custom footnotes:

[1] *The underlying assumptions, definitions and methodologies of the information in this CTF is available at: Section of the BTR 4.1., 4.2. and 4.3., and ETF CTF Table III.1.*

TABLE III.3

Information on financial support mobilized through public interventions under Article 9 of the Paris Agreement in year 2022[a,b,c]

Exchange rate used: 0.949

Recipient [c]	*Title of the project programme, activity or other*[c, d]	*Channel* [c]	*Amount mobilized*[c, e]				*Amount of resources used to mobilize the support* [c]		*Type of public intervention*[c, f]	*Type of support*	*Sector*[c]	*Subsector*[c]	*Additional information*[c, i]
			Face value		*Grant equivalent*								
			Domestic currency	*USD*	*Domestic currency*	*USD*	*Domestic currency*	*USD*					
UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA

Notation keys: NA = not applicable; UA = information not available at the time of reporting; NR = not reported (to indicate the voluntary character of the information).

Note: Where financial support contributes to capacity-building and/or technology development and transfer objectives, information in shaded cells is automatically populated in relevant CTF on information on support for technology development and transfer provided under Article 10 of the Paris Agreement (Table III.4) and/or information on capacity-building support provided under Article 11 of the Paris Agreement (Table III.5).

[a] Relevant information, in textual and/or tabular format, for the previous two reporting years without overlapping with the previous reporting periods, on financial support mobilized through public interventions through bilateral, regional and multilateral channels, including the operating entities of the Financial Mechanism and entities of the Technology Mechanism, as applicable and to the extent possible.

[b] Parties fill in a separate table for each year, namely 20XX-3 and 20XX-2, where 20XX is the reporting year.

[c] Parties provide the underlying assumptions, definitions and methodologies, as applicable, used to identify and/or report this reporting parameter in the respective section of the BTR.

[d] If “other”, Parties should specify this information.

[e] The face value and, on a voluntary basis, the grant-equivalent value, if applicable.

[f] Parties report, to the extent possible, the different amounts per financial instrument, if applicable and as available

[g] Region should be reported when data at country level is not available.

[h] This refers to funding for activities that have both mitigation and adaptation components. Parties report, to the extent possible, the different amounts of components, if applicable and as available.

[i] Report, to the extent possible, information on the project/programme and implementing agency and provide a link to any relevant documentation and as appropriate, support to activities related to averting, minimizing and addressing loss and damage associated with the adverse effects of climate change.

Custom footnotes:

(1) *The underlying assumptions, definitions and methodologies of the information in this CTF is available at: Section of the BTR 4.1., 4.2. and 4.3., and ETF CTF Table III.1.*

TABLE III.4

Information on support for technology development and transfer provided under Article 10 of the Paris Agreement[a]

Title[b]	Recipient entity[b]	Description and objectives[b]	Type of support[b]	Sector[b]	Subsector[b]	Type of technology[b]	Status of measure or activity[b]	Activity undertaken by[b]	Additional information[e]
Strengthening the phytosanitary system and laboratory capacity for the development of the fruit sector in Uzbekistan-2022 - TableIII.1	Related controlling authorities	To strengthen the capacity of the Uzbek phytosanitary system and laboratory capacity, notably for the finding especially dangerous organisms	Mitigation	Agriculture	BTR section 4.3.	To strengthen the capacity of the Uzbek phytosanitary system and laboratory capacity	Completed	Public sector	
Creation of GIS for the management of water supply and sewerage of pilot territory in the field of digitalization-2022 - TableIII.1	Municipal water enterprises in Uzbekistan	to implement a pilot project in the Republic of Uzbekistan in the digitization and implementation of the management system of water supply and sewerage networks, using geographic information system technologies	Cross-cutting	Water and sanitation	BTR section 4 subpoint 4.3.	Geographic information system for the management of water supply and sewerage of the pilot territory	Completed	Public sector	
Improving plant protection system and laboratory capacity to boost food exports in Uzbekistan-2022 - TableIII.1	Quarantine Agency of Uzbekistan	To improve control system of plant protection and fertilizers	Cross-cutting	Agriculture	BTR section 4.3.	To improve laboratory capacity	Completed	Public sector	

Notation keys: NA = not applicable; UA = information not available at the time of reporting; NR = not reported (to indicate the voluntary character of the information).

[a] Quantitative and/or qualitative information in common tabular format on measures or activities related to support for technology development and transfer implemented or planned since their previous BTR, to the extent possible and as relevant.

