PASŪTĪTĀJS: VIDES AIZSARDZĪBAS UN REĢIONĀLĀS ATTĪSTĪBAS MINISTRIJA

IZPILDĪTĀJS: FIZIKĀLĀS ENERĢĒTIKAS INSTITŪTS

LATVIJAS SEG EMISIJU UN PIESAISTES PROGNOŽU SAGATAVOŠANA 2015., 2020., 2025., 2030., 2035. UN 2050. GADAM GALVENAJĀS TAUTSAIMNIECĪBAS NOZARĒS

Līguma Nr. 26/2015

ATSKAITE par 1. un 2. etapu

2015. GADS, DECEMBRIS

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Projekta vadītājs

Gaidis Klāvs

Galvenie izpildītāji

Gaidis Klāvs

Jānis Reķis

Izpildītāji

Laima Bērziņa

Ivars Kudreņickis

Andis Lazdiņš

Atskaites sagatavošanā piedalījās: Intars Cakars, Vita Ratniece, Lauris Siņics

Contents

1. Ievads

Atskaitē ir apkopota informācija par pētījuma gaitā iegūtajiem rezultātiem, kas balstās uz tiešo un netiešo SEG emisiju prognožu aprēķināšanu enerģētikas, transporta, rūpniecisko procesu un lauksaimniecības sektoru attīstības scenārijos uz 2015., 2020., 2025., 2030. un 2035. gadu, ņemot vērā spēkā esošās un plānotās klimata politikas rīcībpolitikas "scenārijam ar esošiem pasākumiem" un „scenārijam ar papildus pasākumiem". Tā kā pētījuma rezultātus tālāk ir paredzēts izmantot Latvijas nacionālo ziņojumu sagatavošanai starptautiskajām organizācijām (Eiropas Komisija un ANO), tad pētījumā izmantotā metodoloģija, skaitlisko rezultātu atskaites formāts un arī saturiskās atskaites formāts atbilst Regulas Nr. 525/2013 un Komisijas Īstenošanas regulas Nr. 749/2014 prasību izpildei sagatavotajiem atskaitīšanās formātiem un Apvienoto Nāciju Organizācijas Vispārējās konvencijas par klimata pārmaiņām nacionālā ziņojuma sagatavošanas prognožu ziņošanas vadlīnijām un divgadu ziņojuma sagatavošanas vadlīnijām (2/CP.17, I pielikums) kā arī Lēmuma 19/CP.18 ietvaros atbilstoši Apvienoto Nāciju Organizācijas Vispārējās konvencijas par klimata pārmaiņām izstrādātām ziņošanas vadlīnijām un ziņošanas formātam.

Atskaitē ir sniegta informācija par SEG emisiju prognozēšanā izmantotajiem datiem, politikas dokumentiem, tiesību aktiem un pasākumiem un to projektiem, kuri ņemti vērā, sagatavojot prognozes, un aprakstītas minētās politikas un pasākumi atbilstoši Regulas Nr. 525/2013, Komisijas Īstenošanas regulas prasībām un Apvienoto Nāciju Organizācijas Vispārējās konvencijas par klimata pārmaiņām publicētajiem norādījumiem Nacionālo ziņojumu izstrādei. Virknei no aprakstītajiem pasākumiem veikts kvantitatīvs novērtējums par šo politiku un pasākumu ietekmi uz siltumnīcefekta gāzu emisijām un piesaisti 2015., 2020., 2025., 2030., 2035. un 2050. gadam, kā arī noteiktas SEG emisiju samazināšanas izmaksas. Aprēķinātās SEG emisiju prognozes, prognozēšanā izmantotie parametri un ziņošanai nepieciešamā informācija par politikām un pasākumiem ir apkopota un iesniegta Komisijas Īstenošanas Regulas 749/2014 XI pielikumā noteikto tabulu formātā un Komisijas nodrošinātajā ziņošanas veidnē, kā arī Apvienoto Nāciju Organizācijas lēmuma 19/CP.18 noteiktā kopējā tabulārajā formātā Apvienoto Nāciju Organizācijas Vispārējās konvencijas par klimata pārmaiņām un Kioto protokola ietvaros.

Kopējās prognozētās SEG emisijas laika posmam 2014.- 2020.; 2025. un 2030.gadam ir aprēķinātas iedalījumā pa emisiju tirdzniecības sistēmas (turpmāk - ETS) un ne-ETS sektoriem, kur ne-ETS sektors ir attēlots pa nozarēm. Šis sadalījumu ir sagatavot "scenārijos ar esošiem pasākumiem" un „scenārijam ar papildus pasākumiem", aizpildot EVA izstrādātas formas atbilstoši Regulas Nr. 525/2013 un Komisijas Īstenošanas regulas Nr.749/2014 prasībām. Pētījuma rezultātu skaitlisko informāciju var meklēt sekojošās interneta vietnēs:

http://cdr.eionet.europa.eu/lv/eu/mmr/art04-13-14_lcds_pams_projections/envva4whq

http://cdr.eionet.europa.eu/lv/eu/mmr/art04-13-14_lcds_pams_projections/envvvneya

2. Information on greenhouse gas emission inventories

This section presents summary information on the national greenhouse gas (GHG) emissions since 1990. The information is consistent with most recent annual inventory submission to UNFCCC where detailed information on GHG emissions and their estimation can be found.

2.1. Summary information on GHG emissions and trends

Description of emission trends by sector

The emission data presented in this chapter and in CTF table 1 are based on the Latvia's national greenhouse gas inventory 1990-2013, submitted to the UNFCCC on 6 November 2015[1]. The inventory is prepared according to the UNFCCC reporting guidelines on annual inventories for Parties included in Annex I to the Convention[2] (Decision 24/CP.19) and with Regulation (EU) No 525/2013. Table 1 and Figure 1 shows a time series of CO_2 equivalent emissions by sectors without LULUCF including indirect CO_2.

Table 1 Latvia GHG emissions by source sector, kt CO_2 eq.

	1990	1995	2000	2005	2010	2011	2012	2013
1. Energy	19,258.46	9,546.94	7,383.68	8,111.14	8,452.79	7,589.42	7,290.72	7,185.09
2. Industrial processes and product use	602.66	151.77	158.61	229.46	566.74	658.90	688.14	668.97
3. Agriculture	5,558.66	2,255.51	1,859.64	2,015.26	2,140.57	2,154.55	2,250.52	2,310.12
4. Land Use, Land-Use Change and Forestry	-8,899.50	-9,505.90	-7,130.69	-4,098.21	881.52	511.94	-416.84	-147.78
5. Waste	764.59	663.06	745.31	683.93	736.84	727.69	737.27	749.54
Indirect CO_2	142.11	133.19	126.63	120.68	114.18	113.53	111.89	111.70
Total (without LULUCF, with indirect)	26,326.48	12,750.47	10,273.87	11,160.46	12,011.12	11,244.09	11,078.53	11,025.43
Total (with LULUCF, with indirect)	17,426.98	3,244.57	3,143.18	7,062.25	12,892.64	11,756.03	10,661.69	10,877.65

According to **Table 1** in 2013, Latvia's GHG emissions composed 11025 kt CO_2 eq. excluding LULUCF in total including indirect CO_2, showing in 2013 a decrease of 58.1% comparing to the base year 1990. The largest decrease is observed in Energy (if accounted without Transport) sector – 73.1% followed by the 58.4% decrease in Agriculture sector. In Transport and Waste sectors the GHG emissions decrease is 6.7% and 2% respectively.

[1] http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/8812.php

[2] http://unfccc.int/resource/docs/2013/cop19/eng/10a03.pdf

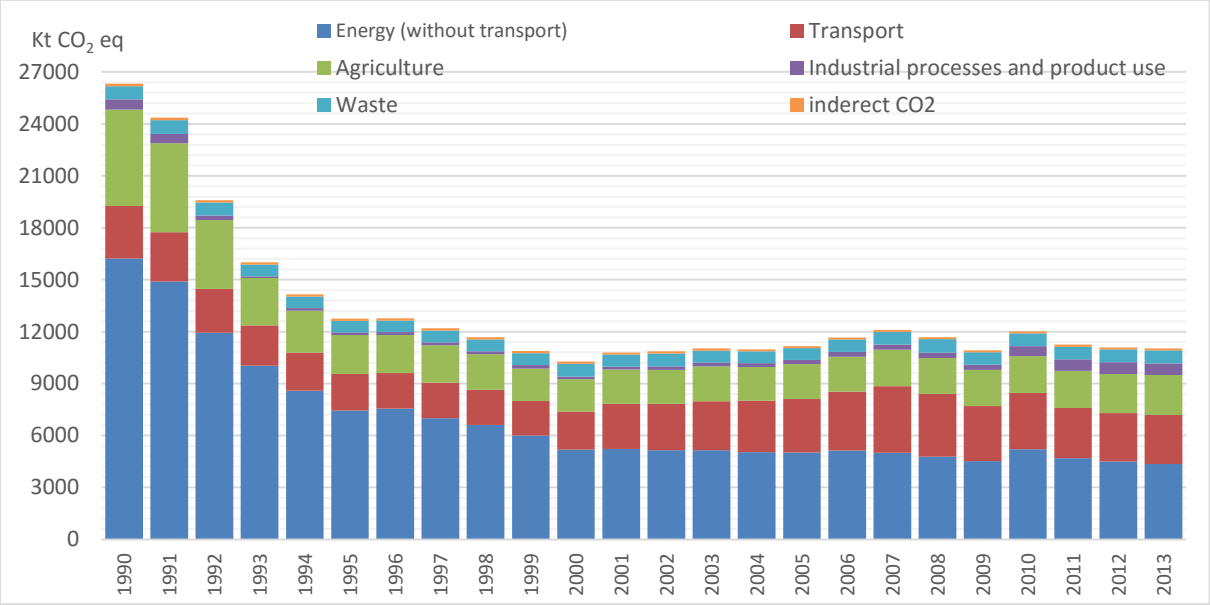

Figure 1 GHG emissions in Latvia by reporting sector (without LULUCF), kt $CO_{2\ eq}$

The GHG emissions had considerably decreased during the time period 1990–1995 (52%) when the national economy of Latvia transformed from central planning economy to a market economy. This transformation had 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 Energy and Agriculture sectors had in this period the largest decrease of GHG emissions against 1990, respectively 49.6% and 59.4%.

The rapid growth of Latvia's economy in the period 2000-2007, during which GDP growth had constituted 82%, resulted also in the growth of the total GHG emissions per 18%. In its turn, in the period 2008-2013 the active implementation of climate policies and measures had took place, which decreased GHG emissions in 2013 per 6% compared to 2008.

The total GHG emissions in 2013, compared to 2012, were by 0.5% lower. This decrease was ensured mainly due to the emissions decrease (per 3.2%) in energy (without transport) sector reached because of implementation of energy efficiency improvement measures and wider use of renewable energy sources. At the same time the increase of emissions in Agriculture sector (per 2.7%) and Transport sector (per 1.2%) shall be noted, as this opposite tendency was caused by increased production and activity in these sectors.

Annual fluctuations in the emissions, particularly in Energy sector, have been large. These have arisen especially from variation in the energy demand for heating depending on weather conditions (heating degree days), availability of hydro resources in national hydro energy power plants, imports of electricity, and the annual structure and volume of domestic energy (electricity and heat) production.

The energy sector is the most significant source of GHG emissions in Latvia with about 65.2% (7185 kt CO_2 eq) share of the total emissions in 2013. This reflects extensive consumption of energy for a long heating period, as well as energy consumption for transport that composes 25.6% (according to the latest submission) of emissions in the energy sector. There are not many energy- intensive manufacturing branches in Latvia. Energy-related CO_2 emissions vary mainly according to the economic trend, the energy supply structure and climate conditions including the impact on hydropower production and electricity import.

Agriculture was the second most significant source of GHG emissions in 2013, accounting for almost 21% (2310 kt CO_2 eq) of the total emissions. Emissions from agricultural soils contributed major share of the total emissions from the sector – 53.7%, enteric fermentation emissions were second largest source from the sector – 34.8%. The share of manure management emissions was evaluated as 10.7% of total emissions in the sector, remaining 0.8% of emissions refer to liming and urea application. GHG emissions increased in 2013 by 2.6% comparing to 2012 due to increase of livestock numbers (excepting goats and horses) with highest value for non-dairy cattle by +5.7%. Statistics also showed increase of synthetic N fertilizer consumption (+6.9%), sown area (+2.2%) and lime application to soils (+33.8%).

The emissions from industrial processes and product use, including CO_2, CH_4, N_2O and F-gases, were 6.1% (669 kt CO_2 eq.) of total GHG emissions in Latvia in 2013, being the fourth largest source of GHG emissions. Largest part of GHG emissions in the Industrial Processes and Product Use (IPPU) sector constitute CO_2 emissions from 2.A Mineral industry (82.2 % of total CO_2 emissions from IPPU sector). The second largest source is 2.F Product Uses as ODS Substitutes causing 15.9% from all IPPU emissions. Considerably smaller are rest of IPPU emission sources – 2.G Other Product manufacture and use, 2.D Non energy products from fuels and solvents use and 2.C Metal industry constituting together 1.9% from entire IPPU emissions in 2013.

The share of IPPU from the total GHG emissions has varied from 1.7 to 6.1 per cent of total emissions during the time period 2000 – 2013. The fluctuation in the emissions from industrial processes is largely consistent with the economic trend, even if the factors influencing the emissions are more diverse.

The waste sector accounted for 6.8% (750 kt CO_2 eq.) of total Latvia GHG emissions in 2013. Emissions from the Waste sector consist of CH_4 and N_2O emissions, the amount of emissions, compared to 1990, is much the same. In 2013, the GHG emissions from the Waste sector were per 2% lower, compared to base, 1990, year.

The following **Figure** 2 shows the total GHG emissions including LULUCF sector.

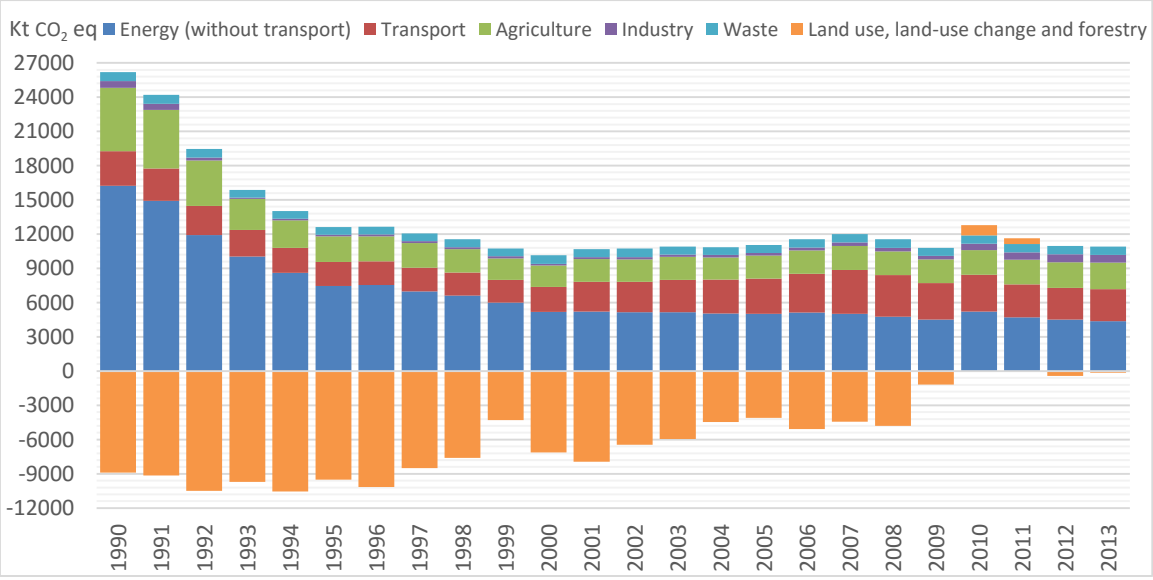

Figure 2 GHG emissions in Latvia by reporting sector (with LULUCF), kt CO_2 eq

Land use, Land use change and forestry (LULUCF) is a net sink in Latvia. In 2013, CO_2 removals were -147.8 kt CO_2 eq compared to -8899.5 kt CO_2 eq in the base year that is approximately 98% less than in 1990 (see Figure 2). Net aggregated emissions in LULUCF sector considerably increased since 1990 due to growth of economic activity in forest sector and due to conversion of forest lands to settlements and croplands. Although the increment of living biomass in forest land remaining forest and afforested land is still larger than the carbon losses due to commercial felling and natural mortality, the gap between gains and losses is decreasing, causing reduction of the net removals of CO_2 in forest land. Taking into account all said above, the total GHG emissions including LULUCF in 2013 has decreased per around 38% compared to 1990.

Description of emission trends by gas

Latvia's GHG emissions presented by gas are shown in the Table 2 and Figure 3.

Carbon dioxide (CO_2) is the main greenhouse gas causing the climate change. In 2013, CO_2 emissions constitute 66.0% of Latvia's total greenhouse gas emissions. In 2013, total CO_2 emissions had decreased by around 62.8% since 1990. The most important source of CO_2 emissions (kt) in 2013 was fossil fuel combustion – 90.8%, including Energy Industries – 28.6%, Manufacturing Industries and Construction –11.3%; Transport – 41.3%, Other sectors (Agriculture, Forestry, etc.) – 18.6 %. Other anthropogenic emission sources of CO_2 are Industrial Processes and Product Use – 7.5 % and Waste 0.01 %.

Main sources of CH_4 emissions in Latvia are Enteric Fermentation of Livestock, Solid Waste Disposal Sites and Energy sector. Other important sources of CH_4 emissions are leakage from natural gas pipeline systems and combustion of biomass. CH_4 emissions in 2013 contribute approximately 18.5 % of total GHG emissions (excluding LULUCF). The methane emissions (kt) decreased by 49.0 % in 2013 since 1990.

Agricultural soils are the main source of N_2O emissions in Latvia generating 83.6 % of all N_2O emissions (kt) in 2013. Other N_2O emission sources are transport and biomass, combustion of liquid and other solid fuels in sectors of energy conversion and industry, waste and sewage. Since 1990, total N_2O emissions had decreased by 44.0 % in 2013, mainly due the decrease in the emissions from agriculture.

Table 2 Latvia's GHG emissions, kt CO_2 eq

	1990	1995	2000	2005	2010	2011	2012	2013
Carbon Dioxide	19681.5	9192.2	7139.1	7853.7	8592.7	7848.2	7526.5	7387.7
Methane	3996.0	2337.8	1995.5	1998.3	1958.8	1924.0	1994.5	2036.5
Nitrous Oxide	2649.2	1218.8	1132.4	1281.4	1373.8	1382.7	1460.2	1484.0
Hydrofluorocarbons, Perfluorocarbons, Sulphur Hexafluoride	NA	0.8	6.4	28.3	87.0	89.6	98.7	117.0
Total (without LULUCF, with indirect)	26,326.48	12,750.47	10,273.87	11,160.46	12,011.12	11,244.09	11,078.53	11,025.43

Emissions from HFCs and sulphur hexafluoride (SF_6) consumption are reported for the period 1995-2013. Total HFCs emissions (kt CO_2 eq) increased in 2013 compared with 2012. SF_6 emissions from electrical equipment contribute 8.50 kt CO_2 eq in 2013.

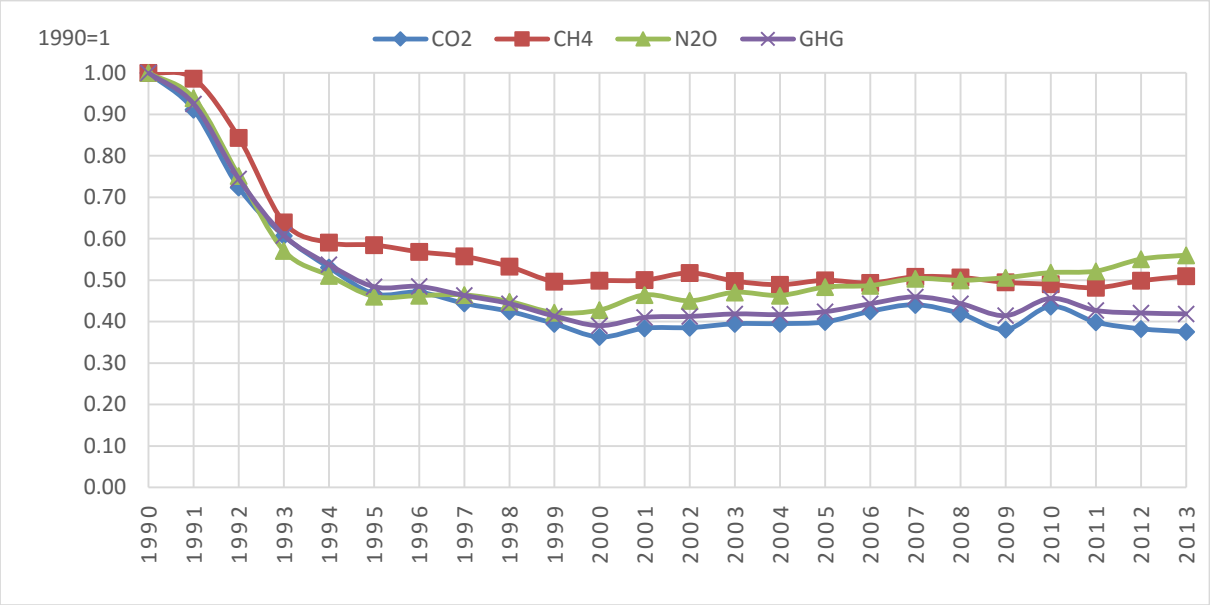

Figure 3 GHG emissions in Latvia by gas 1990 – 2013 (1990 = 1)

Agricultural soils are the main source of N_2O emissions in Latvia generating 83.6 % of all N_2O emissions (kt) in 2013. Other N_2O emission sources are transport and biomass, combustion of liquid and other solid fuels in sectors of energy conversion and industry, waste and sewage. Since 1990, total N_2O emissions had decreased by 44.0 % in 2013, mainly due the decrease in the emissions from agriculture.

Emissions from HFCs and sulphur hexafluoride (SF_6) consumption are reported for the period 1995-2013. Total HFCs emissions (kt CO_2 eq) increased in 2013 compared with 2012. SF_6 emissions from electrical equipment contribute 8.50 kt CO_2 eq in 2013.

In the period from 1990 to 2013 indirect GHG emissions have decreased: NOx by 62.6%, CO by 61.5% and NMVOC by 39.1%. Starting from 2001, slight fluctuations in NOx, NMVOC and CO emissions can be observed as a reason of increasing firewood consumption in Residential sector as well as fuel consumption in Transport sector in particular years. SO_2 emissions have decreased significantly from 1990 to 2013 by 98.5% as a reason of fuel switch and approved legislation.

Indirect greenhouse gases

The emissions trends of indirect greenhouse gases; nitrogen oxides, carbon monoxide and non-methane volatile organic compounds and sulphur oxide and other sulphur emissions calculated as sulphur dioxide are presented in Table 3.

Table 3 Indirect GHG emissions, kt

Year	NOx	CO	NMVOC	SO_2
1990	89.75	387.31	144.03	99.50
1995	50.61	301.76	114.92	53.99
2000	42.86	242.87	102.37	15.04
2005	43.59	204.59	100.03	6.30
2010	37.85	155.30	89.18	2.55
2011	32.88	158.35	88.24	2.27
2012	33.65	165.22	89.37	1.95
2013	33.59	149.19	87.70	1.46

In the period from 1990 to 2013 indirect GHG emissions have decreased: NO_x by 62.6%, CO by 61.5% and NMVOC by 39.1%. SO_2 emissions have decreased significantly from 1990 to 2013 by 98.5%. Taking into account that amount of the indirect GHGs emissions, except NMVOC emissions, in a great extent are determined by the fuel combustion in Energy sector, the GHGs emissions decrease in the period of 1990-1995 was mainly caused by the rapid decrease of fuel consumption in this sector. However, in the subsequent years there were different causes for the reduction of different indirect GHGs emissions. SO_2 emissions decrease took place mainly due to implementation of more stringent regulations regarding maximum Sulphur content in the liquid fuels utilized in both Energy sector stationary sources and transport (mobile sources) as well as fuel switch to renewables. The decrease of NO_x emissions was mainly caused by the wider penetration of new state-of-art technologies in Energy sector (in stationary sources as well as in transport vehicles due to the implementation of catalytic converters), this penetration was favoured by the implementation of regulations regarding NO_x emissions specific values from large combustion plants and all types of road transport (passenger cars, HDV and LDV). One can see, the relative decrease of CO emissions amount is lower than of noted above emissions, this can be explained by the specific Latvia situation, namely, one of the main sources of CO emissions is small combustion devices (in residential and commercial/institutional sector) fuelled by wood fuel, thus resulting in lower CO emissions reduction rate. The biggest part of CO emission reduction is resulting from increased amount of cars with catalytic converters.

In 2013, the most important sector producing indirect GHGs (including fugitive emissions) was Energy sector (including fugitive emissions). Fuel combustion in Energy sector causes the largest part of NO_x emissions (89.8% from total NO_x emissions in 2013), but IPPU and Agriculture sectors make 4.5% and 5.4%, accordingly. Very small part of NOx emissions is produced in LULUCF sector – 0.3% from total NO_x emissions). Almost all CO emissions (94.4%) appear in Energy sector, mainly from fuel combustion in Residential and Commercial/Institutional subsectors (74.5% from all emissions). A small part of CO emissions come from LULUCF sector (3.8%) and IPPU sector (1.7%). The major part of SO_2 emissions (87.9%) comes from Energy sector (fuel combustion), but the second largest sources of Sulphur dioxide emissions is Industrial processes (Cement production and Iron and Steel production), and a negligible part of SO_2 comes also from Waste sector (Waste incineration). The largest

amounts of NMVOC emissions are produced in IPPU sector (59.9%), mainly from solvent use, and 31.3% from total NMVOC emissions in 2013 are produced in Energy sector (fuel combustion mainly in Residential sector). 8.4% of NMVOC emissions are produced in Agriculture sector, but the remaining 0.4% in Waste sector.

3. Quantified economy-wide emission reduction target

This section explains the Latvia's emission reduction target as a member of EU (since 2004) under the UNFCCC.

In 2010, the EU submitted a pledge to reduce its GHG emissions by 2020 by 20 % compared to 1990 levels (UNFCCC, 2014a). This target under the Convention has only been submitted by EU-28 and not by each of its Member States (MS), namely, Latvia as part of the EU-28 takes on a quantified economy-wide emission reduction target jointly with all Member States. Thus, there are no specified convention targets for single EU MS. The EU 2020 Climate and Energy Package introduced a clear internal rules to achieving the 20% reduction of total GHG emissions from 1990 levels, which is equivalent to a 14 % reduction compared to 2005 levels. This 14 % reduction objective is divided between ETS and non-ETS sectors, contributing respectively of two thirds vs one third of the reduction effort (EU, 2009[3]).

The EU ETS target is to be achieved by the EU as a whole, Under the revised EU ETS Directive[4], one single EU ETS cap covers the EU MS and the three participating non-EU MS (Norway, Iceland and Liechtenstein). Sectors included in EU ETS will achieve emissions reductions by 21% against 2005, and there are no further differentiated caps by country.

Non-ETS emissions are addressed under the Effort Sharing Decision (ESD)[5]. The ESD covers emissions from all sources outside the EU ETS, except for emissions from international maritime, domestic and international aviation (which were included in the EU ETS from 1 January 2012) and emissions and removals from land use, land-use change and forestry (LULUCF). It thus includes a diverse range of small-scale emitters in a wide range of sectors. Sectors not included in ETS will achieve emission reductions by 10% EU overall, against 2005. This ESD 2020 target was fairly divided into national emission targets, expressed as percentage changes from 2005 levels, to be achieved individually by each MS. When setting these national targets, the different capacities of MS and their need for development have been taken into account. Latvia's emission reduction target for 2020 includes the positive limit +17% compared to 2005 established for non-ETS sector in line with ESD. By 2013 European Commission

[3] Directive 2009/29/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community (OJ L 140, 05.06.2009, p. 63) (http://eur-lex.europa.eu/ LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0063:0087:en:PDF)

[4] Directive 2009/29/EC of the European Parliament and of the Council amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community

[5] Decision No 406/2009/EC

Decisions (EC 2013)[6+7], these percentage changes have been transferred into binding quantified annual reduction targets for the period from 2013 to 2020, expressed in Annual Emission Allocations (AEAs)**.**

In the year 2013 verified emission of stationary installations covered under the EU-ETS in Latvia summed up to 2.65 Mt CO_2 equivalent. With total GHG emissions of 11.03 Mt CO_2 equivalent (without LULUCF) the share of ETS emissions is 24%.

3.1. Progress in achievement of QEWER target

For the quantification of the progress to 2020 targets, the development of GHG emissions is the key indicator. The Convention target of a reduction of emissions by 20% from 1990 to 2020 only refers to the emissions of the EU-28 as a whole. GHG emissions of EU-28 are calculated as the sum of MS emissions. With this, GHG emissions of Latvia are part of EU-28 emissions with a percentage of 0.25% in the year 2013.

As noted in above, within the general framework of meeting total EU 2020 target, Latvia as the EU Member State, according Effort Sharing Decision, has non-ETS emissions target for 2020. Latvia's emission reduction target for 2020 includes the positive limit +17% compared to 2005 established for non-ETS sector in line with ESD. The compliance assessment for the first year 2013 under the ESD will not take place until 2016. Estimated performance based on submitted inventory shows that in 2013 the non-ETS emissions in Latvia were by 9.7% lower than the 2013 target defined by the respective decisions determining MS annual emissions allocations for non-ETS activities.

Latvia's emission trends 1990 – 2013 are reported in detail in CTF Table 1. The development of GHG emissions is reported in CTF Table 4.

Emissions in the sector of LULUCF are not included under the convention target, therefore they are not included in CTF Tables 4 and 4(a). The latter shall be filled with "NA" for not applicable, with the explanation "Numbers for LULUCF are not reported because this sector is not included under the Convention target".

The use of flexible mechanisms takes place on the one hand by operators in the EU ETS, on the other hand by governments for the achievement of ESD targets. For information on the use in the ETS please see the 2nd BR of the European Union.

The use of flexible mechanisms under the ESD cannot be quantified in the moment: As the compliance assessment for the first year 2013 under the ESD will only take place in 2016, any potential use of units for the first year will only take place in 2016. Thus, for the 2nd BR the EU and its MS can only report that no units have been used under the ESD so far.

[6] Commission decision of 26 March 2013 on determining Member States' annual emission allocations for the period from 2013 to 2020 pursuant to Decision No 406/2009/EC of the European Parliament and of the Council (2013/162/EU)

[7] Commission Implementing Decision of 31 October 2013 on the adjustments to Member States' annual emission allocations for the period from 2013 to 2020 pursuant to Decision No 406/2009/ EC of the European Parliament and of the Council (2013/634/EU)

3.2. Other emission reduction targets

In addition to the EU target under the Convention, Latvia as the member of the EU also committed to a legally binding quantified emission limitation reduction commitment for the second commitment period of the Kyoto Protocol (2013-2020).

4. Policies and measures

The following section describes in short only those GHG emissions reduction policies and measures (PAMs) which were not included in the 1st Latvia Biennial Report and Sixth National Communication (2013), or the content or time horizon have been changed. The full list of GHG PAMs is available in the Annex of the BR2, see CTF Table 3.

4.1. Cross-cutting policies and measures

In 26 March 2014 Cabinet of Ministers adopted new Latvia's **Environmental Policy Strategy 2014-2020** *(Vides Politikas Pamatnostādnes 2014-2020.gadam)".* 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 6 "Climate" are defined as follows: (1) to provide contribution of Latvia to prevention of global climate change by taking into account Latvia's environmental, social and economic interests, and (2) to promote Latvia's preparedness for adaptation to climate change and its impacts.

The following policies and measures are defined by the Strategy as the most important:

1. implementation of GHG emissions reduction measures in all sectors of economy, alongside with promoting sustainable, low carbon capacity and cost-effective development,
2. integration of the climate policy targets in the policy of other sectors by setting the responsibilities of each sector and promoting cooperation between the state, local governments and the private sector,
3. raising public awareness about the climate changes and adaptation to them as well as involving people in the policy development and its implementation,
4. implementation of effective adaptation measures and their integration in the spatial planning and sector policies.

Participation in EEA Financial Mechanism 2009-2014

Programme "National Climate Policy"

The objective of the Programme is to support Latvia in developing a comprehensive national climate policy covering non-TES sector as regards emissions, and all sectors as regards adaptation. Within Programme the Latvian institutional capacity in national climate policy development and implementation is strengthened, including information analyses, scenario development, society involvement, policy analyses and development of documents for integrated climate change mitigation and adaptation to climate change management.

The Programme includes both pre-defined projects and open calls.

Within the framework of the Programme two pre-defined projects are being implemented:

1. "Development of the National System for GHG Inventory and Evaluation and Reporting on Policies, Measures and Projections",
2. "Development of Proposals for National Adaptation Strategy, including Identification of Scientific Data, Measures for Adapting to Changing Climate, Impact and Cost Evaluation".

Project Promoter of both pre-defined projects is the MEPRD and both pre-defined projects have partners from Norway, namely, the 1st pre-defined project is being implemented in co-operation with the Norwegian Environment Agency.

In 2014 two calls for proposals were carried out – (1) open call "Emission reduction technologies including renewable energy, sustainable buildings and technology development" (according to the project selection results in total 7 projects applications was approved for financing) and (2) small grant scheme "Capacity building in the Field of Research and Measures for Enhancing Society's Understanding about Climate Change and its Consequences" (18 projects applications approved for financing).

Programme "Green Industry Innovation"

Development of green incubators is stated as one of the Latvia's Environmental Policy Strategy's 2014-2020 actions. Ministry of Economics is the responsible ministry for the implementation of the programme "Green Industry Innovation". The Programme includes pre-defined project (Establishment of Green Technology Incubator), open call (Financial assistance for implementation of green technologies in production process) and small grant scheme. Responsible institution supervising the implementation of the programme – Investment and Development Agency of Latvia.

4.2. Sectoral policies and measures: Energy

To increase the share of renewable energy sources (RES) in the balance of energy sources

Economic measures

Investment Support Programme for District Heating (DH) Systems.

In financial planning period of 2014-2020 the investment support from Cohesion Fund (CF) is provided within the framework of the national Operational Programme "Growth and Employment", Thematic Objective No4 "Supporting the shift towards a low-carbon economy in all sectors", Investment Priority 4.3. "To Promote the Production and Distribution of Energy derived from RES", the Specific Objective 4.3.1. "To promote energy efficiency and use of local RES in district heating systems"[8]. In total with re-construction and construction of DH systems it is expected to achieve at least 143 MW increase in RES heat capacity, of which 70MW will be achieved by EU CF funds, but remaining by private companies. As a result of planned investment, the efficiency of DH system will be improved, while supplementing investment in energy efficiency of buildings. The share of renewable energy produced in DH systems will rise from the baseline value 18.8% (2012) up to target value of 20.7% in year 2023 (CH specific result indicators). The total amount of financial support is planned ~ 53.2 MEUR (of which 50% for the Intervention Category 11[9] "Renewable Energy: Biomass" and 50% for the Intervention Category 16 "High efficiency cogeneration and district heating").

[8] Operational Programme "Growth and Employment". Ministry of Finance of the Republic of Latvia, English translation: http://www.esfondi.lv/upload/Planosana/FMProg_270115_OP_ENG_2.pdf, sections 333-344.

[9] Intervention categories according the Commissions Implementing Regulation (EU) No215/2014).

Other investment support programmes within national Operational Programme "Growth and Employment 2014-2020"

Other investment support programmes under the noted Thematic Objective No4 "Supporting the shift towards a low-carbon economy in all sectors" includes energy efficiency improvement programmes in manufacturing industry, multi-apartment buildings and public buildings (both state central administration and municipal). The priority objective of these programmes is energy efficiency, however it is planned that these programmes will contribute in new RES capacity as well. The total (for all these programmes) new RES capacity is anticipated 11.4 MW[10].

Investment support to Produce Energy from Biomass which is of an Agricultural or Forestry Origin.

In 2014-2020 EU Funds' programming period the financial support is provided within the framework of the Measure 06 "Farm and business development by supporting the non-agriculture activities", priority 5C of the national Rural Development Programme [11, 12], financially supported by EU ELFLA. Responsible ministry for implementation of the measure - the Ministry of Agriculture, the responsible institution supervising implementation – state administration institution Rural Support Service. According to the Article 13 of the Commission Delegate Regulation (EU) No 807/2014 of 11 March 2014, it is stated by the Rural Development Programme that (i) beneficiary biogas plant shall operate in combined heat-power (CHP) mode and shall utilise at least 70% of the produced heat (to provide own production or shall sold to other business entities), (ii) at least 70% of raw products for fermentation should be provided by the by-products of beneficiaries farm, like manure, waste and residue of food production and processing, not utilizable for food production. The total amount of public allocations is planned 16 MEUR, and it is envisaged at least 45.7 MEUR total investments (public + private).

To increase the efficiency of use of energy sources

Regulatory measures

The new Latvia's "**Energy Policy Strategy 2014-2020 (***Enerģētikas Attīstības Pamatnostādnes 2014.–2020.gadam*, final draft)" defines the following indicators in year 2020 in compliance with EU energy efficiency policy and new Energy Efficiency Directive 2012/27/EU:

- total savings of primary resources in year 2020 – 0.670 Mtoe (20% reduction against the baseline),
- total cumulative energy savings – 0.85 Mtoe (9897 GWh),

[10] Indicators of national Operational Programme "Growth and Employment 2014-2020" (Eiropas Savienības Kohēzijas politikas fondu 2014. - 2020. gada plānošanas perioda darbības programmas "Izaugsme un nodarbinātība" un tās papildinājuma rādītāju saraksts, in Latvian), 30 April 2015

[11] Factsheet on 2014-2020 Rural Development Programme for Latvia, http://ec.europa.eu/agriculture/rural-development-2014-2020/country-files/lv/factsheet_en.pdf

[12] Rural Development Programme for Latvia 2014-2020 (*Latvijas Lauku Attīstības Programma 2014-2020.gadam),* in Latvian, https://www.zm.gov.lv/lauku-attistiba/statiskas-lapas/lauku-attistibas-programma-2014-2020/projekts-latvijas-lauku-attistibas-programma-2014-2020-gadam?nid=1046#jump ; pages 256-257, 136

The importance of comprehensive energy sector development planning at local level for optimal energy efficiency investment and maximising expected benefits is recognised. National Development Plan 2014-2020 directly states the role of municipal energy plans.

The priority Policies and Measures to reach the efficiency of use of energy sources are as follows:

Legislative developments:

The recast Law on the Energy Performance of Buildings, adopted December 2012 in accordance with the requirements of the Directive 2010/31/EC, recasts the general legal framework of setting the mandatory minimum energy performance requirements for buildings, recasts the general principles of mandatory energy efficiency certification for buildings, verification of buildings heating and ventilation systems.

It is introduced by the new Cabinet of Ministers Regulations[13] six (A-F) energy efficiency classes of residential buildings and non-residential buildings. The latest Amendments of the noted Regulations (in force from 21 November 2015) make more precise the specific energy consumption (annual kWh per 1 m2 for heating) value ranges for different classes, the timeframe for transition period to low energy building and clearly states that buildings of F class (specific energy consumption for heating above 150 kWh/1m2 annually) requires energy efficiency improvements. The new buildings shall be almost zero energy buildings: for municipal buildings – starting from the 1st January 2019, for other residential and non-residential buildings – starting from the 1st January 2021.

The particular policy is focused to the residential buildings with the worst specific average heat energy consumption. Namely, the chapter IV of the Cabinet of Ministers Regulations No907 (adopted September 2011, in force 1st January 2012), issued under the Law on Administration of Residential Houses, determines that for multi-apartment buildings energy efficiency measures (including renovation, if necessary) are obliged in case the annual heat consumption (average for last 3 years) exceeds 230 kWh/m^2 – according estimate provided by Ministry of Economy, this requirement may relate to 10% of the existing multi-apartment buildings. In January 2014, Amendments to the noted Cabinet of Ministers Regulations came into force, strengthening this requirement. According to these Amendments, the energy efficiency measures are obliged in case the average annual heat consumption, calculated during previous 3 calendar years, exceeds: (i) 200 kWh/m2 annually for heat and hot water, or (ii) 150 kWh/ m2 annually for heat only.

To co-operate with industrial sector, the government has adopted the framework for signing the voluntary agreements on energy efficiency, promoting energy audits and energy management systems in industrial enterprises.

<u>Economic measures</u>

Investment Support Programme for District Heating (DH) Systems.

In financial planning period of 2014-2020 the investment support from CF is provided within the framework of the national Operational Programme "Growth and Employment", Thematic

13 Governmental Regulations No 383 „Regulations On Energy Certification of Buildings" (*Ministru Kabineta noteikumi Nr.383 „Par ēku energosertifikāciju"*), adopted 09 July 2013, in force 19 July 2013., published in "Latvijas Vēstnesis" 138 (4944), 18.07.2013, http://likumi.lv/doc.php?id=258322, in Latvian.

Objective No4 "Supporting the shift towards a low-carbon economy in all sectors", Investment Priority 4.3. "To Promote the Production and Distribution of Energy derived from RES", the Specific Objective 4.3.1. "To promote energy efficiency and use of local RES in district heating systems"[14]. In total it is expected to achieve at least 70 km of reconstructed heating pipeline networks. Anticipated energy savings due to reconstruction of pipeline networks shall be at least 49 GWh/year in 2023.

Investment Support Programmes to Increase Energy Efficiency in Apartment Buildings.

In financial planning period of 2014-2020, increasing of energy efficiency in multi-apartment buildings is supported within the framework of the new Operational Programme "Growth and Employment": Thematic Objective No4 "Supporting the shift towards a low-carbon economy in all sectors", Investment Priority 4.2. "Support energy efficiency, smart energy management and use of renewable energy sources in public infrastructure, including in the public buildings and in housing sector", Specific Objective 4.2.1. "To increase energy efficiency in public and residential buildings". Investments will ensure conformity to the EU Council Recommendations in the area of energy efficiency. Responsible ministry for implementation – Ministry of Economics. Planned total amount of financial support for the implementation of the measure ~ 166.5 MEUR, of which (i) ERDF co-financing - 150 MEUR[15], and (ii) national (state budget) public financing - 25 MEUR[16]. The financial assistance will be provided in the following forms of .subsidy (grant), repayable loan, guarantee for the loan. High requirements in relation to both the level of energy efficiency to be achieved and the return of the invested funding will be set as the main criteria for the selection of energy efficiency improvement projects: ***the annual heat energy saving after renovation is at least 30%*** compared with the consumption calculated in building's energy audit report before implementation the project, ***the annual heat energy consumption for heating*** after renovation ***shall not exceed 90 kWh/m2/year***, the project should implement (if necessary) the construction, renovation or reconstruction of ventilation system to provide ventilation according the Construction Standards, the implementation of the project shall be economically justified – IRR for 20 years period shall be above zero[17].

Efficient use of energy resources, reduction of energy consumption and transfer to RES in manufacturing industry: 2014-2020 EU Structural Funds programming period

Development of new, innovative energy-saving technology, measures increasing energy efficiency and share of RES is supported within the framework of the new national Operational Programme "Growth and Employment", Thematic Objective No4 "Supporting the shift towards a low-carbon economy in all sectors", Investment Priority 4.1. "Promoting Energy Efficiency and use of RES in enterprises", the Specific Objective 4.1.1. "To promote efficient use of

[14] Operational Programme "Growth and Employment". Ministry of Finance of the Republic of Latvia, English translation: http://www.esfondi.lv/upload/Planosana/FMProg_270115_OP_ENG_2.pdf, sections 333-344.

[15] The Operational Programme: *Table 2.4.13 (7-12), page 121*)

[16] Ministry of Economics. The draft Regulations on the noted Support Programme Darbības programmas „Izaugsme un nodarbinātība" 4.2.1.specifiskā atbalsta mērķa „Veicināt energoefektivitātes paaugstināšanu valsts un dzīvojamās ēkās" 4.2.1.1.specifiskā atbalsta mērķa pasākuma „Veicināt energoefektivitātes paaugstināšanu dzīvojamās ēkās" īstenošanas, in Latvian, https://www.em.gov.lv/lv/es_fondi/normativo_aktu_projekti/

[17] Ministry of Economics. Draft Government Regulations "Regulations regarding the 4.2.1.1. specific target "Energy Efficiency Measures in Residential Buildings" of the Specific Objective No4.2.1 "To increase energy efficiency in public and residential buildings" of the Operational Programme "Growth and Employment"; Draft Text version of 05 March 2015, in Latvian, https://www.em.gov.lv/lv/es_fondi/normativo_aktu_projekti/

energy resources and reduction in energy consumption in the manufacturing industry sector" corresponding to this Investment priority [sections 292-302]. Planned total amount of financial support by Cohesion Fund – 32.6 mln EUR[18], financial instrument – loan with partial defrayment of principal amount may be applied[19]. Indicative activities to be supported: measures for the improvement of energy efficiency of buildings of manufacturing industry enterprises, energy certification of buildings, construction works for the increase of energy efficiency – heat insulation of buildings' delimiting (boundary) structures, reconstruction of engineering systems of buildings, installation of recuperation, energy control and management equipment, acquisition and installation of new and efficient thermal (heat) energy, electricity producing and water boiler production equipment using RES.

Investments to Improve Energy Efficiency in Food Processing Enterprises 2014-2020 EU Funds programming period

The financial support is provided within the framework of the Measure 04 "Investments" of the national Rural Development Programme, financially supported by EU ELFLA. The total amount of support for investments will constitute ~ 75.6 MEUR, of which 11.388 MEUR is directly targeted to improvement of energy efficiency of food processing enterprises and agriculture sector in general under the priority 5B (other investments may bring energy efficiency improvements indirectly as well). Responsible ministry for implementation of the measure - the Ministry of Agriculture, the responsible institution supervising implementation – state administration institution Rural Support Service. The total amount of allocations (public plus private) under the energy efficiency priority is envisaged 28.346 MEUR. Food processing enterprise may use the support for implementation of new energy efficient equipment. To receive the support the enterprise should have the certain threshold regarding the use of local Latvia raw materials for production varying in the range 30%-70% depending on the type of production (this share of local raw materials should be raised at the end of the third year of the project per 10% but is not required higher than 70%). The general support rate is defined 20% or 30%, enterprises with lower turnover may pretend to higher rate. In case of energy efficiency investments, if energy efficiency will be increased at least per 20%, the additional support rate of 10% may be received, however the total support rate shall not exceed 40% (an other additional support rate may be received if enterprise produce or will start to produce the food quality scheme products, healthy products or new innovative (in case of Latvia) products)[20].

Increasing Energy Efficiency in Municipal Buildings: EU Programming Period of 2014-2020

Increasing of energy efficiency in public buildings of local governments is supported within the framework of the new Operational Programme "Growth and Employment", Thematic Objective No4 "Supporting the shift towards a low-carbon economy in all sectors", Investment Priority 4.2. "Support energy efficiency, smart energy management and use of RES in public infrastructure, including in the public buildings and housing sector", the Specific Objective 4.2.2. "To facilitate the increase of energy efficiency in municipal buildings, according to the integrated development programme of the municipality" corresponding to this Investment

[18] This sum is equally dividend between Categories of Investment (*defined by the Commission Implementing Regulation (EU) No 215/2014 of 7 March 2014)* No 68 (*energy efficiency and demonstration projects in SMEs and supporting measures*) and No70 (*promotion of energy efficiency in large enterprises*).

[19] The Operational Programme: page 112, *Table 2.4.14 (7-12)*, & page 107, section 299.

[20] Rural Support Programme, p.206-208; Factsheet on 2014-2020 Rural Development Programme for Latvia.

priority [sections 312-316]. Indicative activities to be supported: construction works and renovation of municipal buildings for the increase of energy efficiency - – heat insulation of buildings' delimiting (boundary) structures, reconstruction of engineering communications of buildings, installation of recuperation, energy control and management equipment, including smart meters and ventilation systems, energy certification of buildings, as well as use of RES in buildings (installation of such RES-based local heating systems is acceptable if particularly high energy efficiency indicators are achieved and the installation is economically justifiable, including measures for the increase of energy efficiency of local energy sources). Planned total amount of financial support by ERDF ~ 31.394 MEUR; form of finance –non-repayable grant. According the ERDF common output indicators, the following target values in year 2023- are stated by the [3*, Table No.2.4.5 (5) in page 113*] for the particular measure: (1) decrease of annual primary energy consumption of municipal public buildings - 13.718 GWh/year, (2) additional renewable energy production capacity installed - 1.2 MW.

Increasing Energy Efficiency in State (Central Government) Public Buildings: EU Programming Period of 2014-2020

Increasing of energy efficiency in public buildings of central government is supported within the framework of the new Operational Programme "Growth and Employment", Thematic Objective No4 "Supporting the shift towards a low-carbon economy in all sectors", Investment Priority 4.2. "Support energy efficiency, smart energy management and use of RES in public infrastructure, including in the public buildings and housing sector"*,* the Specific Objective 4.2.1. "To increase energy efficiency in public and residential buildings" corresponding to this Investment priority [sections 306-311]. Indicative activities to be supported: construction works and renovation of state public buildings for the increase of energy efficiency - – heat insulation of buildings' delimiting (boundary) structures, reconstruction of engineering communications of buildings, installation of recuperation, energy control and management equipment, including smart meters and ventilation systems, energy certification of buildings, use of RES in buildings (installation of such RES systems is acceptable if particularly high energy efficiency indicators are achieved in building and the installation is economically justifiable). Positive financial return of investments is the most important criterion for support. Planned total amount of financial support by ERDF is ~ 97.8 MEUR. The target value for decrease of annual primary energy consumption of state public buildings are stated 36.347 GWh/year in 2023.

