MINISTRY OF ENVIRONMENTAL
PROTECTION AND REGIONAL DEVELOPMENT
OF THE REPUBLIC OF LATVIA

LATVIA'S SIXTH NATIONAL COMMUNICATION and FIRST BIENNIAL REPORT

under the United Nations Framework Convention on Climate Change

December 2013

CONTENTS

Abbreviations	
AWMS	Animal waste management systems
CCFI	Climate Change Financial Instrument
CH	Cohesion Fund
CHP	Cogeneration plants
CRF	Common Reporting Format
CSB	Central Statistical Bureau of the Republic of Latvia
COP	Conference of the Parties
DES	Data Exchange Standards
DH	District heating
DOC	Degradable organic carbon
EC	European Commission
ECHA	European Chemicals Agency
ECMWF	European Centre for Medium-Range Weather Forecasts
EEAP	Energy Efficiency Action Plan
EF	Emission factor
ERDF	EU Regional Development Fund
ETR	Emission Trading Registry
ETS	Emissions Trading System
EU	The European Union
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
EUTL	European Union Transaction Log
GDP	Gross domestic product
GFEC	Gross final energy consumption
GHG	Greenhouse gases
GCOS	Global Climate Observing System
IET	International emissions trading
IPCC	Intergovernmental Panel on Climate Change
IPE	Institute of Physical Energetics
ISO	International Organization for Standardization
ITL	International Transaction Log
LEGMC	Limited liability company "Latvian Environment, Geology and Meteorology Centre"
LULUCF	Land use, land use change and forestry
MEPRD	Ministry of Environmental Protection and Regional Development
MoE	Ministry of Economics
NA	Not applicable
NDP2020	National Development Plan 2014–2020
NE	Not estimated
NGO	Non-governmental organisations
NIR	National Inventory Report
NMVOC	Non-methane volatile organic compounds
NO	Not occurring
PV	Photovoltaic

Abbreviations	
QC	Quality Control
QEWER	Quantified economy-wide emission reduction
RES	Renewable energy sources
SD	Service Desk
SWD	Solid waste disposal
UNFCCC	United Nations Framework Convention on Climate Change
WAM	Scenario with additional measures
WEM	Scenario with existing measures

Chemical formulas	
CH_4	Methane
CO	Carbon monoxide
CO_2	Carbon dioxide
HFC	Hydrofluorocarbons
N	Nitrogen
N_2O	Nitrous oxide
NOx	Nitric oxide
PFC	Perflurocarbons
SF_6	Sulphur hexafluoride

Units of measurement	
CO_2 eq	Carbon dioxide equivalent
^oC	Degree Celsius
Gg	Gigagram
GWh	Gigawatthour
Ha	Hectare
kg yr^{-1}	Kilograms per year
Kha	Kilohectare
kWh	Kilowatthour
MJ	Megajoule
MW	Megawatt
m/s	Meters per second
Mm	Millimetre
%	Per cent
PJ	Peta joule
km^2	Square kilometre
m^2	Square metre
Mill	Millions

INTRODUCTION

This report represents Sixth National Communication on Climate Change of the Republic of Latvia under Article 12 of the United Nations Framework Convention on Climate Change (UNFCCC, the Convention), under Article 7 of the Kyoto Protocol and according to the decisions 2/CP.17 and 9/CP.16 of the Conference of the Parties (COP) under the UNFCCC. It covers questions related to the implementation of the Convention by Latvia and shows progress Latvia is making towards meeting its goals. This report outlines principal information on the main events and Latvia's achievements during the time period from 2008 until 2012.

Information in this report has been prepared according to "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communication".

Latvia's Sixth National Communication report provides:

- Summary of information about national circumstances relevant to GHG emissions and removals on a sectorial basis (Chapter 2);
- Information on most recent GHG inventory, National system and National registry (Chapter 3);
- An overview of actual climate change policies and measures in Latvia (Chapter 4);
- Projections of GHG emissions until 2030 (Chapter 5);
- Assessment of Latvia's vulnerability to climate change impacts and effort achieved in adaptation measures (Chapter 6);
- Information about research activities related to climate research and systematic observation (Chapter 8);
- An overview of measures towards improvements of education, training and public awareness related to climate change issues (Chapter 9).

UNFCCC decision 2/CP.17 requires submitting First Biennial Report by 1st January 2014. Latvia has decided to submit its First Biennial Report as Annex 1 to this Sixth National Communication. The tables as defined in the common tabular format (CTF) for the UNFCCC biennial reporting guidelines for developed country Parties (UNFCCC decision 19/CP.18) are enclosed as Appendix: CTF for Latvia's First Biennial Report of Annex 1. In order to avoid duplication of information, overlapping contents are concentrated in the Sixth National Communication.

A summary table outlining the location of supplementary information required under Article 7, paragraph 2, of the Kyoto Protocol within this National Communication is provided in the Annex 2.

Latvia actively participates in fulfilment of the obligations set forth in the Convention and in the Kyoto Protocol, by implementing national and EU climate policies. The data compiled in this report shows that Latvia is on track for reaching the target of 8% emission reduction over the period from 2008-2012 for the first commitment period under the Kyoto Protocol. For the second commitment period of Kyoto Protocol until 2020 Latvia has committed together with other EU member states to achieve the joint target of emission reduction by 20% comparing to year 1990.

EXECUTIVE SUMMARY

1 EXECUTIVE SUMMARY

Latvia's Sixth National Communication report on Climate Change covers questions related to the implementation of the Convention by Latvia and shows progress Latvia is making towards meeting its goals. As a Party included in Annex I of the Convention Latvia is required to submit a national communication every four years. National communications are designed to provide consistent, comparable, accurate and complete information on actions being taken by Parties towards implementation of the Convention and issues related to the climate change.

According to the Kyoto Protocol Latvia has the obligation to reduce the total greenhouse gas (GHG) emissions by 8% comparing to the GHG emissions of the base year. The base year of the Republic of Latvia for carbon dioxide (CO_2,), methane (CH_4) and nitrous oxide (N_2O) emissions is 1990. To report within the framework of the Kyoto Protocol (according to Article 3.8) Latvia shall use 1995 as the base year for hydrofluorocarbons (HFC) and sulphur hexafluoride (SF_6). For the purposes of calculating achievement of the Kyoto Protocol target emissions occurring in base year are fixed 25909,16 Gg CO_2 eqv according to Latvia's Initial Report under the Kyoto Protocol which was submitted in 2006, based on emissions reported in the 1990-2004 and was subject to official review in 2007.

Since Fifth National Communication report Latvia has improved estimations for GHG inventory as well as projections calculations. Almost all of the policies reported in Fifth National Communication have been renewed for the next period. The main results regarding the policies and measures are the full implementation of the EU's Climate and Energy package (2009). Main events and Latvia's achievements related to climate change (research, education, public awareness) during the time period from 2008 until 2012 have been included in this report.

The report addresses the recommendations of the 2011 UNFCCC Report of the In-Depth Review of the Fifth National Communication of Latvia. Following information has been included in this report: how Latvia believes its policies and measures are modifying long-term trends in anthropogenic GHG emissions and removals; emission projections presented relative to actual inventory data for the preceding years; the total estimated effects of policies and measures; emission projections related to fuel sold to ships and aircraft engaged in international transport; action taken to cooperate with developing countries with regard to adaption; summary information on the Global Climate Observing System (GCOS) activities. No actions have been taken to support capacity-building on research and systematic observation in developing countries, therefore this information is not included in this report.

1.1 NATIONAL CIRCUMSTANCES

Latvia is an independent democratic parliamentary republic. The sovereign power belongs to the people, who are represented by the unicameral parliament (the Saeima), with 100 members elected in general, equal, direct, secret and proportional elections for a four-year period.

In 2012 the total population of Latvia was 2,044,813 people[1]. Over the last 20 years Latvia's population has decreased by an average of 1.19% annually. While population growth is generally considered a driver for greenhouse gas emissions and for increasing energy consumption, the population trends in Latvia do not have a major role in emission trends.

[1] http://www.csb.gov.lv/statistikas-temas/iedzivotaji-datubaze-30028.html

The territory covers an area of 64 569 km^2 in total and the average density of population in Latvia is 32 persons/km^2. [2]

Latvia is situated at the Baltic Sea cost and borders with Estonia in the North, Lithuania and Belarus - in the South and Russia - in the East. Latvia is a typical lowland country and its terrain is characterized by flat, low areas and hilly elevations.

Climate is influenced by Latvia's location in the northwest of the Eurasian continent (continental climate impacts), and by proximity to the Atlantic Ocean (maritime climate impacts). A highly variable weather pattern is determined by the strong cyclonic activity over Latvia. Latvia belongs to fully humid snow climate with warm summers in the Köppen-Geiger climate classification system.

Latvia's economy is driven by exports - contributing nearly a third of gross domestic product (GDP). Due to geographical location, transit services are highly-developed, along with timber and wood-processing, agriculture and food products, and manufacturing of machinery and electronics industries. The economy of Latvia has become more sustainable during the post-crisis period. Economic structure has become versatile and exports are more diversified, and goods and services are sold in many different markets.

Since the end of 2009 the economic recession in Latvia has stopped and growth has resumed. From Since the lowest point of the economy in the 3rd quarter of 2009, until the 3rd quarter of 2012, the GDP has increased by 14.7%.

1.2 GREENHOUSE GAS INVENTORY INFORMATION

As a Party to the UNFCCC and the Kyoto Protocol, Latvia has an obligation to prepare, publish and update greenhouse gas inventories on an annual basis. Since the Fifth National Communication, report Latvia has developed a range of measures to improve the national greenhouse gas inventory system and produce more accurate and comprehensive emission estimation, mainly due to changes in methodology and emission factors in LULUCF and other sectors. These measures are described in Chapter 3.5.1 and are reported on sectorial basis.

Latvia's most recent inventory covers the year 2011 and was submitted to the UNFCCC in 2013. The inventory results for the period between 1990 and 2011 are summarised below and illustrated in Figure 1.1.

[2] http://www.csb.gov.lv/statistikas-temas/iedzivotaji-datubaze-30028.html

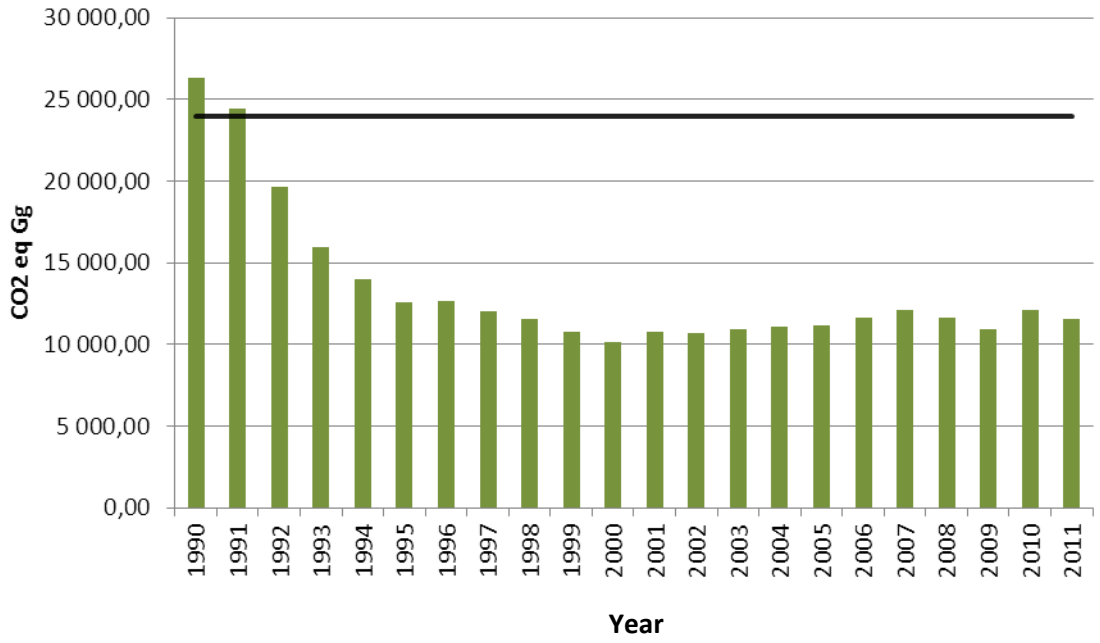


Figure 1.1. GHG emission time series for 1990–2011 and the target of the Kyoto Protocol (Gg CO_2 eq.)

The GHG emissions have considerably decreased during the time period from 1990–2000 when the national economy of Latvia transformed from central planning economy to a market economy which affected all sectors of the national economy. From 2001 the total GHG emissions have been fluctuating due to the economic situation – until year 2007 the emissions have slightly increased by about 13% from 2001 level, whereas in years 2007-2009 emissions have fallen by about 10%. The emissions have large fluctuations in 2009-2011 within 4-10%.

Total GHG emissions, without land use, land use change and forestry (LULUCF) sector, during the time period from 1990-2011 have decreased by 56.1%, though during the last 4 years emission volumes are fluctuating. The major source of GHG in 2011, excluding LULUCF, was CO_2 (8,088 thousand tons), accounting for 70.1% of the total emissions, accordingly CH_4 constituted 14.1%, N_2O – 15%, and fluorinated gases – 0.8% of total emissions. Energy sector caused 68.1% of total GHG emissions, agriculture – 20.1%, industrial processes – 6.3%, waste management – 5.2%, use of solvents and other products – 0.4%.

The main source of CO_2 emission in 2011 was the combustion of fossil fuels – 91.7% (including the following subsectors: energy industry – 25.6%; manufacturing industry and construction – 10.8%; transport – 38.1%; other sectors – households, agriculture, forestry etc. – 17.1%). Other CO_2 emission sources were industrial processes – 7.8%, solvents and other product use – 0.45% and waste management (burning) – 0.004%. On its turn, because of the photosynthesis of plants in forests and arable land the total annual GHG removal exceeded the annual GHG emission increase. In 2011 the net CO_2 removal of the LULUCF sector was 17,349.54 Gg.

The emissions of the second most important GHG - CH_4 (with/without LULUCF sector) in 2011 decreased by almost 53% comparing to 1990. Main CH_4 emission sources are solid municipal waste landfills and enteric fermentation processes of livestock as well as leakage from natural gas pipeline systems.

Since 1990 the total N_2O emissions (with/without LULUCF sector) have decreased by almost 55%. In recent years an increase of the total emission volume was observed. However, in year 2011 the N_2O emissions have decreased by 0.7% comparing to 2010.

Emissions for the following hydrofluorocarbons (fluorinated gases) are estimated in Latvia: HFC-134a, HFC–23, HFC–125, HFC–143a, HFC–152, HFC–227ea, and also SF_6. The most consumed gas is HFC–134a, applied in stationary freezing devices and air conditioning equipment. Although the amount of fluorinated gases and the emissions caused by commercial use and industrial processes are rather small, the meaning of the said cannot be underestimated in the light of the GHG Global Warming Potential. Since 1995 the emissions of fluorinated gases have been increasing year-by-year until 2007 (1995 – 0.89 Gg CO_2 eq., 2007 – 107.25 Gg CO_2 eq.). The reasons for such increase are: growing standards of living , increasing number of new cars and overall development of the national economy. In 2008 an impact of global crisis caused the decrease in emissions comparing to 2007 level. In the recent years (2008-2011) the emissions have been fluctuating within the range of 83-95 Gg CO_2 eq.

During 1990–2000 the amount of indirect GHG emissions had decreased, though since 2001 NOx, NMVOC and CO emissions had the tendency to increase due to more rapid use of firewood in the household sector and fuel consumption in the transport sector. The emissions of SO_2 have considerably decreased due to the replacement of the fuel type used. Fuel types such as natural gas and biomass with practically no sulphur contents are becoming more popular.

National system. The national system for annual GHG emission inventory is specified in the 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. The national system for GHG emission estimates is established in line with the requirements set forth in the Kyoto Protocol.

National registry. The Emission Trading Registry (ETR) of Latvia is governed by the applicable EU laws on GHG emission trading also guaranteeing compliance with the decisions approved in the addendum to the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (13/CMP.1 and 15/CMP.1). The ETR software has been designed and coordinated with the requirements of the Data Exchange Standards (DES) for the Registry Systems under the Kyoto Protocol. According to the Law "On Pollution" Section 32_4, the national GHG emission units registry shall be established and maintained by the Latvian Environment, Geology and Meteorology Centre, address: Maskavas street 165, Riga, LV-1019, by enabling the mandatory and voluntary participants of the International Emission Trading System (ETS), the possibility to perform in the ETR all permitted operations with emission quotas.

1.3 POLICIES AND MEASURES

Issues related to the development and implementation of the climate change policy are the responsibility of Ministry of Environmental Protection and Regional Development (MEPRD), Ministry of Finance, Ministry of Economics, Ministry of Transport, Ministry of Agriculture and institutions supervised by the relevant ministries.

The overall goals of climate policy are as follow:

- Ensure Latvia's contribution to global climate change mitigation, ensuring balance of environmental, social and economic interests;

- Promote Latvia's ability to adapt to climate change and its impacts.

The climate change policy of Latvia is based on the EU climate change policy, the basic principles of which are set down in several political documents, i.e "National Development Plan 2014-2020" (approved on 20.12.2012.), "Sustainable Development Strategy for Latvia until 2030" (approved on 10.06.2010.), "Strategic development plan for Latvia 2010-2013" (approved on 9.04.2010.), "Environmental policy strategy 2009–2015" (approved on 31.07.2009.). Currently Latvia is working on new "Environmental policy strategy 2014-2020" and "Climate Change Policy Strategy 2014-2020". For the second commitment period of Kyoto Protocol until 2020 Latvia has committed together with other EU member states to achieve the joint target of emission reduction by 20% comparing to year 1990. Latvia's quantified emission reduction target for 2020 includes the reduction of the Emission Trading Scheme (EU ETS) emissions (-21% compared to 2005) and the positive limit established for non-EU ETS sector (+17% compared to 2005) in line with Decision 406/2009/EC.

In order to ensure achievement of these goals it is necessary to integrate climate policy objectives into policies of other sectors. It is impossible to achieve climate goals without direct involvement and support from involved ministries. Specific actions should be introduced in all levels of national and local government, businesses and society, which means that climate policy must be inclusive and integrative.

There are several directions of climate policy where appropriate measures are made to achieve overall goals: Energy, Transport, Industrial processes, Agriculture, Waste management, Forestry, Adaptation, Monitoring and reporting and Education and public awareness.

A number of measures have been implemented, adopted and planned to fulfil policy goals mentioned above. Only priority measures with a significant effect to climate change were taken into account in calculations of total effects of policies and measures, which are shown in detail in Chapter 5 and Table 3 in Appendix of Annex1:

- Promotion Public Understanding on the Importance and Possibilities of GHG Emissions Reduction;
- Latvia National Renewable Action Plan;
- Investment Support Programme for District Heating (DH) Systems;
- Energy Efficiency Requirements for District Heating Systems;
- Preferential Feed-in Tariffs for Renewables;
- Preferential Feed-in Tariffs for Combined Heat-Power Production;
- Investment Support in Industrial Buildings Energy Efficiency to Reduce GHG Emissions;
- Agreements on Energy Efficiency, promoting energy audits and energy management systems in industrial enterprises;
- Investment Support Programmes to Increase Energy Efficiency in Apartment Buildings;
- Energy Audits of Residential Multi-apartment buildings;
- Informing Energy Consumers of Residential Sector (Multi-apartment buildings);
- Financial Support (Grants) for Renewable Energy Technologies in Households;
- Investment Support Programmes in Public Sector Energy Efficiency;
- Investment Support Programme in Renewable Technologies for Heat and Electricity Production to Reduce GHG emissions;
- Investment Support to Produce Energy from Biomass of Agriculture and Forestry Origin;
- Energy Performance of Buildings (Directive 2002/91/EC);
- Energy Performance of Buildings;
- Energy Labelling on Household Appliances;

- Fuel Taxation – Other sectors;
- Taxation of Electricity;
- Taxation of CO_2 emissions;
- Taxation on Noxious Air Polluting Emissions;
- Performance of Heat Generators for Space Heating and the Production of Hot Water;
- Biofuel Mix Obligation Requirement;
- Excise Tax – Transport sector;
- Applying of differential tax rates for transport vehicles depending on age and engine size or on CO_2 emission factor;
- New Passenger Car Labelling depending on Fuel Economy Rating;
- Systematic inspection of the technical conditions of motor vehicles;
- Development of public transport network;
- Implementation of Nitrates Directive;
- National Development Plan 2020;
- Reduce disposal of Biodegradable wastes;
- Promotion of recycling of municipal solid waste;
- Regulations for the reporting of the F–gases activities.

Latvia is implementing cross-sectorial climate change mitigation policies and measures that affect several sectors of the national economy simultaneously. Such cross-sectorial policies include implementation of the EU greenhouse gas emission allowance trading scheme, participation in the flexible mechanisms of the Kyoto Protocol, control and reduction of polluting emissions.

Most of the measures reported in Fifth National Communication report are still in place although most of them have been reassessed and only measures with significant effect on GHG emissions have been reported in Sixth National Communication report. Since the last National Communication the main policies and measures include the full implementation of the EU's Climate and Energy package (2009). There are strong relation between policies and measures reported in Chapter 4 and Projections calculated in Chapter 5.

1.4 PROJECTIONS

Chapter 5 presents sectorial projections for greenhouse gas emissions that were prepared in 2013. Projections and the total effects of policies and measures were calculated taking into account the policies and measures described in Chapter 4. Projections are prepared according requirements by UNFCCC and Kyoto Protocol.

According to the projections, the total GHG emission value in the time period until 2020 is shown in Figure 1.2. Total amount of GHG emissions using the "scenario with existing measures" is expected to increase by 14% until 2020 comparing to year 2010. The amount of projected GHG emissions under "scenario with additional measures" is by 4.8% lower in year 2020 than projected emissions under "scenario with existing measures". Figure 1.2 show that Latvia is moving towards its Kyoto Protocol obligation over the period from 2008-2012.

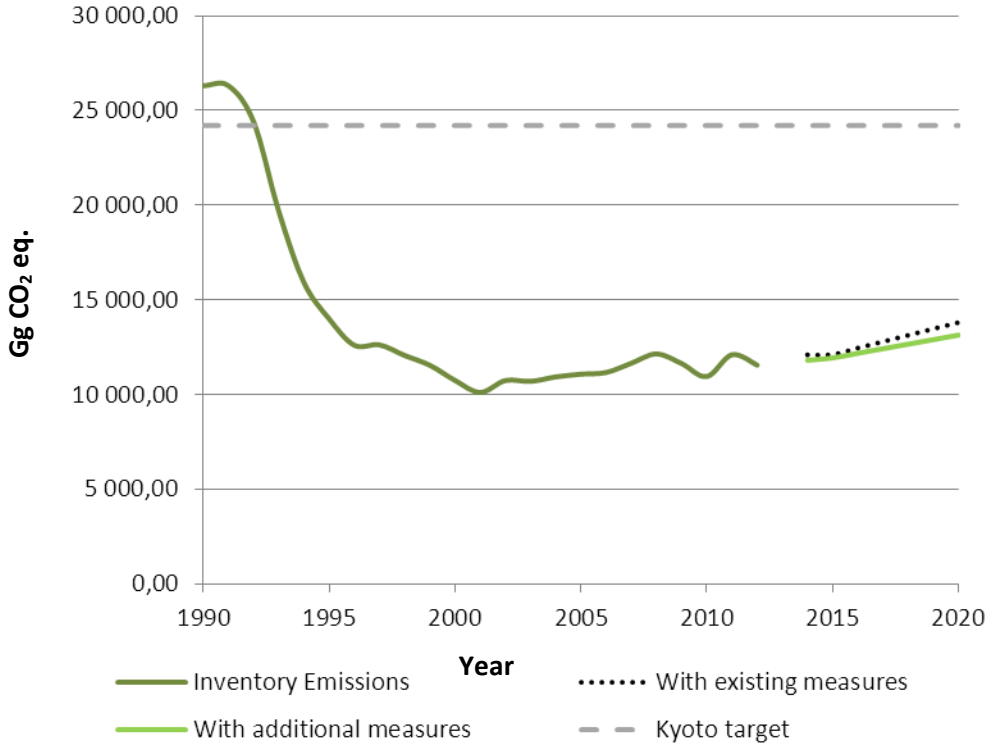


Figure 1.2. Actual and projected total GHG emissions 1990-2020 (Gg CO_2 eq.)

Latvia actively participates in fulfilment of the obligations set forth in the Convention and in the Kyoto Protocol, by implementing national and EU climate change policies.

Projected emissions for 2020 have decreased by 34% comparing to projections in Fifth and Sixth National Communication reports. In 2009 it was projected that GHG emissions in 2020 will increase by 58% comparing 2005 while in 2013 it is projected that these emissions will increase by 24%. Noticeable changes are reported in all sectors – while in Energy, Transport and Industrial processes and Waste management sectors projected emissions have decreased, in Agriculture and LULUCF sectors GHG emissions are projected to increase until 2020.

Since Fifth National Communication report Latvia has improved its estimations for GHG inventory as well as calculations of projections.

1.5 VULNERABILITY ASSESSMENT, CLIMATE CHANGE IMPACTS AND ADAPTATION MEASURES

Latvia is characterized by good climate research traditions and a history of meteorological observations of more than 200 years. In 2013 the limited liability company "Latvian Environment, Geology and Meteorology Centre" (LEGMC) which is responsible for systematic observation in Latvia has prepared climate profile, expected impacts of climate change and vulnerability assessment in Latvia. The past and future climate changes as well as its impact assessment description are based on the results of various studies and research projects (see Chapter 9) or, in some cases, are based on expert opinions. The changes and variability of air temperature, precipitation and snow cover as well as changes in hydrological regime of rivers, lakes and the Baltic Sea costal processes can be considered as important climate change indicators.

Since the beginning of the 20th century records of average air temperature in Latvia have long-term warming trend. The summer seasons of 2002, 2010 and 2011 were three the warmest during the 89 year period of meteorological observations in territory of Latvia. The extreme values of air temperature are increasing along with the increase of the mean values. A significant decreasing trend in the number of frost days and ice days has been observed. In stations located at the coastal territories of the Baltic Sea substantial decreasing tendency in the cold spell duration has been observed. Due to the urban climate influence the cold spell duration has decreased in Riga city. The trend analysis of the precipitation totals discloses temporal and seasonal variability. In general the amount of precipitation in Latvia has a tendency to increase in the cold period. Extreme precipitation is subject to the long-term cyclic fluctuations that are more noticeable than the linear changes.

Many trends in extreme climatic indicators are much stronger in the capital city Riga, especially in respect to the number of summer days and tropical nights, but also in the case of days with heavy precipitation. This may be due to an increasing urban heat island effect or other specific urban climate effects.

Climate change has consequences for various areas of economic activity, social life and welfare. Current and projected impacts of climate change will either directly or indirectly affect agriculture, forestry, water resources and fisheries, energy, transport infrastructure, construction and building sector, biodiversity, health, social impacts, economy and private sector.

Beneficial and adverse impacts caused by the climate change are expected. Adverse effects, caused by the climate change, will be more than beneficial. In order to minimize the risks and to benefit from the opportunities caused by the climate change adaptation measures need to be planned and implemented.

To foster development of national adaptation strategy and establish sound scientific basis the Report on Adaptation to Climate Change was made by MEPRD and approved by Cabinet of Ministers on 5 August 2008. This report names risks related to climate change (e.g. more often and powerful storms, floods, drought, human health problems, loss or migration of animals and plants etc.) as well as advantages of climate change (e.g. a longer vegetation period and an increasing volume of precipitation which will allow to achieve higher and a more stable power generation from own hydro power plants). The report serves as a basis for the development of Latvia's national adaptation strategy. Since the Fifth National Communication report all involved parties have worked to increase their capacity to be able to develop national adaption strategy to the impacts of climate change in the near future.

Several research projects and programmes related to the impacts of climate change have contributed to the development of Latvian adaptation policies and will also support the development of the national adaptation strategy.

1.6 RESEARCH AND SYSTEMATIC OBSERVATION

In Latvia science and research is coordinated by the Ministry of Education and Science. The total funding for research and development in 2011 in Latvia constituted 99.4 million LVL or 0.70% of GDP. 0.18% or 24.7 million LVL were funded by business sector and 0.35% or 50.7 million LVL by foreign sources (including funding from EU structural funds). In order to implement purposefully the science policy and to use effectively financial resources, prior fields in science to finance

fundamental and applied research are defined. In 2009 five prior fields in science were determined for years 2010-2013.

The most important research programmes and projects contributing to adaptation policy development have been the national research programme "KALME" (Assessment of impacts of climate on water), EU funded LIFE-Nature programme research project "Protection and Management of Coastal Habitats in Latvia", project "Developing Policies and Adaptation Strategies to Climate Change in the Baltic Sea Region" (ASTRA), project "Baltic Climate Change: Impacts, Costs and Adaptation in the Baltic Sea Region" (BaltCICA), project "Baltadapt" developing a Baltic Sea Region-wide climate change adaptation strategy, project "BalticClimate".

Number of projects related to climate change have been carried out within national science programmes: "Research and elaboration of modern methods and high developed technologies in the field of energy: environmentally friendly energy, security of energy supply and energy efficiency"; "Substantiation of deciduous trees cultivation and rational use, new products and technologies" and "Climate change impact on water environment in Latvia".

Within last four years several researches have been carried out in National International Long Term Ecological Research network of Latvia: i.e. "Changes in species diversity on the background of fluctuations of climatic and anthropogenic factors" (2009-2013) and "Development of conceptual integrated model of socioeconomic biodiversity pressures, drivers and impacts for the long-term socioecological research platform of Latvia" (2010-2014)[3].

Since 2005 "*Centre* of *Agrochemical Research*" Ltd. have implemented the research project "Soil Mineral Nitrogen Monitoring in Particularly Vulnerable Territories" to provide producers of agricultural products with the forecast to adjust nitrogen doses for winter crops. Since 2010 the soil mineral nitrogen monitoring is performed by the State Plant Protection Service. From 2008 to 2012, the Latvia University of Agriculture implemented the scientific research "Identification of Maximum Standards of Fertilizers for Cultivated Plants". The research revealed the maximum permitted standards of fertilizers for various arable crops in different areas.

Since 2009 LEGMC is responsible for systematic observation in Latvia. In field of climate change LEGMC collects, stores and analyses long-term observation results. It prepares reports, providing information to the public and to the state and local governments and international organizations, as well as maintains the GHG emissions trading registry.

1.7 EDUCATION, TRAINING AND PUBLIC AWARENESS

This section reports the summary information on education, training and public awareness. More detailed information is included in Chapter 9.

Climate change education in primary and secondary schools is possible through public awareness campaigns and projects organised by different organisations. Several school projects are being carried out in Latvia. In Latvia the programme "Eco-schools" has been established and 91 schools received the international Green Flag in year 2013. International Organization's for Standardization (ISO) *The Eco-Schools programme* is based on ISO 14001:2004 that requires an environmental management system to enable an organization to develop and implement a policy and objectives which take into account legal and other requirements to which the organization subscribes, and information about significant environmental aspects.

[3] http://www.lubi.edu.lv/index2.php?lang=2&sid=115

At higher education level the universities do not offer the possibility to study climate change as a separate study program, but many universities provide Bachelor or Master level programmes in environmental studies which incorporate climate change issues. According to the Central Bureau of Statistics in a higher education institutions and colleagues in the programme "nature science, mathematics and information technology" in school year 2012/13 studies has started 6404 students, which is by 200 students more than in school year 2009/10.

A broad range of non-governmental organisations (NGO) are actively involved in the capacity building of climate change issues through research, lobbying, education, training and media activities.

Various public information campaigns and activities related to climate change are carried out in Latvia. In 2012 the "Communication Initiative of the Year Award" granted by the Green Spider Network, was awarded to an innovative and creative Latvian campaign that regularly organises open air concerts in a natural environment "Nature Concert hall".

Scientific and research institutions as well as state institutions and local municipalities are participating in various climate change projects. On-going international cooperation in several projects contributes in preparing a national adaptation strategy by providing new data on risk and vulnerability assessment, impact indicator analyses and area specifics that are crucial for adaptation measures.

NATIONAL CIRCUMSTACES

2 NATIONAL CIRCUMSTANCES

2.1 GOVERNMENT STRUCTURE

Latvia is a parliamentary republic in which the sovereign power belongs to the people, who are represented by a unicameral parliament (Saeima), with 100 members elected in general, equal, direct, secret and proportional elections for a four-year period.

The Saeima, and also the people, have the right to legislate, in accordance with the procedures, and to the extent, provided for by the Constitution. Draft laws may be submitted to the Saeima by the President, the Cabinet or committees of the Saeima, by not less than five members of the Saeima, or, in accordance with the procedures and in the cases provided for in the Constitution, by one-tenth of the electorate. The Saeima elects President for a term of four years. The same person must not hold office as President for more than eight consecutive years. The President represents the State in international relations, appoints the diplomatic representatives of Latvia, and also receives diplomatic representatives of other states. The President implements the decisions of the Saeima concerning the ratification of international agreements. The President has the right to initiate legislation.

The candidate for the post of the Prime Minister who is invited by the President invites ministers to form the Government. The Prime Minister determines the general direction of Government's activities and ensures coordinated and purposeful work of the Cabinet of Ministers. The Prime Minister leads the work of the Cabinet of Ministers and is responsible before the Saeima.

Cabinet of Ministers is a collegial institution, which adopts its decisions at the sittings of the Cabinet of Ministers. Cabinet of Ministers, within the scope of its competence, considers policy planning documents, external and internal legal acts, orders of the Cabinet of Ministers, informative statements, national positions and official opinions of the State.

Ministries are top-level direct administration institutions that develop state policies and that are directly subordinated to a respective Member of the Cabinet of Ministers. There were the State Chancellery and 13 ministries in Latvia in 2012[4]. There are 119 self-governments (9 cities and 110 municipalities) in Latvia after reform of 2009.

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.

2.2 POPULATION PROFILE

While population growth is generally considered a driver for greenhouse gas emissions and for increasing energy consumption, the population trends in Latvia do not have a major role in emission trends. Over the last 20 years the Latvia's population has decreased by an average of 1.19% annually. The total population decrease compared to 1990 is 24.1%[5]. In 2012 the total population of Latvia was 2,044,813 people. The average density of population in Latvia is 32 persons/km^2.

[4]www.latvia.lv
[5] www.csb.gov.lv

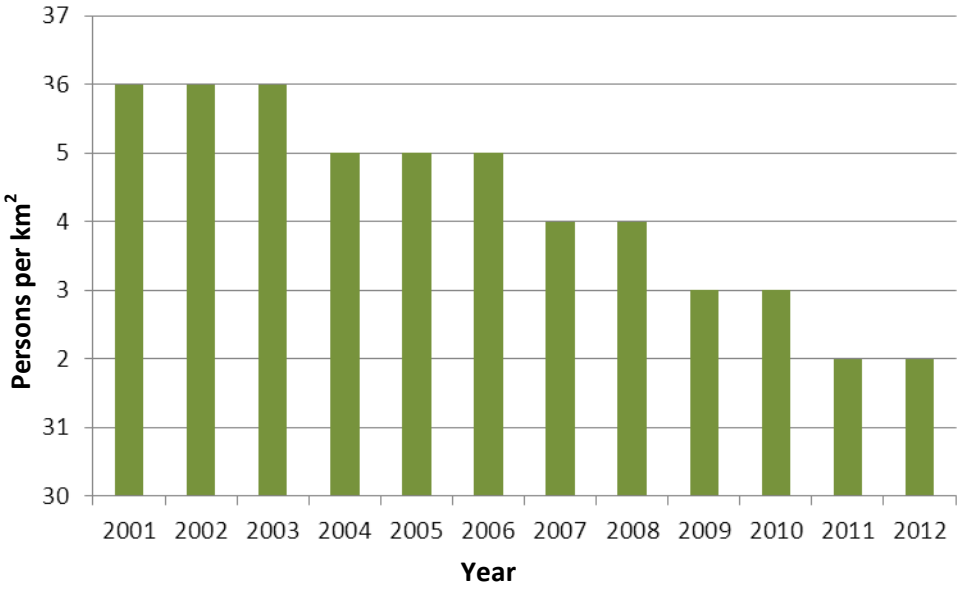


Figure 2.1. Density of population 2001-2012 (persons per km²)[6]

There was Population Census held in Latvia in 2011 to obtain detailed enough view on structure and characteristics of the population. Data acquired in the Population and Housing Census serves as information source for the strategic planning of national economy, formation of economic, social and environmental policy, regional and infrastructure development planning, scientific researches, as well as it helps to inform the society on the demographic situation in the country, living conditions, housing, education and other issues. Further data processing and routine statistics production will be based on the Population and Housing Census 2011 results.

2.3 GEOGRAPHIC PROFILE

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

The territory covers an area of 64 569 km² in total[7]. Its length in the North – South direction is 210 km, and the width in the West – East direction – 450 km. Latvia is a typical lowland country and its terrain is characterized by flat, low areas and hilly elevations. The average height above sea level is 87 m and the highest peak is Gaizinkalns (311.6 m above sea level).

2.4 CLIMATE PROFILE

Climate is a natural resource vital to our well-being, health and prosperity. In Latvia climate acts as a resource for renewable energy, agriculture, forestry, tourism and other production. Climate in Latvia is influenced by Latvia's location in the northwest of the Eurasian continent (continental climate impacts), and by proximity to the Atlantic Ocean (maritime climate impacts). A highly variable weather pattern is determined by the strong cyclonic activity over Latvia. Latvia belongs to fully humid snow climate with warm summers in the Köppen-Geiger climate classification system.

[6] www.csb.gov.lv
[7] http://www.csb.gov.lv/statistikas-temas/iedzivotaji-datubaze-30028.html

Solar radiation. The sun is the most powerful heat generator, which can compete with heat sources created by mankind. The sun as an alternative energy source is used in the national economy. The using of solar energy is completely dependent on solar radiation intensity and season. In Latvia the duration of the daytime and hence sunshine greatly varies throughout the year, with the longest on the 22nd of June (17-18 hours) and the shortest on the 22nd of December (6-7 hours). According to the 1981-2010 data, in Latvia the sun shines on average about 1800 hours per year with variation in territory of about 1600-1970 hours per year. The days without the sun number on average 90-110 due to a higher cloudiness, especially in winter and autumn. The annual mean total solar radiation is about 3500-4000 MJ/m^2 with 600-650 MJ/m^2 in June and 30 MJ/m^2 in December.

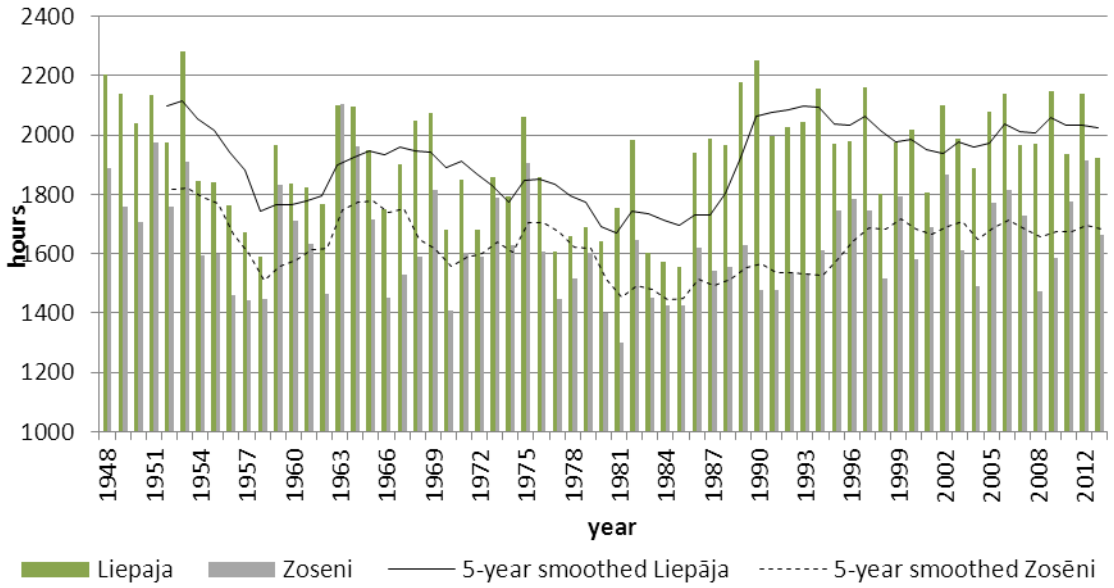


Figure 2.2. Annual hours of sunshine in Latvia (Liepaja and Zoseni station data) - solid lines (red and blue) indicate 5-year smoothed data for Liepaja and Zoseni weather stations respectively

Air temperature. The difference in solar radiation received as well as atmospheric circulation, relief and distance from the Baltic Sea are accountable for the variation in the air temperature in territory of Latvia. Over the period 1981-2010 the mean annual temperature was 5.3°C in more continental Vidzeme and Aluksne Uplands while the annual average temperature of 7.0-7.5°C is at costal territories of the Baltic sea. The coldest month is February with country average air temperature -3.7°C. The warmest month is July with average air temperature +17.4°C. The absolute maximum (+36.4°C) and minimum (-43.2°C) air temperature in territory of Latvia was observed in more continental southeast part (in Daugavpils). The highest average daily temperature differences (daily temperature amplitude) are observed from May to July (9-12°C), the smallest form November to January (4-5°C).

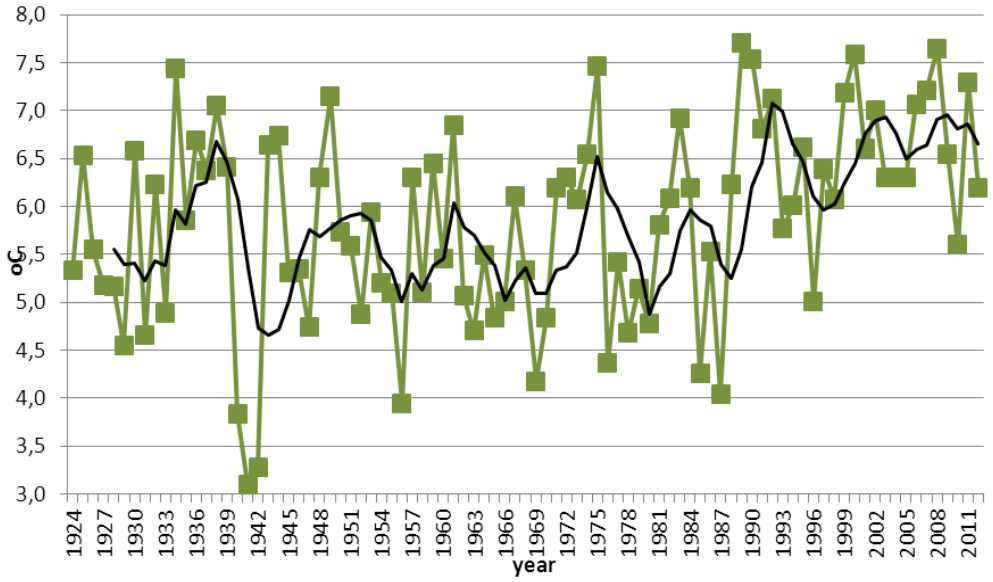


Figure 2.3. Mean annual air temperature in Latvia 1924-2012, °C - solid black line indicate 5-year smoothed data

The first decade of the 21st century (2001-2010) was the warmest decade in the history of Latvian meteorological observations with an average air temperature of +6.7°C. However that was not much above the previous decade (1991 – 2000), which was only 0.1°C colder.