[b] Parties provide the underlying assumptions, definitions and methodologies, as applicable, used to identify and/or report this reporting parameter in the respective section of the BTR.

[c] If “other”, Parties should specify this information.

[d] This refers to activities that have both mitigation and adaptation components.

[e] Report, to the extent possible, information on the project/programme and implementing agency and provide a link to any relevant documentation and as appropriate, support to activities related to averting, minimizing and addressing loss and damage associated with the adverse effects of climate change.

Custom footnotes:

(1) *The underlying assumptions, definitions and methodologies of the information in this CTF is available at: Section of the BTR 4.1., 4.2., 4.3. and 4.4., ETF CTF Table III.1.*

TABLE III.5

Information on capacity-building support provided under Article 11 of the Paris Agreement[a]

Title[b]	Recipient entity[b]	Description and objectives[b]	Type of support[b]	Status of measure or activity[b]	Additional information[d]
Cameroon Guinea Congo Vietnam Ghana - Project Forest-2022 - TableIII.1	Local communities	The project is part of the EU Aid Volunteers initiative and aims to send volunteers to Ghana to strengthen the activities of local organizations that support local communities to jointly protect rainforests and make their management sustainable.	Mitigation	Completed	
Strengthening the phytosanitary system and laboratory capacity for the development of the fruit sector in Uzbekistan-2022 - TableIII.1	Related controlling authorities	To strengthen the capacity of the Uzbek phytosanitary system and laboratory capacity, notably for the finding especially dangerous organisms. Sharing Latvia's expertise the Uzbek system will be provided with practical support and knowledge in the detection, containment and control of the organism: so called a full cycle process.	Mitigation	Completed	
Creation of GIS for the management of water supply and sewerage of pilot territory in the field of digitalization-2022 - TableIII.1	Municipal water enterprises in Uzbekistan	To implement a pilot project in the Republic of Uzbekistan in the digitization and implementation of the management system of water supply and sewerage networks, using geographic information system technologies	Cross-cutting	Completed	
Improving plant protection system and laboratory capacity to boost food	Quarantine Agency of Uzbekistan	To improve control system of plant protection and fertilizers	Cross-cutting	Completed	

Title[b]	Recipient entity[b]	Description and objectives[b]	Type of support[b]	Status of measure or activity[b]	Additional information[d]
exports in Uzbekistan-2022 - TableIII.1					
Support for improving the quality of public services in rural Uzbekistan-2021 - TableIII.1	Regional authorities	Project goal is to improving the quality of public services in the regions of Uzbekistan	Cross-cutting	Completed	
General plan for populated areas of Uzbekistan developing a prototype for a publishing and public consultation portal-2021 - TableIII.1	Public	to develop of a prototype portal for the publication and public consultation of general population plans of the Republic of Uzbekistan in accordance with the requirements of the construction standard of the Republic of Uzbekistan adopted on 22 February 2021	Cross-cutting	Completed	
Civil society engagement in improving rural development and promotion of efficient models for sustainable local development-2021 - TableIII.1	European Union LEADER programme Local Action Groups partneship groups	Civil society engagement in improving the rural	Cross-cutting	Completed	
Capacity building of industry associations serving engineering companies in Kazakhstan and Uzbekistan-2021 - TableIII.1	industry associations in Uzbekistan and Kazakhstan	to strengthen associations capacities to implement international projects	Cross-cutting	Completed	
Capacity building of industry associations serving engineering companies in Kazakhstan and Uzbekistan-2022 - TableIII.1	industry associations in Uzbekistan and Kazakhstan	To improve services to engineering companies provided by associations	Cross-cutting	Completed	
Capacity building for implementing investment projects in the fields of water supply and sewerage in Uzbekistan-2021 - TableIII.1	Experts in the water supply and sewer investment project deployment group in Uzbekistan	Project strengthens capacity of managing of investment projects in the field of water management	Cross-cutting	Completed	

Notation keys: NA = not applicable; UA = information not available at the time of reporting; NR = not reported (to indicate the voluntary character of the information).

[a] Quantitative and/or qualitative information in common tabular format on measures or activities related to capacity-building support implemented or planned since their previous report, to the extent possible and as relevant.

[b] Parties provide the underlying assumptions, definitions and methodologies, as applicable, used to identify and/or report this reporting parameter in the respective section of the BTR.

[c] This refers to activities that have both mitigation and adaptation components.