In years 2015-2016 the promotion public understanding on the importance and possibilities of GHG emissions reduction is supported by the programme "National Climate Policy" of the EEA Financial Mechanism for years 2009-2014. Responsible ministry for the measure is the MEPRD, the responsible institution supervising implementation – State Regional Development Agency. Within the open tender of this programme, announced in summer 2014, it was *ex-ante* allocated 1.24 MEUR for promotion public understanding and knowledge on climate change mitigation and adaptation[21]. The following activities are supported: (1) development and realisation of education/training programmes for professional audiences, municipal specialists and teachers, (2) development and realisation of education modules for vocational secondary education programmes and professional education programmes of high (graduate) schools, (3) organisation of educational activities and actions for pupils of primary, general secondary and vocational education schools, (4) information campaigns and public actions in mass media,

[21] In addition to it, 746.3 thousand EUR were allocated to support science research projects related to climate change.

websites, radio. As a result of the tender it is approved in total 18 projects, of which 14 projects' activities directly or mostly relate to promoting public, both general and professional groups, understanding and knowledge. The activities of the projects should be implemented until 30 April 2016.

In Autumn 2015 the Ministry of Environmental Protection and Regional Development has proposed two new measures: (i) GHG emissions reduction by Low energy building (both new ones, 15 MEUR total co-financing planned, and reconstruction to low energy consumption, 8 MEUR total co-financing planned) focused to culture sector buildings and (ii) GHG emissions reduction by Energy Efficiency Improvements in the Architectural Monuments of State Significance (9 MEUR total co-financing planned), both measures are proposed to be co-financed by the revenues from EU ETS quotas auctioning. These measures are under adoption procedure for the time being, December 2015.

4.3. Sectoral policies and measures: Transport

Regulatory measures

Promotion of clean and energy efficient road transport by public procurement.

The legal norms - special regulations for procurements in the field of road transport - arising from the Directive 2009/33/EC on promotion of clean and energy-efficient road transport vehicles are implemented in Latvia by: (1) the section 46^1 of Public Procurement Law, The given section was introduced by the Amendments (June 2010) and is in force from 15 June 2010, (2) the section 19 of Law on the Procurement of Public Service Providers, the given section was introduced in the basic version of the Law and is in force from 4 September 2010, (3) the section 18 of Law on Public Transport Services, the given section was introduced by the Amendments (June 2013) and is in force from 18 June 2013.

Economic measures

Electro mobility Development: Support for Electric Vehicles (EV) and EV Charging Infrastructure- year 2014

Part of the revenues from the sale of GHG emissions under procedures pursuant to Article 17 of the UNFCCC Kyoto Protocol was allocated as the national Climate Change Financial Instrument (CCFI) programme for CO_2 emissions reduction in transport sector by supporting acquisition of new electric vehicles (EV) and installation of EV charging infrastructure. The beneficiaries were public institutions (both direct and mediates ones), derived public persons and registered in Latvia business entities. The support (~ 3.9 MEUR by CCFI in total) was provided only for "pure" electric vehicles (electric engine is the only one having zero GHG emissions) and publicly available charging infrastructure. Within the programme it was supported acquisition of more than 200 EV and 47 charging stations.

Electro mobility Development: Electric Vehicles Charging Infrastructure Development - EU Structural Funds Programming Period of 2014-2020

Development of EV charging infrastructure is supported within the framework of the new national Operational Programme "Growth and Employment", Thematic Objective No4 "Supporting the shift towards a low-carbon economy in all sectors", Investment Priority 4.4. „To promote low-carbon strategies for all types of territories, in particular for urban areas, including the promotion of sustainable multimodal urban mobility and mitigation-relevant

adaptation measures", the Specific Objective 4.4.1. "To develop EV charging infrastructure in Latvia" corresponding to this Investment priority [sections 346-358]. Availability of a functioning charging network is a crucial precondition for the increase in number of EVs. Introduction of the network of EV charging points will promote energy efficient development of vehicle market, as a result of which the use of EVs in road transport will be promoted. Indicative activities to be supported: the creation of EV charging infrastructure and the development of operator centre software for their management. Planned total amount of financial support by ERDF – 7.1 MEUR[22], financial instrument – non-repayable grant. ERDF specific result and output indicator: (1) rising registered number of electric vehicles in Latvia, target value in year 2023 - 747 EVs, (2) number of installed EV charging points in year 2030 - 235 points.

Development the infrastructure of environmentally friendly public transport: EU Structural Funds Programming Period of 2014-2020

Development of the infrastructure of public transport (PT) will be supported within the framework of the new national Operational Programme 2014-2020 "Growth and Employment", Thematic Objective No4 "Supporting the shift towards a low-carbon economy in all sectors", the Specific Objective 4.5.1. "To develop the infrastructure of environmentally friendly public transport [sections 360 – 371]. As the result of the measure, the use of PT will be promoted by increase of number of environmentally friendly vehicles of PT and length of tram lines. Thus, the flow of passengers will direct from private transport to PT, decreasing the flow of road transport in cities. Thus, more effective urban transport infrastructure will be developed. By developing the route network of PT, the need to use light vehicles in urban traffic will be reduced. It is anticipated that number of passengers of environmentally friendly PT will increase per 1.61 million (from baseline value of 86.81 million in 2012 to target value of 88.42 million passengers in 2023). Indicative total financial amount by Cohesion Fund – 108.516 MEUR. Cohesion Fund specific output indicators: (1) total length of new or improved tram lines – 8 km, (2) number of new vehicles of environmentally friendly public transport – 50 vehicles. Riga city tram infrastructure development project will be the major project.

4.4. Sectoral policies and measures: Industrial processes and product use (F-gases)

Regulatory measures

The most important regulations affecting the amount of these gases are the revised F-gas Regulation (EU) No 517/2014 and the Directive 2006/40/EC relating to emissions from air-conditioning systems in motor vehicles. 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;

[22] This sum is divided between Categories of Investment (*defined by the Commission Implementing Regulation (EU) No 215/2014 of 7 March 2014)* No 43 *Clean urban transport infrastructure and promotion (including equipment and rolling stock)*– 5.887 MEUR and No44 *Intelligent transport systems (including the introduction of demand management, IT monitoring, control and information systems* - 1.206 MEUR

reporting on imports, exports and production of F-gases. Several bans on the placing on the market, maintenance and service products and equipment containing HFCs with high GWPs are requirements of the new regulation.
Avoiding F-gases in some applications where environmentally superior alternatives are cost-effective. Measures include restrictions on the marketing and use of certain products and equipment containing F-gases.

4.5. Sectoral policies and measures: Agriculture

Regulatory 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 greenhouse gas 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 waters against pollution caused by nitrates from agricultural sources have been included in *Law on Pollution* (20 June, 2002) that set base to regulation on protection of water and soil from pollution with nitrates caused by agricultural activity. The Law set requirement to The Cabinet of Ministers to regulate the criteria for determination and managing of highly sensitive territories with increased requirements for the protection of water and soil. *Law on Pollution* also classifying 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 40 000 places for poultry or with more than 2 000 places for production pigs with weight over 30 kg (with more than 750 places for sows). These farms shall apply the best available techniques to prevent pollution. The purpose of *Law on Environmental Impact Assessment* (30 May, 2001) 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 Cabinet of Ministers Regulations No.834 of 23 December, 2014 “Regulations on protections of water and soil from pollution caused by nitrates from agricultural activities” and the Cabinet of Ministers Regulations No.829 of 23 December, 2014 “Specific requirements for carrying of polluting activities in animal sheds”. Requirements included in Regulations that could be linked to mitigation measures of greenhouse gas emissions are:

- appropriate storing and application of fertilizers, manure and fermentation residues to avoid and diminish pollution of air, soil and water;
- limitation of manure and fermentation residues use to170 kg per ha in a year;
- determining of the storage capacity for storing of different types of farmyard manure;
- determining nitrogen requirements for a certain crop upon the expected yield and preparing crop fertilizations plans in highly sensitive territories;
- introduction of green area in the winter period in highly sensitive territories.

All these measures reduce amount of nitrogen used and decrease nitrogen losses through indirect emissions.

Economic and Fiscal measures

The latest reform of the Common Agricultural Policy (CAP) introduces a new instrument, the green payment, to deal with the environmental impacts of agriculture. The green measures include crop diversification, maintaining permanent grasslands and introduction of ecological focus areas. The current programming period until 2020 in Latvia, also envisages financial support for introducing greenhouse gas emission mitigation measures with a focus on climate- and environmentally-friendly agricultural practices or the green component, which is supported as extra payment.

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 lead to the fertility improvement of the farm's agro system by fixing atmospheric nitrogen.

The purpose of *Law on Agriculture and Rural Development* (1 May, 2004) is to provide a legal basis for agricultural development and to specify sustainable agricultural and rural development policy in accordance with the Common Agricultural Policy of the European Union. According to *the law*, Cabinet of Ministers Regulations No.126 (10 March, 2015) set procedure for awarding of direct payments to farmers. The procedure is based on EU Regulation No 1307/2013 (17 December, 2013) establishing rules for direct payments to farmers under support schemes within the framework of the common agricultural policy and repealing Council Regulation (EC) No 637/2008 and Council Regulation (EC) No 73/2009, as well as Commission Delegated Regulation (EU) No 639/2014 (11 March, 2014) supplementing Regulation (EU) No 1307/2013 of the European Parliament and of the Council establishing rules for direct payments to farmers under support schemes within the framework of the common agricultural policy, and Commission Implementing Regulation No 641/2014 (16 June, 2014) laying down rules for the application of Regulation (EU) No 1307/2013 of the European Parliament and of the Council establishing rules for direct payments to farmers under support schemes within the framework of the common agricultural policy.

The Latvian Rural Development Programme (RDP) (2014-2020) describes pathways for the economic development of Latvia's rural areas. The programme facilitates the conversion to organic farming and the development of existing organic farms. Restoring, preserving and enhancing ecosystems related to agriculture and forestry is the main priority of the RDP. 14% of the agricultural area will come under contract for biodiversity, 17% for water management and 17% for soil management. The Programme envisages that GHG and NH_3 emission reduction measures will cover around 10% of agricultural land. Under this priority, production of renewable energy from waste and by - products will be supported[23].

RDP also highlights supporting of GHG emission neutral or reductive agricultural practices. The current programming period, i.e. until 2020, also envisages financial support for

[23] Factsheet on 2014-2020 Rural Development Programme for Latvia. Available:

http://ec.europa.eu/agriculture/rural-development-2014-2020/country-files/lv/factsheet_en.pdf

introducing GHG emission mitigation measures. A special focus will be placed on climate and environmentally friendly agricultural practices or the "green component", which is an extra payment to all beneficiaries of basic payments if corresponding practices are complied with. Introduction of leguminous plants on arable land can fix atmospheric nitrogen through symbiosis with bacteria in nodules of the root system. Leguminous species on arable land improve the fertility of the farm's agro system. The objective for Latvia is to have at least 5 % of leguminous crops in arable land of the farms. The measure leaves a positive impact on nitrogen leaching. Support for implementing of precision farming technologies in the farms also is planned. National Development Plan of Latvia for 2014–2020 set goal to reach area used for organic farming (as a percentage of all land used for agriculture) over 15% in 2030, promoting significant pathway to production in environmentally friendly way.

4.6. Sectoral policies and measures: Land Use, Land Use Change and Forestry

Measures in farmlands

Development and adaptation of drainage systems in cropland

The activity is aimed on reconstruction and improvement of existing drainage systems in cropland.
The direct impact in cropland is associated with accumulation of CO_2 in soil carbon pool due to higher productivity of the drained fields and application of more advanced management practices. The evaluation of impact of the measure considers that it will be implemented in extensively managed cropland where poor conditions of drainage systems shorten active vegetation season or production of agricultural crops is not possible at all.

Support to introduction and promotion of integrated horticulture

The measure applies to the establishment of new orchards. Implementation of the measure will affect carbon stock in living biomass and soil. The impact of the measure is projected for the 20 years' period for soil and 30 years – for living biomass carbon pools.

Support to diversification of crop rotation

The measure considers diversification of crop rotation in cropland, including application of green manure, to secure higher inputs of organic material into soil. Implementation of the measure will result in removals of CO_2 in soil.

Growing of papilionaceous plants (legumes)
This measure considers use of legumes in mixture with other crops in cropland, considering higher inputs of organic material into soil and partial replacement of mineral fertilizers with nitrogen fixing plants. Just like the diversification of crop rotations it considers a set of targets in agriculture. Implementation of the measure will result in CO_2 removals in soil.

Greening of cropland

The scope of the measure is leaving a certain area of cropland out of conventional cropping system. The measure will reduce GHG emissions by reduction of management activities on organic soil in cropland.

Measures in forest land

Development and adaptation of forestry infrastructure

The most of the forest drainage systems in forest land in Latvia are established before 1990. The measure is aimed on reconstruction and improvement of existing drainage systems in forest land increase value of forests and productivity on drained soils. The measure will secure continuous growth of carbon stock in living and dead biomass in drained forests. Forest drainage is one of the most efficient solutions to increase CO_2 removals in living biomass and other carbon pools in forest lands on mineral soils.

Afforestation and improvement of stand quality in naturally afforested areas

The scope of the measure is efficient utilization of farmlands, which are not used for food or fodder production. This is the most efficient climate change mitigation measure in the Rural development plan 2014-2020; however, the impact is limited to the scale of implementation of the measure.

The afforestation secures accumulation of CO_2 in living and dead biomass, litter and soil.

Regeneration of forest stands after natural disturbances

The measure considers restoration of forest stands after natural disturbances, like forest fires and strong storms, as well as reconstruction of diseasing valueless forest stands. The measure will affect mainly carbon stock in living biomass and dead wood carbon pools. The breeding effect in regenerated stands is considered as a main driving force for additional CO_2 removals.

Improvement of ecological value and sustainability of forest ecosystems

The scope of the measure is to support pre-commercial thinning of forests to secure implementation of sustainable forest management practices aimed to increase economic and ecological value of forests.

Pre-commercial thinning has a short and long term impact. A short impact is a transfer of certain portion of the carbon from living biomass to the dead biomass pool with following conversion into CO_2. The long term impact is increase of growing rate (by 15 % annually in average, according to an expert judgement used in growth models).

4.7. Sectoral policies and measures: Waste management

Regulatory measure

Limitation to landfilling

The objective of the Landfill Directive 1999/31/EC is to prevent or reduce as far as possible negative effects on the environment resulting from the landfilling of waste – including emissions of GHG – by introducing stringent technical requirements for waste and landfills. Landfill directive requirements are transposed in several legislations acts of Latvia (Regulations of Cabinet of Ministers No 1032 (30.12.2011), and planning document (Waste management plan 2013-2020). According to targets in Latvia's "Waste management plan 2013-2020" landfilled biodegradable wastes must be reduced to:

- 50% in year 2013 from landfilled biodegradable waste in 1995;
- 35 % in year 2020 from landfilled biodegradable waste in 1995.

In addition, the Landfill Directive requires collection of landfill gas from all landfills receiving biodegradable municipal waste. At this moment in Latvia in 4 active polygons and 2 closed disposed sites methane collection occurring. About 30-35% of total emitted methane form waste disposal sites is collected.

Increase municipal waste recycling

Waste Framework Directive 2008/98/EC requirements for municipal waste recycling are implemented with Regulations of Cabinet of Ministers No 598 (02.08.2011).

Targets of Latvia's "Waste management plan 2013-2020" related to municipal waste recycling:

- prepare for re-use and recycle at least 50% (by weight) of household waste and other similar waste streams of paper, metal, plastic and glass waste till year 2020;
- increased to at least 70% by weight of the preparation for re-use, recycling and other material recovery, including backfilling operations using waste as other material substitutes till year 2020.

The Packaging and Packaging Waste Directive 94/62/EC provides for measures aimed at limiting the production of packaging waste and promoting recycling, re-use and other forms of waste recovery, hence, at reducing the final disposal of such waste. The Packaging and Packaging Waste Directive requirements are implemented with Regulation of Cabinet of Ministers No 983 (19.10.2010).

Targets of Latvia's "Waste management plan 2013-2020" related to packaging waste recycling till 31.12.2015.:

- to recover 60% of the packaging waste and to achieve the following minimum recovery objectives:
- to recycle 55% of packaging waste and to achieve the following minimum recycling objectives:

The Directive on Waste of Electrical and Electronic Equipment (WEEED) 2012/19/EC requires Member States to take measures to encourage producers to design and produce electrical and electronic equipment which take into account and facilitate dismantling and recovery. Moreover, it sets ambitious collection targets in order to minimise the disposal of WEEE in the form of unsorted municipal waste. It also sets targets for re-use and recycling as well as targets for recovery of WEEE to ensure the correct treatment of all collected WEEE.

WEEED requirements are implemented with Regulations of Cabinet of Ministers No 897 (22.11.2011.) Targets of Latvia's "Waste management plan 2013-2020" related to WEEE:

- Ensure collection of WEEE per capita is four kilograms per year till 13.08.2016;
- Increase of WEEE collection rate to 65% of the average weight of EEE that is placed on the Latvian market in the three preceding years, or 85% of the Latvia territory of WEEE generated till 14.08.2021.

Reduction of GHG Emissions from Urban Waste Water Treatment

The **Urban Waste Water Treatment Directive** 91/271/EEC concerns the collection, treatment and discharge of urban wastewater and the treatment and discharge of waste water from certain industrial sectors. The Directive requires, *inter alia*, total nitrogen reduction for discharges from treatment plants to sensitive areas. As increased nitrogen removal has been found to lead to a decrease in N_2O emissions in wastewater treatment plants[24], this requirement can contribute to a reduction of N_2O emissions. The Directive requirements are implemented with Regulations of Cabinet of Ministers No 34 (22.01.2002.).

The Regulation stipulating that by 31 December 2015 in 88 agglomerations of Latvia of more than 2000 population equivalent (p.e.) well-managed biological treatment is to be ensured. In these 88 agglomerations resides 85-90% of the country's population. More stringent treatment which ensures considerable reduction of nitrogen and phosphorus in wastewater is to be ensured in the agglomerations of more than 10 000 p.e. and it had to be already done by 31 December 2011.

Partnership Agreement for the use of European Structural and Investment (ESI) Funds for the 2014-2020 planning period envisages financial support for development of centralized wastewater collection system to increase availability for residents in different agglomerations to connect to a system. Program provides that in agglomerations of more than 2000 p.e. centralized wastewater collection is to be ensured at least from 97% of the residents in the respective agglomeration, but in all other agglomerations – not less than from 92% of the residents in the respective agglomeration.

[24] http://www.bmlfuw.gv.at/publikationen/wasser/abwasser/Lachgasemissionen---Kl-ranlagen.html

5. Projections

The scenarios underlying the emission projections in the 2015 submission have incorporated new insights with regard to economic and demographic developments, sector developments, fossil fuel prices, the CO_2 price and policies when compared with the projection of BR1 (2013). Recent statistics were also taken into account. The base year for the model is 2012, as against 2010 for the previous projection.

Greenhouse gas (GHG) emissions in Latvia have been projected for the years 2015, 2020, 2025 and 2030. Emissions projection includes and provides for the implementation of policies and measures which are defined in policy documents developed by the government of Latvia until the year 2014. These projections correspond to the "scenario with existing measures" (WEM). In addition to this scenario, there are also projected emissions with planned additional measures which are only described in the approved government documents, but legal regulations and implementation mechanisms have not yet elaborated. This is the "scenario with additional measures" (WAM). In addition to the projections, two sensitivity scenarios have been assessed for the energy sector to evaluate the impact of GDP growth rate and the share of electricity import in electricity supply.

The GHG emission projection of Latvia up to 2030 is based upon the long-term macroeconomic projection up to the year 2030 developed by the Ministry of Economics. The scenario projects that the growth rates of exports and the manufacturing industry will remain comparatively high based mainly on both the increased competitiveness of Latvian producers and the growing external demand. According to this scenario it is expected that GDP, similarly to private consumption, will double during 2005-2030 with the average annual growth 3%. The number of population in Latvia is expected to continue to decrease by 13.9% from 2.012 to 1.923 million in the same time period.

The main macro economic parameters are shown in the **Table** 4.

Table 4 The main macro economic indices applied for projecting GHG emissions

	2015	**2020**	**2025**	**2030**
Number of inhabitants, thous.	1979.90	1938.73	1926.86	1923.88
Private consumption, annual changes per period, %	2.5%	4.2%	4.3%	3.3%
GDP growth, annual changes per period, %	2.5%	4.2%	4.3%	3.3%
Agriculture	1.1%	2.9 %	3.8%	2.7%
Service	2.2 %	4.8%	4.6%	3.4%
Manufacturing	0.5%	5.1%	6.7%	5.6%

The more information regarding key parameters' values, applied for calculation of GHG emissions projections, is presented in the Annex CTF Table 5**.**

The projections for WEM scenario show that, including the impact of implemented and adopted measures, but excluding any use of flexible mechanisms such as EU Emissions Trading System (EU ETS), Latvia GHG emissions excluded LULUCF are expected to be 52% below 1990 levels in 2020 and 47% below in 2030 (Table 5).

Analyzing the projected GHG emissions and comparing them to 1990, the different dynamics however are seen in sectors:

- Energy sector (without transport sector) has the largest projected decrease of GHG emissions in 2020 and 2030 compared to 1990, respectively 66% (2020) and 63% (2030),
- In Transport sector the projected GHG emissions in 2020 and 2030 are still below 1990 level, however this decrease is rather small, respectively 5.6 % (2020) and 1% (2030),
- Agriculture sector is also the sector having large projected decrease of GHG emissions in 2020 and 2030 compared to 1990, respectively 50.4% (2020) and 41% (2030),
- In Waste sector the projected decrease of GHG emissions constitute 25% (2020) and 33% (2030), compared to 1990.

- The projections presented in Table 6 (the 'with existing measures' scenario) include the impact of all the Latvia's implemented and adopted policies and measures. These policies and measures and their projected CO_2eq savings are detailed in the Annex (CTF Table 3).

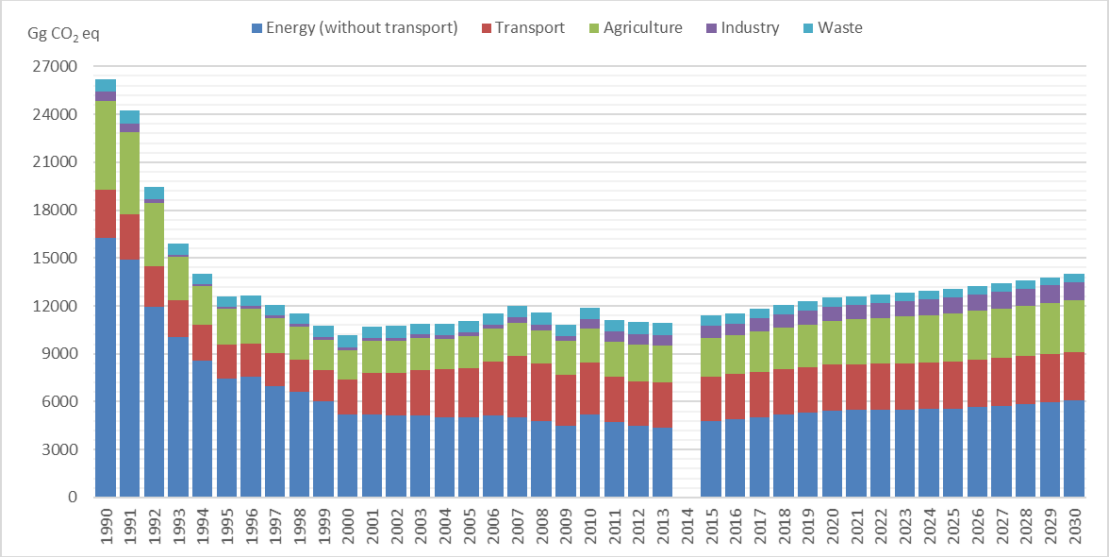

Figure 4 Historic and projected GHG emissions per sector in the WEM scenario

The energy sector including transport will account for the biggest share amounting to 65.9% of the total projected GHG emissions in the year 2020, followed by the agriculture sector with its share amounting to 21.9% and the Industrial Processes and Product Use (IPPU) sector with 7.6% share.

Table 5 Actual and projected total GHG emissions per sector under "scenario with existing measures", kt CO_2 eq.

Sector	1990	2015	2020	2025	2030
Energy excluding transport	16227.9	4767.6	5446.0	5546.6	6067.9
Transport	3030.6	2796.7	2860.2	2944.1	3014.3
Industrial Processes and Product use	602.6	840.9	952.6	1086.7	1215.7
Agriculture	5558.6	2404.7	2757.2	3017.3	3277.4
Waste	764.5	636.4	570.7	538.9	512.5
Total excluding LULUCF	**26326.5**	**11446.3**	**12586.8**	**13133.6**	**14087.8**

In 2030, the share of agriculture and IPPU sectors increases in the total GHG emissions, constituting 23.3% and 8.6% respectively. At the same time the contribution of the energy and waste sectors to total emissions decreases.

Carbon dioxide accounts for almost 70% of the total GHG emissions in 2020, the share of CO_2 emissions in 2020 GHG emission projection is increasing per 3 percentage points compared to 2013. CH_4 and N_2O emissions contribute respectively 16% and 13% in 2020 GHG emissions projection, the rest ~1% is contributed by F-gasses, see **Figure 5**.

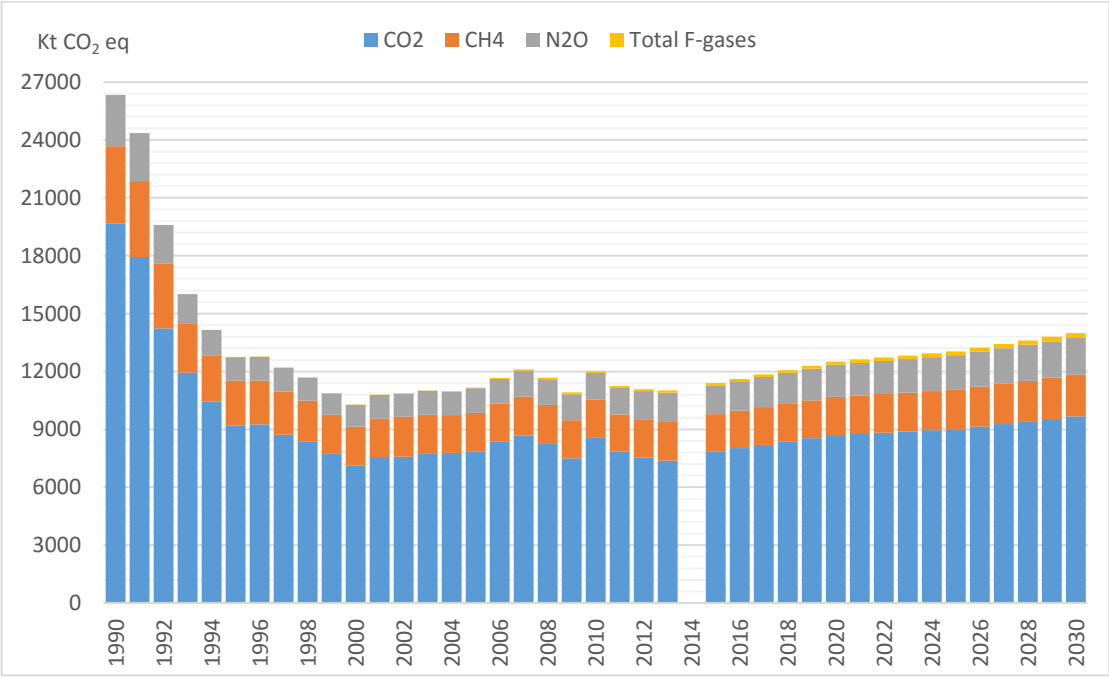

Figure 5 Historic and projected GHG emissions per gas in the WEM scenario

The GHG emission reduction PAMs, considered within WEM scenario, provide that, despite of average GDP growth assumption per at least 3% per year in the period of 2015-2030, the

growth of emissions is considerably lower. This tendency is reflected by the indicator (GHG emissions per GPD unit) values change, showing that in 2030 the indicator value is significantly, per 73%, lower than in 1995 and per around 32% lower compared to the projections' calculation base year (2013), see Figure 6.

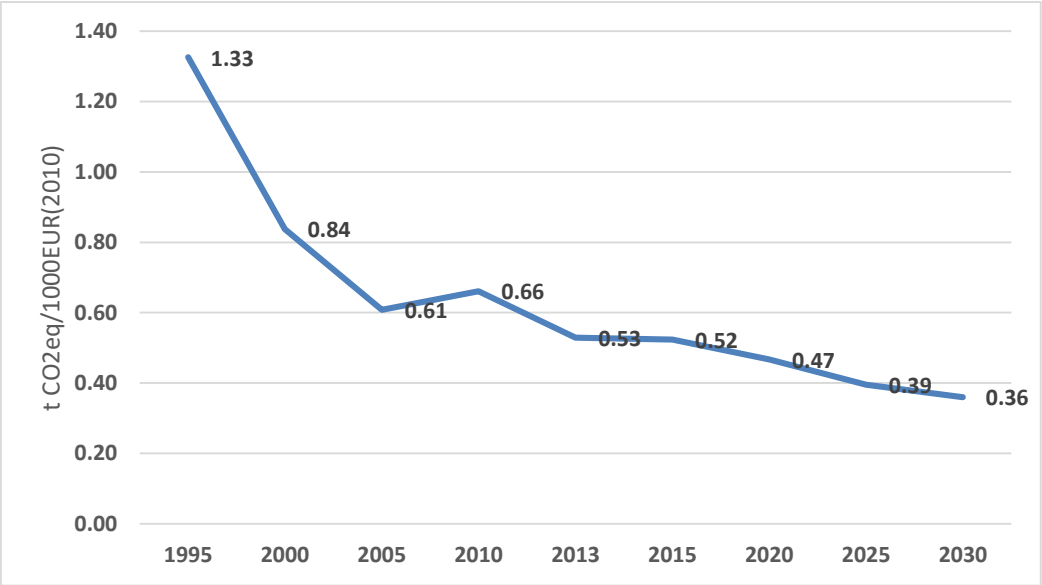

Figure 6 Development of GHG intensity indicator (historical and WEM projections), $tCO_2eq/1000EUR(2010)GDP$

The following figure illustrates the GHG emissions projections in WEM scenario. In addition, in **Figure** 7 the estimated emissions savings resulting from these existing policies and measures, implementation of which had started 2010 and after, are shown. Estimated emission savings in year 2020 is around 920 kt. Based on this impact estimation, it has been calculated the GHG emissions baseline demonstrating amount of projected emissions without measures.

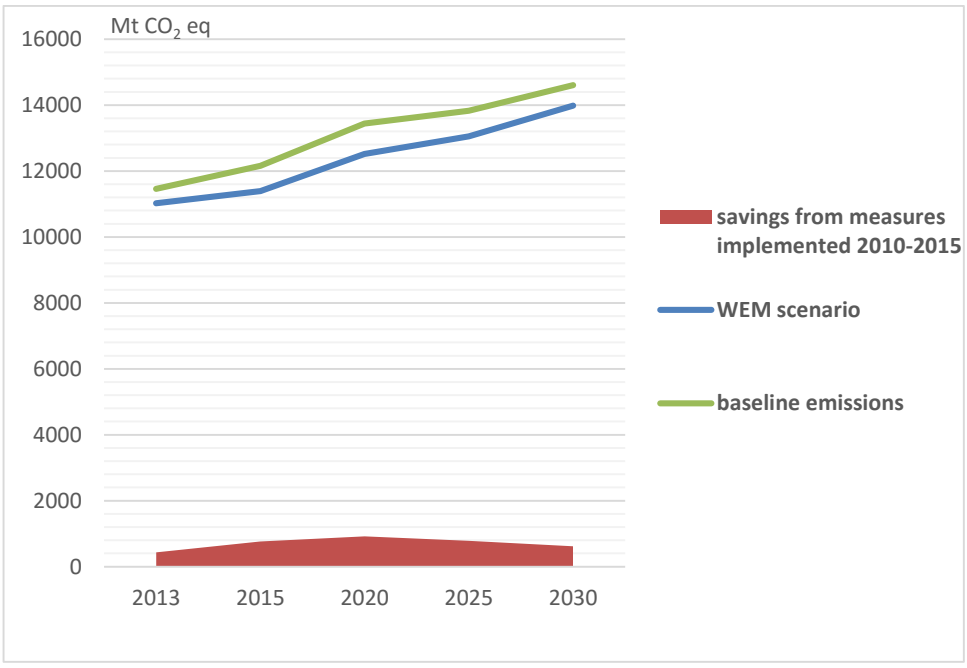

Figure 7 Projected impact of adopted and implemented policies

In addition to WEM scenario, there are also projected emissions with planned additional measures (WAM) 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 an essential reduction of the projected emissions. Thus, in 2020 under the WAM scenario emissions are by 11.4% lower and in 2030 by 16.3% lower than in the respective years under the WEM scenario.

Table 6 Actual and projected total GHG emissions per sector under "scenario with additional measures", kt CO_2 eq.

Sector	1990	2015	2020	2025	2030
Energy excluding transport	16227.9	4664.0	4429.4	4214.8	4428.8
Transport	3030.6	2725.5	2658.2	2738.9	2784.2
Industrial Processes and Product Use	602.6	840.9	952.6	1086.7	1215.7
Agriculture	5558.6	2298.0	2543.6	2725.2	2906.8
Waste	764.5	636.1	570.4	516.6	451.7
Total excluding LULUCF	**26326.5**	**11164.4**	**11154.2**	**11282.2**	**11787.2**

The split of greenhouse gas emissions between the EU ETS sector and the non-ETS sector is illustrated in **Figure** 8. The split is expected to remain roughly the same during the projected time period.

According to the WM projection, the emissions from the non-ETS sector in the year 2020 will be around 7 per cent above the 2005 level, which is sufficient for reaching the target set by the EU Climate and Energy Package (+17% compared to 2005). The calculated projections show that, the emissions from non-ETS sector in the year 2030 will be around 16 percent above the 2005 level.

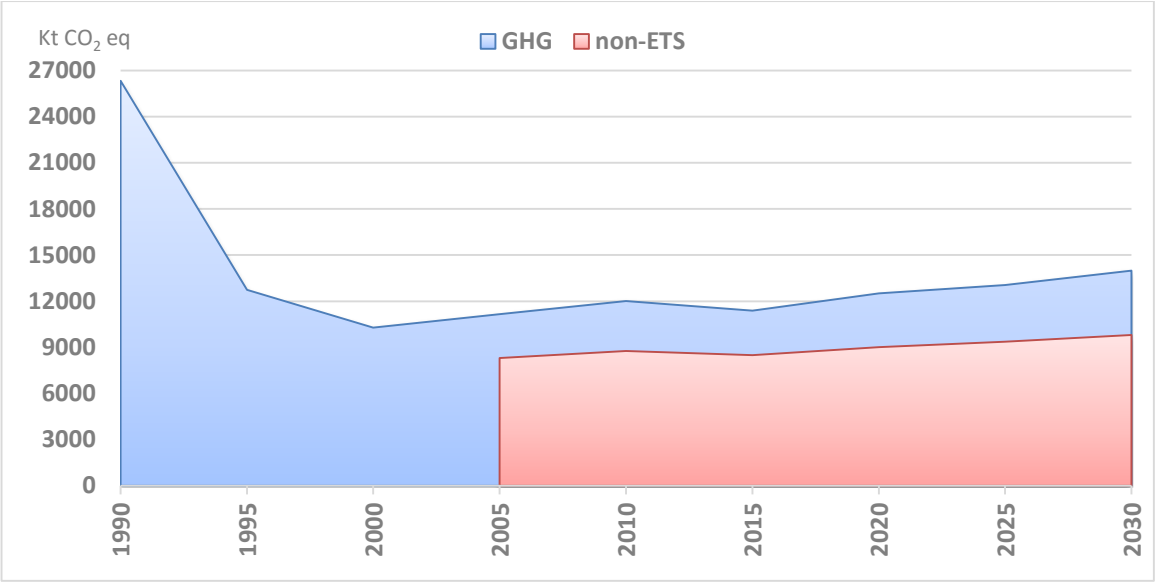

Figure 8 Greenhouse gas emissions (1990-2013) and the WEM projection (up to 2030) in the EU ETS and non-ETS sectors

5.1. Projected emissions per sector

5.1.1. Energy

Total GHG emissions caused by energy production and use (1.Energy, IPCC sector definition) will increase by the year 2030 only under the "scenario with existing measures" in the time span 2015 - 2030, however they are expected to be 56.9% below 1990 levels in 2020 and 52.8% below in 2030. Under the "scenario with additional measures" the GHG emissions volume in 2020 and 2030 is respectively lower by 14.3% and 20.5% than in the "scenario with existing measures". GHG emissions reduction amounts to approximately 1218 kt CO_2 eq in the year 2020.

Energy, kt $CO_{2\ eq}$	1990	2015	2020	2025	2030
WEM scenario	7332.9	7564.3	8306.2	8490.8	9082.3
WAM scenario	7332.9	7389.4	7087.6	6953.8	7213.0

Amount of GHG emissions in Energy sector is mainly determined by the change of Final Energy Consumption (FEC) and Gross Primary Energy Supply (GPES) within considered period of years 2015-2030. GHG emissions projections' in WEM scenario are calculated assuming the total FEC's growth in this period only 6.0% and GPES's growth – 6.2%, however, the energy end-use sectors have different FEC's trends.

High increment rate of Value Added in Manufacturing Sector causes the increase of energy consumption per 29% during 20 years' period. The next-largest energy consumption increase – 18.9% - is projected in Agriculture Sector. In Transport Sector the significantly lower growth of energy consumption is projected – only 8.7%. On the contrary, in Households and Service sector energy consumption will go down, per 19% and 0.5% during 20 years' period.

The Energy sector is affected strongly by the measures to reduce the emissions, enhance the energy efficiency and to increase the share of renewable energy sources.

If in the energy generation sector (electricity generation and district heating system) the main GHG emission reduction measures relate to wider use of RES to replace fossil fuel and reducing energy losses in the supply system, then in the consumption sectors raising of energy efficiency is the priority target.

The increase of the use of renewable energy sources is done in the electricity and district heating sectors by increasing first of all the use of biomass in heating boilers, followed by increasing the use of biomass in CHPs (combined heat and power plants) and then by increasing the use of other RES in the generation of electricity and heating. There are also wide possibilities to replace fossil fuel with biomass in the industrial sector. To increase the use of RES in the residential and service sectors as well as the transport sector is fairly limited.

Taken together, this use of all the renewable energy sources is expected to increase the share of the use of renewable energy sources in the total final energy consumption by 34 % under the WEM scenario and 40% under the WAM scenario. The biggest difference between the

projected scenarios is more extensive use of renewable energy sources under the "scenario with additional measures" in the manufacturing sector.
Energy efficiency measures considered in the National Energy Efficiency Action Plan have been taken into account in both scenarios (WEM and WAM). Energy efficiency measures mainly focus on energy efficiency improvements in buildings (residential and public buildings) and they are already fully being implemented under the WEM scenario. Most of additional energy efficiency measures implemented under the WAM scenario relate to the industrial and service sectors.

5.1.2. Transport sector

The total projected GHG emissions under the "scenario with existing measures" in inland transportation will increase just only by 2.4% and 7.9% in 2020 and 2030 respectively vs. the year 2012. In spite this trend the projected GHG emissions in 2020 and 2030 are still below 1990 level, respectively 5.6 % (2020) and 1% (2030).

Transport, kt $CO_{2\ eq}$	**1990**	**2015**	**2020**	**2025**	**2030**
WEM scenario	3030.6	2796.7	2860.2	2944.1	3014.3
WAM scenario	3030.6	2725.5	2658.2	2739.0	2784.2

Most GHG emissions in the transportation sector are caused by road transport, which accounts for 92% of the total emissions in 2020. Thus, the main emission impacting factor in the transportation sector is the penetration rate of new technologies with higher demands for emission limits and replacing the stock of the existing auto transport. This measure is already included in the emission projections under the WEM scenario.

In railroad transportation due to comparatively short distances inland transportation service is less developed, therefore, international transportation dominate the railroad cargo transportation, thus, external factors have a considerable impact upon the emissions projections in this sector.

Navigation and local aviation account for a very small share of total emissions.

Wider use of biofuels is projected in the WAM scenario.

5.1.3. 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 industrial processes, including emissions from solvent use and F-gases. The share of industrial process emissions is comparatively low in total GHG emissions, however, from 2010 they have a sharp increase in absolute terms. According to the macroeconomic forecast, a fairly high development rate of manufacturing industry is projected up to 2030 which will be determined both by domestic consumption and the possibilities of export development. The total projected GHG emissions under the "scenario with existing measures" in industrial processes will increase in time period 2015 – 2030.

Industrial processes and Product Use, kt $CO_{2\ eq}$	1990	2015	2020	2025	2030
WEM	602.6	840.9	952.6	1086.7	1215.7
WAM	602.6	840.9	952.6	1086.7	1215.7

GHG emissions in industrial processes 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 abatement technologies providing for the lowest level of GHG emissions. This process is regulated and verified under EU ETS legislation and there are list of installations that has permission to acquire free emission allowances as CO_2 quotas.

The use of F-gases is projected taking into account GDP growth rate, the number of households and the number of freezing equipment used (refrigerators and freezers), the development of the service sector and the amount of stationary refrigeration used in it as well as changes in the number of road transport which determine 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 (842/2006), new EC regulation on F-gases (517/2014) repealing regulation 842/2006 and the EC directive on emissions from air conditioning systems in motor vehicles (2006/40/EC) (MAC Directive).

Emissions from refrigeration and air conditioning equipment are expected to decrease due to prohibitions regarding placing on the market certain F-gases as well as according to prohibition to air-conditioning systems designed to contain F-gases with a global warming potential higher than 150 from a certain date.

5.1.4. Agriculture

Projections of greenhouse gases (GHG) emission in Latvia are compiled according to *2006 Intergovernmental Panel on Climate Change* (IPCC) *Guidelines.* Total emissions from agriculture sector include:

- CH_4 (methane) emissions from enteric fermentation of domestic animals and manure management;
- N_2O (nitrous oxide) emissions from manure management and agricultural soils;
- CO_2 (carbon dioxide) emissions from liming and urea fertilization.

Emissions from agricultural soils include direct N_2O emissions from application of synthetic and organic nitrogen fertilizers, urine and dung deposited by grazing animals, emissions caused by mineralized nitrogen resulting from loss of soil organic carbon stocks in mineral soils through land-use change or management practices, emissions from crop residues and

cultivation of organic soils and indirect N_2O emissions from atmospherics deposition and nitrogen leaching and run-off.

Projections of GHG emissions from agriculture sector with existing measures are based on activity data provided by Latvia University of Agriculture in collaboration with Ministry of Agriculture of Republic of Latvia. Activity data for emission calculation in Agriculture sector are projected based on population data, agriculture products consumption indicators, share of agriculture in GDP and global trading data of agriculture products.

Projections of GHG emissions in agricultural production also are based on goals of National Development Plan of Latvia for 2014–2020. By seeking the solution to the efficient use of Latvia's land resources, the target has been set to reach 95% of cultivated land in the total area of agricultural land in 2020. The size of direct support payments for agricultural land has increased for Latvia in the new programming period of the EU Common Agricultural policy. Cultivation of agricultural land in Latvia will be positively affected by lifting of milk production quotas in 2015. Increase in agricultural production is likely to increase GHG emissions in Latvia.

Enteric Fermentation

Number of cattle accounts for more than 90% of CH_4 emissions by enteric fermentation. Projected livestock numbers (Table 7) are based on the assumption that since 2005 there has been a continuous growth in the number of cattle and sheep. Growth of cattle and sheep number is also expected in agricultural producers development plans according to favourable agro-climatic conditions for livestock farming and global demand for dairy and meat products. Sectoral policy strategy document of the Ministry of Agriculture "Development trends of Latvia dairy sector until 2020" shows the goal to increase milk production and reach 30% increase of the average milk yield. It is forecasted that the expiration of milk quotas also will promote production. A slighter increase is expected in numbers of horses, goats, fur-bearing animals and swine.

Table 7 Projected livestock numbers, thousand heads

Category	2012	2015	2020	2025	2030
Dairy cattle	164.6	170	195	213	231
Non-dairy cattle	228.5	272	290	308	325
Sheep	83.6	96	119	142	165
Swine	355.2	361	374	393	412
Goats	13.3	15	16	17	17
Horses	10.9	10	10	10	10
Poultry	4910.9	5359	6089	6771	7452
Rabbits	37.3	33	50	73	96
Fur-bearing animals	231.6	225	250	265	279

Important parameter influencing CH_4 emissions is the gross energy (GE) intake of cattle. For the inventory and projection purposes GE for dairy cattle is calculated on the basis of milk yields. Average milk yield per cow in Latvia is projected to increase until 2030 (**Table 8**).

Table 8 Average milk yield per cow, kg·year^{-1}

Category	2012	2015	2020	2025	2030
Milk yield	5250	5600	6500	7250	8000

Manure Management

Main activity data for calculation of CH_4 and N_2O emissions from manure management are livestock population data and animal manure management systems (MMS) data, as well as excreted nitrogen rate per domestic animal. For annual GHG inventory Latvia uses country specific nitrogen excretion values, these values are also used for projections. Data on MMS are calculated based on results of agricultural census data, national research projects results and livestock numbers in the herd. In the last years, there has been switch in cattle farming to liquid slurry management system due to closing of small farms and to the trend of this management system in developed countries, however liquid slurry produces more methane emissions. One of the mitigation measures to reduce emissions from manure management is to use manure for biogas production. According to projections, biogas production from manure management in cattle, swine and poultry breeding sectors will increase significantly in Latvia (Table 9).

Table 9 Production of biogas from cattle, swine and poultry manure, % from total manure management systems distribution)

Category	2012	2015	2020	2025	2030
Cattle	0.9	9.4	10.8	12.0	13.2
Swine	0.2	33.6	39.7	43.6	47.5
Poultry	40	40.9	44.1	46.8	49.5

Agricultural Soils

The main activity data for calculations of projected N_2O emissions from agricultural soils are amount of synthetics nitrogen fertilizer consumption, harvested crops and cultivated area of organic cropland and grassland soil. According to the National Development Plan 2014-2020, it is determined to intensify the agriculture production in currently extensive farmlands and to return the abandoned agriculture land back to the production. that may significantly increase GHG emissions. The consumption of synthetic N fertilizers is projected as the largest source of emissions in this category and is linked to the planned significant increase of yields and areas for agricultural crops cultivation (**Table 10**).

Table 10 Projected data on crop production and synthetic nitrogen fertilizer consumption, thousand tonnes

Category	2015	2020	2025	2030
Wheat	1640	2301	2714	3127
Barley	213	243	292	341
Oats	124	145	171	197
Rye	70	76	83	90

Maize	616	750	980	1209
Pulses	18	24	31	38
Potatoes	473	483	505	527
Rape	299	390	459	527
Perennial grass	1400	2239	2445	2651
Use of N with synthetic fertilizers	72	90	100	110

Urea application and liming

Consumption of urea for fertilization is highly variable in Latvia. The projection of the amount of urea applied to soils is done on an approximate estimate on an annual basis statistical data with assumption that consumption of urea will not show significant changes. Liming of acidic soils is required on about 40% of agricultural land in Latvia. Since 1992, an insufficient area has been limed, which is beginning to affect soil quality. However, there is no planned support for liming purposes; projections are done with the main task to reach value close to the minimum of required amounts of liming (**Table 11**)

Table 11 Use of urea fertilizers and liming material, tonnes·year^{-1}

Category	2012	2015	2020	2025	2030
Liming	21600	29214	30000	32500	35000
Urea Application	7901	5970	7000	7500	8000

Agriculture total

TABLE 12 represents aggregated GHG emissions from agriculture sector with WEM scenario in kt CO_2 eq. The largest source of GHG emissions refers to direct N_2O emissions by increasing sown area and consumption of synthetic nitrogen fertilizers. An upward trend in GHG emissions in the agriculture sector is also caused by enteric fermentation and manure management due to the growth in livestock numbers and milk yield. It is nationally determined to intensify the agriculture production in currently extensive farmlands and to return the abandoned agriculture land back to the production, which may increase GHG emissions in the agricultural sector up to 45% with WEM scenario in 2030, comparing with emissions level in 2012. In spite of this emission increasing in the time period 2015 – 2030, the 'with measures' projections of emissions from the agriculture sector show that emissions are expected to be 50% lower than 1990 levels by 2020 and 41% below by 2030.

Table 12 GHG emissions from Agriculture WEM scenario, kt CO_2 eq

Category	2012	2015	2020	2025	2030
Enteric fermentation, CH_4	31.0	34.9	40.5	45.6	50.7
Enteric fermentation, total CO_2	775.7	872.7	1012.1	1139.8	1267.4
Manure management, CH_4	5.5	5.7	6.5	7.4	8.2
Manure management, N_2O	0.4	0.3	0.4	0.4	0.5

Manure management, total CO_2	243.8	245.6	282.7	317.1	351.5
Agricultural Soils, N_2O	4.1	4.3	4.8	5.2	5.5
Agricultural Soils, total CO_2	1211.8	1268.1	1443.0	1539.4	1635.9
Liming, CO_2	10.3	13.9	14.3	15.5	16.7
Urea application, CO_2	5.8	4.4	5.1	5.5	5.9
Agriculture total, $CO_{2\,e}$	**2247.4**	**2404.7**	**2757.2**	**3017.3**	**3277.4**

With site-specific crop management or precision farming and organic farming, it is expected to reduce consumption amounts of synthetic fertilizers, but with involving precision animal breeding in the sector, it is expected to increase digestibility and thus decrease methane emissions. These measures are evaluated in WAM scenario. Comparing with WEM scenario, additional measures lead to reduction of total emissions from 5% in 2015 to 11% in 2030, see Table 13.