Precipitation. Because of frequent cyclonic activity over Latvia precipitation occurs about 170-200 days per year. The prevailing westerlies bring significant precipitation to Latvia and the mean annual precipitation (1981-2010) over the territory is 680 mm. The highest amount of annual precipitation (760 to 870 mm) is typical for the western slopes of Vidzeme Upland, Western Kursa Upland and Latgale Upland, whereas the lowest annual sum of precipitation (580 mm) is observed in Zemgale Plain. Convective and stratiform precipitation associated with atmospheric fronts occurs in all seasons and can produce significant amount of daily and monthly precipitation. Heavy and very heavy precipitation occurs mostly in the warm period (April-September). The highest daily amount of precipitation recorded is 160 mm, values above 50 mm are rare.

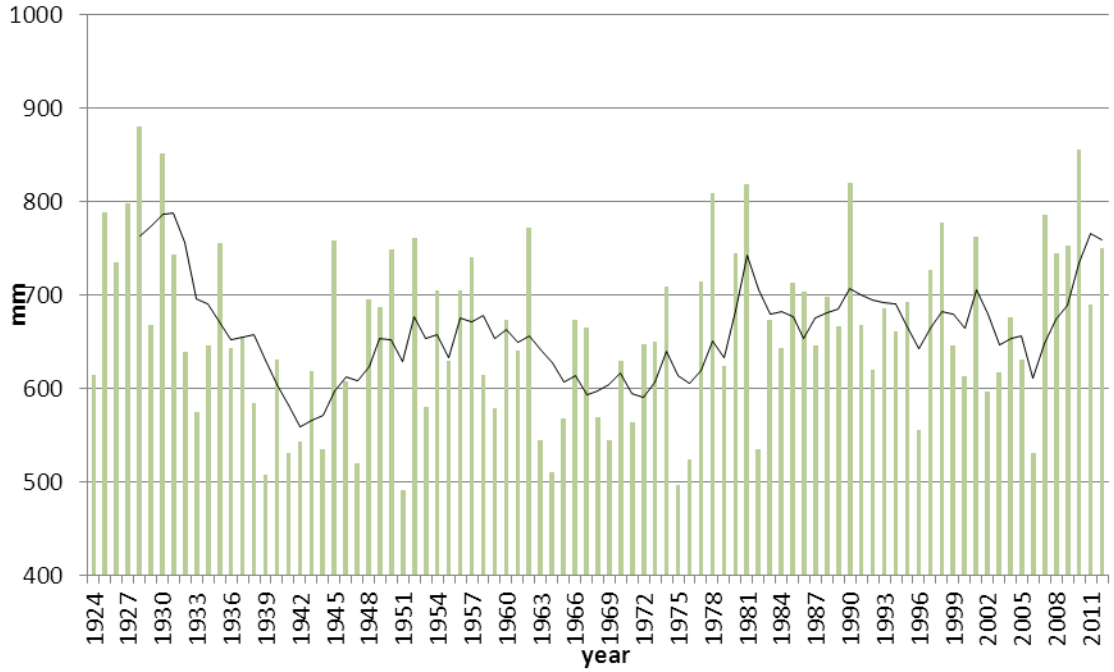


Figure 2.4. Annual precipitation in Latvia 1924-2012 in mm - solid red line indicate 5-year smoothed data

It should be mentioned that with an average rainfall of 856 mm 2010 was the second rainiest year for the last 89 years.

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

Snow cover is unevenly distributed over the territory of Latvia. The regional distribution of snow cover is closely related to the air temperature distribution. The onset of snow cover in autumn takes place in November: along the Baltic Sea coastline it is first established in the 3rd ten-day period of November, along Gulf of Riga, the Zemgale Plain and Kurzeme Upland – in the 2nd ten-day period of November. The earliest autumn snow cover appears in Vidzeme Upland and in the regions to the north to it, the East Latvia Lowland and the Latgale Upland, in the 1st ten-day period of November. A continuous snow cover develops from December 5 to January 6 (Aluksne and Ventspils). The average number of days with snow cover grows towards the eastern part of Latvia: from 60-70 days in the costal territories of Kurzeme to 130 days in Aluksne, and the number of days with continuous snow cover comprise accordingly 50 and 110 days. It should be mentioned that there is a wide variability.

The highest snow cover depths are observed in the 3rd ten-day period of February (on average from 7 cm in the western part to 27 cm in the eastern part). The maximum snow depth 130 cm was observed in Vidzeme Upland.

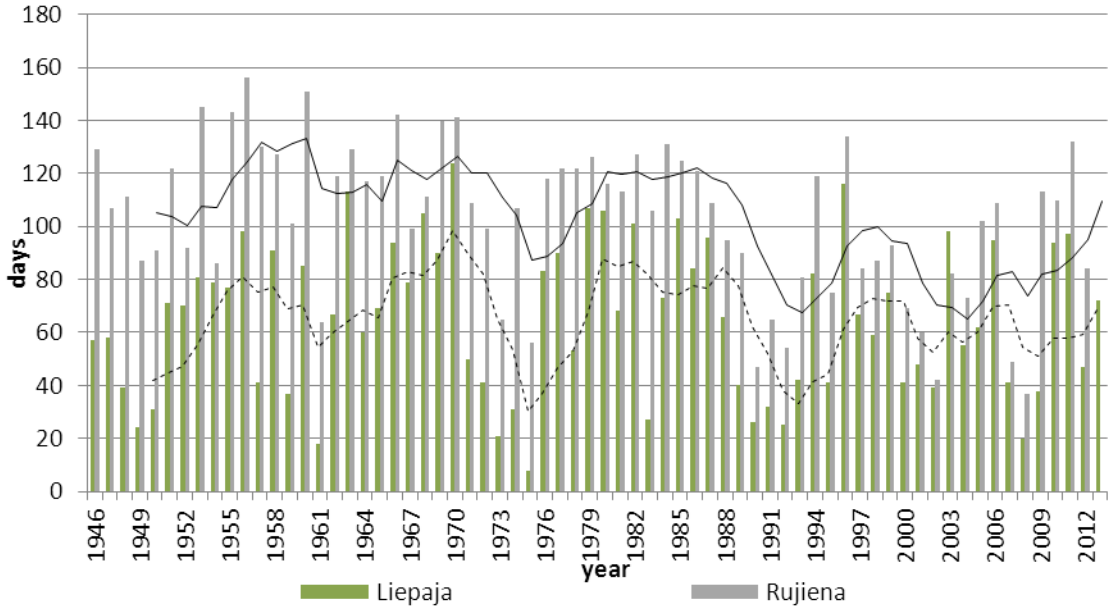


Figure 2.5. Number of days with snow cover in Latvia (Rujiena and Liepaja weather stations data – black lines indicate 5-year smoothed data for Rujiena and Liepaja weather stations respectively

Wind. In annual course the wind direction is mainly from southwest. Annual average wind speed is about 5 m/s in costal territories while for inland it is above 3-4 m/s. The strongest winds blow from November to January (at the costal territories 4-6 m/s, at more continental part of country - 3 m/s. The smallest wind speed is observed in July and August (at the seaside 4 m/s, at more continental part of country 2 m/s). Maximum wind gusts reach the speed up to 48 m/s. There are no great storms every year. Storms usually do not last longer than a day, but sometimes storms may last for 2-3 days. Winds with storm force 20 m/s and more in territory of Latvia are possible in all seasons and locations. Once 10-15 years storms occur from November to December in the coastal territories of the Baltic Sea. However the strong winds with wind speed more than 30 m/s occurs also in more continental parts in warm season. In summer the whirlwinds had been observed in all territory. Calm weather occurs rarely. The frequency of the calm conditions for the period from September to March is 1-15% and from April to August it is 2-24%.

Hydrological profile. The total number of rivers is 12,500, of which only 17 are longer than 100 km, only Daugava River is longer than 500 km. The total length of rivers is ~38,000 km and the mean density of the river network is 0.59 km per 1 km^2. The average annual runoff of rivers is about 35 km^3, of which more than 50% forms in neighbouring countries. The hydrological regime in rivers is influenced not only by the climate (precipitation and air temperature), but also by factors such as geomorphology, geological structure, soil composition and land-use patterns. The coverage of lakes and wetlands in river basins also affects the river stream flow. More than 90% of the total runoff in Latvia is comprised by the five largest rivers.

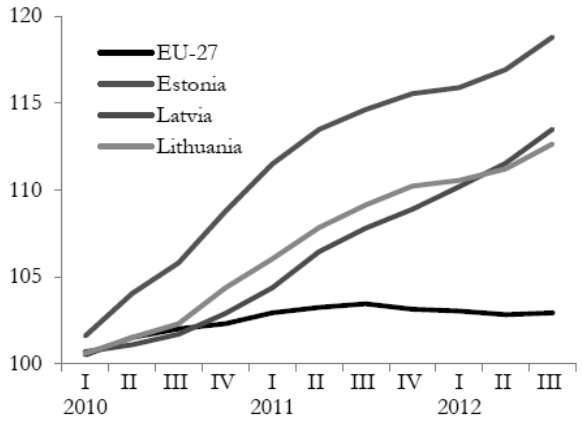
The largest hydropower plants in Latvia produce approximately 50% of the electricity used in the country. In case of hydrology and water resources long-term analysis of changes in discharge can show hydropower potential in hydropower producing rivers. Analysis of long-term discharges at Daugava–Jekabpils and Aiviekste–Aiviekstes HPP shows runoff changes and potential in most important hydropower production rivers in Latvia: Daugava River and Aiviekste River. Chosen period for analysis was 1981 – 2010. Mean discharge in Daugava–Jekabpils for this period was 552

m^3/s, but minimal discharge 66 m^3/s and maximal discharge 4187 m^3/s. Mean discharge in Aiviekste–Aiviekste HPP for the same period is 61 m^3/s, minimal discharge 4.51 m^3/s and maximal discharge 321 m^3/s. April, March and May usually are month with highest runoff in Aiviekste river, but lowest runoff is in August and September. Similarly in Daugava river highest runoff observed in April, May and March, but lowest in August, September and July. Runoff in April and March mostly are generated from snowmelt water.

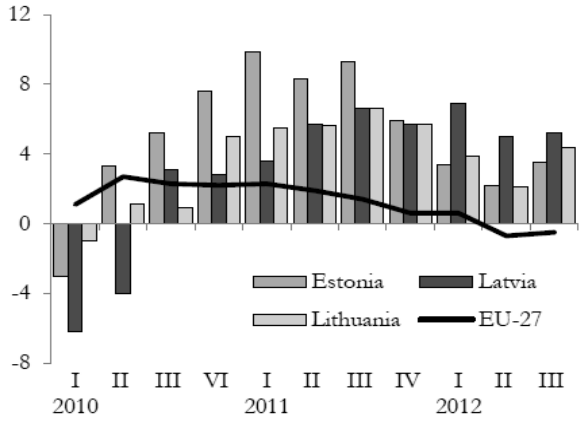
2.5 ECONOMIC PROFILE

Changes in overall GDP. In the early 1990s a transition to a market economy started, in the mid-1990s, after the basic institutions of a market economy and monetary stability were established and the early banking troubles were resolved, in Latvia started a strong and accelerating growth. Despite to the economy's decrease by a quarter in 2008 and 2009[8], GDP in 2012 is 95% above the level of 1995.

Stable growth of national economy of Latvia has been observed in the period from 2009 to 2012, although the overall GDP amount in the EU slightly decreased. In 2012, GDP in Latvia was by 5.6% higher than in 2011. The GDP growth was determined by the increase in both exports and domestic demand.



Seasonally adjusted data, 4th quarter of 2009 = 100



Against the respective period of the previous year

Figure 2.6. GDP dynamics by quarters[9]

The more rapid development scenario expects that the growth rate of GDP in Latvia may reach growth of 4-5% per year. However, the slower development scenario assumes that the economy of Latvia will recover much slower from the consequences of the crisis due to the remaining weak growth in Europe and due to being unable to improve competitiveness of tradable sectors.

[8] During the crisis in 2008 and 2009, GDP decreased by ¼, external debt almost doubled the number of employed decreased by 16%, the real wages dropped by 12 %.
[9] http://www.em.gov.lv/images/modules/items/tsdep/zin_2012_2/2012_dec_eng.pdf

Table 2.1. Latvia: Key Economic Development Indicators 2008-2014[10]							
	2008	**2009**	**2010**	**2011**	**2012**	**2013f**	**2014f**
	changes in comparison with the previous year,%						
Gross domestic product	-3.3	-17.7	-0.9	5.5	5.6	4.5	4.5
Private consumption	5.8	-22.6	2.4	4.8	5.4	5.0	5.0
Public consumption	1.6	-9.4	-7.9	1.1	-0.2	0.6	1.4
Gross fixed capital formation	13.8	-37.4	-18.1	27.9	12.3	-0.5	3.6
Exports	2.5	-13.3	12.7	12.4	8.3	3.0	4.0
Imports	-10.0	-31.6	11.8	22.1	2.9	4.6	3.6
Consumers prices	15.4	3.5	-1.1	4.4	2.3	0.5	2.5
	% of GDP unless indicated otherwise						
General government sector balance	-4.2	-9.7	-8.1	-3.6	-1.2	-1.1	-0.9
General government debt	19.8	36.9	44.4	41.9	40.7	44.5	41.0
Export-import balance	-13.6	-1.5	-1.4	-4.8	-3.3	-3.3	-3.4
Changes in the number of employed (aged 15-74years)*	0.5	-12.2	-4.6	2.5	2.8	2.4	1.3
Unemployment rate (age 15-74 years, %)*	7.5	16.9	18.7	16.2	14.7	12.0	9.6

F –forecast

* - data since 2011 has been recalculated according to the Population Census. Until then, all data after 2011 cannot be compared with the previous periods

Development of economic sectors. As in 2009 the demand dropped in both domestic and foreign markets during the economic crisis, a downturn was observed almost in all sectors of the economy. A significant drop was observed in the trade, construction and manufacturing sectors.

Decrease of economic activities affected commercial services, while reduction of government expenditures had an impact on the output of public services. The decreasing overall wage level during the crisis fostered competiveness of Latvian producers leading to export growth and thus also to development of tradable sectors. Production volumes have been increasing rapidly in the key export sector – manufacturing and the volumes of freight have been increasing gradually since the second half of 2009. The structure of national economy has changed. In 2008, tradable sectors (agricultural, forestry, manufacturing and transport service sectors) constituted only 26% of the total value added; however, in 2012, the share of these sectors has reached 37 per cent.

Table 2.2. Structure of the national economy (by value added, per cent) 2000-2012[11]							
	2000	**2005**	**2008**	**2009**	**2010**	**2011**	**2012**
Agriculture, forestry	4.5	3.9	3.0	3.8	5.0	5.1	5.0
Manufacturing	14.4	12.9	10.8	10.8	13.3	14.1	14.5

[10] http://www.em.gov.lv/images/modules/items/tsdep/zin_2013_1/2013_jun_eng.pdf
[11] http://www.em.gov.lv/images/modules/items/tsdep/zin_2013_1/2013_jun_eng.pdf

Table 2.2. Structure of the national economy (by value added, per cent) 2000-2012[11]							
	2000	**2005**	**2008**	**2009**	**2010**	**2011**	**2012**
Other industries	4.2	3.3	4.3	4.9	5.3	5.2	5.1
Construction	6.8	7.0	10.1	8.0	5.3	5.4	6.1
Trade, accommodation, and catering	18.5	21.6	18.8	16.9	17.3	17.6	17.9
Transport and storage	9.5	10.5	8.1	11.1	11.4	12.3	12.1
Other commercial services	25.1	25.7	28.4	27.5	27.3	26.3	26.1
Public services	17.0	15.1	16.5	17.0	15.2	14.0	13.2
Total	100	100	100	100	100	100	100

Despite to the tense economic situation and even the recession in several EU countries, national economy of Latvia kept growing in 2012. The increase in the total export revenues has progressively fostered the domestic demand and thus also growth of mainly domestic market-oriented sectors.

Table 2.3. Dynamics of GDP (changes compared to the corresponding period of the previous year, in %) 2008-2012					
	2008	**2009**	**2010**	**2011**	**2012**
Agriculture, forestry	-2.2	9.1	-8.9	-0.5	6.9
Manufacturing	-8.6	-17.8	19.1	11.7	9.3
Other industries	6.0	-3.9	2.8	-0.9	-2.0
Construction	-3.5	-32.0	31.1	11.9	14.6
Trade, accommodation	-7.0	-25.2	0.2	9.5	7.3
Transport and storage	-0.3	1.1	-1.8	8.1	4.0
Other commercial services	5.4	-14.7	2.5	1.2	3.4
Public services	-0.1	-9.3	-8.2	0.6	-0.6
GDP	-3.3	-17.7	-0.9	5.5	5.6

2.6 ENERGY PROFILE

Energy supply. Both the imported (natural gas, electricity, oil products, coal, coke, etc.) and local (hydropower, firewood, charcoal, straw, biogas, bioethanol, biodiesel, peat, used tyres, municipal waste for heating, wind energy) energy resources are used in Latvia to supply fuel, electric energy and heat to sectors of economy, commercial consumers and residents.

A part of electricity is generated by Latvian hydropower plants, cogeneration plants, biogas and wind power plants, whereas the rest is imported. Mainly, the imported fuels – natural gas and heavy fuel oil and local fuels – firewood – are used in heating energy generation.

In 2012, energy resource generation and recycled products in Latvia reached 91.7 PJ, but import of energy resources was 172.2 PJ, out of which 57.8 PJ was the import of natural gas.

In 2012, the total consumption of primary energy resources in Latvia amounted to 182.9 PJ, what was by 1% higher than in 2011. Self-security in the total consumption of primary energy resources was 35.8%. In the total consumption of primary energy sources, firewood with its total

consumption forming 46.5 PJ was the most widely used local energy resource, electricity generated in hydropower stations and wind power stations constituted 13.7 PJ.

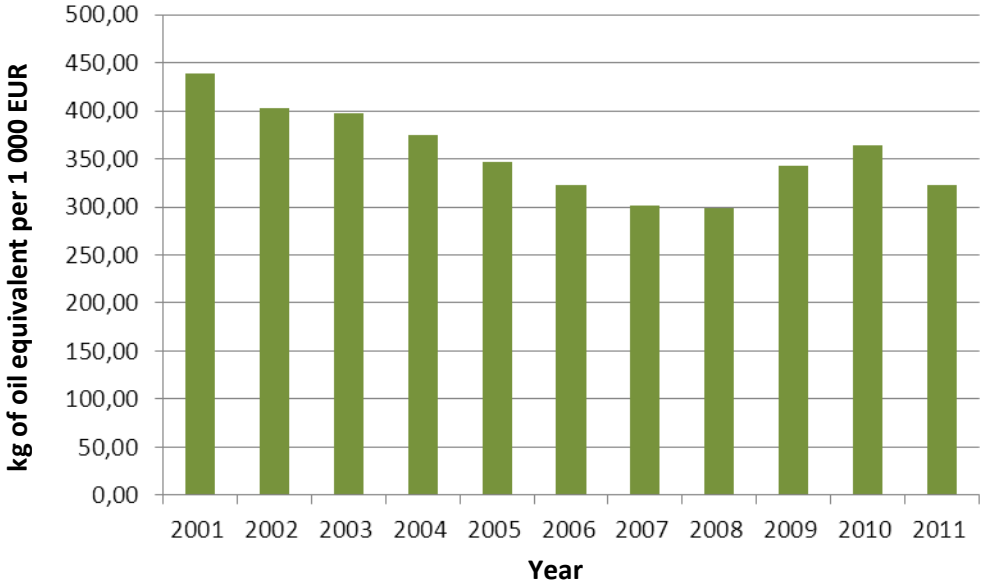


Figure 2.7. Energy intensity of the economy in Latvia (Gross inland consumption of energy divided by GDP (kg of oil equivalent per 1 000 EUR))[12]

Energy consumption in different sectors. The total consumption of energy in 2011 in Latvia comprised 7338 GWh.

Table 2.4. Energy consumption in different sectors (GWh) 2008-2011[13]

	2008	2009	2010	2011	2008	2009	2010	2011	2011/ 2000
	GWh				Growth rates (%)				
Electricity consumption per capita (kWh/cap)	3580	3373	3576	3566	1.4	-5.8	6.0	-0.3	42.6
Gross national electricity consumption	7794	7223	7500	7340	5.0	-7.3	3.8	-2.1	23.9
Electricity consumption in electric boilers		4	5	4			25.0	-20.0	
Energy sector	368	375	555	529	0.3	1.9	48.0	-4.7	16.8
Losses	798	741	725	616	0.0	-7.1	-2.2	-15.0	-37.9
Final electricity consumption	6628	6103	6215	6191	0.3	-7.9	1.8	-0.4	38.3
Industry and construction	1685	1506	1590	1670	-7.2	-10.6	5.6	5.0	16.5
Transport	138	121	126	124	-1.4	-12.3	4.1	-1.6	-18.4
Households	2031	2000	1938	1772	13.2	-1.5	-3.1	-8.6	49.0
Services	2635	2341	2422	2490	-2.8	-11.2	3.5	2.8	61.1

[12] www.eurostat.eu
[13] http://www.em.gov.lv/images/modules/items/Brosura_Latvijas_energetika_skaitlos_2013(1).pdf

Table 2.4. Energy consumption in different sectors (GWh) 2008-2011[13]									
	2008	2009	2010	2011	2008	2009	2010	2011	2011/ 2000
Agriculture, forestry, hunting, fishing	139	135	139	135	-4.1	-2.9	3.0	-2.9	-14.0
	Share (%)				Percentage points				
Electricity consumption in electric boilers		0.1	0.1	0.1		0.1	0.0	0.0	0.1
Energy sector	4.7	5.2	7.4	7.2	0.0	0.5	2.2	-0.2	-0.4
Losses	10.2	10.3	9.7	8.4	0.0	0.0	-0.6	-1.3	-8.4
Final electricity consumption	85.0	84.5	82.9	84.3	0.0	-0.5	-1.6	1.5	8.7
Industry and construction	21.6	20.9	21.2	22.8	-1.7	-0.8	0.4	1.6	-1.4
Transport	1.8	1.7	1.7	1.7	0.0	-0.1	0.0	0.0	-0.9
Households	26.1	27.7	25.8	24.1	3.0	1.6	-1.8	-1.7	4.1
Services	33.8	32.4	32.3	33.9	-1.1	-1.4	-0.1	1.6	7.8
Agriculture, forestry, hunting, fishing	1.8	1.9	1.9	1.8	-0.1	0.1	0.0	0.0	-0.8

Liberalisation and privatisation of energy markets. Energy policy mainly focuses on improving the security of energy supply of the country by encouraging diversification of primary energy resources supplies and creating conditions to increase self-provision of electricity generation, as well as preventing isolation of the regional electricity market through new interconnections. Creation of competition conditions, promotion of use of renewable and local energy resources and environmental protection also play a substantial role.

2.7 TRANSPORT PROFILE

Transport infrastructure is one of the driving factors of entrepreneurial environment. The convenient geographic position – at the crossroads of international roads near the Baltic Sea, with the ice free ports of Liepaja and Ventspils and the railway and motor road network together with gas and oil product pipelines set excellent preconditions for further development of the transport system of Latvia. Transport is the most rapidly growing sector of Latvia. The majority of cargo transport is transit or international transport.

Table 2.5. Cargo transport per main types of transport (thousands of tons)[14]							
Type of transport	1995	2000	2005	2009	2010	2011	2012
Railway	28840	36413	54861	53679	49164	59385	60601
Water*	10587						
Motor road	25026	32911	51525	37820	46809	53936	52621
Air Transport	5	4	10	14	15	13	19

*since 1998 cargo ships in Latvia are registered under foreign flags and are not accounted in Latvia.

[14] http://www.csb.gov.lv/

Table 2.6. Number of transport vehicles (1990- 2012)[15]								
Type of transport vehicle	1990	1995	2000	2005	2009	2010	2011	2012
Ships	...	317	271	206	182	176	162	165
Trucks (thousand)	60	68.7	97.1	113.1	120.6	71.6	72.6	76.3
Buses (thousand)	11.7	16.5	11.5	10.6	9.7	5.4	5.2	5
Personal vehicles (thousand)	282.7	331.8	556.8	742.4	904.3	636.7	612.3	618.3
Trolleybus	416	348	306	322	303	302	302	302
Tramcar	402	358	336	336	313	319	329	312
State railway locomotives	484	349	248	205	197	197	202	202
State railway passenger wagons	1244	1066	701	492	293	238	238	238
Aircrafts (engine propelled)	...	74	72	95	198	215	216	240

The transit transportation system consists also of the natural gas pipeline system and Incukalns Gas Storage Facility, and also oil and oil product transmission pipelines together with oil terminals. From 2004 Russia gradually shifted its oil supplies to Tallinn (Estonia) and Primorsk (Russian Federation) oil terminals and transportation of oil via the transmission pipelines of Ventspils and from 2007 also via the pipeline of Mazeikiai, Lithuania was terminated.

Table 2.7. Pipeline transport operations (1992- 2012)[16]								
Type of pipeline	1992	1995	2000	2005	2009	2010	2011	2012
Oil transport by oil pipeline, mln t	14.2	15.2	21	14.8	-	-	-	-
Oil products transport by oil product pipeline, mln t	-	2.9	3.5	5.5	3.8	5.6	5.8	6.3
Gas transport by gas pipelines, bln m^3	3.2	3.1	3.9	4.7	3.2	4.7	4.8	4.9

2.8 INDUSTRY

As the domestic and external demand shrank significantly due to the crisis, production volumes of manufacturing also experienced a considerable decrease and were on average by 23% lower in 2009 than before the crisis – in 2007.

Since the second half of 2009, production volumes have been growing in manufacturing. As economic growth resumed, manufacturing has been growing at a considerably faster pace than the overall national economy. Currently, manufacturing is the main driver of the national economic growth.

In 2012, production volumes of manufacturing exceeded the level of 2011 by 9.3% and were by nearly 10% higher than in 2007. In 2012, metal processing has contributed the most to growth of manufacturing.

[15] http://www.csb.gov.lv/
[16] http://www.csb.gov.lv/

Table 2.8. Structure of manufacturing in 2012 (per cent)[17]			
	By turnover	**By filled number of jobs**	**Share of exports in the sales of the sector**
Manufacturing – total	100	100	63.5
Food and beverage industry	23.0	22.2	33.9
Light industry	4.0	11.2	84.2
Wood processing	21.5	19.5	73.2
Paper industry and publishing	4.0	3.9	58.3
Chemical industry and related industries	7.7	6.3	77.8
Production of other non-metallic minerals	6.0	4.1	46.3
Production of metals and metal articles	15.7	11.1	76.9
Production of electrical and optical equipment	5.5	3.6	89.3
Production of machinery and equipment	2.3	2.8	80.3
Production of vehicles	4.0	3.1	92.8
Other manufacturing industries	6.3	12.2	43.4

The food and beverage industry is the largest manufacturing industry by both the output and the number of jobs. In 2010 and 2011, production volumes of the food and beverage industry remained at the level of 2009. In 2012, production volumes of the industry slightly increased due to the expanding export possibilities and exceeded the level of 2011 by 2.5%.

The light industry sector sells over 85% of the production in export markets – mainly the EU-15 countries. The industry was hit more severely by the crisis than other manufacturing industries. Although in 2010 and 2011 production volumes in light industry increased by nearly 20% annually, they still were by 20% lower than before the crisis in 2007. In 2012, production volumes were by 3% higher than a year ago.

Wood processing is one of the largest manufacturing sectors, and the sector constitutes $^1/_5$ of the total output and all jobs in manufacturing. Wood processing was one of the first sectors to resume growth after the significant decrease in manufacturing. In 2012, production volumes of the sector continued increasing and were by 5.4% higher than in 2011. Production volumes of the sector already exceed the level of 2007 by 40 per cent. About $^3/_4$ of the total production in the sector is being exported, thus growth of wood processing is closely related to processes in foreign markets.

The paper production and publishing industry is a rather small industry constituting on average 4% of both the total turnover and the number of employed in manufacturing. In the pre-crisis period, most of the production was sold in the domestic market, yet, the opening export opportunities made it possible for the industry to easily adapt itself to new conditions and gradually increase export volumes. Currently, about 60% of all production is exported mainly to neighbouring countries – Lithuania and Estonia.

After weaker output indicators in 2011 when production volumes in manufacturing basically remained at the level of the previous years, a strong growth was already seen in 2012 – production volumes were by over 10% higher than in 2011 and reached the level of 2007.

[17] http://www.em.gov.lv/em/2nd/?cat=30353

The chemical industry and allied industries constitute nearly 7.7% of the total output of manufacturing and provide over 6% of jobs. Over ¾ of chemical industry products are exported. Development tendencies differ among the chemical industry subsectors. In 2012, the total production volumes of the chemical industry increased by 8.3%, though they still were behind the pre-crisis level. The increase in volumes was fostered by production of chemical substances and products (increase by 17%), while production volumes of the pharmacy sector in 2012 remained at the level of 2011. Production of rubber and plastic products was growing at a moderate pace in 2012 (by 1.2%).

The growth of **production of other non-metallic minerals** during the pre-crisis period was to a great extent based on high demand for construction materials, therefore, during the economic crisis, when construction volumes significantly decreased, the production of non-metallic minerals decreased by a half. Production volumes have been increasing since 2010. The recovery of the sector after the crisis is mainly related to the ability to focus on foreign markets. In 2012, production volumes increased by 8.6%.

Table 2.9. Changes of production volumes in manufacturing[18]

	2008	2009	2010	2011	2012
Manufacturing - total	-3.4	-20.2	16.5	11.7	9.3
Food and beverage industry	-2.0	-16.1	-0.1	-0.2	2.5
Light industry	-12.2	-38.6	19.4	19.4	3.0
Wood processing	-12.1	1.6	33.0	12.6	5.4
Paper industry and publishing	-3.9	-17.1	19.8	-0.5	10.1
Chemical industry and related industries	-2.0	-18.5	5.2	4.4	8.3
Production of other non-metallic minerals	-14.4	-40.1	17.6	24.2	8.6
Production of metals and metal articles	1.4	27.1	24.2	28.3	16.3
Production of electrical and optical equipment	14.1	-34.8	33.2	29.6	19.9
Production of machinery and equipment	10.4	35.5	17.8	37.1	8.7
Production of vehicles	5.8	-49.7	59.0	37.0	15.8
Other manufacturing industries	-5.5	-20.1	-4.9	9.5	26.1

Production of electrical and optical equipment is developing rather successfully after the decrease in production volumes during the economic crisis and is one of the fast growing manufacturing industries in Latvia. In 2012, production volumes increased by nearly 20%, compared to 2011, exceeding the level of 2007 by more than 50%. The increase in production volumes of electronic equipment has contributed the most to the growth of the industry, but the production volumes of computer, electronic, and optical equipment are increasing slightly slower.

The industry of production of machinery and equipment is recovering from the crisis rather successfully – production volumes of the industry have been growing faster than average in manufacturing. The growth of the industry relies on export possibilities. Over 80% of all production manufactured in the industry is sold in foreign markets – Lithuania, Estonia, and other EU member states. The production output of machinery and equipment in 2012 was by 8.7% higher than in 2011 and exceeded the pre-crisis level by 25%.

Production of transport vehicles constitutes 4% of the total output of manufacturing. The industry is characterised by explicit fluctuations of production volumes since it mainly deals with

[18] http://www.em.gov.lv/em/2nd/?cat=30353

new orders. As approximately 90% of production is exported, fluctuations in external demand have a significant impact on development of the industry.

2.9 WASTE

Total municipal waste generated in Latvia amounted to 1,799,445 tonnes[19] in 2012. In 2012 out of all the waste managed within territory of Latvia 1,381,355 tonnes (56%) of waste were recycled, 655,694 (27%) tonnes were deposited, but 425,251 (17%) tonnes were exported. Amount of waste generated has increased by 74% since 2009 which can be explained by improvements of waste registration system and economic growth after the financial crisis.

In recent years Latvia has slightly improved its waste recycling system. In previous years many new municipal waste sorting factories have been constructed, as well as individual sorting containers introduced for the individuals increasing the number of recycled waste by 188% since 2009.

2.10 BUILDING STOCK AND URBAN STRUCTURE

In recent years the construction sector has experienced the deepest decline in production volumes during the time period of 2009 - 2010. Construction volumes due to the decrease of investments in the economy in 2009 went down by almost 40% comparing to 2008 and in 2010, if compared to 2009, have decreased by 24.2%. Overall construction volumes shrank by almost 60% during crisis.

At the beginning of 2011, the number of issued construction permits increased, as well as large state and municipal investment projects were launched or continued, which allowed the construction sector to recover from the crisis. Recovery of construction sector was mainly due to the active absorption of the EU funds. It should be noted that the construction sector has been quite successful in reorienting to external markets during the crisis. In 2011, the volume of construction works performed by Latvian builders outside Latvia exceeded four times the level of 2008.

The construction sector keeps growing - in 2011 it increased by 11.9%, but in 2012, construction volumes increased by 14.6%. Although construction volumes have been growing quite fast over the past three years, currently they are considerably behind the pre-crisis level.

The majority of inhabitants of Latvia live in apartment or flat, in a building with 10 or more dwellings (in 2012, nearly two thirds - 61%). 8.6% live in apartment or flat in a building with not more than 9 dwellings. The average size of dwelling in Latvia is 62.2 m^2. The average number of rooms per household member is 1.2 and average number of rooms in household is 3. In detached houses live 26.5% of inhabitants and 3.7% in semi-detached or terraced houses.

2.11 AGRICULTURE

Agriculture is one of the most important sectors of the national economy of Latvia not only in terms of production, but also to a considerable extent determining the quality of the surrounding environment and is the life style for the majority of rural population.

According to the Agricultural Census 2010[20] data there were more than 83 thousand agriculture holdings, of which 35,475 are field crop farms, 17,662 dairying farms, 11,135 mixed cropping and

[19] http://data.csb.gov.lv
[20] http://www.csb.gov.lv/en/dati/statistics-database-30501.html

livestock farms and other. In agriculture according to these data regularly are employed 181 thousand people (~10% of total population).

In 2010 the area of utilized agricultural land was about 1800 thousand ha. The average size of farms is 21.6 ha. From the total area of agricultural lands – arable land occupies 65%, pastures and meadows 34% and gardens – 1%.

2.12 FORESTRY

Latvia is among the most densely forested countries in Europe. Forests are of major importance for the national economy of Latvia, for purification of air by capturing CO_2 and have also a recreational value. Since the beginning of last century the forest area of Latvia has almost doubled by occupying 3,290,288 ha (51% from the total area of the country) in 2012. In terms of property share – 52.5% are state owned forests.

The species dominating in the forest stand of Latvia are - pine, spruce and birch occupying 74% from the total forest area. Though, coniferous forests dominate in state owned forests. In the result of fast overgrowing of agricultural and coniferous forest felling areas with deciduous trees the share of birch and other foliage threes is increasing in the forest stand of Latvia.

Forest resources constitute the main national wealth. The total growing stock of Latvia is 12 million m^3 per year.

GREENHOUSE GAS INVENTORY INFORMATION

3 GREENHOUSE GAS INVENTORY INFORMATION

This chapter[21] provides information on GHG emission inventory for the time period 1990-2011, the national system for development of GHG inventory and the national ETR submitted to the Convention Secretariat on 20 September 2013. Information within the framework of the Convention has to be provided in the form of the Common Reporting Format (CRF) in tables enclosed to the report as Annex 2.

3.1 SUMMARY TABLES AND DESCRIPTIVE SUMMARY OF GHG EMISSION TRENDS

3.1.1 OVERALL GREENHOUSE GAS EMISSION TRENDS

Total GHG emissions, without LULUCF sector, during the time period from 1990-2011 have decreased by 56.1%, though during the last 4 years emission volumes are fluctuating. GHG emission time series for 1990 – 2011 are outlined in Figure 3.1.

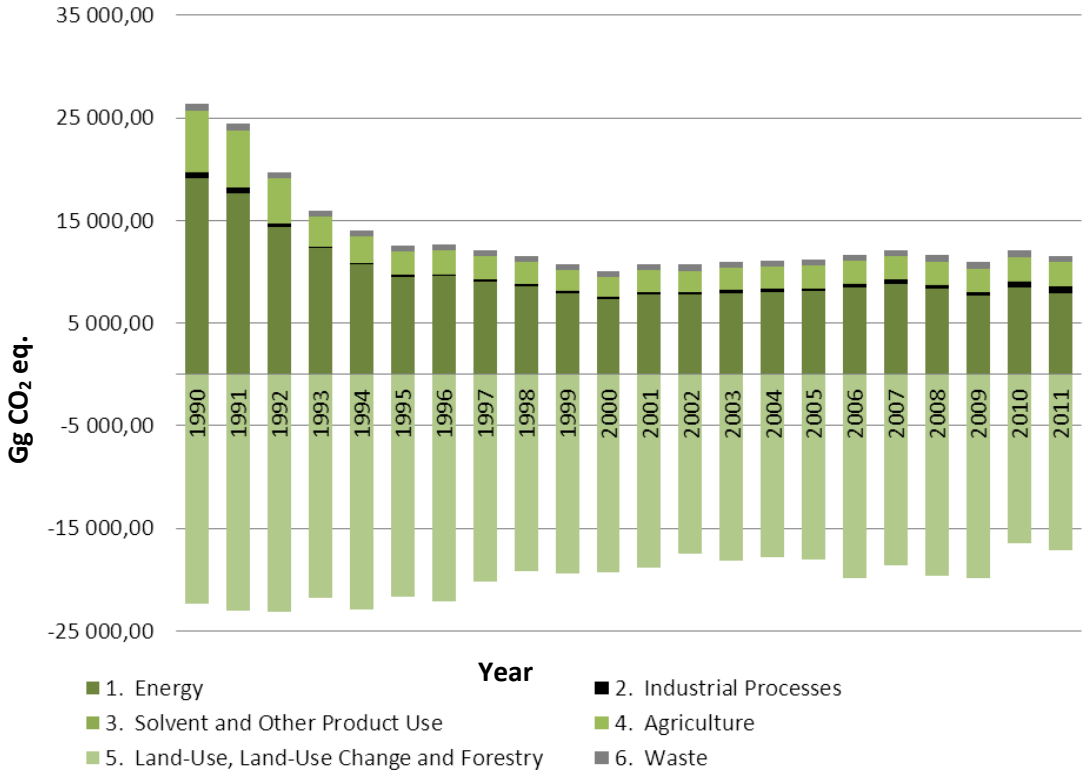


Figure 3.1. GHG emission time series for 1990–2011 (Gg CO_2 eq.)

The emission data of the base year of the Kyoto Protocol differs from the data of the base year reported under the Kyoto Protocol according to the improvements made in the GHG inventory. The major source of GHG emissions in 2011, excluding LULUCF, was CO_2 (8 088 thousand tons),

[21] Information on Greenhouse Gas Inventory, National System and National Registry, Latvian Environment, Geology and Meteorology Centre , Riga, 2013

accounting for 70.1% from the total emissions, accordingly CH_4 constituted 14.1%, N_2O – 15%, and fluorinated gases – 0.8% from total emissions.

The Energy sector caused 68.1% from total GHG emissions, Agriculture – 20.1%, Industrial processes – 6.3%, Waste management – 5.2%, Use of solvents and other products – 0.4%.

The main sources of GHG emission and CO_2 removals in years 1990 – 2011 are outlined in Table 3.1, whereas the amounts of emissions per sectors of national economy are provided in Table 3.2.

Energy sector, transport including is the largest source of GHG emissions and accounts for 68.1% of the total emissions in 2011. In recent years the emission amount fluctuates annually even by 10% with a slightly decreasing trend. Emission fluctuation can be largely explained with changes of economic situation in the country, also with different average temperatures in winter, and with decrease of vehicle use. Transport sector generates 26.7% of the total emissions and Energy sector - 41.6% of the total emissions. The emissions from transport have increased by 10.5% comparing to 2007 because of economic recession and decrease of inhabitants in Latvia. The largest sources of CO_2 emissions in the Energy sector are combustion of diesel oil in Transport sector as well as burning of natural gas in the public and private sector that can be explained with the increasing demand for electrical energy and heat. The increasing consumption of natural gas can be explained with replacement of the type of fuel used - from liquid and solid fuels to natural gas, affected by the price and availability of natural gas and also by the local legislation regulating the amount of sulphur content in liquid fuels and the fact that the majority of large enterprises have joined the EU Emissions Trading System (ETS). The rapid development of manufacturing and construction is another factor affecting increasing emission volumes from the energy sector.

Agriculture is the second largest emission source accounting for around 20% of total emission volume of Latvia. Compared to 1990, emission volume in 2011 had decreased by 61% - mainly due to restructuring of the national economy, reducing output of farms and dissolution of large farms. Increase/reduction of emissions is affected by fluctuations in the number of breeding stock, and also by the amount of fertilizers used.

In 2011 **the Industrial processes** sector generated ca. 6.3% from the total GHG emissions. The highest emission reduction was experienced in the time period from 1990 – 1993 when the manufacturing sector was facing the crisis caused by changes in the political, economic and social situation. From 1994 to 2000 emissions have a stable trend with a slight increase in 1999. Since 2000 total emission volume expressed in CO_2 equivalents increased because of the growth of the Industry sector. However, the most rapid and great increase of emissions can be seen in years from 2009 to 2011 where the increase is 114.3%. That is explained with a modern facility launched by "CEMEX".

Use of solvents and other products produce 0.4% from total emissions. The emission amount from this sector is associated with the economic situation in the country.

As to 2011 comparing to 1990 the GHG emissions from **waste management** had increased by 0.6%, however, in 2011 comparing to 2010 - the emission rate has gone down by 5.4%, because the amount of disposed wastes and decrease of national population, which affects emissions from waste water handling sector. Emissions from waste sector contribute 5.2% of national total GHG emissions.

Forests and soil (meadows) capture and store atmospheric carbon dioxide, whereas falling of trees and transformation of meadows into arable land cause potential CO_2 emissions. Currently **Land use, Land use change and forestry sector** is a CO_2 removal source. Comparing to 1990 in 2011 the removal of CO_2 had decreased by 23%.