[d] Report, to the extent possible, information on the project/programme and implementing agency and provide a link to any relevant documentation and as appropriate, support to activities related to averting, minimizing and addressing loss and damage associated with the adverse effects of climate change.

Custom footnotes:

[(1)] *The underlying assumptions, definitions and methodologies of the information in this CTF is available at: Section of the BTR 4.1., 4.2., 4.3. and 4.5., and ETF CTF Table III.1.*

Annex 5 Methodology applied for the identification of GHG emissions from international aviation and navigation in the scope of the EU NDC

The scope of the EU 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 by using the Joint Research Centre's Integrated Database of the European Energy System (JRC-IDEES).[157] It allows to split the international transport CO2 emissions into intraEU/extraEU and intraEEA/extraEEA and the departing flights from the EU to the UK and Switzerland, categories backwards in time (i.e. 1990) (i.e. for the time period back to 1990).[158]

For international transport, JRC-IDEES applies 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 domestic, intra-EU/intra-EEA, and extra-EU/extra-EEA activity for each EU Member State, Norway and Iceland.

In aviation, JRC-IDEES distinguishes passenger and freight modes, with three geographical categories of flight origin/destinations for each mode: domestic, intra-EEA + UK, and extra-EEA + UK. Intra-EU, the UK, and EEA[159] 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 decomposition first allocates EU-level activity data from the Transport Pocketbook[160] 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

[157] 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. Available: doi:10.2760/614599

[158] 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 includes emissions related to the UK but not to Switzerland, where total CO_2 emissions for the scope are additionally estimated from EUROCONTROL data

[159] In this annex, EEA stands for European Economic Area, which comprises the 27 EU Member States, Iceland, Liechtenstein and Norway.

[160] Statistical pocketbook 2023. Available: https://transport.ec.europa.eu/facts-funding/studies-data/eu-transport-figures-statistical-pocketbook/statistical-pocketbook-2023_en

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 is 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 is 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 intra-EU 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 CO_2, CH_4, and N_2O 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'[161]), namely EU-level mileage data and country-specific vessel sizes to estimate load 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 so as 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 is 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 is not available, it is estimated from Eurostat energy consumption;
- Missing mileage data is derived from the activity and load factor estimates;

[161] THETIS MRV. Available: https://mrv.emsa.europa.eu/#public/eumrv

- 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 so as 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.

Aviation emissions covered by the EU NDC scope

Emissions	**Domestic aviation**		**Intra-EEA aviation**			**Extra-EEA aviation**
Current NDC commitment	Domestic EU flights (e.g. Palermo Milan	Domestic “non-EU EEA” flights (e.g. Oslo to Bergen)	Flights between “non-EU EEA” countries (from Oslo to Reykjavik)	Flights within the EEA, departing from EU airports	Flights to/from EU airports to OMRs	Departing flights from EU airports to UK and Switzerland
Current NDC commitment	Yes	No	No	Yes	Yes From Jan 2024	Yes

Maritime navigation emissions covered by the EU NDC

Emissions	**Domestic aviation**		**Intra-EEA aviation**			**Extra-EEA aviation**
Current NDC commitment	Domestic EU flights (e.g. Palermo Milan	Domestic “non-EU EEA” flights (e.g. Oslo to Bergen)	Flights between “non-EU EEA” countries (from Oslo to Reykjavik)	Flights within the EEA, departing from EU airports	Flights to/from EU airports to OMRs	Departing flights from EU airports to UK and Switzerland
Current NDC commitment	Yes	No	No	Yes	Yes From Jan 2024	Yes

Annex 6 Description of implemented models for GHG projections

Model	Gases and/sector	Type of model/approach and characteristics	Original purpose and changes to climate change purposes	Strengths and weaknesses of the model/approach	Overlap or synergies with PAM
TIMES	*All GHG and air pollution emissions* *Energy and Transport*	*Partial equilibrium, bottom-up, optimization model. It is used Elastic demand approach.* *Additional information can be found at: https://iea-etsap.org/index.php/etsap-tools/model-generators/times*	*Original purpose is to describe development of the Latvian energy system over a period of 50 years on the national level.* *The model structure is adapted, so that emissions can be calculated and reported not only by the type of fuel, but also by sector and corresponding type of technologies. Model is developed to investigate impact of specific policies (energy efficiency and RES) to GHG emissions.*	*Strength:* *Well understood least-cost modelling paradigm (efficient markets);* *Provides a framework to evaluate technologies on the basis of cost assumptions, to check the consistency of results and explore sensitivities to key data and assumptions;* *Transparent framework; open assumptions on data, technology pathways, constraints etc;* *Interactions within entire energy system (e.g. resource supply curves, competing use for infrastructures and fuels, sectoral technology diffusion);* *Ability to track emissions and energy consumption across the energy system, and model the impact of constraints on both;* *Weaknesses:* *Model is highly data intensive (characterization of technologies and RES);* *Limited ability to model consumers' behaviour;*	*Considering that TIMES model is optimisation model, the impact assessment of defined PaMs might be done without overlapping. The TIMES model chooses the PaMs according to the least cost order (e.g., at first it is chosen the energy efficiency measures having lower costs which are followed by the higher costs' RES measures). Thus as the result, the integrated evaluation of energy system is performed.* *To minimise the risk of overlapping the GHG savings from PaMs a package approach has been adopted when accounting for the impact of policies on emissions.*