Table 13 GHG emissions from Agriculture WAM scenario, kt CO_2 eq

Category	2012	2015	2020	2025	2030
Enteric fermentation, CH_4	31.0	33.0	36.2	39.6	43.0
Enteric fermentation, total CO_2	775.7	824.4	905.1	989.9	1074.6
Manure management, CH_4	5.5	5.0	5.3	5.6	6.0
Manure management, N_2O	0.4	0.3	0.4	0.4	0.4
Manure management, total CO_2	243.8	221.7	237.0	253.5	270.1
Agricultural Soils, N_2O	4.1	4.1	4.6	4.9	5.2
Agricultural Soils, total CO_2	1211.8	1233.7	1382.0	1460.8	1539.6
Liming, CO_2	10.3	13.9	14.3	15.5	16.7
Urea application, CO_2	5.8	4.4	5.1	5.5	5.9
Agriculture total, CO_2 eq	**2247.4**	**2298.0**	**2543.6**	**2725.2**	**2906.8**

5.1.5. Waste management

Main assumptions in the activity data projection

The calculation of the activity data and emission projections was done on the basis of the following main assumptions and the existing policies and plans:

- Projections on the country's population and macroeconomic factors prepared by the Ministry of Economics;
- The requirements set in the Landfill Directive (1999/31/EC) on the volume of the disposed biodegradable waste are met;
- The requirements set for 2020 in the Waste Framework Directive (2008/98/EC) on recycling of municipal waste are met.

It is assumed that under the WAM scenario (with additional measures) in addition to the above measures the waste disposal in landfills reduces mechanically on account of biodegrading that will fully take place in Latvia at the sites of waste management (including landfills). Consequently, composting and other recycling activities will increase.

The following assumptions and existing measures were used in the activity data projection:

- The Urban Waste Water Treatment Directive 91/271/EEC (the requirements have been transposed into Latvian legislation since 2002, namely, Regulations of the Cabinet of Ministers No 34 "Regarding Emissions of Pollutants into Aquatic Environment" of 22 January 2002. The first phase of the Directive implementation was completed by the end of 2008; the last phase should be completed by the end of 2015);
- Projections on the country's population and macroeconomic factors for the manufacturing industry prepared by the Ministry of Economics (the given industry is the main source of GHG emissions in the industrial wastewater management sector).

Under "scenario with existing measures" the decrease of the volume of biologically degradable waste within the total volume of disposed waste is taken into account. Volumes of biologically degradable waste are defined in the Waste management plan 2013-2020, which are calculated based upon the volumes of implementation of the disposal sites directive. To project Generated waste amount GDP and population projections are used. CH_4 recovery is projected as equal growth till 2020. After 2020 no growth of CH_4 recovery is projected. Composting is projected as equal growth till 2020.

For the purpose of the "scenario with additional measures" it is assumed that decrease of disposed wastes after year 2020 will take place.

Biological processing of solid waste

Composting corresponds to biological processing of solid waste. In compliance to IPCC guidelines emissions of two gases - methane (CH_4) and nitrogen monoxide (N_2O), are important regarding waste composting.
In scenario with additional measures is projected that composting continuing increasing after year 2020, when landfill directive requirements already are reached.

Projected emissions

There is reduction in total emissions from waste disposal under the WEM scenario in the period up to 2030. In 2020, it is by around 25%, and in 2030 - by 33% as compared with 1990. The trend gains ground due to the above mentioned measures concerning reduction in the volume of the disposed biodegrading waste in landfills and implementing recycling of municipal waste.

The additional measures under the WAM scenario leave an impact upon emissions reduction starting from 2020 and at the end of the projection period (2030) total emissions from waste disposal will be by 26% lower than under the WEM scenario.

Waste, kt $CO_{2\ eq}$	1990	2015	2020	2025	2030
WEM	764.5	636.4	570.7	538.9	512.5
WAM	764.5	636.1	570.4	516.6	451.7

Solid waste disposal (SWD) is the most essential GHG emission source in the waste sector. Within SWD methane (CH_4) is the most important GHG, other GHG emissions (CO_2, N_2O) are not essential and therefore they are not calculated.

Wastewater management sector

According to the calculated projections, CH_4 emissions from the wastewater management sector will decrease in the period up to 2015 due to complete implementation of the Urban Waste Water Treatment Directive. After 2015, CH_4 emissions stabilization to 6 kt is expected.

As regards N_2O emissions, the projected outcomes reveal slight, but still consistent increase of emissions. The main causes are the growth in number of modern, centralized wastewater treatment plants (according to the existent methodology on emissions projections, the mentioned measure of aquatic environment protection is a factor promoting emission of N_2O) and the macroeconomic projection with regard to the increase of production volume in the manufacturing industry which is the source of N_2O emission in the industrial wastewater management sector.

5.2. Sensitivity analysis

As it is known, GHG emissions and their projections are impacted by several parameters and the development of their scenarios may have a vital difference upon the GHG volume. In order to assess the dependence of GHG emission projections on the development trends of separate parameters, sensitivity analysis was done to emission projections in the energy sector. Two parameters were selected for the sensitivity analysis of GHG emissions in Latvia under the alternative scenario. First – it was GDP growth rate, second – the amount of electricity imports, a vital parameter for the Latvian energy sector).

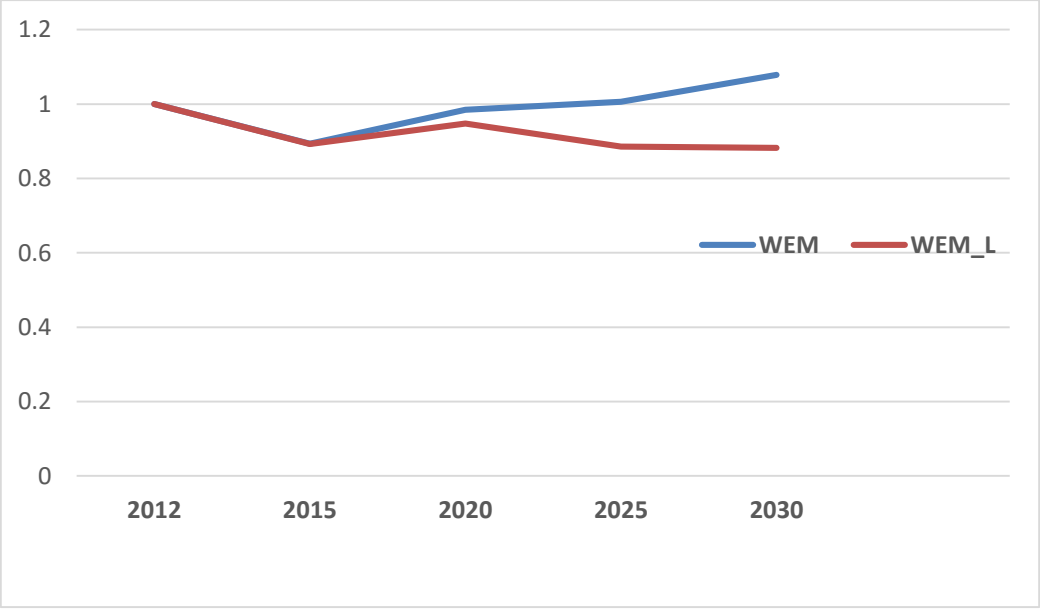

Figure 9 Results of sensitivity analysis in the energy sector on the impact of assumptions for lower GDP growth

If under the WEM scenario the average annual GDP growth rate was 3% (in the period 2005-2030), under the alternative scenario the average annual GDP growth rate was 2.1%. The

modelling results reveal that under the scenario of lower GDP growth (see **Figure** 9 scenario WEM_L) total GHG emissions in 2020 and 2030 are lower than under the WEM scenario by 3.8% and 18.2% respectively. The scenario of lower GDP growth rate has the most vital impact upon energy consumption and respectively also upon GHG emissions in manufacturing subsector.

In Latvia electricity supply from hydro energy and the amount of electricity import changes from year to year. These changes leave an essential impact on the GHG emissions volume.

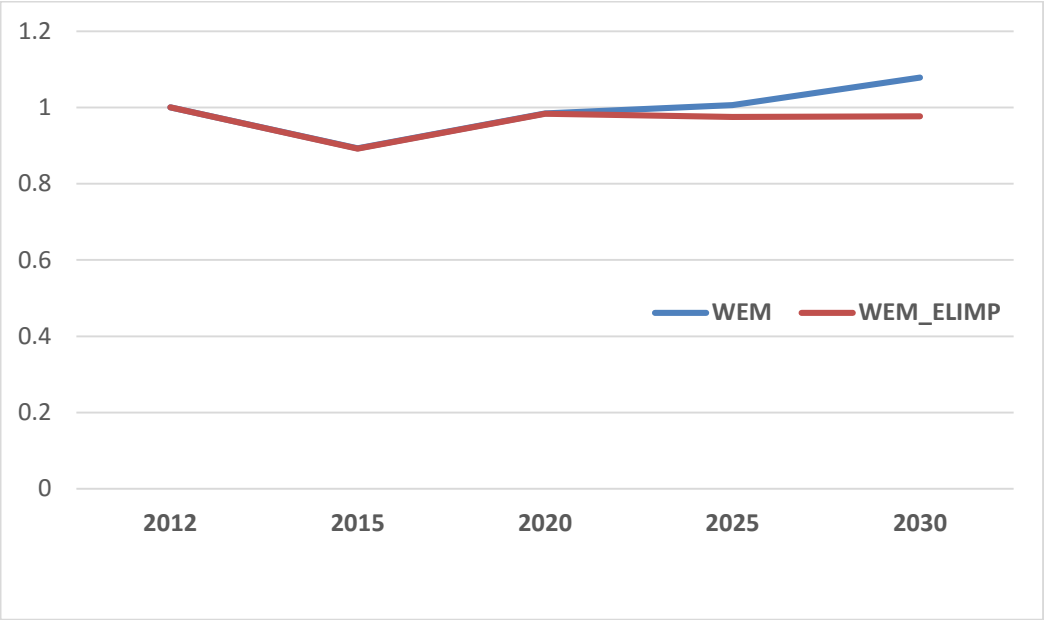

Figure 10 Results of sensitivity analysis in the energy sector on the impact of assumptions for higher electricity import amount

Under the alternative scenario with the assumption for possibly higher electricity import amount (see Figure 10 scenario WEM_ELIMP) the permitted electricity import amount was raised almost twice after 2020 as compared to the WEM scenario. At competitive electricity import price, the modelling results reveal increase of electricity import amount and under this scenario emission in 2020 and 2030 are lower than under the WEM scenario by 0.1% and 9.4% respectively. Assumptions on different electricity import amounts leave the most critical impact on emissions in the ETS sector.

5.3. Models and methodology

Emissions of energy sector have been projected using MARKAL model that describes the whole energy supply – demand system by stages of primary energy supply, transformation sector, energy end consumption and energy demand. MARKAL-LV is an optimisation model that describes development of the Latvian energy system over a period of 30 years on the national level.

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 MARKAL model. Consumption of electricity and district heating is calculated internally within the model.

Activity data for projections of GHG emissions from agriculture sector have been calculated using an approach based on combined results of linear and non-linear multiple regression analysis and corrections of results by agriculture experts within statistical forecast confidence limits. Regression analysis factors include population data, agriculture products consumption indicators, share of agriculture in GDP and global trading data of agriculture products.

The combined method of time series and impact of macroeconomic indices was applied for projection of emissions from Industrial Processes and Product Use. Correlations of amounts of output of every subsection are formed in the form of "correction of errors", which comply with the model of error correction. The obtained time lines were corrected in compliance to the known and forecasted technologies changes in every subsection.

A summary of key variables and assumptions used for GHG emission projections is presented in CTF Table 5.

5.4. Changes compared to the Sixth National Communication and the First Biennial Report

The models used for the preparation the projections of the Second Biennial Report are basically the same as those used for the Sixth National Communication and the First Biennial Report.

In order to set up the national system for policies and measures and projections the Environmental monitoring program (Order No 67) of the Minister of the Environmental Protection and Regional Development (MEPRD) of 26 February 2015 was adopted. With this Order the principles of GHG emission and CO_2 removals projections - main responsibilities of the involved institutions, parameters, timelines and methods, data flow and quality assurance and quality control principles are defined. The overall responsibility for climate change policy development lies within MEPRD, and a number of other national institutions are involved in the implementation of this policy, including the Ministry of Finance, Ministry of Economics, Ministry of Transport and Ministry of Agriculture and institutions supervised by relevant ministries.
Since the spring of 2015 the amendments of low on Pollution is under development where the legislation on GHG projections national system will be established.

CTF Annex: Common Tabular Format workbook for the 2nd Biennial Report

Contents

Table 1

Emission trends: summary [1]

(Sheet 1 of 3)

GREENHOUSE GAS EMISSIONS	Base year[a]	1990	1991	1992	1993	1994	1995	1996	1997
	kt CO_2 eq								
CO_2 emissions without net CO_2 from LULUCF	19,539.34	19,539.34	17,787.49	14,097.51	11,805.81	10,307.09	9,059.01	9,133.74	8,604.93
CO_2 emissions with net CO_2 from LULUCF	9,756.92	9,756.92	7,753.70	2,633.77	1,203.70	-1,138.72	-1,369.62	-1,950.79	-822.74
CH_4 emissions without CH_4 from LULUCF	3,995.93	3,995.93	3,939.44	3,371.15	2,555.02	2,360.44	2,337.68	2,272.27	2,227.07
CH_4 emissions with CH_4 from LULUCF	4,299.65	4,299.65	4,238.30	3,751.55	2,860.00	2,664.16	2,652.30	2,590.14	2,549.81
N_2O emissions without N_2O from LULUCF	2,649.10	2,649.10	2,487.69	1,991.80	1,512.56	1,353.18	1,219.75	1,225.95	1,229.66
N_2O emissions with N_2O from LULUCF	3,228.30	3,228.30	3,071.88	2,590.46	2,107.94	1,953.71	1,827.86	1,838.79	1,846.86
HFCs	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	0.67	0.84	2.03
PFCs	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
Unspecified mix of HFCs and PFCs	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
SF_6	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	0.17	0.18	0.37
NF3	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
Total (without LULUCF)	26,184.37	26,184.37	24,214.61	19,460.45	15,873.39	14,020.70	12,617.28	12,632.97	12,064.06
Total (with LULUCF)	17,284.87	17,284.87	15,063.89	8,975.77	6,171.63	3,479.14	3,111.38	2,479.16	3,576.33
Total (without LULUCF, with indirect)	26,326.48	26,326.48	24,356.19	19,601.22	16,011.12	14,156.04	12,750.47	12,764.51	12,194.29
Total (with LULUCF, with indirect)	17,426.98	17,426.98	15,205.47	9,116.54	6,309.35	3,614.48	3,244.57	2,610.70	3,706.57

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year[a]	1990	1991	1992	1993	1994	1995	1996	1997
	kt CO_2 eq								
1. Energy	19,258.46	19,258.46	17,744.53	14,461.67	12,355.03	10,797.79	9,546.94	9,614.55	9,050.72
2. Industrial processes and product use	602.66	602.66	527.15	250.50	92.10	139.09	151.77	163.59	170.11
3. Agriculture	5,558.66	5,558.66	5,144.47	3,988.23	2,741.95	2,415.07	2,255.51	2,199.19	2,166.92
4. Land Use, Land-Use Change and Forestry[b]	-8,899.50	-8,899.50	-9,150.72	-10,484.68	-9,701.77	-10,541.56	-9,505.90	-10,153.82	-8,487.72
5. Waste	764.59	764.59	798.46	760.05	684.32	668.75	663.06	655.64	676.30
6. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total (including LULUCF)	17,284.87	17,284.87	15,063.89	8,975.77	6,171.63	3,479.14	3,111.38	2,479.16	3,576.33

Note: All footnotes for this table are given on sheet 3.

[1] The common tabular format will be revised, in accordance with relevant decisions of the Conference of the Parties and, where applicable, with decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol."

Table 1 LVA_BR2_v0.1

Emission trends: summary [1]
(Sheet 2 of 3)

GREENHOUSE GAS EMISSIONS	*1998*	1999	2000	2001	2002	2003	2004	2005	2006	2007
CO_2 emissions without net CO_2 from LULUCF	8,227.86	7,643.66	7,012.42	7,428.51	7,454.85	7,639.71	7,647.62	7,733.03	8,234.41	8,557.09
CO_2 emissions with net CO_2 from LULUCF	-326.90	2,368.97	-1,092.84	-1,436.80	38.36	726.44	2,244.71	2,708.24	2,164.40	3,197.95
CH_4 emissions without CH_4 from LULUCF	2,129.99	1,985.65	1,995.39	2,086.22	2,069.05	1,988.73	1,955.41	1,998.30	1,972.69	2,032.34
CH_4 emissions with CH_4 from LULUCF	2,455.04	2,343.19	2,339.18	2,391.81	2,403.03	2,301.91	2,262.47	2,279.00	2,295.10	2,311.69
N_2O emissions without N_2O from LULUCF	1,187.54	1,116.67	1,133.07	1,230.08	1,192.28	1,246.07	1,226.59	1,280.18	1,289.92	1,334.67
N_2O emissions with N_2O from LULUCF	1,808.83	1,745.63	1,763.86	1,861.50	1,832.37	1,888.84	1,871.33	1,926.05	1,947.44	1,990.01
HFCs	3.09	3.49	5.47	8.13	10.60	13.38	18.03	24.51	42.22	63.20
PFCs	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
Unspecified mix of HFCs and PFCs	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
SF_6	0.52	0.71	0.88	1.39	2.62	2.76	3.25	3.78	4.07	4.55
NF3	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
Total (without LULUCF)	11,549.00	10,750.18	10,147.24	10,754.33	10,729.39	10,890.64	10,850.90	11,039.79	11,543.31	11,991.85
Total (with LULUCF)	3,940.57	6,461.99	3,016.55	2,826.03	4,286.98	4,933.33	6,399.79	6,941.58	6,453.24	7,567.40
Total (without LULUCF, with indirect)	11,677.95	10,877.97	10,273.87	10,879.69	10,853.03	11,013.12	10,972.17	11,160.46	11,664.32	12,105.69
Total (with LULUCF, with indirect)	4,069.53	6,589.78	3,143.18	2,951.39	4,410.62	5,055.81	6,521.06	7,062.25	6,574.24	7,681.24

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	*1998*	1999	2000	2001	2002	2003	2004	2005	2006	2007
1. Energy	8,637.88	8,001.91	7,383.68	7,817.48	7,820.23	7,973.21	8,005.95	8,111.14	8,532.88	8,852.18
2. Industrial processes and product use	172.92	205.67	158.61	181.79	195.76	211.11	229.35	229.46	277.19	301.50
3. Agriculture	2,052.36	1,860.43	1,859.64	1,979.87	1,965.20	2,017.84	1,940.71	2,015.26	2,023.13	2,105.92
4. Land Use, Land-Use Change and Forestry [b]	-7,608.42	-4,288.19	-7,130.69	-7,928.30	-6,442.41	-5,957.31	-4,451.11	-4,098.21	-5,090.07	-4,424.45
5. Waste	685.83	682.18	745.31	775.20	748.21	688.47	674.89	683.93	710.12	732.25
6. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total (including LULUCF)	3,940.57	6,461.99	3,016.55	2,826.03	4,286.98	4,933.33	6,399.79	6,941.58	6,453.24	7,567.40

Note: All footnotes for this table are given on sheet 3.

Table 1 LVA_BR2_v0.1

Emission trends: summary [1]
(Sheet 3 of 3)

GREENHOUSE GAS EMISSIONS	*2008*	2009	2010	2011	2012	2013	Change from base to latest reported year
							(%)
CO_2 emissions without net CO_2 from LULUCF	8,127.83	7,392.13	8,478.49	7,734.62	7,414.61	7,276.02	-62.76
CO_2 emissions with net CO_2 from LULUCF	2,386.62	5,244.62	8,376.65	7,244.62	5,973.77	6,080.75	-37.68
CH_4 emissions without CH_4 from LULUCF	2,026.35	1,979.40	1,958.76	1,923.95	1,994.42	2,036.42	-49.04
CH_4 emissions with CH_4 from LULUCF	2,304.35	2,277.06	2,263.10	2,240.68	2,326.28	2,385.07	-44.53
N_2O emissions without N_2O from LULUCF	1,323.88	1,341.02	1,372.67	1,382.42	1,458.88	1,484.32	-43.97
N_2O emissions with N_2O from LULUCF	1,983.62	2,013.13	2,051.69	2,067.63	2,151.02	2,183.16	-32.37
HFCs	79.57	83.14	79.68	82.11	90.96	108.46	
PFCs	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	
Unspecified mix of HFCs and PFCs	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	
SF_6	5.23	7.33	7.35	7.47	7.78	8.50	
NF3	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	
Total (without LULUCF)	11,562.85	10,803.02	11,896.94	11,130.56	10,966.65	10,913.73	-58.32
Total (with LULUCF)	6,759.39	9,625.27	12,778.46	11,642.50	10,549.81	10,765.95	-37.71
Total (without LULUCF, with indirect)	11,680.38	10,913.13	12,011.12	11,244.09	11,078.53	11,025.43	-58.12
Total (with LULUCF, with indirect)	6,876.91	9,735.39	12,892.64	11,756.03	10,661.69	10,877.65	-37.58

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	*2008*	2009	2010	2011	2012	2013	Change from base to latest reported year
							(%)
1. Energy	8,405.16	7,699.60	8,452.79	7,589.42	7,290.72	7,185.09	-62.69
2. Industrial processes and product use	309.45	304.85	566.74	658.90	688.14	668.97	11.00
3. Agriculture	2,076.27	2,092.61	2,140.57	2,154.55	2,250.52	2,310.12	-58.44
4. Land Use, Land-Use Change and Forestry [b]	-4,803.46	-1,177.74	881.52	511.94	-416.84	-147.78	-98.34
5. Waste	771.97	705.96	736.84	727.69	737.27	749.54	-1.97
6. Other	NO	NO	NO	NO	NO	NO	
Total (including LULUCF)	6,759.39	9,625.27	12,778.46	11,642.50	10,549.81	10,765.95	-37.71

Notes:

(1) Further detailed information could be found in the common reporting format tables of the Party's greenhouse gas inventory, namely "Emission trends (CO_2)", "Emission trends (CH_4)", "Emission trends (N_2O)" and "Emission trends (HFCs, PFCs and SF_6)", which is included in an annex to this biennial report.

(2) 2011 is the latest reported inventory year.

(3) 1 kt CO_2 eq equals 1 Gg CO_2 eq.

Abbreviation: LULUCF = land use, land-use change and forestry.

[a] 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 Conference of the Parties. For these Parties, this different base year is used to calculate the percentage change in the final column of this table.

[b] Includes net CO_2, CH_4 and N_2O from LULUCF.

Table 1 (a) LVA_BR2_v0.1

Emission trends (CO_2)

(Sheet 1 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year [a]	1990	1991	1992	1993	1994	1995	1996	1997
	kt								
1. Energy	18,556.81	18,556.81	17,021.04	13,808.80	11,709.08	10,164.95	8,905.57	8,969.08	8,435.31
A. Fuel combustion (sectoral approach)	18,556.80	18,556.80	17,021.02	13,808.79	11,709.07	10,164.94	8,905.56	8,969.07	8,435.31
1. Energy industries	6,201.22	6,201.22	5,692.55	4,861.46	3,939.64	3,712.96	3,391.71	3,511.75	3,275.72
2. Manufacturing industries and construction	3,889.62	3,889.62	2,935.87	2,492.18	2,159.26	1,960.11	1,909.08	1,865.84	1,818.00
3. Transport	2,930.37	2,930.37	2,744.56	2,449.39	2,259.59	2,143.87	2,040.66	2,006.00	1,997.55
4. Other sectors	5,535.58	5,535.58	5,648.04	4,005.76	3,350.58	2,347.99	1,564.12	1,585.29	1,343.94
5. Other	NO, NE	NO, NE	NO, NE	NO, NE	NO, NE	NO, NE	NO, NE	0.19	0.10
B. Fugitive emissions from fuels	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
1. Solid fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. Oil and natural gas and other emissions from energy production	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
C. CO2 transport and storage	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. Industrial processes	602.59	602.59	527.10	250.46	92.06	139.04	150.89	162.54	167.64
A. Mineral industry	589.20	589.20	518.03	244.41	84.67	132.13	146.11	158.69	159.31
B. Chemical industry	NO	NO	NO	NO	NO	NO	NO	NO	NO
C. Metal industry	12.82	12.82	8.70	5.73	7.00	6.55	4.43	3.48	7.99
D. Non-energy products from fuels and solvent use	0.58	0.58	0.37	0.32	0.39	0.37	0.35	0.36	0.33
E. Electronic industry									
F. Product uses as ODS substitutes									
G. Other product manufacture and use	NA	NA	NA	NA	NA	NA	NA	NA	NA
H. Other	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
3. Agriculture	379.13	379.13	238.59	37.52	4.00	2.46	1.96	1.52	1.33
A. Enteric fermentation									
B. Manure management									
C. Rice cultivation									
D. Agricultural soils									
E. Prescribed burning of savannas									
F. Field burning of agricultural residues									
G. Liming	371.42	371.42	231.99	33.65	1.67	0.76	1.29	0.67	0.19
H. Urea application	7.71	7.71	6.59	3.87	2.33	1.70	0.67	0.85	1.14
I. Other carbon-containing fertilizers	NO	NO	NO	NO	NO	NO	NO	NO	NO
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO
4. Land Use, Land-Use Change and Forestry	-9,782.42	-9,782.42	-10,033.79	-11,463.74	-10,602.11	-11,445.81	-10,428.63	-11,084.53	-9,427.67
A. Forest land	-15,040.33	-15,040.33	-15,831.67	-16,306.33	-15,476.58	-15,953.71	-14,565.04	-14,606.06	-12,084.56
B. Cropland	3,249.06	3,249.06	3,280.45	3,302.13	3,326.69	3,348.09	3,368.44	3,053.24	3,053.50
C. Grassland	851.29	851.29	820.87	796.51	765.71	732.70	699.13	661.58	624.32
D. Wetlands	1,215.01	1,215.01	1,744.39	565.19	252.13	385.26	394.87	378.51	427.78
E. Settlements	108.91	108.91	115.11	122.10	131.99	139.04	147.95	118.59	123.56
F. Other land	NO	NO	NO	NO	NO	NO	NO	NO	NO
G. Harvested wood products	-166.36	-166.36	-162.93	56.66	397.94	-97.18	-473.98	-690.40	-1,572.27
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Waste	0.81	0.81	0.77	0.72	0.67	0.63	0.58	0.61	0.65
A. Solid waste disposal	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
B. Biological treatment of solid waste									
C. Incineration and open burning of waste	0.81	0.81	0.77	0.72	0.67	0.63	0.58	0.61	0.65
D. Waste water treatment and discharge									
E. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO
6. Other (as specified in the summary table in CRF)	NO	NO	NO	NO	NO	NO	NO	NO	NO
Memo items:									
International bunkers	1,721.08	1,721.08	747.50	653.73	756.98	963.50	554.58	408.31	324.27
Aviation	221.15	221.15	299.01	84.10	84.10	77.87	77.87	99.67	99.67
Navigation	1,499.94	1,499.94	448.49	569.64	672.88	885.63	476.72	308.64	224.60
Multilateral operations	NA	NA	NA	NA	NA	NA	NA	NA	NA
CO2 emissions from biomass	2,964.03	2,964.03	3,476.19	3,466.38	3,862.23	4,003.92	4,538.64	4,744.49	4,755.49
CO2 captured	NO	NO	NO	NO	NO	NO	NO	NO	NO
Long-term storage of C in waste disposal sites	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indirect N2O									
Indirect CO2 (3)	142.11	142.11	141.58	140.77	137.72	135.33	133.19	131.54	130.24
Total CO2 equivalent emissions without land use, land-use change and forestry	26,184.37	26,184.37	24,214.61	19,460.45	15,873.39	14,020.70	12,617.28	12,632.97	12,064.06
Total CO2 equivalent emissions with land use, land-use change and forestry	17,284.87	17,284.87	15,063.89	8,975.77	6,171.63	3,479.14	3,111.38	2,479.16	3,576.33
Total CO2 equivalent emissions, including indirect CO2, without land use, land-use change and forestry	19,681.45	19,681.45	17,929.07	14,238.28	11,943.53	10,442.42	9,192.20	9,265.28	8,735.17
Total CO2 equivalent emissions, including indirect CO2, with land use, land-use change and forestry	9,899.03	9,899.03	7,895.28	2,774.54	1,341.42	-1,003.39	-1,236.43	-1,819.25	-692.50

Note: All footnotes for this table are given on sheet 3.

Table 1 (a)

Emission trends (CO_2)

(Sheet 2 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	*1998*	1999	2000	2001	2002	2003	2004	2005	2006	2007
1. Energy	8,054.53	7,438.06	6,852.83	7,251.76	7,251.94	7,417.36	7,436.71	7,528.48	7,999.21	8,315.68
A. Fuel combustion (sectoral approach)	8,054.52	7,438.05	6,852.82	7,251.76	7,251.93	7,417.36	7,436.70	7,528.48	7,999.20	8,315.68
1. Energy industries	3,338.13	2,919.47	2,474.11	2,421.19	2,317.01	2,246.23	2,056.91	2,047.02	2,073.74	1,944.72
2. Manufacturing industries and construction	1,589.62	1,441.60	1,177.84	1,078.32	1,125.46	1,132.98	1,149.31	1,153.03	1,223.89	1,216.41
3. Transport	1,972.62	1,940.55	2,149.98	2,542.26	2,619.80	2,763.23	2,902.53	3,028.08	3,340.06	3,780.74
4. Other sectors	1,153.96	1,136.28	1,050.76	1,209.82	1,182.77	1,268.75	1,318.31	1,292.72	1,354.01	1,370.96
5. Other	0.19	0.15	0.14	0.17	6.88	6.16	9.63	7.62	7.51	2.84
B. Fugitive emissions from fuels	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00
1. Solid fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. Oil and natural gas and other emissions from energy production	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00
C. CO2 transport and storage	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. Industrial processes	169.26	201.40	152.19	172.19	182.47	194.91	208.00	201.10	230.81	233.68
A. Mineral industry	160.38	193.30	143.39	163.77	174.47	182.32	194.36	183.31	212.83	218.10
B. Chemical industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C. Metal industry	8.50	7.71	8.42	8.04	7.60	12.16	12.90	12.35	12.56	14.57
D. Non-energy products from fuels and solvent use	0.38	0.39	0.39	0.39	0.40	0.43	0.73	0.59	0.69	1.01
E. Electronic industry										
F. Product uses as ODS substitutes										
G. Other product manufacture and use	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
H. Other	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	4.85	4.73	NO, NA
3. Agriculture	3.39	3.45	6.21	2.19	20.14	27.07	2.47	3.00	2.86	6.53
A. Enteric fermentation										
B. Manure management										
C. Rice cultivation										
D. Agricultural soils										
E. Prescribed burning of savannas										
F. Field burning of agricultural residues										
G. Liming	2.24	2.34	4.86	0.33	15.68	25.64	1.05	1.57	1.43	5.10
H. Urea application	1.15	1.11	1.35	1.85	4.46	1.42	1.42	1.43	1.43	1.43
I. Other carbon-containing fertilizers	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
4. Land Use, Land-Use Change and Forestry	-8,554.77	-5,274.69	-8,105.26	-8,865.31	-7,416.49	-6,913.26	-5,402.91	-5,024.79	-6,070.00	-5,359.13
A. Forest land	-10,685.23	-7,494.70	-9,940.37	-10,965.44	-9,823.41	-9,180.83	-7,764.35	-7,542.89	-8,751.66	-8,185.48
B. Cropland	3,052.98	3,055.17	3,052.08	3,019.98	3,014.92	3,013.36	3,010.85	3,006.31	3,001.18	2,993.16
C. Grassland	594.56	553.28	519.37	474.57	441.39	406.10	364.80	322.28	278.56	197.61
D. Wetlands	326.30	780.41	552.61	634.29	996.91	848.05	855.05	1,088.02	1,332.87	689.86
E. Settlements	130.93	137.90	144.20	296.92	310.61	324.01	336.87	349.82	362.01	310.56
F. Other land	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
G. Harvested wood products	-1,974.30	-2,306.76	-2,433.15	-2,325.63	-2,356.91	-2,323.94	-2,206.12	-2,248.32	-2,292.96	-1,364.85
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Waste	0.68	0.75	1.19	2.36	0.30	0.37	0.45	0.44	1.53	1.20
A. Solid waste disposal	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
B. Biological treatment of solid waste										
C. Incineration and open burning of waste	0.68	0.75	1.19	2.36	0.30	0.37	0.45	0.44	1.53	1.20
D. Waste water treatment and discharge										
E. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
6. Other (as specified in the summary table in CRF)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Memo items:										
International bunkers	137.42	121.77	106.14	697.07	733.88	714.90	788.19	1,003.69	825.81	810.74
Aviation	90.33	90.33	80.98	80.98	84.10	121.50	148.08	179.57	201.59	245.82
Navigation	47.10	31.44	25.15	616.09	649.79	593.40	640.11	824.12	624.22	564.93
Multilateral operations	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CO2 emissions from biomass	4,693.46	4,608.88	4,283.36	4,783.36	4,753.46	5,046.98	5,322.48	5,329.70	5,371.17	5,248.42
CO2 captured	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Long-term storage of C in waste disposal sites	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indirect N2O										
Indirect CO2 (3)	128.95	127.79	126.63	125.36	123.63	122.48	121.27	120.68	121.00	113.85
Total CO2 equivalent emissions without land use, land-use change and forestry	11,549.00	10,750.18	10,147.24	10,754.33	10,729.39	10,890.64	10,850.90	11,039.79	11,543.31	11,991.85
Total CO2 equivalent emissions with land use, land-use change and forestry	3,940.57	6,461.99	3,016.55	2,826.03	4,286.98	4,933.33	6,399.79	6,941.58	6,453.24	7,567.40
Total CO2 equivalent emissions, including indirect CO2, without land use, land-use change and forestry	8,356.82	7,771.45	7,139.05	7,553.87	7,578.48	7,762.19	7,768.89	7,853.70	8,355.41	8,670.93
Total CO2 equivalent emissions, including indirect CO2, with land use, land-use change and forestry	-197.95	2,496.76	-966.21	-1,311.44	161.99	848.93	2,365.98	2,828.91	2,285.40	3,311.80

Note: All footnotes for this table are given on sheet 3.

Table 1(a) LVA_BR2_v0.1

Emission trends (CO_2)

(Sheet 3 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	*2008*	2009	2010	2011	2012	2013	Change from base to latest reported year
							%
1. Energy	7,896.71	7,168.97	7,992.45	7,152.43	6,808.91	6,705.77	-63.86
A. Fuel combustion (sectoral approach)	7,896.70	7,168.96	7,992.44	7,152.43	6,808.90	6,705.76	-63.86
1. Energy industries	1,917.50	1,866.76	2,249.56	2,071.47	1,855.35	1,918.68	-69.06
2. Manufacturing industries and construction	1,112.86	887.11	1,078.96	878.52	931.37	761.10	-80.43
3. Transport	3,570.62	3,130.02	3,197.78	2,839.45	2,736.39	2,772.11	-5.40
4. Other sectors	1,292.32	1,279.73	1,458.28	1,355.77	1,278.47	1,247.42	-77.47
5. Other	3.41	5.34	7.87	7.22	7.33	6.45	
B. Fugitive emissions from fuels	0.00	0.00	0.00	0.00	0.00	0.01	-30.46
1. Solid fuels	NO	NO	NO	NO	NO	NO	
2. Oil and natural gas and other emissions from energy production	0.00	0.00	0.00	0.00	0.00	0.01	-30.46
C. CO2 transport and storage	NO	NO	NO	NO	NO	NO	
2. Industrial processes	224.58	214.33	479.64	569.29	589.29	551.98	-8.40
A. Mineral industry	214.80	203.91	467.36	567.56	585.36	549.95	-6.66
B. Chemical industry	NO	NO	NO	NO	NO	NO	
C. Metal industry	8.73	9.56	11.28	0.72	2.87	0.96	-92.55
D. Non-energy products from fuels and solvent use	1.06	0.86	1.00	1.02	1.06	1.08	87.19
E. Electronic industry							
F. Product uses as ODS substitutes							
G. Other product manufacture and use	NA	NA	NA	NA	NA	NA	
H. Other	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	
3. Agriculture	6.03	8.50	6.05	12.55	16.09	17.85	-95.29
A. Enteric fermentation							
B. Manure management							
C. Rice cultivation							
D. Agricultural soils							
E. Prescribed burning of savannas							
F. Field burning of agricultural residues							
G. Liming	2.86	4.15	2.05	8.29	10.30	13.78	-96.29
H. Urea application	3.17	4.35	4.00	4.25	5.79	4.08	-47.13
I. Other carbon-containing fertilizers	NO	NO	NO	NO	NO	NO	
J. Other	NO	NO	NO	NO	NO	NO	
4. Land Use, Land-Use Change and Forestry	-5,741.21	-2,147.52	-101.84	-490.00	-1,440.84	-1,195.27	-87.78
A. Forest land	-9,231.69	-5,598.06	-3,004.15	-3,222.23	-4,242.75	-3,952.38	-73.72
B. Cropland	2,988.14	2,741.84	2,722.50	2,715.33	2,708.31	2,700.97	-16.87
C. Grassland	151.88	142.24	132.50	151.93	170.91	188.32	-77.88
D. Wetlands	1,073.95	948.80	989.29	991.07	958.77	1,003.23	-17.43
E. Settlements	323.90	844.01	885.87	916.33	969.06	1,006.11	823.83
F. Other land	NO	NO	NO	NO	NO	NO	
G. Harvested wood products	-1,047.38	-1,226.35	-1,827.85	-2,042.44	-2,005.14	-2,141.52	1,187.31
H. Other	NO	NO	NO	NO	NO	NO	
5. Waste	0.51	0.34	0.34	0.34	0.32	0.43	-47.28
A. Solid waste disposal	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	
B. Biological treatment of solid waste							
C. Incineration and open burning of waste	0.51	0.34	0.34	0.34	0.32	0.43	-47.28
D. Waste water treatment and discharge							
E. Other	NO	NO	NO	NO	NO	NO	
6. Other (as specified in the summary table in CRF)	NO	NO	NO	NO	NO	NO	
Memo items:							
International bunkers	950.79	1,181.67	1,156.28	1,038.54	1,125.20	1,118.11	-35.03
Aviation	296.15	311.90	357.76	359.15	363.38	375.15	69.64
Navigation	654.64	869.77	798.52	679.39	761.83	742.95	-50.47
Multilateral operations	NA	NA	NA	NA	NA	NA	
CO2 emissions from biomass	4,971.89	5,682.66	5,054.93	5,286.10	5,923.17	5,992.02	102.16
CO2 captured	NO	NO	NO	NO	NO	NO	
Long-term storage of C in waste disposal sites	NA	NA	NA	NA	NA	NA	
Indirect N2O							
Indirect CO2 (3)	117.52	110.11	114.18	113.53	111.89	111.70	-21.40
Total CO2 equivalent emissions without land use, land-use change and forestry	11,562.85	10,803.02	11,896.94	11,130.56	10,966.65	10,913.73	-58.32
Total CO2 equivalent emissions with land use, land-use change and forestry	6,759.39	9,625.27	12,778.46	11,642.50	10,549.81	10,765.95	-37.71
Total CO2 equivalent emissions, including indirect CO2, without land use, land-use change and forestry	8,245.35	7,502.24	8,592.67	7,848.15	7,526.50	7,387.73	-62.46
Total CO2 equivalent emissions, including indirect CO2, with land use, land-use change and forestry	2,504.14	5,354.73	8,490.83	7,358.15	6,085.66	6,192.45	-37.44

Abbreviations : CRF = common reporting format, LULUCF = land use, land-use change and forestry.

[a] 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 Conference of the Parties. For these Parties, this different base year is used to calculate the percentage change in the final column of this table.

[b] Fill in net emissions/removals as reported in CRF table Summary 1.A of the latest reported inventory year. For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

Emission trends (CH_4)

(Sheet 1 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year[a]	1990	1991	1992	1993	1994	1995	1996	1997
	kt								
1. Energy	22.11	22.11	23.09	20.94	21.30	20.99	21.26	21.32	20.14
A. Fuel combustion (sectoral approach)	12.21	12.21	13.55	12.24	12.99	12.86	13.35	13.69	13.02
1. Energy industries	0.19	0.19	0.17	0.15	0.14	0.15	0.12	0.15	0.19
2. Manufacturing industries and construction	0.22	0.22	0.12	0.11	0.13	0.13	0.14	0.15	0.15
3. Transport	0.79	0.79	0.73	0.69	0.67	0.64	0.58	0.55	0.52
4. Other sectors	11.00	11.00	12.53	11.29	12.05	11.94	12.51	12.84	12.17
5. Other	NO, NE	NO, NE	NO, NE	NO, NE	NO, NE	NO, NE	NO, NE	0.00	0.00
B. Fugitive emissions from fuels	9.90	9.90	9.54	8.70	8.32	8.13	7.92	7.63	7.12
1. Solid fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. Oil and natural gas and other emissions from energy production	9.90	9.90	9.54	8.70	8.32	8.13	7.92	7.63	7.12
C. CO2 transport and storage									
2. Industrial processes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
A. Mineral industry									
B. Chemical industry	NO	NO	NO	NO	NO	NO	NO	NO	NO
C. Metal industry	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
D. Non-energy products from fuels and solvent use	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
E. Electronic industry									
F. Product uses as ODS substitutes									
G. Other product manufacture and use	NA	NA	NA	NA	NA	NA	NA	NA	NA
H. Other	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
3. Agriculture	107.62	107.62	103.03	83.98	54.04	47.18	46.24	43.87	42.43
A. Enteric fermentation	91.28	91.28	87.80	73.22	47.23	40.78	39.67	37.94	36.79
B. Manure management	16.34	16.34	15.22	10.76	6.81	6.40	6.57	5.94	5.63
C. Rice cultivation	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Agricultural soils	NE	NE	NE	NE	NE	NE	NE	NE	NE
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field burning of agricultural residues	NO	NO	NO	NO	NO	NO	NO	NO	NO
G. Liming									
H. Urea application									
I. Other carbon-containing fertilizers									
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO
4. Land use, land-use change and forestry	12.15	12.15	11.95	15.22	12.20	12.15	12.58	12.71	12.91
A. Forest land	3.35	3.35	3.16	6.44	3.44	3.41	3.87	4.02	4.25
B. Cropland	5.00	5.00	5.01	5.00	4.99	4.98	4.96	4.94	4.93
C. Grassland	2.65	2.65	2.64	2.64	2.63	2.62	2.61	2.61	2.59
D. Wetlands	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14
E. Settlements	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Other land	NO	NO	NO	NO	NO	NO	NO	NO	NO
G. Harvested wood products									
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Waste	30.11	30.11	31.46	29.93	26.86	26.25	26.01	25.69	26.52
A. Solid waste disposal	15.71	15.71	16.29	16.76	17.13	17.40	17.57	17.78	18.05
B. Biological treatment of solid waste	NO, NE	NO, NE	NO, NE	NO, NE	NO, NE	NO, NE	NO, NE	NO, NE	NO, NE
C. Incineration and open burning of waste	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE
D. Waste water treatment and discharge	14.39	14.39	15.17	13.17	9.73	8.85	8.44	7.92	8.47
E. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO
6. Other (as specified in the summary table in CRF)	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total CH4 emissions without CH4 from LULUCF	159.84	159.84	157.58	134.85	102.20	94.42	93.51	90.89	89.08
Total CH4 emissions with CH4 from LULUCF	171.99	171.99	169.53	150.06	114.40	106.57	106.09	103.61	101.99
Memo items:									
International bunkers	0.10	0.10	0.03	0.04	0.04	0.06	0.03	0.02	0.01
Aviation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Navigation	0.09	0.09	0.03	0.04	0.04	0.06	0.03	0.02	0.01
Multilateral operations	NA	NA	NA	NA	NA	NA	NA	NA	NA
CO2 emissions from biomass									
CO2 captured									
Long-term storage of C in waste disposal sites									
Indirect N2O									
Indirect CO2 (3)									

Note: All footnotes for this table are given on sheet 3.

Table 1(b) LVA_BR2_v0.1

Emission trends (CH_4)

(Sheet 2 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	*1998*	1999	2000	2001	2002	2003	2004	2005	2006	2007
1. Energy	19.02	18.46	17.26	18.28	18.29	17.47	17.80	18.37	16.51	16.54
A. Fuel combustion (sectoral approach)	12.19	11.95	11.23	12.44	12.19	12.71	13.09	13.04	12.69	12.62
1. Energy industries	0.21	0.19	0.15	0.17	0.18	0.20	0.20	0.17	0.19	0.19
2. Manufacturing industries and construction	0.15	0.14	0.12	0.16	0.16	0.15	0.19	0.22	0.24	0.20
3. Transport	0.49	0.47	0.50	0.55	0.51	0.48	0.45	0.39	0.38	0.35
4. Other sectors	11.33	11.15	10.46	11.56	11.34	11.88	12.25	12.25	11.89	11.88
5. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B. Fugitive emissions from fuels	6.83	6.51	6.03	5.84	6.10	4.76	4.71	5.33	3.82	3.92
1. Solid fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. Oil and natural gas and other emissions from energy production	6.83	6.51	6.03	5.84	6.10	4.76	4.71	5.33	3.82	3.92
C. CO2 transport and storage										
2. Industrial processes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
A. Mineral industry										
B. Chemical industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C. Metal industry	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
D. Non-energy products from fuels and solvent use	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
E. Electronic industry										
F. Product uses as ODS substitutes										
G. Other product manufacture and use	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
H. Other	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
3. Agriculture	39.38	34.30	33.48	35.15	34.99	34.85	33.64	34.55	34.74	36.14
A. Enteric fermentation	34.04	29.30	28.95	30.21	29.98	29.88	28.72	29.56	29.55	30.84
B. Manure management	5.34	5.00	4.54	4.94	5.01	4.97	4.92	4.99	5.19	5.30
C. Rice cultivation	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Agricultural soils	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field burning of agricultural residues	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
G. Liming										
H. Urea application										
I. Other carbon-containing fertilizers										
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
4. Land use, land-use change and forestry	13.00	14.30	13.75	12.22	13.36	12.53	12.28	11.23	12.90	11.17
A. Forest land	4.37	5.69	5.17	3.67	4.81	4.00	3.81	2.81	4.43	2.82
B. Cropland	4.91	4.89	4.87	4.85	4.83	4.81	4.79	4.77	4.74	4.72
C. Grassland	2.59	2.58	2.57	2.57	2.58	2.58	2.54	2.51	2.58	2.49
D. Wetlands	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14
E. Settlements	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Other land	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
G. Harvested wood products										
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Waste	26.80	26.67	29.07	30.01	29.48	27.23	26.77	27.01	27.66	28.61
A. Solid waste disposal	18.37	18.74	19.15	19.62	19.51	17.88	17.09	17.63	18.38	19.36
B. Biological treatment of solid waste	NO, NE	NO, NE	NO, NE	NO, NE	NO, NE	0.01	0.03	0.03	0.05	0.04
C. Incineration and open burning of waste	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE
D. Waste water treatment and discharge	8.43	7.94	9.92	10.40	9.96	9.34	9.65	9.36	9.23	9.21
E. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
6. Other (as specified in the summary table in CRF)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total CH4 emissions without CH4 from LULUCF	85.20	79.43	79.82	83.45	82.76	79.55	78.22	79.93	78.91	81.29
Total CH4 emissions with CH4 from LULUCF	98.20	93.73	93.57	95.67	96.12	92.08	90.50	91.16	91.80	92.47
Memo items:										
International bunkers	0.00	0.00	0.00	0.04	0.04	0.04	0.04	0.05	0.04	0.04
Aviation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Navigation	0.00	0.00	0.00	0.04	0.04	0.04	0.04	0.05	0.04	0.03
Multilateral operations	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CO2 emissions from biomass										
CO2 captured										
Long-term storage of C in waste disposal sites										
Indirect N2O										
Indirect CO2 (3)										

Note: All footnotes for this table are given on sheet 3.