Table 3.1.a. GHG emissions/removals 1990 – 2000 (CO_2 equivalents Gg)											
SEG emissions	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
CO2 emissions including net CO_2 from LULUCF*	-3 432.60	-5 725.36	-9 302.22	-10 247.59	-12 836.17	-12 775.30	-13 154.67	-11 823.06	-11 195.61	-11 940.56	-12 471.76
CO_2emissions without net CO_2 from LULUCF	19 041.87	17 486.32	14 007.64	11 743.53	10 231.94	9 036.44	9 130.59	8 603.33	8 220.37	7 627.03	6 992.61
CH_4emissions including CH_4 from LULUCF	3 485.94	3 407.70	2 958.29	2 245.43	2 077.38	2 062.55	2 004.89	1 972.09	1 900.54	1 784.81	1 764.89
CH_4emissions without CH_4 from LULUCF	3 466.57	3 385.21	2 920.39	2 220.01	2 048.15	2 026.36	1 968.47	1 925.71	1 848.98	1 726.74	1 706.04
N_2O emissions including N_2O from LULUCF	3 953.05	3 692.15	2 901.14	2 107.22	1 865.91	1 692.50	1 677.39	1 683.20	1 626.58	1 542.91	1 561.97
N_2O emissions without N_2O from LULUCF	3 804.00	3 541.58	2 745.55	1 953.73	1 710.92	1 535.40	1 519.69	1 524.13	1 466.52	1 381.29	1 399.83
HFCs	IE,NA, NE,NO	IE,NA, NE,NO	IE,NA, NE,NO	IE,NA, NE,NO	IE,NA, NE,NO	0.64	0.84	1.93	2.86	3.28	5.12
SF_6	NA,NE, NO	NA,NE, NO	NA,NE, NO	NA,NE, NO	NA,NE, NO	0.25	0.29	0.51	0.71	0.98	1.28
Total emissions (including LULUCF)	**4 006.39**	**1 374.49**	**-3 442.79**	**-5 894.94**	**-8 892.88**	**-9 019.36**	**-9 471.28**	**-8 165.33**	**-7 664.92**	**-8 608.59**	**-9 138.51**
Total emissions (excluding LULUCF)	**26 312.45**	**24 413.11**	**19 673.59**	**15 917.27**	**13 991.01**	**12 599.09**	**12 619.87**	**12 055.61**	**11 539.44**	**10 739.32**	**10 104.88**

Table 3.1.b. GHG emissions/removals 2001 – 2011 (CO_2 equivalents Gg)											
SEG emissions	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
CO2 emissions including net CO_2 from LULUCF*	-11 647.56	-10 287.59	-10 676.50	-10 148.69	-10 398.74	-11 746.78	-10 160.09	-11 675.23	-12 628.41	-8 084.79	-9 261.49
CO_2emissions without net CO_2 from LULUCF	7 412.10	7 409.32	7 633.83	7 799.15	7 789.85	8 273.31	8 629.23	8 175.66	7 433.66	8 529.00	8 088.05
CH_4emissions including CH_4 from LULUCF	1 827.86	1 822.42	1 744.88	1 736.70	1 758.75	1 732.12	1 771.28	1 753.84	1 773.07	1 780.14	1 641.07
CH_4emissions without CH_4 from LULUCF	1 794.96	1 782.45	1 707.17	1 702.52	1 723.91	1 693.86	1 739.94	1 725.65	1 738.73	1 739.71	1 631.52
N_2O emissions including N_2O from LULUCF	1 678.15	1 646.61	1 726.01	1 703.29	1 768.98	1 773.63	1 824.85	1 808.37	1 843.29	1 905.49	1 891.08
N_2O emissions without N_2O from LULUCF	1 518.40	1 484.96	1 564.53	1 542.04	1 607.48	1 609.75	1 662.76	1 646.26	1 680.37	1 742.91	1 730.28
HFCs	7.59	9.87	15.72	18.10	28.39	62.64	98.66	72.96	74.48	72.32	82.97
SF_6	1.98	3.38	4.41	5.37	7.53	7.12	8.60	10.08	13.53	13.13	12.45
Total emissions (including LULUCF)	**-8 131.98**	**-6 805.30**	**-7 185.47**	**-6 685.23**	**-6 835.09**	**-8 171.26**	**-6 456.70**	**-8 029.98**	**-8 924.04**	**-4 313.72**	**-5 633.92**
Total emissions (excluding LULUCF)	**10 735.03**	**10 689.98**	**10 925.67**	**11 067.17**	**11 157.16**	**11 646.68**	**12 139.19**	**11 630.61**	**10 940.78**	**12 097.07**	**11 545.28**

*Land use, land use change and forestry

Table 3.2.a. GHG emissions/removals per sectors of industry 1990 – 2000 (CO_2 equivalent Gg)											
	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
1. Energy	19 136.30	17 664.32	14 400.15	12 297.42	10 713.17	9 514.63	9 593.72	9 031.25	8 615.22	7 961.29	7 341.10
2. Industrial processes	598.87	536.07	256.64	83.67	146.72	160.21	176.27	183.12	184.86	222.76	179.40
3. Solvent and other products use	50.70	46.49	44.20	41.35	40.51	41.49	43.65	44.48	43.88	45.03	44.81
4. Agriculture	5 931.27	5 561.65	4 369.49	2 906.43	2 506.98	2 307.62	2 238.59	2 227.74	2 110.86	1 926.19	1 956.33
5. Land use, land use change and forestry	-22 306.06	-23 038.62	-23 116.38	-21 812.20	-22 883.89	-21 618.46	-22 091.15	-20 220.94	-19 204.37	-19 347.90	-19 243.39
6. Waste	595.30	604.58	603.11	588.41	583.62	575.14	567.64	569.01	584.62	584.05	583.24
Total emissions (including LULUCF)	**4 006.39**	**1 374.49**	**-3 442.79**	**-5 894.94**	**-8 892.88**	**-9 019.36**	**-9 471.28**	**-8 165.33**	**-7 664.92**	**-8 608.59**	**-9 138.51**

Table 3.2.b. GHG emissions/removals per sectors of industry 2001– 2011 (CO_2 equivalent Gg)											
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
1. Energy	7 761.67	7 755.94	7 953.73	7 980.08	8 079.26	8 491.69	8 816.78	8 353.54	7 691.09	8 487.08	7 857.03
2. Industrial processes	207.29	223.70	247.28	389.84	286.20	348.05	404.10	371.84	339.63	605.33	727.69
3. Solvent and other products use	50.89	36.49	29.40	35.88	35.69	55.21	63.25	43.62	26.55	45.25	41.31
4. Agriculture	2 101.72	2 065.29	2 119.15	2 081.67	2 174.00	2 168.32	2 260.04	2 224.03	2 255.96	2 326.80	2 320.62
5. Land use, land use change and forestry	-18 867.01	-17 495.28	-18 111.14	-17 752.40	-17 992.25	-19 817.94	-18 595.88	-19 660.60	-19 864.82	-16 410.78	-17 179.20
6. Waste	613.45	608.55	576.11	579.69	582.00	583.41	595.01	637.58	627.56	632.60	598.63
Total emissions (including LULUCF)	**-8 131.98**	**-6 805.30**	**-7 185.47**	**-6 685.23**	**-6 835.09**	**-8 171.26**	**-6 456.70**	**-8 029.98**	**-8 924.04**	**-4 313.72**	**-5 633.92**

3.1.2 EMISSION TRENDS BY GAS

Further paragraphs provide detailed information on direct and indirect GHG emissions.

3.1.2.1 CARBON DIOXIDE EMISSIONS AND REMOVALS

The main CO_2 emission source in 2011 was the combustion of fossil fuels – 91.7% (including the Energy sector – 25.6%; manufacturing industry and construction – 10.8%; transport – 38.1%; other sectors – households, agriculture, forestry etc. – 17.1%). The remaining CO_2 emission sources were Industrial processes – 7.8%, Solvents and other product use – 0.45% and waste management (burning) – 0.004%.

On its turn, because of the photosynthesis of plants in forests and arable land the total annual GHG removal exceeded the annual GHG emission. In 2011 the net CO_2 removal of the LULUCF sector was 17349.54 Gg.

The total CO_2 emissions (without removals from LULUCF) and emissions with CO_2 removals from LULUCF in the time period from 1990–2011 are given in the Figure 3.2 below.

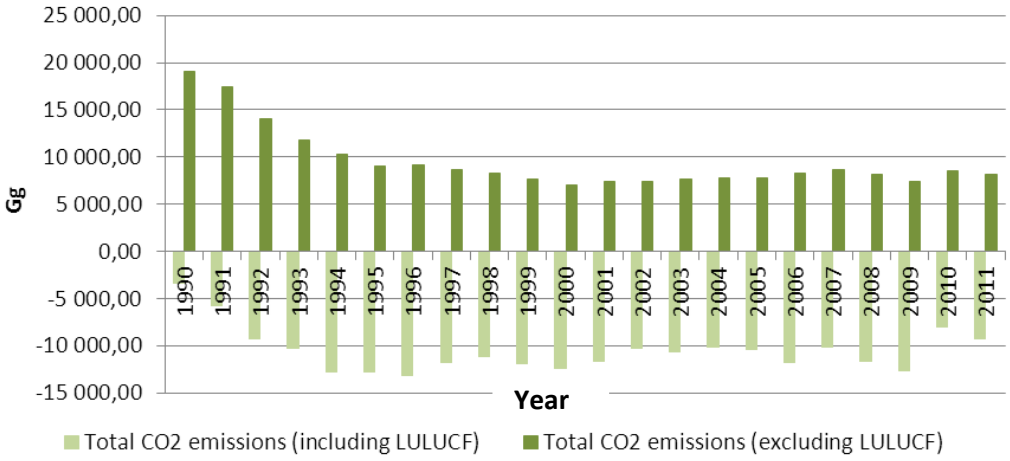


Figure 3.2. CO_2 emissions and removals 1990 – 2011 (Gg)

Detailed distribution of CO_2 emissions and removals is given in Table 3.3 below.

Table 3.3. Total CO_2 emissions and removals 1990, 1995, 2000, 2005 – 2011 (Gg)

	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011
1. Energy	**18392.36**	**8840.19**	**6776.86**	**7506.59**	**7950.19**	**8272.03**	**7847.13**	**7159.24**	**7968.23**	**7419.12**
1.A Fuel combustion	18392.34	8840.17	6776.84	7506.57	7950.17	8272.01	7847.11	7159.22	7968.21	7419.10
1.A.1.Energy industries	6266.63	3417.88	2475.88	2047.55	2073.32	1943.80	1916.58	1865.12	2247.73	2071.74
1.A.2.Manufacturing industries, construction	3724.11	1863.11	1151.91	1165.21	1213.16	1225.26	1111.76	883.50	1069.24	876.11
1.A.3.Transport	2897.89	2013.78	2111.87	2990.42	3298.23	3735.21	3528.57	3130.03	3205.12	3084.85
1.A.4.Other sectors	5503.71	1539.28	1037.04	1295.79	1356.59	1364.90	1286.81	1275.25	1438.26	1379.21
1.A.5.Other	NO	6.12	0.14	7.60	8.87	2.83	3.39	5.32	7.85	7.20
1.B. Fugitive emissions from fuels	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
1.B.1. Oil and Natural Gas	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
2. Industrial processes	**598.81**	**159.29**	**172.95**	**250.23**	**278.23**	**296.79**	**288.75**	**251.57**	**519.83**	**632.25**
2.A. Mineral products	585.98	154.86	164.52	237.87	265.66	282.22	280.01	242.00	508.55	631.77
2.B.Metal production	12.83	4.43	8.43	12.36	12.57	14.57	8.73	9.56	11.28	0.48
3. Solvents and other product use	**50.70**	**36.96**	**41.62**	**32.59**	**43.38**	**59.22**	**39.28**	**22.52**	**40.60**	**36.35**
4. Land use, Land use change	**-22474.48**	**-21811.74**	**-19464.37**	**-18188.59**	**-20020.09**	**-18789.31**	**-19850.89**	**-20062.07**	**-16613.79**	**-17349.54**

Table 3.3. Total CO_2 emissions and removals 1990, 1995, 2000, 2005 – 2011 (Gg)										
	1990	**1995**	**2000**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
and forestry										
4.A.Forest land	-23068.99	-22313.06	-17902.36	-17055.48	-18927.31	-18717.60	-20119.73	-18899.42	-15789.12	-16249.62
4.B. Arable land	602.97	680.42	518.90	506.32	507.92	513.03	512.69	448.55	392.40	368.63
4.C. Grasslands	40.15	47.08	55.44	60.06	103.62	65.40	61.12	67.90	64.27	62.62
4.D. Wetlands	19.80	19.80	19.80	19.80	19.80	19.80	19.80	19.80	19.80	19.80
4.E. Settlements	104.59	251.01	348.84	645.71	689.88	734.06	778.23	825.10	855.87	883.03
4.F. Other land	-173.00	-497.00	-2505.00	-2365.00	-2414.00	-1404.00	-1103.00	-2524.00	-2157.00	-2434.00
5. Waste management	**NA,NO**	**NA,NO**	**1.18**	**0.44**	**1.51**	**1.18**	**0.50**	**0.34**	**0.34**	**0.33**
5.A.Waste combustion	NO	NO	1.18	0.44	1.51	1.18	0.50	0.34	0.34	0.33
Total CO_2 emissions with CO_2 from LULUCF	**-3432.60**	**-12775.30**	**-12471.76**	**-10398.74**	**-11746.78**	**-10160.09**	**-11675.23**	**-12628.41**	**-8084.79**	**-9261.49**
Total CO_2 emissions without CO_2 from LULUCF	**19041.87**	**9036.44**	**6992.61**	**7789.85**	**8273.31**	**8629.23**	**8175.66**	**7433.66**	**8529.00**	**8088.05**
International bunkering	1721.08	554.58	106.14	1003.69	825.81	810.74	950.79	1181.67	1156.28	1038.54
Aircraft	221.15	77.87	80.98	179.57	201.59	245.82	296.15	311.90	357.76	359.15
Shipping	1499.94	476.72	25.15	824.12	624.22	564.93	654.64	869.77	798.52	679.39
CO_2 emissions from biomass	2964.03	4538.71	4280.66	5361.72	5395.88	5280.87	5002.76	5723.20	5663.29	5244.40

Energy, including transport sector. The main CO_2 emission sources in 2011 were transport (41.6%), combustion of natural gas in the energy sector – 25.8%, and burning of fossil fuels and natural gas in service, household, agriculture and forestry sectors – 8.1% and 7.6% accordingly.

Due to the constant increase of the number of vehicles, the emissions from transport are growing year-by-year. In 2007 the amount of emissions had gone up by 28.9% comparing to 1990, but in the next years there is a decrease in emissions which can be associated with global economic crisis. Since 2007 the emissions in Transport sector have decreased by 17.4%.

Industrial processes. In 2011 the second largest amount of CO_2 emissions that are not related to energy sector in Latvia's industry originated from production of mineral products (production of cement, clinker, lime, bricks and ceramic tiles) generating 99% of the total CO_2 emissions from industrial processes.

Land use, land-use change and forestry. In annual submission 2013 the CO_2 emissions and removals from LULUCF submitted to the Convention Secretariat were recalculated by applying different methodology for all-time series. In 2011 the CO_2 removals from LULUCF had decreased by 22.8% in comparison to 1990. The largest sources of CO_2 removal were forest lands constituting 93.7% of the total CO_2 removal.

3.1.2.2 Methane Emissions

The emissions of the second most important GHG - methane CH_4 (with/without LULUCF sector) in 2011 comparing to 1990 had decreased by almost 53% (see Figure 3.3 and Table 3.4.).

Main CH_4 emission sources are solid municipal waste landfills and enteric fermentation processes of livestock as well as leakage from natural gas pipeline systems.

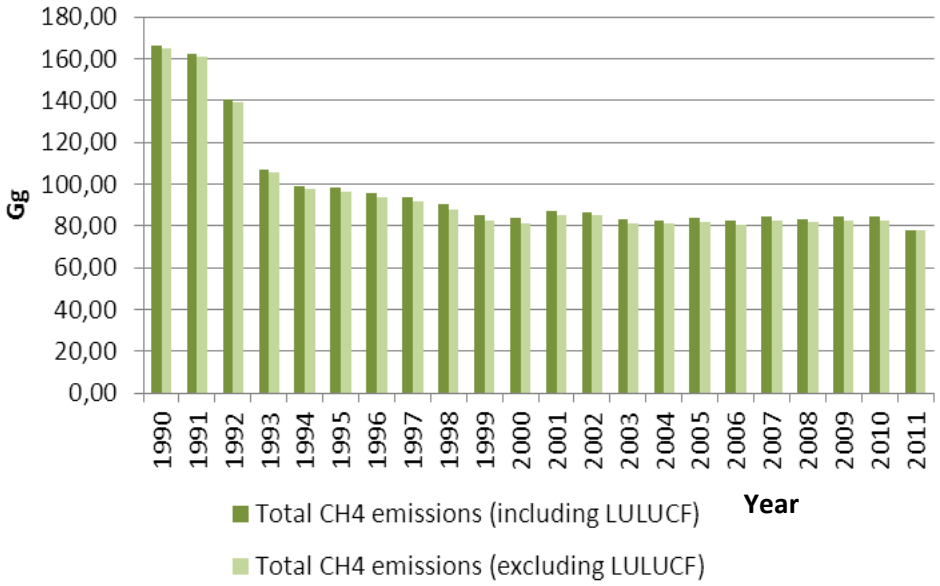


Figure 3.3. CH_4 emissions 1990 – 2011 (Gg)

Energy, including transport sector. The main source of CH_4 emissions in energy sector is combustion of fuel wood in households. CH_4 forms as a result of incomplete combustion of hydrocarbons contained in the fuel and constitute 69.9% from the total CH_4 emissions in Energy sector and 19.3% from total CH_4 emissions. CH_4 leakage in the environment accounts for 30% of CH_4 emissions in the energy sector.

Industrial processes. A rather insignificant share of the total CH_4 emissions is generated by the metal production sector – only 0.001% from total CH_4 emissions.

Agriculture. In the agriculture sector CH_4 (46.8% from total methane emissions) is produced in herbivores as a by-product of normal enteric fermentation and constitutes 87.8% of the total emissions from agriculture sector and is also formed in decomposition of livestock manure in anaerobic conditions. Livestock manure accounts for 12.2% from total emissions in the agriculture sector.

Land use, land-use change and forestry. In this sector CH_4 emissions are generated as the result of biomass burning processes from on-site burning of wood residues from wood felling and also in case of forest fires and burning of last year's grass. CH_4 emissions from LULUCF sector constitute 0.6% from the CH_4 emissions (LULUCF including).

Waste management. CH_4 emissions from waste sector have increased in comparison with 1990 by 3.2%. In calculation of CH_4 emission from waste disposal Tier2 method based on long term waste decay have been used. Since 2002, the collection of CH_4 in Latvian waste landfills is taking place and it compensates for an increase in emissions from waste disposal. CH_4 emissions in 2011 decreased by 5.3% in comparison with year 2010.

Table 3.4. Total CH_4 emissions in 1990, 1995, 2000, 2005 – 2011 (Gg)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011
1. Energy	**27.91**	**26.52**	**21.85**	**21.03**	**19.68**	**19.68**	**18.17**	**19.48**	**18.88**	**15.10**
1.A. Fuel Combustion (Sectoral Approach)	12.52	13.53	11.34	13.09	12.75	12.70	11.74	12.85	12.17	10.55

Table 3.4. Total CH_4 emissions in 1990, 1995, 2000, 2005 – 2011 (Gg)										
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	**1990**	**1995**	**2000**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
1.A.1. Energy Industries	0.27	0.23	0.22	0.18	0.20	0.19	0.19	0.19	0.21	0.20
1.A.2. Manufacturing Industries and Construction	0.26	0.17	0.16	0.26	0.29	0.27	0.28	0.33	0.40	0.46
1.A.3. Transport	0.78	0.58	0.49	0.39	0.37	0.34	0.28	0.24	0.23	0.21
1.A.4. Other Sectors	11.20	12.56	10.47	12.25	11.89	11.89	10.99	12.09	11.33	9.69
1.A.5. Other	NO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.B. Fugitive Emissions from Fuels	15.39	12.99	10.51	7.94	6.93	6.98	6.43	6.62	6.71	4.54
1.B.1 Oil and Natural Gas	15.39	12.99	10.51	7.94	6.93	6.98	6.43	6.62	6.71	4.54
2. Industrial Processes	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
2.A. Metal Production	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3. Agriculture	**111.96**	**45.47**	**34.38**	**36.03**	**35.94**	**37.55**	**36.29**	**36.10**	**36.49**	**36.57**
3.A. Enteric Fermentation	102.29	41.51	30.89	32.10	31.75	33.21	32.04	31.79	32.01	32.10
3.B. Manure Management	9.67	3.96	3.50	3.93	4.19	4.34	4.25	4.30	4.48	4.47
4. Land Use, Land-Use Change and Forestry	**0.92**	**1.72**	**2.80**	**1.66**	**1.82**	**1.49**	**1.34**	**1.63**	**1.93**	**0.45**
4.A. Forest Land	0.92	1.72	2.80	1.65	1.76	1.48	1.34	1.62	1.92	0.45
4.B. Grassland	IE,NO	0.00	0.01	0.01	0.06	0.01	0.00	0.01	0.01	0.00
5. Waste	**25.21**	**24.50**	**25.00**	**25.02**	**25.04**	**25.63**	**27.71**	**27.22**	**27.47**	**26.02**
5.A. Solid Waste Disposal on Land	15.71	17.57	19.15	17.63	18.38	19.36	20.16	20.35	20.73	20.91
5.B. Waste-water Handling	9.49	6.93	5.85	7.37	6.61	6.23	7.51	6.81	6.67	5.02
5.C. Other	NE	NE	NE	0.03	0.05	0.04	0.04	0.06	0.07	0.09
Total CH_4 emissions including CH_4 from LULUCF	**166.00**	**98.22**	**84.04**	**83.75**	**82.48**	**84.35**	**83.52**	**84.43**	**84.77**	**78.15**
Total CH_4 emissions excluding CH_4 from LULUCF	**165.07**	**96.49**	**81.24**	**82.09**	**80.66**	**82.85**	**82.17**	**82.80**	**82.84**	**77.69**
International Bunkers	0.10	0.03	0.00	0.05	0.04	0.04	0.04	0.06	0.05	0.05
Aircraft	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shipping	0.09	0.03	0.00	0.05	0.04	0.03	0.04	0.05	0.05	0.04

3.1.2.3 Nitrous Oxide Emissions

Since 1990 the total N_2O emissions (with/without LULUCF sector) have decreased by almost 55% (see Figure 3.4 and Table 3.5). In recent years an increase of the total emissions volume was observed. However, in year 2011 the N_2O emissions have decreased by 0.7% comparing to 2010.

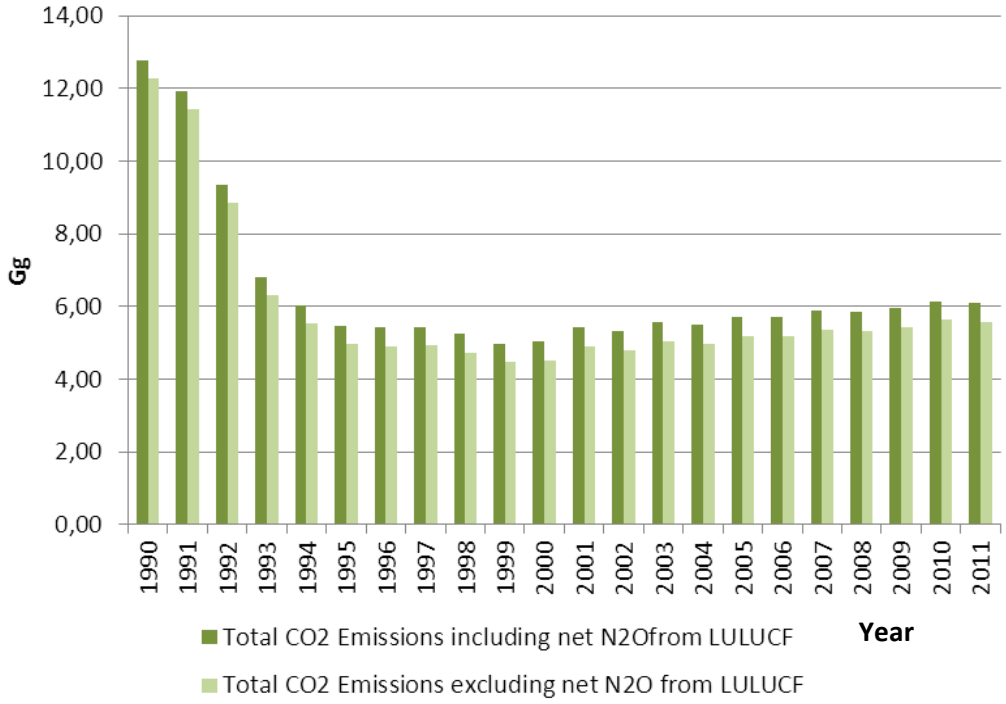


Figure 3.4. N_2O emissions 1990 – 2011 (Gg)

The main N_2O emission source is agricultural land generating 82.6% (without LULUCF sector) from N_2O emissions of 2011. Less important N_2O emission sources are transport, combustion of biomass, waste management (composting) and wastewater treatment.

Energy, including transport. Main N_2O emission sources in the energy sector are transport (43%) and burning of firewood by households (35%) in year 2011.

Solvents and other product use. This sector accounts for an insignificant share of the total N_2O emissions – 0.3%, generated by application of N_2O in anaesthesia. The data are available since 1995.

Agriculture. In Latvia, N_2O emissions in the agriculture sector are estimated from agricultural land and use of organic fertilizers. In comparison with 1990, the total N_2O emissions in 2011 had decreased by 57%. The main share of N_2O emissions was generated by agriculture land - 92% and mainly because of increased use of mineral fertilizers.

Land use, land-use change and forestry. N_2O emissions in this sector originate from on-site burning of wood residues from forest felling and in cases of forest fire or burning of last year's grass. N_2O emissions from LULUCF constitute 8.5% from the total N_2O emissions.

Waste management. The main sources of N_2O emissions from the waste sector are wastewater handling and waste composting, composing respectively 2.62% and 0.12% of N_2O emissions including LULUCF sector and to 2.87% and 0.13% when the LULUCF sector is not included.

Table 3.5. Total N_2O emission 1990, 1995, 2000, 2005 – 2011 (Gg)										
	1990	**1995**	**2000**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
1. Energy	**0.51**	**0.38**	**0.34**	**0.42**	**0.41**	**0.42**	**0.40**	**0.40**	**0.39**	**0.39**
1.A. Fuel combustion	0.51	0.38	0.34	0.42	0.41	0.42	0.40	0.40	0.39	0.39
1.A.1. Energy industries	0.05	0.04	0.03	0.02	0.03	0.03	0.02	0.03	0.03	0.03
1.A.2. Manufacturing industries and construction	0.03	0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.05	0.06
1.A.3. Transport	0.27	0.15	0.15	0.20	0.19	0.20	0.19	0.16	0.16	0.17
1.A.4. Other sectors	0.16	0.17	0.14	0.17	0.16	0.17	0.16	0.17	0.16	0.14
1.A.5. Other	NO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2. Solvents and other product use	**NA,NE,NO**	**0.01**	**0.01**	**0.01**	**0.04**	**0.01**	**0.01**	**0.01**	**0.02**	**0.02**
3. Agriculture	**11.55**	**4.36**	**3.98**	**4.57**	**4.56**	**4.75**	**4.72**	**4.83**	**5.03**	**5.01**
3.A. Manure management	1.84	0.75	0.52	0.50	0.47	0.48	0.45	0.45	0.42	0.39
3.B. Agricultural Soils	9.71	3.62	3.46	4.08	4.09	4.27	4.26	4.38	4.62	4.61
4. Land use, Land use change and forestry	**0.48**	**0.51**	**0.52**	**0.52**	**0.53**	**0.52**	**0.52**	**0.53**	**0.52**	**0.52**
4.A. Forest land	0.47	0.48	0.48	0.47	0.48	0.47	0.47	0.47	0.47	0.47
4.B. Arable land	0.00	0.03	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.04
4.C. Grasslands	IE,NO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
4.D. Wetlands	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5. Waste management	**0.21**	**0.20**	**0.18**	**0.18**	**0.18**	**0.18**	**0.18**	**0.18**	**0.18**	**0.17**
5.A. Waste combustion	0.21	0.20	0.18	0.18	0.18	0.18	0.17	0.17	0.17	0.16
5.B. Waste incineration	NO	NA,NO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.C. Other	NE	NE	NE	0.00	0.00	0.00	0.00	0.00	0.01	0.01
Total N_2O emissions with N_2O from LULUCF	**12.75**	**5.46**	**5.04**	**5.71**	**5.72**	**5.89**	**5.83**	**5.95**	**6.15**	**6.10**
Total N_2O emissions without N_2O from LULUCF	**12.27**	**4.95**	**4.52**	**5.19**	**5.19**	**5.36**	**5.31**	**5.42**	**5.62**	**5.58**
International bunkering	0.19	0.05	0.01	0.13	0.10	0.09	0.08	0.11	0.12	0.12
Aircraft	0.01	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Shipping	0.18	0.04	0.01	0.13	0.09	0.09	0.07	0.10	0.10	0.11

3.1.2.4 Hydrofluorocarbons and Sulphur Hexafluoride Emissions

Emissions for the following hydrofluorocarbons (fluorated gases) are estimated in Latvia: HFC-134a, HFC-23, HFC–125, HFC–143a, HFC–152, HFC–227ea, and also SF_6. The most consumed gas is HFC-134a, applied in stationary freezing devices and air conditioning equipment. Although the amount of fluorinated gases and the emissions caused by commercial use and industrial processes are rather small, the meaning of the said cannot be underestimated in the light of the GHG Global Warming Potential.

From 1995 the emissions of fluorinated gases increased year-by-year until year 2007 (1995 – 0.89 Gg CO_2 eq., 2007 – 107.25 Gg CO_2 eq.). The reasons for such increase are: growing standarts of the living , increasing number of new cars and overall development of the national economy. In 2008 an impact of global crisis caused the decrease in emissions comparing to 2007 level. However, in the recent years (2008-2011) the emissions are fluctuating within 83-95 Gg CO_2 eq.

3.1.3 INFORMATION ON INDIRECT GREENHOUSE GAS EMISSIONS

During the time period from 1990–2000 the amount of indirect emissions had decreased (see Table 3.6) though starting with 2001 NOx, NMVOC and CO emissions had the tendency to increase due to more rapid use of firewood in the household sector and fuel consumption in the transport sector. The emissions of SO_2 have considerably decreased due to replacement of the used type of fuel. Natural gas and biomass as a type of fuel with practically no sulphur contents are becoming more popular.

Table 3.6. Indirect GHG and SO_2 (Gg)

	NOx	CO	NMVOC	SO_2
1990	64.56	455.09	101.48	104.71
1991	59.11	399.73	75.62	85.90
1992	50.04	386.83	70.86	72.87
1993	45.10	384.95	70.98	67.42
1994	42.37	372.01	69.91	67.26
1995	39.12	347.35	67.23	49.05
1996	39.45	354.62	69.80	55.19
1997	38.67	325.77	66.57	42.90
1998	37.76	305.53	64.24	38.50
1999	36.17	290.88	63.83	30.26
2000	35.85	289.21	64.59	15.77
2001	38.99	298.61	68.80	12.45
2002	38.59	287.75	64.66	11.01
2003	38.94	288.34	64.47	8.83
2004	38.64	283.70	109.51	6.78
2005	37.12	282.45	73.14	6.60
2006	37.22	281.50	74.30	5.85
2007	38.15	265.62	82.68	5.67
2008	33.90	249.08	73.45	4.77
2009	32.07	269.35	60.87	4.18
2010	34.01	258.94	66.08	3.25
2011	31.66	225.31	69.91	3.17

Information on indirect GHG and SO_2 emissions per sectors of industry is provided below.

Energy, including transport sector. The main CO_2 emission sources in 2011 were transport (41.6%), combustion of natural gas in the energy sector – 25.8%, and burning of fossil fuels and natural gas in service, household, agriculture and forestry sectors – 8.1% and 7.6% accordingly.

Due to the constant increase in number of vehicles, (1990-2007) the emissions from transport increased year-by-year with a peak point in 2007 when emissions gone up to 28.9% comparing to 1990. However, since 2007 the emissions in Transport sector have decreased by 17.4%. In Energy Industries, Manufacturing Industries and Construction sectors the emissions have decreased by

66.9% and 76.5%, accordingly, with fluctuations in 2010-2011 due to differences in average temperatures in winter. A sharp decrease in emissions can also be seen in other sectors where amounts of CO_2 emitted have decreased by 74.9%. However, since year 2000, emissions have increased by 33.0% generally due to increasing amounts of natural gas consumed. The amount of CO_2 emitted from other sectors are fluctuating over years, because in this section emission from military off-road vehicles are reported, which are not dependent on economical situation or other factors which might influence other Energy sectors.

Industrial processes. In 2011 the Industrial sector produced 32.5% of the total NMVOC emissions and 5.6% of total NOx emissions. The distribution of NMVOC emissions from Industrial processes are as follows: paving of roads – 93.7%, food industry – 5.8%, metal production – 0.3%, whereas cement production and metal production accounted for the highest NOx emissions of the sector – 52.2% and 47.8% respectively.

Solvents and other product use. Solvent and Other Product Use sector generated 17.7% of NMVOC emissions in 2011. The biggest subcategory (51%) of Solvent and Other product use is „Other product use" which include glues, adhesives etc.

Land use, land-use change and forestry. As outlined before NOx and CO emissions are generated by combustion processes. The emission fluctuations year-by-year depend on regularity, number of burning cases and burning area of not controlled burning processes. The CO and NOx emissions in 2011 comparing to 2010 had increased by 14.8% and 16.6% accordingly.

Waste management. The waste sector produces a comparatively small amount of indirect GHG. Main sources are waste incineration and cremation. NMVOC emissions also are calculated from solid waste disposal sector.

3.1.4 ACCURACY/UNCERTAINTY OF THE DATA

The uncertainty estimates are performed in accordance with the Tier1 method presented by the IPCC GPG 2000. The Tier1 method is based on emission estimates and uncertainty coefficients for activity data and emission factors. In many cases uncertainty coefficients have been assigned based on default uncertainty estimates according to IPCC GPG 2000 or on expert judgment, because there is a lack of the information. For each source, the uncertainty for activity data and emission factors was estimated and given in percentage.

The uncertainty calculation is made in Excel file, which is sent to sectorial experts for updating annually. The uncertainty analysis is done for the all sectors: Energy, Industrial Processes, Solvent and Other Product Use, Agriculture, Waste and LULUCF sectors. Uncertainties are estimated for direct greenhouse gases, e.g. CO_2, CH_4, N_2O and F-gases.

Detailed descriptions of uncertainty assessment are included in the National Inventory Report submitted to the Convention Secretariat on 15 April 2013 in the chapters of each sub sector.

3.1.5 CHANGES SINCE THE FIFTH NATIONAL COMMUNICATION REPORT

After publication of the Fifth National Communication report of the Republic of Latvia the improvements affecting the emission time series were introduced in the GHG inventory. The total GHG emission reduction for the time period 1990 - 2007 published in the Fifth National Communication report was 59.1%, though, in the inventory information submitted in 2009 – 54.1%, mainly due to changes in methodology and emission factors in LULUCF and other sectors.

The explanations of the last calculations are included in the national inventory report submitted to the Convention Secretariat on 15 April 2013 and in the re-submission of revisions made by Latvia in its 2013 inventory on 20 September 2013. The main changes according to the mentioned papers are outlined in Table 3.7.

Table 3.7. Main changes in the Sixth National Communication report compared to the Fifth National Communication report	
Energy	Changes in activity data for natural gas, landfill and sludge gas. Included new fuels such as straws.
Transport	Change in methodology in aviation emissions, corrected emission factors for railway, corrected sulphur amount in gasoline and diesel.
Industrial processes	Carbon conversion factor for Iron and Steel sector was precised, CO_2 emission factor for produced clinker was changed, as well as large recalculations in Asphalt roofing and Road paving with asphalt sectors due to change in activity data. Fluorinated gases were recalculated for all-time series.
Solvent and other product use	Methodology changed from Tier1 to Tier3.
Agriculture	Area for Histosols was recalculated, emission factors for enteric fermentation were changed, recalculated emissions in Agricultural soils, Manure management. AWMS were corrected for all-time series, CH_4 emissions were changed to Tier2. Nitrogen fractions for crops were changed. Pasture range and Paddock was evaluated as manure management system (AWMS) and included in calculations. Default emission factor (EF) for CH_4 emissions from manure management for other cattle was changed with calculated EF values with T2. Also historical values for EF of dairy cattle was checked and adjusted. Updated VS and GE historically calculated values for 1990-1999 for dairy and non-dairy cattle.
LULUCF	Significant improvements are done in the LULUCF sector, using the methodologies and data elaborated for calculation of the national forest management reference level; therefore, the most of the changes are applied to the forest land remaining forest category.
Waste management	A study on the amount of Degradable organic carbon (DOC) in waste is carried out. Now in the calculations national DOC factor (0.17) is used. Amount of waste disposed among the managed and unmanaged landfills is specified. Emissions from Domestic Waste Water recalculated using IPCC default method. Because of default method included also CH_4 emissions from Sewage Sludge recalculations affected that sector as well.

3.2 NATIONAL SYSTEM

3.2.1 INSTITUTIONAL ARRANGEMENTS

The national system for annual GHG emission inventory is specified in the Cabinet of Ministers Regulations No. 217 adopted on 27 March 2012 "The National Inventory System of Greenhouse Gas Emission Units" (the Cabinet Regulations No. 217). This legislative enactment regulates institutional cooperation for establishment and maintenance of the national GHG inventory system, including data collection mechanism and the reporting procedure.

The national system for GHG emission estimates is established in line with the requirements set forth in the Kyoto Protocol. Main institutions, involved in preparing GHG inventory, their tasks and responsibility is specified in Figure 3.5.

The institution in charge of the GHG inventory is MEPRD[22], in cooperation with other institutions specified in the Cabinet Regulations No. 217. The GHG inventory is coordinated with the ministries of sectors involved. After approval of the GHG inventory the MEPRD shall send it to the European Commission via the official representative office in Brussels, and shall upload it to the European Environmental Agency Central Data Repository.

The GHG inventory information duly approved by the MEPRD shall be placed in a special reporting portal of the Convention Secretariat.

LEGMC shall prepare the national air pollution emission inventory within the framework of the United Nations Economic Commissions for Europe Convention on Long-Range Transboundary Air Pollution that helps to guarantee coherence of both submittable reports.

More detailed information on national system is provided in the National Inventory Report submitted to the Convention Secretariat on 15 April 2013.

[22]The name and contact information for the national entity and its designed representative with overall responsibility for the national inventory of Latvia can be found in MEPRD web page www.varam.gov.lv

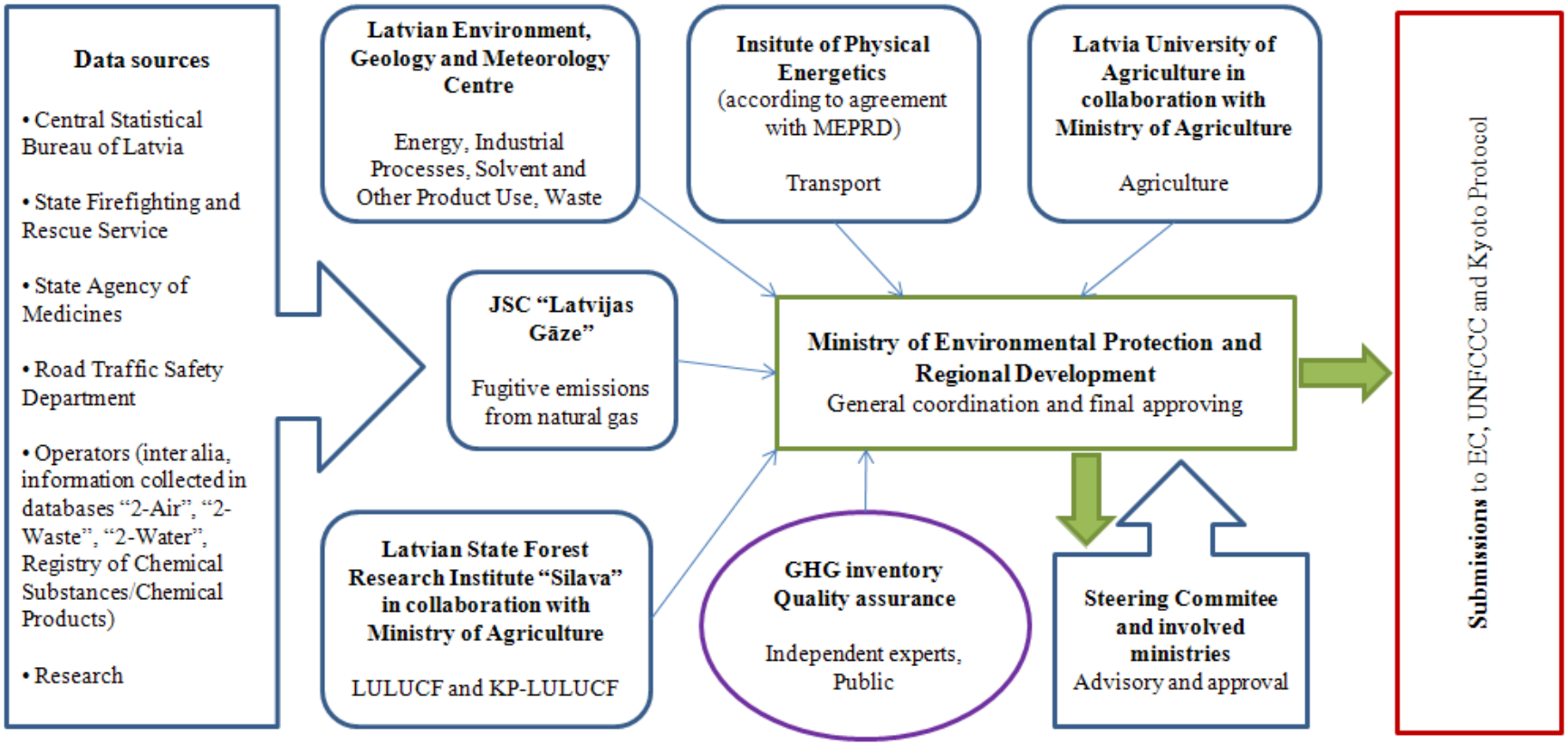


Figure 3.5 National System for Preparation of the Annual GHG Inventory

3.2.2 QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

According to the Cabinet Regulations No. 217 specified above, the institutions involved in GHG inventory are obliged to observe the quality control requirements defined in the Guidelines of the Intergovernmental Panel on Climate Change (IPCC).

The MEPRD is liable for overall quality control and implementation of the national system for GHG inventory and coordination of international inspections under the Convention. The MEPRD is responsible for coordination of the GHG inventory, including also compliance with quality control procedures. Each of the institutions involved in the GHG inventory is liable for compliance with the quality control requirements.

The following quality control measures shall be implemented during the GHG inventory of 2013:

- Verification of recording (description) of used assumptions and criteria, operational data and emission factors;
- Verification of emission time series;
- Verification of the used units of measure;
- Verification of data consistency among branch categories.