Model	Gases and/sector	Type of model/approach and characteristics	Original purpose and changes to climate change purposes	Strengths and weaknesses of the model/approach	Overlap or synergies with PAM
F-gases Excel based accounting model	*HFC and SF_6 CRT 2.F Product uses as substitutes for ODS; CRT 2.G Other product manufacture and use.*	*Accounting model: Top-down accounting model is based on 2006 IPCC guidelines and adjusted for projection estimation incorporating parameters according to macroeconomic forecast.*	*The F-gases accounting model originally was designed for F-gases emission calculation in annual GHG inventory.*	*<u>Strength:</u>* *As the one model is used for F-gases emission calculation in both GHG inventory and for estimation of projections hence the consistency is ensured* *<u>Weakness:</u>* *Susceptible to trivial human errors.*	*In purpose to avoid the overlapping that may exist between different policies and measures (PaMs) the analyse of PaMs is carried out before including them into WEM or WAM scenario. Afterwards measures are grouped and combined by the type of their effect.*
IPCC Waste model and Excel based estimation of activity data	*All GHG and air pollution emissions CRT 5 Waste*	*IPCC Waste model: bottom-up approach.* *Emission projection estimations based on IPCC methodology. Estimations of activity data are based on macroeconomic forecast, existing trends and existing/planned PaMs in the sector.*	*IPCC Waste model was originally designed for estimation of CH_4 emission from solid waste disposal.*	*<u>Strength:</u>* *IPCC Waste model:* *Comparability with calculations from other countries.* *Excel based estimations: simplicity and flexibility.* *<u>Weakness</u>:* *IPCC Waste model:* *Low flexibility if parameters are changing due to time series.* *Excel based estimations:* *Susceptible to trivial human errors in interpretation of existing or projected trends in the sector.*	*Existing and planned PaMs are taken into account in order to estimate relevant activity data for emission projections.*
IPCC AFOLU model and Excel or R based estimation of activity data	*All GHG and air pollution emissions CRT 3 Agriculture.*	*IPCC AFOLU model: bottom-up approach.* *Emission projection estimations are based on IPCC methodology. Estimations of activity data are based on forecast of milk and grain price; as well as on existing trends of agricultural sector activity data.*	*IPCC AFOLU model was originally designed for estimation of CH_4 and N_2O emissions from enteric fermentation, manure and soil management.*	*<u>Strength:</u>* *IPCC AFOLU model:* *Comparability of calculations for inventory and providing of calculation consistency.* *<u>Weakness:</u>*	*Existing PaMs are evaluated in order to estimate relevant emission projections by using IPCC methodology.*

Model	Gases and/sector	Type of model/approach and characteristics	Original purpose and changes to climate change purposes	Strengths and weaknesses of the model/approach	Overlap or synergies with PAM
				Regression based estimation of activity data is done by using different sources of macroeconomic indicators, low flexibility in relation to existing PaMs.	
LULUCF	*Primarily CO_2*	*AGM model for calculation of forest growth considering probabilities of different forest management measures. Predicts increment, natural mortality and harvesting, as well as forest structure (species composition, age structure, dimensions of trees). The model is working with National forest inventory data extrapolated of national scale.*	*Originally developed to predict forest resources, additions implemented – special forms to calculate GHG fluxes using national GHG inventory model.*	*Strengths:* *The model is verified using historical data and provides data necessary for modelling of all carbon pools.* *Weakness:* *Cumulative effect of ageing of forests and depletion of drainage systems is not considering potentially underestimating carbon losses due to natural disturbances.*	*The model is used to evaluate PaMs in forest lands.*