Table 1(b) LVA_BR2_v0.1

Emission trends (CH_4)

(Sheet 3 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	*2008*	2009	2010	2011	2012	2013	Change from base to latest reported year
							%
1. Energy	15.69	16.60	14.07	12.97	14.44	14.36	-35.03
A. Fuel combustion (sectoral approach)	11.66	12.80	10.40	10.45	11.25	10.32	-15.41
1. Energy industries	0.18	0.18	0.20	0.19	0.22	0.32	70.61
2. Manufacturing industries and construction	0.22	0.29	0.35	0.41	0.47	0.48	120.61
3. Transport	0.28	0.24	0.23	0.21	0.20	0.19	-75.98
4. Other sectors	10.99	12.09	9.61	9.64	10.36	9.33	-15.23
5. Other	0.00	0.00	0.00	0.00	0.00	0.00	
B. Fugitive emissions from fuels	4.03	3.81	3.66	2.52	3.18	4.04	-59.21
1. Solid fuels	NO	NO	NO	NO	NO	NO	
2. Oil and natural gas and other emissions from energy production	4.03	3.81	3.66	2.52	3.18	4.04	-59.21
C. CO2 transport and storage							
2. Industrial processes	0.00	0.00	0.00	0.00	0.00	0.00	-64.87
A. Mineral industry							
B. Chemical industry	NO	NO	NO	NO	NO	NO	
C. Metal industry	0.00	0.00	0.00	0.00	0.00	0.00	-64.87
D. Non-energy products from fuels and solvent use	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	
E. Electronic industry							
F. Product uses as ODS substitutes							
G. Other product manufacture and use	NA	NA	NA	NA	NA	NA	
H. Other	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	
3. Agriculture	35.00	34.77	35.26	35.42	36.38	37.62	-65.04
A. Enteric fermentation	29.87	29.65	29.96	30.15	31.03	32.14	-64.79
B. Manure management	5.12	5.11	5.30	5.27	5.35	5.48	-66.47
C. Rice cultivation	NO	NO	NO	NO	NO	NO	
D. Agricultural soils	NE	NE	NE	NE	NE	NE	
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	
F. Field burning of agricultural residues	NO	NO	NO	NO	NO	NO	
G. Liming							
H. Urea application							
I. Other carbon-containing fertilizers							
J. Other	NO	NO	NO	NO	NO	NO	
4. Land use, land-use change and forestry	11.12	11.91	12.17	12.67	13.27	13.95	14.79
A. Forest land	2.82	3.63	3.92	4.41	5.01	5.67	69.13
B. Cropland	4.69	4.67	4.66	4.68	4.69	4.71	-5.94
C. Grassland	2.47	2.47	2.45	2.44	2.43	2.43	-8.45
D. Wetlands	1.14	1.14	1.14	1.14	1.14	1.14	0.00
E. Settlements	NO	NO	NO	NO	NO	NO	
F. Other land	NO	NO	NO	NO	NO	NO	
G. Harvested wood products							
H. Other	NO	NO	NO	NO	NO	NO	
5. Waste	30.36	27.81	29.03	28.56	28.96	29.47	-2.11
A. Solid waste disposal	20.16	20.35	20.73	20.91	21.36	21.32	35.66
B. Biological treatment of solid waste	0.04	0.06	0.07	0.09	0.07	0.06	
C. Incineration and open burning of waste	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	
D. Waste water treatment and discharge	10.16	7.40	8.22	7.56	7.53	8.10	-43.74
E. Other	NO	NO	NO	NO	NO	NO	
6. Other (as specified in the summary table in CRF)	NO	NO	NO	NO	NO	NO	
Total CH4 emissions without CH4 from LULUCF	81.05	79.18	78.35	76.96	79.78	81.46	-49.04
Total CH4 emissions with CH4 from LULUCF	92.17	91.08	90.52	89.63	93.05	95.40	-44.53
Memo items:							
International bunkers	0.04	0.06	0.05	0.05	0.05	0.06	-42.00
Aviation	0.00	0.00	0.00	0.00	0.00	0.01	511.41
Navigation	0.04	0.05	0.05	0.04	0.05	0.05	-51.06
Multilateral operations	NA	NA	NA	NA	NA	NA	
CO2 emissions from biomass							
CO2 captured							
Long-term storage of C in waste disposal sites							
Indirect N2O							
Indirect CO2 (3)							

Abbreviations : CRF = common reporting format, LULUCF = land use, land-use change an

[a] 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 Conference of the Parties. For these Parties, this different base year is used to calculate the percentage change in the final column of this table.

Table 1(c) LVA_BR2_v0.1

Emission trends (N_2O)

(Sheet 1 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	*Base year*[a]	1990	1991	1992	1993	1994	1995	1996	1997
	kt								
1. Energy	0.50	0.50	0.49	0.43	0.38	0.36	0.37	0.38	0.38
A. Fuel combustion (sectoral approach)	0.50	0.50	0.49	0.43	0.38	0.36	0.37	0.38	0.38
1. Energy industries	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03
2. Manufacturing industries and construction	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02
3. Transport	0.27	0.27	0.26	0.22	0.16	0.15	0.15	0.15	0.16
4. Other sectors	0.16	0.16	0.18	0.17	0.17	0.16	0.17	0.18	0.17
5. Other	NO, NE	NO, NE	NO, NE	NO, NE	NO, NE	NO, NE	NO, NE	0.00	0.00
B. Fugitive emissions from fuels	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
1. Solid fuels	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
2. Oil and natural gas and other emissions from energy production	NO	NO	NO	NO	NO	NO	NO	NO	NO
C. CO2 transport and storage									
2. Industrial processes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
A. Mineral industry									
B. Chemical industry	NO	NO	NO	NO	NO	NO	NO	NO	NO
C. Metal industry	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Non-energy products from fuels and solvent use	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
E. Electronic industry									
F. Product uses as ODS substitutes									
G. Other product manufacture and use	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
H. Other	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
3. Agriculture	8.35	8.35	7.82	6.21	4.65	4.14	3.68	3.69	3.71
A. Enteric fermentation									
B. Manure management	1.02	1.02	0.99	0.80	0.52	0.45	0.45	0.42	0.39
C. Rice cultivation									
D. Agricultural soils	7.33	7.33	6.83	5.41	4.13	3.68	3.24	3.27	3.32
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field burning of agricultural residues	NO	NO	NO	NO	NO	NO	NO	NO	NO
G. Liming									
H. Urea application									
I. Other carbon containing fertlizers									
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO
4. Land use, land-use change and forestry	1.94	1.94	1.96	2.01	2.00	2.02	2.04	2.06	2.07
A. Forest land	1.92	1.92	1.91	1.95	1.92	1.91	1.92	1.92	1.93
B. Cropland	0.01	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.07
C. Grassland	0.00	0.00	0.00	0.01	0.01	0.02	0.02	0.03	0.03
D. Wetlands	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
E. Settlements	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.02	0.02
F. Other land	NO	NO	NO	NO	NO	NO	NO	NO	NO
G. Harvested wood products									
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Waste	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
A. Solid waste disposal									
B. Biological treatment of solid waste	NO, NE	NO, NE	NO, NE	NO, NE	NO, NE	NO, NE	NO, NE	NO, NE	NO, NE
C. Incineration and open burning of waste	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
D. Waste water treatment and discharge	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03
E. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO
6. Other (as specified in the summary table in CRF)	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total direct N2O emissions without N2O from LULUCF	8.89	8.89	8.35	6.68	5.08	4.54	4.09	4.11	4.13
Total direct N2O emissions with N2O from LULUCF	10.83	10.83	10.31	8.69	7.07	6.56	6.13	6.17	6.20
Memo items:									
International bunkers	0.19	0.19	0.04	0.04	0.06	0.11	0.05	0.04	0.03
Aviation	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Navigation	0.18	0.18	0.03	0.03	0.06	0.11	0.04	0.03	0.03
Multilateral operations	NA	NA	NA	NA	NA	NA	NA	NA	NA
CO2 emissions from biomass									
CO2 captured									
Long-term storage of C in waste disposal sites									
Indirect N2O	IE, NA, NO	IE, NA, NO	IE, NA, NO	IE, NA, NO	IE, NA, NO	IE, NA, NO	IE, NA, NO	IE, NA, NO	IE, NA, NO
Indirect CO2 (3)									

Note: All footnotes for this table are given on sheet 3.

Table 1(c) LVA_BR2_v0.1

Emission trends (N_2O)

(Sheet 2 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	*1998*	1999	2000	2001	2002	2003	2004	2005	2006	2007
1. Energy	0.36	0.34	0.33	0.36	0.37	0.40	0.42	0.41	0.41	0.41
A. Fuel combustion (sectoral approach)	0.36	0.34	0.33	0.36	0.37	0.40	0.42	0.41	0.41	0.41
1. Energy industries	0.04	0.03	0.02	0.02	0.03	0.03	0.03	0.02	0.02	0.02
2. Manufacturing industries and construction	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03
3. Transport	0.15	0.14	0.15	0.16	0.17	0.19	0.20	0.19	0.19	0.20
4. Other sectors	0.16	0.15	0.14	0.16	0.16	0.16	0.17	0.17	0.16	0.16
5. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B. Fugitive emissions from fuels	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
1. Solid fuels	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
2. Oil and natural gas and other emissions from energy production	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C. CO2 transport and storage										
2. Industrial processes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
A. Mineral industry										
B. Chemical industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C. Metal industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Non-energy products from fuels and solvent use	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
E. Electronic industry										
F. Product uses as ODS substitutes										
G. Other product manufacture and use	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
H. Other	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
3. Agriculture	3.57	3.35	3.41	3.69	3.59	3.76	3.68	3.85	3.87	4.01
A. Enteric fermentation										
B. Manure management	0.36	0.32	0.34	0.37	0.36	0.36	0.35	0.36	0.37	0.38
C. Rice cultivation										
D. Agricultural soils	3.21	3.04	3.07	3.32	3.23	3.40	3.33	3.50	3.50	3.64
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field burning of agricultural residues	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
G. Liming										
H. Urea application										
I. Other carbon containing fertlizers										
J. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
4. Land use, land-use change and forestry	2.08	2.11	2.12	2.12	2.15	2.16	2.16	2.17	2.21	2.20
A. Forest land	1.93	1.94	1.93	1.92	1.93	1.93	1.92	1.91	1.93	1.91
B. Cropland	0.08	0.08	0.09	0.09	0.09	0.10	0.10	0.10	0.11	0.11
C. Grassland	0.04	0.04	0.05	0.06	0.06	0.07	0.07	0.08	0.09	0.09
D. Wetlands	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
E. Settlements	0.03	0.03	0.03	0.03	0.04	0.04	0.05	0.05	0.06	0.06
F. Other land	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
G. Harvested wood products										
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Waste	0.05	0.05	0.06	0.08	0.04	0.02	0.02	0.03	0.06	0.05
A. Solid waste disposal										
B. Biological treatment of solid waste	NO, NE	NO, NE	NO, NE	NO, NE	NO, NE	0.00	0.00	0.00	0.00	0.00
C. Incineration and open burning of waste	0.01	0.02	0.02	0.05	0.01	0.01	0.01	0.01	0.03	0.03
D. Waste water treatment and discharge	0.04	0.03	0.04	0.03	0.03	0.02	0.01	0.02	0.02	0.02
E. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
6. Other (as specified in the summary table in CRF)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total direct N2O emissions without N2O from LULUCF	3.99	3.75	3.80	4.13	4.00	4.18	4.12	4.30	4.33	4.48
Total direct N2O emissions with N2O from LULUCF	6.07	5.86	5.92	6.25	6.15	6.34	6.28	6.46	6.54	6.68
Memo items:										
International bunkers	0.02	0.02	0.01	0.14	0.12	0.11	0.11	0.13	0.10	0.09
Aviation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01
Navigation	0.02	0.01	0.01	0.14	0.12	0.10	0.11	0.13	0.09	0.09
Multilateral operations	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CO2 emissions from biomass										
CO2 captured										
Long-term storage of C in waste disposal sites										
Indirect N2O	IE, NA, NO	IE, NA, NO	IE, NA, NO	IE, NA, NO	IE, NA, NO	IE, NA, NO	IE, NA, NO	IE, NA, NO	IE, NA, NO	IE, NA, NO
Indirect CO2 (3)										

Note: All footnotes for this table are given on sheet 3.

Table 1(c) LVA_BR2_v0.1

Emission trends (N_2O)

(Sheet 3 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	*2008*	2009	2010	2011	2012	2013	Change from base to latest reported year
							%
1. Energy	0.39	0.39	0.36	0.38	0.41	0.40	-19.28
A. Fuel combustion (sectoral approach)	0.39	0.39	0.36	0.38	0.41	0.40	-19.28
1. Energy industries	0.02	0.02	0.03	0.02	0.03	0.04	13.00
2. Manufacturing industries and construction	0.03	0.04	0.05	0.06	0.07	0.07	124.88
3. Transport	0.19	0.16	0.16	0.16	0.17	0.17	-38.21
4. Other sectors	0.15	0.16	0.13	0.13	0.14	0.13	-21.58
5. Other	0.00	0.00	0.00	0.00	0.00	0.00	
B. Fugitive emissions from fuels	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	
1. Solid fuels	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	
2. Oil and natural gas and other emissions from energy production	NO	NO	NO	NO	NO	NO	
C. CO2 transport and storage							
2. Industrial processes	0.00	0.00	0.00	0.00	0.00	0.00	12.50
A. Mineral industry							
B. Chemical industry	NO	NO	NO	NO	NO	NO	
C. Metal industry	NO	NO	NO	NO	NO	NO	
D. Non-energy products from fuels and solvent use	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	
E. Electronic industry							
F. Product uses as ODS substitutes							
G. Other product manufacture and use	0.00	0.00	0.00	0.00	0.00	0.00	12.50
H. Other	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	
3. Agriculture	4.01	4.08	4.21	4.22	4.45	4.54	-45.69
A. Enteric fermentation							
B. Manure management	0.36	0.36	0.35	0.35	0.36	0.37	-63.57
C. Rice cultivation							
D. Agricultural soils	3.65	3.72	3.85	3.87	4.09	4.16	-43.19
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	
F. Field burning of agricultural residues	NO	NO	NO	NO	NO	NO	
G. Liming							
H. Urea application							
I. Other carbon containing fertlizers							
J. Other	NO	NO	NO	NO	NO	NO	
4. Land use, land-use change and forestry	2.21	2.26	2.28	2.30	2.32	2.35	20.66
A. Forest land	1.91	1.93	1.94	1.95	1.97	1.98	3.54
B. Cropland	0.12	0.12	0.11	0.10	0.09	0.08	616.32
C. Grassland	0.10	0.10	0.10	0.09	0.09	0.09	47,128.79
D. Wetlands	0.01	0.01	0.01	0.01	0.01	0.01	0.00
E. Settlements	0.07	0.09	0.11	0.13	0.15	0.18	5,672.45
F. Other land	NO	NO	NO	NO	NO	NO	
G. Harvested wood products							
H. Other	NO	NO	NO	NO	NO	NO	
5. Waste	0.04	0.04	0.04	0.04	0.04	0.04	11.09
A. Solid waste disposal							
B. Biological treatment of solid waste	0.00	0.00	0.01	0.01	0.01	0.00	
C. Incineration and open burning of waste	0.01	0.01	0.01	0.01	0.01	0.01	-11.01
D. Waste water treatment and discharge	0.03	0.02	0.02	0.03	0.03	0.02	7.69
E. Other	NO	NO	NO	NO	NO	NO	
6. Other (as specified in the summary table in CRF)	NO	NO	NO	NO	NO	NO	
Total direct N2O emissions without N2O from LULUCF	4.44	4.50	4.61	4.64	4.90	4.98	-43.97
Total direct N2O emissions with N2O from LULUCF	6.66	6.76	6.88	6.94	7.22	7.33	-32.37
Memo items:							
International bunkers	0.08	0.11	0.12	0.12	0.14	0.12	-34.13
Aviation	0.01	0.01	0.01	0.01	0.01	0.01	140.94
Navigation	0.07	0.10	0.10	0.11	0.12	0.11	-40.10
Multilateral operations	NA	NA	NA	NA	NA	NA	
CO2 emissions from biomass							
CO2 captured							
Long-term storage of C in waste disposal sites							
Indirect N2O	IE, NA, NO	IE, NA, NO	IE, NA, NO	IE, NA, NO	IE, NA, NO	IE, NA, NO	
Indirect CO2 (3)							

Abbreviations : CRF = common reporting format, LULUCF = land use, land-use change and

[a] 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 Conference of the Parties. For these Parties, this different base year is used to calculate the percentage change in the final column of this table.

Table 1(d) LVA_BR2_v0.1

Emission trends (HFCs, PFCs and SF_6)

(Sheet 1 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	*Base year*[a]	1990	1991	1992	1993	1994	1995	1996	1997
	kt								
Emissions of HFCs and PFCs - (kt CO2 equivalent)	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	0.67	0.84	2.03
Emissions of HFCs - (kt CO2 equivalent)	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	0.67	0.84	2.03
HFC-23	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	0.00	0.00	0.00
HFC-32	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NE, NA, NO	NE, NA, NO	NE, NA, NO
HFC-41	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
HFC-43-10mee	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
HFC-125	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE
HFC-134	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
HFC-134a	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	0.00	0.00	0.00
HFC-143	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
HFC-143a	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE
HFC-152	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
HFC-152a	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA, NE	NO, NA, NE	NO, NA, NE
HFC-161	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
HFC-227ea	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE
HFC-236cb	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
HFC-236ea	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
HFC-236fa	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
HFC-245ca	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
HFC-245fa	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA, NE	NO, NA, NE	NO, NA, NE
HFC-365mfc	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA, NE	NO, NA, NE	NO, NA, NE
Unspecified mix of HFCs(4) - (kt CO_2 equivalent)	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
Emissions of PFCs - (kt CO2 equivalent)	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
CF_4	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
C_2F_6	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
C_3F_8	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
C_4F_{10}	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
c-C_4F_8	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
C_5F_{12}	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
C_6F_{14}	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
C10F18	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
c-C3F6	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
Unspecified mix of PFCs(4) - (kt CO_2 equivalent)	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
Unspecified mix of HFCs and PFCs - (kt CO2 equivalent)	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
Emissions of SF6 - (kt CO2 equivalent)	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	0.17	0.18	0.37
SF_6	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	0.00	0.00	0.00
Emissions of NF3 - (kt CO2 equivalent)	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
NF3	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA

Note: All footnotes for this table are given on sheet 3.

Table 1(d) LVA_BR2_v0.1

Emission trends (HFCs, PFCs and SF_6)
(Sheet 2 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	*1998*	1999	2000	2001	2002	2003	2004	2005	2006	2007
Emissions of HFCs and PFCs - (kt CO2 equivalent)	3.09	3.49	5.47	8.13	10.60	13.38	18.03	24.51	42.22	63.20
Emissions of HFCs - (kt CO2 equivalent)	3.09	3.49	5.47	8.13	10.60	13.38	18.03	24.51	42.22	63.20
HFC-23	0.00	0.00	0.00	0.00	0.00	0.00	NO, NA, NE, IE	NO, NA, IE	NO, NA, IE	NO, NA, IE
HFC-32	NE, NA, NO	NE, NA, NO	NE, NA, NO	NE, NA, NO	NE, NA, NO	NE, NA, NO	0.00	0.00	0.00	0.00
HFC-41	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
HFC-43-10mee	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
HFC-125	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	0.00	0.00	0.00	0.00
HFC-134	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
HFC-134a	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.03	0.03
HFC-143	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
HFC-143a	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	0.00	0.00	0.00	0.00
HFC-152	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
HFC-152a	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	0.00	0.00
HFC-161	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
HFC-227ea	NO, NA, NE	NO, NA, NE	NO, NA, NE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HFC-236cb	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
HFC-236ea	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
HFC-236fa	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
HFC-245ca	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
HFC-245fa	NO, NA, NE	NE, NA, NO	NE, NA, NO	NE, NA, NO	NE, NA, NO	NE, NA, NO	0.00	NO, NA	NO, NA	NO, NA
HFC-365mfc	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE	NO, NA, NE
Unspecified mix of HFCs(4) - (kt CO_2 equivalent)	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
Emissions of PFCs - (kt CO2 equivalent)	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
CF_4	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
C_2F_6	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
C_3F_8	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
C_4F_{10}	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
c-C_4F_8	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
C_5F_{12}	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
C_6F_{14}	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
C10F18	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
c-C3F6	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
Unspecified mix of PFCs(4) - (kt CO_2 equivalent)	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
Unspecified mix of HFCs and PFCs - (kt CO2 equivalent)	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
Emissions of SF6 - (kt CO2 equivalent)	0.52	0.71	0.88	1.39	2.62	2.76	3.25	3.78	4.07	4.55
SF_6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Emissions of NF3 - (kt CO2 equivalent)	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA
NF3	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA

Note: All footnotes for this table are given on sheet 3.

Table 1(d) LVA_BR2_v0.1

Emission trends (HFCs, PFCs and SF_6)

(Sheet 3 of 3)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	*2008*	2009	2010	2011	2012	2013	Change from base to latest reported year
							%
Emissions of HFCs and PFCs - (kt CO2 equivalent)	79.57	83.14	79.68	82.11	90.96	108.46	
Emissions of HFCs - (kt CO2 equivalent)	79.57	83.14	79.68	82.11	90.96	108.46	
HFC-23	0.00	0.00	0.00	0.00	0.00	0.00	
HFC-32	0.00	0.00	0.00	0.00	0.00	0.00	
HFC-41	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	
HFC-43-10mee	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	
HFC-125	0.00	0.00	0.00	0.00	0.00	0.01	
HFC-134	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	
HFC-134a	0.04	0.04	0.04	0.04	0.04	0.05	
HFC-143	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	
HFC-143a	0.00	0.00	0.00	0.00	0.00	0.00	
HFC-152	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	
HFC-152a	0.00	0.00	0.00	0.00	0.00	0.00	
HFC-161	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	
HFC-227ea	0.00	0.00	0.00	0.00	0.00	0.00	
HFC-236cb	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	
HFC-236ea	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	
HFC-236fa	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	
HFC-245ca	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	
HFC-245fa	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	
HFC-365mfc	0.00	0.00	0.00	0.00	0.00	0.00	
Unspecified mix of HFCs(4) - (kt CO_2 equivalent)	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	
Emissions of PFCs - (kt CO2 equivalent)	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	
CF_4	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	
C_2F_6	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	
C_3F_8	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	
C_4F_{10}	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	
c-C_4F_8	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	
C_5F_{12}	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	
C_6F_{14}	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	
C10F18	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	
c-C3F6	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	
Unspecified mix of PFCs(4) - (kt CO_2 equivalent)	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	
Unspecified mix of HFCs and PFCs - (kt CO2 equivalent)	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	
Emissions of SF6 - (kt CO2 equivalent)	5.23	7.33	7.35	7.47	7.78	8.50	
SF_6	0.00	0.00	0.00	0.00	0.00	0.00	
Emissions of NF3 - (kt CO2 equivalent)	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	
NF3	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	

Abbreviations : CRF = common reporting format, LULUCF = land use, land-use change and forestry.

[a] 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 Conference of the Parties. For these Parties, this different base year is used to calculate the percentage change in the final column of this table.

[c]Enter actual emissions estimates. If only potential emissions estimates are available, these should be reported in this table and an indication for this be provided in the documentation box. Only in these rows are the emissions expressed as CO2 equivalent emissions.

[d]In accordance with the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories", 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, respectively. Note that the unit used for this row is kt of CO2 equivalent and that appropriate notation keys should be entered in the cells for the individual chemicals.)

Table 2(a) LVA_BR2_v0.1

Description of quantified economy-wide emission reduction target: base year[a]

Party	*Latvia*	
Base year /base period	1990	
Emission reduction target	% of base year/base period	% of 1990 [b]
	20.00	20.00
Period for reaching target	BY-2020	

[a] Reporting by a developed country Party on the information specified in the common tabular format does not prejudge the position of other Parties with regard to the treatment of units from market-based mechanisms under the Convention or other market-based mechanisms towards achievement of quantified economy-wide emission reduction targets.

[b] Optional.

Table 2(b) LVA_BR2_v0.1

Description of quantified economy-wide emission reduction target: gases and sectors covered[a]

Gases covered		*Base year for each gas (year):*
CO_2		1990
CH_4		1990
N_2O		1990
HFCs		1995
PFCs		NA
SF_6		1995
NF_3		NA
Other Gases (specify)		
Sectors covered[b]	Energy	Yes
	Transport[f]	Yes
	Industrial processes[g]	Yes
	Agriculture	Yes
	LULUCF	No
	Waste	Yes
	Other Sectors (specify)	
	Aviation in the scope of the EU-ETS	Yes

Abbreviations : LULUCF = land use, land-use change and forestry.

[a] Reporting by a developed country Party on the information specified in the common tabular format does not prejudge the position of other Parties with regard to the treatment of units from market-based mechanisms under the Convention or other market-based mechanisms towards achievement of quantified economy-wide emission reduction targets.

[b] More than one selection will be allowed. If Parties use sectors other than those indicated above, the explanation of how these sectors relate to the sectors defined by the IPCC should be provided.

[f] Transport is reported as a subsector of the energy sector.

[g] Industrial processes refer to the industrial processes and solvent and other product use sectors.

Table 2(c) LVA_BR2_v0.1

Description of quantified economy-wide emission reduction target: global warming potential values (GWP)[a]

Gases	*GWP values* [b]
CO_2	4th AR
CH_4	4th AR
N_2O	4th AR
HFCs	4th AR
PFCs	4th AR
SF_6	4th AR
NF_3	4th AR
Other Gases (specify)	

Abbreviations : GWP = global warming potential

[a] Reporting by a developed country Party on the information specified in the common tabular format does not prejudge the position of other Parties with regard to the treatment of units from market-based mechanisms under the Convention or other market-based mechanisms towards achievement of quantified economy-wide emission reduction targets.

[b] Please specify the reference for the GWP: Second Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) or the Fourth Assessment Report of the IPCC.

Table 2(d) LVA_BR2_v0.1

Description of quantified economy-wide emission reduction target: approach to counting emissions and removals from the LULUCF sector[a]

Role of LULUCF	LULUCF in base year level and target	Excluded
	Contribution of LULUCF is calculated using	

Abbreviation : LULUCF = land use, land-use change and forestry.

[a] Reporting by a developed country Party on the information specified in the common tabular format does not prejudge the position of other Parties with regard to the treatment of units from market-based mechanisms under the Convention or other market-based mechanisms towards achievement of quantified economy-wide emission reduction targets.

Table 2(e)I LVA_BR2_v0.1

Description of quantified economy-wide emission reduction target: market-based mechanisms under the Convention[a]

Market-based mechanisms under the Convention	*Possible scale of contributions (estimated kt CO_2 eq)*
CERs	NA
ERUs	NA
AAUs[i]	NA
Carry-over units[j]	NA
Other mechanism units under the Convention (specify)[d]	

Abbreviations : AAU = assigned amount unit, CER = certified emission reduction, ERU = emission reduction unit.

[a] Reporting by a developed country Party on the information specified in the common tabular format does not prejudge the position of other Parties with regard to the treatment of units from market-based mechanisms under the Convention or other market-based mechanisms towards achievement of quantified economy-wide emission reduction targets.

[d] As indicated in paragraph 5(e) of the guidelines contained in annex I of decision 2/CP.17 .

[i] AAUs issued to or purchased by a Party.

[j] Units carried over from the first to the second commitment periods of the Kyoto Protocol, as described in decision 13/CMP.1 and consistent with decision 1/CMP.8.

Table 3 LVA_BR2_v0.1

Progress in achievement of the quantified economy-wide emission reduction target: information on mitigation actions and their effects

No.	*Name of mitigation action*[a]	*Sector(s) affected*[b]	*GHG(s) affected*	*Objective and/or activity affected*	*Type of instrument*[c]	*Status of implementation*[d]	*Brief description*[e]	*Start year of implementation*	*Implementing entity or entities*	*Estimate of mitigation impact (not cumulative, in kt CO_2 eq)*	
1	Investment Support Programme for District Heating (DH) Systems: 2007-2013 EU Funds programming period*	Energy	CO_2	Effective use of fuel in the DH systems, reducing energy loss and emissions, increasing the share of RES (both for heat and CHP production)	Economic	Implemented	Increasing the efficiency of heat supply production, reducing the loss of heat energy in the DH transmission & distribution systems and fostering the replacement of imported fossil fuels with RES, including the increase of the CHP production utilising the RES. In financial programming period of 2007-2013 the support was provided by the Cohesion Fund in the frame of National operational programme "Infrastructure and services", part „Energy" (activities No3521&3522).	2010	Ministry of Economic		390.00
2	Energy Efficiency Requirements for District Heating Systems *	Energy	CO_2	More effective use of fuel in the DH system, reducing energy loss and emissions	Regulatory	Implemented	The Governmental Regulations No 1214 (2009) had defined the mandatory minimum energy efficiency for new and reconstructed DH networks put into operation after 01.01.2010. The minimum requirements were stated: 1) efficiency of heat production boilers - 92% (gaseous), 85% (liquid), 75% (solid), 2) efficiency of CHP units - 80% (gaseous & liquid), 75% (solid), 3) annual maximum heat loss in DH pipeline network - 22%.	2010	Ministry of Economic		NE
3	Investment Support in Industrial Buildings' and Technologies' Energy Efficiency to Reduce GHG emissions*	Industry/industrial processes	CO_2	Reduction of CO2 emissions in industrial/business sector entities	Economic	Implemented	Receipts from the sale of GHG emissions (pursuant to Art.17 of UNFCC Kyoto protocol) were earmarked as national Climate Change Financial Instrument (CCFI). Part of them were allocated for CO2 emissions reduction in industrial/business sector entities. Eligible investments included energy efficiency investments of different kind both in buildings and technological equipment; installation of efficient lightning; heat supply switch from fossils to RES & installation of RES based heat supply system (up to 3 MW). Commercial sector entities, which corresponds to certain NACE codes, may apply as well.	2010	Ministry of Environment and Regional Development		38
4	Investment Support Programme in Renewable Technologies for Heat and Electricity Production to Reduce GHG emissions *	Energy	CO_2	Reduction of CO2 emission by installation of RES technologies for both heat, power and CHP production,	Economic	Implemented	The support was available from the receipts of the sale of GHG emissions (national Climate Change Financial Instrument). The eligible beneficiaries were both business sector entities and public sector institutions	2010	Ministry of Environment and Regional Development		105
5	Investment Support to Produce Energy from Biomass of Agriculture and Forestry Origin: 2007-2013 EU Funds programming period*	Energy	CO_2, CH_4	Reduction of GHG emissions by electricity production in CHP mode by utilising biogas fermented in anaerobic processes from biomass of an agricultural origin.	Economic	Implemented	In financial period of 2007-2013 the support was provided by national Rural Development Programme within the sub-measure 312/311(3) for the agriculture sector business entities & service cooperatives to develop the production of electricity and heat in CHP mode by utilising biogas fermented in anaerobic processes from biomass of an agricultural or forestry origin.	2010	Ministry of Agriculture		69.3
6	Investment Support to Produce Energy from Biomass of Agriculture Origin: 2014-2020 EU Funds programming period	Energy	CO_2, CH_4	Reduction of GHG emissions by electricity production in CHP mode by utilising biogas fermented in anaerobic processes from biomass of an agricultural origin.	Economic	Planned	In financial programming period of 2014-2020 the support is provided by national Rural Development Programme within the framework of the Measure 06 "Farm and business development by supporting the non-agriculture activity", Priority 5C, to develop the production of electricity and heat in CHP mode by utilising biogas fermented in anaerobic processes from biomass of an agricultural origin.	2016	Ministry of Agriculture		12
7	Investment Support Programmes to Increase Energy Efficiency in Apartment Buildings: 2007-2013 EU Funds Programming Period*	Energy	CO_2	More efficient use of final energy, reducing energy losses and emissions by involving end-users to increase energy performance of buildings.	Economic	Implemented	In financial period of 2007-2013 the investments in energy efficient building renovation were co-financed from the EU Regional Development Fund under the Latvia national operational programme "Infrastructure and Services", activity No.344 "Energy Efficiency in Housing". The measure had 2 target audiences: 1) apartments owners of multi-apartment residential buildings, and 2) tenants of municipal social residential buildings.	2008	Ministry of Economic		43
8	Energy Performance of Buildings*	Energy	CO_2	Reducing final energy and emissions in buildings by increasing energy efficiency and public informing	Regulatory	Implemented	The recasted Law on the Energy Performance of Buildings (adopted Dec 2012) recast the general legal framework of setting the mandatory minimum energy performance requirements for buildings, the general principles of mandatory energy efficiency certification for buildings, verification of buildings heating and ventilation systems. The energy efficiency classification system for buildings are introduced by Governmental Regulations.general legal framework of setting the mandatory minimum energy performance requirements for buildings, the general principles of mandatory energy efficiency certification	2013	Ministry of Economic		NE

9	Agreements on Energy Efficiency, promoting energy audits and energy management systems in industrial enterprises*	Energy	CO_2	Raising energy efficiency in industry sector (in industrial buildings and technologies)	Voluntary Agreement	Implemented	The objective of the particular agreement is to achieve in the company the energy saving of at least 10%	2011	Ministry of Economic		NE
10	Energy Audits of Residential Multi-apartment buildings*	Energy	CO_2	More efficient use of final energy, reducing energy loss and emissions by providing recommendations for increasing energy efficiency	Information	Implemented	In 2009-2010 the government provided the financial support to realise energy audit and prepare the documentation necessary for building renovation projects. Afterwards the financial support is provided by a number of municipalities. Within the framework of eligible costs provided for renovation works by ERDF (see previous Policy 9), the financing is provided also for energy audit and preparation of construction works' technical documentation as the first stage of renovation project.	2009	Ministry of Economic		NE
11	Informing Energy Consumers of Residential Sector (Multi-apartment buildings)*	Energy	CO_2	To inform final energy consumers of the energy efficiency measures and their economic benefits.	Information	Implemented	The measure (i) motivates flats' owners to renovate them in the frame of the ERDF supported activity of Increasing energy efficiency in multi-apartment buildings (the Policy 9 above), (ii) informs and consults buildings' management companies and societies of the flats' owners regarding conditions and benefits of the Policy 9, (iii) encourages building companies, building materials producers and traders to take initiatives regarding renovation of multi-apartment buildings, (iv) raises understanding on energy efficiency and thus promotes to reduce heat energy consumption. The measure will be continued in 2014-2020 EU Funds programming period as well.	2010	Ministry of Economic		NE
12	Financial Support (Grants) for Renewable Energy Technologies in Households*	Energy	CO_2	CO2 emissions reduction by implementing RES based heat and electricity micro-generation technologies in households	Economic	Implemented	The financial support (particular programme of national Climate Change Financial Instrument) was available from the revenues of the sale of GHG emissions (under procedures pursuant to Art. 17 of UNFCCC Kyoto protocol). Eligible micro-generation technologies were: solar heat collectors (up to 25 kW), solar electricity (up to 10 kW), wind (up to 10 kW), wood, wood chips, wood pellets and straw technologies (up to 50 kW), heat pumps (up to 50 kW) as well as combined use of above technologies. Both existing houses and new buildings registered under construction were eligible. The support for 1 project might be up to 9960 EUR.	2011	Ministry of Environment and Regional Development		15
13	Investment Support Programmes in Public Sector Energy Efficiency*	Energy	CO_2	Reduction of CO2 emissions in public (municipal and state) sector	Economic	Implemented	The financial support (particular programmes of national Climate Change Financial Instrument) was available from the revenues of the sale of GHG emissions (under procedure pursuant to Art.17 of UNFCCC Kyoto protocol). The support was available to improve heating and lightning energy efficiency as well as to realize fuel switch to RES in the public buildings	2010	Ministry of Environment and Regional Development		54
14	Promotion Public Understanding on the Importance and Possibilities of GHG Emissions Reduction*	Cross-cutting	CO_2	Promotion Public Understanding on the Importance and Possibilities of GHG Emissions Reduction	Information	Implemented	Years 2010-2013. The financial support (particular programme of national Climate Change Financial Instrument) was provided from the revenues of the sale of GHG emissions (under procedures pursuant to Art.17 of UNFCCC Kyoto protocol). The support was available for publications in mass media for both general and targeted audiences, thematic broadcasts, organisation of thematic workshops and trainings for targeted audience groups, educational projects. Years 2015-2016. The measure is supported by the programme "National Climate Policy" of the EEA Financial Mechanism for years 2009-2014. The following activities are supported: education/training programmes for different audiences, information campaigns and public actions in mass media, websites, radio, TV.	2011	Ministry of Environment Protection and Regional Development		NE
15	Energy Labelling on Household Appliances*	Energy	CO_2	Reducing energy consumption and emissions in households	Regulatory	Implemented	The current mandatory energy labelling for household electrical appliances is established by the set of relevant EC Delegated Regulations (The Governmental Regulations on labelling for the first time in Latvia had been issued in 2001. The mandatory energy labelling, corresponding to the requirements of EC Directives, was established in Latvia by the set of Governmental Regulations in 2004 when Latvia had joined EU). The requirements relating to the publication of information / labelling on the consumption of energy by household appliances allow consumers to choose appliances on the basis of their energy efficiency.	2002	Ministry of Economic		NE

16	Biofuel Mix Obligation Requirement*	Transport	CO_2	Increasing the share of RES in the fuel balance of transport sector	Regulatory	Implemented	In 01.10.2009 Latvia had introduced the Biofuel Mix Obligation Requirement (Governmental Regulations No.648, 25.06.2009, Art. 8.1&9.1). 4.5-5% (volume) bioethanol mix is mandatory for the gasoline of "95" trademark. 4.5-5% (volume) biodiesel mix is mandatory for the diesel fuel, including diesels of A-F categories, utilised in moderate climate conditions, exemption is made for diesels of 0-4 classes utilised in case of arctic/winter climate conditions..	2010	Ministry of Economic		81
17	Excise Tax – Transport sector*	Transport	CO_2	To provide economic incentives regarding effective use of transport fuel and use of RES fuel in transport, thus reducing emissions	Fiscal	Implemented	"The procedure is established by the Law ""On Excise Duties"". The Art.14 determines the rates of duty for mineral oils and their substitutes. Regarding transport sector the reduced tax rates currently are applied for produced in Latvia or imported from EU member states: (1) gasoline with 70-85% (volume) of ethanol produced from agriculture origin raw materials, and (2) pure biodiesel is exempted from taxation. The Amendments, adopted 17 December 2014, had cancelled the reduced tax rate for the diesel (gas oil) with at least 30% (volume) mix. The reduced tax rate is applied for certain amount of diesel which is used for agriculture sector land cultivation and production purposes. Starting from 2010, the amendments of the Law have introduced the excise tax also for natural gas used in transport sector. "	1993	Ministry of Economy, Ministry of Finance		NE
18	Applying of differential tax rates for transport vehicles depending on age and engine size or on CO2 emission factor*	Transport	CO_2	To foster the economic advantages of vehicles with a smaller engine size and less fuel consumption, thus reducing emissions	Fiscal	Implemented	The measure is aimed at structural changes of the car fleet, which will foster a reduction in fuel consumption and the number of kilometres driven. In addition, the measure will foster a reduction in the average age of vehicles, which will also have a positive impact on the efficient use of energy. The actual legal system is established by 2 laws: (1) the law "On the Vehicle Operation Tax and Company Car Tax" determines annual taxation system for cars, (2) "The Law On Car and Motorcycle Tax" determines the taxation procedure for the car's first time registration in Latvia; the amendments of this law introduced a new taxation approach depending on CO2 emission factor per km for the new cars, previously non-registered or have been registered abroad after 01.01.2009	2007	Ministry of Transport, Ministry of Finance		41
19	New Passenger Cars Labelling on Fuel Economy Rating*	Transport	CO_2	To motivate car owners to choose fuel consumption and CO2 emissions efficient car	Information	Implemented	The labelling of cars regarding fuel consumption (litres per 100 km or km per litre) and CO2 emissions (grams per km)	2003	Ministry of Economic, Ministry of Transport		56
20	Taxation of Electricity*	Energy	CO_2	To provide economic incentives for rational use of electricity	Fiscal	Implemented	The procedure is prescribed by the Electricity Tax Law. Tax shall apply to entities who are engaged in the generation, distribution, supply, selling of electricity as well as purchasing electricity in electricity spot excahnge. The exemptions are made 1) for the electricity obtained (i) from renewable energy sources, (ii) in hydro power stations, (iii) in CHP stations complying with the efficiency criteria specified in the regulatory enactments; 2) for the electricity used for: (i) electricity generation, (ii) the generation of heat energy and electricity in CHP mode, (iii) the carriage of goods and public carriage of passengers, including rail transport and public transport in towns, (iv) household users, (v) street lighting services. 3) for autonomous producers if they correspond to certain criteria.	2007	Ministry of Economy, Ministry of Finance		NE
21	Taxation of CO2 emissions *	Energy	CO_2	To provide economic incentives to reduce CO2 emissions	Fiscal	Implemented	The procedure is prescribed by the Natural Resources Tax Law. The subject of CO2 taxation is CO2 emitting activities (installations) requiring a GHG emission permit - if the amount of the activity (installation) is below the limit defined for inclusion in EU ETS. The tax shall not be paid (Article 10) (i) for the CO2 emissions which emerges from the installations participating in the EU ETS, and (ii) while using renewable energy sources and peat. The tax rate per 1 ton of CO2 emission is gradually raised up from the starting rate 0.142 EUR up to 3.50 EUR (from 01.01.2015).	2005	Ministry of Economy, Ministry of Finance		NE
22	Taxation on Noxious Air Polluting Emissions *	Energy	CO_2	To provide economic incentives to reduce noxious air emissions, thus providing synergy with CO2 reduction, by the use of more energy efficient and less polluting technologies	Fiscal	Implemented	The procedure is prescribed by the Natural Resources Tax Law. The emissions of PM10, CO, SO2, NOx, NH3, H2S and other non-organic compounds, CnHm, VOC, metals (Cd, Ni, Sn, Hg, Pb, Zn, Cr, As, Se, Cu) and their compounds, V2O5 are taxable. Improvement of combustion processes as the technical measure to controll noxious emissions results in reducing fuel consumption as well thus creating synergy with GHG emissions emerging in both ETS and non-ETS sectors.	1991	Ministry of Economy, Ministry of Finance		NE

23	Systematic inspection of the technical conditions*	Transport	CO_2	To provide exploitation of transport vehicles in accordance with the technical requirements of the manufacturer thus reaching improvements in fuel consumption and reducing emissions	Regulatory	Implemented	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 road transport	1996	Ministry of Transport, Road Traffic Safety Directorate		NE
24	Development of public transport network*	Transport	CO_2	To decrease total fuel consumption by further development and optimisation of public transport network	Economic	Implemented	The given measure envisages the improvement of the system of public transport network; revision of the public transport subsidising system (to avoid simultaneous subsidising of parallel functioning regional and intercity buses and railway routes), harmonisation of traffic schedules; etc. Significant investments for environmentally friendly public transport, including trams and buses, infrastructure development is allocated for 2014-2020 EU Funds planning period (national Operational Programme "Growth and Employment", investment priority No4.5)	2011	Ministry of Transport		NE
25	Performance of Heat Generators for Space Heating and the Production of Hot Water*	Energy	CO_2	Reducing energy and emissions by prescribing essential requirements for heat boilers	Regulatory	Implemented	In 26 September 2013 the Commission Regulation (EU) No 813/2013 of 2 August 2013 had come into force. Latvia has used the transition period. Namely, up to 26 September 2015 the Latvia Governmental Regulations on Hot-Water Boilers are in force. These Regulations prescribe the essential energy efficiency requirements for water heating boilers, fuelled by gaseous or solid fuels with nominal heat capacity in the range of 4-400 kW and used for heat supply	2004	Ministry of Economic		NE
26	Preferential Feed-in Tariffs for Renewables*	Energy	CO_2	Increasing RES utilization in the electricity supply	Economic	Implemented	Application of RES feed-in tariffs in dependence of RES type and unit capacity. In the period 26 May 2011 - 01 January 2016, according Governmental Regulations, new RES electricity producers may not receive rights for selling electricity within the scope of mandatory procurement.	1996	Ministry of Economic		NE
27	Preferential Feed-in Tariffs for Combined Heat-Power Production*	Energy	CO_2	Increasing CHP production in the electricity supply	Economic	Implemented	Application of CHP feed-in tariffs in dependence of fuel type and unit capacity. In the period 10 September 2012 - 01 January 2016, according Governmental Regulations, new CHP producers may not receive rights for selling electricity within the scope of mandatory procurement.	1996	Ministry of Economic		NE
28	Energy Certification of Buildings	Energy	CO_2	More efficient use of final energy, reducing energy loss and emissions by implementing buildings' certification for increasing energy efficiency	Regulatory	Planned	The Governmental Regulations No.383 "On Energy Certification of Buildings" (adopted 09 July 2013) introduce six (A-F) energy efficiency classes for residential buildings and five classes (A-E) for non-residential buildings	2013	Ministry of Economic		NE
29	Increased minimum thermal insulation standards of buildings*	Energy	CO_2	More efficient use of final energy, reducing energy loss and emissions by implementing thermal insulation standards during construction process	Regulatory	Implemented	The actual (2014) version of Latvian Construction Standard LBN002-01 "Thermotechnics of Building Envelopes" introduce increased standards for heat transmittance coeficients for the construction elements	2014	Ministry of Economic		NE
30	Investment Support Programme for District Heating (DH) Systems: 2014-2020 EU Funds programming period	Energy	CO_2	Effective use of fuel in the DH systems, reducing energy loss and emissions, increasing the share of RES for heat production	Economic	Adopted	"The increasing efficiency and RES share in DH supply systems is supported within the framework of the new National Operational Programme "Growth and Employment", Thematic Objective No4 "Supporting the shift towards a low-carbon economy in all sectors", Specific Objective 4.3.1. "To promote energy efficiency and use of local RES in the district heating supply". Indicative activities to be supported:(i) reconstruction for increase of energy efficiency of heat production sources and use of RES, (ii) reconstruction and construction of district heat transmission and distribution systems aimed at reducing heat losses. "	2016	Ministry of Economic		71.5
31	Investment Support in Manufacturing Industry sector to promote energy efficiency and RES use	Industry/industrial processes	CO_2	Efficient use of energy resources, reduction of energy consumption and transfer to RES in manufacturing industry	Economic	Adopted	"Development of new, innovative energy-saving technology, measures increasing energy efficiency and share of RES is supported within the framework of the new national Operational Programme "Growth and Employment", Thematic Objective No4 "Supporting the shift towards a low-carbon economy in all sectors", the Specific Objective 4.1.1. Indicative activities to be supported: (i) measures for the improvement of energy efficiency of buildings of manufacturing industry enterprises, (ii) energy certification of buildings, (iii) acquisition and installation of new and efficient thermal (heat) energy, electricity producing and water boiler production equipment using RES. "	2016	Ministry of Economic		17

32	Investment Support to Improve Energy Efficiency in Food Processing Enterprises	Industry/industrial processes	CO_2	improvement of energy efficiency of food processing enterprises and agriculture sector in general	Economic	Adopted	The financial support is provided within the framework of the Measure 04 "Investments" of the national Rural Development Programme , under the priority 5B (other investments may bring energy efficiency improvements indirectly as well).	2016	Ministry of Agriculture		NE
33	Investment Support Programme to Increase Energy Efficiency in Apartment Buildings: 2014-2020 EU Funds programming period	Energy	CO_2	More efficient use of final energy, reducing energy loss and emissions by involving end-users to increase energy performance of buildings	Economic	Adopted	Increasing of energy efficiency in multi-apartment buildings is supported within the framework of the national Operational Programme "Growth and Employment": Thematic Objective No4 "Supporting the shift towards a low-carbon economy in all sectors", Specific Objective 4.2.1. "To increase energy efficiency in public and residential buildings". The financial assistance will be provided in the following forms of subsidy (grant), repayable loan with low interest rate, guarantee for the loan. Subsidy will apply if the certain required energy efficiency level after renovation works will be reached.	2016	Ministry of Economic		26
34	Investment Support Programme to Increase Energy Efficiency in Public (State Central Government) Buildings: 2014-2020 EU Funds programming period	Energy	CO_2	More efficient use of final energy, reducing energy loss and emissions by increasing energy performance of buildings	Economic	Adopted	"Increasing of energy efficiency in state (central government) public buildings is supported within the framework of the national Operational Programme "Growth and Employment": Thematic Objective No4 "Supporting the shift towards a low-carbon economy in all sectors", Specific Objective 4.2.1. "To increase energy efficiency in public and residential buildings". Positive financial return of investments is the most important criterion for support. "	2016	Ministry of Economic		14
35	Investment Support Programme to Increase Energy Efficiency in Municipal Buildings: EU Funds Programming Period of 2014-2020	Energy	CO_2	More efficient use of final energy, reducing energy loss and emissions by increasing energy performance of buildings	Economic	Adopted	"Increasing of energy efficiency in public buildings of municipalities is supported within the framework of the national Operational Programme "Growth and Employment", Thematic Objective No4 "Supporting the shift towards a low-carbon economy in all sectors", the Specific Objective 4.2.2. "To facilitate the increase of energy efficiency in municipal buildings, according to the integrated development programme of the municipality". "	2016	Ministry of Economic		NE
36	Investments in Biomass Technologies for Heat Production to Reduce GHG Emissions	Energy	CO_2	Contribute to achieving the Latvian climate goals for 2020 and 2030, by implementation of activities in the non-ETS sector - replace the existing fossil fuels with renewable energy resources.	Economic	Adopted	Latvia has revenues from the auctioning of Latvia's allocated EU ETS GHG emission quotas, these revenues form the national Emissions Quotas Auctioning Financial Instrument will provide co-financing for the described particular measure. The measure will intend to provide financial support for the transition from fossil energy sources based to biomass-based heat producing technologies, which will result in CO2 emissions reduction.	2016	Ministry of Environment Protection and Regional Development		15
37	Electromobility Development	Transport	CO_2	CO2 reduction by use of electric vehicles	Economic	Adopted	Year 2014. The financial support (particular programme of national Climate Change Financial Instrument) was provided from the revenues of the sale of GHG emissions (under procedures pursuant to Art.17 of UNFCCC Kyoto protocol). The support was availaible for purchase of electric vehicles and installation of public charging points. Years 2015-2022. Development of electric vehicles charging infrastructure is supported within the framework of the new national Operational Programme "Growth and Employment", Thematic Objective No4 "Supporting the shift towards a low-carbon economy in all sectors", Investment Priority 4.4. „To promote low-carbon strategies for all types of territories, in particular for urban areas, including the promotion of sustainable multimodal urban mobility and mitigation-relevant adaptation measures", the Specific Objective 4.4.1. "To develop EV charging infrastructure in Latvia" corresponding to this Investment priority. Thus creation of electric vehicles charging network as crucial precondition for electromobility development will be reached.	2016	Ministry of Environment Protection and Regional Development		NE
38	Implementation of the EU Emissions Trading Scheme*	Energy	CO_2	Reduction of CO2 emissions emitted by EU ETS operators	Regulatory	Implemented	Limitation of amount of emission quota allocated for ETS operators	2005	Ministry of Environment Protection and Regional Development		NE
39	Latvia National Renewable Action Plan	Energy	CO_2	Target is to increase the use of RES from 32.6% of gross final energy consumption (GFEC) in 2005 up to 40% in 2020, and to increase it gradually thereafter	Regulatory	Adopted	Latvia's Renewable Energy Action Plan sets the following sub-targets regarding the share of renewable energy in 2020, this share must reach (i) in the transport sector - at least 10% of GFEC, (ii) in the electricity sector – at least 59.8% of GFEC, (iii) in the heating and cooling sector – 53.4% of GFEC.	2010	Ministry of Economic		192

40	Organic farming	Agriculture	N_2O	Expanding organic farming area for reduction of fertilizer/manure use on cropland and support other activities improving cropland management	Economic	Adopted	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.	2016	Ministry of Agriculture		213
41	Precision agriculture technologies	Agriculture	N_2O, CH_4	Reduction of GHG emissions	Voluntary Agreement	Adopted	Reduction of N2O emissions	2016	Ministry of Agriculture		NE
42	Precision livestock feeding strategies	Agriculture	CH_4, N_2O	Improved livestock management	Voluntary Agreement	Adopted	reduction of GHG emissions	2016	Ministry of Agriculture		NE
43	"Introduction of leguminous plants on arable land"	Agriculture	N_2O	"improving cropland management by increasing 5% leguminous plants in arable land structure"	Voluntary Agreement	Adopted	Support to use of legumes as green manure and fodder in crop rotation	2016	Ministry of Agriculture		NE
44	Management of nitrate vulnerable territories*	Agriculture	N_2O	Reduction of fertilizer/manure use on cropland	Regulatory	Implemented	"Restriction for nitrogen usage, reduction of nitrogen leaching. Water protection against pollution caused by nitrates from agricultural sources. Rules for management of vulnerable zones"	2014	Ministry of Agriculture		NE
45	Requirements for the protection of soil and water from agricultural pollution caused by nitrates*	Agriculture	N_2O	Regulations for N fertilizer and manure usage.	Regulatory	Implemented	Restriction for nitrogen usage, reduction of nitrogen leaching. The limit of 170 kg nitrogen from manure and digesters per hectare, limits for other fertilizers use.Reduction of nondirect N2O emissions	2014	Ministry of Agriculture		NE
46	Crop fertilization plans*	Agriculture	N_2O	Providing calculations of N content of manure, determining N requirements for a certain crop upon planning the expected yield	Regulatory	Implemented	"If managed land is over 20 ha at vulnerable territories farms prepare crop fertilization plans. Providing calculations of N content of manure, determining N requirements for a certain crop upon planning the expected yield."	2012	Ministry of Agriculture		NE
47	"Requirements for manure storage and spreading"*	Agriculture	CH_4, N_2O	Requirements for storing of manure to improve animal waste management systems	Regulatory	Implemented	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.	2014	Ministry of Agriculture		NE
48	Integrated farming	Agriculture	N_2O	to improve cropland management and reduction of agriculture pollution	Voluntary Agreement	Adopted	"The growing of agricultural products utilising environmentally friendly measures, preserving biological diversity and reducing risks to human health and the environment, at the same time ensuring plant protection, animal health and welfare measures."	2014	Ministry of Agriculture		NE
49	Cropland drainage	Agriculture	CO_2	improving of cropland management	Economic	Adopted	Restoration of malfunctioning drainage systems in cropland	2016	Ministry of Agriculture		6
50	Production of legumes	Agriculture	CO_2	to improve management of organic soils	Economic	Adopted	Support to use of legumes as green manure and fodder in crop rotation	2016	Ministry of Agriculture		NE
51	"Reducing of biodegradable waste landfilling"*	Waste management/waste	CH_4	Reduce amount of landfilled biodegradable wastes	Regulatory	Implemented	"Decreasing of the maximum amount of biologically degradable municipal wastes deposited on landfills according to the Landfill Directive 99/31/EC. Till 2020 reduce biodegradable waste disposing till 35% of 1995 biodegradable waste amount."	2006	Ministry of Environment Protection and Regional Development		92
52	Municipal waste recycling*	Waste management/waste	CH_4	Enhance recycling	Regulatory	Implemented	Increase waste recycling to reach recycling share 50% till 2020	2012	Ministry of Environment Protection and Regional Development		NE
53	Regulations on emissions of pollutants into the aquatic environment*	Waste management/waste	CH_4	To provide complient treatment of urban waste water in agglomerations larger than 2000 p.e.	Regulatory	Implemented	Current national law is taking into account EC Directive on Urban Waste Water Treatment, aimed to protect surface waters from organic pollution and requiring to provide proper treatment of urban waste water from settlements large enough (i.e. agglomerations) to be source of significant pollution.	2002	Ministry of Environment Protection and Regional Development		NE

54	Reduce emissions of fluorinated greenhouse gases*	Industry/industrial processes	HFCs, PFCs	Reduction of emissions of fluorinated gases; Replacement of fluorinated gases by other substances	Regulatory	Implemented	Regulations for the containment, use, recovery and destruction of certain fluorinated greenhouse 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 commercialisation, as well as to the training and certification of personnel and enterprises.	2006	Ministry of Environment Protection and Regional Development		NE
55	Reduce emissions of fluorinated greenhouse gases.*	Industry/industrial processes	HFCs, PFCs	Reduction of emissions of fluorinated gases; Replacement of fluorinated gases by other substances	Regulatory	Implemented	Prevent and minimise emissions of fluorinated greenhouse gases. Bans on the placing on the market, maintainance and service products and equipment containing HFCs with high GWPs.	2015	Ministry of Environment Protection and Regional Development		NE
56	Improve control of fugitive emissions from F gases consumption and phase out particular F gas used in Mobile air conditioning*	Industry/industrial processes	HFCs, PFCs	Reduction of emissions of fluorinated gases. Improved control of fugitive emissions from F gases consumption.	Regulatory	Implemented	"Regulation lay down the requirements for the EC type approval or national type-approval of vehicles as regards emissions from, and the safe functioning of, air-conditioning systems fitted to vehicles. Regulation contains provisions on retrofitting and refilling of such systems. These requirements are set according to objective of EU policy to reduce emissions of fluorinated greenhouse gases in the air-conditioning systems fitted to passenger cars and light commercial vehicles and prohibit from a certain date air-conditioning systems designed to contain F-gases with a global warming potential higher than 150."	2008	Ministry of Environment Protection and Regional Development		NE
57	LULUCF accounting (LULUCF Decision 529/2013/EU)*	Forestry/LULUCF	CO_2	Robust accounting of LULUCF activities across Europe	Regulatory	Adopted	Provides the basis for a formal inclusion of the LULUCF sector and ensures a harmonized legal framework allowing the collection of reliable data by robust accounting and reporting in a standardised way.	2013	Ministry of Agriculture		NE

Note: The two final columns specify the year identified by the Party for estimating impacts (based on the status of the measure and whether an ex post or ex ante estimation is available).