More detailed information on the applied quality control procedures, including emission factors used for the purpose of the GHG inventory is provided in section 1.6 of the National Inventory Report submitted to the Convention Secretariat on 15 April 2013.

Since publication of the Fifth National Communication report of Latvia the legislative basis regulating quality control and establishing quality assurance procedures was improved.

3.2.3 THE INVENTORY METHODOLOGY AND DATA

For the purpose of preparing the GHG inventory information Latvia has used the reporting guidelines[23] referred to in the Convention and also IPCC methodology approved by the conferences of the parties:

- Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories;[24]
- Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories (2000); [25]
- Good Practice Guidance for Land use, Land- use Change and Forestry (2003).[26]

3.2.4 KEY CATEGORY ANALYSIS

[23] http://unfccc.int/resource/docs/2006/sbsta/eng/09.pdfhttp://unfccc.int/files/national_reports/annex_i_natcom_/application/pdf/nc5outline.pdf

[24] http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm

[25] http://www.ipcc-nggip.iges.or.jp/public/gp/english/gpgaum_en.htm

[26] http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.htm

Key sources are the emissions/removals, which have a significant influence on the total inventory in terms of the absolute level of emissions and the trend of emissions or both. Level Assessment (L) identify source category whose level has a significant effect on total national emissions. Trend Assessment (T) identifies sources that are the key because of their contribution to the total trend of national emissions.

It is important to identify key source categories so that the resources available for inventory preparation may be prioritized and the best possible estimates prepared for the most significant source categories.

The identification of key categories is described in the IPCC Good Practice Guidance, Chapter 7 and in the IPCC Good Practice Guidance for Land Use, Land-Use Change and Forestry, Chapter 5.4.

IPCC methodologies offer two different methods for identifying key sources: Tier1 and Tier2. In the Tier1 method, the emission sources are sorted according to their contribution to emission level or trend. In the Tier2 method, the relative uncertainties of the source categories are also taken into account. The key sources are the emission categories, which represent together 90% of the inventory uncertainty.

Tier2 method is used to identify key sources for time period 1990-2011. The identification is divided in two parts, key sources excluding LULUCF and key sources including LULUCF source categories. The starting point for the choice of source categories without LULUCF is the list presented in the Good Practice Guidance as Table 7.1 and with LULUCF is presented in Good Practice Guidance for LULUCF as Table 5.4.1. The base year for CO_2, CH_4, and N_2O greenhouse gas emissions is 1990.

Key categories for 2011 (Table 3.8) were identified as described in the IPCC GPG 2000 using Tier2 level and trend assessment taking into account qualitative criteria (Q). Category uncertainty estimates developed under Tier1 uncertainty analysis are incorporated in Tier2 approach for determination of key sources.

Table 3.8. GHG key categories for 2011

IPCC GHG Source and Sink Categories	Direct	Key category	Criteria for identification
1.A.3.b Road Transportation - Diesel Oil	CO_2	Yes	L,T, Q
1.A.1.a Public Electricity and Heat Production - Gaseous Fuels	CO_2	Yes	L,T, Q
4.D.1 Direct Soil Emissions	N_2O	Yes	L,T, Q
1.A.3.b Road Transportation - Gasoline	CO_2	Yes	L,Q
4.A. Enteric Fermentation	CH_4	Yes	L,T, Q
2.A.1 Cement Production	CO_2	Yes	L,T, Q
4.D.3.Indirect Emissions	N_2O	Yes	L,T, Q
1.A.4.c Agriculture/Forestry/Fisheries - Liquid Fuels	CO_2	Yes	L,T, Q
6.A.2 Unmanaged Waste Disposal Sites	CH_4	Yes	L,T, Q
1.A.4.a Commercial/Institutional - Gaseous Fuels	CO_2	Yes	L,T, Q
1.A.4.b Residential - Gaseous Fuels	CO_2	Yes	L,T, Q
1.A.3.c Railways - Liquid Fuels	CO_2	Yes	L,Q
1.A.2.f Other - Gaseous Fuels	CO_2	Yes	L,T, Q
1.A.2.f Other - Solid Fuels	CO_2	Yes	L,T, Q
1.A.4.b Residential - Biomass	CH_4	Yes	L,T, Q
1.A.4.b Residential - Liquid Fuels	CO_2	Yes	L,T, Q
1.A.2.f Other - Liquid Fuels	CO_2	Yes	L,T, Q

Table 3.8. GHG key categories for 2011			
IPCC GHG Source and Sink Categories	**Direct**	**Key category**	**Criteria for identification**
4.B.Manure Management	N_2O	Yes	L,T, Q
6.A.1 Managed Waste Disposal on Land	CH_4	Yes	L,T, Q
1.A.4.a Commercial/Institutional - Solid Fuels	CO_2	Yes	L,T, Q
1.A.2.e Food Processing, Beverages and Tobacco - Gaseous Fuels	CO_2	Yes	L,Q
1.A.4.b Residential - Solid Fuels	CO_2	Yes	L,T, Q
1.A.4.a Commercial/Institutional - Liquid Fuels	CO_2	Yes	L,T, Q
1.B.2.b Natural Gas	CH_4	Yes	L,Q
4.B Manure Management	CH_4	Yes	L,T, Q
4.D.2 Pasture, Range and Paddock Manure	N_2O	Yes	L,T, Q
2.F(a).1 Refrigeration and Air Conditioning Equipment	HFCs	Yes	L,T, Q
1.A.3.b Road Transportation - LPG	CO_2	Yes	L,Q
1.A.2.f Other – Other Fuels	CO_2	Yes	L,T, Q
1.A.2.a Iron and Steel - Gaseous Fuels	CO_2	Yes	L,Q

3.3 NATIONAL REGISTRY

The ETR of Latvia is governed by the applicable EU laws on GHG emission trading guaranteeing compliance with the decisions approved in the addendum to the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (13/CMP.1 and 15/CMP.1). The ETR software has been designed and coordinated with the requirements of the Data Exchange Standards for the Registry Systems under the Kyoto Protocol[27] (DES).

According to the Law "On Pollution" Section 32_4, the national GHG emission units registry shall be established and maintained by the Latvian Environment, Geology and Meteorology Centre, address Maskavas 165, Riga, LV-1019, by enabling the mandatory and voluntary participants of the International Emission Trading System, the possibility to perform in the ETR all permitted operations with emission quotas.

The ETR of Latvia for the EU ETS for the time period 2005 - 2007 and the first commitment period of the Kyoto Protocol 2008-2012 was established and developed on the basis of the software licensed by the UK Department of Forest, Environment and Rural Affairs *(DEFRA*) the so-called *GRETA* software. The ETR was established in full compliance with the Commission Regulation (EC) No. 2216/2004 for a standardised and secured system of registries pursuant to the Directive 2003/87/EC of the European Parliament and of the Council and Decision No. 280/2004/EC of the European Parliament and of the Council and DES.

Directive 2009/29/EC adopted in 2009, provides for the centralization of the EU ETS operations into a single European Union registry operated by the European Commission as well as for the inclusion of the aviation sector. At the same time, and with a view to increasing efficiency in the operations of their respective national registries, the EU Member States who are also Parties to the Kyoto Protocol (25) plus Iceland, Liechtenstein and Norway decided to operate their registries in a consolidated manner in accordance with all relevant decisions applicable to the establishment of Party registries - in particular Decision 13/CMP.1 and decision 24/CP.8.

[27]Data Exchange Standards for the Registry Systems under the Kyoto Protocol

With a view to complying with the new requirements of Commission Regulation 920/2010 and Commission Regulation 1193/2011, in addition to implementing the platform shared by the consolidating Parties, the registry of EU has undergone a major re-development. The consolidated platform which implements the national registries in a consolidated manner (including the registry of EU) is called Consolidated System of EU registries (CSEUR).

3.3.1 LATVIA'S EMISSION TRADING REGISTRY'S ADMINISTRATOR AND CONTACT INFORMATION

According to the procedure set forth in the Commission Regulation (EC) No.2216/2004 for the purpose of maintenance of the national registry the LEGMC has appointed two administrators and also a technical administrator. The contact information of registry administrators has been reported according to the common reporting form together with Latvia's Initial Report under the Kyoto Protocol and filed to the International Trading Registry technical provider of the system established by the Convention secretariat[28]- the International Transaction Log (ITL), including reporting on any changes in the composition of the ETR administrators.

3.3.2 COOPERATION WITH OTHER MEMBER STATES IN MAINTENANCE OF LATVIA'S ETR

On 2005 LEGMC concluded an agreement with DEFRA on purchase and use of GRETA ETR software licence, help desk and receipt of updates. Latvia was joined to the GRETA ETR system during the EU ETS period and on the first (2008) and second (2009) year of the first commitment period of the Kyoto Protocol. The LEGMC provided ETR technical infrastructure (server, connection facilities, licences and certificates) performed installation of the software, all necessary inspections and appointed ETR administrators.

In 2008 the LEGMC contracted a cooperation agreement with the Finnish company "Innofactor ltd" on registry's technical administration services, technical supplies and maintenance of a backup server for restoration of ETR information in case of breakdown or error. Such changes were implemented due to lapse of the term of the license agreement executed with DEFRA and change of the licensor of the software product (from 2008 *GRETA International Limited* (GIL)) and imposition of new software use terms unfavourable for the user of the software.

Latvia's ETR is joined with the national ETR's of other Member States via the ETR server of the European Commission (EUTL – *European Union Transaction Log*). Besides, the National Registry of Latvia is also connected to the national registers of other participants of the Kyoto Protocol via the ITL.

Hence European Union Consolidated registry system developing in 2012 ETS service desk (*ETS SD-ETS Service Desk)* were set up to support the registry administrators. The new service desk acts as 2nd level of support to the local support provided by the Parties. It also plays a key communication role with the ITL Service Desk with regards notably to connectivity or reconciliation issues.

3.3.3 DATABASE STRUCTURE AND THE CAPACITY OF LATVIA'S ETS

The EU Registry is a Java EE applications which must be deployed on a Weblogic 11 cluster composed of at least 2 nodes. Its operations require also an Oracle 11 database and a load balancer.

[28]http://unfccc.int/files/national_reports/initial_reports_under_the_kyoto_protocol/application/pdf/latvia_aa_report__unfccc.pdf

The machines hosting the Weblogic nodes and the database should be Solaris servers. Finally the system would need a file system with at least 500 GB of free space.

During the time period from 2005– 2007 (EU ETS period) there were two registry's administrators appointed by the LEGMC and two technical administrators. After signing the agreement with the Finnish company "Innofactor ltd" the functions of the technical administrators were taken over by the said company. The LEGMC provided two administrators and also availability of IT specialists if necessary (ensuring continuous operation of the ETR technical infrastructure).

During the time period from 2008–2012 (EU ETS period) there were still two registry administrators appointed by the LEGMC, two technical administrators and two technical administrators from Finnish company "Innofactor ltd". Starting from June of 2012 the contract with Finnish company was suspended due to a fact that European Commission is responsible for maintaining and technical supporting of Consolidated System of EU registries.

In 2012, the EU registry underwent a major redevelopment with a view to comply with the new requirements of Commission Regulation 920/2010 and Commission Regulation 1193/2011 in addition to implementing the Consolidated System of EU registries (CSEUR).

3.3.4 COMPLIANCE WITH THE REQUIREMENTS OF THE DATA EXCHANGE STANDARDS FOR REGISTRY SYSTEMS UNDER THE KYOTO PROTOCOL

ES ETR system which is used in Latvia has been developed for operations within EU ETS, where the ETS of the participants (Member States) have to be fully compatible with DES. The ETR software enables issuance, conversion, external transfers, cancellation, retirement and reconciliation processes using XML data exchange files and web-services as specified in the DES.

In addition, the ETR also contains: 24 hour clean – up, transaction status enquiry, time synchronization, data logging requirements (including transaction log, reconciliation log, Internal Audit Log and Message Archive) and different identified forms as specified in the UN DES document. ES ETR works in close collaboration with ITL administrators and the development team within the UNFCCC Secretariat.

Latvia's ETR meets all conformity requirements of the Data Exchange Standards. These obligations include adequate transaction procedures; adequate security measures to prevent unauthorized manipulations and adequate measures for data storage and registry recovery.

A strategy has been developed to perform the data migration process and the decoupling process for the full activation of the Union Registry.

Data Migration refers to the migration of all the necessary data (were kept in MS National registries) to ensure that Union Registry can hold and manage EUAs from January onwards and (optionally) all the necessary data to operate the KP national registries in consolidated manner.

Decoupling refers to the creation of distinct units for EUAs (distinguishing the AAUs and the EUAs) as opposed to marking AAUs. New EUAs are issued into the relevant holding accounts whereas old EUAs (seen as AAUs by the ITL) and are reserved in a MS deposit account.

3.3.5 MINIMIZATION OF DISCREPANCIES AND TRANSACTION CANCELLATION PROCEDURE

To minimize discrepancies between the Registry and the Transaction Log a common approach adjusted to all EU ETS ETR systems has been adopted. The same approach was adopted for the development of the remaining Kyoto Protocol Registry software functions:

- Communications between the National Registry and the ITL will be via web-services using XML messages;
- If applicable, before forwarding of a request to the ITL for processing. The Registry shall validate data entries against the list of checks. This will help to minimize sending of incorrect information to the ITL for approval;
- All assigned amount units that are involved in a transaction shall be earmarked internally within the Registry, by allocating individual codes, thereby preventing the assigned amount units from being involved in another transaction before a response has been received from the ITL and the current transaction has been completed;
- The web-service that automatically sends the message to the ITL for processing will ensure that a message received acknowledgement is received from the ITL before completing the submission of the message. When no acknowledgement message has been received following a number of retries, the web-service will terminate the submission and roll-back any changes made to the unit blocks that were involved;
- Where a 24 hour clean-up message is received from the ITL, the existing web-service will roll back any pending transactions and the units that were involved, thereby preventing any discrepancies in the unit blocks between the Registry and the ITL;
- In the event of an unforeseen failure, the data discrepancies between the Registry and the ITL can be corrected via a manual intervention function within the Registry. Following this, reconciliation will be performed to validate that the data is in sync between the Registry and the ITL.

3.3.6 SECURITY MEASURES FOR PREVENTION OF UNAUTHORIZED MANIPULATIONS AND OPERATORS' ERRORS

The security measures of the Register are defined in several documents elaborated on the basis of the LEGMC information system security policies instrument. The EU ETR system includes several security measures implemented to prevent unauthorized access.

3.3.7 PREVENTING UNAUTHORIZED ACCESS

For access to ES registry there are carried out two-factor authentication and user must create their own (*ECAS- European Commission Authentication Service*) account. It means that user access to the Registry is possible only via username, password and mobile phone number. The Username is created by the ETR software itself on registration in the ETR; though the password is created by user. SMS authentication is used as second authentication factor to log in registry, propose transactions and approve transfers. Users are suggested not to use a smartphone to receive SMS challenge code in case the same phone is used to connect 3G or internet to access ETS registry website in order to minimize the risk of unauthorized access to user account.

The main scope of the LEGMC information source logical data protection is to ensure coordinated availability and management of information. The access control is provided on the basis of the LEGMC operational requirements, safety rules, provisions of the Commission Regulation (EC) No.2216/2004 (21 December 2004) for a standardized and secured system of registries pursuant to Directive 2003/87/EC of the European Parliament and of the Council and Decision No. 280/2004/EC of the European Parliament and of the Council, the applicable Latvian laws, normative enactments and DES recommendations.

The users shall observe the mandatory requirements for password criteria that are one of the important IT security requirements – the password must contain at least minimum of required characters including special characters and digits and must complying with Hypertext Transfer Protocol (HTTP) basic authentication scheme. The users are prohibited from disclosing one's account identifier and/or password to another person and use the same password for several accounts. It is also prohibited to write the password down, send it by e-mail in plain text, spell on the phone or disclose otherwise.

To guarantee that only licensed software is used and no unauthorized downloading of software or software tools is admissible. It is recommended to record and maintain information about software downloaded to the PC of the particular user and e.g. verify such information on quarterly basis.

3.3.8 PREVENTION OF UNPERMITTED MANIPULATIONS AND OPERATOR'S ERRORS

Operations to be performed by a particular user in the ETR are controlled via an authorization system preventing unauthorized access to certain functions and operations. All operations performed by a particular user are registered and recorded by the internal control procedures. Any manipulations with the database can be performed via the internal procedures that cannot be directly accessed from the user's interface and is only an intranet service.

To prevent operator's errors, the Registry software incorporates the following design:

- Regular validation and control is performed on all user inputs to ensure that only valid details are approved and submitted to the ITL for general approval (processing);
- Repeated confirmation of user input is displayed to help the user to spot any errors that may have been made;
- An internal process has been implemented for secondary approval for relevant operations before submitting the details to the ITL for processing.

3.3.9 PUBLICLY ACCESSIBLE INFORMATION VIA LATVIA'S ETR USERS INTERFACE

Only authorized persons (with created ECAS account) have access to Latvia's ETR accounts. With these instruments the user can access to all accounts in one Member state registry. Only the ETR administrator has access to all ETR information without any limitations.

According to the UN Framework of Climate Change Convention Conference of the Parties decision 13/CMP/1 Annex E Articles 44 – 48 the following information has to be publicly available:

- Article 45 – Information about the accounts opened in Latvia's Emission trading registry, account types, account holders and contact persons has been published in the Latvia's Emission trading registry public reports section –

http://www.meteo.lv/fs/CKFinderJava/userfiles/files/Vide/Klimats/SEG/Public_info.pdf

- Article 46 – One Joint Implementation project "The Liepaja Regional Solid Waste Management Project" is registered in the 2012. The information of the project is available in the UNFCCC webpage:

  http://ji.unfccc.int/JIITLProject/DB/JFNQLCBVKMHCWY7HVH1YC7610UVHOD/details

- Article 47 – Information of the Kyoto Protocol units in the Latvia's Emission Trading registry opened accounts as well as transactions of Kyoto Protocol units is submitted in Standard Electronic Format" (see Table 3.9).

Table 3.9. Information of the Kyoto Protocol units in the Latvia's Emission Trading registry	
AAU – Assigned Amount Units in registry	119 182 130
EUA_AAU (European Union units) according to Latvia's National Allocation Plan	31 265 730
EUA_AAU allocated to Latvia's operators in 2012 according to Latvia's National Allocation Plan and its amendments	4 991 646
National Reserve (according to Latvia's National Allocation Plan)	8 304 122
Commitment Period Reserve	57 726 425

3.3.10 MEASURES TO SAFEGUARD, MAINTAIN AND RECOVER DATA IN THE EVENT OF A DISASTER

In case of a disaster in a data corruption of the main site the following procedure must be applied for restoring the data:

– The ITL and EUTL must be informed about the disaster and have temporarily suspended to receive the ETS member state requests.

– Request must be made to the backup and restore team to restore the latest backup and provide the timestamp of this restored backup.

– Request must be made to the ITL Service Desk to provide a list of all the transactions involving a member state which have been updated between the backup timestamp and now. The status history and the transaction block must be provided along.

EU ETS system ensures automatic registration of transactions in the application software database and in XML format – in transaction registration files.

The central administrator and Member States shall ensure that the Union Registry and other KP registries store records concerning all relevant KP processes, log data and account holders of KP accounts for 15 years after the closure of the account or until any issue of implementation relating to them arising within the context of the UNFCCC bodies has been resolved, whichever is the later.

The central administrator shall ensure that national administrators are able to access, query and export all records held in the Union Registry in relation to accounts that are or were administered by them.

The Central Administrator shall take all reasonable steps to ensure the communication links between the Union registry and the EUTL are maintained 24 hours a day, 7 days a week and also

available for account holders. The backup hardware and software necessary in the event of a breakdown in operations of the primary hardware and software is provided. The Central Administrator shall keep interruptions to the operation of the Union registry and EUTL to a minimum.

In case of any discrepancies between EU ETS and ITL server, the Latvian Registry administrator shall immediately communicate with the EU ETS support service. Information exchange, database improvements and receipt of necessary assistance (advice) for improvement of listed problems is received and delivered via e-mail.

3.3.11 TEST PLANS AND TEST REPORTS

The overall change to a Consolidated System of EU Registries triggered changes the registry software and required new conformance testing. The complete description of the consolidated registry was provided in the common readiness documentation and specific readiness documentation for the national registry of EU and all consolidating national registries.

During certification, the consolidated registry was notably subject to connectivity testing, connectivity reliability testing, distinctness testing and interoperability testing to demonstrate capacity and conformance with DES. All tests were executed successfully and lead to successful certification on 1 June 2012.

On 2 October 2012 a new software was released (called version v4) including functionalities enabling the auctioning of phase3 and aviation allowances, a new EU ETS account type (trading account) and a trusted account list went into Production. The trusted account list adds to the set of security measures available in the CSEUR. This measure prevents any transfer from a holding account to an account that is not trusted.

The October 2012 release affected only ETS functionality and had no impact on Kyoto functions. Both regression testing and tests on the new functionality were successfully carried out prior to release of the version to Production. The site acceptance test was carried out by quality assurance consultants on behalf of and assisted by the European Commission.

During the time period of 18-27 June 2012 the EUCR and EUTL SAT (*Site Acceptance tests*) were done, as a result Version 4.0 is a final version. New functions were tested- trusted account list, auctioning and impact on existing functions related with users, account management, compliance, transactions, account holdings and transfers.

Since 30 June 2012 Latvian registry works in EU Consolidated registry system in uninterrupted mode.

POLICIES AND MEASURES

4 POLICIES AND MEASURES

This chapter provides a description of policies and measures to be implemented to move towards goals set by the Convention and Kyoto Protocol. A number of measures have been implemented, adopted and planned to fulfil goals mentioned above. The summary of policies and measures has been drafted in accordance with Report of Latvia to the European Commission submitted on 13 June 2013 (which takes into account the implementation of the Climate and Energy package adopted in 2009). Only priority measures with a significant effect to climate change were taken into account in calculations of total effects of policies and measures.

Since the last National Communication the main results regarding the policies and measures are the full implementation of the EU's Climate and Energy package (2009). Most of the policy documents mentioned in the Fifth National Communication report have been renewed for next planning period until year 2020.

4.1 THE POLICY MAKING PROCESS

Procedure of the policy development process in Latvia is determined by the Rules of Procedure of the Cabinet of Ministers and Rules of Procedure of the Parliament (Saeima). MEPRD is the institution that is responsible for coordination of compliance with the requirements of the Convention and the Kyoto Protocol.[29]

Issues related to development and implementation of the climate change policy are carried out by MEPRD, Ministry of Finance, Ministry of Economics, Ministry of Transport, Ministry of Agriculture and institutions supervised by the relevant ministries.

MEPRD is the leading state administrative institution in the field of environmental protection which includes protection of environment and nature, maintenance and rational utilization of natural resources as well as it ensures planning and coordination process of state and regional development, local governments' development and supervision, territorial development planning and implementation of e-Government.

MEPRD also coordinates acquisition of funds of the climate change financial instruments. In order to ensure that environment protection requirements are set for certain polluting activities by application of the system of permits, the MEPRD and institutions supervised by MERPD carry out control over implementation of the environmental requirements and compliance to them.

Institutions supervised by the MEPRD – State Environmental Service, Environment State Bureau and the state limited liability company "Latvian Environment, Geology and Meteorology Centre" - ensure implementation of the climate policy within framework of their competence.

4.2 NATIONAL AND REGIONAL PROGRAMMES

Taking into account the size of Latvia and government structure there are no subnational or regional programmes developed or implemented in Latvia.

The overall goals of climate policy are as follow:

[29] www.varam.gov.lv

- ensure Latvia's contribution to global climate change mitigation, ensuring balance of environmental, social and economic interests;
- promote Latvia's ability to adapt to climate change and its impacts.

The climate policy of Latvia is based on the EU climate change policy, the basic principles of which are set down in several political documents, i.e "National Development Plan 2014-2020"'(approved on 20.12.2012.),"Sustainable Development Strategy for Latvia until 2030" (approved on 10.06.2010.), "Strategic development plan for Latvia 2010-2013" (approved on 9.04.2010.), "Environmental Policy Strategy 2009-2015" (approved on 31.07.2009.). Currently Latvia is working on new "Environmental Policy Strategy 2014-2020" and Climate Change Policy Strategy 2014 - 2020.

Latvia National Reforms' Programme to Implement Europe 2020 Strategy (approved on 26.04.2011) defines that, according to the Effort Sharing Decision 406/2009/EC, GHG emission increase in Latvia non-ETS sector in total shall not increase by more than 17% by year 2020, comparing to 2005. Total GHG emission in Latvia, including both EU ETS and non-ETS sectors, shall not exceed 12.19 million CO_2 eq. tons by year 2020.

Latvia believes that these actions will reduce the long-term impact on climate change:

- development of renewable energy production, that will reduce the amount of energy produced by fossil energy sources,

- implementation of sustainable transport system, development of public transportation and usage of renewable energy in transport sector,

- increase of energy efficiency,

- public awareness of GHG emission issues and development of new technologies.

Latvia's national environmental policy framework document **"Environmental Policy Strategy 2009-2015"** (approved on 31.07.2009) defines the climate policy objective under the section "Climate" as follows: contribution of Latvia in prevention of global climate change by ensuring balance between environmental and economic interests. The following measures are provided to achieve the objective above:

- MEPRD as coordinator of measures in order to ensure harmonized reduction of GHG emissions and increase of CO_2 capture;
- Participation of Latvia in the Flexible Mechanisms of the Kyoto Protocol;
- Co-ordination of the EU Emission Trading Scheme operation in Latvia;
- Introduction a legislative framework for operation of the national GHG emission scheme, including GHG emission inventories and projections;
- Encouraging change of the consumption model according to the sustainable development approach;
- Facilitating renovation of multi-apartment buildings according to the energy audit results;
- Encouraging development and introduction of efficient and environmentally friendly technologies to increase energy efficiency and the use of renewable energy sources (RES);
- Improving the tax system with a view to reduce the use of fossil fuels and increase use of RES;
- Increasing the share of RES in the balance of energy sources;
- Supporting efficient and rational use of energy;
- Promoting scientific studies on mitigation of climate change and adaptation;

- Ensuring communication for informing all groups of society about climate change and for increasing public participation, encouraging initiative at local level;
- 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;
- 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.

4.3 POLICIES AND MEASURES AND THEIR EFFECTS

This section provides information on adopted and planned policies and measures, which contribute to achieve the GHG mitigation goals at EU, Convention taking into account Kyoto Protocol. To achieve GHG mitigation goals it is necessary for Latvia to implement the following climate change mitigation policy actions:

- Establish integrated GHG emission inventory and projection system;
- Improve efficiency of ETS;
- Reduce Non-ETS emissions;
- Establish climate change adaption management system;
- Implement financial instruments to achieve goals of climate change and adaption policy;
- Develop technologies to reduce GHG emissions and promote technology transfer;
- Improve research and public awareness about climate change;
- Introduce and develop Low carbon Concept in Latvia;
- Promote green public procurement.

There are several directions of climate policy where appropriate measures are made to achieve overall goals[30]:

Table. 4.1. Climate change policy directions

Climate policy directions/ sectors	Goals of sectorial policies related to climate change	Sectorial policy planning documents
Energy	To increase the share of renewable energy sources (RES) in the balance of energy sources To increase the efficiency of use of energy sources To implement efficient energy saving technologies	Energy Development Guidelines 2007-2016 Guidelines on Use of Renewable Energy Sources 2006-2013 Latvia National Renewable Action Plan The 1st Energy Efficiency Action Plan of the Republic of Latvia Programme on Development of Biogas Production and Utilisation 2007-2011
Transport	To develop public transportation and cycling To implement energy efficient transport To increase use of biofuels	Transport Development Strategy 2007-2013 Latvian First Energy Efficiency Action Plan 2008-2010
Industrial processes	To improve industrial processes To increase energy-efficiency in industrial processes To introduce principles of cleaner production	
Agriculture	To introduce Good Agricultural Practice	Rural Development Strategy Plan 2007-

Table. 4.1. Climate change policy directions		
Climate policy directions/ sectors	**Goals of sectorial policies related to climate change**	**Sectorial policy planning documents**
	To arrange manure storage and manure processing To introduce balanced animal feeding To introduce precise fertilization	2013
Waste management	To implement recycling To reduce waste generation To increase biogas utilization in landfills To close landfills, which do not fulfil environmental requirements	Waste management plan 2013-2020
Forestry	To increase productivity of forests To promote afforestation To expand use of wood products To implement efficient environmentally friendly technologies	Development plan for Forests and forest based industries development
Adaptation	Identification of climate risks (floods, storms, drought, hot weather, etc.) Development of adaptation measures Improvement of insurance system Regional planning Development of monitoring system for climate change adaption	National Program of Evaluation and Management of Flood Risks for 2008-2015 National Security Concept
Monitoring and reporting	To fulfil international and EU reporting requirements Improvement of reporting system (scientific research, capacity-building) Development of emissions and removals projections	Environmental monitoring program 2009-2012 Environmental monitoring guidelines 2009-2012
Education, public awareness	Education about climate change Access to information	

A number of measures has been implemented, adopted and planned to fulfill policy goals mentioned above. Only priority measures with a significant effect to climate change were taken into account in calculations of total effects of policies and measures.

The following chapters provide a description of measures according to these directions of action, as well as implemented additions and changes in policy documents and legal acts since development of Fifth National Communication report of the Republic of Latvia.

4.3.1 ENERGY

4.3.1.1 To increase the share of renewable energy sources 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 49.3% (of total national

electricity consumption in year 2010) of the total consumption by all end consumers of electricity in Latvia has to be covered by electricity generated from RES

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% by 2020, and to increase it gradually thereafter. This goal is stated by the Latvia National Renewable Action Plan 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

- in the transport sector – at least 10% of GFEC,
- in the electricity sector – at least 59.8% of GFEC,
- in the heating and cooling sector – 53.4% of GFEC,
- in the building sector regarding heating and cool– 58% (in residential sector buildings – 72%, in commercial sector buildings – 44% of GFEC).

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 is provided by the EU Cohesion Fund (CF) in the framework of the Latvia national operation programme „Infrastructure and Services", part „Energy". The "Energy" programme aims the increase of 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 cogeneration plants (CHP) units utilising the RES. The programme consists of 2 activities: (1) **„Measures to increase the efficiency of district heating systems"** 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 utilizing renewable energy sources"** to support development of RES utilising CHP units. The ex-ante planned support for the whole period by the CF is stated ~ 109.129 mill EUR, where 78.728 mill EUR (~ 72%) is for the energy efficiency increase in DH systems pipeline networks and introduction of effective biomass based heat production units and 30.400 mill EUR (~ 28%) is for the introduction of RES based CHP. As a result of the programme: 10 CHP projects implemented, utilising RES, with total electrical capacity of 36.75 MW_{el} and heat capacity 106.45 MW_{th} and more than 20 biomass based heat production projects have been supported (until 1 April 2013).

Investment Support Programme in Renewable Technologies for Heat and Electricity Production to Reduce GHG emissions. The support - national Climate Change Financial Instrument (CCFI) - is available from the receipts of the international GHG emissions trading under procedures of Kyoto protocol and is provided for installation of RES technologies for heat, electricity and CHP production (the capacity of one RES unit - up to 3 MW). The eligible beneficiaries are both business sector entities (operators participating in EU ETS are non-eligible) and public institutions. It is implemented by two open tenders "Technology switch from fossil to renewable energy sources" and "Utilisation of renewable energy sources for GHG emissions reduction" supervised by MEPRD. The ex-ante contracted costs by CCFI are indicated 46.7 mill EUR. As a result of mentioned programme, the total planned RES installations electricity capacity is evaluated 124.84 MW_{el}. The total planned RES installations heat capacity is evaluated as 70 MW_{th} and higher.

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"**

defines 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 defines the goal to reach the biogas production volume of 13 mill m^3. In financial planning period of 2007-2013 the support to energy production from biogas is provided for the agriculture sector business entities & service co-operatives by national Rural Development Programme, co-financed by EU. The support is 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 is 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 Governmental Regulations defining the procedure of support state that at least 50% (initial Regulations) to 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 state that at least 30% of raw materials for fermentation of biogas shall be provided by the by-products of animal origin and derived products. According to the information provided by Latvia Rural Support Service 67 projects with total investment of 78.7 mill EUR are supported, the total electric capacity of these projects may be evaluated up to 55 MWel.

Financial support for Renewable Energy Technologies in Households. The support is provided by national CCFI. Eligible micro-generation technologies are solar heat collectors (up to 25 kW), solar photovoltaic (PV) (up to 10 kW), wind (up to 10 kW), wood, woodchips, wood pellets and straw technologies (up to 50 kW) as well as combined use of above technologies. The residential house shall 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 one project may be up to 9960 EUR, the beneficiary shall provide at least 50% co-financing of project's total eligible costs. As a result 1761 projects have been supported (36% for heat pumps, 32% - solar heat collectors, 25% - biomass heating equipment, 5% - wind, 2% - solar PV). The total support by CCFI is amounted ~ 8.6mill EUR.

Preferential Feed-in Tariffs for Renewables and for Combined Heat-Power Production are prescribed in the Electricity Market Law and the regulations issued pursuant to this Law. The Art.100 of the Amendments (17.05.2011&28.08.2012) of the Regulations No.262 (16.03.2010) regarding feed-in tariffs for RES and the Art.70 of the Amendments (28.08.2012) of the Regulations No.221 (10.03.2009) regarding feed-in tariffs for CHP production state that the Ministry of Economy 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 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.

4.3.1.2 TO INCREASE THE EFFICIENCY OF USE OF ENERGY SOURCES

The 1st Energy Efficiency Action Plan of the Republic of Latvia (EEAP), elaborated incompliance to the End-use efficiency and energy services Directive 2006/32/EC, plans for the total savings of 3483 GWh in year 2016, where 2701 GWh goes for Residential sector, 408 GWh - Tertiary sector, 170 GWh - Industry sector and 204 GWh - Transport Sector. This goal is not changed 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 efficiency measures compared to assessed consumption without implementation of them. By year2016 the average specific heat consumption in buildings has to be reduced from 220-250 kWh/1m^2/year to 195kWh/1m$_2$/year and by 2020 the annual average specific heat consumption of 150kWh/1m$_2$/year has to be achieved.

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 in 2008, is introducing 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 in 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. The energy efficiency classification system for buildings shall be introduced by the Cabinet of Ministers Regulations. In addition, 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 No.907 (adopted in September 2011, in force 1 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/1m^2 – according to estimation provided by Ministry of Economy, this requirement may relate to 10% of the existing multi-apartment buildings.

Investment Support Programme for DH Systems. As noted before, in financial planning period of 2007-2013 the investment support is provided by the Cohesion Fund. **Measures to increase the efficiency of district heating systems**" supports both RES utilisation in DH systems (discussed 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, until 1 April 2013 50 DH networks renovation projects of different scale are supported.

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 are 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". The programme has two 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 a result of the renovation project, at least 20% of heat energy saving

has to be reached. The Cabinet of Ministers Regulations, 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/1m^2 (for 1 and 2 storey multi-apartment houses) or 100 kWh/1m^2 (for 3 and more storeys multi-apartment buildings). The ex-ante planned support by ERDF is stated ~96.2 mill EUR, of which ~89.3 mill EUR for multi-apartment buildings and ~6.9 mill EUR for social residential buildings. So far it is contracted renovation of 741 multi-apartment buildings and 56 social residential buildings. To provide informative and technical support for multi-apartment buildings renovation, two support measures are realized: (1) Informing energy consumers of multi-apartment buildings – 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 and (2) Energy audits of multi-apartment buildings. In 2009-2010 the government has provided 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 Latvian municipalities.

Investment Support in Industrial Buildings Energy Efficiency to Reduce GHG emissions is important focus of national CCFI. So far three open tenders are implemented, namely, "Complex Measures to Reduce GHG Emissions in Industrial Buildings" and "Complex Measures to Reduce GHG Emissions: Tender 1 & Tender 2". 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 ex-ante contracted costs by CCFI are stated ~ 17 mill EUR, which results in ex-ante ~95 GWh heat energy savings; in addition, in year 2013 the last tender of the mentioned CCFI sub-programme is planned. To co-operate with industrial sector, the government has adopted the framework for signing the agreements on energy efficiency, promoting energy audits and energy management systems in industrial enterprises.

Investment Support Programmes in Public Sector Energy Efficiency is important focus of national CCFI. Until now five open tenders are 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: Tender 2" (beneficiaries of this tender can be public education buildings as well). Eligible investments include energy efficiency investments in buildings' heating and lightning systems and heat supply switch to RES (up to 3 MW). The ex-ante contracted costs by CCFI are stated ~95 mill EUR, which results in ex-ante ~ 120GWh heat energy savings. In addition, in year 2013 the last tender of the CCFI sub-programme "Complex Measures to Reduce GHG Emissions" is planned (beneficiaries may be public educational and health care institutions). A minimum threshold requirement of energy consumption after renovation is stated 90-100 (depending on the particular tender) kWh/1m^2/year. In addition, a particular CCFI sub-programme "Reduction of GHG emissions in Municipal Public Territories Lightning Infrastructure" is targeted to improve efficiency of public (outdoor) territories lighting.

Fiscal Instruments:

CO_2 tax. The procedure of CO_2 emission 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 up to 2.846 EUR (from 1 January 2013). The tax shall not be paid for the emissions of CO_2 which emerges:

- while using RES and local fuel peat,
- from 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 PM_{10}, CO, SO_2, NO_x, NH_3, H_2S and other non-organic compounds, hydrocarbons, 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 where 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) are 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 is reintroduced having the rate ~17.07 EUR/1000 m^3 (~ 0.5122 EUR/GJ). For the period until 01.01.2014 the exempt is made for natural gas utilised for heating greenhouses in agriculture sector and for heating industrial premises and utilisation in technological equipment of industrial entities, after this data these sectors will be taxed as well. Due to it, at the moment Ministry of Finance in co-operation with the Ministry of Economy is planning to revise taxation on natural gas, three different scenarios regarding rates are prepared for discussion. (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.

Electricity taxation. 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. The tax shall not apply to autonomous producers who generate and consume electricity for their own needs if the total generating capacity does not exceed 2 MW and energy resources applicable with fuel taxation or electricity taxable with electricity tax is used for the generation of electricity. The exemption or zero rate is stated for the electricity:

- obtained from RES, in hydro power stations, in CHP stations complying with the efficiency criteria specified in the regulatory enactments;
- used for electricity generation, generation of heat and electricity in CHP mode, household users, street lightning services.

Table 4.2. Summary of policies and measures by energy sector								
Name of policy or measure	**Objective and/or activity affected**	**GHG affected**	**Type of instrument**	**Status**	**Implementing entity or entities**	**Estimate of mitigation impact, by gas CO_2 eq.**		
						2015	**2020**	**2025**
Energy supply								
Investment Support Programme for District Heating Systems	Effective use of fuel in the DH systems, reducing energy loss and emissions, increasing the share of RES (both for heat and CHP production)	CO_2	Economic	Implemented	MoE	176	176	176
Energy Efficiency Requirements for District Heating Systems	More effective use of fuel in the DH system, reducing energy loss and emissions	CO_2	Regulatory	Implemented	MoE	IE	IE	IE
Preferential Feed-in Tariffs for Renewables	Increasing RES utilization in the electricity supply	CO_2	Economic	Expired	MoE	NE	NE	NE
Preferential Feed-in Tariffs for Combined Heat-Power Production	Increasing CHP production in the electricity supply	N_2O CH_4	Economic	Adopted	MEPRD	IE	IE	IE
Energy use -Industry / Construction								
Investment Support in Industrial Buildings Energy Efficiency to Reduce GHG emissions	Reduction of CO_2 emissions in industrial/business sector entities	CO_2	Economic	Implemented	MEPRD	20	20	20
Agreements on Energy Efficiency, promoting energy audits and energy management systems in industrial enterprises	Raising energy efficiency in industry sector (in industrial buildings and technologies)	CO_2	Voluntary/ negotiated agreement	Adopted	MoE	IE	IE	IE
Energy use - residential								
Investment Support Programmes to Increase Energy Efficiency in Apartment Buildings	More efficient use of final energy, reducing energy loss and emissions by involving end-users to increase energy performance of buildings.	CO_2	Economic	Implemented	MoE	23	23	23
Energy Audits of Residential Multi-apartment buildings	More efficient use of final energy, reducing energy loss and emissions by providing recommendations for increasing energy efficiency	CO_2	Economic/ Information	Implemented	MoE	IE	IE	IE
Informing Energy Consumers of Residential Sector (Multi-apartment buildings)	To inform final energy consumers of the energy efficiency measures and their economic benefits.	CO_2	Information	Implemented	MoE	IE	IE	IE
Financial Support (Grants) for Renewable Energy Technologies in Households	CO_2 emissions reduction by implementing RES based heat and electricity micro-generation technologies in households	CO_2	Economic	Implemented	MEPRD	16	16	16
Energy use - other (commercial and agricultural)								
Investment Support Programmes in Public Sector Energy Efficiency	Reduction of CO_2 emissions in public (municipal and state) sector	CO_2	Economic	Implemented	MEPRD	27	27	27
Energy – crossectional								
Investment Support Programme in	Reduction of CO_2 emission by installation of	CO_2	Economic	Implem	MEPRD	195	195	195

Table 4.2. Summary of policies and measures by energy sector								
Name of policy or measure	**Objective and/or activity affected**	**GHG affected**	**Type of instrument**	**Status**	**Implementing entity or entities**	**Estimate of mitigation impact, by gas CO_2 eq.**		
						2015	**2020**	**2025**
Renewable Technologies for Heat and Electricity Production to Reduce GHG emissions	RES technologies for both heat, power and CHP production,			ented				
Investment Support to Produce Energy from Biomass of Agriculture and Forestry Origin	Reduction of GHG emissions by electricity production in CHP mode by utilising biogas fermented in anaerobic processes from biomass of an agricultural origin.	CO_2	Economic	Implemented	Ministry of Agriculture	51	51	51
Energy Performance of Buildings (Directive 2002/91/EC)	Reducing final energy and emissions in buildings by increasing energy efficiency	CO_2	Regulatory	Expired	MoE	IE	IE	IE
Energy Performance of Buildings	Reducing final energy and emissions in buildings by increasing energy efficiency and public informing	CO_2	Regulatory	Adopted	MoE	IE	IE	IE
Energy Labelling on Household Appliances	Reducing energy consumption and emissions in households	CO_2	Regulatory/ information	Implemented	MoE	NE	NE	NE
Fuel Taxation – Other sectors	To provide economic incentives for effective use of fossil fuels and promote use of RES fuel thus reducing emissions	CO_2	Fiscal	Implemented	MoE, Ministry of Finance	NE	NE	NE
Taxation of Electricity	To provide economic incentives for rational use of electricity	CO_2	Fiscal	Implemented	MoE, Ministry of Finance	NE	NE	NE
Taxation of CO_2 emissions	To provide economic incentives to reduce CO_2 emissions	CO_2	Fiscal	Implemented	MoE, Ministry of Finance	NE	NE	NE
Taxation on Noxious Air Polluting Emissions	To provide economic incentives to reduce noxious air emissions (synergy with CO_2 reduction) by the use of more energy efficient and less polluting technologies	CO_2	Fiscal	Implemented	MoE, Ministry of Finance	NE	NE	NE
Performance of Heat Generators for Space Heating and the Production of Hot Water	Reducing energy and emissions by prescribing essential requirements for heat boilers	CO_2	Regulatory	Implemented	MEPRD	NE	NE	NE
Implementation of the EU Emissions Trading Scheme	Reduction of CO_2 emissions emitted by EU ETS operators	CO_2	Regulatory/ Economic	Expired	MoE	IE	IE	IE

4.3.1 TRANSPORT

Biofuel Mix Obligation Requirement. To ensure efficient growth of the share of renewable sources in the transport sector, the mandatory biofuel mix to gasoline (4.5-5% volume of bioethanol mix is obligatory for the gasoline of "95" trademark) and diesel (4.5-5% volume of biodiesel mix is obligatory 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) has been introduced as from 1 October 2009 according to the Cabinet of Ministers Regulations No.648 (Art.8.1 and9.1). It is planned to introduce, starting from 1 April 2014, 6.5-7% (volume) biodiesel mix.

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) ethanol produced from agriculture origin raw materials, (2) diesel oil with a minimum 30% (volume) biodiesel or rapeseed oil, (3) for biodiesel that is completely made up from rapeseed and rapeseed oil is stated zero tax rate. 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. To promote the competitiveness of agriculture sector the exempt from taxation is made for certain amount of diesel which is used for agriculture sector land cultivation and production purposes. Starting from 01.07.2010, the amendments of the Law have introduced the excise tax also for natural gas utilised in transport sector.

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 two laws: (1) the Law "On Transport Vehicle Circulation Tax and Business Entities Owned Cars Taxation" 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, 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: tax rate depending on the age of the car, and the additional tax rate depending on the engine size is applied for cars with engines above 3000 cm^3. The amendments of the law 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.

Development of public transport network motivates consumers to choose public transport as the measure to reduce mobility costs.

Table 4.3. Summary of policies and measures by transport sector

Name of policy or measure	Objective and/or activity affected	GHG affected	Type of instrument	Status	Implementing entity or entities	Estimate of mitigation impact, by gas CO_2 equivalent		
						2015	2020	2025
Transport								
Biofuel Mix Obligation Requirement	Increasing the share of RES in the fuel balance of transport sector	CO_2	Regulatory	Implemented	MoE	125	125	125
Excise Tax – Transport sector	To provide economic incentives regarding effective use of transport fuel and use of RES fuel in transport, thus reducing emissions	CO_2	Fiscal	Implemented	MoE, Ministry of Finance	NE	NE	NE
Applying of differential tax rates for transport vehicles depending on age and engine size or on CO_2 emission factor	To foster the economic advantages of vehicles with a smaller engine size and less fuel consumption, thus reducing emissions	CO_2	Fiscal	Implemented	Ministry of Transport, Ministry of Finance	41	41	NE
New Passenger Cars Labelling on Fuel Economy Rating	To motivate car owners to choose fuel consumption and CO_2 emissions efficient car	CO_2	Regulatory/ information	Implemented	MoE	56	205	205
Systematic inspection of the technical conditions of motor vehicles	To provide exploitation of transport vehicles in accordance with the technical requirements of the manufacturer thus reaching improvements in fuel consumption and reducing emissions	CO_2	Regulatory	Implemented	Ministry of Transport, Road Traffic Safety Directorate	NE	NE	NE
Development of public transport network	To decrease fuel consumption by further development and optimisation of public transport network	CO_2	Planning	Adopted	Ministry of Transport	NE	NE	NE

4.3.3 AGRICULTURE

Existing measures in agriculture included in the WEM scenario are following:

Regulation No. 33 of the Cabinet of Ministers "Regulation Regarding Protection of Water and Soil from Pollution with Nitrates Caused by Agricultural Activity" from 11 January 2011 determines the requirements and restrictions for the use and land application of different types of fertilizers. In particularly vulnerable territories, additional measures and restrictions have been established regarding the use of fertilizers: a prohibition period for manure and fertilizer distribution has been determined, a requirement regarding preparation of projects on fertilization of cultivated plants, compliance with the maximum standards of fertilizers for

cultivated plants, recording of fertilizers, a requirement for minimal vegetation ("the green area") maintenance in the land utilized in agriculture in autumn and winter period.

Regulation No. 628 of the Cabinet of Ministers from 27 July 2004 "Special Environmental Requirements for Performance of Polluting Activities in Animal Housing" prescribes environmental requirements for manure management in animal housing.

The conditions for good agricultural practice, issued on 1999 and 2008, facilitate farmers' understanding of environmentally-friendly farming. In 2008, the technical provisions of enterprises (the industry standard) "Manure Production and Management" and "Manure Transport and Land Application" were developed, containing useful information on the management and use of manure.

A farmer applying for EU direct payments and the measures under Axis 2 of the Rural Development Programme (2007-2013) is obliged to comply with the provisions of good agricultural and environmental condition, included in Regulations No. 173 of the Cabinet of Ministers from 1 March 2011 "Procedures by which State and European Union Support is Granted to Agriculture in the Framework of Direct Support Schemes".

The Rural Development Programme 2007-2013 includes a 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.

Policies and additional planned measures in agriculture are following:

The Rural Development Programme 2014-2020 intends to support such measures of GHG emission reduction as development of organic farming, promotion of introduction of integrated horticulture, maintenance of biodiversity in grassland, as well as disbursement of payments of Natura 2000, and measures providing practical education and information for farmers.

From 2014 to 2020, in the framework of Common Agricultural Policy, a mandatory component of direct payments will be introduced, which should be allocated 30% of the total amount of direct payments and which will be granted as an additional payment for all recipients of the basic payment, provided that they comply with the respective practices, aimed at mitigation of climate change, provision of biodiversity, environmental protection, reduction/removal of CO_2 emissions.

Table 4.4. Summary of policies and measures by agriculture sector

Name of policy or measure	Objective and/or activity affected	GHG affected	Type of instrument	Status	Implementing entity or entities	Estimate of mitigation impact, by gas CO_2 equivalent		
						2015	2020	2025
Agriculture								
Implementation of Nitrates Directive	Arrangement and construction of manure storage facilities. Reduced water pollution and reduced emissions when fertilisers are applied to the soil.	CH_4, N_2O	Regulatory	Implemented	Ministry of Agriculture	NE	NE	NE
National Development Plan of Latvia for 2014–2020*	Maintain of the natural capital as the basis for sustainable economic growth and promote its sustainable uses while minimising natural and human risks to the quality of the environment.	CH_4 N_2O	Voluntary/ negotiated Planning	Planned	Ministry of Agriculture	NE	NE	NE

*Measure is included "with additional measures" projection

4.3.4 WASTE MANAGEMENT

The most important document that describes development of waste management system and planned policies is "Waste management plan 2013-2020", 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 Latvia`s legislation on environmental protection. In general, this is governed by more than 40 laws and regulations, including the Waste Management Law, the Law on Regulators of Public Utilities, the Municipalities Law and the Natural Resources Tax Law.

Legislation describes principles and targets of waste management in Latvia. All requirements are connected with EU legislations.

Regulations of Cabinet of Ministers, which has an effect on GHG emissions from the waste sector:

- Regulations Cabinet of Ministers of 30 December 2011 No.1032 “Landfill and landfill management, closure and remediation policies”;
- Regulations Cabinet of Ministers of 22 November 2011 No.898 "Regulations on waste collection and sorting";
- Regulations Cabinet of Ministers of 2 August 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 24 May 2011 No.401 "Requirements for incineration of waste and incineration facilities";
- Regulations of Cabinet of Ministers of 19 April 2011 No.301 "Regulations on asbestos and asbestos products manufacturing environmental pollution and asbestos waste";
- Regulations of Cabinet of Ministers of 21 June 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 4.5. The tax rates for waste disposal from 1 July 2009

Waste type	Unit	The tax rate 01.07.2009-31.07.2009	The tax rate 01.01.2010-31.12.2010	The tax rate 01.01.2011-31.12.2011	The tax rate from 01.01.2012
Municipal wastes	Ton	1.25	3.00	5.00	7.00
Construction and demolition wastes	Ton	1.25	5.00	10.00	15.00
Asbestos fibres and dust wastes	Ton	10.00	25.00	25.00	25.00
Hazardous wastes	Ton	25.00	25.00	25.00	25.00
Industrial wastes	Ton	1.25	3.00	10.00	15.00

Table 4.6. Summary of policies and measures by waste management sector								
Name of policy or measure	**Objective and/or activity affected**	**GHG affected**	**Type of instrument**	**Status**	**Implementing entity or entities**	**Estimate of mitigation impact. by gas CO_2 equivalent**		
						2015	**2020**	**2025**
Waste								
Reduce disposal of Biodegradable wastes	Reducing biodegradable waste disposal in landfills.	CH_4	Regulatory/ Planning	Planned	MEPRD	IE	IE	IE
Promotion of recycling of municipal solid waste *	Promotion of recycling of municipal solid waste	CO_2	Regulatory/ Planning	Planned	Ministry of Economy	NE	NE	NE

*Measure is included "with additional measures" projection

4.3.5 INDUSTRIAL PROCESSES (F-GASES)

The most important regulations affecting the amount of these gases are the F-gas regulation (842/2006) 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; labelling of equipment containing F-gases; reporting on imports, exports and production of F-gases.
- 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.

Table 4.7. Summary of policies and measures by industrial processes								
Name of policy or measure	**Objective and/or activity affected**	**GHG affected**	**Type of instrument**	**Status**	**Implementing entity or entities**	**Estimate of mitigation impact. by gas CO_2 equivalent**		
						2015	**2020**	**2025**
Industrial Processes								
Regulations for the reporting of the F–gases activities	Contain. prevent and thereby reduce emissions of the fluorinated greenhouse gases covered by the Kyoto Protocol.	HFC PFC SF_6	Regulatory	Implemented	MEPRD	NE	NE	NE

4.3.6. LAND USE, LAND USE CHANGE AND FORESTRY

Afforestation is done mostly by private forest owners, in spite the state forest company "Latvijas valsts meži" is also investing in afforestation. The most common tree species in afforested lands is spruce. Until 2006 birch was leader. Other species including pine contributes to about 10% of afforested area. Afforestation was supported to some extent by the Latvia Single Programming Document Objective Programme 2004-2006 and later by Rural Development Plan for 2007-2013. Draft versions of the new Rural Development Plan for 2014-2020 consider afforestation of approximately 40 kha of farmlands, if 50% support rate is applied. Forest owners and management companies can pretend to EU funds also for improvement of economic value of

forests, however in short term these activities will not affect the National greenhouse gas balance.

No support is available for short rotation crops and purposeful forest regeneration (except regeneration of degraded forest stands), which are the most visible measures to improve national GHG balances in LULUCF sector, besides drainage of forests.

4.3.7. CROSS-SECTORIAL

Latvia is implementing cross-sectorial climate change mitigation policies and measures that affect several sectors of the national economy simultaneously. Such cross-sectorial policies include implementation of the EU greenhouse gas emission allowance trading scheme, participation in the flexible mechanisms of the Kyoto Protocol, control and reduction of polluting emissions.

European Union emission allowances trading system. The regional emission allowances trading system has been in operation in the EU Member States as from January 1, 2005. The system was established by the Directive of the European Parliament and Council 2003/87/EC of 13 October 2003, which establishes the system of trade of allowances of emissions of greenhouse gases in the Community and amends the Council Directive 96/61/EC. The basic goal of the EU ETS is to promote actual reduction of CO_2 emissions from installations covered by ETS, thus, helping the Member States and also the European Union to comply with the relevant obligations for reduction of emissions provided for in Kyoto Protocol in the most profitable manner.

The scheme has been divided into a number of trading periods. The first ETS trading period lasted three years, from January 2005 to December 2007. The second trading period ran from January 2008 until December 2012, coinciding with the first commitment period of the Kyoto Protocol. The third trading period began in January 2013 and will span until December 2020. Compared to 2005, when the EU ETS was first implemented, the proposed caps for 2020 represent a 21% reduction of greenhouse gases.

The Latvian National Emissions Allowances Allocation Plan for 2013-2020 was approved by the Ordinance of the Cabinet of Ministers No. 499 of 29 September 2011 "On Emissions Allowances Allocation Plan for 2013-2020" (with amendments in 2013). According to the plan there are 65 installations from Latvia participating in the EU ETS during the period.

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. Latvian 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 CCFI) are directed to open tenders of investment projects focused on reduction of CO_2 (GHG) emissions by improving energy efficiency and use of RES (see above the description of the measures "Investment Support in Industrial Buildings Energy Efficiency to Reduce GHG emissions", "Investment Support Programme in Renewable Technologies for Heat and Electricity Production to Reduce GHG emissions", "Investment Support Programmes in Public Sector Energy Efficiency", "Financial support for Renewable Energy Technologies in Households").

Important, the special "soft" programmes are focused on capacity building mentioned above, promotion public understanding on the importance and possibilities of GHG emissions reduction, on supporting research, innovative environmentally friendly energy technologies pilot projects.

Table 4.8. Summary of cross-cutting policies and measures

Name of policy or measure	Objective and/or activity affected	GHG affected	Type of instrument	Status	Implementing entity or entities	Estimate of mitigation impact, by gas CO_2 equivalent		
						2015	2020	2025
Cross-cutting								
Promotion Public Understanding on the Importance and Possibilities of GHG Emissions Reduction	Promotion Public Understanding on the Importance and Possibilities of GHG Emissions Reduction	CO_2	Information/ education	Implemented	MEPRD	IE	IE	IE
Latvia National Renewable Action Plan *	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	CO_2	Planning	Planned	Ministry of Economy	NE	NE	20

*Measure is included "with additional measures" projection

4.4 POLICIES AND MEASURES NO LONGER IN PLACE

Most of the policy documents mentioned in the Fifth National Communication report have been renewed for next planning period until year 2020. The main results regarding the policies and measures are the full implementation of the EU's Climate and Energy package (2009).

Table 4.9. Changes in policies reported in Fifth National Communication report

Policy document reported in Fifth National Communication report	Status in 2013
Climate change mitigation policy for 2005 - 2010	Informative Report on implementation of "Climate Change Mitigation Policy 2005-2010" was prepared in 13.01.2012. The policy's goal was achieved by implementing policies and measures which promote reduction of GHG emissions, by participating in Kyoto flexible mechanisms and by providing investment to projects which lead to GHG emissions reduction and support international cooperation related to climate change issues. Since 2009 climate change policy objectives (according to Climate and Energy package) and measures have been integrated into "Environmental Policy Strategy 2009-2015" (approved 31.07.2009) and Latvia National Reforms' Programme to Implement Europe 2020 Strategy (see Chapter 4.2.). In 2014 it is planned to develop a separate climate change policy for the period until 2020.
Climate and Energy Package	Still in action
Guidelines on use of renewable energy sources for 2006 – 2013	Still in action

Table 4.9. Changes in policies reported in Fifth National Communication report	
Policy document reported in Fifth National Communication report	**Status in 2013**
The Latvian National Emissions Allowances Allocation Plan for 2005 – 2007 **The Latvian National Emissions Allowances Allocation Plan for 2008 – 2012**	The Latvian National Emissions Allowances Allocation Plan for 2013 – 2020
Latvian National Development Plan for 2007 – 2013	Latvian National Development Plan for 2014 - 2020
Latvian First Energy Efficiency Action Plan for 2008 – 2010	Second National Energy Efficiency Action Plan of Latvia 2011 – 2013
Production and use of bio fuel in Latvia (2003 – 2010)	Document is not renewed.
Latvian Industry Development Guidelines (2004 – 2013)	At the moment "Guidelines on National Industrial Policy 2014-2020" are prepared

Since Fifth National Communication report several changes have been made in measures to achieve policy goals. In the following table main changes are explained.

Table 4.10. Changes in measures reported in Fifth National Communication report		
	Measures still in place	**Measures no longer in place**
Energy	For following period Latvia has set its goals to focus on improving energy efficiency, therefore support programmes for district heating systems, improvement of energy efficiency in district heating, industrial buildings, public infrastructure and apartment buildings have been renewed for following period. New support programmes for energy audits and promotion of energy efficiency have been implemented.	For following period Latvia has set its goals to focus on improving energy efficiency, therefore support programmes for energy generation in small hydroelectricity plants and support programmes for energy production from wind, biogas or using other renewable energy have been closed, although support for cogeneration plants and energy production form biomass of agriculture and forestry origin has remained.
	Preferential Feed-in Tariffs for Renewables and Combined Heat-Power Production are still in place since 1996.	
	New support programme to promote renewable energy technologies in households has been introduced.	
	Taxation measures on fuel, electricity, CO_2 emissions and noxious air polluting emissions is still in place	
Transport	All the measures in transport sector reported in Fifth National Communication report are still in place – promotion of use of bio fuel and other renewable fuels in transport is made by Biofuel mix obligation requirement, promotion of the renewal of the car fleet is made by applying different tax rates depending on age and engine of the car, labelling new cars and inspecting the old	

Table 4.10. Changes in measures reported in Fifth National Communication report		
	Measures still in place	**Measures no longer in place**
	ones. CO_2 emissions are limited by Excise Tax.	
Industry/Industrial proceses	Measures to limit GHG emissions from industrial processes mentioned in Fifth National Communication report are still in place, but their effects on future emissions have been reassessed. In Sixth National Communication report only effect from implementation of Nitrates Directive was estimated.	Regulations of the Cabinet of Ministers No. 688 "Regulations on Ozone Layer Depleting Substances and Fluoride Greenhouse Effect Gases, which are Refrigerating Mediums" (approved 6.09.2005.) have been replaced by Regulations of the Cabinet of Ministers No. 563 "Regulations on Prohibitions and Restrictions on the Handling on Ozone Layer Depleting Substances and Fluoride Greenhouse Effect Gases" (approved 12.07.2011.)
Agriculture	Measures to limit GHG emissions from agriculture mentioned in Fifth National Communication report are still in place, but their effects on future emissions have been reassessed. In Sixth National Communication report only effect set by National Development Plan of Latvia for 2014-2020 was assessed.	
Waste	Measures to limit GHG emissions from waste mentioned in Fifth National Communication report are still in place, but their effects on future emissions have been reassessed. In Sixth National Communication report only effect reduction of disposal of biodegradables wastes and promotion of recycling of municipal solid waste are taken in account.	
LULUCF	See Chapter 4.3.6.	

As shown in table above most of the measures reported in Fifth National Communication report are still in place although most of them have been reassessed and only measures with significant effect on GHG emissions have been reported in Sixth National Communication report. There are strong relation between policies and measures reported in Chapter 4 and Projections calculated in Chapter 5.

PROJECTIONS

5 PROJECTIONS AND THE TOTAL EFFECTS OF POLICIES AND MEASURES

This chapter shows an indication of future trends in GHG emissions and removals in Latvia, given current national circumstances and implemented and adopted policies and measures described in Chapter 4, and give an indication of the path of emissions and removals without such policies and measures[31].

GHG emissions in Latvia have been projected until 2030, including years 2015, 2020 and 2025. Projection of emissions includes and provides for implementation of policies and measures, which are defined in policy documents developed by the government of Latvia until year 2012. These projections correspond to the "*scenario with existing measures (WEM)"*. In addition to this scenario also emissions with planned additional measures, which have not been approved in government documents and legal regulations, are projected. This is the *„scenario with additional measures (WAM)").* In addition one sensitivity scenario has been estimated for the energy sector to evaluate the impact of rate of energy efficiency measures implementation.

Projections as well as policies and measures in Chapter 4 are divided into the following reporting categories according to the Updated UNFCCC reporting guidelines on annual inventories following incorporation of the provisions of decision 14/CP.11 (UNFCCC 2006): Energy (CRF 1), Industrial processes (CRF 2), Solvent and product use (CRF 3), Agriculture (CRF 4), Land Use, Land Use Change and Forestry (LULUCF) (CRF 5), and Waste (CRF 6).

Latvia is moving towards its Kyoto Protocol obligation to reduce the total GHG emissions by 8% comparing to the fixed base year (1990). This chapter provides information on Latvia's path towards target set in the Kyoto Protocol.

5.1 PROJECTIONS

5.1.1. ENERGY

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. Most of the energy production is in the ETS sector. The increase of the use of renewable energy sources is done in the electricity sector and space heating sector, i.e. wind power and wood chips in CHP plants and heat only boilers. Other renewable energy use is in road transportation fuels and in space heating in households and service sectors with wood logs, pellets. Together this use of all the renewable energy sources is expected to increase the share of use of renewable energy sources in the total final energy consumption to the 34% in the WEM scenario and 40% in the WAM scenario. The biggest difference between the projected scenarios is more extensive use of renewable energy sources using "scenario with additional measures". RES consumption in year 2020 is by 16 PJ higher in "scenario with additional measures" than using "scenario with existing measures".

Total GHG emissions caused by energy production and use will increase by year 2020 using both projected scenarios. Using „scenario with additional measures" the GHG emissions volume in 2020 is by 6.8% lower than it is using "scenario with existing measures". GHG emissions reduction between both scenarios amounts to approximately 622 Gg CO_2 eq in 2020.

[31] Projections of Latvian direct and indirect greenhouse gas emissions and removals until 2020 and 2030 under United Nations Framework Convention on Climate Change and Kyoto Protocol, Institute of Physical Energetic, Riga, 2013

Table 5.1. Actual and projected total GHG emissions using WEM and WAM scenarios in energy sector					
Energy, Gg CO_2 eq	**2010**	**2015**	**2020**	**2025**	**2030**
WEM scenario	8487	8312	9173	9438	9765
WAM scenario	8487	8173	8551	8844	9076

Energy efficiency measures considered in the National Energy Efficiency Action Plan have been taken into account in both of scenarios (WEM and WAM). Energy efficiency measures mainly focus to energy efficiency improvements in buildings (households and public buildings).

Figure 5.1. Structure of consumption of primary resources using WEM and WAM scenarios

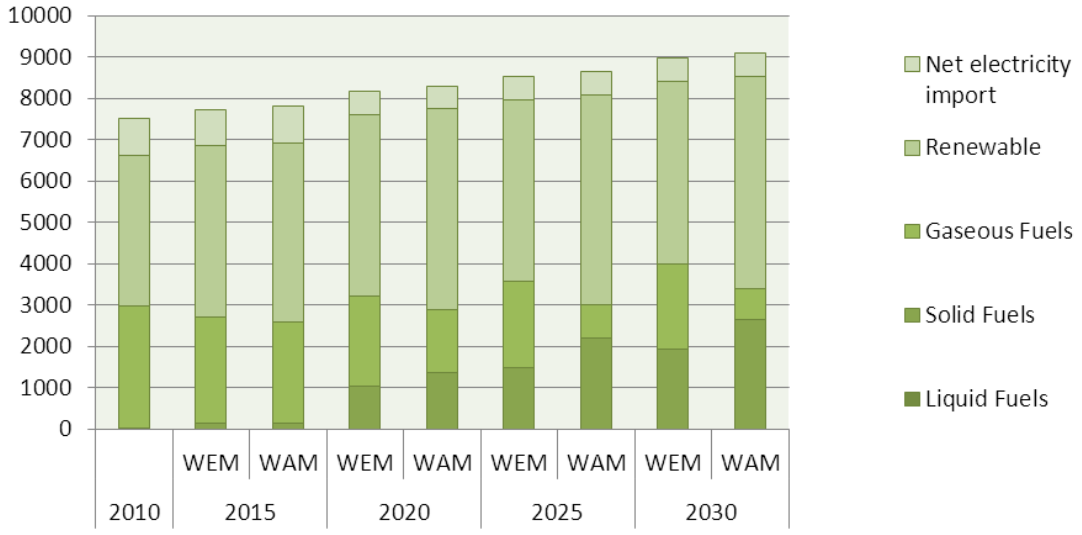


Figure 5.2. Electricity generation structure by fuel type using "scenario with existing measures"

Manufacturing sector. The GHG emissions of manufacturing sector will increase during the period from 2010 to 2020, 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 industry branches. Production increase is projected also in such energy intensive sectors as wood industry, production of cement and lime, production of ceramic products.

Table 5.2. Actual and projected total GHG emissions using WEM and WAM scenarios in energy sector from manufacturing					
Manufacturing, Gg CO_2 eq	**2010**	**2015**	**2020**	**2025**	**2030**
WEM scenario	1087	1430	1828	1903	1945
WAM scenario	1087	1368	1316	1392	1499

Residential and tertiary sector. Taking into account the projected almost stable demand for fuel in households and tertiary sector during the time period from 2010 to 2020, total GHG emissions decrease in this sector, and in 2020 the emissions are by 22% lower than in 2010.

Table 5.3. Actual and projected total GHG emissions using WEM and WAM scenarios in energy sector from residential and tertiary sector					
Households, tertiary, others Gg CO_2 eq	**2010**	**2015**	**2020**	**2025**	**2030**
WEM scenario	1729	1416	1344	1192	1127
WAM scenario	1729	1416	1344	1192	1127

Implementation of energy efficiency measures in compliance to the national energy efficiency plan is the main cause behind decrease of energy consumption in households and services sector.

[*Ex ante*:] It is evaluated that implementation of energy efficiency measures in buildings and other sectors will decrease primary energy consumption by 9% in 2020 in WEM scenario. This means that emission reduction from this measure in the energy sector would be 454 Gg CO_2 in 2020 using WEM and WAM scenarios.

[*Ex ante*:] It is expected to increase the share of use of renewable energy sources in the total final energy consumption to the 40% in the WAM scenario. Results of modelling study show that it will decrease GHG emissions by 519 Gg CO_2 in 2020 using WAM scenario.

Transport sector. Most of the GHG emissions in the transportation sector are caused by road transport, which accounts for 93% of the total emissions in 2020. 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 considerable impact on the emissions project in this sector.

GHG emissions of railway sector accounts for 6.3% of the total emissions in transport sector in 2020. Navigation and local aviation account for a very small share of total emissions. Promoting the use of biofuels and renewing of the vehicle fleet are the main measures to reduce GHG emissions in road transport.

The total projected GHG emissions using "scenario with existing measures" in inland transportation will increase just only by 5.5% comparing to the reference year by 2020.

Table 5.4. Actual and projected total GHG emissions using WEM and WAM scenarios in energy sector from transport sector					
Transport, Gg CO_2 eq	**2010**	**2015**	**2020**	**2025**	**2030**
WEM scenario	3259	3291	3401	3446	3550
WAM scenario	3259	3248	3350	3405	3449

[*Ex ante*:] It is expected that biofuels will account for 10% of all fuels consumed in transport in 2020. Biofuels would, in other words, replace fossil fuels in transport in 2020. This means that emission reduction in the transport sector would be 51 Gg CO_2 in 2020 using WAM scenario.

[*Ex post*:] During the period 2000-2010, the average CO_2 emissions of passenger cars stock decreased by some 7%. The emission reduction effects of renewing of passenger cars stock has been estimated at approximately 41 Gg CO_2 in 2010.

[*Ex ante*:] If the renewal rate of the vehicle fleet speeds up to reach the level considered in the WEM and WAM scenario, the emission reduction effects of new vehicle technologies are estimated to be 205 Gg CO_2 in 2020.

5.1.2. INDUSTRIAL PROCESSES

GHG emissions from use of raw materials in technological equipment and that are not directly related to the combustion of fuel are accounted under industrial processes. The share of process emissions are comparatively low of total GHG emissions, however, from 2009 they have sharp increase in absolute terms. Taking into account industry development possibilities (forecast of Value Added), higher increase of emissions is possible in the future. According to the macroeconomic forecast the manufacturing industry sector mainly will be influenced by the increase of the export volumes. The total projected GHG emissions using "scenario with existing measures" in industrial processes will increase by 56% comparing to the reference year by 2020.

Table 5.5. Actual and projected total GHG emissions using WEM and WAM scenarios in industry/ industrial processes

Industrial processes Gg CO_2 eq	**2010**	**2015**	**2020**	**2025**	**2030**
WEM scenario	651	891	1014	1110	1205
WAM scenario	651	891	1014	1110	1205

Projection of direct GHG emissions in the industrial processes sector have been calculated taking into account projection of the production volume which was linked with forecast of macroeconomic development. Calculations have been performed on the basis of IPCC 1996, IPCC GPG 2000 and EMEP/EEA 2009 guidelines.

GHG emissions in common reporting format of IPCC are presented in the table. Similarly to the historic structure of emissions the cement production accounts for the largest share in the projected emissions following by emissions from the use of F-gases.

The use of F-gases are directly related to welfare and overall development of the country, due to F-gases are mostly used in stationary and mobile freezing equipment, fire extinguishing devices and medicines. Emission projections are estimated with existing measures. As there is no additional measures in this sector, there are used the same projection values as with existing measures.

GHG emissions in industrial processes are projected taking into account that the production processes of enterprises will comply with the requirements defined in the "Law on Pollution". In compliance to 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 emission of GHG. GHG emissions are projected based on production trends in each particular production sub-sectors. It should be noted that in case of building new large production capacities the projected production volumes can change considerably, taking into account the scale of the Latvian economy.

Solvents and other product use. This category includes CO_2, N_2O and NMVOC emissions from solvents and other product use in industrial processes and households. NMVOC are not considered direct GHG but in the atmosphere it will oxidise to CO_2.

Projection of emissions is done by the extrapolation of three year moving average emissions from 2002 to 2011 for each subcategory. A logarithmic fit gives the best approximation. Therefore, all projected CRF 3 categories show an increase in emissions.

5.1.3. AGRICULTURE

National Development Plan of Latvia for 2014–2020 sets target to increase percentage of cultivated land in the total area of agricultural land to 95% in 2020. After sharp decrease of production numbers in the livestock industry in 1992, it is expected that agricultural production levels of dairy farming, pig, poultry and sheep production will be intensified with the aim to improve production efficiency.

The emissions of GHG from agriculture sector include emissions of CH_4 from enteric fermentation, manure management and emissions of N_2O from manure management and agricultural soils. N (nitrogen) emissions from agricultural soils include direct N_2O emissions (application of synthetic N fertilizers, animal manure applied to soils, biological nitrogen fixation of N-fixing crops, crop residues and cultivation of organic soils) and indirect N_2O emissions (atmospherics deposition and nitrogen leaching and run-off).

Projections of GHG emissions from agriculture sector in the "scenario with existing measures" are based on forecast of livestock production, crop harvest, milk yield and synthetic N fertilizer use amounts provided by the Ministry of Agriculture of Latvia. Forecast of cultivated area of histosols is provided by Latvian State Forest Research Institute "Silava".

Table 5.6. Actual and projected total GHG emissions using WEM and WAM scenarios in agriculture sector

Agriculture Gg CO_2 eq	**2010**	**2015**	**2020**	**2025**	**2030**
WEM scenario	2327	2373	3142	3884	4625
WAM scenario	2327	2364	3128	3817	4505

It is projected that there will be a sharp increase of total GHG emissions in agriculture sector during the period 2015-2030. It leads that total GHG emissions will increase by 2% in 2015, 35% in 2020 and close to 100% in 2030 comparing to 2010.

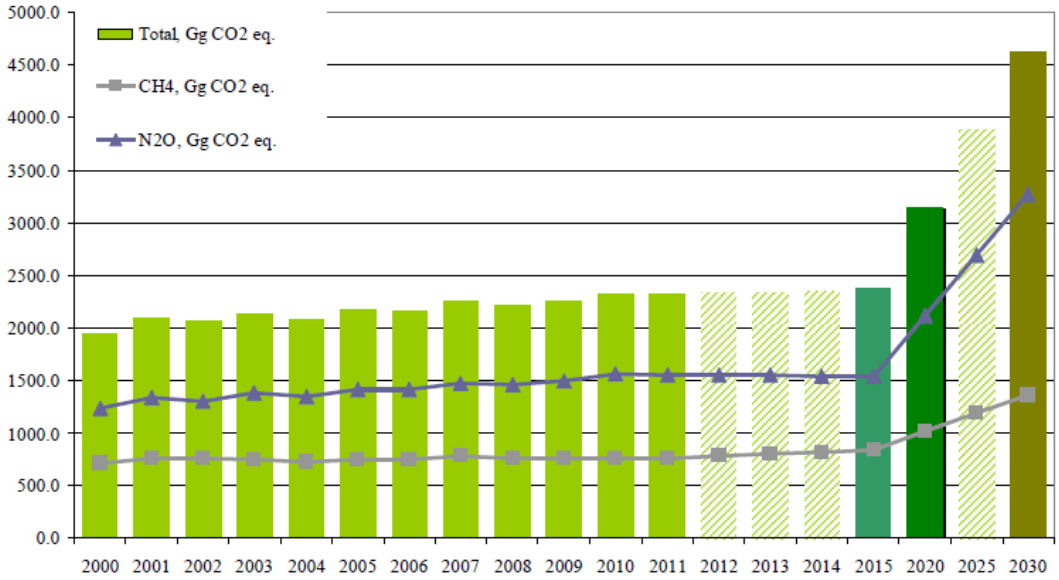


Figure 5.3. Historical and projected GHG emissions in agriculture sector

Considering additional measures for GHG reduction from agriculture sector possibilities to reduce the use of synthetic fertilizers are considered. National Development Plan of Latvia for 2014–2020 sets target to expand area used for organic farming from 9% of total area of agricultural land (2010) to over 15% in 2030.

Development of organic farming promotes minimizing of risks to the quality of the environment also in other emission calculation subsectors. These measures have been taken into account in the "scenario with additional measures". The main outcome of WAM is possibility to reduce direct-indirect emissions till 5%. There also have been planned several additional activities to reduce GHG emissions. The Rural Development Programme 2014-2020 will support GHG reduction measures, such as organic farming, integrated horticultural and conservation of biodiversity in grasslands. Also with optimization of feed rations it is planned to reduce significantly the amount of methane produced per unit of milk or meat.

Projections of CH_4 emissions – enteric fermentation. Important parameter causing high GHG emissions is the livestock population. Population of cattle results in more than 90% of CH_4 emissions by enteric fermentation. It is forecasted that number of dairy cows will increase by 34% and number of non-dairy cattle by 80% in 2030 compared with 2010 and this will lead to increase of CH_4 emissions to 73% in the period 2010-2030. For calculation of CH_4 emissions also average milk yield per cow is relevant indicator. It is expected that average milk yield will reach 8000 kg yr^{-1} in 2030 compared with 4997 kg yr^{-1} in 2010.

Projections of CH_4 emissions – manure management. The main activity data for calculation of CH_4 from manure management is livestock population, mainly cattle and swine. Due to expected increase of cattle number to 60%, number of swine to 77%, number of sheep to 200% and number of poultry to 23% till 2030, also emissions of CH_4 from manure management will redouble.

Projections of N_2O emissions – manure management. The main activity data for calculation of N_2O from manure management is livestock population and animal waste management systems. Expected expansion of anaerobic digester as AWMS is main reason that reduces sharp increase of emissions of N_2O from manure management.

Projections of N_2O emissions – agricultural soils. The main activity data for calculations of projected N_2O emissions from agricultural soils are amount of synthetic N fertilizers, harvest crops and cultivated area of histosols. The use of synthetic N fertilizers is projected as the largest

source of emissions in this category. The calculated amounts of synthetic N fertilizers are linked to planned significant increase of areas for agricultural crops cultivation; however the cultivation of histosols will be reduced. N_2O emissions from animal manure applied to soils are calculated on the basis of manure management emissions calculation output data. The volume of N-fixing crops is estimated at approximately 1% comparing to total numbers of harvested crops. It is forecasted that area for non N-fixing crops cultivation will be expanded from 973 thousand ha (2015) to 1550 thousand ha in 2030.

Indirect N_2O emissions are calculated as emissions from atmospherics deposition, nitrogen leaching and run-off and are strongly linked to total N excretion by livestock and use of synthetic N fertilizers. Indirect emissions shared 27% of total direct-indirect emissions in 2010.

The largest source of GHG emissions on forecast base will be particularly direct N_2O emissions and use of synthetic N fertilizers. Noticeable reason for GHG emissions increasing will be also enteric fermentation. In these two subsectors GHG emissions will increase up to 100% compared to 2010.

5.1.4. WASTE MANAGEMENT

In the waste management sector emissions are calculated from four types of operations:

- Solid waste disposal;
- Solid waste biological processing;
- Waste water handling;
- Waste incineration (without energy recovery) and open incineration.

Practically no waste incineration without energy recovery takes place in Latvia, and therefore the amount of emissions of 2011 is used in the projection. No legislative enactments or planning documents refer to a necessity to build a waste incineration plant with no energy recovery in Latvia. According to the experts' assessment this volume should not increase, as it is not profitable to carry out waste incineration without energy recovery. Emissions from open incineration are not calculated and assessed in case of Latvia. GHG emissions are projected according to two following scenarios: taking into account passed legislation (WEM) and taking into account possible additional measures (WAM).

GHG emissions from waste sector will decrease already in the WEM scenario. The main reason for that is the implementing the Landfill Directive and national legislation and strategies aiming at reducing the amount of waste and minimizing the amount of waste delivered to the landfills.

Table 5.8. Actual and projected total GHG emissions using WEM and WAM scenarios in waste management sector

Waste Gg CO_2 eq	2010	2015	2020	2025	2030
WEM scenario	633	530	471	451	439
WAM scenario	633	503	442	403	358

Solid waste disposal (SWD). Solid waste disposal is the most essential GHG emission source in the waste sector. Within SWD methane is the most important GHG, other GHG emissions (CO_2, N_2O) are not essential and therefore they are not calculated. Using "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 on 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 waste after year 2020 will take place. There are possible new requirements for disposed waste decreasing.

Biological processing of solid waste. Composting corresponds to biological processing of solid waste. In compliance to IPCC guidelines emissions of two gases - CH_4 and 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.

Waste water handling. For the purpose of calculation of methane emissions from the domestic waste water handling sector data on the national population and its distribution depending on the type and level of waste water treatment provided for every particular part of population are taken into account. Data on treatment of domestic waste water are taken from the national report on water use. For the purpose of developing forecasts regarding distribution of waste water treatment trends the national and European policy requirements (Urban waste water treatment Directive, 91/271/EEC) are taken into account.

Data on produced food and production volumes of some other branches (paper, organic chemicals, etc.) are used for calculating methane emissions from the industrial waste water handling sector. Macroeconomic forecasts in relation to the activity data are used for forecasting GHG emissions from this sector.

Data on anaerobic processed sewage sludge from the national statistical report on water use are used for calculation of the methane emissions from sewage sludge handling. Forecasting of emissions takes place using the forecasts of both national population and macroeconomics.

Data on the national population and average protein consumption per person are used for calculating on the nitrogen oxide emissions from human sewage. For the purpose of developing forecasts only the forecasts on the national population are taken into account, because the protein consumption per person has not been properly studied in Latvia and it is difficult to forecast changes of this factor.

The data of the national water use statistics report on the total volume of nitrogen transferred to the surface water by the industry sector are used for calculating nitrogen oxide emissions. The macroeconomic forecast is used for emission forecasts.

In compliance to the planned policy in the area of domestic waste water handling, by year 2015 Latvia has to ensure full implementation of the Urban waste water treatment Directive (91/271/EEC) in all agglomerations causing a load larger than 2000 population equivalents. If this requirement is complied with, it can be expected that the share of well managed biological treatment will increase up to 90% in 2015, reducing the number of people, who do not receive waste water collection and treatment services. However, because of two deadlines of said Directive are already past (31 December 2008 and 31 December 2011), it seems for the moment that Directive most likely won't be fully implemented in the last deadline planned (31 December of 2015) and in terms of this emission forecast full implementation of Urban Waste Water Treatment Directive is seen as additional measure.

Historically, methane emission from domestic waste water handling sector fluctuates around 3000 tons of CH_4 per year with decrease in the 2010-2011 to 2000 tons of CH_4 per year. Methane emission from industrial waste water handling at first decreases significantly in the 90-ies due to collapse of USSR and its impact on economics, then there are rise again in period 1998–2006, and decrease after that most likely because of global economic crisis in 2008 and its consequences later. Methane emission from sewage sludge tends to decrease due to the slow but steady decrease of national population, decrease of economic in the entire period, and implementing of methane recovery technologies. N_2O emissions from both domestic and

industrial waste water decreases due to decrease of national population and decrease of economic activity and implementing of better treatment methods and plants for industrial waste water.

Additional measures available or possible in the waste water handling sector can affect only methane emission from domestic and industrial waste water treatment, since other emissions are calculated directly from activity data and only way to affect its result is only to increase or decrease activity. Since one of such activity data is national population, there are no additional measures possible to affect it.

Full implementation of Urban Waste Water Treatment Directive by the 2015, as well as gradual improvement of waste water treatment is viewed as additional measures within these projections. As result, CH_4 emission could be decreased from ~2 to less than 0.7 thousand tons annually in domestic waste water handling sector, and from 10% to 20% in industrial waste water handling sector.

Generally, projections show increase of the emissions in the period of projection. Additional measures could provide a temporal decrease of emissions below the actual levels of situation as at 2011, however, due to optimistic forecasts of development of economy and slow but increase of national population, further rise of emissions in the perspective seems to be unavoidable.

5.1.5. LAND USE, LAND USE CHANGE AND FORESTRY

LULUCF sector has been always since 1990 a sink of CO_2 removals (Figure 5.4). The peak of CO_2 removals were reached in 2006, mainly due to temporal reduction of harvesting rate after storm in 2005. After 2006 net CO_2 removals in LULUCF sector started to decrease. The main driving forces of emission growth of GHG in LULUCF sector were increasing harvesting rate in ageing forests and increasing emissions due to deforestation for road construction. Deforestation for expansion of cropland nearly stopped in 2011.

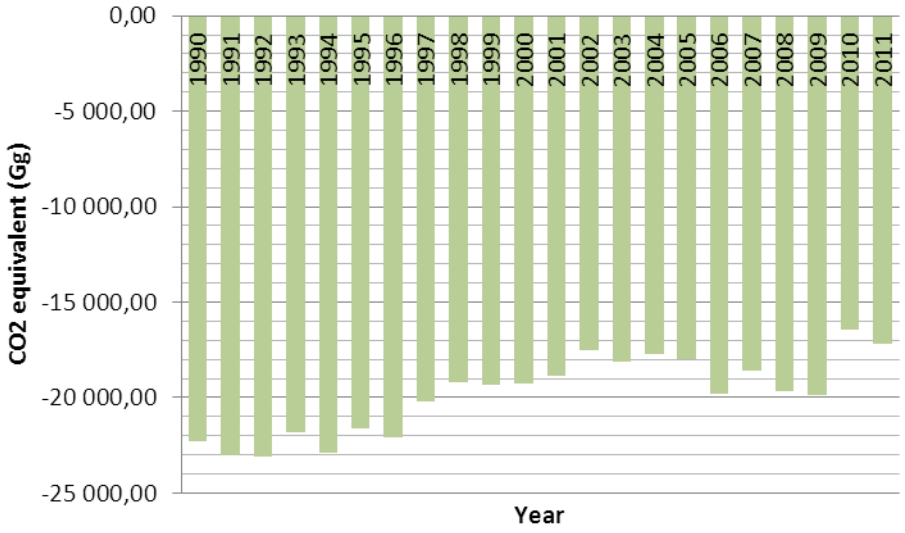


Figure 5.4. Net emissions in LULUCF sector

The main sources of emissions are settlements (deforestation) and cropland (deforestation and organic soils). During recent decade grassland became a significant sink of CO_2 removals in soil due to abandonment of cropland.