Abbreviations: GHG = greenhouse gas; LULUCF = land use, land-use change and forestry.

[a] Parties should use an asterisk (*) to indicate that a mitigation action is included in the 'with measures' projection.

[b] To the extent possible, the following sectors should be used: energy, transport, industry/industrial processes, agriculture, forestry/LULUCF, waste management/waste, other sectors, cross-cutting, as appropriate.

[c] To the extent possible, the following types of instrument should be used: economic, fiscal, voluntary agreement, regulatory, information, education, research, other.

[d] To the extent possible, the following descriptive terms should be used to report on the status of implementation: implemented, adopted, planned.

[e] Additional information may be provided on the cost of the mitigation actions and the relevant timescale.

[f] Optional year or years deemed relevant by the Party.

Reporting on progress[a, b]

	Total emissions excluding LULUCF	*Contribution from LULUCF*[d]	*Quantity of units from market based mechanisms under the Convention*		*Quantity of units from other market based mechanisms*	
Year[c]	*(kt CO_2 eq)*	*(kt CO_2 eq)*	*(number of units)*	*(kt CO_2 eq)*	*(number of units)*	*(kt CO_2 eq)*
(1990)	26,326.48		NA		NO	
2010	12,011.12		NA		NO	
2011	11,244.09		NA		NO	
2012	11,078.53		NA		NO	
2013	11,025.43		NA, NO		NO	
2014	NA		NO, NA		NO	

Abbreviation : GHG = greenhouse gas, LULUCF = land use, land-use change and forestry.

[a] Reporting by a developed country Party on the information specified in the common tabular format does not prejudge the position of other Parties with regard to the treatment of units from market-based mechanisms under the Convention or other market-based mechanisms towards achievement of quantified economy-wide emission reduction targets.

[b] For the base year, information reported on the emission reduction target shall include the following: (a) total GHG emissions, excluding emissions and removals from the LULUCF sector; (b) emissions and/or removals from the LULUCF sector based on the accounting approach applied taking into consideration any relevant decisions of the Conference of the Parties and the activities and/or land that will be accounted for; (c) total GHG emissions, including emissions and removals from the LULUCF sector. For each reported year, information reported on progress made towards the emission reduction targets shall include, in addition to the information noted in paragraphs 9(a–c) of the UNFCCC biennial reporting guidelines for developed country Parties, information on the use of units from market-based mechanisms.

[c] Parties may add additional rows for years other than those specified below.

[d] Information in this column should be consistent with the information reported in table 4(a)I or 4(a)II, as appropriate. The Parties for which all relevant information on the LULUCF contribution is reported in table 1 of this common tabular format can refer to table 1.

Custom Footnotes

Total GHG emissions (with indirect), including domestic and international aviation, but excluding LULUCF, as reported to the UNFCCC in 2015. Thus no data for 2014 is available.

Table 4(b) LVA_BR2_v0.1

Reporting on progress[a, b, c]

Units of market based mechanisms			*Year*	
			2013	*2014*
Kyoto Protocol units[d]	*Kyoto Protocol units*	*(number of units)*	NA, NO	NO, NA
		(kt CO_2 eq)		
	AAUs	*(number of units)*	NA	NA
		(kt CO2 eq)		
	ERUs	*(number of units)*	NA	NA
		(kt CO2 eq)		
	CERs	*(number of units)*	NA	NA
		(kt CO2 eq)		
	tCERs	*(number of units)*	NO	NO
		(kt CO2 eq)		
	lCERs	*(number of units)*	NO	NO
		(kt CO2 eq)		
Other units[d,e]	*Units from market-based mechanisms under the Convention*	*(number of units)*		
		(kt CO_2 eq)		
	Units from other market-based mechanisms	*(number of units)*		
		(kt CO_2 eq)		
Total		*(number of units)*	NA, NO	NO, NA
		(kt CO_2 eq)		

Abbreviations : AAUs = assigned amount units, CERs = certified emission reductions, ERUs = emission reduction units, lCERs = long-term certified emission reductions, tCERs = temporary certified emission reductions.
Note: 2011 is the latest reporting year.

[a] Reporting by a developed country Party on the information specified in the common tabular format does not prejudge the position of other Parties with regard to the treatment of units from market-based mechanisms under the Convention or other market-based mechanisms towards achievement of quantified economy-wide emission reduction targets.

[b] For each reported year, information reported on progress made towards the emission reduction target shall include, in addition to the information noted in paragraphs 9(a-c) of the reporting guidelines, on the use of units from market-based mechanisms.

[c] Parties may include this information, as appropriate and if relevant to their target.

[d] Units surrendered by that Party for that year that have not been previously surrendered by that or any other Party.

[e] Additional rows for each market-based mechanism should be added, if applicable.

Custom Footnotes

Use of units from mechanisms cannot be quantified at the time of reporting.

Table 5 LVA_BR2_v0.1

Summary of key variables and assumptions used in the projections analysis[a]

Key underlying assumptions		*Historical*[b]								Projected		
Assumption	*Unit*	*1990*	*1995*	2000	2005	2010	2011	2013	2015	2020	2025	2030
Population	*thousands*					2,097.55	2,059.71	2,012.65	1,979.90	1,938.73	1,926.86	1,923.88
Number of households	thousands					825.60	817.00	823.30	816.82	817.01	829.45	845.95
Gross domestic product	MEUR(2010)					18,367.88	19,074.04	20,841.25	21,755.60	26,779.27	33,041.48	38,852.36
Gross value added industry	MEUR(2010)					2,775.83	2,790.00	2,811.11	2,968.13	3,668.74	4,765.17	5,945.78
EU ETS carbon price	EUR(2000)/EUA								4.08	8.17	11.43	28.58
Coal import prices	EUR(2000)/GJ					2.09	2.58	2.49	3.47	4.05	4.24	4.43
Crude oil import prices	EUR(2000)/GJ					10.58	12.37	11.75	12.06	12.87	14.09	15.43
Natural gas import prices	EUR(2000)/GJ					5.53	6.07	7.60	7.23	7.54	8.08	8.66
Number of passenger-kilometres (all modes)	Mpkm					16,195.28	14,938.24	14,612.83	14,801.97	16,309.16	17,701.41	18,667.95
Freight transport tonnes-kilometres (all modes)	Mtkm					27,769.00	33,541.00	32,348.00	32,945.28	35,788.08	38,768.08	41,139.51
Number of heating degree days (HDD)	count					4,622.25	3,939.94	4,092.00	4,092.00	4,092.00	4,092.00	4,092.00
Household size (inhabitants/household)	count					2.54	2.52	2.44	2.42	2.37	2.32	2.27
Livestock-dairy cattle	thousands					164.10	164.10	165.00	170.00	195.00	213.00	231.00
Livestock - non-dairy cattle	thousands					215.40	216.50	241.50	272.00	290.00	307.50	325.00
Livestock -sheep	thousands					76.80	79.70	84.80	96.00	119.00	142.00	165.00
Livestock -pig	thousands					389.70	375.00	367.50	361.00	374.00	393.00	412.00
Livestock-poultry	thousands					4,948.70	4,417.90	4,985.80	5,359.00	6,089.00	6,770.50	7,452.00
Nitrogen input from application of synthetic fertilizers	kt N					59.50	59.80	69.70	69.70	90.00	100.00	110.00
Nitrogen input from application of manure	kt N					16.02	16.30	17.42	16.53	19.42	21.87	24.31
Nitrogen in crop residues returned to soils	kt N					14.24	16.62	18.54	22.25	26.70	29.37	32.04
Area of cultivated organic soils	ha					126,450.00	126,332.00	126,028.00	127,145.64	132,322.34	133,102.34	133,702.34

Municipal solid waste (MSW) generation	t					1,131,000.00	1,535,000.00	1,779,000.00	1,968,928.50	2,188,770.10	2,389,704.40	2,577,054.30
Municipal solid waste (MSW) going to landfills	t					605,360.00	548,700.00	533,000.00	448,000.00	322,000.00	322,000.00	322,000.00
Share of CH4 recovery in total CH4 generation from landfills	%					26.20	27.40	28.20	31.20	40.92	42.91	44.60
Primary energy consumption - coal	PJ					5.75	6.87	5.26	4.69	12.89	21.55	31.03
Primary energy consumption - oil	PJ					64.58	59.50	59.27	58.60	60.27	61.78	62.97
Primary energy consumption - natural gas	PJ					61.31	54.03	50.27	54.63	54.79	43.79	38.35
Primary energy consumption - renewables	PJ					61.38	59.34	67.46	68.78	57.93	56.89	55.80
Primary energy consumption - total	PJ					193.03	179.74	182.26	186.70	185.87	184.00	188.16
Gross electricity production - coal	TWh					0.02	0.00	0.00	0.00	0.13	0.18	0.77
Gross electricity production - oil	TWh					0.01	0.00	0.00	0.00	0.04	0.00	0.00
Gross electricity production - natural gas	TWh					2.95	3.01	2.67	2.49	2.83	2.56	2.50
Gross electricity production - renewables	TWh					3.63	3.08	3.53	3.76	3.85	3.98	3.95
Gross electricity production - total	TWh					6.63	6.09	6.21	6.25	6.86	6.72	7.23
Total net electricity imports	TWh					0.87	1.25	1.36	2.23	1.96	2.50	2.50
Final energy consumption - industry	PJ					32.47	31.32	32.16	37.01	38.33	42.99	47.49
Final energy consumption-Transport	PJ					50.27	45.98	45.32	44.84	46.00	47.44	48.60
incl.final energy demand for road transport	PJ					42.09	36.64	35.67	36.13	36.76	37.62	38.40
Final energy consumption-Residential	PJ					59.66	55.54	53.07	53.70	51.33	45.35	42.79
Final energy consumption-Agriculture/Forestry	PJ					6.58	6.46	6.48	6.73	7.08	7.59	7.94
Final energy consumption -Services	PJ					25.65	23.45	25.26	24.56	24.93	24.42	24.32
Final energy consumption-Total	*PJ*					174.63	162.76	162.28	166.84	167.67	167.78	171.14
[a] Parties should include key underlying assumptions as appropr												
[b] Parties should include historical data used to develop the greenhouse gas projections reported.												

Table 6(a) LVA_BR2_v0.1

Information on updated greenhouse gas projections under a 'with measures' scenario[a]

	GHG emissions and removals[b]							GHG emission projections	
	(kt CO_2 eq)							(kt CO_2 eq)	
	Base year (1990)	1990	1995	2000	2005	2010	2013	2020	2030
Sector[d,e]									
Energy	16,227.79	16,227.79	7,447.20	5,177.50	5,015.46	5,202.14	4,358.51	5,446.04	6,067.97
Transport	3,030.67	3,030.67	2,099.74	2,206.18	3,095.67	3,250.65	2,826.58	2,860.19	3,014.31
Industry/industrial processes	602.66	602.66	151.77	158.61	229.46	566.74	668.97	882.06	1,116.93
Agriculture	5,558.66	5,558.66	2,255.51	1,859.64	2,015.26	2,140.57	2,310.12	2,757.24	3,277.38
Forestry/LULUCF	-8,899.50	-8,899.50	-9,505.90	-7,130.69	-4,098.21	881.52	-147.78	4,905.55	7,133.75
Waste management/waste	764.59	764.59	663.06	745.31	683.93	736.84	749.54	570.71	512.45
Other (specify)									
Gas									
CO_2 emissions including net CO_2 from LULUCF	9,756.92	9,756.92	-1,369.62	-1,092.84	2,708.24	8,376.65	6,080.75	12,650.01	15,827.91
CO_2 emissions excluding net CO_2 from LULUCF	19,539.34	19,539.34	9,059.01	7,012.42	7,733.03	8,478.49	7,276.02	8,707.91	9,681.52
CH_4 emissions including CH_4 from LULUCF	4,299.65	4,299.65	2,652.30	2,339.18	2,279.00	2,263.10	2,385.07	2,287.50	2,492.47
CH_4 emissions excluding CH_4 from LULUCF	3,995.93	3,995.93	2,337.68	1,995.39	1,998.30	1,958.76	2,036.42	1,978.96	2,151.91
N_2O emissions including N_2O from LULUCF	3,228.30	3,228.30	1,827.86	1,763.86	1,926.05	2,051.69	2,183.16	2,325.33	2,552.88
N_2O emissions excluding N_2O from LULUCF	2,649.10	2,649.10	1,219.75	1,133.07	1,280.18	1,372.67	1,484.32	1,670.42	1,906.07
HFCs	NO, NA, NE	NO, NA, NE	0.67	5.47	24.51	79.68	108.46	148.22	233.97
PFCs	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NA, NO	NA, NO
SF_6	NO, NA, NE	NO, NA, NE	0.17	0.88	3.78	7.35	8.50	10.72	15.54
Other (specify)									
Total with LULUCF[f]	17,284.87	17,284.87	3,111.38	3,016.55	6,941.58	12,778.47	10,765.94	17,421.78	21,122.77
Total without LULUCF	26,184.37	26,184.37	12,617.28	10,147.23	11,039.80	11,896.95	10,913.72	12,516.23	13,989.01

Abbreviations : GHG = greenhouse gas, LULUCF = land use, land-use change and forestry.

[a] In accordance with the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications", at a minimum Parties shall report a 'with measures' scenario, and may report 'without measures' and 'with additional measures' scenarios. If a Party chooses to report 'without measures' and/or 'with additional measures' scenarios they are to use tables 6(b) and/or 6(c), respectively. If a Party does not choose to report 'without measures' or 'with additional measures' scenarios then it should not include tables 6(b) or 6(c) in the biennial report.

[b] Emissions and removals reported in these columns should be as reported in the latest GHG inventory and consistent with the emissions and removals reported in the table on GHG emissions and trends provided in this biennial report. Where the sectoral breakdown differs from that reported in the GHG inventory Parties should explain in their biennial report how the inventory sectors relate to the sectors reported in this table.

[c] 20XX is the reporting due-date year (i.e. 2014 for the first biennial report).

[d] In accordance with paragraph 34 of the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications", projections shall be presented on a sectoral basis, to the extent possible, using the same sectoral categories used in the policies and measures section. This table should follow, to the extent possible, the same sectoral categories as those listed in paragraph 17 of those guidelines, namely, to the extent appropriate, the following sectors should be considered: energy, transport, industry, agriculture, forestry and waste management.

[e] To the extent possible, the following sectors should be used: energy, transport, industry/industrial processes, agriculture, forestry/LULUCF, waste management/waste, other sectors (i.e. cross-cutting), as appropriate.

[f] Parties may choose to report total emissions with or without LULUCF, as appropriate.

Table 6(c) LVA_BR2_v0.1

Information on updated greenhouse gas projections under a 'with additional measures' scenario[a]

	GHG emissions and removals[b]							GHG emission projections	
	(kt CO_2 eq)							(kt CO_2 eq)	
	Base year (1990)	1990	1995	2000	2005	2010	2013	2020	2030
Sector[d,e]									
Energy	16,227.79	16,227.79	7,447.20	5,177.50	5,015.46	5,202.14	4,358.51	4,429.40	4,428.84
Transport	3,030.67	3,030.67	2,099.74	2,206.18	3,095.67	3,250.65	2,826.58	2,658.18	2,784.19
Industry/industrial processes	602.66	602.66	151.77	158.61	229.46	566.74	668.97	882.06	1,116.93
Agriculture	5,558.66	5,558.66	2,255.51	1,859.64	2,015.26	2,140.57	2,310.12	2,543.59	2,906.78
Forestry/LULUCF	-8,899.50	-8,899.50	-9,505.90	-7,130.69	-4,098.21	881.52	-147.78	4,905.55	7,133.75
Waste management/waste	764.59	764.59	663.06	745.31	683.93	736.84	749.54	570.75	452.04
Other (specify)									
Gas									
CO_2 emissions including net CO_2 from LULUCF	9,756.92	9,756.92	-1,369.62	-1,092.84	2,708.24	8,376.65	6,080.75	11,421.16	13,944.68
CO_2 emissions excluding net CO_2 from LULUCF	19,539.34	19,539.34	9,059.01	7,012.42	7,733.03	8,478.49	7,276.02	7,479.06	7,798.29
CH_4 emissions including CH_4 from LULUCF	4,299.65	4,299.65	2,652.30	2,339.18	2,279.00	2,263.10	2,385.07	2,151.48	2,193.28
CH_4 emissions excluding CH_4 from LULUCF	3,995.93	3,995.93	2,337.68	1,995.39	1,998.30	1,958.76	2,036.42	1,842.94	1,852.73
N_2O emissions including N_2O from LULUCF	3,228.30	3,228.30	1,827.86	1,763.86	1,926.05	2,051.69	2,183.16	2,257.96	2,435.04
N_2O emissions excluding N_2O from LULUCF	2,649.10	2,649.10	1,219.75	1,133.07	1,280.18	1,372.67	1,484.32	1,603.04	1,788.23
HFCs	NO, NA, NE	NO, NA, NE	0.67	5.47	24.51	79.68	108.46	148.22	233.97
PFCs	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NO, NA	NA, NO	NA, NO
SF_6	NO, NA, NE	NO, NA, NE	0.17	0.88	3.78	7.35	8.50	10.72	15.54
Other (specify)									
Total with LULUCF[f]	17,284.87	17,284.87	3,111.38	3,016.55	6,941.58	12,778.47	10,765.94	15,989.54	18,822.51
Total without LULUCF	26,184.37	26,184.37	12,617.28	10,147.23	11,039.80	11,896.95	10,913.72	11,083.98	11,688.76

Abbreviations : GHG = greenhouse gas, LULUCF = land use, land-use change and forestry.

[a] In accordance with the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications", at a minimum Parties shall report a 'with measures' scenario, and may report 'without measures' and 'with additional measures' scenarios. If a Party chooses to report 'without measures' and/or 'with additional measures' scenarios they are to use tables 6(b) and/or 6(c), respectively. If a Party does not choose to report 'without measures' or 'with additional measures' scenarios then it should not include tables 6(b) or 6(c) in the biennial report.

[b] Emissions and removals reported in these columns should be as reported in the latest GHG inventory and consistent with the emissions and removals reported in the table on GHG emissions and trends provided in this biennial report. Where the sectoral breakdown differs from that reported in the GHG inventory Parties should explain in their biennial report how the inventory sectors relate to the sectors reported in this table.

[c] 20XX is the reporting due-date year (i.e. 2014 for the first biennial report).

[d] In accordance with paragraph 34 of the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications", projections shall be presented on a sectoral basis, to the extent possible, using the same sectoral categories used in the policies and measures section. This table should follow, to the extent possible, the same sectoral categories as those listed in paragraph 17 of those guidelines, namely, to the extent appropriate, the following sectors should be considered: energy, transport, industry, agriculture, forestry and waste management.

[e] To the extent possible, the following sectors should be used: energy, transport, industry/industrial processes, agriculture, forestry/LULUCF, waste management/waste, other sectors (i.e. cross-cutting), as appropriate.

[f] Parties may choose to report total emissions with or without LULUCF, as appropriate.

Provision of public financial support: summary information in 2013[a]

Allocation channels	Year									
	European euro - EUR					USD [b]				
	Core/ general [c]	Climate-specific [d]				Core/ general [c]	Climate-specific [d]			
		Mitigation	Adaptation	Cross-cutting [e]	Other [f]		Mitigation	Adaptation	Cross-cutting [e]	Other [f]
Total contributions through multilateral channels:		10,000.00					13,281.00			
Multilateral climate change funds[g]										
Other multilateral climate change funds[h]										
Multilateral financial institutions, including regional development banks		10,000.00					13,281.00			
Specialized United Nations bodies										
Total contributions through bilateral, regional and other channels		1,888.07					2,507.55			
Total		11,888.07					15,788.55			

Abbreviation: USD = United States dollars.

[a] Parties should fill in a separate table for each year, namely 2011 and 2012, where 2014 is the reporting year.

[b] Parties should provide an explanation on methodology used for currency exchange for the information provided in table 7, 7(a) and 7(b) in the box below.

[c] This refers to support to multilateral institutions that Parties cannot specify as climate-specific.

[d] Parties should explain in their biennial reports how they define funds as being climate-specific.

[e] This refers to funding for activities which are cross-cutting across mitigation and adaptation.

[f] Please specify.

[g] Multilateral climate change funds listed in paragraph 17(a) of the "UNFCCC biennial reporting guidelines for developed country Parties" in decision 2/CP.17.

[h] Other multilateral climate change funds as referred in paragraph 17(b) of the "UNFCCC biennial reporting guidelines for developed country Parties" in decision 2/CP.17.

Custom Footnotes

European Central Bank (www.ecb.europa.eu) average year rate in 2013 - 1 EUR=1,3281 USD.   Domestic currency in 2014 was euro. According to data from European Central Bank (www.ecb.europa.eu) average year rate in 2014 - 1 EUR=1,3285 USD.

Each Party shall provide an indication of what new and additional financial resources they have provided, and clarify how they have determined that such resources are new and additional. Please provide this information in relation to table 7(a) and table 7(b).
Documentation Box: Assumptions: Domestic currency in 2013 was latvian lats. According to data from Central Bank of Latvia (www.bank.lv) average year rate in 2013 - 1 USD=0,52954972 LVL, According to data from European Central Bank (www.ecb.europa.eu) average year rate in 2013 - 1 EUR=1,3281 USD. Domestic currency in 2014 was euro. According to data from European Central Bank (www.ecb.europa.eu) average year rate in 2014 - 1 EUR=1,3285 USD. Voluntary contribution to the Green Climate Fund (GCF), 350 000€ , at the end of December 2014, □ Voluntary contribution to the Eastern Europe Energy Efficiency and Environment partnership Fund (E5P), 35 000€, Year 2014 □

Provision of public financial support: summary information in 2014[a]

Allocation channels	*Year*									
	European euro - EUR					*USD[b]*				
	Core/ general[c]	*Climate-specific[d]*				*Core/ general[c]*	*Climate-specific[d]*			
		Mitigation	*Adaptation*	*Cross-cutting[e]*	*Other[f]*		*Mitigation*	*Adaptation*	*Cross-cutting[e]*	*Other[f]*
Total contributions through multilateral channels:		45,000.00			350,000.00		59,782.50			464,975.00
Multilateral climate change funds[g]					350,000.00					464,975.00
Other multilateral climate change funds[h]										
Multilateral financial institutions, including regional development banks		45,000.00					59,782.50			
Specialized United Nations bodies										
Total contributions through bilateral, regional and other channels					24,985.00					33,192.57
Total		45,000.00			374,985.00		59,782.50			498,167.57

Abbreviation: USD = United States dollars.

[a] Parties should fill in a separate table for each year, namely 2011 and 2012, where 2014 is the reporting year.

[b] Parties should provide an explanation on methodology used for currency exchange for the information provided in table 7, 7(a) and 7(b) in the box below.

[c] This refers to support to multilateral institutions that Parties cannot specify as climate-specific.

[d] Parties should explain in their biennial reports how they define funds as being climate-specific.

[e] This refers to funding for activities which are cross-cutting across mitigation and adaptation.

[f] Please specify.

[g] Multilateral climate change funds listed in paragraph 17(a) of the “UNFCCC biennial reporting guidelines for developed country Parties” in decision 2/CP.17.

[h] Other multilateral climate change funds as referred in paragraph 17(b) of the “UNFCCC biennial reporting guidelines for developed country Parties” in decision 2/CP.17.

Custom Footnotes

European Central Bank (www.ecb.europa.eu) average year rate in 2013 - 1 EUR=1,3281 USD.   Domestic currency in 2014 was euro. According to data from European Central Bank (www.ecb.europa.eu) average year rate in 2014 - 1 EUR=1,3285 USD.

Each Party shall provide an indication of what new and additional financial resources they have provided, and clarify how they have determined that such resources are new and additional. Please provide this information in relation to table 7(a) and table 7(b).
Documentation Box: Assumptions: Domestic currency in 2013 was latvian lats. According to data from Central Bank of Latvia (www.bank.lv) average year rate in 2013 - 1 USD=0,52954972 LVL, According to data from European Central Bank (www.ecb.europa.eu) average year rate in 2013 - 1 EUR=1,3281 USD. Domestic currency in 2014 was euro. According to data from European Central Bank (www.ecb.europa.eu) average year rate in 2014 - 1 EUR=1,3285 USD. Voluntary contribution to the Green Climate Fund (GCF), 350 000€ , at the end of December 2014, □ Voluntary contribution to the Eastern Europe Energy Efficiency and Environment partnership Fund (E5P), 35 000€, Year 2014.□

Table 7(a) LVA_BR2_v0.1

Provision of public financial support: contribution through multilateral channels in 2013 [a]

Donor funding	*Total amount*				*Status* [b]	*Funding source* [f]	*Financial instrument* [f]	*Type of support* [f, g]	*Sector* [c]
	Core/general [d]		*Climate-specific* [e]						
	European euro - EUR	*USD*	*European euro - EUR*	*USD*					
Total contributions through multilateral channels			10,000.00	13,281.00					
Multilateral climate change funds [g]									
1. Global Environment Facility									
2. Least Developed Countries Fund									
3. Special Climate Change Fund									
4. Adaptation Fund									
5. Green Climate Fund									
6. UNFCCC Trust Fund for Supplementary Activities									
7. Other multilateral climate change funds									
Multilateral financial institutions, including regional development banks			10,000.00	13,281.00					
1. World Bank									
2. International Finance Corporation									
3. African Development Bank									
4. Asian Development Bank									
5. European Bank for Reconstruction and Development			10,000.00	13,281.00	Provided	ODA	Grant	Mitigation	Energy
6. Inter-American Development Bank									
7. Other									
Specialized United Nations bodies									
1. United Nations Development Programme									
2. United Nations Environment Programme									
3. Other									

Abbreviations: ODA = official development assistance, OOF = other official flows.

[a] Parties should fill in a separate table for each year, namely 2011 and 2012, where 2014 is the reporting year.

[b] Parties should explain, in their biennial reports, the methodologies used to specify the funds as provided, committed and/or pledged. Parties will provide the information for as many status categories as appropriate in the following order of priority: provided, committed, pledged.

[c] Parties may select several applicable sectors. Parties may report sectoral distribution, as applicable, under "Other".

[d] This refers to support to multilateral institutions that Parties cannot specify as climate-specific.

[e] Parties should explain in their biennial reports how they define funds as being climate-specific.

[f] Please specify.

[g] Cross-cutting type of support refers to funding for activities which are cross-cutting across mitigation and adaptation.

Custom Footnotes

Assumptions: 1- Domestic currency in 2013 was latvian lats. According to data from Central Bank of Latvia (www.bank.lv) average year rate in 2013 - 1 USD=0,52954972 LVL.   Domestic currency in 2014 was euro. According to data from European Central Bank (www.ecb.europa.eu) average year rate in 2014 - 1 EUR=1,3285 USD.   2-Voluntary contribution to the Green Climate Fund (GCF), 350 000€ , at the end of December 2014,   3-Voluntary contribution to the Eastern Europe Energy Efficiency and Environment partnership Fund (E5P), 35 000€, Year 2014.   4-Participation in the Eastern Europe Energy Efficiency and Environment partnership Fund (E5P) under agreement, Annually 10 000€, Year 2011-2015. In fact, payment for 2014 was carried out in 2015.

Table 7(a) LVA_BR2_v0.1

Provision of public financial support: contribution through multilateral channels in 2014[a]

Donor funding	*Total amount*				*Status*[b]	*Funding source*[f]	*Financial instrument*[f]	*Type of support*[f,g]	*Sector*[c]
	Core/general[d]		*Climate-specific*[e]						
	European euro - EUR	*USD*	*European euro - EUR*	*USD*					
Total contributions through multilateral channels			395,000.00	524,757.50					
Multilateral climate change funds[g]			350,000.00	464,975.00					
1. Global Environment Facility									
2. Least Developed Countries Fund									
3. Special Climate Change Fund									
4. Adaptation Fund									
5. Green Climate Fund			350,000.00	464,975.00	Provided	Other ()	Grant	Other ()	Not applicable
6. UNFCCC Trust Fund for Supplementary Activities									
7. Other multilateral climate change funds									
Multilateral financial institutions, including regional development banks			45,000.00	59,782.50					
1. World Bank									
2. International Finance Corporation									
3. African Development Bank									
4. Asian Development Bank									
5. European Bank for Reconstruction and Development			35,000.00	46,497.50	Provided	ODA	Grant	Mitigation	Energy
6. Inter-American Development Bank			10,000.00	13,285.00	Committed	ODA	Grant	Mitigation	Energy
7. Other									
Specialized United Nations bodies									
1. United Nations Development Programme									
2. United Nations Environment Programme									
3. Other									

Abbreviations: ODA = official development assistance, OOF = other official flows.

[a] Parties should fill in a separate table for each year, namely 2011 and 2012, where 2014 is the reporting year.

[b] Parties should explain, in their biennial reports, the methodologies used to specify the funds as provided, committed and/or pledged. Parties will provide the information for as many status categories as appropriate in the following order of priority: provided, committed, pledged.

[c] Parties may select several applicable sectors. Parties may report sectoral distribution, as applicable, under "Other".

[d] This refers to support to multilateral institutions that Parties cannot specify as climate-specific.

[e] Parties should explain in their biennial reports how they define funds as being climate-specific.

[f] Please specify.

[g] Cross-cutting type of support refers to funding for activities which are cross-cutting across mitigation and adaptation.

Custom Footnotes

Assumptions: 1- Domestic currency in 2013 was latvian lats. According to data from Central Bank of Latvia (www.bank.lv) average year rate in 2013 - 1 USD=0,52954972 LVL.   Domestic currency in 2014 was euro. According to data from European Central Bank (www.ecb.europa.eu) average year rate in 2014 - 1 EUR=1,3285 USD.   2-Voluntary contribution to the Green Climate Fund (GCF), 350 000€ , at the end of December 2014,   3-Voluntary contribution to the Eastern Europe Energy Efficiency and Environment partnership Fund (E5P), 35 000€, Year 2014.   4-Participation in the Eastern Europe Energy Efficiency and Environment partnership Fund (E5P) under agreement, Annually 10 000€, Year 2011-2015. In fact, payment for 2014 was carried out in 2015.

Table 7(b) LVA_BR2_v0.1

Provision of public financial support: contribution through bilateral, regional and other channels in 2013 [a]

Recipient country/ region/project/programme [b]	*Total amount*		*Status* [c]	*Funding source* [g]	*Financial instrument* [g]	*Type of support* [g, h]	*Sector* [d]	*Additional information* [e]
	Climate-specific [f]							
	European euro - EUR	*USD*						
Total contributions through bilateral, regional and other channels	1,888.07	2,507.55						
Belarus, Ukraine /	1,888.07	2,507.55	Provided	ODA	Other ()	Mitigation	Energy	The project - "Raising stakeholder awareness on building energy efficiency in Russia, Belarus, Ukraine".

Abbreviations: ODA = official development assistance, OOF = other official flows; USD = United States dollars.

[a] Parties should fill in a separate table for each year, namely 2011 and 2012, where 2014 is the reporting year.

[b] Parties should report, to the extent possible, on details contained in this table.

[c] Parties should explain, in their biennial reports, the methodologies used to specify the funds as provided, committed and/or pledged. Parties will provide the information for as many status categories as appropriate in the following order of priority: provided, committed, pledged.

[d] Parties may select several applicable sectors. Parties may report sectoral distribution, as applicable, under "Other".

[e] Parties should report, as appropriate, on project details and the implementing agency.

[f] Parties should explain in their biennial reports how they define funds as being climate-specific.

[g] Please specify.

[h] Cross-cutting type of support refers to funding for activities which are cross-cutting across mitigation and adaptation.

Custom Footnotes

Assumptions: 1- Domestic currency in 2013 was latvian lats. According to data from Central Bank of Latvia (www.bank.lv) average year rate in 2013 - 1 USD=0,52954972 LVL, According to data from European Central Bank (www.ecb.europa.eu) average year rate in 2013 - 1 EUR=1,3281 USD. Domestic currency in 2014 was euro. According to data from European Central Bank (www.ecb.europa.eu) average year rate in 2014 - 1 EUR=1,3285 USD.

Table 7(b) LVA_BR2_v0.1

Provision of public financial support: contribution through bilateral, regional and other channels in 2014 [a]

Recipient country/ region/project/programme [b]	*Total amount*		*Status* [c]	*Funding source* [g]	*Financial instrument* [g]	*Type of support* [g, h]	*Sector* [d]	*Additional information* [e]
	Climate-specific [f]							
	European euro - EUR	*USD*						
Total contributions through bilateral, regional and other channels	24,985.00	33,192.57						
Uzbekistan /	24,985.00	33,192.57	Provided	ODA	Other ()	Other ()	Other (Higher education)	The project - "Development cooperation project for sustainable environmental engineering education promotion between Urgench State University and Riga Technical University".

Abbreviations: ODA = official development assistance, OOF = other official flows; USD = United States dollars.

[a] Parties should fill in a separate table for each year, namely 2011 and 2012, where 2014 is the reporting year.

[b] Parties should report, to the extent possible, on details contained in this table.

[c] Parties should explain, in their biennial reports, the methodologies used to specify the funds as provided, committed and/or pledged. Parties will provide the information for as many status categories as appropriate in the following order of priority: provided, committed, pledged.

[d] Parties may select several applicable sectors. Parties may report sectoral distribution, as applicable, under "Other".

[e] Parties should report, as appropriate, on project details and the implementing agency.

[f] Parties should explain in their biennial reports how they define funds as being climate-specific.

[g] Please specify.

[h] Cross-cutting type of support refers to funding for activities which are cross-cutting across mitigation and adaptation.

Custom Footnotes

Assumptions: 1- Domestic currency in 2013 was latvian lats. According to data from Central Bank of Latvia (www.bank.lv) average year rate in 2013 - 1 USD=0,52954972 LVL, According to data from European Central Bank (www.ecb.europa.eu) average year rate in 2013 - 1 EUR=1,3281 USD. Domestic currency in 2014 was euro. According to data from European Central Bank (www.ecb.europa.eu) average year rate in 2014 - 1 EUR=1,3285 USD.

Table 9 LVA_BR2_v0.1

Provision of capacity-building support[a]

Recipient country/region	*Targeted area*	*Programme or project title*	*Description of programme or project* [b,c]
Uzbekistan	Multiple Areas	Development cooperation project for sustainable environmental engineering education promotion between Urgench State University and Riga Technical University.	The aim of the project was to train Urgench State University students and staff in sustainable environmental engineering in order to be able to carry out such training program further by using their own staff/faculty. Thus, through raising the level of training of environmental engineering will contribute to the sustainable environmental development, including production of energy, by formation of knowledgeable professionals who will be able to implement their knowledge in practice.
Belarus, Ukraine	Mitigation	Raising stakeholder awareness on building energy efficiency in Russia, Belarus, Ukraine.	The aim of the project was to increase knowledge and understanding of energy saving and building energy efficiency opportunities through a comprehensive approach for the population, non-governmental organizations (NGOs) and future specialists, taking into account socio-economic, technical and environmental aspects. (2013)

[a] To be reported to the extent possible.

[b] Each Party included in Annex II to the Convention shall provide information, to the extent possible, on how it has provided capacity-building support that responds to the existing and emerging capacity-building needs identified by Parties not included in Annex I to the Convention in the areas of mitigation, adaptation and technology development and transfer.

[c] Additional information may be provided on, for example, the measure or activity and co-financing arrangements.

Atskaites sadaļa Regulas Nr. 525/2013 un Komisijas Īstenošanas regulas Nr. 749/2014 prasību izpildei par mehānismu siltumnīcefekta gāzu emisiju pārraudzībai un ziņošanai

1. Greenhouse gas emissions in Latvia

The annual greenhouse gas inventory provides information on the historical trends in national greenhouse gas emissions and removals since 1990. This information is essential for the planning and monitoring of climate policies and for the development of GHG projections.

The greenhouse gas emissions and removals are divided into the following reporting categories according to the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories" following incorporation of the provisions of decision 24/CP.19 (UNFCCC 2013): Energy (CRF 1), Industrial processes (CRF 2), Agriculture (CRF 3), Land Use, Land Use Change and Forestry (LULUCF) (CRF 4), and Waste (CRF 5).

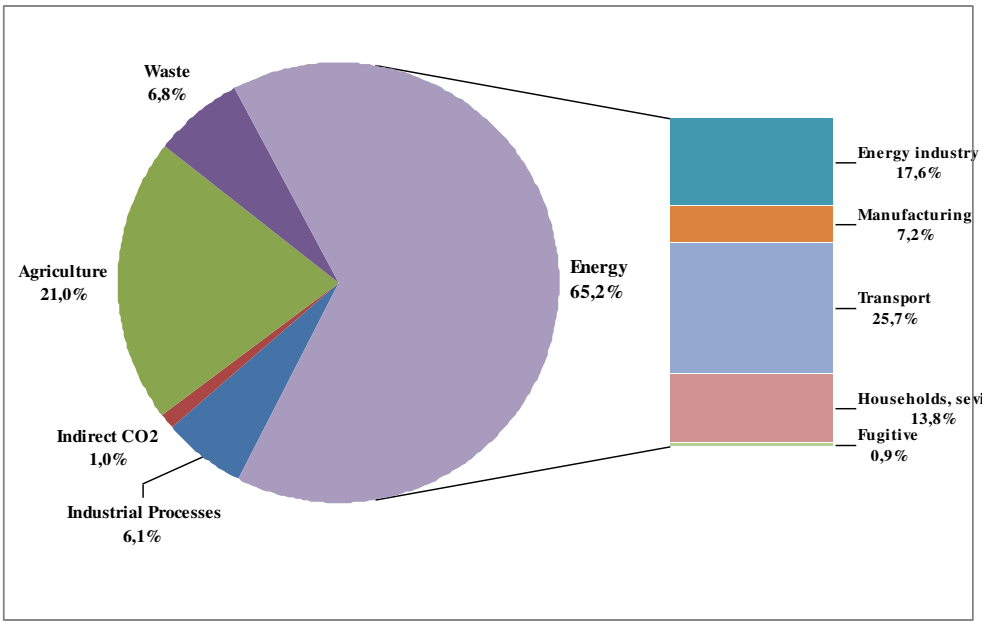

FIGURE 11 THE COMPOSITION OF LATVIA GHG EMISSIONS IN 2013 (LULUCF SECTOR EXCLUDED).

The energy sector is the most significant source of greenhouse gas emissions in Latvia with an around 65.2% (7185 Gg CO_2 eq) share of the total emissions in 2013. This reflects extensive consumption of energy for a long heating period, as well as energy consumption for transport. There are not many energy intensive manufacturing branches in Latvia. Energy-related CO_2 emissions vary mainly according to the economic trend, the energy supply structure and climate conditions including the impact on hydro power production and electricity import.

Agriculture was the second most significant source of greenhouse gas emissions in 2013, accounting for almost 21% (2311 Gg CO_2 eq) of the total emissions. The emissions of greenhouse gases (GHG) from agriculture sector include emissions of CH_4 (methane) from enteric fermentation, manure management and emissions of N_2O (nitrous oxide) from manure management and agricultural soils. Given in CO_2 eq., N_2O emission contributed 58.5%, but CH_4 emission contributed remaining 41.5% of total GHG emissions from agricultural sector. 85% of total CH_4 emissions from agriculture sector resulted from enteric fermentation and 15% from manure management. The major portion (almost 92%) of agriculture sector total N_2O emissions resulted from direct-indirect emissions; only 8% of total N_2O emissions were contributed from manure management.

The emissions from industrial processes including CO2, CH4, N2O and F-gases, were 6.1% (669 Gg CO2 eq.) of total greenhouse gas emissions in Latvia in 2013, being the fourth largest source of greenhouse gas emissions. Their share from the total greenhouse gas emissions has varied from 1.7 to 6.1 per cent of total emissions during the time period 2000 - 2013. The fluctuation in the emissions from industrial processes is largely consistent with the economic trend, even if the factors influencing the emissions are more diverse.

The waste sector accounted for 6.8% (750 Gg CO2 eq.) of total Latvia greenhouse gas emissions in 2013.

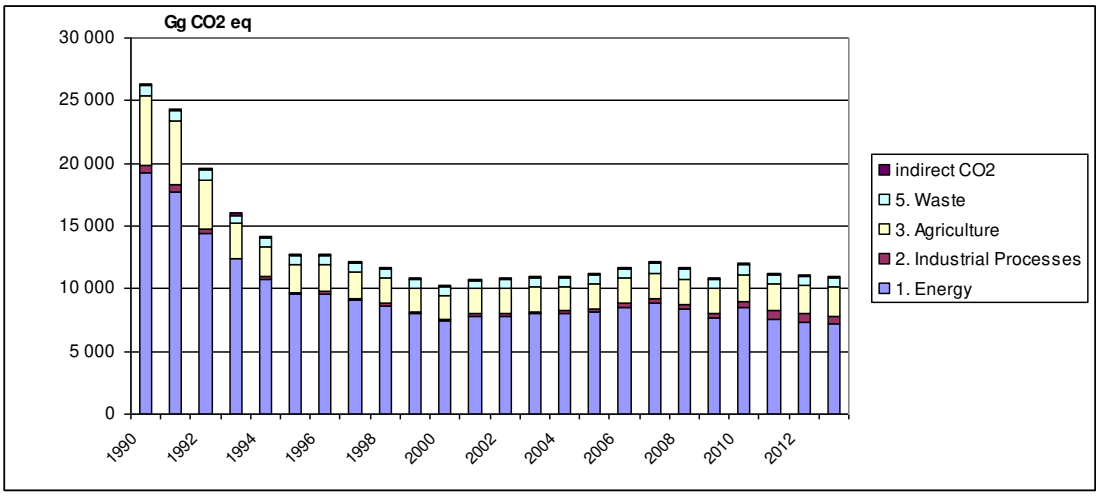

FIGURE 12 GHG EMISSIONS IN LATVIA 1990 – 2013 BY REPORTING SECTORS, GG $CO_{2\ EQ}$

In 2013, Latvia's greenhouse gas emissions totalled 11026 Gg CO2 eq. excluding LULUCF. Latvia's total GHG emissions without LULUCF in 2013 showed a decrease of 58.1% comparing to the base year (1990). Annual fluctuations in the emissions have been large. These have arisen especially from variation in the energy demand for heating depending on weather conditions (heating degree days), availability of hydro resources in national hydro energy power plants, imports of electricity, and the annual structure and volume of domestic energy production.

2. Reporting on a national system for policies and measures and projections

This chapter covers the information on Latvia´s national system for reporting on policies and measures pursuant to Article 13(1)(a) of Regulation (EU) No 525/2013 (MMR) and reporting on national systems for policies and measures and projections to Article 20 of Commission implementing Regulation (EU) No 749/2014.

Article 13.1a

(a) a description of their national system for reporting on policies and measures, or groups of measures, and for reporting on projections of anthropogenic greenhouse gas emissions by sources and removals by sinks pursuant to Article 12(1), where such description has not already been provided, or information on any changes made to that system where such a description has already been provided.

In order to set up the national system for policies and measures and projections the Order No 67 on the Environmental monitoring programm of the Minister of the Environmental Protection and Regional Development (MEPRD) of 26 February 2015 was adopted. With this Order the principles of GHG emission and CO_2 removals projections - main responsibilities of the involved institutions, parameters, timelines and methods, data flow and quality assurance and quality control principles are defined.

The overall responsibility for climate change policy making lies within MEPRD, and a number of other national institutions are involved in the implementation of this policy, including the Ministry of Finance, Ministry of Economics, Ministry of Transport and Ministry of Agriculture and institutions supervised by relevant ministries.

The Latvia's GHG inventory is compiled according to Regulations of the Cabinet of Ministers No. 217 adopted on 27 March 2012 "The National Inventory System of Greenhouse Gas Emission Units". This legislative enactment regulates institutional cooperation for establishment and maintenance of the national GHG inventory system, including data collection mechanism and the reporting procedure. Climate Change Department of MEPRD coordinates' policy related to the climate changes and renewable energy in Latvia as well as is designated as the single national entity with overall responsibility for the Latvian GHG inventory.

According to Article 20 of Commission implementing Regulation (EU) No 749/2014, Member States shall report on national systems for policies and measures and projections referred to in Article 13(1)(a) of Regulation (EU) No 525/2013, including:

(a) information concerning the relevant institutional, legal and procedural arrangements, including the designation of the appropriate national entity or entities entrusted with overall responsibility for the policy evaluation of the Member State concerned and for the projections of anthropogenic greenhouse gas emissions;

GHG emissions / removals projections are prepared by a special emissions projection calculation models, for example MARKAL for energy sector, on the basis of macro-economic indicators developed by the Ministry of Economy long-term projections and various sectoral development strategies and policy planning documents. The institutions involved in the

preparation of the GHG emissions and removals projections are laid down in the Regulation No 419 of the Cabinet of Ministers and Regulation No 67.

(b)a description of relevant institutional, legal and procedural arrangements established within a Member State for evaluating policy and for making projections of anthropogenic greenhouse gas emissions by sources and removals by sinks;

The scheme of the institutional arrangements is shown in the Annex. The institutions involved in the preparation of the projections are as follows:

MEPRD

Ministry of the Environmental Protection and Regional Development ensures the submission of the GHG emission/removals projections to the relevant international institutions (UNFCCC, EC/EIONET, CLRTAP etc.) and monitor the co-operation of the authorities involved.

Ministry of Economy (MoE)

Until 1 August, every second year, MoE shall prepare the macroeconomic, energy, industrial manufacturing, construction and agricultural sectors activity data projections.

Latvian Environment, Geology and Meteorology Centre (LEGMC)

Every second year until 1 March LEGMC collects, calculates, coordinates and harmonises the different sectors (energy, transport, agriculture, industrial process solvent and other product use, land use, land-use change and forestry, waste management) GHG emissions and air pollutants and CO_2 removal projections and prepares the descriptive part on 2015., 2020., 2025; 2030. - 2050. year in accordance with the requirements set out, on the basis of the projections delivered by the institutions involved in the development of the sectoral projections. The information shall be co-ordinated with the institutions involved and shall submit to the MEPRD.

In addition LEGMC shall prepare projections in industrial processes, wastewater treatment and waste management sector, as well as is responsible for preparation of QC procedures for relevant categories and documentation and archiving of materials of emission calculations.

Ministry of Agriculture (MoA)

Until 1 August, every second year prepare agriculture and land use, land use change and forestry sector activity data projections.

Latvian State Forest Research Institute "Silava"

In collaboration with Ministry of Agriculture is responsible for GHG emission/removals projection preparation from LULUCF sector.

Institute of Physical Energetics

Carries out emission calculation from Energy and Transport sector according to the agreement with MEPRD.

Latvia University of Agriculture

In collaboration with Ministry of Agriculture is responsible for GHG emission projection preparation from agriculture sector.

Data suppliers

- Central Statistical Bureau –main data supplier of historical statistical data;
- State Medicals Agency;
- A/S "Latvenergo" provides data on SF_6 consumption;
- Enterprises (information from databases "2-Gaiss", "3-Atkritumi", "2-ūdens" etc.);
- ETS operators.

(c) a description of the relevant procedural arrangements and timescales to ensure the timeliness, transparency, accuracy, consistency, comparability and completeness of the information reported on policies and measures and the information reported on projections;

Ministry of the Environmental Protection and Regional Development is responsible for ensuring the timeliness of the reporting.

Every second year until 1 February the involved institutions provide their respective information concerning the policies and measures and projections to the LEGMC, which compiles all the information into the reporting tools and a single paper report and send to MEPRD not later than 10 March.

Every second year, starting with 2015, the MEPRD shall submit to the EC (until 15 March) and the Climate Convention Secretariat (until 31 December) most recent available GHG projections.

Timeline that concerns the involved institutions is covered in the para b(a).

(d) a description of the overall process for the collection and use of data, together with an assessment of whether consistent processes for collection and use of data are underpinning the evaluation of policies and measures and the making of projections as well as the different projected sectors in the making of projections;

The data collection, parameters, regularity and methodology is as follows:

Direct and indirect GHG emissions and CO_2 removals projection based on estimates of the Intergovernmental Panel on Climate Change in accordance with established guidelines (guidelines 8.1. 2. section).

National projections take into account the national and EU policies and measures, and shall include:

- projections without measures (base line scenario), if available, projections with measures and with additional measures;
- the scale of the impact of policies and measures. If such a policy and measures are included, this shall be clearly indicated and explained;
- the sensitivity analysis;
- a description of the national system for reporting on policies and measures of GHG projections or details of any changes in the system, if such description has already been submitted;
- updates related to low carbon emission development strategies and progress in the implementation of this strategy;

- information on national policies and measures, as well as groups of measures on EU or national policy and the implementation of the measure group to limit or reduce GHG emissions /removals.

(e) a description of the process for selecting assumptions, methodologies and models for policy evaluation, and for making projections of anthropogenic greenhouse gas emissions;

Latvia is presently improving the national system for policies and measures and projections, using experiences with the existing national inventory system and with previous reporting to EU and UNFCCC on projections and policies.

The planned improvements of the national system of policies and measures and projections lies under 2009 – 2014 EEA GRANTS PROGRAMME "NATIONAL CLIMATE POLICY", pre-defined project "Development of the national system for greenhouse gas (GHG) inventory and reporting on policies, measures and projections". The Project is implemented by Ministry of Environmental Protection and Regional Development in cooperation with Project partners – Norwegian Environment Agency, State LTD „Latvian Environment, Geology and Meteorology" and Ministry of Agriculture.

The main objective of the project is to strengthen Latvia's institutional capacity to improve the national system for preparing, analysing and reporting high quality information to ensure continuous improvements of the GHG emission inventory, policies, measures and projections and to comply with the relevant UNFCCC, Kyoto protocol and European Commission reporting requirements. The main target groups of the project are state institutional officials and sectoral experts involved in inventory and reporting. One of the main outcomes of the project is improved quality of ex-ante and ex-post evaluation of climate change policy measures and development of model system for climate change mitigation policy evaluation, including guidelines for cost assessment of different policy measures and ex-ante and ex-post policy assessment.

The Project is implemented from 1 April 2014 until 30 April 2016.

(f) a description of the quality assurance and quality control activities and of the sensitivity analysis for projections carried out.

The quality assurance / quality control procedures and the objectives to be achieved are determined in the Regulation No 217 of the Cabinet of Ministers.

MEPRD approves the instruction developed by LEGMC on GHG emission /removals preparation, data collection in common reporting formats, QA/QC procedures.

3. Information on policies and measures

National climate policy planning

Latvia National Reforms' Programme to Implement *Europe 2020* Strategy (LNRP, approved by the Government, 26.04.2011) defines that, agreeably to the Effort Sharing Decision, GHG emission increase in Latvia non-ETS sector in total shall not increase "+17%" in year 2020, comparing to 2005. Total GHG emission in Latvia, including both EU ETS and non-ETS sectors, accordingly LNRP, shall not increase in year 2020.gadā 12.19 million $CO_{2\text{-eq.}}$ tons.

Latvia national environmental policy framework document "**Environmental Policy Strategy 2009-2015**" (approved by the Cabinet of Ministers 31.07.2009, in force till 25 March 2014) defined the climate policy objective under the section "Climate" as follows: to provide contribution of Latvia to prevention of global climate change by ensuring balance between environmental and economic interests. The following measures were provided for in order to achieve the above objective: (1) Ministry of Environmental Protection and Regional Development (MEPRD) as co-ordinator of measures in order to ensure harmonised reduction of GHG emissions and increase of CO_2 capture, (2) participation of Latvia in the flexible mechanisms of the Kyoto Protocol, (3) co-ordination of the EU Emission Trading Scheme operation in Latvia, (4) introduction a legislative framework for operation of the national GHG emission scheme, including GHG emission inventories and projections, (5) encouraging change of the consumption model according to the sustainable development approach, (6) facilitating renovation of multi-apartment buildings according to the energy audit results, (7) encouraging development and introduction of efficient and environmentally friendly technologies to increase energy efficiency and the use of renewable energy sources (RES), (8) improving the tax system with a view to reduce the use of fossil fuels and increase use of RES, (9) increasing the share of RES in the balance of energy sources, (10) supporting efficient and rational use of energy, (11) promoting scientific studies on mitigation of climate change and adaptation to it, (12) ensuring communication for informing all groups of society about climate change and for increasing public participation, encouraging initiative at local level, (13) providing the public with high-quality information on the necessity to reduce the effects of harmful climate change and about implementation of planned national measures, (14) developing the Adaptation Concept envisaging the inclusion of climate change related impact assessments and risk management in the policies of the respective sectors of national economy.

In 26 March 2014 Cabinet of Ministers adopted new Latvia's **Environmental Policy Strategy 2014-2020** *(Vides Politikas Pamatnostādnes 2014-2020.gadam)".* 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 No6 "Climate" are defined as follows: (1) to provide contribution of Latvia to prevention of global climate change by taking into account Latvia's environmental, social and economic interests, and (2) to promote Latvia's preparadness for adaptation to climate change and its impacts. The Strategy identifies the following topical problems for ensuring GHG emissions reduction and CO_2 removal, solving of which requires implementation of definite policy:

1. lack of unified policy for limiting GHG emissions concerning actions, not included in the EU ETS (inadequate integration of climate policy objectives in separate sectors policy planning documents, support instruments and measures taken, especially in the agriculture and transport sectors),
2. the risk of unproviding the CO_2 removal objective in the forestry (the reference level),
3. in the country no directions have been developed for promoting low carbon economy,
4. high energy consumption by households and the public sector,
5. low energy efficiency in buildings,
6. low ratio of biodiesel use in the transport sector and limited technical possibilities for increasing it,
7. low ratio of electric power use in the transport sector,
8. insufficient efficiency when using resources and technologies in the production processes, high energy intensity in the manufacturing sector,
9. insufficient economic and technical justification of support mechanisms and misalignment of economic instruments hamper the promotion of wider use of renewable energy resources,
10. the administrative burden hampers the operators' possibilities of implementing emission reduction measures and using free company resources to the effect,
11. national legislation does not stipulate efficiency raising measures in ETS (including non-inclusion of ETS costs in the thermal and electric power tariffs).

The most topical problems of GHG emissions inventory and projections are as follows: (i) it is essential to improve the monitoring system of GHG emissions and removals projections as well as monitoring of policy, (ii) mismatch of statistical data and the lack of integrated data base have a negative impact upon preparing of different reports on climate policy, (iii) insufficient capacity of financial, technical and personnel power resources for ensuring the national GHG inventory system and preparation of Latvia's report to the European Commission and the UNFCCC Secretariat.

The most topical problems have been identified to adapting the climate change as well.

The following policies and measures are defined by the Strategy as the most important:

5. implementation of GHG emissions reduction measures in all sectors of economy, alongside with promoting sustainable, low carbon capacity and cost-effective development,
6. integration of the climate policy targets in the policy of other sectors by setting the responsibilities of each sector and promoting cooperation between the state, local governments and the private sector,
7. raising public awareness about the climate changes and adaptation to them as well as involving people in the policy development and its implementation,
8. implementation of effective adaptation measures and their integration in the spatial planning and sector policies.

To reach the above quantitative targets, the Strategy sets the following concrete activities:

(1) ensure execution of ETS activities (the responsible ministry – the Ministry of Environmental Protection and Regional Development (MEPRD))

(2) prepare the planning document for low carbon development (the responsible ministry – MEPRD),

(3) promote sustainable use of biomass for energy production by applying low carbon emitting technologies (the responsible ministry – the Ministry of Economics (ME), involved – the Ministry of Agriculture (MA) and MEPRD),

(4) promote ensuring the supply of economically and ecologically sustainable biomass (the responsible ministry – MA),

(5) promote energy efficiency in buildings (the responsible ministry – ME, involved – MEPRD, local governments),

(6) increase the efficiency of lighting infrastructure (the responsible ministry – MEPRD, involved – local governments),

(7) promote ensuring of CO_2 removal in forest lands (the responsible ministry – MA, involved – MEPRD),

(8) promote carbon removal in wood products with long useful lifetime (the responsible ministries – MA, ME),

(9) introduce low carbon emitting technologies and sustainable farming practices in agriculture (the responsible ministry – MA),

(10) integrate climate issues in the transport policy at national and local level (the responsible ministry – the Ministry of Transport (MT), involved – local governments),

(11) develop environmentally friendly transport infrastructure and promote the use of renewable energy resources in public transport (the responsible ministry – MT, involved – ME, MEPRD, local governments),

(12) prepare and execute the plan for promoting Green Public Procurement (the responsible ministry – MEPRD),

(13) research in the fields of climate change and adaptation (the responsible ministries – MEPRD, MA, involved – ME, the Ministry of Education and Science),

(14) promote the use of renewable energy resources and energy efficiency in district heating (the responsible ministry – ME),

(15) develop Green Technologies Incubator (the responsible ministry – ME),

(16) prepare and implement a climate change action plan (the responsible ministry – MEPRD, involved – ME, MA, MT).

During years 2005-2010 the national **"Climate Change Reduction Programme 2005-2010"** (approved by the Government, 06.04.2005) was in force. Its primary goal was to ensure that as from year 2008 the total GHG emission does not exceeds 92% of the level of 1990. The following policies and measures were defined by the Programme for achieving the above target: (1) to increase the share of RES in the balance of energy sources, (2) to increase the efficiency

of use of energy sources, (3)to develop environmentally friendly transport system, (4) to promote introduction of the best available methods, environmentally friendly technologies and cleaner production, (5) to promote introduction of agricultural methods which preserve environment and reduce direct GHG emissions, (6) to increase the CO_2 capture in forestry sector, (7) to establish waste management system ensuring collection of biogas at household waste disposal sites, (8) to participate in the EU ETS and the Flexible Mechanisms of the Kyoto Protocol, (9) to promote introduction of environment management systems. As stated by the new Latvia's Environmental Policy Strategy 2014-2020, a new national climate programme will be developed which would contain policies and measures to limit the GHG emissions in Latvia agreeably to the EU climate policy framework.

Participation in the flexible mechanisms of the Kyoto protocol

Latvia as a Member State of the Kyoto Protocol of the UNFCCC has a possibility to participate in the flexible mechanisms provided for in the Protocol. Latvia is using two Kyoto mechanisms – joint implementation (JI) as a host country and international emissions trading (IET) as a seller. Especially important in case of Latvia is the IET mechanism. Latvia government ensures that every AAU sold will be used for "greening" purposes which means climate change mitigation, promotion of low carbon economy development by application of innovative environmental technologies, increase of RES use and improvement of energy efficiency as well as capacity building for climate change policy design and implementation.

Funds obtained from the sale of GHG emissions allowances (national Climate Change Financial Instrument) were directed by open tenders to investment projects' assistance focused on reduction of CO_2 (GHG) emissions by improving energy efficiency and use of RES (see below the description of the measures). Important, the special "soft" programmes were focused on general public and stakeholders capacity building, promotion public understanding on the importance and possibilities of GHG emissions reduction (see the description of the given measure above), on supporting R&D, innovative environmentally friendly energy technologies pilot projects.

Participation in EEA Financial Mechanism 2009-2014

1. Programme "National Climate Policy"

The objective of the Programme is to support Latvia in developing a comprehensive national climate policy covering non-TES sector as regards emissions, and all sectors as regards adaptation. Within Programme the Latvian institutional capacity in national climate policy development and implementation is strengthened, including information analyses, scenario development, society involvement, policy analyses and development of documents for integrated climate change mitigation and adaptation to climate change management.

The Programme includes both pre-defined projects and open calls.

Within the framework of the Programme two pre-defined projects are being implemented:

3. "Development of the National System for GHG Inventory and Evaluation and Reporting on Policies, Measures and Projections",
4. "Development of Proposals for National Adaptation Strategy, including Identification of Scientific Data, Measures for Adapting to Changing Climate, Impact and Cost Evaluation".

Project Promoter of both pre-defined projects is the MEPRD and both pre-defined projects have partners from Norway, namely, the 1st pre-defined project is being implemented in co-operation with the Norwegian Environment Agency.

In 2014 two calls for proposals were carried out – (1} open call "Emission reduction technologies including renewable energy, sustainable buildings and technology development" (according to the project selection results in total 7 projects applications was approved for financing) and (2) small grant scheme "Capacity building in the Field of Research and Measures for Enhancing Society's Understanding about Climate Change and its Consequences" (18 projects applications approved for financing).

2. Programme "Green Industry Innovation"

Development of green incubators is stated as one of the Latvia's Environmental Policy Strategy's 2014-2020 actions. Ministry of Economics is the responsible ministry for the implementation of the programme "Green Industry Innovation". The Programme includes pre-defined project (Establishment of Green Technology Incubator), open call (Financial assistance for implementation of green technologies in production process) and small grant scheme. Responsible institution supervising the implementation of the programme – Investment and Development Agency of Latvia.

Energy

To increase the share of renewable energy sources (RES) in the balance of energy sources

According to national „***Energy Development Guidelines 2007-2016***" and „***Guidelines on Use of Renewable Energy Sources 2006-2013***", for the purpose of achieving the defined goal of self-supply at the level of at least 36-37% of the total consumption of primary energy resources, increase of use of RES should be promoted in the fields of electricity generation, heat production and also transport sector. Use of RES should be co-ordinated with sustainability of forests and agriculture development. The ***Electricity Market Law*** stipulates that the share of the total consumption by all end consumers of electricity in Latvia which has to be covered by electricity generated from RES shall amount to 49.3% of the total national electricity consumption in 2010.

Pursuant to Annex I(A) to Directive 2009/28/EC, Latvia's target is to increase the use of RES from 32.6% of gross final energy consumption (GFEC) in 2005 up to 40% in 2020. This goal is stated by the **Latvia National Renewable Action Plan**[25] and is included in WAM scenario when preparing GHG emissions projections. Latvia's Renewable Energy Action Plan sets the following sub-targets regarding the share of renewable energy in 2020, this share must reach (i) in the transport sector - at least 10% of GFEC, (ii) in the electricity sector – at least 59.8% of GFEC, (iii) in the heating and cooling sector – 53.4% of GFEC, (iv) in the building sector regarding heating and cool– 58% (in residential sector buildings – 72%, in commercial sector buildings – 44% of GFEC).

[25] Informative Report. Republic of Latvia National Renewable Energy Action Plan for implementing Directive 2009/28/ES of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC by 2020

The priority Policies and Measures to increase the share of RES in the balance of energy sources are as follows:

Investment Support Programme for District Heating (DH) Systems.

In financial planning period of 2007-2013 the investment support was provided by the Cohesion Fund (CF) in the framework of the Latvia national operation programme „Infrastructure and Services", part „Energy". The "Energy" programme was aimed at increasing the efficiency of heat supply, reducing the loss of heat energy in DH transmission and distribution systems and fostering replacement of imported fossil fuels with RES, including both the increase of heat production units and CHP units utilising the RES. The programme consisted of 2 activities: (1) ***„Measures to increase the efficiency of district heating systems"*** (activity No 3521) to support heat supply efficiency improvements in DH systems and development of RES utilising heat production units, and (2)***„Development of combined heat-power plants utilising renewable energy sources"*** (activity No.3522) to support development of RES utilising CHP units. The support for the whole period provided by the CF constitute 107.571[26] MEUR of which 78.797 MEUR (~ 73%) for the energy efficiency increase in DH systems pipeline networks and introduction of effective biomass based heat production units (activity 3521) and 28.775 MEUR (~ 27%) for the introduction of RES based CHP (activity 3522). As a result of the programme (i) it is implemented 10 CHP projects, utilising RES, with total electrical capacity of 36.75 MW_{el} and heat capacity 106.45 MW_{th}[27] (ii) the total supported biomass based heat boilers production capacity will be at least 200 MW_{th} and higher.

In financial planning period of 2014-2020 the investment support from CF is provided within the framework of the national Operational Programme "Growth and Employment", Thematic Objective No4 "Supporting the shift towards a low-carbon economy in all sectors", Investment Priority 4.3. "To Promote the Production and Distribution of Energy derived from RES", the Specific Objective 4.3.1. "To promote energy efficiency and use of local RES in district heating systems"[28]. In total with re-construction and construction of DH systems it is expected to achieve at least 143 MW increase in RES heat capacity, of which 70MW will be achieved by EU CF funds, but remaining by private companies. As a result of planned investment, the efficiency of DH system will be improved, while supplementing investment in energy efficiency of buildings. The share of renewable energy produced in DH systems will rise from the baseline value 18.8% (2012) up to target value of 20.7% in year 2023 (CH specific result indicators). The total amount of financial support is planned ~ 53.2 MEUR (of which 50% for the Intervention Category 11[29] "Renewable Energy: Biomass" and 50% for the Intervention Category 16 "High efficiency cogeneration and district heating").

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[26] Ministry of Economics. EU Funds Implementation Progress: monthly report (26.06.2015), https://www.em.gov.lv/lv/es_fondi/istenosanas_progress_/

[27] Ministry of Economics. Informative Report (28.03.2013) "Action Plan to Limit the Risks Increasing the Total Price of Electricity (Rīcības plāns elektroenerģijas kopējās cenas pieauguma risku ierobežošanai)", in Latvian, p.5.

[28] Operational Programme "Growth and Employment". Ministry of Finance of the Republic of Latvia, English translation: http://www.esfondi.lv/upload/Planosana/FMProg_270115_OP_ENG_2.pdf, sections 333-344.

[29] Intervention categories according the Commissions Implementing Regulation (EU) No215/2014).

Investment Support Programme in Renewable Technologies for Heat and Electricity Production to Reduce GHG emissions. The support (national Climate Change Financial Instrument, CCFI) was provided in years 2010-2012 from the receipts of the GHG emissions trading under procedures pursuant to Article 17 of the UNFCCC Kyoto Protocol for installation of RES technologies for both heat, electricity and CHP production (the capacity of one RES unit - up to 3 MW). The eligible beneficiaries were both business sector entities (operators participating in EU ETS were non-eligible) and public institutions. It was implemented 2 open tenders "Technology switch from fossil to renewable energy sources" and "Utilisation of renewable energy sources for GHG emissions reduction" supervised by MEPRD. According to GHG emission reporting format, the impact was reached in 3 sectors: (1.A.2.) Manufacturing Industries and Construction; (1.A.4.a) Commercial/Institutional; and (1.A.1.a) Energy Industries: Public Electricity and Heat production. The total support provided by the CCFI for these tenders are 19.1 MEUR[30].

Investments in Biomass Technologies for Heat Production to Reduce GHG Emissions in Municipalities

Latvia has revenues from the auctioning of Latvia's allocated EU ETS GHG emission quotas, these revenues form the national Emissions Quotas Auctioning Financial Instrument (EQAI) which will provide co-financing for the described particular measure in year 2015/2016[31]. The MEPRD will be the responsible ministry for the implementation of the measure. The Cabinet of Ministers Decision regarding the adoption of proposed by the MEPRD measure will be made after 28 August 2015. The measure is thus considered as the WAM measure. The beneficiaries of the measure are planned: (i) local municipality or its established authority/institution, and (ii) in the Republic of Latvia registered business entity, which provides heat supply to residents (regardless of who owns the housing fund), local municipality or state public buildings. The total available financial support to these beneficiaries within the tender is planned 8 MEUR. Support is planned to be provided for the two groups of projects: (1) one technology – biomass heat boilers – introduction, (2) two technologies - biomass heat boilers and solar collectors - simultaneous introduction. In both project groups, the total thermal (heat) capacity of biomass boilers installed within a single project should not exceed 1 MW. Biomass technologies' efficiency factor should be at least 80% (for biomass pellets boiler at least 82%). To ensure effective use of the financial support, the reduction of CO_2 emissions in relation to the financial support requested from the EQAI should not be less than 1500 $gCO_2/1\ EUR_{supported}$ per year. Based on available total co-financing by EQAI, average support intensity and average specific

[30] Ministry of Environmental Protection and Regional Development (MEPRD). "Informative Report on the Results of the Climate Change Financial Instrument Operation in Year 2013" (*Informatīvais ziņojums "Par Klimata pārmaiņu finanšu instrumenta darbību 2013.gadā*), 17 September 2014, in Latvian, http://polsis.mk.gov.lv/view.do?id=4931 .

[31] Ministry of Environmental Protection and Regional Development (MEPRD). Informative Repot "On the Use of Auctioning Revenues in Year 2014" (*Informatīvais ziņojums "Par izsoļu ieņēmumu izmantošanu 2014.gadā*), 13 April 2015, http://polsis.mk.gov.lv/view.do?id=5186 , in Latvia.

maximum eligible costs per 1 kW, it may be anticipated installation of new biomass-based heat capacity up to ~27 MW.

Investment support to Produce Energy from Biomass which is of an Agricultural or Forestry Origin.

The "***Programme on Development of Biogas Production and Utilisation 2007-2011***" defined the goal of developing production and utilisation of biogas as a renewable energy source in Latvia, at the same time ensuring complex solution of issues related to management of biologically degradable by-products and waste products of agriculture sector as well as reducing the risk of pollution of soil, water and air and possible threat to human health. The programme defined the goal to reach the biogas annual production volume of 13 mill m^3.

In financial planning period of 2007-2013 the support to energy production from biogas was provided for the agriculture sector business entities & service co-operatives by national Rural Development Programme, co-financed by EU ELFLA, as the sub-measure 312(311)/3. The financial support was provided to develop the production of electricity in CHP mode by utilising biogas fermented in anaerobic processes from biomass of agriculture and forestry sector origin. The measure was directly focused to increase RES electricity in national electricity supply – at least 51% of electricity produced shall be sold (utilised outside the beneficiary's own production premises). To provide strong synergy effect with by-products and waste processing of agriculture sector, especially with livestock farming, the Cabinet of Ministers Regulations[32], defining the procedure of support, had stated that at least 50% (basic version of Regulations) or 70% (2011 Amendments of the Regulations) of the raw materials required for biogas production have to be provided by beneficiary's own farm; 2011 Amendments also had stated that at least 30% of raw materials for fermentation of biogas should be provided by the by-products of animal origin and derived products. In 2014, 49 biogas plants, utilising agriculture sector raw materials, with total electrical capacity of 49.6 MWel had been under operation in Latvia[33]. These stations had sold, within the procedure of preferential feed-in tariffs and mandatory procurement of electricity, to the national grid.

In 2014-2020 EU Funds' programming period the financial support is provided within the framework of the Measure 06 "Farm and business development by supporting the non-

[32] (1) Cabinet of Ministers Regulations No 696 "Regulations on the State and EU financial support for the activity "Support for business entities establishment and development (including diversification of non- agriculture related activities), sub-activity "Energy production from biomass of agriculture and forestry origin" (adopted 25 August 2008, in force 11 September 2008 – 27 March 2010). http://www.likumi.lv/doc.php?id=180818.

(2) Cabinet of Ministers (CM) Regulations No.268 "Regulations on the State and EU financial support for the activity "Support for business entities establishment and development (including diversification of non-agriculture related activities), sub-activity "Energy production from biomass of agriculture and forestry origin", adopted 16 March 2010, in force 27 March 2010. Amendments adopted (i) 5 May 2010, the CM Regulations Nr.418, (ii) 3 August 2010, the CM Regulations Nr.739, (iii) 30 August 2011, the CM Regulations Nr.671, in force 2 September 2011, and (iv) 29 October 2013, the CM Regulations No.1197, in force 01.01.2014. Consolidated version in Latvian: http://www.likumi.lv/doc.php?id=207116 .

[33] before 2009, only one biogas plant, utilising agriculture sector raw materials, was operated in Latvia by the Latvia Agriculture University.

agriculture activities", priority 5C of the national Rural Development Programme [34, 35], financially supported by EU ELFLA. Responsible ministry for implementation of the measure - the Ministry of Agriculture, the responsible institution supervising implementation – state administration institution Rural Support Service. According the Article 13 of the Commission Delegate Regulation (EU) No 807/2014 of 11 March 2014, it is stated by the Rural Development Programme that (i) beneficiary biogas plant shall operate in combined heat-power (CHP) mode and shall utilise at least 70% of the produced heat (to provide own production or shall sold to other business entities), (ii) at least 70% of raw products for fermentation should be provided by the by-products of beneficiaries farm, like manure, waste and residue of food production and processing, not utilizable for food production. The total amount of public allocations is planned 16 MEUR, and it is envisaged at least 45.7 MEUR total investments (public + private).

Financial support for Renewable Energy Technologies in Households.

1. The support in years 2011-2012 was provided by national CCFI. Eligible micro-generation technologies were: solar heat collectors (up to 25 kW), solar PV (up to 10 kW), wind (up to 10 kW), wood, wood chips, wood pellets and straw technologies (up to 50 kW) as well as combined use of above technologies. The residential house should not be rented or used for commercial activities. The electrical and heat energy, produced by supported technology, shall be used only for own consumption of particular household. The financial support for 1 project might be up to 9960 EUR, the beneficiary should provides at least 50% co-financing of project's total eligible costs. As a result[36], it was financially supported 1761 project (of which 36% - heat pumps, 32% - solar heat collectors, 25% - biomass heating equipment, 5% - wind, 2% - solar PV); the total support by CCFI is amounting ~ 8.6 MEUR.

2. Latvia has revenues from the auctioning of Latvia's allocated EU ETS GHG emission quotas, these revenues form the national Emissions Quotas Auctioning Financial Instrument (EQAI) which will provide co-financing for the described particular measure in year 2015/2016[37]. The MEPRD will be the responsible ministry for the implementation of the measure. The Cabinet of Ministers Decision regarding the adoption of proposed by the MEPRD measure will be made after 28 August 2015. The measure is thus considered as the WAM measure. The total available financial support to households beneficiaries within the tender is planned 2 MEUR. Support is planned to be provided for the installation of biomass boilers, if the total installed capacity in a single project does not exceed 150 kW. The project's financial support rate from EQAI is stated 50% as maximum, maximum financing provided by EQAI for 1 project is stated 10 000 EUR.

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[34] Factsheet on 2014-2020 Rural Development Programme for Latvia, http://ec.europa.eu/agriculture/rural-development-2014-2020/country-files/lv/factsheet_en.pdf

[35] Rural Development Programme for Latvia 2014-2020 (*Latvijas Lauku Attīstības Programma 2014-2020.gadam),* in Latvian, https://www.zm.gov.lv/lauku-attistiba/statiskas-lapas/lauku-attistibas-programma-2014-2020/projekts-latvijas-lauku-attistibas-programma-2014-2020-gadam?nid=1046#jump ; pages 256-257, 136

[36] Information (28 March 2013) provided by Latvian Environmental Investment Fund as the responsible authority for the implementation of the programme.

[37] Ministry of Environmental Protection and Regional Development (MEPRD). Informative Repot "On the Use of Auctioning Revenues in Year 2014" (*Informatīvais ziņojums "Par izsoļu ieņēmumu izmantošanu 2014.gadā*), 13 April 2014, http://polsis.mk.gov.lv/view.do?id=5186 , in Latvian.

Biomass technologies' efficiency factor should be at least 80%. To ensure effective use of the financial support, the reduction of CO_2 emissions in relation to the financial support requested from the EQAI should not be less than 1500 $gCO_2/1\ EUR_{support}$ per year. Based on available total co-financing by EQAI, average support intensity and average specific maximum eligible costs per 1 kW, it may be anticipated installation of new biomass-based heat capacity up to 30 MW.

Preferential Feed-in Tariffs for Renewables and for Combined Heat-Power Production are prescribed by the Electricity Market Law and the governmental regulations issued pursuant to this Law. The Art.100 of the Amendments (17.05.2011&28.08.2012) of the Cabinet of Ministers Regulations No262 (16.03.2010) regarding feed-in tariffs for RES-electricity[38] and the Art.70 of the Amendments (28.08.2012) of the Cabinet of Ministers Regulations No221 (10.03.2009) regarding feed-in tariffs for CHP-electricity[39] state that the Ministry of Economics shall not organize tenders for the acquisition of the right to sell electricity produced in biomass, biogas, solar or wind power plants (from 26.05.2011 until 01.01.2016) and cogeneration (from 10.09.2012 until 01.01.2016) and the producer may not qualify for selling electricity within the scope of mandatory procurement and for acquisition of the right to receive a guaranteed fee for the installed electric capacity. Thus for the time being the application of preferential feed-in tariffs is continuing relating to the existing RES and CHP plants which had obtained the mentioned rights before noted governmental regulations came into force but does not relate to new RES and CHP power plants. The existing RES feed-in tariffs are calculated depending on RES type and unit capacity; the existing CHP feed-in tariffs are calculated depending on fuel type and unit capacity.

The total installed electric capacity in 2014 constituted[40]: (i) small hydro plants – 28.3 MWel, (ii) wind plants – 58.3 MWel, (iii) solid biomass plants - 40.2 MWel , (iv) biogas plants – 62.2 MWel, (v) natural gas plants with electric capacity below 4MWel –103.1 MWel.

To increase the efficiency of use of energy sources

The 1st Energy Efficiency Action Plan of the Republic of Latvia, elaborated in compliance to the End-use efficiency and energy services Directive 2006/32/EC, plans for the total savings of 3483 GWh in year 2016, of which 2701 GWh in Residential sector, 408 GWh in Tertiary sector, 170 GWh in Industry sector and 204 GWh in Transport Sector. This goal is not change by the 2nd EEAP of Latvia. Thus energy efficiency in buildings is clear priority of national energy sector policy.

According to the national „***Energy Development Guidelines 2007-2016***" as from year 2008 the consumption of primary energy resources has to decrease by 1% per year in the result of energy

[38] Governmental Regulations No 262 (16.03.2010) "Regulations regarding the Production of Electricity Using Renewable Energy Sources and the Procedures for the Determination of the Price", http://likumi.lv/doc.php?id=207458

[39] Governmental Regulations No 221 (10.03.2009) "Regulations regarding Electricity Production and Price Determination upon Production of Electricity in Cogeneration", http://likumi.lv/doc.php?id=189260.

[40] Ministry of Economics. Information regarding mandatory procurement of electricity: Feed-in payments 2014 (*Informācija par izdotajiem lēmumiem par elektroenerģijas obligāto iepirkumu: komersantiem 2014 .gadā obligātā iepirkuma ietvaros izmaksātās summas*), in Latvian, https://www.em.gov.lv/lv/nozares_politika/atjaunojama_energija_un_kogeneracija/informacija_par_izdotajiem_lemumiem_par_elektroenergijas_obligato_iepirkumu/

efficiency measures compared to assessed consumption without implementation of them. During the period up to 2016 the average specific heat consumption in buildings has to be reduced from 220-250 kWh/1m^2/year down to 195 kWh/1m^2/year and by 2020 the annual average specific heat consumption of 150 kWh/1m^2/year has to be achieved.

The new Latvia's "**Energy Policy Strategy 2014-2020** (*Enerģētikas Attīstības Pamatnostādnes 2014.–2020.gadam*, final draft)" defines the following indicators in year 2020 in compliance with EU energy efficiency policy and new Energy Efficiency Directive 2012/27/EU:

- total savings of primary resources in year 2020 – 0.670 Mtoe (20% reduction against the baseline),
- total cumulative energy savings – 0.85 Mtoe (9897 GWh),

The importance of comprehensive energy sector development planning at local level for optimal energy efficiency investment and maximising expected benefits is recognised. National Development Plan 2014-2020 directly states the role of municipal energy plans.

The priority Policies and Measures to reach the efficiency of use of energy sources are as follows:

Legislative developments.

The Law on the Energy Performance of Buildings, adopted 2008, introduced the general legal framework of setting the mandatory minimum energy performance requirements for new buildings and for buildings under reconstruction. The recast Law on the Energy Performance of Buildings, adopted December 2012 in accordance with the requirements of the Directive 2010/31/EC, recasts the general legal framework of setting the mandatory minimum energy performance requirements for buildings, recasts the general principles of mandatory energy efficiency certification for buildings, verification of buildings heating and ventilation systems.

It is introduced by the new Cabinet of Ministers Regulations[41] six (A-F) energy efficiency classes of residential buildings and five (A-E) energy efficiency classes of non-residential buildings.

The particular policy is focused to the residential buildings with the worst specific average heat energy consumption. Namely, the chapter IV of the Cabinet of Ministers Regulations No907 (adopted September 2011, in force 1st January 2012), issued under the Law on Administration of Residential Houses, determines that for multi-apartment buildings energy efficiency measures (including renovation, if necessary) are obliged in case the annual heat consumption (average for last 3 years) exceeds 230 kWh/m^2 – according estimate provided by Ministry of Economy, this requirement may relate to 10% of the existing multi-apartment buildings. In January 2014 Amendments to the noted Cabinet of Ministers Regulations came into force, strengthening this requirement. According these Amendments the energy efficiency measures are obliged in case the average annual heat consumption, calculated during previous 3 calendar

41 Governmental Regulations No 383 „Regulations On Energy Certification of Buildings" (*Ministru Kabineta noteikumi Nr.383 „Par ēku energosertifikāciju"*), adopted 09 July 2013, in force 19 July 2013., published in "Latvijas Vēstnesis" 138 (4944), 18.07.2013, http://likumi.lv/doc.php?id=258322, in Latvian.

years, exceeds: (i) 200 kWh/m2 annually for heat and hot water, or (ii) 150 kWh/ m2 annually for heat only.

To co-operate with industrial sector, the government has adopted the framework for signing the voluntary agreements on energy efficiency, promoting energy audits and energy management systems in industrial enterprises.

Investment Support Programme for District Heating (DH) Systems.

As noted above, in **financial planning period of 2007-2013** the investment support **was** provided by the Cohesion Fund (CF) in the framework of the Latvia national operation programme „Infrastructure and Services", part „Energy". The activity No 3521 of the programme "Energy" ***Measures to increase the efficiency of district heating systems"*** supports both RES utilisation in DH systems (presented above) and reduction of heat losses in the DH transmission and distribution networks. As a result of the programme regarding efficiency improvements of DH networks, ~ 150 km of heat pipelines were reconstructed.

In financial planning period of 2014-2020 the investment support from CF is provided within the framework of the national Operational Programme "Growth and Employment", Thematic Objective No4 "Supporting the shift towards a low-carbon economy in all sectors", Investment Priority 4.3. "To Promote the Production and Distribution of Energy derived from RES", the Specific Objective 4.3.1. "To promote energy efficiency and use of local RES in district heating systems"[42]. In total it is expected to achieve at least 70 km of reconstructed heating pipeline networks.

Investment Support Programmes to Increase Energy Efficiency in Apartment Buildings.

In financial planning period of 2007-2013 the investments in energy efficient residential building renovation were co-financed by the EU Regional Development Fund (ERDF) in the framework of the Latvia national operation programme „Infrastructure and Services", part „Energy Efficiency in Housing" (activity No344). The programme had 2 target audiences: (1) apartment owners of multi-apartment buildings, and (2) tenants of municipal social residential buildings to provide adequate housing for socially vulnerable persons. As result of the renovation project, at least 20% of heat energy saving has to be reached. The Cabinet of Ministers Regulations[43], adopted in April 2011, in addition to this general criterion have introduced also the quantitative threshold criterion for heat energy consumption – after reconstruction the annual heat energy consumption for heating shall not increase 120 kWh/m^2 (for 1 and 2 storey multi-apartment houses) or 100 kWh/m^2 (for 3 and more storeys multi-apartment buildings). The support for the whole period provided by ERDF is stated ~ 77.6 MEUR, of which ~ 72.5 MEUR for multi-apartment buildings and ~ 5.176 MEUR for social residential buildings. It is contracted renovation of more than 800 multi-apartment buildings

[42] Operational Programme "Growth and Employment". Ministry of Finance of the Republic of Latvia, English translation: http://www.esfondi.lv/upload/Planosana/FMProg_270115_OP_ENG_2.pdf, sections 333-344.

43 Cabinet of Ministers Regulations No 272 „Regulations of the 9th and 10th Open Tender „Improvement of Heat Insulation of Multi-Apartment Residential Buildings" Financed by the National Operational Programme "Infrastructure and Services" Activity 3.4.4.1 *(Ministru Kabineta noteikumi Nr.272 „Noteikumi par darbības programmas „Infrastruktūra un pakalpojumi" papildinājuma 3.4.4.1. aktivitāti „Daudzdzīvokļu māju siltumnoturības uzlabošanas pasākumi" projektu iesniegumu atlases devīto un desmito kārtu"*), adopted 5 April 2011, in force 20 April 2011, published in Latvian: "Latvijas Vēstnesis" 61 (4459), 19.04.2011. Actual consolidated version: http://likumi.lv/doc.php?id=228846 , in Latvian.

and 55 social residential buildings[44]. To provide informative and technical support for multi-apartment buildings renovation, informing energy consumers of multi-apartment buildings was done by the informative campaign "Let's live warmer!' applying wide scope of methods to reach target groups of owners of apartments and apartment owners' associations, building managers, building contractors, producers and sellers of building materials.

In financial planning period of 2014-2020, increasing of energy efficiency in multi-apartment buildings is supported within the framework of the new Operational Programme "Growth and Employment": Thematic Objective No4 "Supporting the shift towards a low-carbon economy in all sectors", Investment Priority 4.2. "Support energy efficiency, smart energy management and use of renewable energy sources in public infrastructure, including in the public buildings and in housing sector", Specific Objective 4.2.1. "To increase energy efficiency in public and residential buildings". Investments will ensure conformity to the EU Council Recommendations in the area of energy efficiency. Responsible ministry for implementation – Ministry of Economics. Planned total amount of financial support for the implementation of the measure _~ 176.5 MEUR, of which (i) ERDF co-financing - 150 MEUR[45], and (ii) national (state budget) public financing - 26.5 MEUR. The financial assistance will be provided in the following forms of .subsidy (grant), repayable loan, guarantee for the loan. High requirements in relation to both the level of energy efficiency to be achieved and the return of the invested funding will be set as the main criteria for the selection of energy efficiency improvement projects: ***the annual heat energy saving after renovation is at least 30%*** compared with the consumption calculated in building's energy audit report before implementation the project, ***the annual heat energy consumption for heating*** after renovation ***shall not exceed 90 kWh/m2/year***, the project should implement (if necessary) the construction, renovation or reconstruction of ventilation system to provide ventilation according the Construction Standards, the implementation of the project shall be economically justified – IRR for 20 years period shall be above zero[46].

Investment Support in Industrial Buildings Energy Efficiency to Reduce GHG emissions was important focus of national Climate Change Financial Instrument. Up to 2015 the 6 open tenders was implemented, namely, "Complex Measures to Reduce GHG Emissions in Industrial Buildings" and "Complex Measures to Reduce GHG Emissions: Tenders No1-5". Eligible investments include energy efficiency investments of different kind both in buildings and technological equipment, installation of efficient lightning as well as heat supply switch from fossils to RES & installation of RES based heat supply systems (up to 3 MW). The total ex-ante support provided by CCFI are ~ 38 MEUR, total eligible costs ~ 70 MEUR. Dominant part of CO_2 savings relates to savings in heat energy consumption.

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[44] Ministry of Economics. EU Funds Implementation Progress: monthly report (26.06.2015), https://www.em.gov.lv/lv/es_fondi/istenosanas_progress_/

[45] the Operational Programme: *Table 2.4.13 (7-12), page 121*)

[46] Ministry of Economics. Draft Government Regulations "Regulations regarding the 4.2.1.1. specific target "Energy Efficiency Measures in Residential Buildings" of the Specific Objective No4.2.1 "To increase energy efficiency in public and residential buildings" of the Operational Programme "Growth and Employment"; Draft Text version of 05 March 2015, in Latvian, https://www.em.gov.lv/lv/es_fondi/normativo_aktu_projekti/

Efficient use of energy resources, reduction of energy consumption and transfer to RES in manufacturing industry: 2014-2020 EU Structural Funds programming period

Development of new, innovative energy-saving technology, measures increasing energy efficiency and share of RES is supported within the framework of the new national Operational Programme "Growth and Employment", Thematic Objective No4 "Supporting the shift towards a low-carbon economy in all sectors", Investment Priority 4.1. "Promoting Energy Efficiency and use of RES in enterprises", the Specific Objective 4.1.1. "To promote efficient use of energy resources and reduction in energy consumption in the manufacturing industry sector" corresponding to this Investment priority [sections 292-302]. Planned total amount of financial support by Cohesion Fund – 32.6 mln EUR[47], financial instrument – loan with partial defrayment of principal amount may be applied[48]. Indicative activities to be supported: measures for the improvement of energy efficiency of buildings of manufacturing industry enterprises, energy certification of buildings, construction works for the increase of energy efficiency – heat insulation of buildings' delimiting (boundary) structures, reconstruction of engineering systems of buildings, installation of recuperation, energy control and management equipment, acquisition and installation of new and efficient thermal (heat) energy, electricity producing and water boiler production equipment using RES.

Investments to Improve Energy Efficiency in Food Processing Enterprises

2014-2020 EU Funds programming period

The financial support is provided within the framework of the Measure 04 "Investments" of the national Rural Development Programme, financially supported by EU ELFLA. The total amount of support for investments will constitute ~ 75.6 MEUR, of which 11.388 MEUR is directly targeted to improvement of energy efficiency of food processing enterprises and agriculture sector in general under the priority 5B (other investments may bring energy efficiency improvements indirectly as well). Responsible ministry for implementation of the measure - the Ministry of Agriculture, the responsible institution supervising implementation – state administration institution Rural Support Service. The total amount of allocations (public plus private) under the energy efficiency priority is envisaged 28.346 MEUR. Food processing enterprise may use the support for implementation of new energy efficient equipment. To receive the support the enterprise should have the certain threshold regarding the use of local Latvia raw materials for production varying in the range 30%-70% depending on the type of production (this share of local raw materials should be raised at the end of the third year of the project per 10% but is not required higher than 70%). The general support rate is defined 20% or 30%, enterprises with lower turnover may pretend to higher rate. In case of energy efficiency investments, if energy efficiency will be increased at least per 20%, the additional support rate of 10% may be received, however the total support rate shall not exceed 40% (an other

[47] This sum is equally dividend between Categories of Investment (*defined by the Commission Implementing Regulation (EU) No 215/2014 of 7 March 2014)* No 68 (*energy efficiency and demonstration projects in SMEs and supporting measures*) and No70 (*promotion of energy efficiency in large enterprises*).

[48] the Operational Programme: page 112, *Table 2.4.14 (7-12)*, & page 107, section 299.

additional support rate may be received if enterprise produce or will start to produce the food quality scheme products, healthy products or new innovative (in case of Latvia) products)[49].

Investment Support Programmes in Public Sector Energy Efficiency was important focus of national Climate Change Financial Instrument. The 8 open tenders were implemented, namely, (1) "Energy Efficiency Measures in Municipal Buildings", (2) "Complex Measures to Reduce GHG Emissions in Municipal Buildings", (3) "Energy Efficiency Measures in Higher Educational Institutions Buildings ", (4) "Complex Measures to Reduce GHG Emissions in Municipal and State Professional Educational Buildings", (5) "Complex Measures to Reduce GHG Emissions: Tenders No2-5" (beneficiaries of these tenders were public education buildings as well). Eligible investments included energy efficiency investments in buildings' heating and lightning systems and heat supply switch to RES (up to 3 MW). Minimum threshold requirements of energy consumption after renovation is stated 90-100 (depending on the particular tender) kWh/m^2/year. The ex-ante financial support provided by CCFI constitute ~ 123 MEUR.

In addition, a particular CCFI sub-programme "Reduction of GHG emissions in Municipal Public Territories Lightning Infrastructure" was targeted to improve efficiency of public (outdoor) territories lighting. The total support provided by CCFI within the four tenders of this programme constitute ~ 10.8 MEUR Within this programme it is expected the *ex-ante* saving of ~ 10.4 GWh electric energy annually.

Increasing Energy Efficiency in Municipal Buildings: EU Programming Period of 2014-2020

Increasing of energy efficiency in public buildings of local governments is supported within the framework of the new Operational Programme "Growth and Employment", Thematic Objective No4 "Supporting the shift towards a low-carbon economy in all sectors", Investment Priority 4.2. "Support energy efficiency, smart energy management and use of RES in public infrastructure, including in the public buildings and housing sector", the Specific Objective 4.2.2. "To facilitate the increase of energy efficiency in municipal buildings, according to the integrated development programme of the municipality" corresponding to this Investment priority [sections 312-316]. Indicative activities to be supported: construction works and renovation of municipal buildings for the increase of energy efficiency - – heat insulation of buildings' delimiting (boundary) structures, reconstruction of engineering communications of buildings, installation of recuperation, energy control and management equipment, including smart meters and ventilation systems, energy certification of buildings, as well as use of RES in buildings (installation of such RES-based local heating systems is acceptable if particularly high energy efficiency indicators are achieved and the installation is economically justifiable, including measures for the increase of energy efficiency of local energy sources). Planned total amount of financial support by ERDF ~ 31.394 MEUR; form of finance –non-repayable grant. According the ERDF common output indicators, the following target values in year 2023- are stated by the [3, *Table No.2.4.5 (5) in page 113*] for the particular measure: (1) decrease of

[49] Rural Support Programme, p.206-208; Factsheet on 2014-2020 Rural Development Programme for Latvia.

annual primary energy consumption of municipal public buildings - 13.718 GWh/year, (2) additional renewable energy production capacity installed - 1.2 MW.