After introduction of the Common agricultural policy in Latvia and development of agriculture's subsidiary system area of abandoned cropland started to decrease and restoration of cropland

takes place, which will be the main driving force for increase of GHG emissions from cropland in the next decades. At the same time afforestation of non-valuable farmlands continues, especially in regions located far from industrial centres and having fragmented structure of land.

If forest lands, which is the major source of GHG emissions and contributes to the most of CO_2 removals in LULUCF sector, are evaluated separately, than reduction of net CO_2 removals occur even faster than in the whole LULUCF sector. Already in 2010 the net CO_2 removals in forest lands were less than in 1990. This is major concern about future structure and absolute value of GHG emissions. Rapid increase of average age of forests, especially in deciduous stands with considerably shorter rotation period, will lead to increase of mortality rate and emissions due to decomposition of dead wood. At the same time, insufficient maintenance of drainage systems in forests leads to degradation of forests, resulting, again, in growing emissions from dead wood. Purposeful forest regeneration has been nearly stopped in private forests, making further increase of growing stock by use of better planting material nearly impossible.

In long term prospective the most important measures to secure high rate of CO_2 removals or at least positive balance of the CO_2 removals in forest lands is renovation and expansion of forest drainage systems, purposeful forest regeneration and afforestation of non-valuable farmlands.

The main assumptions. The projections are based on the prognosis of the Ministry of Agriculture of Republic of Latvia, that area of cropland will increase in future and area of artificially maintained grassland will go down. Similarly, area of settlements will continue to grow due to development of road network, particularly, increase of density of coverage of forest roads. No net changes are proposed for wetlands and other lands area. It is also considered that in both scenarios (WEM and WAM) area of forestlands will continue to grow due to afforestation of grassland and spreading of agroforestry systems. The land use structure for WEM scenario is shown in Figure 5.5.

According to the projections forest area, excluding forest infrastructure, without additional measures will increase in 2030 to 53% (by 1% in compare to current situation); cropland will be 28%; grassland – 10%; wetlands, including drainage systems and hydro-power station reservoirs – 7%; settlements – 4%. Area of other lands will not change and will be less than 1%.

Implementation of additional climate change mitigation targeted measures will affect area of grasslands and forest lands. According to different estimations, there are about 300 kha of abandoned grasslands, which can be afforested or used for agro-forestry purposes. The scenario with additional measures considers stepwise afforestation of these grasslands and reduction of the grassland's area to 326 kha in compare with 554 kha in base scenario in 2030.

The projections of GHG emissions and CO_2 removals are calculated for all land use categories – forest land, cropland, grassland, wetlands, settlements and other lands.

All lands are considered being managed, including wetlands and other lands. At least living biomass and dead wood is accounted in all land use categories. Considering that the methodology is developing all the time, the net emissions in all land use categories are slightly or significantly to those reported in the national GHG inventory report, for instance the forest management reference level methodology (UNFCCC 2011) applied to the GHG inventory contains considerable overestimation of emissions due to commercial harvesting. This is corrected in the provided projections and historical data.

Table 5.9. Actual and projected total GHG emissions using WEM and WAM scenarios in LULUCF

LULUCF Gg CO_2 eq	2010	2015	2020	2025	2030
WEM scenario	-16411	-21152	-18333	-15899	-13526
WEM scenario	-16411	-21517	-19025	-16957	-14944

Net emissions of GHG in 2030 will increase using WEM scenario in compare to 1990. The net GHG emissions in 1990 were -22,306 Gg CO_2 eq, but 2030 they will increase to -13,526 Gg CO_2 eq (reduction of the net CO_2 removals 39%). The increase of the net GHG emissions will be determined by reduction of the gross increment in forest land due ageing of forests in Latvia and due to land use change from grassland to cropland, causing considerable soil emissions in future. It must be noted, that the GHG accounting methodology is under development, particularly methods relevant to harvested wood products and wetlands; therefore, uncertainty level of the provided estimations might be relatively high.

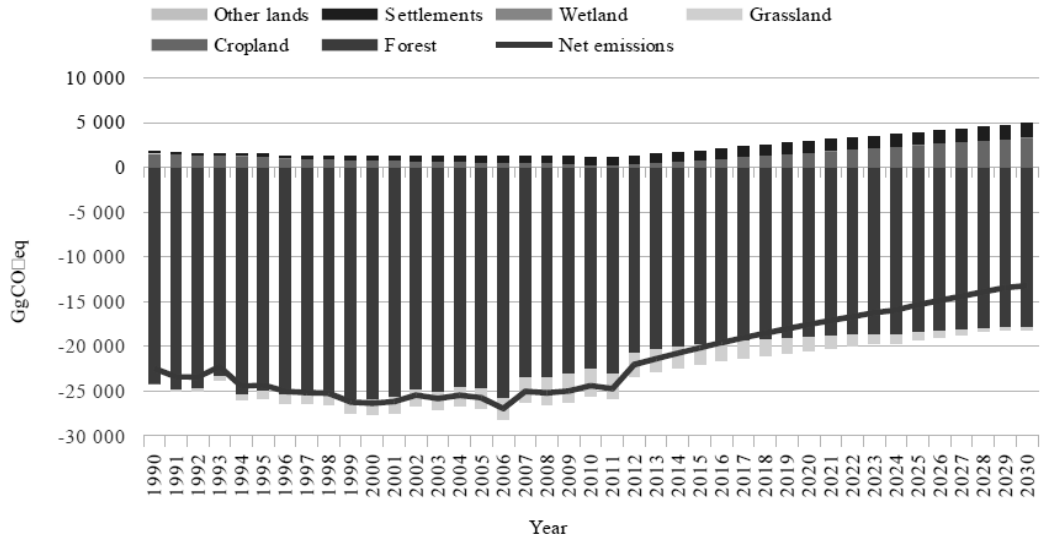


Figure 5.5. GHG emissions and CO_2 removals in LULUCF using WEM scenario

Summary of projected GHG emissions in different land use categories is provided in Table 5.10. The most important source of GHG emissions and CO_2 removals are forest stands. Afforestation is important sink category in long term prospective – it will contribute by the CO_2 removals to 7% of the net CO_2 removals in LULUCF sector.

Table 5.10. Summary of GHG emissions using WEM scenario, Gg CO2 eq				
Year	**2015**	**2020**	**2025**	**2030**
Forest	20842	19776	19047	18241
Cropland	-866	-1708	-2550	-3384
Grassland	2182	1477	759	199
Wetlands	-14	-14	-15	-14
Settlements	-992	-1198	-1342	-1514
Other lands	0	0	0	0
Net emissions	21152	18333	15899	13526

Net emissions of GHG in 2030 will increase using WAM scenario in compare to 1990 similarly to the scenario without additional measures. According calculations in this study the net GHG emissions in 2030 in LULUCF sector will increase to -14,944Gg CO_2 eq (reduction of the net CO_2 removals 33%). The role of afforestation is increasing significantly in WAM scenario – it will contribute by the CO_2 removals to 19% of the net CO_2 removals in LULUCF sector - 2,808 Gg CO_2 or two times more than in WEM scenario.

Reduction of the GHG emissions due to additional measures will reach 1,418 Gg CO_2 annually in 2030. The growth of reduction of emissions will continue after 2030. The reduction of emissions

will take place in forest lands and grasslands; however the major part of reduction will occur in forest lands due to increase of stock of living biomass.

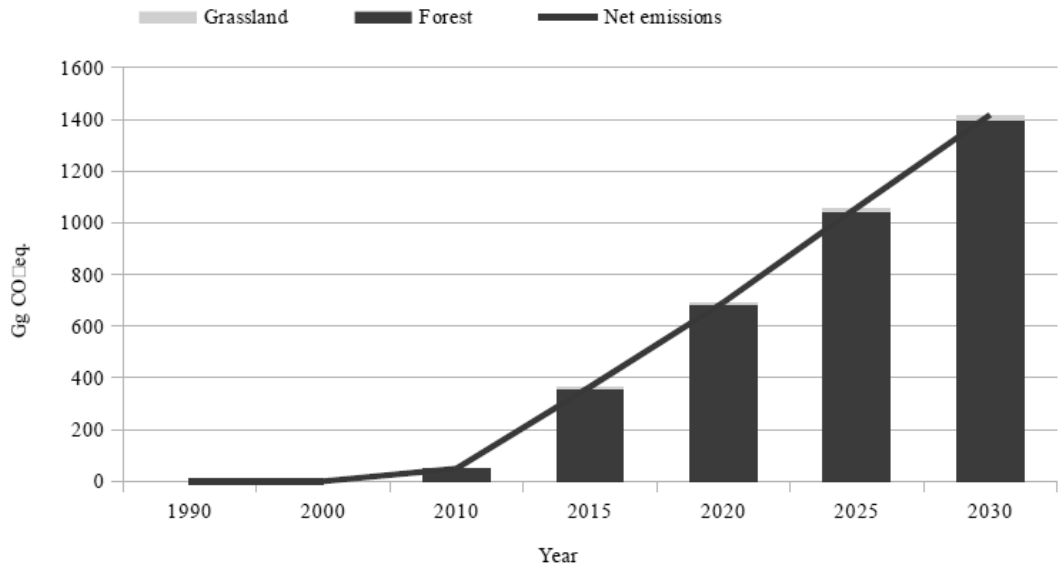


Figure 5.6. Reduction of emissions due to additional measures (WAM scenario comparing to WEM scenario)

Forest land. Emissions from living biomass (commercial harvesting), dead biomass and soil are accounted in this land use category. Removals of CO_2 are accounted in living biomass. HWP are accounted using the forest management reference methodology with corrected equations for emissions due to commercial felling. Net emissions of CO_2 eq. from forest lands, including deforestation and afforestation (activities reported under Kyoto protocol articles 3.3 and 3.4), in 1990 were equal to -23,891 Gg CO_2 eq.; in 2030 they will increase to -16,706 Gg CO_2 eq. If deforestation is not accounted in forest lands, the net emissions in forest lands in 2030 will be -18,241 Gg CO_2 eq. Net emissions in 2030 will increase by 25% in compare to 1990.

Impact of afforestation will increase to 8% of the net emissions in forest land in 2030. Increase of emissions until 2030 can be explained by increase of harvesting rate during the last decade, which is result of maturity of forests (nearly half of growing stock in forests can be legally harvested in final felling until 2020). Other carbon pools except living biomass, has minor impact on the net emissions in forest lands.

Cropland. Emissions from soil, dead biomass and due to land use change are accounted under croplands' category. Removals of CO_2 in living biomass in groups of trees and plantations are also accounted. The net emissions from cropland in 1990 were 1,506 Gg CO_2 eq., in 2030 they will increase to 3,384 Gg CO_2 eq. The assumption about reduction of area of organic soils in farmlands is approved by the forest inventory – only 3% of afforested areas are on organic soils, in spite area of organic soils in farmlands should be 5.18% according to historical soil inventory data. It is assumed that area of organic soils in cropland will not decrease until 2030.

Another source of emissions in cropland is conversion of grassland into cropland. Opposite process dominated until end of the last decade and a lot of former cropland areas were converted to grassland and afforested further, causing considerable removals of CO_2 in soil. During recent years conversion of grassland to cropland starts to dominate, in spite both types of conversion are still common. Conversion of grassland to cropland in future will be the most significant source of emission in croplands.

The reason for deforestation was removal of woody vegetation from abandoned farmlands. It should be noted, that the last wave of abandonment of farmlands in Latvia started before the

independence and huge areas of farmlands were afforested already before 1990. Deforestation to cropland went down during recent years, leaving space for deforestation to settlements and conversion of grassland. Therefore the emissions due to deforestation will be considerably smaller in 2030 in compare to 1990.

Grassland. Emissions from soil, dead biomass, incineration of grass and due to land use change are accounted under grasslands' category. Removals of CO_2 in living biomass in groups of trees are accounted. The net emissions from grassland in 1990 were 152 Gg CO_2 eq., in 2030 they will decrease to -199 Gg CO_2 eq. and grassland will become net sink. The highest rate of CO_2 removals in grassland took place until 2010 due to conversion of cropland into grassland. During end of last century and the first decade many croplands were set aside (converted into grasslands), but nowadays they are cultivated again. It is easy to predict, that grasslands will become again net source of emissions.

Wetlands. Wetlands are net source of emissions. The CO_2 and N_2O emissions due to peat extraction and decomposition of dead wood are accounted under wetlands' category. No reduction of emissions due to drainage of wetlands is considered in the calculation. Sequestration of CO_2 in living biomass on drainage systems, riverside sand other wetlands are accounted as removals. The net emissions from wetlands in 1990 were 13.5 Gg CO_2 eq., in 2030 they will decrease to 14.4 Gg CO_2 eq. It should be noted, that uncertainty level of estimations of the emissions due to peat extraction as well as the carbon stock changes in living and dead biomass has high uncertainty level.

Settlements. Settlements are net source of emissions. The CO_2 emissions due to land use change and decomposition of dead wood is accounted under settlements' category. Sequestration of CO_2 in living biomass is accounted as removals. The net emissions from settlements in 1990 were 98 Gg CO_2 eq., in 2030 they will increase to 1 514 Gg CO_2 eq. According to projections the increase of emissions will take place due to deforestation – development of road infrastructure, especially building of forest roads, following to the State forest company target to reach at least the same density of forest roads as in Finland.

5.2 ASSESSMENT OF AGGREGATE EFFECTS OF POLICIES AND MEASURES

Latvia believes that policies and measures described in Chapter 5.1 are modifying long-term trends in anthropogenic GHG emissions and removals, consistent with the objective of the Convention. Policies driving down the carbon intensity of the Latvian power sector trough the increased use of high-efficiency natural gas power generation technologies and RES are having a long-term impact on GHG emissions that is proved by mitigation effect shown in previous tables.

Total GHG emissions using the “scenario with existing measures” will increase by 14% until 2020 comparing to year 2010. The energy will account for the biggest share amounting to 66.5% of the total projected GHG emissions in year 2020, followed by the agriculture sector with its share amounting to 22.8% and industrial processes with 7% share. The projected emissions change trends differ across different sectors. The highest increase of the total GHG emissions in year 2020 is projected in industrial processes (56%), agriculture sectors (35%) comparing to year 2010. In agriculture and industrial processes sectors it is related to the projected extension of production. In the energy sector projections of emissions show increasing by 9%. It is related to increase of demand for electricity and construction of new power plants for the purpose of reducing the capacity deficit in Latvia, and substitution of electricity import by domestic generated electricity.

Table 5.11. Actual and projected total GHG emissions per sector using "scenario with existing measures", thousand ton CO_2 eq.					
	2010	**2015**	**2020**	**2025**	**2030**
Energy	5 228	5021	5772	5992	6215
Transport (included in energy section)	3 259	3 291	3 401	3 446	3 550
Industry/industrial Processes	651	891	1014	1110	1205
Agriculture	2 327	2373	3142	3884	4625
LULUCF	-16 411	-21 152	-18 333	-15 899	-13 526
Waste management/ waste	633	530	471	451	439
Total with LULUCF	**-4314**	**-9047**	**-4533**	**-1016**	**2508**
Total without LULUCF	**12097**	**12105**	**13800**	**14883**	**16034**

Carbon dioxide accounts for almost 70% of the total GHG emissions in 2010 and it is projected that it will grow and will amount to 13.8% in 2020 comparing to the reference year. There are very small changes in methane emissions during the projected time period until 2020. N2O and HFCs and SF_6 increase by at least 32.6%.

Table 5.12. Actual and projected total GHG emissions per type of gas using "scenario with existing measures", thous.t.CO_2 eq.					
	2010	**2015**	**2020**	**2025**	**2030**
CO_2 emissions including net CO_2 from LULUCF	-8085	-12711	-8984	-6281	-3605
CO_2 emissions excluding net CO_2 from LULUCF	8529	8660	9652	10004	10390
CH_4 emissions including CH_4 from LULUCF	1780	1624	1643	1662	1679
CH_4 emissions without CH_4 from LULUCF	1740	299	290	281	272
N_2O emissions including N_2O from LULUCF	1905	1936	2070	2203	2336
N_2O emissions without N_2O from LULUCF	1743	135	135	136	137
HFCs	72	89	119	151	185
PFCs	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
SF_6	13	16	19	23	27
Total with LULUCF	**-4314**	**-9047**	**-4533**	**-1016**	**2508**
Total without LULUCF	**12097**	**12105**	**13800**	**14883**	**16034**

GHG emission depends, in general, on both the volume of economic activities and carbon intensity of economy. As illustrated by the Figure 5.7 the development of GHG emission in Latvia correlates with GDP development. The existing measures of climate mitigation policy included in the WEM scenario will promote that the GHG emission growth is relatively lower compared to GDP growth. However the full decoupling of GHG emission and GDP growth was not achieved with existing policy measures.

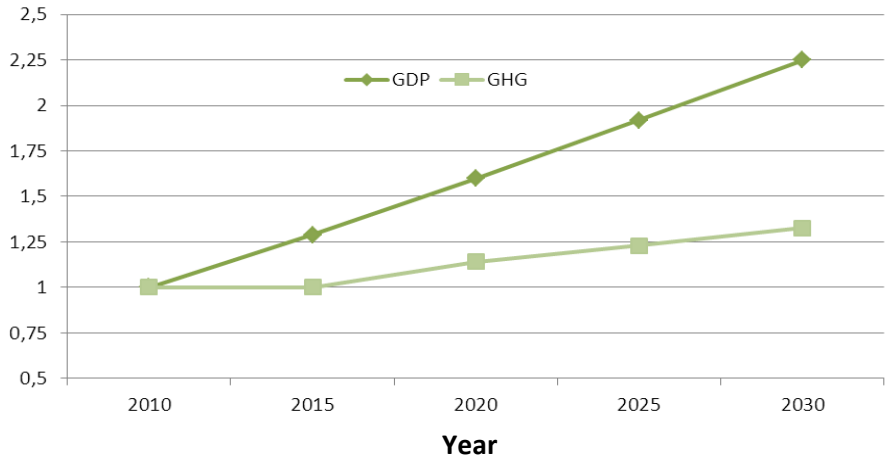


Figure 5.7. Development of GHG emission and GDP, 2010-2030 (2010 = 1).

The amount of projected GHG emissions using "scenario with additional measures" is by 4.8% lower in year 2020 than projected emissions using "scenario with existing measures".

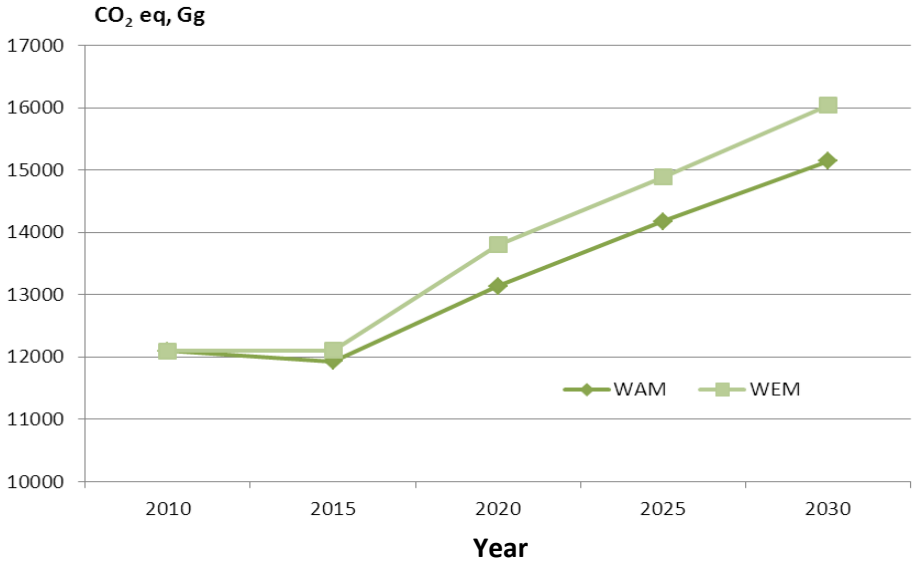


Figure 5.8. Actual and projected total GHG emissions using WEM and WAM scenarios

Table 5.13. Actual and projected total GHG emissions per sector using "scenario with additional measures", thousand ton CO_2 eq.					
	2010	**2015**	**2020**	**2025**	**2030**
Energy	5 228	4925	5201	5439	5627
Transport (included in energy section)	3 259	3248	3350	3405	3449
Industry/industrial Processes	651	891	1014	1110	1205
Agriculture	2 327	2364	3128	3817	4505
LULUCF	-16 411	-21517	-19025	-16957	-14944
Waste	633	503	442	403	358
Total with LULUCF	**-4314**	**-9587**	**-5892**	**-2783**	**201**
Total without LULUCF	**12097**	**11929**	**13134**	**14174**	**15145**

Energy industry, transport and waste management sectors contribute most to reduction of emissions (see Figure 5.9).

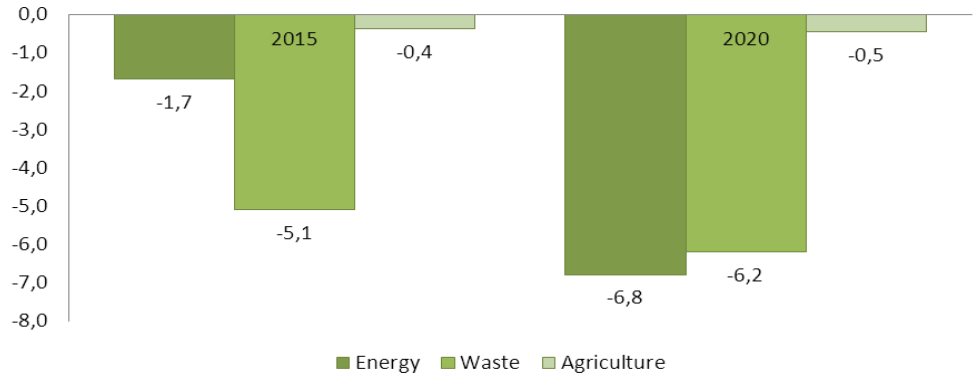


Figure 5.9. Reduction of GHG emissions using "scenario with additional measures" comparing to „scenario with existing measures", per cent points

Latvia's commitment for the sectors outside the EU Emissions Trading Scheme according to the EU's Climate and Energy Package is that emissions have to increase by 17% between 2005 and 2020 (EU ETS scope 2008-2012, excluding aviation). A split of GHG emissions to EU ETS and non-ETS sectors for the projections 2013-2020 have been done based on historical 3-years average shares in each ETS sector.

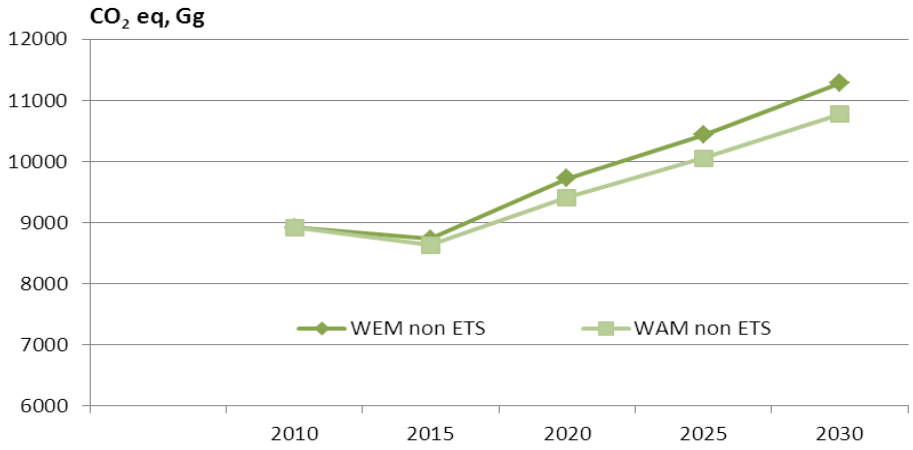


Figure 5.10. Actual and projected total GHG emissions using WEM and WAM scenarios in non-ETS sector

The emissions from the non-trading in WEM scenario are projected to increase until 2020 by 9% comparing to year 2010. The amount of projected GHG emissions using "scenario with additional measures" is by 3% lower in year 2020 than projected emissions using "scenario with existing measures" (see Figure 5.10).

Since Fifth National Communication report Latvia has improved its estimations for GHG inventory as well as calculations for projections. In the following table difference between projections in Fifth and Sixth National Communication reports is shown.

Table 5.14. Changes in projections since Fifth National Communication report

Projections in Fifth National Communication report							
Sector	**2005**	**2010**	**2015****	**2020****	**2025****	**2030****	**2020/ 2005**
Energy	4989*	6136	7401	7804	NE	NE	56%
Transport	3122*	4281	5199	5878	NE	NE	88%
Industry/industrial processes	288*	787	939	1323	NE	NE	359%

Table 5.14. Changes in projections since Fifth National Communication report							
Projections in Fifth National Communication report							
Agriculture	1981*	1961	1939	1926	NE	NE	-3%
LULUCF	-28245	-15242	-19008	-19003	NE	NE	-33%
Waste management	834*	801	768	792	NE	NE	-5%
Total with LULUCF	**-17031**	**-1275**	**-2762**	**-1281**	**NE**	**NE**	**-92%**
Total without LULUCF	**11213**	**13967**	**16246**	**17722**	**NE**	**NE**	**58%**
Projections in Sixth National Communication report using WEM scenario							
Energy	5019*	5228*	5021	5772	5992	6215	15%
Transport	3060*	3259*	3291	3401	3446	3550	11%
Industry/industrial processes	322*	651*	891	1014	1110	1205	215%
Agriculture	2174*	2327*	2373	3142	3884	4625	45%
LULUCF	-17992	-16411	-21152	-18333	-15899	-13526	2%
Waste management	582*	633*	530	471	451	439	-19%
Total with LULUCF	**-6835***	**-4314***	**-9047**	**-4533**	**-1016**	**2508**	**-34%**
Total without LULUCF	**11157***	**12097***	**12105**	**13800**	**14883**	**16034**	**24%**

*Historical data from GHG inventory
**Projected data

Projected emissions for year 2020 have decrease by 34% comparing projections in Fifth and Sixth National Communication reports. In 2009 it was projected that GHG emissions in 2020 will increase by 58% comparing 2005 while in 2013 it is projected that these emissions will increase by 24%. Noticeable changes are reported in all sectors – while in Energy, Transport and Industry/industrial processes and Waste management sectors projected emissions have decreased, in Agriculture and LULUCF sectors GHG emissions are projected to increase until 2020.

According projections reported in previous chapters, Latvia is moving towards its Kyoto Protocol obligation over the period from 2008-2012 for the first commitment period to reduce the total GHG emissions by 8% comparing to the base year (1990).

Using WEM scenario GHG emissions are projected to increase by 24% until 2020 reaching 13,800 Gg CO_2 eq. For the second commitment period until 2020 the target for the EU and its Member States is based on the understanding that it will be fulfilled jointly. Latvia as a Party of the Convention and Kyoto Protocol together with other EU member states has committed to achieve emission reduction of 20% by 2020 comparing to year 1990.

5.3 SENSITIVITY ANALYSIS

In 2011 the fuel and energy consumption for heating constitutes more than 45% of the country's total primary energy. Therefore a sensitivity analysis has been made on how the implementation rate of energy efficiency measures in buildings affect the overall primary energy consumption and emissions in energy sector (including transport) in Latvia. The main factor affected implementation rate of energy efficiency measures is availability of developed support Programs with varied financial Funds and mechanisms.

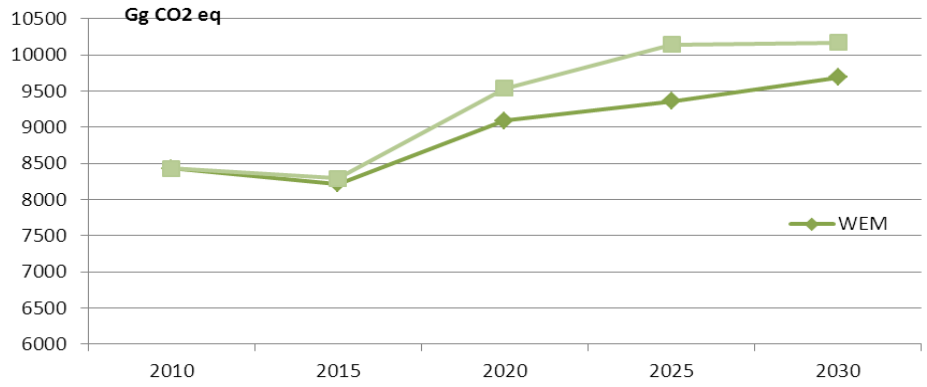


Figure 5.11. Results of sensitivity analyses in energy sector on impact of implementation rate of energy efficiency measures

The sensitivity analyses compares with the existing measures projection (WEM) with scenario (WEM_Altern), where the rate of energy efficiency measures implementation is lower from year 2013 onwards.

Modelling study shows that using the alternative scenario (WEM_Altern) the total GHG emissions in Energy are by 5% higher in year 2020 than using "scenario with existing measures". One of the main parameters with high impact to projections of energy demand and GHG emissions in energy sector is assumption for GDP growth. Therefore, in addition to the sensitive analyses mentioned above it was also evaluated that the higher GDP growth can have considerable impact on the projected GHG emissions volume. Using the alternative scenario (see Figure 5.12 WEM-demand + scenario) the total GHG emissions are 9.8% higher in year 2020 than using "scenario with existing measures".

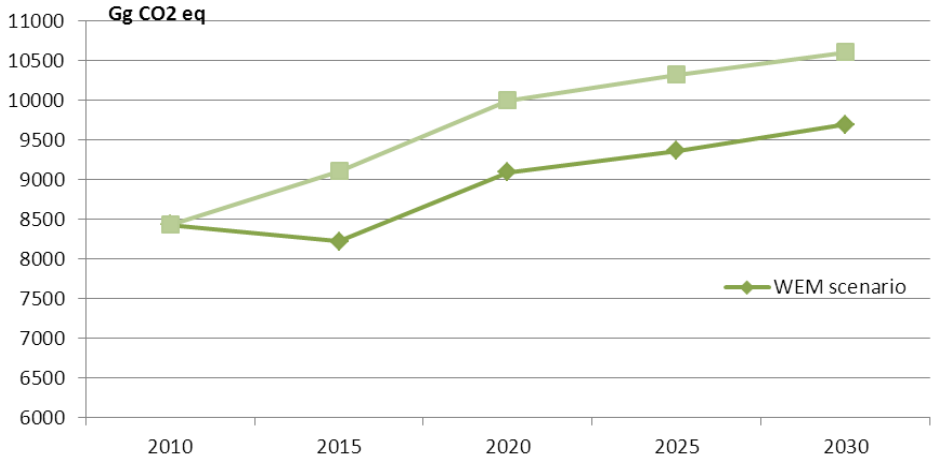


Figure 5.12. Results of sensitivity analyses in energy sector on impact of assumptions for higher GDP growth

In a waste management sector the most important CH_4 emissions come from landfills, so the sensitivity analysis is done for CH_4 emissions from waste disposal. Assuming that the failure to comply with bio-waste disposal restrictions until 2020. Evaluation is done for the assumption that on average the ratio between the deposited wastes and generated wastes by the average period of 2004 – 2011, the ratio is 0.529 to 1.000 disposed non-hazardous wastes. Calculated on the 0.529 ratio is defined quantity of waste deposited. The resulting quantity is used the same as in the WEM scenario.

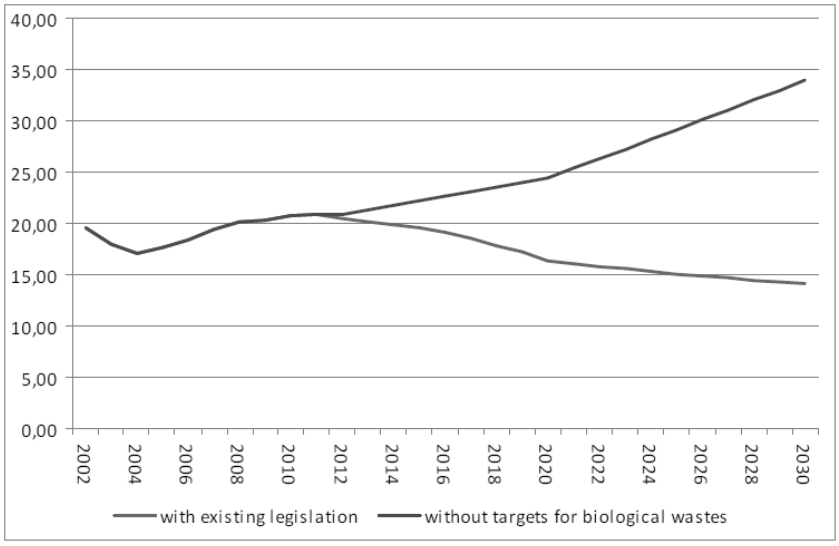


Figure 5.13. Results of sensitivity analyses in waste management sector on impact of assumptions for bio-waste disposal

5.4 SUPPLEMENTARITY

The analyses given in the report confirm that no additional measures or cooperation with other countries are necessary for Latvia to achieve the GHG emission level set in the Kyoto Protocol.

5.5 METHODOLOGY

The GHG emission projection for Latvia until 2030 is based on the long-term macroeconomic projection until 2030 developed by the Ministry of Economics. In compliance to the growth scenario, for the purpose of ensuring the annual average growth at least 4.4% during the period 2013-2020, the production volumes of the manufacturing have to increase by at least 5.5% per year.

Table 5.15. The main macroeconomic indices applied for projecting GHG emissions

	2010	2015	2020	2025	2030
Number of inhabitants, thous.	2161	1993	1950	1940	1945
Annual changes per period, %		-1.6%	-0.4%	-0.1%	0.1%
Private consumption, annual changes per period, %		4.7%	4.3%	3.5%	3.3%
GDP growth, annual changes per period, %		5.1%	4.4%	3.7%	3.2%
agriculture		2.9%	3.8%	2.6%	2.3%
service		3.9%	4.0%	3.9%	3.4%
manufacturing		8.0%	5.5%	3.9%	3.7%

Implemented method for projections. 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 macroeconomic projection until 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.

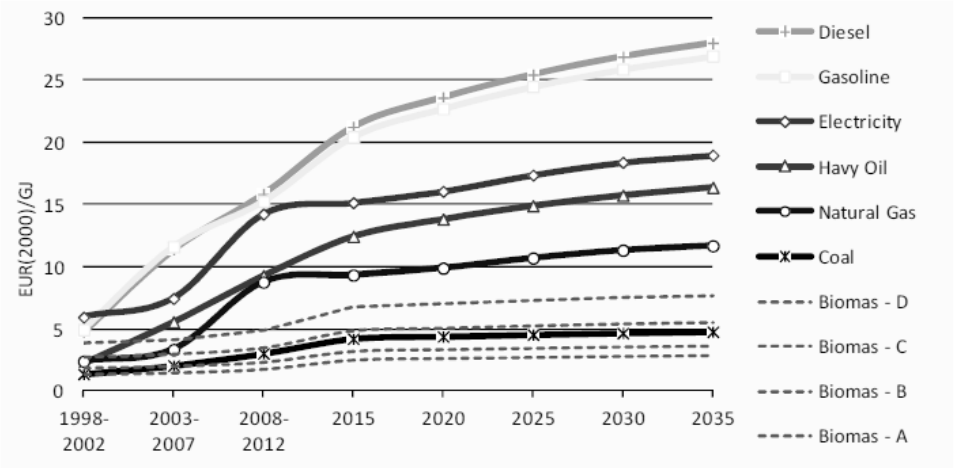


Figure 5.14. Projection of energy prices in MARKAL model

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 2010-2030 prices of energy resources will increase. Price projection of imported energy resources (oil products, natural gas, coal) have been developed based on information from IEA WEO 2011. 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 on 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.

VULNERABILITY ASSESSMENT, CLIMATE CHANGE IMPACTS AND ADAPTATION MEASURES

6 VULNERABILITY ASSESSMENT, CLIMATE CHANGE IMPACTS AND ADAPTATION MEASURES

6.1 OBSERVED PATTERNS OF CLIMATE CHANGE

The changes and variability of air temperature, precipitation and snow cover as well as changes in hydrological regime of rivers and lakes and Baltic Sea costal processes can be considered as important climate change indicators. [32]

Since the beginning of the 20th century records of average air temperature in Latvia have long-term warming trend which has been especially rapid in recent decades (See table 6.1) with marked rising temperatures of winter and spring seasons. However, since the 1980s the relative rapid warming trend is also evident in summer. The summer seasons of 2002 and 2010, and 2011 were three the warmest during last 89 years of meteorological observations in the territory of Latvia (Figure 6.1). The extreme values of air temperature are increasing along with the increase in the mean values, wherewith there has been an increase in the number of days with extremely high temperatures and a decrease in the number of days with extremely low air temperatures. In most of the observation stations in Latvia a significant decreasing trend in the number of frost days and ice days has been observed. In stations located at the coastal territories of the Baltic Sea substantial decreasing tendency in the cold spell duration has been observed. Due to the urban climate influence the cold spell duration has decreased in Riga city. Extreme events associated with high air temperatures show an increasing tendency: in most of the stations there has been a notable increase in very hot nights with minimum air temperature above +20°C, and in half of the stations the number of days with the maximum air temperature above +25°C has increased. The increase in the warm spell duration which is present in all of the stations can be considered as the most alarming and can have a critical negative effect on human morbidity and mortality. The increase of winter air temperature is related to significant fall the consumption of energy necessary for heating buildings in the cold period of the year. Due to the increase in average air temperature in spring seasons, an important increase in the length of the growing season has been observed.

The trend analysis of the precipitation totals discloses temporal and seasonal variability In general the amount of precipitation in Latvia has a tendency to increase in the cold period. The time series of selected precipitation extremes indices also show a well pronounced positive tendency in the cold period of the year, particularly in winter. It is also noted that extreme precipitation is subject to long-term cyclic fluctuations that are more pronounced than the linear changes.

Many of the trends in extreme climatic indicators are much stronger in the capital city Riga, especially in respect to the number of summer days and tropical nights, but also in the case of days with heavy precipitation. This may be due to an increasing urban heat island effect or other specific urban climate effects.

The increase of air temperature caused the decrease of snow and ice season for rivers, lakes and sea. Climate changes have induced and are projected to result in long-term changes in river flows.

[32] LEMGC Report on Climate Change,2013

No significant trend has yet emerged with regard to wind speed. Long time series for mean wind speed show a number of periodic fluctuations as well as slight decreasing tendency. Projections of changes in wind speed shows no significant changes in the average wind speed and inter-annual variability of annual and monthly wind speed for the middle and the end of the 21st century. This means that wind energy will continue to be a stable renewable resource for electricity generation in the region over the 21st century. The several hazardous storms were observed during 19-20th century which caused loss of life and properties as well as damages to forestry, electric lines, and agriculture. The increase of storms frequency is projected for Gulf of Riga Baltic sea coast.

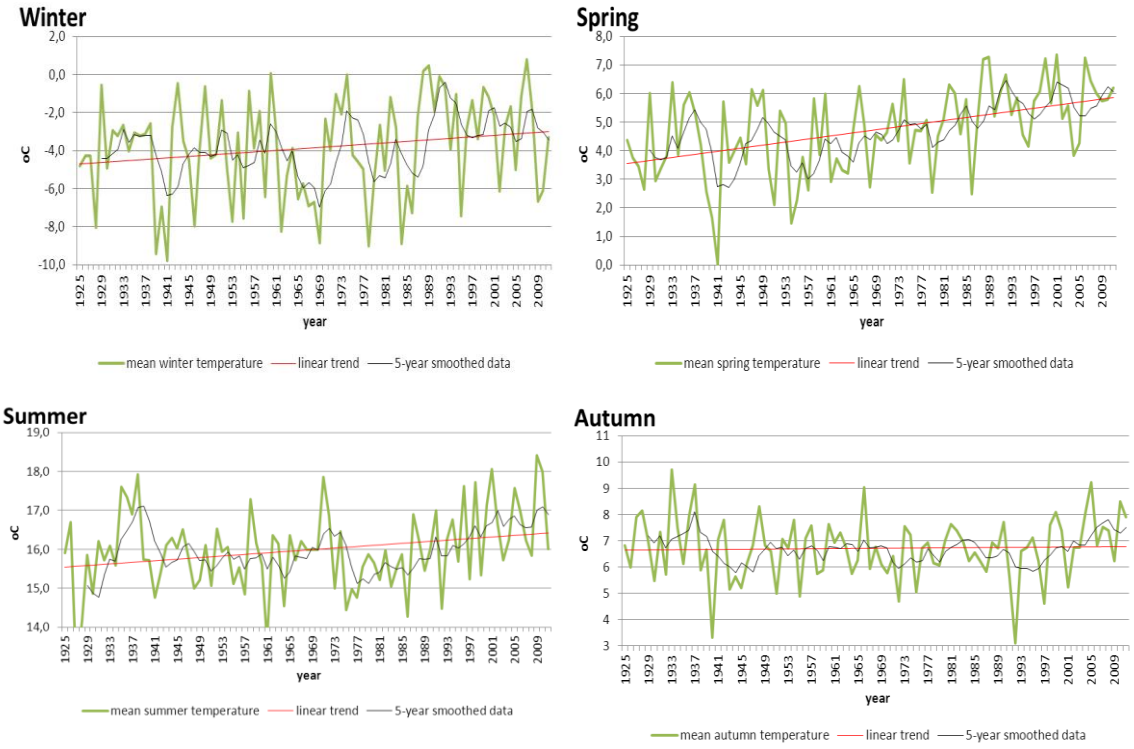


Figure 6.1. Time series for mean seasonal temperature in Latvia, with linear trend and 5-year smoothed data to show the long-term trend and variability

Table 6.1 summarizes the observed and projected changes in the Latvian climate based on the recent research findings.

Table 6.1. Observed and projected climate change		
Variables	**Observed past changes**	**Projected future changes**
Key climate variables		
Mean air temperature	For the period 1924-2012 the annual mean air temperature has increased by +1°C ; mean winter temperature by 1.8°C ; mean spring temperature by 2.2°C; mean summer temperature by 0.9°C; mean autumn temperature by 0.2°C.	Annual mean air temperature is projected to increase between 2.5°C-2.7°C (B2 scenario) and 3.8-4.1°C (A2 scenario) in the period 2071-2100 in relation to 1961-1990. Statistical notable increase in all seasons but the most significant increase is forecasted for winter and autumn.
Precipitation	Statistically significant increase in winter season precipitation by 10-50%. Decreasing pattern for summer and autumn season precipitation.	Statistical significant increase in precipitation during the winter season by 47-69% (A2 scenario) and 28-32% (B2 scenario) in the period 2071-2100 in relation to 1961-1990. Not substantial changes for other seasons.
Snow cover	For the period 1945-2012 the number of days with snow cover has decreased by 5-30 days. A general decrease of snow cover depth.	Due to increase of winter temperature it is expected the reduction in the extent and duration of snow cover. Climate change is projected to decrease twice of ratio of snow/rain ratio.
Wind speed	There is no clear indication on past trends for average wind speed due to a lack of homogenize long-term data.	Projection suggests slight increase (not significant) in average wind speed for Gulf of Riga for the period 2071-2100 in relation to 1961-1990. The increase of storms frequency is projected for Gulf of Riga.
Air temperature extremes		
Maximum and minimum air temperature	Statistically significant increase in the values of mean daily minimum and mean daily maximum temperatures. Decrease of diurnal temperature range associated with grater increase of daily minimum temperatures.	Future increase of mean maximum temperature (4.0-4.7°C A2 scenario and 1.7-2.1°C B2 scenario) and mean minimum temperature (8.0-9.5°C A2 scenario and 5.4-7.3°C B2 scenario). The maximum temperature will increase at a higher rate during autumn, and the minimum temperature will increase at higher rate during winter and autumn.
Summer days	Increase of warm temperature indices: summer days by 1-10 days; warm spell duration index by 8-13 days (1924-2012). More tropical nights in recent years.	The observed changes are projected to continue with future projected climate changes.
Tropical nights		
Warm spell duration		
Frost days	Decrease of cold temperature indices: frost days by 14-39; ice days by 12-22; cold spell duration by 1-10 days (1924-2012).	
Ice days		
Cold spell duration		
Precipitation extremes		
Number of wet days	Increase in winter season, no significant changes or decreasing	The observed changes are projected to continue in the

Table 6.1. Observed and projected climate change		
Variables	**Observed past changes**	**Projected future changes**
	tendency in summer.	future but quantitative projections are rather uncertain.
Heavy and very heavy precipitation days	Increase in winter season, no significant changes in summer.	Increase number of days with heavy (>10 mm) precipitation by 20-100 days.
Drought extremes		
Standardized precipitation index	Increase of dryness in warm seasons for long-time period.	Drought recurrence will be relatively lower, but the drought will be more severe in the 21st century. Increase of 20-day and 30-day drought periods.
Number of consecutive dry days	Increase of number of dry days in warm season.	
Climate impact indices		
Growing season length	Significant increase of length of growing season (by 10-30 days) and growing degree days (by 5-10%) from the beginning of the 20th century.	The growing season length is projected to increase by 30-40 days in the period 2071-2100 in relation to 1961-1990.
Growing degree days		
Phenological seasons	The length of spring, summer an autumn is increasing. Length of spring has changes on average by 6.2 days/decade; summer by 5.4 days/decade; autumn by 4.3 days/ decade. Significant decrease of winter.	Phenological changes are expected to continue with projected future climate changes.
Heating degree days	Heating degree days have decreased by 10% for the period 1851-2010 in Riga city and by 14-18% in the territory of Latvia for the period 1961-2012.	The heating degree days is expected to decrease due to increase of winter temperature.
Hydrological system		
Rivers discharge	Increased river flows during winter by 10% and lower river flows during spring (8%) and autumn (3%).	The mean annual discharge is predicted to decrease by 2–15% according to A2 and by 3–18% according to B2 scenario. In winter, statistically significant increase in the river runoff is predicted: by 34–93% based on A2 scenario and by 17–46% based on B2 , followed by a 26–40% decrease in spring river runoff according to A2 scenario and 13–33% decrease according to B2 scenario.
River floods	Decrease of maximum spring floods.	According to A2 scenario, the maximum discharge will increase by 26–45% in winter and decrease by 28–44% in spring and by 22–39% in autumn.
River flow drought	Decrease of river flow droughts in winter season, no significant changes in other seasons.	According to the forecasts of climate changes in the second half of the year, in most cases the decrease in the river runoff is predicted which can lead to river flow drought events.
Lake and river ice cover	The decrease of duration of lake and rivers ice covers by 5-10 days/decade.	The observed trends are expected to continue.

Table 6.1. Observed and projected climate change		
Variables	**Observed past changes**	**Projected future changes**
Baltic sea coastal areas		
Sea level rise and storm surges	Average sea level rise is estimated about 0.3-0.5mm/year on the coast of the Baltic Sea and 2 mm/year in the southern part of Gulf of Riga . Several large storm surges have caused damage to property during past centuries. Hazardous extreme values of sea level have been more frequent since the middle of the 20th century.	The observed trends are expected to continue. The water level in heavy storm surges could increase from 10 to 20 cm for the next 20-30 years. There are estimations by Riga city's planners that the current 1% probability of flooded urban area of 31.1 km^2 will increase in year 2100 by 28 per cent. The projection was made based on A1B scenario that indicates water level raise by 4.8 mm per year.
Sea ice conditions	Substantial decreasing tendency of the length of the ice season for the period 1949-2012 has been observed for the coastline of the Baltic Sea (by 45 days) and even more significant decreasing trend has been observed for the Gulf of Riga (by 70 days).	The observed trends are expected to continue
Sea water temperature	According to the long-term data (1945-2012), the sea water temperatures have increased by 0.7-0.8^{o}C near the Baltic Sea coast and up to 1.1^{o}C in Gulf of Riga. The increasing tendency is very well pronounced during winter, spring and for southern part of Gulf of Riga also in summer period.	The observed trends are expected to continue.
Coastal erosion	The estimated maximum rate of coastal erosion is 0.5-3.0 m/year.	During the next 50 years the maximum rate of coastal erosion is projected to increase by 30-100% and will be 1.0-6.0 m/year.

6.2 EXPECTED IMPACTS AND VULNERABILITIES OF CLIMATE CHANGE

Climate change has consequences for various areas. Current and projected impacts of climate change will either directly or indirectly affect agriculture, forestry, water resources and fisheries, energy, transport infrastructure, construction and building sector, biodiversity, health, food security, social impacts, economy and private sector. In the table 6.2 is summarized the information on beneficial and adverse vulnerabilities.

Table 6.2. Beneficial and adverse vulnerabilities by sectors.

Vulnerable area	Vulnerability effects
Agriculture	*Adverse* • Yield reduction of traditional crops, fruits and vegetables; • Insect and diseases damage to livestock; • Crop losses in floods; • Storm damages to crops; • Soil erosion impacts on agriculture; • Heat stress effects on agriculture and livestock; • Changes in distribution of cold-adapted crops and species. *Beneficial* • Many perennial crops are used to certain phonological season length; and temperature, therefore will be ill affected; • The area will become suitable for warm-season crops.
Forestry	*Adverse* • Increasing number of forest fires; • Windfalls; • Drying of new forest plantations; • Insect caused damages; • Damage to spruce stands during the hot summer months; • Problematic forest cutting due to unstable soil condition during the cold season.
Water resources and infrastructure	*Adverse* • Damage to hydropower plants (HPP) built on a big rivers as a result of extreme hydrological conditions; • Flood caused problems in a water supply and sewage systems; • Flood caused threat to public and civil engineering infrastructure; • Threat caused by the coastal erosion to the infrastructure objects near the Baltic Sea and / or the Gulf of Riga; • Ice congestion and flood damage to private properties. *Beneficial* • Increase in river flow; • Changes in the seasonality of river flows and hydroelectric power resources; • Decrease of the early spring flooding risk.
Fishery	*Adverse* • Decreasing fish stocks in the Baltic Sea caused by the reduction of oxygen concentration; • Reduction of the of cod stock in the Baltic Sea and the Gulf of Riga caused by the decreasing water salinity; • Ice blasting damage to the fish stocks in inland waters; • Harm caused to fish stocks by the increasing number of invasive species; • Mortality of cold water fish aeries in fish farms and inland waters in summer period.

Table 6.2. Beneficial and adverse vulnerabilities by sectors.	
Vulnerable area	Vulnerability effects
Energy	*Adverse* • Storm caused damages to power supply systems and interruptions in electricity supply; • Increased energy demand for cooling in summer; • More snow-brake and icing periods will lead to damages for electric-power lines and forestry; • River flow drought can lead to reduction of hydropower resources. *Beneficial* • Reduced demand for heating in winter season; • Wind energy resources will continue to be a stable resource for electricity generation in the region; • Changes in the seasonality of river flows and hydroelectric power resources.
Transport infrastructure	*Adverse* • Flood caused damages to the roads and other transport infrastructure; • Traffic disruption caused by the heavy snowfall; • Autumn storm created problems in ports and in shipping; • Negative impact of adverse weather conditions to the air traffic operation; • More snow-brake and icing periods will lead to damages for roads, electric-power lines and forestry.
Construction and building	*Adverse* • Decrease of real estate property value in flood affected area; • Increasing cost of property insurance in flood affected areas; • Storm damage to real estate properties; • Damages caused by extreme precipitation (rain, snow) to the real estate properties; • Increase of the risks posed by precipitation-related hazards (flash floods, landslides).
Biodiversity	*Adverse* • Changes in distribution of cold-adapted species; • Invasion of new species caused by climatic factors(or a significant increase in the incidence); • Changes of species distribution patterns from south to north; • River flow drought can have adverse effect to freshwater ecosystems and water quality; can negatively affect crop productivity, increase risk of forest fires; • Different ecosystems and different species and varieties will be differently affected; • Significant changes in the species composition of the site-specific terrestrial habitats caused by the climatic factors; • Significant changes in the species composition of the site-specific aquatic habitats; • Changes of landscape (including degradation); • Eutrophication; • Changes of coastal habitats caused by the coastal erosion.
Health	*Adverse* • Increase in heat risks associated with heat waves, especially in vulnerable groups; • Increase in heat risks associated with extreme colds during the winter season; • Health problems caused by the pollution of groundwater; • Respiratory diseases caused by the air pollution from forest fires; • Health problems caused by the new invasive species (mainly insects); • Health problems caused by the decreasing quality of bathing waters due to the eutrophication; • Health problems caused by the food safety hazards throughout the food chain; • Stress caused by the floods, storms, draught. *Beneficial* • Decrease of cold-related mortality.

Table 6.2. Beneficial and adverse vulnerabilities by sectors.	
Vulnerable area	Vulnerability effects
Social impacts	*Adverse:* • Latvia will lose 310 ha of its costal territories by the next 15 years. Coastal erosion will cause significant ecological damage, economic loss and other societal problems; • Increasing of social inequality – floods will cause more problems to socially unfavourable households; • Stress caused by the floods, storms, draught.
Economy and private sector (including tourism)	*Adverse:* • Losses to tourism industry due to the worsening of bathing water quality caused by eutrophication; • Losses to tourism industry related with the reduction of winter sport and recreation industries due to mild winters; • Latvia will lose 310 ha of its costal territories by the next 15 years. Coastal erosion will cause significant ecological damage, economic loss and other societal problems; • Increase of storms frequency can lead to storm surges and coastal erosion, increasing risks related to storms. *Beneficial* • Benefits to tourism industry related to the relatively favourable climatic conditions during the tourist season; • Decrease of accumulated snow leads to decrease of peaks of spring floods; • Decreasing of the early spring flooding risk.
Coastal development	*Adverse:* • Latvia will lose 310 ha of its costal territories by the next 15 years. Coastal erosion will cause significant ecological damage, economic loss and other societal problems. • Increase of storms frequency can lead to storm surges and coastal erosion, increasing risks related to storms. *Beneficial* • Benefits to tourism industry related to the relatively favourable climatic conditions during the tourist season.

6.3 ADAPTION MEASURES

Climate change impacts provide both, risks and opportunities. In order to minimize the risks and to benefit from the opportunities caused by the climate change adaptation measures need to be planned and implemented.

To foster development of national adaptation strategy and establish sound scientific basis the Report on Adaptation to Climate Change was made by MEPRD and approved by Cabinet of Ministers on 5 August 2008. This report names risks related to climate change (e.g. more often and powerful storms, floods, drought, human health problems, loss or migration of animals and plants etc.) as well as advantages of climate change (e.g. a longer vegetation period and an increasing volume of precipitation which will allow to achieve higher and a more stable power generation from own hydro power plants). The report serves as basis for the development of Latvia's national adaptation strategy. Since the Fifth National Communication report all involved parties have worked to increase capacity to adapt to the impacts of climate change.

In Latvia, the preparation process of a national adaptation strategy is led and coordinated by the Ministry of Environmental Protection and Regional Development. Inside the ministry, the responsibility lies with the Climate Policy Division of the Climate Policy and Technology Department.

Several research projects and programmes related to the impacts of climate change have contributed to the development of Latvian adaptation policies and will also support the

development of the national adaptation strategy. One of the most important research programmes contributing to adaptation policy development has been the national research programme "KALME" which focused on the impacts of climate on water. Furthermore, research projects related to the impacts of climate change on forests, agriculture or geological coastal processes in Latvia have been carried out, among them the EU funded LIFE-Nature project "Protection and Management of Coastal Habitats in Latvia"

Among international research projects on climate policy, a contribution to the development of adaptation policies has in particular been made by the project "Developing Policies and Adaptation Strategies to Climate Change in the Baltic Sea Region" (ASTRA), implemented from 2005-2007.

In 2009, the international project "Baltic Climate Change: Impacts, Costs and Adaptation in the Baltic Sea Region" (BaltCICA) was launched with Latvian participation. In the frame of BaltCICA, a small regional adaptation strategy in the Salacgriva region has been prepared and was adopted in August 2011. Possible adaptation options have been developed and appraised, and their implementation will be initiated with particular focus to coastal erosion, flooding, water quality and water availability.

The project "Baltadapt" within the Baltic Sea Region Programme 2007-2013 of the EU aims at developing a Baltic Sea Region-wide climate change adaptation strategy.

The project "BalticClimate", as well funded by the Baltic Sea Region Programme 2007-2013 of the European Commission, aims at enabling Baltic Sea region municipalities, regions and local actors to deal with the climate change issue in a cooperative, integrated and sustainable way and to support their development.

In the table 6.3 is summarized the information on various institutional, legal, financial and informative adaptation policy instruments.

Table 6.3. Institutional, legal, financial and informative adaptation policy instruments

Adaptation policy instruments	
Institutional	Ministries and subordinated institutions. • Ministry of Environmental protection and Regional Development; • Ministry of Economy; • Ministry of Agriculture; • Ministry of Finance; • Ministry of Transport; • Latvian Environmental, Geology and Meteorology Centre; • Latvian Institute of Aquatic Ecology; • Nature Protection Board; • State Forestry Service; • Latvian Geospatial Information Agency; • Etc. Scientific research institutes: • Latvian State Forest Research Institute "Silava"; • Latvian State Institute of Agrarian Economics; • Institute of Physical Energetics; • Institute of Biology; • Etc. Universities: • University of Latvia; • Riga Technical University; • University of Agriculture. Entrepreneurs; Municipalities; Non-governmental organizations:

Table 6.3. Institutional, legal, financial and informative adaptation policy instruments	
Adaptation policy instruments	
	• Latvian Society of Ornithology; • Latvian Insurers Association.
Legal instruments	• Policy documents (flood risk assessment and management, agricultural risk management, land policy, rural development, Baltic Sea and the Gulf of Riga coastal management, National security and civil defence system policy, etc.); • Legal acts (EU Directive on flood risk management, Marine Framework Directive, Water Framework Directive, the national legislation on water management, protection zones, protected territories and other government regulations on compensation payments for rural development and fisheries, flood risk reduction, etc.); • Climate change monitoring program, implemented by Latvian Environmental, Geology and Meteorology Centre.
Economic and financial instruments	Latvian government program: Climate Change Financial Instrument (CCFI); EU financial programming period 2007-2013 National Programme activity "Reduction of Environmental Risks" for acquiring the European Regional Development Fund; The EEA Financial Mechanism 2009 to 2014 programme National Climate Policy; Nature resource tax.
Informative	National Reports; Reports of the projects; Monitoring reports; Etc.

FINANCIAL RESOURCES AND TRANSFER OF TECHNOLOGY

7 FINANCIAL RESOURCES AND TRANSFER OF TECHNOLOGY

Latvia is not an Annex II Party therefore the provisions of United Nations Framework Convention on Climate Change Article 4.3, 4.4 and 4.5 are not applicable.

RESEARCH AND SYSTEMATIC OBSERVATION

8 RESEARCH AND SYSTEMATIC OBSERVATION

8.1 GENERAL POLICY ON AND FUNDING OF RESEARCH AND SYSTEMATIC OBSERVATION

In Latvia science and research is coordinated by Ministry of Education and Science. Science and innovation in Latvia are the key resources to achieve the state development aims, therefore the main aims of science and technology development policy are to promote the change of national economic model in Latvia, e.g., promoting the transition from labour-consuming economy towards knowledge economy.[33]

The scientific activities in Latvia are determined by the Law on Scientific Activity and other normative acts and policy planning documents. At the moment one of the prior tasks is to participate in the EU 7th Framework Programme for Research and Technological Development (2009-2013) and preparing for EU Research and Innovation Framework Programme Horizon 2020 (2014-2020) stating the priority in the development of science, technology and innovation and the tasks of the government policy to be achieved.

Drawing up the aims and objectives of national science and technology development policy in Latvia the following principles are being observed:

- Development of science and technology is the determinant factor for sustainable development of economy, to ensure the welfare of society and preserve environment and natural resources;
- Science and research are the basis of national culture, national identity and self-awareness and necessary prerequisite for the development;
- Science, research and innovation in Latvia form an integral, harmonic part of the European Research Area and the science in the world.

Scientific institutions in Latvia can be scientific institutes, higher education establishments, commercial companies and other institutions. There are 136 scientific institutions, inter alia, 12 institutions are state founded. The scientific work is mainly organised in Riga and Riga region but during the last years the gradual development of scientific research capacity is taking place in regions too.

The total funding for research and development in 2011 in Latvia constituted 99.4 million LVL or 0.70% of GDP. 0.18% or 24.7 million LVL were funded by business sector and 0.35% or 50.7 million LVL by foreign sources (including funding from EU structural funds).

According to the aims determined by the European Union level of „EU2020" strategy that should be achieved by 2020, investment in scientific research should constitute 3% of GDP. Despite the strict fiscal policy for the forthcoming years, Latvia has set the quantitative target concerning the investments in science and development; in 2015 1.0% of GDP but in 2020 to achieve 1.5 % of GDP for research and development.

Since 2001 priority fields of science are defined to finance fundamental and applied research in order to purposefully implement the science policy and to use the financial resources effectively. In 2009 five priority fields of science were determined for years 2010-2013; these fields are as follows:

[33] http://izm.izm.gov.lv/science.html

- energy and environment;
- innovative materials and technologies;
- national identity;
- public health;
- sustainable use of local resources— new products and technologies[34].

On the basis of the five priority fields five state research programmes are implemented. National research programmes can be considered a significant and possibly the only medium-term government commission for research since reestablishment of independence of Latvia. They provide integrated solution of complex and current economic problems, involvement of experts from various branches of science and efficient application of material and technical resources of scientific institutions. National research programmes represent government commissioned scientific research in a particular field of economics, education, culture or other field defined as a national priority, with the aim to facilitate development of this specific field.

Currently under development by the Ministry of Education and Science is list of priority scientific fields for the funding of basic and applied researches 2014-2017. It is expected that this plan will increase the share of climate research, including climate change mitigation.

8.2 RESEARCH

Within previous years significant efforts have been made with regard to research related to subjects of climate change. The most significant ones are:

Research and elaboration of modern methods and high developed technologies in the field of energy: environmentally friendly energy, security of energy supply and energy efficiency[35] (2006–2009)

Aim of the programme: to develop methods and solutions that would promote faster progress of Latvian power industry towards the development of sustainable and secure energy supply system, in compliance with the basic standpoints of Latvian energy policy. To constitute grounds for development of new technologies that would promote wide application of renewable energy resources, rational use of energy resources and security of Latvian energy supply.

Main results of the programme: As a result of the programme, methods and models have been created to measure the possibilities for application of renewable energy resources in Latvia, to develop recommendations for assessment of economic and environmental impact and efficient use of energy in various sectors of power consumption, as well as in management of power efficiency measures and adjustment of technologies increasing power efficiency in conditions of Latvia.

Substantiation of deciduous trees cultivation and rational use, new products and technologies (2005–2009)

Aim of the programme: to work out innovative, ecologically and economically justified technological solutions for sustainable use of forest and non-forest land for growing deciduous woods and for development of industries based on use of forestry production.

[34] http://izm.izm.gov.lv/upload_file/en/NATIONAL_RESEARCH_PROGRAMMES_eng.pdf
[35] http://izm.izm.gov.lv/upload_file/en/NATIONAL_RESEARCH_PROGRAMMES_eng.pdf

Main results of the programme:

- Several original elaborations for development of forest industry have been worked out, already patented or submitted for patent, and experimental equipment purchased, which is important for solving research and production problems topical in the world and in Latvia and for developing new themes.
- Supported participation at the European Union Framework programme projects Wood-Net, Forbioplast, Biocore, WoodWisdom-Net, COST campaigns and others.
- Developed proposals for increasing forest value by growing deciduous trees on forest and non-forest lands, comprehensively researched structure and qualities of the wood of quick-growing deciduous trees, development of new technologies have for wood-processing and improving the qualities of wood products. Approbated recycling and deep processing technologies of waste deciduous wood for getting new products.
- New knowledge important for economics of Latvia has been acquired about growing of the soft deciduous wood and about possibilities of using wood in order to get high-quality materials.

Climate change impact on water environment in Latvia (2006–2009)

Aim of the programme: to evaluate the impacts of short-term, mid-term and long-term climate variability on the environmental quality and ecosystems of inland waters and the Baltic Sea, thus creating scientific basis for adaptation to climate change as part of the environmental policy and sector policies in Latvia.

Main results of the programme: Integrated climatic, hydrochemical and biological data, creating understanding of the processes within the environment of inland waters and stimulating cooperation among scientists working in different fields, and development of branches of environmental science and biology.

Methods have been developed for assessment of regional climate models, their comparison and correction of systematic errors, which allows forecasting the anticipated changes in the water ecosystems of Latvia.

By applying created models and methods, river discharge climatic data rows were calculated for areas of confluence basins in Latvia for 30 years; by applying the created models of Riga Gulf, the sea climatic data rows were calculated for 30 years.

Technologies for Innovative Production and Use of Energy Resources and Provision of Low Carbon Emissions by Means of Renewable Energy Resources, Support Measures for the Mitigation of Environmental and Climate Degradation – LATENERGI (2010-2013)[36]

The aim of the programme: To develop methods, models and solutions for development of new, innovative technology in energy sector, which would promote diversification of energy resources, energy system development in accordance with regional accessibility of renewable energy resources and the integration of renewable energy resources in the national energy system. The research results will enable to diversify renewable energy resources in Latvia and increase their capacity, and provide contribution to the mitigation of climate change taking into account biological diversity. The programme aims to find methodological approach for sustainable development of the national energy system based on integrated research of energy supply and demand. The programme will evaluate how energy efficiency measures and energy efficiency technology development make impact on the demand of resources, environmental quality and socio-economic development.

[36] http://www.innovation.lv/fei/national2.html

ILTER is a global 'network of networks' of research sites located in a wide array of ecosystems worldwide that can help understand long term environmental changes across globe. Latvia is a member of International Long Term Ecological Research (ILTER) network and Europe Long Term Ecological Research member network (EUROPE LTER).

National LTER network of Latvia is supported by the Council of Sciences of Latvia. Objectives of studies:

- Effects of climate warming on species diversity of terrestrial and aquatic ecosystems;
- Long term effects of human influence and ecosystem management practice on communities and ecosystems of Latvia;
- Providing data on the state of ecosystems of Latvia for governmental environment protection institutions;
- Support to environmental education at universities, schools and whole society level.

Within last four years number of studies have been carried out in several projects related climate change: "Changes in species diversity on the background of fluctuations of climatic and anthropogenic factors" (2009-2013) and "Development of conceptual integrated model of socioeconomic biodiversity pressures, drivers and impacts for the long-term socioecological research platform of Latvia" (2010-2014)[37].

Since 2005, "Centre of Agrochemical Research" Ltd. have implemented the research project "Soil Mineral Nitrogen Monitoring in Particularly Vulnerable Territories" to provide the forecast to adjust nitrogen doses for winter crops to producers of agricultural products . Since 2010, the soil mineral nitrogen monitoring is performed by the State Plant Protection Service.

From 2008 to 2012, the Latvia University of Agriculture has implemented the scientific research "Identification of Maximum Standards of Fertilizers for Cultivated Plants". The research revealed the maximum permitted standards of fertilizers for various arable crops in different areas.

FUTUREforest INTERREG IVC European project - a partnership of regions sharing ideas on how the forests of Europe could adapt to climate change using innovative natural solutions, contribute towards carbon sequestration and reduce risks caused by climate change such as flooding, drought, fire and soil erosion[38].

From 2009 to 2012 the Latvian State Forest Research Institute "Silava" , the main centre of forest science in Latvia and one of the leading establishments of scientific ideas in forestry and the related research and development in the country, participated in the project FUTUREforest. Within the framework of the project Latvian forestry scientists developed a booklet Forest Management in the Context of Climate Change. In order to increase the knowledge about climate change in Latvia and improve understanding of its possible influence on forest management the project results were presented to the forestry students of Latvia University of Agriculture[39].

8.3 SYSTEMATIC OBSERVATION

Since 2009 the limited liability company "Latvian Environment, Geology and Meteorology Centre" (hereinafter – LEGMC) is responsible for systematic observation in Latvia according Cabinet of Ministers Order No. 448 from 1 July 2009 "On the State agency "Latvian Environment, Geology and Meteorology Agency "and the State Hazardous Waste Management Agency liquidation and the limited liability company" Latvian Environment, Geology and Meteorology Agency" foundation"[40]. In the climate change field LEGMC collects, stores and analyses long-term

[37] http://www.lubi.edu.lv/index2.php?lang=2&sid=115
[38] http://www.futureforest.eu/index.php
[39] http://www.silava.lv/91/view.aspx
[40] http://likumi.lv/doc.php?id=194489

observation results. It prepares reports, providing information to the public and to the state and local governments and international organizations, as well as maintains a greenhouse gas emission trading registry.

Main activities of LEGMC:

- Development of environmental monitoring system in line with national and European policy needs, international recommendations and guidelines;
- Assessment of environmental quality and natural resources;
- Report on environment quality, meteorological, hydrological phenomena, warnings of dangerous and natural disasters, weather and hydrological forecasting;
- Environment laboratory testing;
- Management of environmental data, maintenance of databases on water resources and inland water quality, air emissions, air quality, chemicals, waste management and polluted areas;
- Maintenance of GHG emissions trading national scheme;
- Supervision of subsoil resources and insurance of rational subsoil use;

The Centre represents the Republic of Latvia within the World Meteorological Organization (WMO), performs executive functions in Latvia implementing international conventions related to meteorology, hydrology and environment. LEGMC is a member of EUMETNET and EurogeoSuvey as well as represents Latvia at European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT), European Centre for Medium-Range Weather Forecasts (ECMWF), European Chemicals Agency (ECHA) and acts as the National Focal Point of the European Environment Agency (EEA) within the European environment information and observation network (Eionet).

Environmental monitoring guidelines and program. Environmental monitoring is a tool for environmental policy planning and assessing the effectiveness of the environmental protection measures. It includes the Early Warning System for dangerous change in quality of the environment, which is the basis for emergency actions for the recovery or mitigation. Environmental monitoring program sets parameters, frequency and methods for Latvia's environmental monitoring network organized by environmental authorities.

"Environmental monitoring program 2009-2012" [41] was developed on the basis of "Environmental monitoring guidelines 2009-2012", approved by the Cabinet of Ministers Order No. 187 "On Environmental monitoring program guidelines 2009-2012" in 11 March 2009.

The main task of Environmental monitoring program is to create a structure for monitoring information system, which ensures:

- Requirements of legislative acts of Republic of Latvia;
- Requirements of EU directives;
- Requirements of International conventions Latvia are involved.

Environmental monitoring program consists of Air monitoring program, Water monitoring program, Earth monitoring program and Biodiversity monitoring program.

Each of the programs is divided into sections according the structure required by Environmental Monitoring program guidelines 2009-2012.

Atmospheric and climate observation systems [42]. LEGMC carry out meteorological observations in 35 observation stations, spread over the entire territory of Latvia. The location

[41] http://meteo.lv/lapas/noverojumi/vides-monitoringa-pamatnostadnes-un-programma/vides-monitoringa-pamatnostadnes-un-programma?id=1539&nid=695

of meteorological stations in the territory is optimal to accurately describe the weather conditions and climate variables in Latvia. In 23 weather stations automatic meteorological sensors are used allowing continuous observations of the main meteorological parameters over 24 hours. The observations results of these stations have been entered into the Integrated Meteorological System, which processes the measurements, prepares reports and transmits to a database via the Telecommunication Centre. Observations of the meteorological elements most variable in space – atmospheric precipitation, snow cover and atmospheric phenomena, are carried out at 11 observation stations. Observation data series from meteorological stations are available for more than 50 years. 50% of all observation series cover at least 80 years but several stations have been operating for more than 100 years. The weather station Riga-University operates on an on-going basis since 1795.

LEGMC operates one upper air station, which makes sounding every other day. The observations of upper air in the territory of Latvia have been taking place for 68 years.

Dopler's meteorological radar METEOR 500C was installed in 2005, providing precise and regularly updated information on physical characteristics and processes in the atmosphere including also the higher atmospheric layers. The meteorological radar observation data are stored in the digital database and can be extensively used for climate system research in the future.

Since 2006 Latvia is a member of the European Meteorological Satellite Organization (EUMETSAT), which promotes the use of satellite technologies for atmospheric monitoring above the territory of Latvia. Latvia receives and processes the data from geostationary satellite MGS and polar orbit satellite NOAA.

The long-term metrological observation data from weather stations are widely used for climate change research in Latvia, Baltic countries, Europe and the world. Data from the Latvian meteorological stations are reported through the WMO international data exchange and are sent to the World Data Centres according to standard procedures:

- meteorological observation data from Liepaja weather station – to the World Data Center for Meteorology, Asheville, USA as part of GCOS programme „Implementation of the Global Climate Observation System Surface Network",
- data of global solar radiation from 3 stations – to the World Radiation Data Centre , St. Petersburg, Russian Federation,
- on a regular basis Latvia sends reports „Latvia's report of activities under the implementation plan for the evolution of the surface and space-based sub-systems of the GOS" to WMO EGOS-IP (Implementation Plan for the Evolution of Global Observing Systems).

Real time data are exchanged internationally within the framework of GTS – Global Telecommunication System:

- meteorological observation data from 7 weather stations and upper air observations from Skriveri station – to Regional Basic Synoptic Network (RBSN),
- data from 4 weather stations – to Regional Basic Climatic Network (RBCN),
- meteorological radar real time data – within the international projects NORDRAD, OPERA and BALTRAD.

Latvia sends the information from 18 weather stations to the Climatology Centre Deutscher Wetterdienst, Offenback, Germany under the WMO World Climate Research Programme (WCRP) Global Energy and Water Cycle Experiment (GEWEX) Global Precipitation Climatology Project (GPCP).

[42] LEGMC Information on Systematic Observations, 2013

Latvia participates in the EUMETNET project European Climate Assessment & Dataset. To produce a consistent climate database covering most of the Europe, Latvia has sent the data from 32 observation stations to this international dataset. The data from 6 observation stations are regularly updated.

Latvia has also contributed to the World Weather Records (WWR) tenth series (2001-2010) by sending the data from 7 weather stations to this database, which has been widely employed in operational climate monitoring, international climate assessments, and numerous other applications.

Latvia sends the annual information for the WMO issue "Annual Statement on the Status of the Global Climate" as well as information about annual extreme weather conditions to the Annual Bulletin on the Climate in RA VI (RA VI Bulletin).

Annually LEGMC set up and made freely available report based on long-term data from 4 meteorological stations and from 4 hydrological stations within the national monitoring programme on climate change.

LEGMC provides environmental quality observations in Latvia, including atmospheric air quality monitoring, which are managed in 4 cities - Riga, Ventspils, Liepaja, Rezekne (in 7 observation stations) as well as in rural stations Rucava and Zoseni. 20 air pollutant parameter analyses are carried out at observation stations .

Air quality monitoring data and information are presented according to prescribed format and forwarded to the European Commission, the European Environment Agency and uploaded in EIONET databases store.

Latvia provides assessment of the impact of air quality on ecosystems and monitoring of the impacts of trans-boundary air pollution on ecosystems within the scope of several international programmes:

- EMEP (Cooperative Programme for the Monitoring and Evaluation of Long Range Air Pollutants in Europe) – in monitoring stations Rucava and Zoseni;
- Regional GAW (Global Atmosphere Watch) - atmospheric air quality monitoring in Rucava and Zoseni and precipitation quality in 4 monitoring stations (Aluksne, Dobele, Riga and Zilani);
- ICP Integrated Monitoring - International Cooperative Programme on Integrated Monitoring of Air Pollution Effects on Ecosystems – in 2 monitoring stations (IM Rucava and IM Zoseni);
- ICP Waters (International Cooperative Programme on Assessment and Monitoring Effects of Air Pollution on Rivers and Lakes) in 5 monitoring stations;
- ICP Vegetation (ICP Vegetation - The International Cooperative Programme on Effects of Air Pollution on Natural Vegetation and Crops) – heavy metal content in mosses are observed in 101 monitoring points, environmental fitoindication in 85 monitoring points and ground level ozone impact bioindication in 5 monitoring points.

Monitoring data and information are regularly sent to the WMO, to The World Data Centre for Greenhouse Gases, to the World Data Centre for Aerosols, to the World Data Centre for Precipitation Chemistry, to the Chemical Co-ordinating Centre of EMEP, to the European Environment Agency, to the ICP IM Finland's environmental administration, to the Institutional Programme Centre for ICP Waters.

Oceanographic observations. Baltic Sea observations are performed by the LEGMC. LEGMC provides regular measurements and data on sea water level, water temperature, water salinity, sea ice conditions and waves from 9 coastal observation stations. 4 coastal observation stations have been collecting observation data series for more than 100 years; observations at other

stations cover period of nearly 80 years. Coastal observation monitoring data and information are regularly sent to the international institutions through GTS (Global Telecommunication System) and Regional Basic Synoptic Network (RBSN).

Two coastal observation stations regularly provide data and information exchange within Baltic Operational Oceanographic System (BOOS).

Terrestrial observations. Land Cover monitoring. In accordance with CORINE Land Cover program Latvian Geospatial Information Agency (LGIA) is the responsible institution for land cover monitoring in Latvia. In 2012 LGIA has done the preparatory work for implementation of the land cover monitoring for year 2013.

Modern monitoring of geological processes**.** In 2009 modern monitoring of geological processes was carried out in 100 monitoring places with the funding of the Latvian Environmental Protection Fund Administration. Risk areas on the shores were identified,, coastal erosion places were observed and the extent of erosion risk was evaluated making use of the monitoring data. Modern monitoring of geological processes has not been carried out since 2010 due to reduced public funding.

Seismic monitoring. The main objective of seismic monitoring is to control seismic processes. The monitoring covers possible regional earthquakes and explosions localization and evaluation of their parameters, control of regional seismic regime and collection of statistical information about seismic events. Information on seismic monitoring can be used to identify seismically active regions, to evaluate their parameters and also to evaluate seismic risk at these regions.

In 2006 in Dundaga district at Slitere lighthouse territory broadband seismic station was set up (Slitere seismic observation point). This Slitere station is included in international seismic GEOFON network with its centre at GFZ Potsdam, Germany. Seismic monitoring in Latvia is carried out at two seismic stations – Skuja (SKJA) that is located in Burtnieku district Rencenu area (NE part of Latvia) and Slitere (SLIT) that is located in Dundaga district, Slitere (W part of Latvia).

If requested, seismic information (bulletin) is send to European-Mediterranean Seismological Centre (EMSC) and also to regional partners (Geological Survey of Estonia and Lithuanian Geological Survey). There is a periodical information exchange with regional partners to specify hypocenter localization.

Hydrogeological monitoring. Hydrogeological observations in the territory of Latvia are ensured by State groundwater observation network which provides groundwater level measurements in 287 wells of 58 observation stations and water quality observation in 206 wells of 51 stations and 30 springs. Network covers whole territory of Latvia and provides observations of all active water exchange zone horizons, focusing on the horizons which are mainly used for water supply. The largest density of network is in Riga, Jurmala and Liepaja cities where the largest rate of groundwater extraction is observed and most potential sources of groundwater contamination are identified. 121 wells of 26 observation stations are equipped with automatic level loggers which take measurements every day. In other observation wells the level measurements are taken manually and number of measurements differs from once a month to four times a year depending on aim of the observation station.

The annual report about groundwater condition is reported to European Environment Agency and included in the EIONET database.

Surface water hydrological observations. LEGMC provides surface hidrological observations. Hydrological observations are carried out in 62 stationary observation stations located near rivers and reservoirs of Latvia. Water level, flow, water temperature, ice phenomena and ice thickness are monitored. Modern technical equipment, automatic observation sensors and

mobile communication devices provide the possibility to receive water level and temperature data in real time regime and perform operative information follow-up and correction of possible inaccuracies. Two of the terrestrial hydrological observation stations currently operating have been operating for more than 100 years. More than a half of the stations have covered observations of data series for more than 80 years.

4 terrestrial hydrological stations daily runoff data is sent to Global Runoff Data Center, Germany.

Large part of the long-term meteorological and hydrological data is digitized and together with current systematic observation data are stored in the data base CLIDATA. This database contains data of more than 500 meteorological and hydrological parameters from the beginning of the 19th century. The quality of operative observation data and the homogeneity of historical measurement data series is controlled and analyzed on a regular basis. In 2012 the database CLIDATA has been updated with the new version containing „Clidata Java", which allows completing, analysing, and quality control of large data array as well as distributing the information via Internet.

With the financial support of ERAF during 2011-2012 the project "Unified Environmental Information System" was implemented in Latvia. Within this project the system for distribution of meteorological, hydrological, oceanographic, geological data and information about environment quality were established. This data is now made freely available on the web (www.meteo.lv). This web site includes both real-time data as well as long historical series.

All observation data are kept in LEGMC archives – part in digital, part in a paper form. The latest systematic observation data are stored in observation databases. The quality of the operative observation data and the quality and homogeneity of historical measurement data series is controlled and analyzed on a regular basis. Observation data are available without restrictions to all parties of concern. Online information on air pollution as well as monthly analysis of air quality and meteorological and hydrological observation data are available on the LEGMC's web page. Other observation data, including the historical observations, are available from LEGMC data archives.

Hydro meteorological information and data are regularly exchanged among appropriate services in the neighbouring countries - Lithuania, Belarus and Russia, and for cooperation within the framework in international projects and programs (with WMO, ECMWF, ECOMET, EUMETSAT) is taking place.

Databases. Until July 2013 LEGMC maintained 16 databases and registers of which 10 were publicly available. In the data bases data and information on meteorology, terrestrial and marine hydrology, environmental quality, emissions, natural resources, chemicals is entered, controlled and revised (see table 7.1), including summary tables and thematic maps on human-induced environmental load.

Table 8.1. LEGMC databases

Data bases	Information stored
On state of environment and natural resources	Mineral Deposit Register Register of polluted and potentially polluted sites Database of environmental damage
On environmental load	Europe Union greenhouse gas Emission trading registry system Annual Governmental statistical report "2-Air" Annual Governmental statistical report "3 – Waste" Annual Governmental statistical report "2 – Water" *EUROPEAN POLLUTANT RELEASE AND TRANSFER REGISTER (E-PRTR)* Hazardous waste transport registration system Register of chemical substances and products

Table 8.1. LEGMC databases	
Data bases	**Information stored**
Observation data	Surface water quality monitoring database Air pollution observation data collection and information processing system Surface water quality monitoring, biological data information system Laboratory Test Result Processing System Climatological database (CLIDATA) Hydrometric data processing system (HYMER)

Summarizing and processing the collected information held in databases, various public reports are developed: “National Report on the State of Environment”, “Report on Environmental and Surface Water Quality in Latvia”; “Air quality annual report” as well as reports to the European Commission and international organizations.

EDUCATION, TRAINING AND PUBLIC AWARENESS

9 EDUCATION, TRAINING AND PUBLIC AWARENESS

9.1 GENERAL POLICY TOWARD EDUCATION, TRAINING AND PUBLIC AWARENESS

The **National Development Plan 2014–2020** (NDP2020) is hierarchically the highest national-level medium-term planning document. NDP2020 is closely related to the Sustainable Development Strategy of Latvia until 2030 and the National Reform Programme for the Implementation of the EU2020 Strategy.

The Government-approved guiding principle of an "economic breakthrough" and the three priorities – "Growth of the National Economy", "Human Securitability" (a form of resilience) and "Growth for Regions"– form a mutually effective and unified system that fits a sustainable planning approach as well as the structure defined in Latvia2030 and the NRP.

The NDP2020 defines following targets of strategic objective "Advanced Research and Innovation and Higher Education":

- Increase investment in research and development to 1.5% of the gross domestic product in 2020, with targeted efforts to attract human resources, develop innovative ideas, improve the research infrastructure, facilitate cooperation between higher education, science and the private sector, as well as the transfer of research and innovation to business;
- Through the commercialisation of knowledge, promote the creation of innovative and internationally competitive products with high added value as well as their introduction into production, increasing the share of output of such products in the national economy.

The main policy document is **Environmental Policy Strategy 2009-2015**. The overall objective of the environmental policy is to provide the public with the opportunity to live in a clean and well-arranged environment through sustainable development, preservation of environmental quality and biological diversity, sustainable use of natural resources, as well as participation of the public in the decision-making and its awareness of the environmental situation. One of the principles applied by the Environmental Policy Strategy is principle of public awareness and participation – institutions shall promote the public awareness and education, listen to the public opinion and assess it.

The Environmental Policy Strategy foresees that in order to increase the scientific knowledge base on the aspects of mitigation of climate change and adaptation to it the state-funded studies on climate change have to be organized and in order to rise the public awareness of importance of the natural assets and climate change public awareness and education activities have to be carried out.

The **Environmental Protection Law** (2006) lays down the main environmental principles:

- the "polluter pays" principle – a person covers all costs, which are related to the assessment, prevention, and limitation of pollution or liquidation of the consequences thereof caused due to his or her activities;
- the precautionary principle – it is admissible to limit or prohibit an activity or measure, which may affect the environment or human health, but the impact of which is not sufficiently assessed or scientifically proved, if prohibition is a proportionate means in order to ensure the protection of the environment or human health. The principle shall not be applicable to immediate measures that are performed in order to prevent threats of damage or irreversible damage;

- the prevention principle – a person prevents the emerging of the pollution and other adverse effects damaging to the environment or human health as much as possible, but, if it is not possible, prevents the spread and the negative consequences thereof;
- the assessment principle – the effect of any such activity or measure, which may substantially affect the environment or human health, shall be assessed prior to permission or commencement of this activity or measure. An activity or measure, which may have adverse effects on the environment or human health even if all requirements of environmental protection are observed, shall be allowed only in such case, if the intended positive result for the public as a whole exceeds the damage caused by the relevant activity or measure to the environment and the public.