Increasing Energy Efficiency in State (Central Government) Public Buildings : EU Programming Period of 2014-2020

Increasing of energy efficiency in public buildings of central government is supported within the framework of the new Operational Programme "Growth and Employment", Thematic Objective No4 "Supporting the shift towards a low-carbon economy in all sectors", Investment Priority 4.2. "Support energy efficiency, smart energy management and use of RES in public infrastructure, including in the public buildings and housing sector", the Specific Objective 4.2.1. "To increase energy efficiency in public and residential buildings" corresponding to this Investment priority [sections 306-311]. Indicative activities to be supported: construction works and renovation of state public buildings for the increase of energy efficiency - – heat insulation of buildings' delimiting (boundary) structures, reconstruction of engineering communications of buildings, installation of recuperation, energy control and management equipment, including smart meters and ventilation systems, energy certification of buildings, use of RES in buildings (installation of such RES systems is acceptable if particularly high energy efficiency indicators are achieved in building and the installation is economically justifiable). Positive financial return of investments is the most important criterion for support. Planned total amount of financial support by ERDF ~ 97.8 MEUR.

The particular targeted CCFI programme ***Promotion Understanding on the Importance and Possibilities of GHG Emissions Reduction*** was implemented in years 2010-2013. The financial support was available for publications in mass media for both general and targeted audiences, thematic broadcasts, organisation of thematic workshops and trainings for targeted audience groups, educational projects for pupils and students of Latvia primary, general and professional educational institutions. The applicants might be registered in Latvia mass media, broadcast organizations, NGO, foundations, municipal or regional energy agencies, higher educational institutions. The total financial support provided by CCFI for the programme was ~ 0.75 MEUR. In the framework of the Programme 22 information/education/training projects were implemented.

In years 2015-2016 the promotion public understanding on the importance and possibilities of GHG emissions reduction is supported by the programme "National Climate Policy" of the EEA Financial Mechanism for years 2009-2014. Responsible ministry for the measure is the MEPRD, the responsible institution supervising implementation – State Regional Development Agency. Within the open tender of this programme, announced in summer 2014, it was *ex-ante* allocated 1.24 MEUR for promotion public understanding and knowledge on climate change mitigation and adaptation[50]. The following activities are supported: (1) development and realisation of education/training programmes for professional audiences, municipal specialists and teachers, (2) development and realisation of education modules for vocational secondary education programmes and professional education programmes of high (graduate) schools, (3) organisation of educational activities and actions for pupils of primary, general secondary and vocational education schools, (4) information campaigns and public actions in mass media,

[50] In addition to it, 746.3 thousand EUR were allocated to support science research projects related to climate change.

websites, radio. As a result of the tender it is approved in total 18 projects, of which 14 projects' activities directly or mostly relate to promoting public, both general and professional groups, understanding and knowledge. The activities of the projects should be implemented until 30 April 2016.

Fiscal Instruments

CO_2 tax. The procedure of CO_2 emissions taxation is prescribed by the Natural Resources Tax Law. The tax rate per 1 ton of CO_2 emission has been gradually raised up from the starting rate of 0.142 EUR (01.07.2005) up to 3.5 EUR (from 01.01.2015). The subject of CO_2 taxation is CO_2 emitting activities (installations) requiring a GHG emission permit - if the amount of the activity (installation) is below the limit defined for inclusion in EU Emissions Trading Scheme. The tax shall not be paid for the emissions of CO_2 which emerges (i) while using RES and local fuel peat, and (ii) form the installations participating in EU ETS (the amount of CO_2 emitted by EU ETS installations and not included in the amount of transferred GHG allowances is taxed by 100 EUR / 1 ton CO_2).

Taxation on Noxious Air Polluting Emissions creates synergy effect with CO_2 taxation and thus stimulates the reduction of CO_2 emissions. The procedure of air polluting emissions taxation is prescribed by the Natural Resources Tax Law. The emissions of PM10, CO, SO_2, NO_x, NH_3, H_2S and other non-organic compounds, C_nH_m, VOC, metals (Cd, Ni, Sn, Hg, Pb, Zn, Cr, As, Se, Cu) and their compounds, V_2O_5 are taxable.

Fuel taxation *(*for transport fuel taxation see below, in Transport chapter). Law "On Excise Duties" establishes procedure by which excise duty shall be imposed on oil products and natural gas.

(1) Articles 5&14 determine the rates of ***duty for mineral oils*** and their substitutes utilised for heat production. The exempt is made for the oil products utilised for electricity production and for production in combined heat-power mode. The reduced tax rate is applied for oil products with at least 5% mix of rapeseed oil or biodiesel, produced in Latvia or imported from EU member state, zero rate is applied for pure biodiesel. The oil gasses and other hydrocarbons if utilised by private persons as fuel or in gas furnaces (not as the transport fuel) is exempted from the duty as well.

(2) Articles 6^1& 15^1 determine the rates of ***duty for natural gas*** utilised for energy production. Initially the taxation on natural gas was in force for the short period 01.01.2010-31.08.2010, afterwards for the period 01.09.2010-30.06.2011 the taxation was cancelled. Starting from 01.07.2011 the taxation on natural gas was re-introduced having the rate ~17.07 EUR /1000 m^3 (~ 0.5122 EUR/1 GJ). For the period up to 01.01.2014 the exempt was made for natural gas utilised for heating greenhouses in agriculture sector and for heating industrial premises and utilisation in technological equipment of industrial entities. Starting from the 1st January 2014 the differentiated rates are applied, namely, the reduced (33%) rate is applied for natural gas utilised as fuel for production processes and for providing necessary climate conditions in production premises, and the exemption from taxation is continued in agriculture sector for providing heat for greenhouses, industrial scale henhouses/sheds and incubators. The exemption from taxation is continued also for: (i) natural gas utilised for other purposes (not as fuel or transport fuel) or utilised in two ways (including processes of chemical reduction, electrolytic and metallurgy processes), (ii) amount of natural gas used by the operator of natural

gas transmission, storage and distribution system for the technological needs of natural gas supply (including losses during supply), (iii) utilised in mineralogy processes.

(3) the procedure of ***taxation applicable for coal,*** coke and lignite is prescribed by the Natural Tax Law, the exemption is stated for coal utilised for electricity production and combined heat-power production.

(4) ***Taxation applicable for the use of water for electricity production in hydropower plants with total electrical capacity below 2 MW.*** This type of taxation has been introduced by the Amendments (adopted 06 November 2011, in force from 01 January 2014) of the Natural Resources Tax Law. The current rate is 0.00853 EUR per 100 m3 water flow through the hydrotechnical construction. Hydropower plants with capacity above 2 MW is exempted from this taxation.

Electricity taxation. The procedure of taxation of electricity is prescribed by the Electricity Tax Law. The actual tax rate for electricity is 1.01 EUR/ 1 MWh. According the Law, electricity supplied to an end user, as well as electricity, which is supplied for own consumption (see exemption below), shall be taxable. Taxpayers shall be the entities who supply electricity to end users and have entered into contracts or otherwise agreed regarding the supply (selling) of electricity, and autonomous producers (the exemption is done 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). The taxpayers shall be also end-users which purchase electricity in electricity spot exchange.The following tax exemptions are made for the electricity (Article 6 of the Electricity Tax Law):

- obtained from (i) renewable energy resources, (ii) in hydro power stations; (iii) in combined heat-power (CHP) stations complying with the efficiency criteria specified in the regulatory enactments regarding the generation of electricity through the process of cogeneration.
- used for the following purposes: (i) electricity generation, (ii) the generation of heat energy and electricity in CHP mode, (iii) the carriage of goods and public carriage of passengers, including on rail transport and in public carriage of passengers in towns, (iv) household users, (v) street lighting services.

Transport

Biofuel Mix Obligation Requirement. To ensure efficient growth of the share of renewable sources in the transport sector, the mandatory 4.5-5% volume of bioethanol mix for the gasoline of "95" trademark and mandatory 4.5-5% volume of biodiesel mix for the diesel fuel (including diesels of A-F categories, utilised in moderate climate conditions, exemption is made for diesels

of 0-4 classes utilised in case of winter conditions) were introduced as from October 1, 2009 according to the Cabinet of Ministers Regulations No.648[51] (Art.8.[1] and 9.[1]).

Excise Tax – Transport sector. Law "On Excise Duties" establishes procedure by which duty shall be imposed. The Art.14 determines the rates of duty for gasoline and diesel oil. Reduced rates currently are applied for following biofuels produced in Latvia or imported from EU member state: (1) gasoline with 70-85% (volume) mix of ethanol produced from agriculture origin raw materials, and (2) pure biodiesel, made from rapeseed oil is exempted from taxation. To promote the competitiveness of agriculture sector, the reduced tax rate is applied for the certain amount of diesel (gas oil) which is used for agriculture land cultivation purposes. A number of exemptions were cancelled recently: (i) after introducing the biofuel mix obligation the excise tax's reduced rates for the transport fuels with 5% biofuel mix were cancelled from 01.01.2010, (ii) The Amendments, adopted 17 December 2014 cancelled the reduced tax rate for the diesel (gas oil) with at least 30% (volume) mix of biodiesel as well. The Amendments of the Law (the articles 6^1&15^1), adopted in 2010, had introduced excise ***duty for natural gas*** utilised as transport fuel

Exemption from electricity taxation. The exemption is stated for the electricity used for carriage of goods and public carriage of passengers including rail transport and public transport in towns.

Measures to motivate consumers to choose effective fuel consumption vehicle. A set of measures is motivating consumers, such as:

Applying of differentiated tax rates for transport vehicles depending on age and engine size or on car's CO_2 emission factor (annual taxation and first time registration in Latvia tax). The measure is aimed at structural changes of the car fleet which will foster a reduction in fuel consumption. The actual legal system is established by 2 laws: (1) the Law "On the the Vehicle Operation Tax and Company Car Tax" establishes annual taxation system. For cars, which are registered in Latvia after 01.01.2005, the annual tax calculation is depending on engine size, maximal power of engine and full mass of vehicle (for the cars registered before 01.01.2005, tax rate calculation continues to depend on the full mass of the car). The tax is not applied for the vehicles with an electric motor only (however, starting from 01.01.2016 it will be applied Company Car Tax for the electromobiles owned by the business entities), the exemption is made for the vehicles owned by socially low-protected inhabitants' groups and reduced rate is applied for vehicles used in agriculture production sector. (2) The Law "On Cars and Motorcycles Tax" determines the taxation procedure for car's first time registration in Latvia. For the cars which have been registered for the first time abroad before 01.01.2009 and now are undergoing registration in Latvia, the registration tax rate is obtained by summing up two parts: (i) tax rate depending on the age of the car, and (ii) the additional tax rate depending on the engine size is applied for cars with engines above 3000 cm^3. The amendments of the law

[51] Cabinet of Ministers Regulations No. 648 "Amendments on the Cabinet of Ministers Regulations No332, 26 September 2000, "Requirements for Conformity Assessment of Petrol and Diesel Fuel" (*Ministru Kabineta Noteikumi Nr.648* "***Grozījumi Ministru kabineta 2000.gada 26.septembra noteikumos Nr.332 "Noteikumi par benzīna un dīzeļdegvielas atbilstības novērtēšanu"*****), adopted 25 June 2009, the articles** 8.[1] and 9.[1] in force from 01 October 2009), http://likumi.lv/doc.php?id=194227

have established the new approach – based on car's CO_2 emission factor per 1 km - for those cars which are previously non-registered or have been registered for the first time abroad after 01.01.2009 and now are undergoing first time registration in Latvia.

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).

Mandatory annual systematic inspection of technical conditions of motor vehicles is providing exploitation of transport vehicles in accordance with the technical requirements and in compliance with emissions limits. Only vehicles that comply with technical and environmental requirements are being allowed to take part in road transport.

Promotion of clean and energy efficient road transport by public procurement.

The legal norms - special regulations for procurements in the field of road transport - arising from the Directive 2009/33/EC on promotion of clean and energy-efficient road transport vehicles are implemented in Latvia by: (1) the section 46^1 of Public Procurement Law, The given section was introduced by the Amendments (June 2010) and is in force from 15 June 2010, (2) the section 19 of Law on the Procurement of Public Service Providers, the given section was introduced in the basic version of the Law and is in force from 4 September 2010, (3) the section 18 of Law on Public Transport Services, the given section was introduced by the Amendments (June 2013) and is in force from 18 June 2013.

Electro mobility Development

1.Support for Electric Vehicles (EV)and EV Charging Infrastructure: year 2014

Part of the revenues from the sale of GHG emissions under procedures pursuant to Article 17 of the UNFCCC Kyoto Protocol was allocated as the national Climate Change Financial Instrument (CCFI) programme for CO_2 emissions reduction in transport sector by supporting acquisition of new electric vehicles (EV) and installation of EV charging infrastructure. Responsible ministry for the measure – MEPRD. The beneficiaries were public institutions (both direct and mediates ones), derived public persons and registered in Latvia business entities. The support (~ 3.9 MEUR by CCFI in total) was provided only for "pure" electric vehicles (electric engine is the only one having zero GHG emissions) and publicly available charging infrastructure. Within the programme it was supported acquisition of more than 200 EV and 47 charging stations.

2.Electric Vehicles (EV) Charging Infrastructure Development: EU Structural Funds Programming Period of 2014-2020

Development of EV charging infrastructure is supported within the framework of the new national Operational Programme "Growth and Employment", Thematic Objective No4 "Supporting the shift towards a low-carbon economy in all sectors", Investment Priority 4.4. „To promote low-carbon strategies for all types of territories, in particular for urban areas, including the promotion of sustainable multimodal urban mobility and mitigation-relevant adaptation measures", the Specific Objective 4.4.1. "To develop EV charging infrastructure in Latvia" corresponding to this Investment priority [sections 346-358]. Availability of a functioning charging network is a crucial precondition for the increase in number of EVs. Introduction of the network of EV charging points will promote energy efficient development of vehicle market, as a result of which the use of EVs in road transport will be promoted.

Indicative activities to be supported: the creation of EV charging infrastructure and the development of operator centre software for their management. Planned total amount of financial support by ERDF – 7.1 MEUR[52], financial instrument – non-repayable grant. ERDF specific result and output indicator: (1) rising registered number of electric vehicles in Latvia, target value in year 2023 - 747 EVs, (2) number of installed EV charging points in year 2030 - 235 points.

Development the infrastructure of environmentally friendly public transport:

EU Structural Funds Programming Period of 2014-2020

Development of the infrastructure of public transport (PT) will be supported within the framework of the new national Operational Programme 2014-2020 "Growth and Employment", Thematic Objective No4 "Supporting the shift towards a low-carbon economy in all sectors", the Specific Objective 4.5.1. "To develop the infrastructure of environmentally friendly public transport [sections 360 – 371]. As the result of the measure, the use of PT will be promoted by increase of number of environmentally friendly vehicles of PT and length of tram lines. Thus, the flow of passengers will direct from private transport to PT, decreasing the flow of road transport in cities. Thus, more effective urban transport infrastructure will be developed. By developing the route network of PT, the need to use light vehicles in urban traffic will be reduced. It is anticipated that number of passengers of environmentally friendly PT will increase per 1.61 million (from baseline value of 86.81 million in 2012 to target value of 88.42 million passengers in 2023). Indicative total financial amount by Cohesion Fund – 108.516 MEUR. Cohesion Fund specific output indicators: (1) total length of new or improved tram lines – 8 km, (2) number of new vehicles of environmentally friendly public transport – 50 vehicles. Riga city tram infrastructure development project will be the major project.

Agriculture

Latvia's farmers have introduced a number of measures for reducing GHG emissions from agricultural activity since 2004. Farmers who were eligible for EU direct payments had to comply with the certain requirements as well as measures of the Rural Development Programmes 2004-2006 and 2007-2013, which contributed to good agricultural practices, applied to the agricultural area, and to the environmental situation, including the reduction of GHG emissions. Besides, the introduction of GHG mitigation measures is indirectly affected by the Cabinet regulations that regulate such areas as:

- control of pollution produced by agricultural activity;
- protection of nitrate vulnerable territories;
- management of manure in livestock buildings;

[52] This sum is dividend between Categories of Investment (*defined by the Commission Implementing Regulation (EU) No 215/2014 of 7 March 2014)* No 43 *Clean urban transport infrastructure and promotion (including equipment and rolling stock)*– 5.887 MEUR and No44 *Inteligent transport systems (including the introduction of demand management, IT monitoring, control and information systems* - 1.206 MEUR

- biogas production[53].

To decrease the negative influence of farming on the environment Latvia has developed **Code of Good Agriculture Practice (GAP)**. The Code of Good Agricultural Practice contains legislation obligations, recommendations and practical advice envisaged for farmers and everyone who is involved in agricultural production. GAP comprises main spheres of agricultural activities that are critical in causing water, air, and soil pollution. The goal to establish GAP Code for each country is determined by the Nitrate Directive of the European Union (EEC/91/676). Helsinki Convention on the Protection of the Marine Environment of the Baltic Sea Area (HELCOM) calls for a prompt action in Latvia that would decrease the negative influence of agriculture on the environment[54].

Environmental requirements regarding agricultural practice are introduced in the Cabinet of Ministers Regulations No.834 of 23 December 2014 "Regulations on protections of water and soil from pollution caused by nitrates from agricultural activities" and the Cabinet of Ministers Regulations No.829 of 23 December 2014 "Specific requirements for carrying of polluting activities in animal sheds".

The most important issues of Regulations are:

- lay down control on and requirements for storing and use of fertilizers, manure and fermentation residues to avoid and diminish pollution of air, soil and water;
- to protect soil from the use of unjustifiably high and economically inconsistent portions of nutrients, when applying manure and fermentation residues, as well as ensuring their spreading during plant vegetation;
- providing farmers with basic data for calculations of nitrogen content of farmyard manure necessary, when applying farmyard manure to fields and preparing crop fertilizations plans;
- laying down requirements to be taken into consideration when determining nitrogen requirements for a certain crop upon planning the expected yield;
- revise and specify the requirements for storing of solid manure outside animal shed;
- to lay down requirements for storing of solid manure for small animal husbandry farms (up to 10 animal units and in vulnerable territories – up to 5 animals units);
- to tighten the requirements for monitoring of lagoon type storages by laying down the requirements for an operator who manages the lagoon type manure storage, to ensure monitoring of underground water quality;

[53] Rivza et.al (2015) National Research Programme "The value and dynamic of Latvia's ecosystems under changing climate (EVIDEnT)". Sub-project 3.2. "Analysis of GHG emissions from agricultural sector and economic assessment of GHG emissions mitigation measures". Report for a 1st period: from 01.10.2014. till 28.02.2015.

[54] Ministry of Environmental Protection and Regional Development of Latvia. Available: http://www.varam.gov.lv/eng/print/?doc=3803&from=346

- to supplement regulations with the storage capacity calculation formulas for storing of different types of farmyard manure[55].

The Latvian Rural Development Programme (RDP) for the period 2007 to 2013, supported variety of measures, contributing to GHG emission reductions – modernization of agricultural holdings, a number of agro-environmental subprograms, involving support for organic farms, integrated farming and other measures.

Biogas production at farm level is considered as one of the most powerful way to reduce emissions. Due to the covering process the emission of methane and ammonia from manure storage can be avoided. Biogas technology is well developed, although continuous progress is made to improve its efficiency. CH_4 emissions from manure storage are avoided and renewable energies are produced and linked to the NEC Directive (Directive on National Emission Ceilings for certain pollutants (Directive 2001/81/EC) implementation.

The 2014-2020 RDP for Latvia was formally adopted by the European Commission on 13 February, 2015 and describes pathways for the economic development of Latvia's rural areas The programme facilitate the conversion to organic farming and the development of existing organic farms, with the aim of having at least 2 700 ha of farm land under organic farming. Restoring, preserving and enhancing ecosystems related to agriculture and forestry is the main priority of the RDP. 14% of the agricultural area will come under contract for biodiversity, 17% for water management and 17% for soil management. 10% of agricultural land will be under contract for GHG and NH_3 reduction. Under this priority, production of renewable energy from waste and by - products will be supported[56].

RDP also highlights supporting of GHG emission neutral or reductive agricultural practices. The current programming period, i.e. until 2020, also envisages financial support for introducing GHG emission mitigation measures. A special focus will be placed on climate and environmentally friendly agricultural practices or the "green component", which is an extra payment to all beneficiaries of basic payments if corresponding practices are complied with. Introduction of leguminous plants on arable land can fix atmospheric nitrogen through symbiosis with bacteria in nodules of the root system. Leguminous species on arable land improve the fertility of the farm's agro system. The objective for Latvia is to have at least 5 % of leguminous crops in arable land of the farms. The measure leaves a positive impact on nitrogen leaching. Supporting of involving of precision farming technologies in the farms also is planned. National Development Plan of Latvia for 2014–2020 set goal to reach area used for organic farming (as a percentage of all land used for agriculture) over 15% in 2030, promoting significant pathway to production in environmentally friendly way.

All the above mentioned measures of Latvia's agricultural policy (2014-2020 RDP for Latvia) concerning GHG emission mitigation measures are evaluated in WAM scenario. With site specific crop management or precision farming and organic farming it is expected to reduce

[55] Source: Ministry of Agriculture Republic of Latvia. Available: http://www.zm.gov.lv/en/lauksaimnieciba/statiskas-lapas/agricultural-resources?nid=1184#jump

[56] Factsheet on 2014-2020 Rural Development Programme for Latvia. Available:

http://ec.europa.eu/agriculture/rural-development-2014-2020/country-files/lv/factsheet_en.pdf

consumption amounts of synthetic fertilizers, but with involving precision animal breeding in the sector, it is expected to increase digestibility (DE) and to decrease methane emissions.

Waste management

The most important document that describes the Latvian progress and planned policies on waste management is "Waste management plan 2013th - 2020 ", approved by Cabinet of Ministers order No. 100, 21 March 2013. The waste management system is one of the most important directions of the EU and Latvian legislation on environmental protection. In general, this is governed by the Latvian 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. The Regulations of Cabinet of Ministers, which is an effect on GHG emissions from the waste sector:

- Regulations Cabinet of Ministers of December 30, 2011 No 1032 "Landfill, landfill and landfill management, closure and remediation policies";
- Regulations Cabinet of Ministers of November 22, 2011 No 898 "Regulations on waste collection and sorting";
- Regulations Cabinet of Ministers of August 2, 2011 No 598 "Rules for separate collection, preparation for re-use, recycling and recovery of materials";
- Regulations of Cabinet of Ministers of 21 June 2011 No 485 "Certain types of hazardous waste management procedures";
- Regulations of Cabinet of Ministers of May 24, 2011 No 401 "Requirements for incineration of waste and incineration facilities";
- Regulations of Cabinet of Ministers of June 21, 2011 No. 470 "Mining waste management procedures."

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

TABLE 14 THE TAX RATES FOR WASTE DISPOSAL FROM JULY 1, 2009

No.	Waste type	Unit	The tax rate for the period 01.07.2009. – 31.07.2009 (Ls)	The tax rate for the period 01.01.2010. – 31.12.2010 (Ls)	The tax rate for the period 01.01.2011. – 31.12.2011 (Ls)	The tax rate for the period from 01.01.2012. (Ls)*
1.	Municipal wastes	tonns	1,25	3,00	5,00	7,00
2.	Construction and demolition wastes (including excavated from contaminated soil sites in the raw state)	tonns	1,25	5,00	10,00	15,00
3.	Asbestos fibers and dust wastes	tonns	10,00	25,00	25,00	25,00
4.	Hazardous wastes	tonns	25,00	25,00	25,00	25,00
5.	Industrial wastes	tonns	1,25	3,00	10,00	15,00

* Note: 1 EUR = 0.702804 Ls

The following are the main regulatory policies and measures for the wastewater management sector:

- Urban Waste Water Treatment Directive 91/271/EEC stipulating that by 31 December 2015 in 88 agglomerations of Latvia of more than 2000 p. e. well-managed biological treatment is to be ensured. In these 88 agglomerations resides 85-90% of the country's population. More stringent treatment which ensures considerable reduction of nitrogen and phosphorus in wastewater is to be ensured in the agglomerations of more than 10 000 p.e. and it had to be already done by 31 December 2011.
- Partnership Agreement for the use of European Structural and Investment (ESI) Funds for the 2014-2020 planning period provides that in agglomerations of more than 2000 p.e. centralized wastewater collection is to be ensured at least from 97% of the residents in the respective agglomeration, but in all other agglomerations – not less than from 92% of the residents in the respective agglomeration.

Industrial processes (F-gases)

The most important regulations affecting the amount of these gases are the F-gas regulation (517/2014) and the directive of HFC emissions from air conditioning in motor vehicles (2006/40/EC). 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; labeling of equipment containing F-gases; reporting on imports, exports and production of F-gases. Several bans on the placing on the market, maintenance and service products and equipment containing HFCs with high GWPs are requirements of the new regulation.
- Avoiding F-gases in some applications where environmentally superior alternatives are cost-effective. Measures include restrictions on the marketing and use of certain products and equipment containing F-gases.

Solvent use

- Regulation No. 1082 "Procedure by Which Polluting Activities of Category A, B and C Shall Be Declared and Permits for the Performance of Category A and B Polluting Activities Shall Be Issued" (Adopted 30 November 2010) contains legal norms arising from Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control);
- Regulation No. 213 "Regulations Regarding the Limitation of Emissions of Volatile Organic Compounds From Certain Products" (Adopted 3 April 2007) contain legal norms arising from Directive 2004/42/EC of the European Parliament and of the Council of 21 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.

LULUCF sector

The measures proposed in the LULUCF sector action plan (529/2013/EU art 10) have been subordinated to medium term planning document: **National Development Plan of Latvia for 2014-2020**[57]. The listing of policies is based on the final version of the Rural Development Programme 2014-2020 (*Zemkopības ministrija*, 2014) and regulations of Cabinet of Ministers No. 136 on Procedures for granting direct payments to farmers.

Measures in cropland

Development and adaptation of drainage systems in cropland

The activity is aimed on reconstruction and improvement of existing drainage systems in cropland to maintain and increase economic value of land and productivity of crops on drained lands. The measure has direct and indirect impact on GHG emissions in short and in long term.

Drainage systems in cropland in Latvia are usually established not for continuous operation, but to get rid of exceeding water in spring, so that the mechanical processing of soil can be started earlier, and to avoid floods during heavy rain and snow melting.

The direct impact in cropland is associated with accumulation of CO_2 in soil carbon pool due to higher productivity of the drained fields and application of more advanced management practices. The evaluation of impact of the measure considers that it will be implemented in extensively managed cropland where poor conditions of drainage systems shorten active vegetation season or production of agricultural crops is not possible at all.

Support to introduction and promotion of integrated horticulture

The measure applies to the establishment of new orchards on existing cropland and extracted peat quarries. Implementation of the measure will affect carbon stock in living biomass and soil. Change of the land management system, particularly, establishment of continuous ground vegetation, will affect N_2O and CH_4 emissions; however, existing methods are not elaborated. The impact of the measure is projected for the 20 years' period for soil and 30 years – for living biomass carbon pools.

Support to diversification of crop rotation

The measure is implemented according to regulations of Cabinet of Ministers No. 136 on Procedures for granting direct payments to farmers. It considers diversification of crop rotation in cropland, including application of green manure, to secure higher inputs of organic material into soil. It will be implemented in intensively managed cropland with medium input of organic material (the carbon stock change factor for input equals to 1.0, IPCC 2006). After implementation, the management system in the affected fields will be changed to "High, without manure" according to the IPCC 2006; respectively the carbon stock change factor for input will increase to 1.11.

Growing of papilionaceous plants (legumes)

[57] http://www.nap.lv/

This measure is also implemented according to regulations of Cabinet of Ministers No. 136 on Procedures for granting direct payments to farmers and considers use of legumes in mixture with other crops in cropland, considering higher inputs of organic material into soil and partial replacement of mineral fertilizers with nitrogen fixing plants. It will be implemented in the intensively managed cropland with medium input of organic material (the carbon stock change factor for input equals to 1.0, IPCC 2006). After application of the measure the management system in the affected fields, will be changed to "High, without manure" according to the IPCC 2006 and the carbon stock change factor for input will increase to 1.11.

Greening of cropland

This measure is also implemented according to regulations of Cabinet of Ministers No. 136 on Procedures for granting direct payments to farmers. Leaving a certain area of cropland out of conventional cropping system, if the area is not afforested or used for perennial crop production, in general will not lead to reduction of the GHG emissions or increase of CO_2 removals, because reduction of the field size should be compensated by increase of a field area in other place to maintain production, if no other productivity measures are applied. However, there is an option to reduce GHG emissions by reduction of management activities on organic soil. In the impact calculation it is assumed, that share of cropland on organic soil left for greening purposes will be equal to share of organic soils in cropland.

Measures in forest land

Development and adaptation of forestry infrastructure

The most of the forest drainage systems in forest land in Latvia are established before 1990. The measure is aimed on reconstruction and improvement of existing drainage systems in forest land to maintain and increase economic value of land and productivity on drained lands. The measure has a direct and indirect impact on GHG emissions in short and in long term. Living and dead biomass carbon pool is highly affected in forest land.

Forest drainage is one of the most efficient solutions to increase CO_2 removals in living biomass and other carbon pools in forest lands on mineral soils.

Afforestation and improvement of stand quality in naturally afforested areas

The scope of afforestation is economically and environmentally efficient utilization of farmlands, which are not used for food of fodder production. This is the most efficient climate change mitigation measure in the Rural development plan 2014-2020.

The afforestation secures accumulation of CO_2 in living and dead biomass, litter and soil (only in less fertile and depleted soils).

Regeneration of forest stands after natural disturbances

Regeneration of forest stands after natural disasters considers restoration of forest stands after natural disturbances, like forest fires and strong storms, as well as reconstruction of diseasing valueless forest stands. The measure will affect mainly carbon stock in living biomass and

dead wood carbon pools. The breeding effect in regenerated stands is considered as a main driving force for additional CO_2 removals according to the recent research results.

Improvement of ecological value and sustainability of forest ecosystems

The scope of the measure is to support pre-commercial thinning of young stands in private forests to secure implementation of sustainable forest management practices aimed to increase economic and ecological value of forests in long term.

Pre-commercial thinning has a short and long term impact. A short impact is a transfer of certain portion of the carbon from living biomass to the dead biomass pool with following conversion into CO_2 during 20 years according to Tier 1 approach according to IPCC 2006. The long term impact is increase of growing rate (by 15 % annually in average, according to an expert judgement used in some growth models).

4. Projected greenhouse gas emissions until 2035

The scenarios underlying the emission projections in the 2015 submission have incorporated new insights with regard to economic and demographic developments, sector developments, fossil fuel prices, the CO2 price and policies when compared with the projection of 2013. Recent statistics were also taken into account. The base year for the model is 2012, as against 2010 for the previous projection.

Greenhouse gas (GHG) emissions in Latvia have been projected for the years 2015, 2020, 2025, 2030 and 2035. Emissions projection includes and provides for the implementation of policies and measures which are defined in policy documents developed by the government of Latvia until the year 2014. These projections correspond to the "scenario with existing measures" (WEM). In addition to this scenario, there are also projected emissions with planned additional measures which are not described in the approved government documents and legal regulations. This is the "scenario with additional measures" (WAM). In addition to the projections, two sensitivity scenarios have been assessed for the energy sector to evaluate the impact of GDP growth rate and the share of electricity import in electricity supply.

The GHG emission projection of Latvia up to 2035 is based upon the long-term macroeconomic projection up to the year 2035 developed by the Ministry of Economics. The scenario projects that the growth rates of exports and the manufacturing industry will remain comparatively high, based mainly on both the increased competitiveness of Latvian producers and the growing external demand. According to this scenario it is expected that GDP, similarly to private consumption, will double during 2005-2030 with the average annual growth 3%. The number of population in Latvia is expected to continue to decrease by 13.9% from 2.012 to 1.923 million in the same time period.

TABLE 15 THE MAIN MACRO ECONOMIC INDICES APPLIED FOR PROJECTING GHG EMISSIONS

	2015	2020	2025	2030	2035
Number of inhabitants, thous.	1979.90	1938.72	1926.85	1923.87	1924.47
Private consumption, annual changes per period, %	2.5%	4.2%	4.3%	3.3%	2.7%
GDP growth, annual changes per period, %	2.5%	4.2%	4.3%	3.3%	2.7%
agriculture	1.1%	2.9 %	3.8%	2.7%	2.1%
service	2.2 %	4.8%	4.6%	3.4%	2.7%
manufacturing	0.5	5.1%	6.7%	5.6%	4.4%

Total GHG emissions under the "scenario with existing measures" increase by 13.8% up to 2020 and 27.4% up to 2030 compared to the year 2012. The energy sector will account for the biggest share amounting to 65.9% of the total projected GHG emissions in the year 2020, followed by the agriculture sector with its share amounting to 21.9% and the industrial processes with 7.6% share. The projected emissions change trends differ across different sectors. The highest increase of the total GHG emissions in the year 2020 is projected in the industrial processes (15%) and agriculture sectors (22.7%) vs. the year 2012. In the agriculture and industrial processes sectors it is related to the projected extension of production. In the energy sector emission projections show increase by 13.3%. It is related mainly to the increase of energy demand in the manufacturing sector and demand for electricity, and substitution of electricity import by domestic generated electricity.

TABLE 16 ACTUAL AND PROJECTED TOTAL GHG EMISSIONS PER SECTOR UNDER "SCENARIO WITH EXISTING MEASURES", THOUSAND TON CO_2 EQ.

	2012 (reference year)	**2015**	**2020**	**2025**	**2030**	**2035**
Energy excluding transport	4540.1	4767.6	5446.0	5546.6	6067.9	6177.8
Transport	2792.8	2796.7	2860.2	2944.1	3014.3	3044.8
Industrial processes	828.3	840.9	952.6	1086.7	1215.7	1327.5
Agricultue	2247.4	2404.7	2757.2	3017.3	3277.4	3551.9
Waste	704.2	636.4	570.7	538.9	512.5	491.8
Total excluding LULUCF	**11053.6**	**11446.3**	**12586.8**	**13133.6**	**14087.8**	**14593.8**
Land Use, Land-Use Change and Forestry	-137.57	2031.0	4905.6	5874.3	7133.8	8185.1

In 2030 the share of agriculture and industrial process sectors increases in the total GHG emissions, constituting 23.3% and 8.6% respectively. At the same time the contribution of the energy and waste sectors to total emissions decreases.

Carbon dioxide accounts for almost 68% of the total GHG emissions in 2012 and it is projected that it will grow and will amount to 15.9% and 31.4% respectively in 2020 and 2035 vs. the reference year.

TABLE 4 ACTUAL AND PROJECTED TOTAL GHG EMISSIONS PER SECTOR UNDER "SCENARIO WITH ADDITIONAL MEASURES", THOUSAND TON CO_2 EQ.

	2012 (reference year)	2015	2020	2025	2030	2035
Energy excluding transport	4540.1	4664.0	4429.4	4214.8	4428.8	4715.9
Transport	2792.8	2725.5	2658.2	2738.9	2784.2	2839.3
Industrial processes	828.3	840.9	952.6	1086.7	1215.7	1327.5
Agricultue	2247.4	2298.0	2543.6	2725.2	2906.8	3096.4
Waste	704.2	636.1	570.4	516.6	451.7	401.5
Total excluding LULUCF	11053.6	11164.4	11154.2	11282.2	11787.2	12380.7
Land Use, Land-Use Change and Forestry	-137.6	2031.0	4905.6	5874.3	7133.8	8185.1

Energy, agriculture and waste management sectors contribute most to reduction of emissions.

Total GHG emissions under the WEM scenario increase in 2020 and 2030 against 2012 by 13.8% and 27.4% respectively. The additional GHG emission mitigation measures under the WAM scenario allow an essential reduction of the projected emissions. Thus, in 2020 under the WAM scenario emissions are by 11.4% lower and in 2030 by 16.3% lower than in the respective years under the WEM scenario.

In any of the sectors the trends in the projected emission changes under the WEM and WAM scenario are different as well as is different the range of the applied additional measures and impacts. The matter is discussed in greater detail in the following sections on emission analysis.

5. Projected emissions per sector

5.1. Energy

Total GHG emissions caused by energy production and use (1.Energy) will increase by the year 2030 only under the "scenario with existing measures", and they increase in 2020 and 2030 by 13.3% and 23.8% respectively compared to the year 2012. Under the "scenario with additional measures" the GHG emissions volume in 2020 and 2030

is respectively lower by 14.3% and 20.5% than in the "scenario with existing measures". GHG emissions reduction amounts to approximately 1218 Gg CO_2 eq in the year 2020.

Energy, Gg $CO_{2\ eq}$	**2012**	**2015**	**2020**	**2025**	**2030**	**2035**
WEM scenario	7332.9	7564.3	8306.2	8490.8	9082.3	9222.7
WAM scenario	7332.9	7389.4	7087.6	6953.8	7213.0	7555.5

Amount of GHG emissions in Energy Sector is mainly determined by the change of Final Energy Consumption (FEC) and Gross Primary Energy Supply (GPES) within considered period of years 2015-2035. GHG emissions projections' in WEM scenario are calculated assuming the total FEC's growth in this period only 6.3% and GPES's growth – 6.5%, however, the sectors have different FEC's trends.

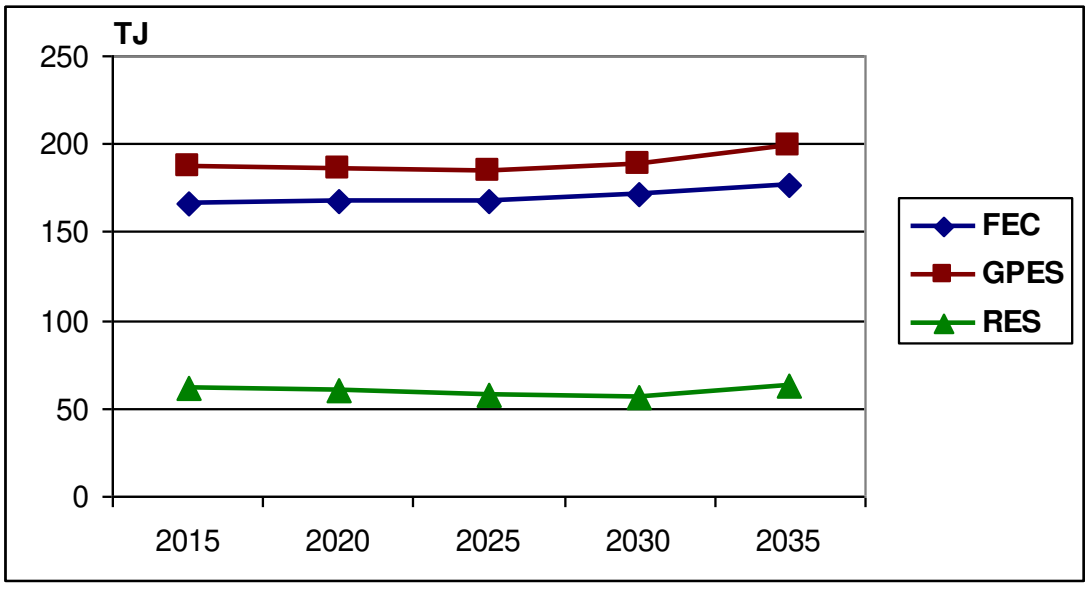

FIGURE 13 FEC, GPES AND RES DEVELOPMENT IN WEM SCENARIO, TJ

High increment rate of Value Added in Manufacturing Sector causes the increase of energy consumption per 29% during 20 years period. The next-largest energy consumption increase – 18.9% - is projected in Agriculture Sector. In Transport Sector the significantly lower growth of energy consumption is projected – only 8.7%. On the contrary, in Households and Service sector energy consumption will go down, per 19% and 0.5% during 20 years period.

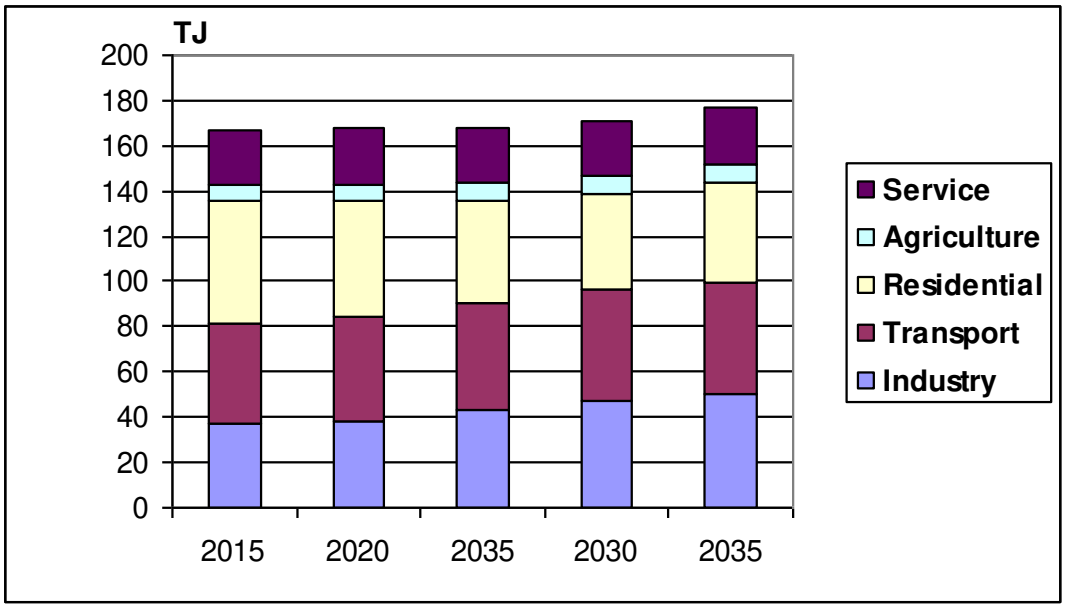

FIGURE 14 FEC DEVELOPMENT IN SECTORS UNDER WEM SCENARIO, TJ

The energy sector is affected strongly by the measures to reduce the emissions, enhance the energy efficiency and to increase the share of renewable energy sources.

If in the energy generation sector (electricity generation and district heating system) the main GHG emission reduction measures relate to wider use of RES to replace fossil fuel and reducing energy losses in the supply system, then in the consumption sectors raising of energy efficiency is the priority target.

The increase of the use of renewable energy sources is done in the electricity and district heating sectors by increasing first of all the use of biomass in heating boilers, followed by increasing the use of biomass in CHPs (combined heat and power plants) and then by increasing the use of other RES in the generation of electricity and heating. There are also wide possibilities to replace fossil fuel with biomass in the industrial sector. To increase the use of RES in the residential and service sectors as well as the transport sector is fairly limited.

Taken together, this use of all the renewable energy sources is expected to increase the share of the use of renewable energy sources in the total final energy consumption by 34 % under the WEM scenario and 40% under the WAM scenario. The biggest difference between the projected scenarios is more extensive use of renewable energy sources under the "scenario with additional measures" in the manufacturing sector.

Energy efficiency measures considered in the National Energy Efficiency Action Plan have been taken into account in both scenarios (WEM and WAM). Energy efficiency measures mainly focus on energy efficiency improvements in buildings (residential and public buildings) and they are already fully being implemented under the WEM scenario. Most of additional

energy efficiency measures implemented under the WAM scenario relate to the industrial and service sectors.

Manufacturing sector

The GHG emissions in the manufacturing sector will increase during the period from 2012 to 2035, taking into account the projected long-term development trends of the national economy and the government statements concerning encouragement of development and export capacity of various manufacturing branches. Production increase is projected also in such energy intensive sectors as wood industry, production of cement and lime, production of ceramic products.

Manufacturing, Gg $CO_{2\ eq}$	2012	2015	2020	2025	2030	2035
WEM	960.7	1188.9	1477.4	2100.3	2543.7	2714.4
WAM	960.7	1048.7	1013.2	1253.8	1456.4	1922.0

The main additional measures allowing reduction of GHG emissions under the WAM scenario compared to the WEM scenario are as follows:

- replacing fossil fuels with biomass fuel technologies which ensure the required quality indices;
- raising energy efficiency by replacing the installed heating generation technologies and electricity demanding technologies with more efficient.

Residential and tertiary sector

Though useful energy demand is projected in the sector, the implementation of a wide range of energy efficiency measures, mainly building renovation, increases minimally the final energy demand in the sector, but GHG emissions under the WEM scenario already in 2020 are by 7.2% lower and in 2030 by 33% lower than in the year 2012. The above energy efficiency measures and, thus, the energy saving potential are already being implemented under the WEM scenario to a great extent.

Households, tertiary, others Gg $CO_{2\ eq}$	2012	2015	2020	2025	2030	2035
WEM	1571.2	1518.6	1457.2	1193.3	1037.1	841.0
WAM	1571.2	1521.6	1430.4	1178.4	1016.3	856.6

Transport sector

The total projected GHG emissions under the "scenario with existing measures" in inland transportation will increase just only by 2.4% and 7.9% in 2020 and 2030 respectively vs. the year 2012.

Transport, Gg $CO_{2\ eq}$	**2012**	**2015**	**2020**	**2025**	**2030**	**2035**
WEM scenario	2792.7	2796.7	2860.2	2944.1	3014.3	3044.8
WAM scenario	2792.7	2725.5	2658.2	2739.0	2784.2	2839.3

Most GHG emissions in the transportation sector are caused by road transport, which accounts for 92% of the total emissions in 2020. Thus, the main emission impacting factor in the transportation sector is the penetration rate of new technologies with higher demands for emission limits and replacing the stock of the existing auto transport. This measure is already included in the emission projections under the WEM scenario.

In railroad transportation due to comparatively short distances inland transportation service is less developed, therefore, international transportation dominate the railroad cargo transportation, thus, external factors have a considerable impact upon the emissions projections in this sector.

Navigation and local aviation account for a very small share of total emissions.

Wider use of biofuels is projected in the WAM scenario.

5.2. Industrial processes

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 industrial processes, including emissions from solvent use and F-gases. The share of industrial process emissions is comparatively low in total GHG emissions, however, from 2010 they have a sharp increase in absolute terms. According to the macroeconomic forecast, a fairly high development rate of manufacturing industry is projected up to 2030 which will be determined both by domestic consumption and the possibilities of export development. The total projected GHG emissions under the "scenario with existing measures" in industrial processes will increase by 15% and 46% in 2020 and 2030 respectively vs the year 2012.

industrial processes, Gg $CO_{2\ eq}$	2012	2015	2020	2025	2030	2035
WEM	828.3	840.9	952.6	1086.7	1215.7	1327.5
WAM	828.3	840.9	952.6	1086.7	1215.7	1327.5

GHG emissions in industrial processes 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.

The use of F-gases is projected taking into account the number of households and the number of freezing equipment used (refrigerators and cold chambers), the development of the service sector and the amount of stationary refrigeration used in it as well as changes in the number of road transport which determine 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 (842/2006), new EC regulation on F-gases (517/2014) repealing regulation 842/2006 and the EC directive on emissions from air conditioning systems in motor vehicles (2006/40/EC) (MAC Directive).

Emissions from refrigeration and air conditioning equipment are expected to decrease due to prohibitions regarding placing on the market certain F-gases as well as according to prohibition to air-conditioning systems designed to contain F-gases with a global warming potential higher than 150 from a certain date.

5.3. Agriculture

Projections of greenhouse gases (GHG) emission in Latvia are compiled according to *2006 Intergovernmental Panel on Climate Change* (IPCC) *Guidelines.* Total emissions from agriculture sector include:

- CH_4 (methane) emissions from enteric fermentation of domestic animals and manure management;
- N_2O (nitrous oxide) direct and direct emissions of from manure management and agricultural soils;
- CO_2 (carbon dioxide) emissions from liming and urea fertilization.

Emissions from agricultural soils include direct N_2O emissions from application of synthetic and organic nitrogen fertilizers, urine and dung deposited by grazing animals, emissions caused by mineralized nitrogen resulting from loss of soil organic carbon stocks in mineral soils through land-use change or management practices, emissions from crop residues and cultivation of organic soils and indirect N_2O emissions from atmospherics deposition and nitrogen leaching and run-off.

Projections of GHG emissions from agriculture sector with existing measures are based on activity data provided by Latvia University of Agriculture in collaboration with Ministry of Agriculture of Republic of Latvia. Methodology of forecasting of agricultural indicators are based on combined results of linear and nonlinear multiple regression analysis and corrections of results by agriculture experts within statistical forecast confidence limits. Regression analysis factors include population data, agriculture products consumption indicators, share of agriculture in GDP and global trading data of agriculture products.

Projections of GHG emissions in agricultural production also are based on goals of National Development Plan of Latvia for 2014–2020. By seeking the solution to the efficient use of Latvia's land resources, the target has been set to reach 95% of cultivated land in the total area of agricultural land till 2020. The size of direct support payments for agricultural land has increased for Latvia in the new programming period of the EU Common Agricultural policy (CAP). Cultivation of agricultural land in Latvia will be positively affected by lifting of milk production quotas in 2015. By increasing of agricultural production, it is expected to increase GHG emissions in Latvia.

Enteric Fermentation

Population of cattle results in more than 90% of CH_4 emissions by enteric fermentation. It is forecasted that number of cattle will increase by 54% and number of sheep by 124% in 2035 compared with 2012 (Table5). Projected livestock numbers is based on the assumption that since 2005 there has been a continuous growth in the number of cattle and sheep. There is also expected growth of cattle and sheep number in agricultural producers development plans according to favourable agro-climatic conditions for livestock farming and global demand for dairy and meat products. Sectoral policy strategy document of the Ministry of Agriculture "Development trends of Latvia dairy sector till 2020" shows the goal to increase milk production and reach 30% growth of the average milk yield. It is forecasted that an expiring of milk quotas also will promote production. For numbers of horses, goats, fur animals and swine is expected to show slighter increase level.

Table 5 Projected livestock numbers, thousand heads

Category	2012	2015	2020	2025	2030	2035
Dairy cattle	164.6	170	195	213	231	250
Non-dairy cattle	228.5	272	290	308	325	351
Sheep	83.6	96	119	142	165	187
Swine	355.2	361	374	393	412	452
Goats	13.3	15	16	17	17	20
Horses	10.9	10	10	10	10	10
Poultry	4910.9	5359	6089	6771	7452	8385
Rabbits	37.3	33	50	73	96	164
Fur-bearing animals	231.6	225	250	265	279	288

Important parameter influencing CH_4 emissions is the gross energy (GE) intake of cattle. For the inventory and projections purposes GE for dairy cattle is calculated on the basis of milk yields. Average milk yield per cow in Latvia is projected to increase until 2035 (Table 6).

Table 6 Average milk yield per cow, kg·year^{-1}

Category	2012	2015	2020	2025	2030	2035
Milk yield	5250	5600	6500	7250	8000	9500

Manure Management

Main activity data for calculation of CH_4 and N_2O emissions from manure management are livestock population data and animal manure management systems (MMS) data, as well as excreted nitrogen rate per domestic animal. For inventory purposes Latvia uses country specific nitrogen excretion values, these values are also used for projections. Data on MMS are calculated based on results of agricultural census data, national research projects results and livestock numbers in the heard. In last year's, cattle farming turn to liquid slurry management system according to closing of small farms and reflection to the trend to this management system in developed countries, however liquid slurry produces more methane and promote increase of this kind of emissions. One of the mitigation measures to reduce emissions from manure management is to use manure for biogas production. According to projections results Latvia will turn to sharp increase of biogas production from manure management in cattle, swine and poultry breeding sectors (Table 7).

Table 7 Production of biogas from cattle, swine and poultry manure, %

Category	2012	2015	2020	2025	2030	2035
Cattle	0.9	9.4	10.8	12.0	13.2	14.8
Swine	0.2	33.6	39.7	43.6	47.5	53.0
Poultry	40	40.9	44.1	46.8	49.5	51.8

Agricultural Soils

The main activity data for calculations of projected N_2O emissions from agricultural soils are amount of synthetics nitrogen fertilizer consumption, harvested crops and cultivated area of organic cropland and grassland soil. Latvia sets plans of intensification of the currently extensive agricultural production and for abandoned agricultural land returning for production, which may significantly increase GHG emissions. The consumption of synthetic N fertilizers is projected as the largest source of emissions in this category and is linked to planned significant increase of yields and areas for agricultural crops cultivation (Table 8).

Table 8 Projected data on crop production and synthetic nitrogen fertilizer consumption, thousand tonnes

Category	2015	2020	2025	2030	2035
Wheat	1640	2301	2714	3127	3664
Barley	213	243	292	341	471
Oats	124	145	171	197	260
Rye	70	76	83	90	105
Maize	616	750	980	1209	1865
Pulses	18	24	31	38	56
Potatoes	473	483	505	527	580
Rape	299	390	459	527	664
Perennial grass	1400	2239	2445	2651	2978
Use of N with synthetic fertilizers	72	90	100	110	118

Urea application and liming

Consumption of urea for fertilization is highly variable Latvia. The projection of the amount of urea applied to soils is done on an approximate estimate on an annual basis statistical data with assumption that consumption of urea will not show significant changes. Liming of acidic soils is required on about 40% of agricultural land in Latvia. Since 1992, an insufficient area has been limed, which is beginning to affect soil quality. However, there is no planed support for liming purposes; projections are done with the main task to reach value close to the minimum of required amounts of liming (Table 9).

Table 9 Use of urea fertilizers and liming material, tonnes·year^{-1}

Category	2012	2015	2020	2025	2030	2035
Liming	21600	29214	30000	32500	35000	47500
Urea Application	7901	5970	7000	7500	8000	8000

Agriculture total

Table 10 and Figure 5 represent aggregated GHG emissions from agriculture sector with WEM scenarios in Gg CO_2 eq. The largest source of GHG emissions refers to direct N_2O emissions by increasing sown area and consumption of synthetic nitrogen fertilizers. An upward trend in GHG emissions in the agriculture sector is also caused by enteric fermentation and manure management due to the growth in livestock numbers and milk yield. Latvia has plans of intensification of the currently extensive agricultural production and restoration of abandoned

farmland in agricultural production, which may increase GHG emissions in the agricultural sector up to 58% with WEM scenario until 2035, comparing with emissions level in 2012.

Table10 GHG emissions from Agriculture WEM scenario, Gg

Category	2012	2015	2020	2025	2030	2035
Enteric fermentation, CH_4	31.0	34.9	40.5	45.6	50.7	57.3
Enteric fermentation, total CO_2	**775.7**	**872.7**	**1012.1**	**1139.8**	**1267.4**	**1432.7**
Manure management, CH_4	5.5	5.7	6.5	7.4	8.2	9.4
Manure management, N_2O	0.4	0.3	0.4	0.4	0.5	0.5
Manure management, total CO_2	**243.8**	**245.6**	**282.7**	**317.1**	**351.5**	**399.9**
Agricultural Soils, N_2O	4.1	4.3	4.8	5.2	5.5	5.7
Agricultural Soils, total CO_2	**1211.8**	**1268.1**	**1443.0**	**1539.4**	**1635.9**	**1693.7**
Liming, CO_2	10.3	13.9	14.3	15.5	16.7	19.7
Urea application, CO_2	5.8	4.4	5.1	5.5	5.9	5.9
Agriculture total, CO_2	**2247.4**	**2404.7**	**2757.2**	**3017.3**	**3277.4**	**3551.9**

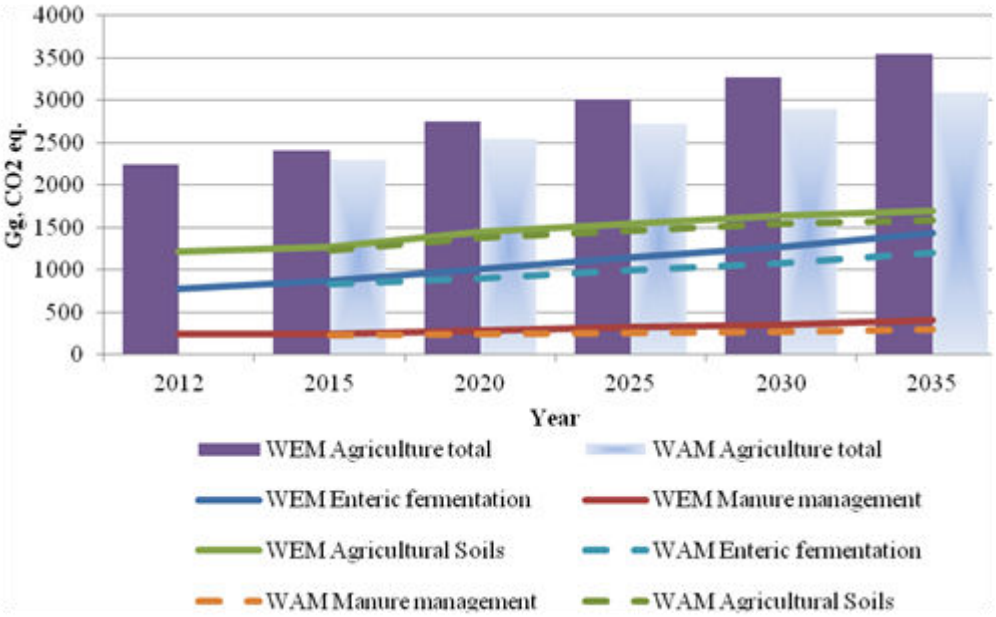

FIGURE 15 COMPARISON OF PROJECTED EMISSIONS WITH WEM AND WAM SCENARIO IN AGRICULTURE SECTOR

All the above mentioned measures of Latvia's agricultural policy concerning GHG emission mitigation measures (see chapter 2) are evaluated in WAM scenario. With site specific crop management or precision farming and organic farming it is expected to reduce consumption amounts of synthetic fertilizers, but with involving precision animal breeding in the sector, it is expected to increase digestibility (DE) and to decrease methane emissions. Comparing with

WEM scenario, additional measures lead to reduction of total emissions from 5% in 2015 to 20% in 2035 (Figure 1).

Table 11 represent aggregated GHG emissions from agriculture sector with WAM scenarios in Gg CO_2 eq., which show increase of GHG emissions in the agricultural sector up to 38% with until 2035, comparing with emissions level in 2012.

Table 11 GHG emissions from Agriculture WAM scenario, Gg

Category	2012	2015	2020	2025	2030	2035
Enteric fermentation, CH_4	31.0	33.0	36.2	39.6	43.0	47.7
Enteric fermentation, total CO_2	**775.7**	**824.4**	**905.1**	**989.9**	**1074.6**	**1193.4**
Manure management, CH_4	5.5	5.0	5.3	5.6	6.0	6.6
Manure management, N_2O	0.4	0.3	0.4	0.4	0.4	0.4
Manure management, total CO_2	**243.8**	**221.7**	**237.0**	**253.5**	**270.1**	**296.21**
Agricultural Soils, N_2O	4.1	4.1	4.6	4.9	5.2	5.3
Agricultural Soils, total CO_2	**1211.8**	**1233.7**	**1382.0**	**1460.8**	**1539.6**	**1581.27**
Liming, CO_2	10.3	13.9	14.3	15.5	16.7	19.7
Urea application, CO_2	5.8	4.4	5.1	5.5	5.9	5.9
Agriculture total, CO_2	**2247.4**	**2298.0**	**2543.6**	**2725.2**	**2906.8**	**3096.4**

5.4. Waste management

Main assumptions in the activity data projection

The calculation of the activity data and emission projections was done on the basis of the following main assumptions and the existing policies and plans:

- Projections on the country's population and macroeconomic factors prepared by the Ministry of Economics;
- The requirements set in the Landfill Directive (1999/31/EC) on the volume of the disposed biodegradable waste are met;
- The requirements set for 2020 in the Waste Framework Directive (2008/98/EC) on recycling of municipal waste are met

It is assumed that under the WAM scenario (with additional measures) in addition to the above measures the waste disposal in landfills reduces mechanically on account of biodegrading that will fully take place in Latvia at the sites of waste management (including landfills). Consequently, composting and other recycling activities will increase.

The following assumptions and existing measures were used in the activity data projection:

- The Urban Waste Water Treatment Directive 91/271/EEC (the requirements have been transposed into Latvian legislation since 2002, namely, Regulations of the Cabinet of Ministers No 34 "Regarding Emissions of Pollutants into Aquatic Environment" of 22 January 2002. The first phase of the Directive implementation was completed by the end of 2008; the last phase should be completed by the end of 2015);
- Projections on the country's population and macroeconomic factors for the manufacturing industry prepared by the Ministry of Economics (the given industry is the main source of GHG emissions in the industrial wastewater management sector).

Projected emissions

There is reduction in total emissions from waste disposal under the WAM scenario in the period up to 2035. In 2020 it is by 18.9%, and in 2035 – by 35% as compared with 2012. The trend gains ground due to the above mentioned measures concerning reduction in the volume of the disposed biodegrading waste in landfills and implementing recycling of municipal waste.

The additional measures under the WAM scenario leave an impact upon emissions reduction starting from 2020 and at the end of the projection period (2035) total emissions from waste disposal will be by 26% lower than under the WEM scenario.

Waste, Gg CO_2 eq	**2012**	**2015**	**2020**	**2025**	**2030**	**2035**
WEM	704.2	636.4	570.7	538.9	512.5	491.8
WAM	704.2	636.1	570.4	516.6	451.7	401.5

Solid waste disposal (SWD) is the most essential GHG emission source in the waste sector. Within SWD methane (CH4) is the most important GHG, other GHG emissions (CO2, N2O) are not essential and therefore they are not calculated.

Under **"scenario with existing measures"** the decrease of the volume of biologically degradable waste within the total volume of disposed waste is taken into account. Volumes of biologically degradable waste are defined in the Waste management plan 2013-2020, which are calculated based upon the volumes of implementation of the disposal sites directive. To project Generated waste amount GDP and population projections are used. CH4 recovery is projected as equal growth till 2020. After 2020 no growth of CH4 recovery is projected. Composting is projected as equal growth till 2020.

For the purpose of the "**scenario with additional measures"** it is assumed that decrease of disposed wastes after year 2020 will take place.

Biological processing of solid waste

Composting corresponds to biological processing of solid waste. In compliance to IPCC guidelines emissions of two gases - methane (CH_4) and nitrogen monoxide (N2O), are important regarding waste composting.

In scenario with additional measures is projected that composting continuing increasing after year 2020, when landfill directive requirements already are reached.

Wastewater management sector

According to the calculated projections, CH_4 emissions from the wastewater management sector will decrease in the period up to 2015 due to complete implementation of the Urban Waste Water Treatment Directive. After 2015, CH_4 emissions stabilization to 6 Gg is expected.

As regards N_2O emissions, the projected outcomes reveal slight, but still consistent increase of emissions the main cause of which will be both the growth in number of modern, centralized wastewater treatment plants (regretfully, according to the existent methodology on emissions projections, the mentioned measure of aquatic environment protection is a factor promoting emission of N_2O) and the macroeconomic projection with regard to the increase of production volume in the manufacturing industry which is the source of N_2O emission in the industrial wastewater management sector.

5.5. Land use, land use change and forestry

Main assumptions

The main data source for land use and carbon stock changes is National forest monitoring program. Other data sources and research data are used as supplementary data sources, for quality assurance purposes as well as to provide activity data for those sources which are not covered by the National forest monitoring programme.

Area of organic soils in croplands and grasslands is updated according to the inventory of historical data about farmlands implemented in 2009 (L.U. Consulting, 2010). Area of cropland and grassland in LULUCF reporting is synchronized with Agriculture reporting, including recalculation of cultivated organic soils.

The NFI and research data are used to estimate time series for areas and gross increment. Mortality data are calculated on the base of the NFI data and mortality factors (Lazdiņš et al., 2012b). Distinction between forest land remaining forest land and areas converted to forest land is made according to the age of dominant species in forests on afforested land – if age of dominant species is less than zero in 1990, it is considered as land converted to forest, in other cases it is considered as forest land remaining forest land.

Projections of the GHG emissions

The impact of the existing measures (WEM scenario) on CO2 emissions and removals is considered in the projection of the LULUCF sector. According to the land use estimates the net CO_2 emissions in scenario without measures will increase from 1.1 million tonnes CO2 in

2015 to 7.2 million tonnes CO2 in 2035 (**Error! Reference source not found.**6). The main drivers for increase of the CO_2 emissions will be ageing of forest and projected decrease of increment, deforestation to settlements due to growth of economic activity in rural regions and increase of peat production for use in horticulture. Notably, that the biggest sources of future CO_2 emissions are estimated using Tier 1 method according to the IPCC 2006. Implementation of the Tier 2 methods and application of the country specific emission factors might change the estimates dramatically, like it happened due to implementation of the soil emissions factors according to IPCC 2014a.

Implementation of existing measures will reduce CO_2 emissions by 199 Gg CO_2 annually, in average, reaching maximum at 2020 and starting to reduce after 2029 (see figure **Error! Reference source not found.**7).

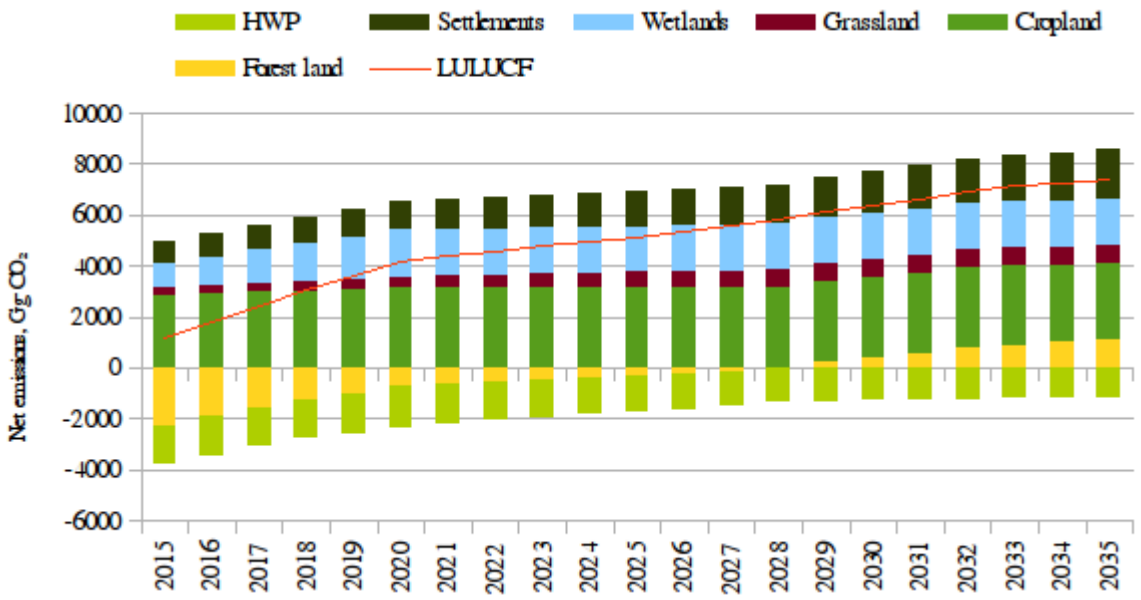

FIGURE 16 PROJECTIONS OF CO2 EMISSIONS FROM LULUCF SECTOR WITHOUT MEASURES

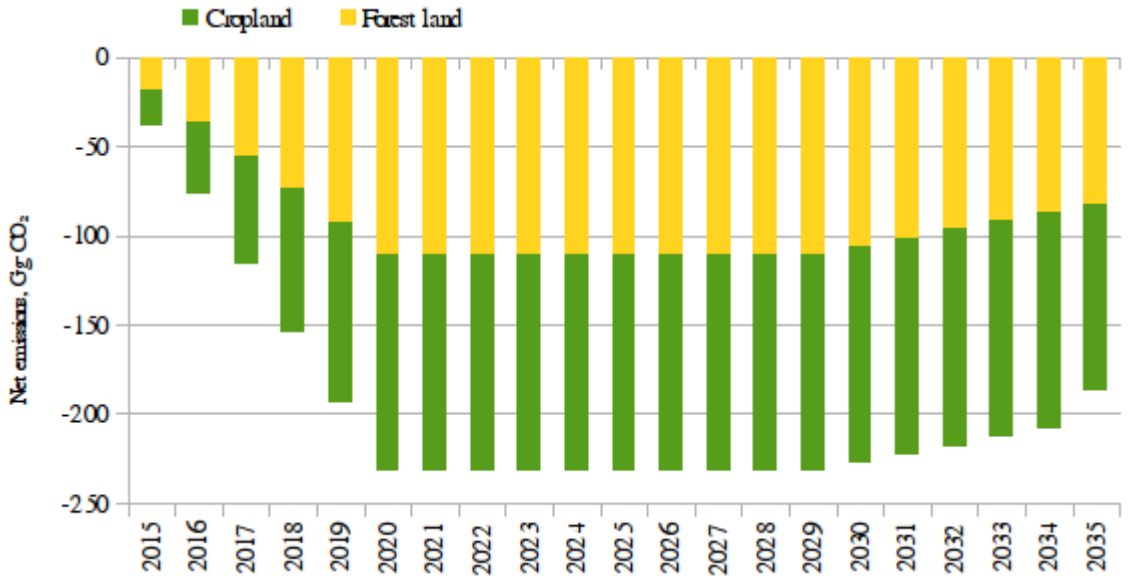

FIGURE 17 IMPACT OF EXISTING MEASURES ON PROJECTIONS OF CO2 EMISSIONS FROM LULUCF SECTOR

N_2O emissions are much more stable in the projections – 2.17 Gg N2O annually in average (647 Gg CO_2eq) in WOM scenario (see Figure 8). The most of the N_2O emissions are associated with organic soil in forest lands. N_2O emissions from organic soil in cropland and grassland not being subject of land use changes are accounted under Agriculture sector.

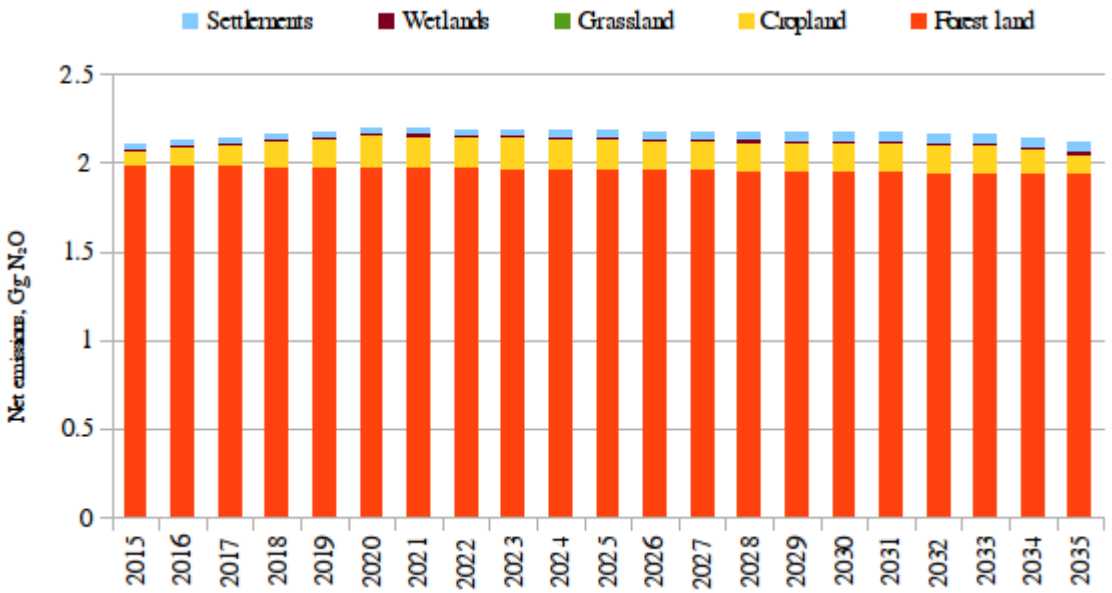

FIGURE 18 PROJECTIONS OF N2O EMISSIONS FROM LULUCF SECTOR WITHOUT MEASURES

The average CH_4 emissions in WOM scenario in 2015-2035 is 12.95 Gg CH_4 (324 Gg CO2eq), they are increasing from 11.49 Gg CH_4 in 2015 to 14.26 Gg CH4 in 2035 (see Figure 9). The main driving force for increase of CH_4 emissions are rewetting of forest lands.

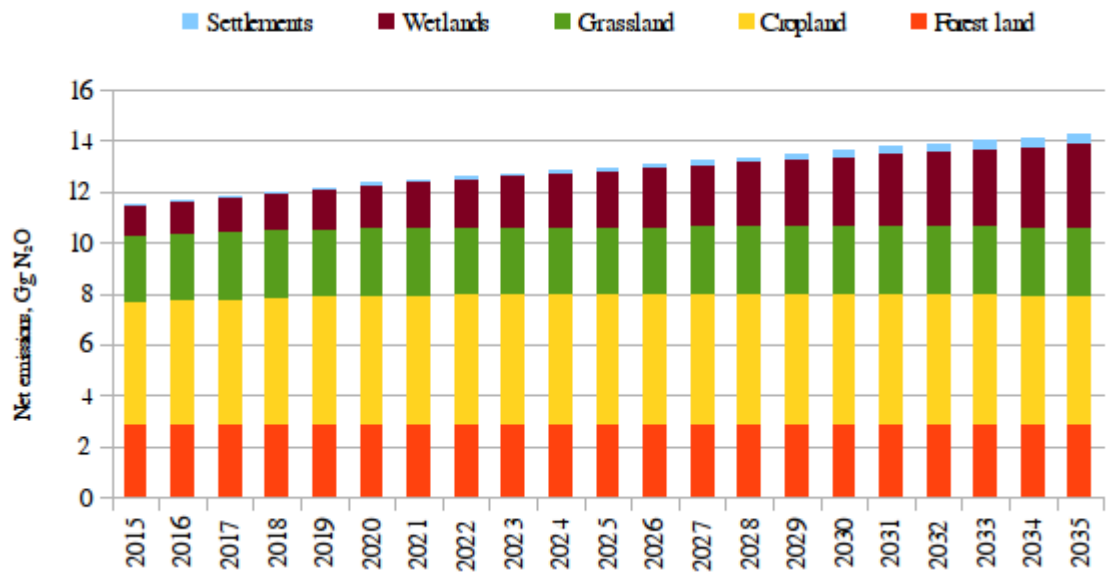

FIGURE 19 PROJECTIONS OF CH4 EMISSIONS FROM LULUCF SECTOR WITHOUT MEASURES

The net GHG emissions from LULCF sector according to the projections of WOM scenario will increase from 2069 Gg CO_2eq in 2015 to 8371 Gg CO2 eq in 2035 (see Figure 10). The

increase of emissions is determined by several reasons, but the most important are increase of economic activity (conversion of land use to settlements and cropland), ageing and reduction of increment in forest lands and increase of peat production for agriculture. Peat production suppose to have opposite impact – increase of carbon stock in soil, but it is mostly exported therefore this impact is not accounted in Latvia.

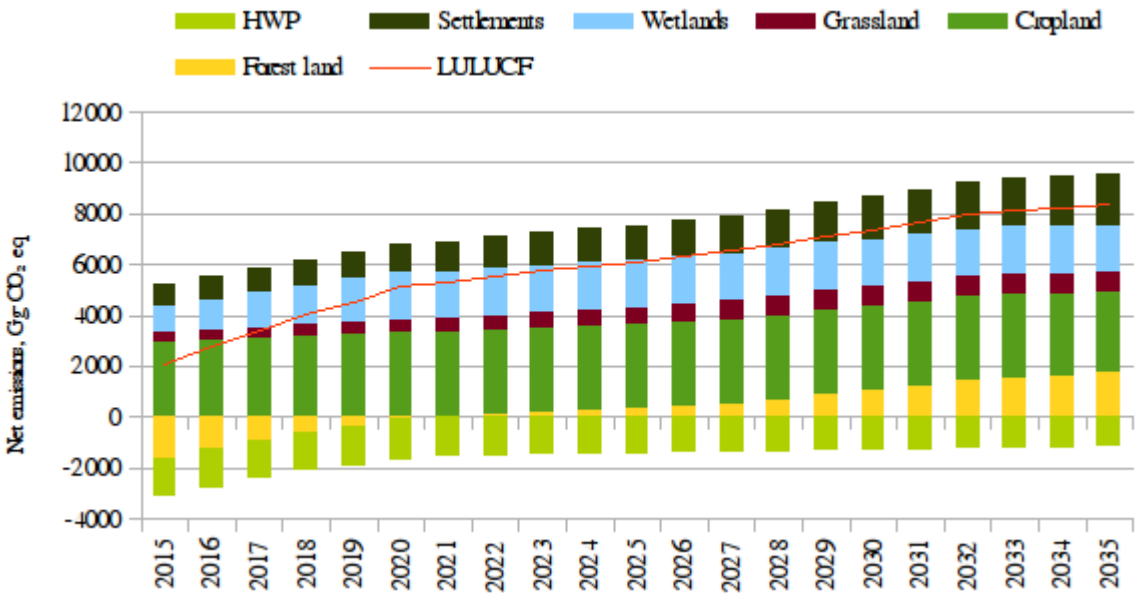

FIGURE 20 PROJECTIONS OF GHG EMISSIONS FROM LULUCF SECTOR WITHOUT MEASURES

Comparing different GHG, the most significant and continuously growing source of emissions is CO_2. Emissions on N2O and CH4 are minor part of the GHG emissions (see Figure 11).

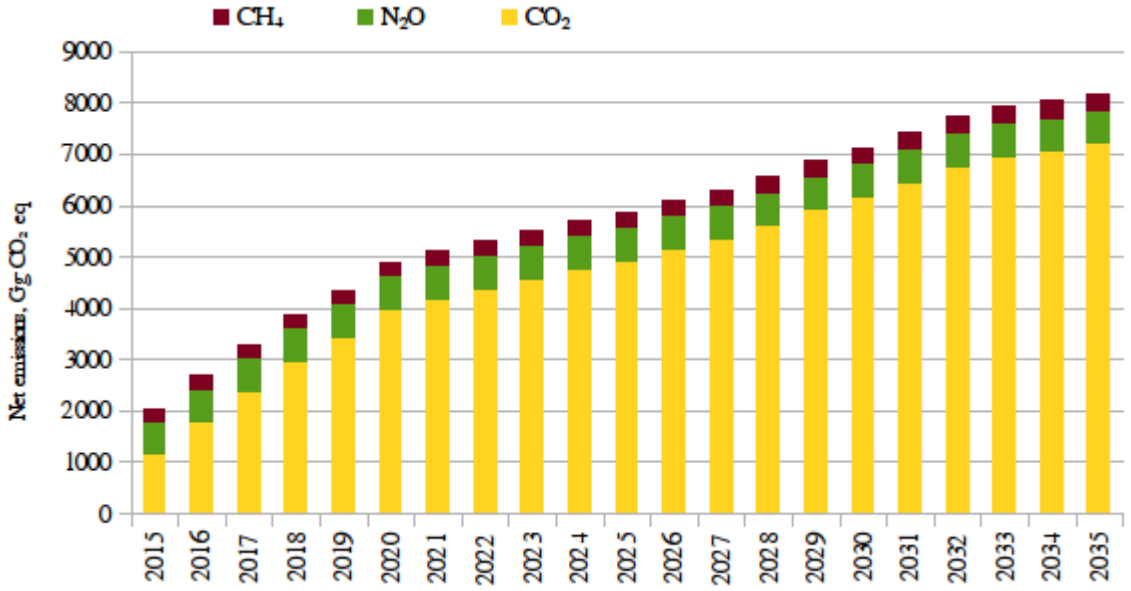

FIGURE 21 PROJECTIONS OF GHG EMISSIONS FROM LULUCF SECTOR WITH EXISTING MEASURES

The relative impact of the climate change mitigation measures in WEM scenario ranges from 1.8 % to 4.5 % of the emissions in WOM scenario (see Figure 12).

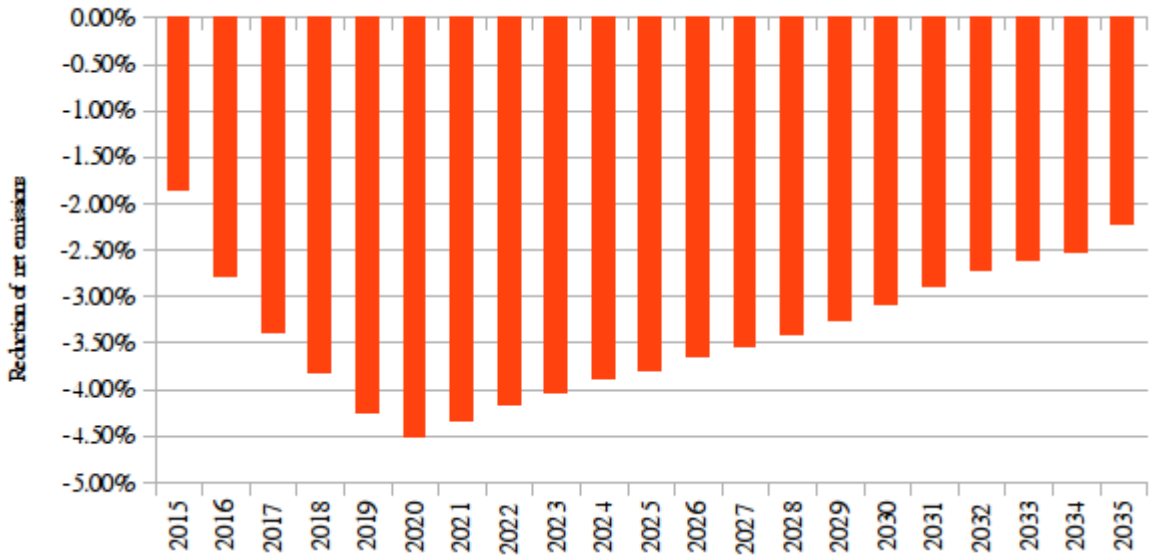

FIGURE 22 RELATIVE IMPACT OF THE EXISTING MEASURES ON GHG EMISSIONS FROM LULUCF SECTOR

6. Total projected GHG emissions and the Effort Sharing Decision target

Total GHG emissions under the WEM scenario increase in 2020 and 2030 against 2012 by 13.8% and 27.4% respectively. The additional GHG emission mitigation measures under the WAM scenario allow an essential reduction of the projected emissions. Thus, in 2020 under the WAM scenario emissions are by 11.4% lower and in 2030 by 16.3% lower than in the respective years under the WEM scenario.

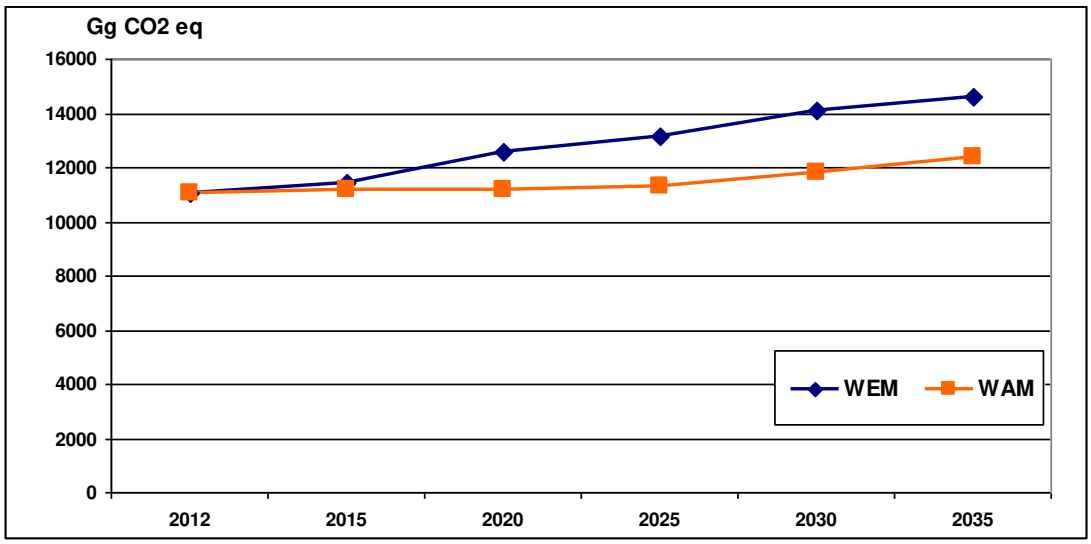

FIGURE 23 TOTAL GHG EMISSIONS UNDER THE WEM AND WAM SCENARIOS

Latvia's commitment for the sectors outside the EU Emissions Trading Scheme according to the European Commission Decision 2013/162/EU on determining Member States' annual emission allocations for the period from 2013 to 2020 pursuant to Decision No 406/2009/EC of the European Parliament and of the Council is that emissions have to increase by 17% between 2005 and 2020 (EU ETS scope 2008-12, excluding aviation) and in 2020 they cannot exceed 9.9 Mt CO2 eq. A split of greenhouse gas emissions to the EU ETS and non-ETS sectors for the projections 2015 - 2020 have been done based on historical 3-years average shares in each ETS sector. The reporting excel-template includes a split of greenhouse gas emissions to the EU ETS and non-ETS sectors.

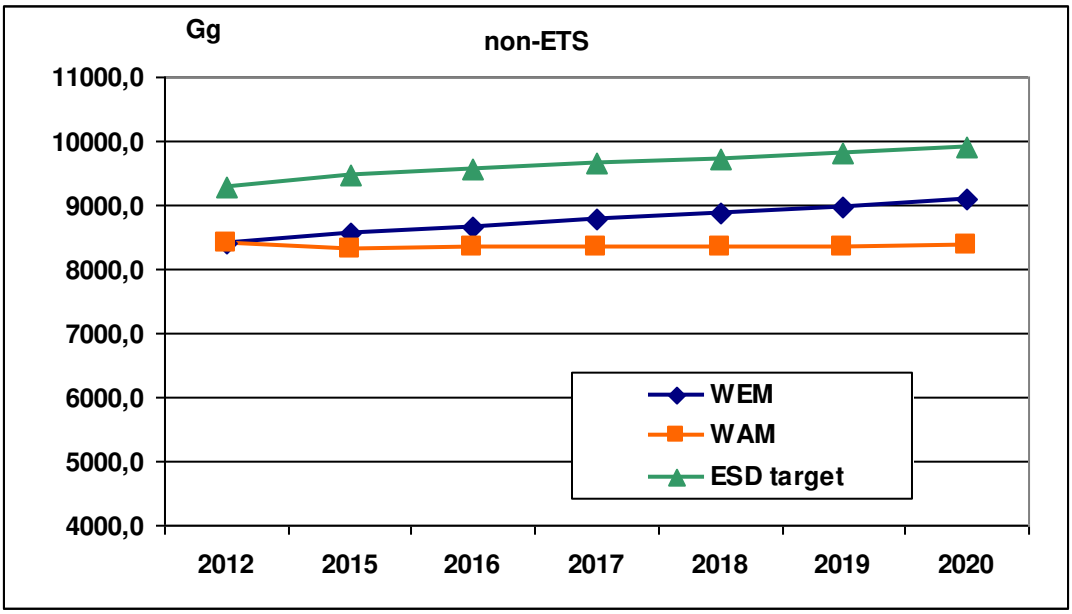

FIGURE 24 ACTUAL AND PROJECTED TOTAL GHG EMISSIONS UNDER THE WEM AND WAM SCENARIOS IN THE NON-ETS SECTOR

Though it is projected that under the WEM scenario in 2020 GHG emissions in the non-ETS sector will increase by 8.3% as compared to the year 2012, they will not exceed the annual emission allocation. The amount of projected GHG emissions under the "scenario with additional measures" is by 7.9 % lower in the year 2020 than the projected emissions under the "scenario with existing measures" (see Figure 14).

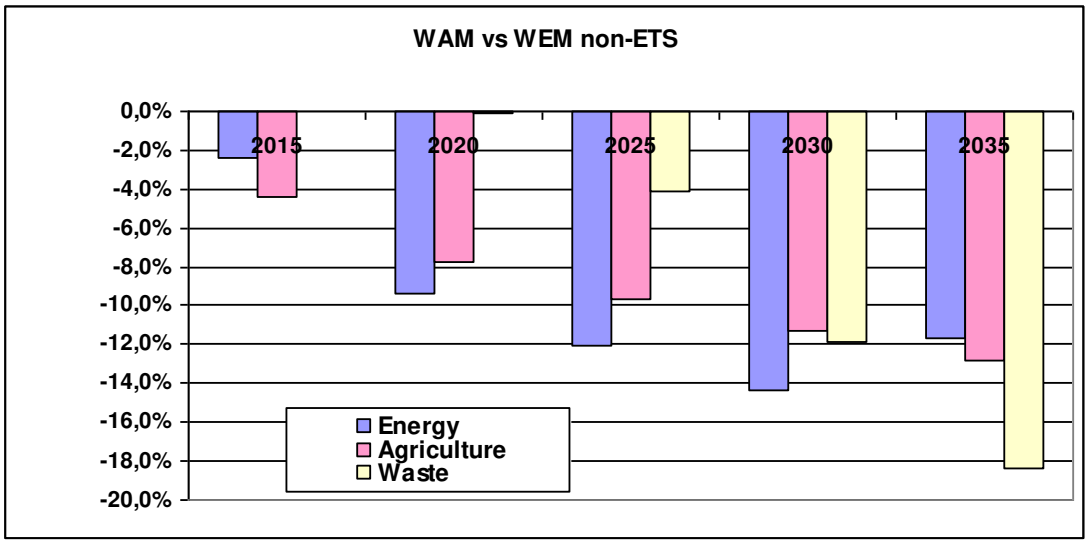

FIGURE 25 EMISSION REDUCTION IN THE NON-ETS SECTORS UNDER THE WAM SCENARIO AGAINST THE WEM SCENARIO

Figure 15 reveals that emission reduction under the WAM scenario for 2020 is due to additional measures in the energy and agriculture sectors. There is a projection for 2030 of emission reduction also in the waste sector because of additional measures.

7. Sensitivity analysis

As it is known, GHG emissions and their projections are impacted by several parameters and the development of their scenarios may have a vital difference upon the GHG volume. In order to assess the dependence of GHG emission projections on the development trends of separate parameters, sensitivity analysis was done to emission projections in the energy sector. Two parameters were selected for the sensitivity analysis of GHG emissions in Latvia under the alternative scenario. First – it was GDP growth rate, second – the amount of electricity import, a vital parameter for the Latvian energy sector.

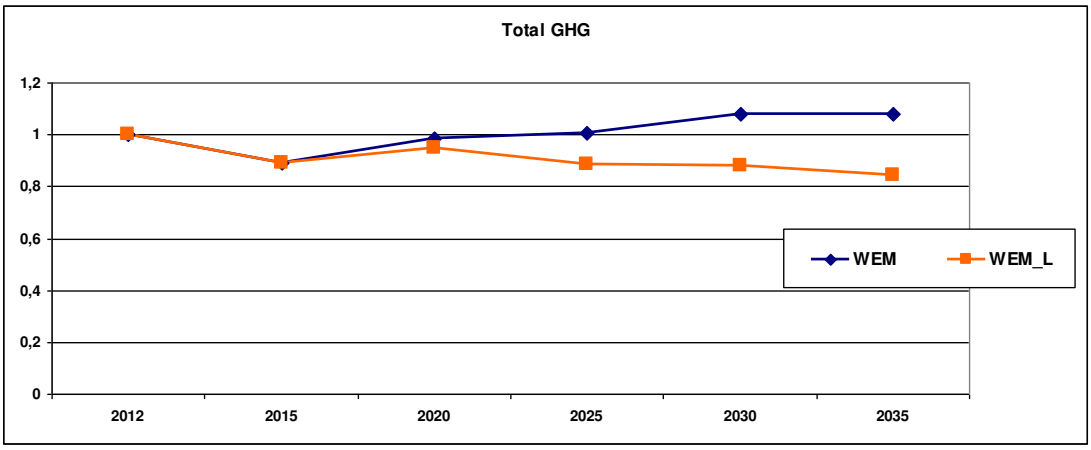

FIGURE 26 RESULTS OF SENSITIVITY ANALYSIS IN THE ENERGY SECTOR ON THE IMPACT OF ASSUMPTIONS FOR LOWER GDP GROWTH

If under the WEM scenario the average annual GDP growth rate was 3% (in the period 2005-2030), under the alternative scenario the average annual GDP growth rate was 2.1%. The modelling results reveal that under the scenario of lower GDP growth (see Figure 16 scenario WEM_L) total GHG emissions in 2020 and 2030 are lower than under the WEM scenario by 3.8% and 18.2% respectively. The scenario of lower GDP growth rate has the most vital impact upon energy consumption and respectively also upon GHG emissions in industry.

In Latvia electricity supply from hydro energy and the amount of electricity import changes from year to year. These changes leave an essential impact on the GHG emissions volume.

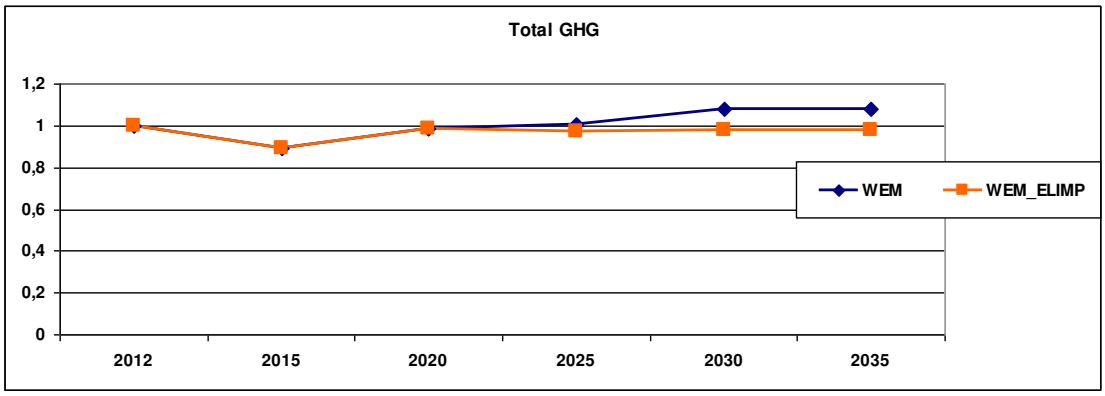

FIGURE 27 RESULTS OF SENSITIVITY ANALYSIS IN THE ENERGY SECTOR ON THE IMPACT OF ASSUMPTIONS FOR HIGHER ELECTRICITY IMPORT AMOUNT

Under the alternative scenario with the assumption for possibly higher electricity import amount (see Figure 17 scenario WEM_ELIMP) the permitted electricity import amount was raised almost twice after 2020 as compared to the WEM scenario. At competitive electricity import price, the modelling results reveal increase of electricity import amount and under this scenario emissions in 2020 and 2030 are lower than under the WEM scenario by 0.1% and 9.4% respectively.

Assumptions on different electricity import amounts leave the most critical impact on emissions in the ETS sector.

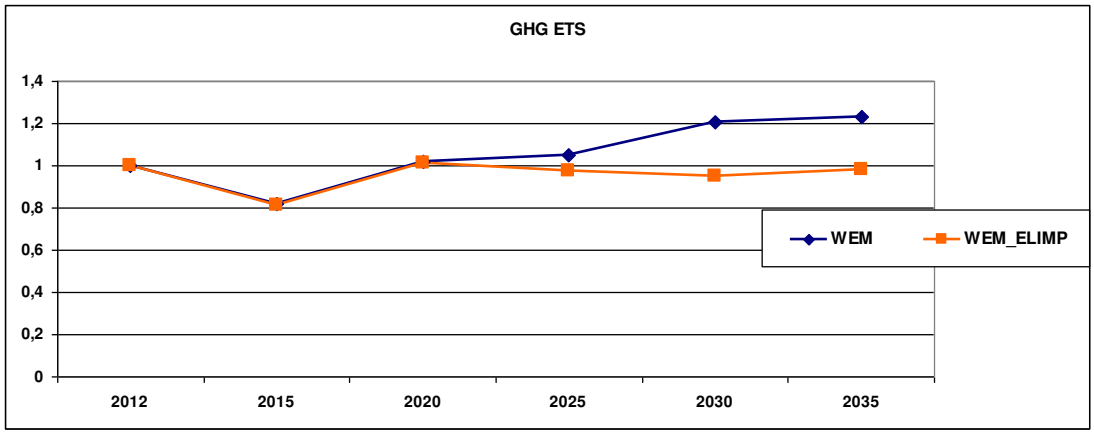

FIGURE 28 RESULTS OF SENSITIVITY ANALYSIS IN THE ETS SECTOR ON THE IMPACT OF ASSUMPTIONS FOR HIGHER ELECTRICITY IMPORT AMOUNT

Figure 18 reveals that under the alternative scenario (WEM_ELIMP) GHG emissions in the ETS sector are lower in 20202 and 2030 than under the WEM scenario by 0.3% and 21.3% respectively. In the non-ETS sector these changes are insignificant as in 2030 the difference is only by 2%.

8. Implemented method for projections in energy sector

Emissions of energy sector have been projected using MARKAL model that describes the whole energy supply – demand system by stages of primary energy supply, transformation sector, energy end consumption and energy demand. MARKAL-LV is an optimisation model that describes development of the Latvian energy system over a period of 30 years on the national level. Results obtained with the MARKAL model depend on the input parameters and the model algorithm. The main paradigms of the model are the perfect market (*competitive partial equilibrium*) and visibility of technology development over the whole period under review *(perfect foresight)*.

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 MARKAL 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 macro economic projection up to year 2030 developed by the Ministry of Economics, has been used. This projection has been applied in projecting electricity consumption, heat consumption, as well as fuel consumption in individual sectors.

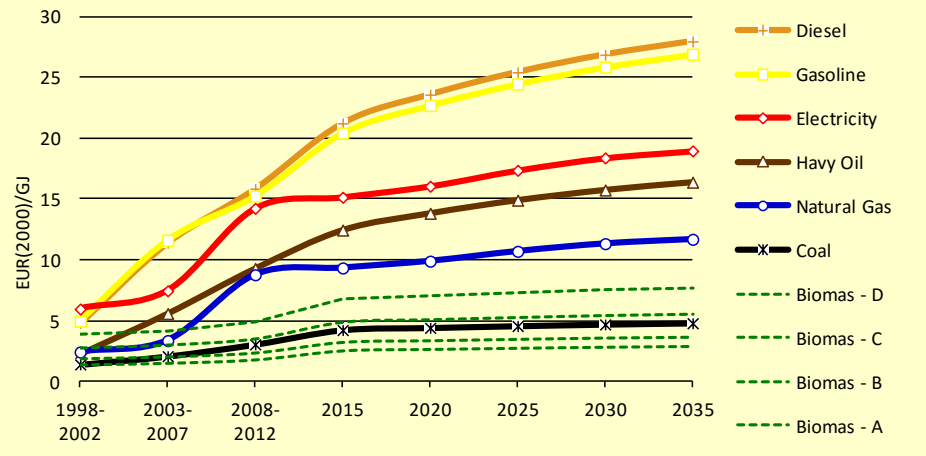

FIGURE 29 PROJECTION OF ENERGY PRICES IN MARKAL-LATVIA MODEL

Price of primary energy resources is an important factor for formation of energy consumption and supply. Actual prices of energy resources are projected without taking into account taxes. The assumed price trajectory is quite smooth, however, it does not mean that they are interpreted as stable price projection; rather these are long-term trajectories within what prices may fluctuate. It is projected that during the time period 2015-2035 prices of energy resources will increase. Price projection of imported energy resources (oil products, natural gas, coal) have been developed based upon information from IEA WEO 2014. Prices of local energy

resources depend on the geographical location of usage; therefore, the price may differ. Projection of average prices of these fuels have been developed based upon available statistics, various studies, taking into account the projection price trends of imported energy resources. Solid biomass (wood) is split to four price groups with difference available amounts of sources.

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