In order to promote cooperation between institutions related to environmental science and educational development and to facilitate the implementation of the environmental policy, in May 2004, by an order of the Minister of Environment, the **Latvian Council of Environmental Science and Education** - a coordinating and consultative intersectoral institution - was established whose decisions are of recommendatory nature in the field of environmental science and educational development. The aim of the Council is to promote cooperation between institutions related to environmental science and educational development in order to identify and effectively address problems in the field environmental science and educational development. The Latvian Council of Environmental Science and Education until 2011 organised the competition "Environment Science Award".

Substantial financial support in the development of education, training and public environmental awareness is provided each year by the **Latvian Environmental Protection Fund** and its Administration. The Administration of the Latvian Environmental Protection Fund is a direct administration authority subordinated to the MEPRD whose functions and tasks are laid down in the Latvian Environmental Protection Fund Law. The aim of the Fund is to promote the development of sustainable national economy by integrating the environmental protection requirements in all sectors of national economy in order to ensure the right of the people to live in qualitative environment in accordance with environmental policy guidelines, as well as sufficient measures for the preservation of biological diversity and protection of ecosystems.

9.2 PRIMARY, SECONDARY AND HIGHER EDUCATION

The Ministry of Science and education is the leading state administration institution in the field of education and science. The Ministry prepares educational policy, coordinates its implementation and is responsible for educational matters at all educational levels. Education is organised mainly within the public sector and there are only a few private schools. [43]

The general educational system is divided into four levels. Pre-school is the first educational level and is intended for children from age of 2 until the age of 7. Basic education can be acquired in primary schools (grades 1–6), basic schools (grades 1–9) and upper secondary schools (grades 10–12). Environmental studies at school are part of many subjects, i.e. nature science, geography, biology, chemistry and physics. There are about 700 general education institutions in Latvia. The number of institutions decreases every year – in 2009/2010 there were 711 institutions and in 2012/2013 - 648 institutions.

Climate change education in primary and secondary schools is possible through public awareness campaigns and projects organised by different organisations.

At a primary and secondary school level the "Environmental Education Fund" under the programme "Eco-schools" of the International organisation Foundation for Environmental

[43] http://izm.izm.gov.lv/58.html

Education works. The Eco-Schools aims to raise students' awareness of sustainable development issues through classroom study as well as school and community action. Successful Eco-Schools are awarded the Green Flag, an internationally acknowledged symbol for environmental excellence. In 2013 91 schools received the international Green Flag in Latvia. ISO the Eco-Schools programme is based on ISO14001:2004 that requires an environmental management system to enable an organization to develop and implement a policy and objectives which take into account legal and other requirements to which the organization subscribes, and information about significant environmental aspects.

26 schools in Latvia have participated in the Baltic Sea Project within the framework programme *Baltic 21E*. It is the first regional project within UNESCO Associated Schools Project to combine environmental education on a specific environmental issue, the Baltic Sea and intercultural learning. The objectives of the project are to increase students' awareness of the environmental problems of the Baltic Sea area and to give them an understanding of the scientific, social and cultural aspects of the interdependence between man and nature, to develop the ability of the students to study changes in the environment, and to encourage students to participate in developing a sustainable future.

There are three levels of higher education programmes in Latvia – Bachelor, Master and Doctor. There are 37 public institutions of higher education and 21 higher education institutions established by legal bodies. The higher education in Latvia can be received in 6 Universities, 26 State Institutions of higher education and 26 Colleges. Universities and colleges implement academic and professional higher education programmes as well as scientific activities, research and artistic creativeness.

Environmental science is an independent and generally accepted science: it solves environmental problems, offers environmental friendly management tools, develops cleaner technologies in accordance to the existing legislative situation and even stimulates the creation of new regulations towards environmental protection.

According to the classification of the Latvian educational system, environmental science is included in the thematic group of natural science and mathematics. Environmental science is run as an interdisciplinary theme and is integrated within the content of various courses as biology, geography, chemistry, physics and natural science. New disciplines' standard projects prognosticate that environmental science and sustainable development issues are included in each course taking into account the specific features of those courses, thereby ensuring and aligning succession between different educational levels.

The University of Latvia, Faculty of Geography and Earth Sciences, provides academic studies in geography, geology and environmental sciences. The faculty offers higher academic education at three level studies: bachelor's, master's and doctoral study programmes, as well as professional training in teacher's study programme of geography and natural sciences, and also professional higher education master's study programme of spatial development planning. The academic personnel of the faculty in collaboration with scientists from many countries of the world ensure also development of scientific research in geography, geology and environmental sciences in Latvia.

In Riga Technical University knowledge on climate technologies can be obtained at the Faculty of Power and Electrical Engineering, the study programmes "Power and Electrical Engineering" and "Environmental Science", but research is dealt with by the Institute of Energy and the Institute of Energy Systems and Environment. The basic aim and task of the study programme "Environmental Sciences" is to familiarise students with the environmental protection and climate change problems by drawing attention to their causes and possibilities of problem solutions. The sub-area of environmental engineering sciences include other areas - agricultural

engineering science, biology, chemical technology, construction, mechanics, energy, ecology, geology, etc.

In the Latvia University of Agriculture in relation to climate change the most of attention to the teaching and research process is paid in the Faculty of Forest (the study programmes "Forestry Research", "Woodworking", "Woodworking Technologies", "Forest Ecology and Forestry", "Forestry Operations and Technology", "Forestry Economics and Politics", "Wood Materials and technologies", etc.); the Faculty of Rural Engineering (the study programmes "Landscape Gardening and Architecture", "Land Survey", "Environmental Science", "Environment and Water Management", "Hydroengineering", "Construction Science", "Environmental Engineering", etc.), and the Faculty of Agriculture. The Latvia University of Agriculture has established the obligatory undergraduate study course "Ecology and Environmental Protection".

According to the Central Bureau of Statistics in a higher education institutions and colleagues in the programme "nature science, mathematics and information technology" in school year 2012/13 studies has started 6404 students, or 6.7% of a total number of students, which is by 200 students more than in school year 2009/10 (see table 9.1).

Table 9.1. Students in programme nature science, mathematics and information technology

Year	2000/01	2005/06	2009/10	2010/11	2011/12	2012/13
Nature science, mathematics and information technology students	6592	6792	6213	6298	6378	6404
Students TOTAL	101270	131125	112567	103856	97041	94474
%	6.5	5.2	5.5	6.1	6.6	6.7

9.3 PUBLIC INFORMATION CAMPAIGNS

The particular targeted CCFI programme **Promotion Understanding on the Importance and Possibilities of GHG Emissions Reduction** is implemented. The support is 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 ex-ante contracted costs by CCFI for the programme is ~832 thousand EUR. In the framework of the Programme 22 information/education/training projects are implemented.

In 2012 the "Communication Initiative of the Year Award", launched in 2006 by the Green Spider Network, was awarded to an innovative and creative Latvian campaign that regularly organises open air concerts in a natural environment "Nature Concert hall". This award is granted to the best examples of environmental communication campaigns.[44]

The Nature Concert hall is a method for public awareness raising which has been tested and practiced in various places in Latvia since 2006 and shows that it is possible, through a specially targeted, interactive and multi-disciplinary approach to attract many thousands of people from different backgrounds, to change perception on the importance of sustainable development and to motive to introduce change. The Nature Concert hall facilitates interest of public in sustainable approach to economic development and its effects on nature, which, in the long-term, provides support to the decision-makers in implementation of environmental measures. The Nature Concert hall combines several disciplines to raise the public's awareness on the

[44] http://ec.europa.eu/environment/networks/doc/newsflash/Newsflash_94.pdf

importance of different species in our environment and our responsibility to take care to maintain biodiversity it brings together science, music, poetry and visual images.

Various other campaigns and activities related to climate change are carried out in Latvia:

- **European Mobility Week** is celebrated yearly to raise public awareness of the need to take action against the air pollution and climate change caused by the increase in the number of cars in the urban environment.
- The **Car-free Day** every year on 22nd of September during which the citizens of Riga city are asked to not use a private cars and use public transport or bicycles.
- The **Earth Hour** is organized every year on 23rd of March at 20:30 o'clock local time when all people are asked to switch lights off for an hour.
- In 2012 and 2013 a **campaign "My Sea"** was organized by the "Foundation for Environmental Education" within the framework of the project "Baltic Marine Litter - MARLIN project". These are expeditions along the Baltic Sea coastline which aims to promote unique natural values of the Latvia's coast and to draw attention to the waste problems.

9.4 PROJECTS AND TRAINING PROGRAMMES

Several international projects related to climate change adaptation are already accomplished or still on-going.

The national research programme implemented during 2006-2009 **"KALME"** focused on the impacts of climate on water. Furthermore, national research projects related to the impacts of climate change on forests, agriculture or geological coastal processes in Latvia have been carried out.

International research project on climate policy, the project "Developing Policies and Adaptation Strategies to Climate Change in the Baltic Sea Region" (**ASTRA**), implemented from 2005-2007, has particularly contributed to the development of adaptation policies.

The BaltCICA Project ("Baltic Climate Change: Impacts, Costs and Adaptation in the Baltic Sea Region") formed part of the Baltic Sea Region Programme 2007-2013. It was partly financed by the EU (European Regional Development Fund and European Neighbourhood and Partnership Instrument). The project duration was from February 2009 to January 2012. The BaltCICA project has identified and implemented climate change adaptation measures in various case studies in the Baltic Sea Region. The 13 BaltCICA case studies focused on specific thematic areas. Activities in Latvia focused on the environment and a scenario development and citizen participation.

The municipality of the city Salacgriva has adopted the Declaration on Green municipality and has also prepared its own Climate Change Adaptation Strategy under „BaltCICA" project.

The program **"Baltic Climat: Baltic Challenges and Chances for local and regional development generated by Climate Change"** (2009-2011). It provides the Toolkit that supports the development of municipalities, regions and companies, and assists to increase their competitiveness in times of climate change. Policy makers, spatial planners and business people get enabled to deal with mitigation of and adaptation to climate change in a cooperative, integrated and sustainable way.

The project **"BaltClim"** (2011-2013) is supporting national adaptation strategies to climate change in the Baltic States. The Project activities include organizing meetings for information and experience exchange among the Ministries of Environment of the Baltic States, experts from Germany and Finland, preparation of an overview on climate change adaptation activities in the

Baltic countries, to identify barriers and possible actions in the preparation of national adaptation strategies and roadmaps and to support ministries in preparation of the national climate change adaptation strategy for Estonia, Latvia and Lithuania.

The project "**BaltAdapt**" (Adaptation to climate change in the Baltic Sea region). Within the framework of the project ***BaltAdapt*** is developed a Baltic Sea Region-wide climate change adaptation strategy with focus on the sea itself and its coastline and an accompanying action plan.

Since 2013 Latvia is participating in Norwegian Financial instrument programme **"National Climate Policy"** and is developing a national adaptation strategy.

The municipality of the capital Riga has commenced active work on evaluation of risks and opportunities related to climate change, including economic assessments. From 2009 to 2013 the City Development Department of Riga City Council implemented the project „**Integrated Strategy for Riga City to Adapt to the Hydrological Processes Intensified by Climate Change Phenomena**". The project was co-funded by the LIFE+ programme. The key goal of the project was to identify on a timely basis, the hydrologic factors that could adversely affect Riga's residents and economy, as well as to find ways to protect nature and cultural heritage from future climate change impacts, aiming to prevent or to reduce these effects.

Project Blended capacity-building on sustainable energy measures and action plans for European municipalities (**BEAM 21**) 01/09/2009 - 31/08/2012. BEAM 21 has been developing and implementing capacity-building training programmes for decision makers and administrative staff in European municipalities. Its aims were to encourage them to apply intelligent measures for increasing energy efficiency, reduce CO_2 emissions, and install renewable energies in municipalities. Facing the relevance of energy for the economy of the European states and considering the global crises, the question of intelligent energy management is one of the decisive questions to achieve European climate protection targets.

The project developed, tested and provided blended (i.e. real and virtual) training sessions to local authorities and other relevant stakeholders (businesses, NGOs) on a range of topics including e-government, procurement, energy saving and renewable energy sources. This multi-lingual training component contributed to enable local and regional authorities to elaborate or complement their sustainable energy plans in 9 countries, including Latvia.

The Environmental Investment Fund who is supervising the implementation and post-implementation monitoring of projects co-financed by CCFI works also with the awareness raising about the successful realization of the environmental project related issues:

- Organization of informative seminars (including - visits to project realization places);
- Specialized interactive site maintenance www.videsrisinajumi.lv;
- The preparation of guidelines for the project implementers;
- External tutorials of Fund specialists.

In the framework of main activities the Environmental Investment Fund on a regular basis organizes regional seminars, including outings to the successfully realized project places and informing the society. The employees of local government and other interested parties have opportunity on regular basis get valuable information from the Environmental Investment Fund specialists and implementers of projects for each of the successfully implemented environmental projects.

9.5 RESOURCE OR INFORMATION CENTRES

The Environmental Investment Fund who is supervising the implementation and post-implementation monitoring of projects co-financed by CCFI is maintaining a specialized interactive site www.videsrisinajumi.lv (environmental measures).

Websites of NGO's:

- In the World Wildlife Fund, Latvian Division (WWF Latvia) website www.pdf.lv is available information on climate calculator that can be used by every inhabitant to calculate its CO_2 emissions;
- In the Baltic Environmental Forum (BEF) website www.bef.lv is information on various projects and project seminars, including reports and presentations, about climate change topic.
- The website of The Green Liberty www.zb-zeme.lv informs the public on various aspects of the climate change.

With the support of EEA granted project: ***Development of environmental science study content and study materials*** (2008-2011) were developed study courses in environmental science education and educational tools.

The purpose of the Project was to develop study courses in environmental science education for universities and higher education institutions in Latvia; with the overall objective of a well-developed environmental education system at university level supporting the sustainable development process of society through environmental education.

The project has been implemented in partnership with a network of 220 universities in 14 countries in the Baltic Sea Region. During the course of the project, environmental scientists and educators from several European universities, including those of Hamburg, Oslo, Uppsala, Saint Petersburg, and Tallinn, have been invited to provide advice on how to best teach environmental science.

These consultations have resulted in the development of 8 academic textbooks:

- "Environmental Education at Universities";
- "Environmental Pollution and its Impact";
- "Environmental Technologies";
- "Ecology";
- "Nature Protection";
- "Environment and Economy";
- "Environmental Management"; and
- "Environment and Sustainable Development".

The project has also involved the development of curricula, e-learning tools and teaching guides, as well as the organisation of both national and international conferences to discuss environmental education and introduce the educational package on environmental science and sustainable development resulting from the project.

The latter book, "Environment and Sustainable Development", has been published in both English and Latvian, and has been distributed to universities in the Baltic Sea Region, the USA, Australia, Africa and Asia.

9.6 INVOLVEMENT OF THE PUBLIC AND NON-GOVERNMENTAL ORGANIZATIONS

The overall responsibility for coordination the climate change policy and its implementation lies with the Ministry of Environmental Protection and Regional Development, Climate and Environmental Policy Department, Climate Change and Adaptation Policy Division.

Two expert groups have been established for the development of a national adaptation strategy: an inter-institutional working group including representatives from ministries, and an expert working group with representatives from scientific institutions, universities and other involved organisations dealing with climate change and adaptation issues.

The Advisory Council of CCFI [45] promotes the economic efficiency of utilisation of the resources of the CCFI and the efficiency of environmental protection; and promotes co-operation and the exchange of information among State administrative institutions, individuals and the society on issues related to implementation of the CCFI.

A broad range of non-governmental organisations (NGOs) are actively involved in the capacity building of climate change issues through research, lobbying, education and training, and media activities:

- The Latvian Environmental Protection Club (VAK) is a NGO with long traditions (established in 1987) that are paying much attention in its research and actions to climate change, renewable energy sources, price of energy resources and dependency on supplies, energy efficiency, as well as to evaluation and reduction of energy infrastructure risks related to natural disasters.[46]
- The World Wildlife Fund, Latvian Division (WWF Latvia), has been working in Latvia since 1991, and was re-registered in 2005 as an establishment with the name "World Wide Fund for Nature". It has developed a special climate calculator that can be used by every inhabitant to calculate its CO_2 emissions made during a year. The World Wildlife Fund, Latvian Division every year is organizing action *Earth Hour*. *The Earth Hour* is organized every year on 23rd of March at 20:30 o'clock local time when all people are asked to switch lights off for an hour.[47]
- The Green Liberty was founded in 1993 as the Green Library of the VAK and re-registered in 2000 with the name "Zala Briviba" (Green Freedom). It informs the public on impact of the consumer philosophy and way of life, as well as of globalisation on the nature and social environment and advocates environmentally and climate friendly consumption and green procurement. The Green Freedom in the frames of various projects cooperates closely with academia, with other NGOs and professional associations.[48]
- The Baltic Environmental Forum (BEF) that was founded in 1995 by the Baltic Ministries of Environment, Germany and the European Commission as a technical assistance project takes part in various projects related to climate change. In order to support the process, BEF is organising workshops and meetings for the stakeholders concerned to raise their awareness and knowledge about the emissions trading scheme and practical implementation of the requirements. Since 2008 Baltic Environmental Forum Latvia is a campaign associate of the Sustainable Energy Europe Campaign.[49]

[45] http://likumi.lv/doc.php?id=174716
[46] www.vak.lv
[47] www.pdf.lv
[48] www.zb-zeme.lv
[49] www.bef.lv

- The project "Footprints" (founded in 2002) organises annually measures (including waste collection bees) popularising the environmental protection aspects, sustainable way of life and consumption, etc.

9.7 INTERNATIONAL COOPERATION ON EDUCATION, TRAINING AND PUBLIC AWARENESS

Within the period from the last National Communication Report, Latvia has participated in several international cooperation measures. They are listed in Table 9.2.

Table 9.2. International Cooperation Measures

Recipient country/ region	Mitigation Adaptation Technology development and transfer Multiple areas	Programme or project title	Description of programme or project
Iraq	Multiple areas	Training course for the Ministry of Environment of Iraq Kurdistan Region representatives	The training took place in Latvia 15 – 25 October 2009 and representatives of Kurdistan were introduced with environmental institutional framework and legislation of Latvia as well as implementation experience of a number of environmental projects was shared.[50]
Georgia Armenia	Multiple areas		Exchange of experience with the Representatives of Georgian Ministry of Environmental Protection and Natural Resources and Ministry of Nature Protection of Armenia and about Kyoto commitments, including emissions trading (2009).
Georgia	Multiple areas		Exchange of experience and training for Representatives of Georgian Ministry of Environmental Protection and Natural Resources (2009).
Georgia	Mitigation	Bilateral agreement	Under agreement action aims to build the capacity of public administration and experts and provide methodological support in receiving country. The skills gained will be used during the project for creating instruments for raising public awareness and to promote climate change mitigation actions and technologies. Exchange of the experience (2011).
Azerbaijan Georgia Moldova	Mitigation	Bilateral agreement	Under agreement action aims to build the capacity of public administration and experts and provide methodological support in receiving country. The skills gained will be used during the project for creating instruments for raising public awareness and to promote climate change mitigation actions and technologies. Exchange of the experience (2012).

[50] http://varam.gov.lv/lat/aktual/preses_relizes/?doc=9636

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3. Information on Greenhouse Gas Inventory, National System and National Registry, Latvian Environment, Geology and Meteorology Centre , Riga, 2013
4. Projections of Latvian direct and indirect greenhouse gas emissions and removals until 2020 and 2030 under United Nations Framework Convention on Climate Change and Kyoto Protocol, Institute of Physical Energetic, Riga, 2013
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6. 2011 Survey of resource efficiency policies in EEA member and cooperating countries. Latvia. European Environmental Agency, 2012
7. Commission Regulation (EC) No. 2216/2004 for a standardised and secured system of registries pursuant to the Directive 2003/87/EC of the European Parliament and of the Council and Decision No. 280/2004/EC of the European Parliament and of the Council and DES
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11. Environmental Policy Strategy for Latvia 2009–2015, approved on 31.07.2009.
12. Fifth National Communication of the Republic of Latvia to the United Nations Framework Convention on Climate Change, Ministry of Environment, 2009
13. Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories, UNFCCC
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15. Latvia National Reforms' Programme to Implement Europe 2020 Strategy**,** approved on 26.04.2011
16. Latvia's Initial Report under the Kyoto Protocol Determination of Assigned Amount, Ministry of the Environment of the Republic of Latvia; Latvian Environment, Geology and Meteorology Agency, 2006
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18. Law On Pollution, Republic of Latvia, 2001

19. Law On the Energy Performance of Buildings, Republic of Latvia, 2012

20. National Development Plan 2014-2020, Republic of Latvia, approved on 20.12.2012.

21. Programme on Development of Biogas Production and Utilisation 2007-2011, Ministry of Economics Republic of Latvia, Riga 2007

22. Regulation No. 33 of the Cabinet of Ministers Republic of Latvia "Regulation Regarding Protection of Water and Soil from Pollution with Nitrates Caused by Agricultural Activity" from 11 January 2011

23. Regulation No. 628 of the Cabinet of Ministers Republic of Latvia "Special Environmental Requirements for Performance of Polluting Activities in Animal Housing" from 27 July 2004

24. Regulations No. 173 of the Cabinet of Ministers Republic of Latvia "Procedures by which State and European Union Support is Granted to Agriculture in the Framework of Direct Support Schemes" from 1 March 2011

25. Regulations of the Cabinet of Ministers Republic of Latvia No. 217 "The National Inventory System of Greenhouse Gas Emission Units" from 27 March 2012

26. Report of the in-depth review of the fifth national communication of Latvia, FCCC/IDR.5/LVA, 14 September 2011

27. Report on Adaptation to Climate Change, approved by Cabinet of Ministers Republic of Latvia on 5 August 2008

28. Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories

29. Rural Development Programme 2007-2013, Ministry of Agriculture Republic of Latvia, Riga 2007

30. Strategic Development Plan for Latvia 2010-2013, approved on 9.04.2010.

31. Sustainable Development Strategy for Latvia until 2030, approved on 10.06.2010.

32. The Latvian National Emissions Allowances Allocation Plan for 2013-2020, approved by the Ordinance of the Cabinet of Ministers Republic of Latvia No. 499 of 29 September 2011

33. Updated UNFCCC reporting guidelines on annual inventories following incorporation of the provisions of decision 14/CP.11, FCCC/SBSTA/2006/9 18 August 2006

34. Waste management plan 2013-2020, approved by Cabinet of Ministers Republic of Latvia on 21 March 2013

INTERNET RESOURCES

http://ec.europa.eu/environment/networks

http://izm.izm.gov.lv

http://meteo.lv

http://epp.eurostat.ec.europa.eu

http://unfccc.int/files/national_reports

http://unfccc.int/resource

http://www.futureforest.eu/index.php

http://www.innovation.lv/fei

http://www.ipcc-nggip.iges.or.jp

http://www.lubi.edu.lv

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http://www.latvia.lv

http://www.likumi.lv

http://www.lubi.edu.lv

http://www.pdf.lv

ANNEXES

ANNEX 1

LATVIA'S FIRST BIENNIAL REPORT TO THE UNFCCCC

I INTRODUCTION

First Latvian Biennial report, which has been prepared according to "UNFCCC biennial reporting guidelines for developed country Parties", is presented as a part of the Sixth National Communication report of the Republic of Latvia (according decision 2/CP.17 (para.15)). This report contains summary information on GHG inventory information for the time period 1990-2011, summary information on quantified economy-wide emission reduction target and Latvia's progress in achievement of this target, as well as summary information on projections until year 2030. Tables according decision 19/CP.18 – Common tabular format for "UNFCCC biennial reporting guidelines for developed country Parties" – are enclosed as Appendix of Annex1: Latvia's First Biennial Report.

II GHG emissions and trends

This section presents information on GHG emissions and trends. Further information is reported in the Sixth National Communication report Chapter 3 "Greenhouse Gas Inventory Information" and Table 1 included in Appendix of First Biennial Report.

As a Party to the UNFCCC and the Kyoto Protocol, Latvia has an obligation to prepare, publish and update greenhouse gas inventories on an annual basis. Since the Fifth National Communication, report Latvia has developed a range of measures to improve the national GHG inventory system and produce more accurate and comprehensive emission estimation, mainly due to changes in methodology and emission factors in LULUCF and other sectors. These measures are described in Sixth National Communication report Chapter 3.5.1 and are reported on sectorial basis. Figure 1 shows the trend in emissions for time period 1990 - 2011 and the emissions reduction target relating to the first commitment period under the Kyoto Protocol.

Annual GHG emissions estimates for 2011 were an estimated 55.4% below the fixed base[51] year emissions.

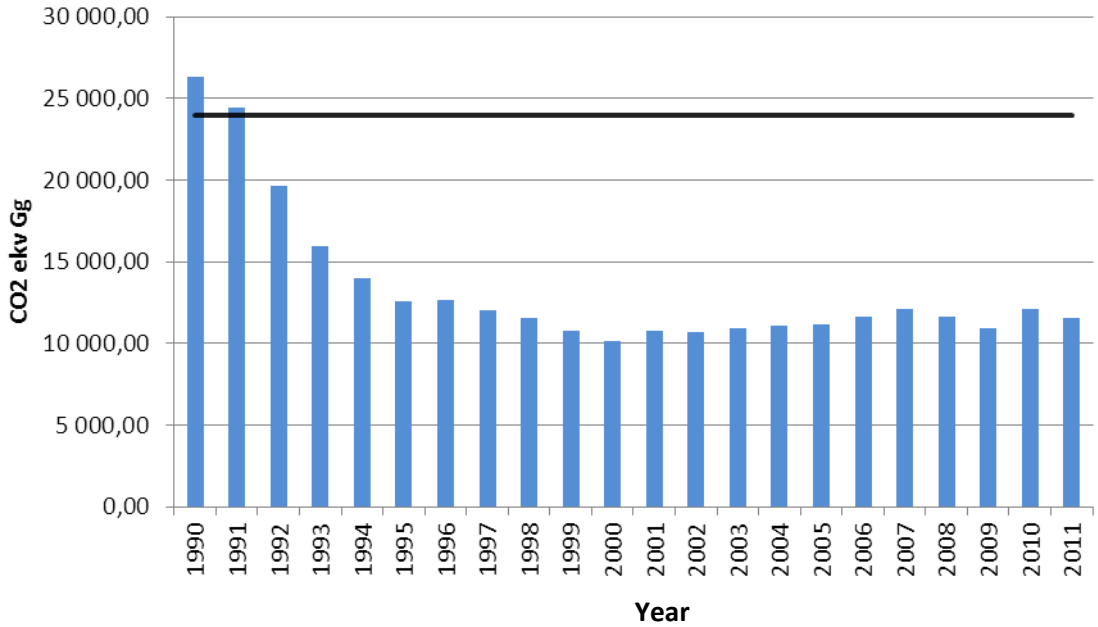

Figure 1 GHG emission time series for 1990–2011 and the target of the Kyoto Protocol (Gg CO_2 eq.)

[51] The Fixed Base Year is taken from the Latvia's Initial Report under the Kyoto Protocol. This report was submitted in 2006, based on emissions reported in the 1990-2004 and was subject to official review in 2007. For the purposes of calculating achievement of the Kyoto Protocol target emissions occurring in this base year are now fixed - 25909,16 Gg CO_2eqv.

The GHG emissions have considerably decreased during the time period from 1990–2000 when the national economy of Latvia transformed from central planning economy to a market economy which affected all sectors of the national economy. From 2001 the total GHG emissions have been fluctuating due to the economic situation – until year 2007 the emissions have slightly increased by about 13% from 2001 level, whereas in years 2007-2009 emissions have fallen by about 10%. The emissions have large fluctuations in 2009-2011 within 4-10%. Further information can be found in chapter 3 of the Latvia's Sixth National Communication.
The major source of GHG in 2011, excluding LULUCF, was CO_2 (8,088 thousand tons), accounting for 70.1% of the total emissions, accordingly CH_4 constituted 14.1%, N_2O – 15%, and fluorinated gases – 0.8% of total emissions. Energy sector caused 68.1% of total GHG emissions, agriculture – 20.1%, industrial processes – 6.3%, waste management – 5.2%, use of solvents and other products – 0.4%. Further information can be found in section 3.1.2 of the Latvia's Sixth National Communication.

National Inventory Arrangements

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 Policy and Technology 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.

LEGMC is responsible for collecting of activity data (activity data is mainly collected from other institutions and LEGMC uses this data to calculate emissions), preparation of the emission estimates for the Energy, Industrial Processes, Solvent and Other Product use and Waste sectors, preparation of QC procedures for relevant categories and documentation and archiving of materials of emission calculations. Latvian State Forest Research Institute "Silava" in collaboration with Ministry of Agriculture is responsible for GHG inventory preparation from LULUCF and KP activities. Latvia University of Agriculture in collaboration with Ministry of Agriculture is responsible for GHG inventory preparation from agriculture sector. IPE carries out emission calculations from Transport sector according to the agreement with MEPRD. The main data supplier for the Latvian GHG inventory is CSB.

The GHG inventory is compiled annually according to Intergovernmental Panel on Climate Change (IPCC) Guidelines and Good Practice Guidance (IPCC, 1996, 2000 and 2003). All methodological improvements are applied back to 1990 to ensure a consistent time series.

Inventory activities include planning, preparation and management.

The inventory phases are:

- Collecting activity data;
- Selecting methods and emission factors appropriately;
- Estimating anthropogenic GHG emissions by sources and removals by sinks;
- Implementing uncertainty assessment; implementing QA/QC (quality control) activities.

Further information can be found in section 3.2 of the Latvia's Sixth National Communication.

Changes in National Inventory Arrangements

Since the submission of the Fifth National Communication in 2009 several changes have been made in national inventory arrangements:

- CO_2 Removals and emission calculations for the LULUCF sector have been carried out by Latvian State Forest Research Institute "Silava" in collaboration with Ministry of Agriculture.
- According to the agreement with MEPRD IPE carries out emission calculations from Transport sector.
- Since 2012 calculations of the emissions from Agriculture sector have been carried out by Latvia University of Agriculture in collaboration with Ministry of Agriculture.

After publication of the Fifth National Communication report improvements affecting the emission time series have been introduced in the GHG inventory.

In 2013 steering committee of GHG inventory preparation was established for advisory purposes.

Summary information on the major revisions to the Latvia's GHG since the publication of the Fifth National Communication can be found in section 3.1.5 of the Latvia's Sixth National Communication.

III Quantified economy-wide emission reduction (QEWER) target

Chapter 4 of the Sixth National Communication provides information on the policies and measures that contribute to the Latvia meeting its quantified economy-wide emission reduction targets.

Latvia as a Party of the Convention and Kyoto Protocol together with other EU Member States has committed to achieve emission reduction of 20% by 2020 comparing to year 1990. According to the "Compilation of economy-wide emission reduction targets to be implemented by Parties included in Annex I to the Convention"[52] the target for the EU and its Member States is based on the understanding that it will be fulfilled jointly. The 20% emission reduction target by 2020 is supported by Climate and Energy Package (2009).

The common EU goal is recalculated and determined internally against 2005, providing that:

- sectors included in EU ETS will achieve emissions reductions by 21%,
- sectors not included in ETS (such as transport (except aviation), agriculture, construction, waste management, services, small industries, etc.) will achieve emission reductions by 10%.

In order to ensure that the common EU climate policy objectives are achieved, the different capacities of Member States and their need for development have been taken

[52] FCCC/SB/2011/INF.1/Rev.1 Compilation of economy-wide emission reduction targets to be implemented by Parties included in Annex I to the Convention

into account and emission targets have been fairly divided between the EU Member States by Effort Sharing Decision - European Parliament and Council Decision No 406/2009/EC on the effort of member states to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments until year 2020 in Article 3 and Annex II.

For Non-ETS sectors Effort Sharing Decision (ESD) establishes annual emission targets for each Member State for the time period 2013-2020, which determines its fair share of the common EU goal. Latvia's quantified emission reduction target for 2020 includes the reduction of ETS emissions -21% compared to 2005 and the positive limit +17% compared to 2005 established for non-ETS sector in line with Decision No 406/2009/EC.

Detailed information on the EU target including the gases regulated in achieving its emissions reduction – are provided in Table 2 of the Appendix of the Annex1: Latvia's First Biennial Report.

IV Progress in achievement of QEWER target

This section presents information on progress in achievement of QEWER target. Further information is reported in Sixth National Communication report Chapter 4 "Policies and Measures" and Table 1 included in of the Appendix of the Annex1: First Biennial Report.

Issues related to the development and implementation of the climate change policy are the responsibility of MEPRD, Ministry of Finance, MoE, Ministry of Transport, Ministry of Agriculture and institutions supervised by the relevant ministries.

The overall goals of climate policy are as follow:

- Ensure Latvia's contribution to global climate change mitigation, ensuring balance of environmental, social and economic interests;
- Promote Latvia's ability to adapt to climate change and its impacts.

The climate policy of Latvia is based on the EU climate policy, the basic principles of which are set down in several political documents, i.e "National Development Plan 2014-2020" (approved on 20.12.2012.), "Sustainable Development Strategy for Latvia until 2030" (approved on 10.06.2010.), "Strategic development plan for Latvia 2010-2013" (approved on 9.04.2010.), "Environmental policy strategy 2009–2015" (approved on 31.07.2009.). Currently Latvia is working on new "Environmental Policy Strategy 2014-2020" and "Climate Change Policy Strategy 2014-2020".

A number of measures have been implemented, adopted and planned to fulfil policy goals mentioned above. Only priority measures with a significant effect to climate change were taken into account in calculations of total effects of policies and measures, which are shown in detail in Sixth National Communication Chapter 5 and Table 3 in the Appendix of the Annex1: Latvia's First Biennial Report.

V Projections

Projections are made depending on policies and measures, which are defined in policy documents developed by the government of Latvia until year 2012. The GHG emission projection of Latvia is based on the long-term macroeconomic projection until year 2030 developed by the Ministry of Economics as well as development strategies and planning documents of related sectors.Further information is reported in the Sixth National Communication report Chapter 5

"Projections and the total effects of policies and measures" and Tables 5 and 6 included in the Appendix of the Annex1: Latvia's First Biennial Report.

Changes in Models or Methodologies

Changes in models or methodologies since Fifth National Communication report are reported in the Chapter 5.2 of the Sixth National Communication.

VI Provision of Financial, Technological and Capacity-building Support to Developing Country Parties

Latvia is not an Annex II Party therefore the provisions of United Nations Framework Convention on Climate Change Article 4.3, 4.4 and 4.5 are not applicable, but it was decided to report provision of financial support according to EU Regulation No.525/2013 of the European Parliament and of the Council on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change and repealing Decision no. 280/2004/EC.

Further information on the financial and provision of capacity – building support can be found in the Tables 7 and 9 included in the Appendix of the Annex1: Latvia's First Biennial Report.

The technology support and transfer were not provisioned (Appendix of the Annex1: Latvia's First Biennial Report, Table 8).

Appendix of Annex 1: Latvia's First Biennial Report

Common tabular format (CTF) for "UNFCCC biennial reporting guidelines for developed country Parties"

Table 1 Emission trends by gas, CO_2 equivalent (Gg): Summary

GREENHOUSE GAS EMISSIONS	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Change from base to latest reported year
																								%
CO_2 emissions including net CO_2 from LULUCF	-3 432,60	-3 432,60	-5 725,36	-9 302,22	-10 247,59	-12 836,17	-12 775,30	-13 154,67	-11 823,06	-11 195,61	-11 940,56	-12 471,76	-11 647,56	-10 287,59	-10 676,50	-10 148,69	-10 398,74	-11 746,78	-10 160,09	-11 675,23	-12 628,41	-8 084,79	-9 261,49	169,81
CO_2 emissions excluding net CO_2 from LULUCF	19 041,87	19 041,87	17 486,32	14 007,64	11 743,53	10 231,94	9 036,44	9 130,59	8 603,33	8 220,37	7 627,03	6 992,61	7 412,10	7 409,32	7 633,83	7 799,15	7 789,85	8 273,31	8 629,23	8 175,66	7 433,66	8 529,00	8 088,05	-57,52
CH_4emissions including CH_4 from LULUCF	3 485,94	3 485,94	3 407,70	2 958,29	2 245,43	2 077,38	2 062,55	2 004,89	1 972,09	1 900,54	1 784,81	1 764,89	1 827,86	1 822,42	1 744,88	1 736,70	1 758,75	1 732,12	1 771,28	1 753,84	1 773,07	1 780,14	1 641,07	-52,92
CH_4emissions without CH4 from LULUCF	3 466,57	3 466,57	3 385,21	2 920,39	2 220,01	2 048,15	2 026,36	1 968,47	1 925,71	1 848,98	1 726,74	1 706,04	1 794,96	1 782,45	1 707,17	1 702,52	1 723,91	1 693,86	1 739,94	1 725,65	1 738,73	1 739,71	1 631,52	-52,94
N_2O emissions including N_2O from LULUCF	3 953,05	3 953,05	3 692,15	2 901,14	2 107,22	1 865,91	1 692,50	1 677,39	1 683,20	1 626,58	1 542,91	1 561,97	1 678,15	1 646,61	1 726,01	1 703,29	1 768,98	1 773,63	1 824,85	1 808,37	1 843,29	1 905,49	1 891,08	-52,16

GREENHOUSE GAS EMISSIONS		N_2O emissions without N_2O from LULUCF	HFCs	PFCs	SF_6	Total (including LULUCF)	Total (excluding LULUCF)
Base year		3 804,00	IE,NA,NE, NO	NA,NO	NA,NE,NO	**4 006,39**	**26 312,45**
1990		3 804,00	IE,NA,NE, NO	NA,NO	NA,NE,NO	**4 006,39**	**26 312,45**
1991		3 541,58	IE,NA,NE, NO	NA,NO	NA,NE,NO	**1 374,49**	**24 413,11**
1992		2 745,55	IE,NA,NE, NO	NA,NO	NA,NE,NO	**-3 442,79**	**19 673,59**
1993		1 953,73	IE,NA,NE, NO	NA,NO	NA,NE,NO	**-5 894,94**	**15 917,27**
1994		1 710,92	IE,NA,NE, NO	NA,NO	NA,NE,NO	**-8 892,88**	**13 991,01**
1995		1 535,40	0,64	NA,NO	0,25	**-9 019,36**	**12 599,09**
1996		1 519,69	0,84	NA,NO	0,29	**-9 471,28**	**12 619,87**
1997		1 524,13	1,93	NA,NO	0,51	**-8 165,33**	**12 055,61**
1998		1 466,52	2,86	NA,NO	0,71	**-7 664,92**	**11 539,44**
1999		1 381,29	3,28	NA,NO	0,98	**-8 608,59**	**10 739,32**
2000		1 399,83	5,12	NA,NO	1,28	**-9 138,51**	**10 104,88**
2001		1 518,40	7,59	NA,NO	1,98	**-8 131,98**	**10 735,03**
2002		1 484,96	9,87	NA,NO	3,38	**-6 805,30**	**10 689,98**
2003		1 564,53	15,72	NA,NO	4,41	**-7 185,47**	**10 925,67**
2004		1 542,04	18,10	NA,NO	5,37	**-6 685,23**	**11 067,17**
2005		1 607,48	28,39	NA,NO	7,53	**-6 835,09**	**11 157,16**
2006		1 609,75	62,64	NA,NO	7,12	**-8 171,26**	**11 646,68**
2007		1 662,76	98,66	NA,NO	8,60	**-6 456,70**	**12 139,19**
2008		1 646,26	72,96	NA,NO	10,08	**-8 029,98**	**11 630,61**
2009		1 680,37	74,48	NA,NO	13,53	**-8 924,04**	**10 940,78**
2010		1 742,91	72,32	NA,NO	13,13	**-4 313,72**	**12 097,07**
2011		1 730,28	82,97	NA,NO	12,45	**-5 633,92**	**11 545,28**
Change from base to latest reported year	%	-54,51	100,00	0,00	100,00	**-240,62**	**-56,12**

Table 1 Emission trends by categories, CO_2 equivalent (Gg): Summary

GREENHOUSE GAS SOURCE AND SINK	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Change from base to latest reported year
																								%
1. Energy	19 136,30	19 136,30	17 664,32	14 400,15	12 297,42	10 713,17	9 514,63	9 593,72	9 031,25	8 615,22	7 961,29	7 341,10	7 761,67	7 755,94	7 953,73	7 980,08	8 079,26	8 491,69	8 816,78	8 353,54	7 691,09	8 487,08	7 857,03	-58,94
2. Industrial Processes	598,87	598,87	536,07	256,64	83,67	146,72	160,21	176,27	183,12	184,86	222,76	179,40	207,29	223,70	247,28	389,84	286,20	348,05	404,10	371,84	339,63	605,33	727,69	21,51
3. Solvent and Other Product Use	50,70	50,70	46,49	44,20	41,35	40,51	41,49	43,65	44,48	43,88	45,03	44,81	50,89	36,49	29,40	35,88	35,69	55,21	63,25	43,62	26,55	45,25	41,31	-18,52
4. Agriculture	5 931,27	5 931,27	5 561,65	4 369,49	2 906,43	2 506,98	2 307,62	2 238,59	2 227,74	2 110,86	1 926,19	1 956,33	2 101,72	2 065,29	2 119,15	2 081,67	2 174,00	2 168,32	2 260,04	2 224,03	2 255,96	2 326,80	2 320,62	-60,87
5. Land-Use, Land-Use Change and Forestry	-22 306,06	-22 306,06	-23 038,62	-23 116,38	-21 812,20	-22 883,89	-21 618,46	-22 091,15	-20 220,94	-19 204,37	-19 347,90	-19 243,39	-18 867,01	-17 495,28	-18 111,14	-17 752,40	-17 992,25	-19 817,94	-18 595,88	-19 660,60	-19 864,82	-16 410,78	-17 179,20	-22,98
6. Waste	595,30	595,30	604,58	603,11	588,41	583,62	575,14	567,64	569,01	584,62	584,05	583,24	613,45	608,55	576,11	579,69	582,00	583,41	595,01	637,58	627,56	632,60	598,63	0,56

GREENHOUSE GAS SOURCE AND SINK	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Change from base to latest reported year
7. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0,00
Total (including LULUCF)	**4 006,39**	**4 006,39**	**1 374,49**	**-3 442,79**	**-5 894,94**	**-8 892,88**	**-9 019,36**	**-9 471,28**	**-8 165,33**	**-7 664,92**	**-8 608,59**	**-9 138,51**	**-8 131,98**	**-6 805,30**	**-7 185,47**	**-6 685,23**	**-6 835,09**	**-8 171,26**	**-6 456,70**	**-8 029,98**	**-8 924,04**	**-4 313,72**	**-5 633,92**	**-240,62**

Table 2 Description of quantified economy-wide emission reduction target

Emission reduction target: base year and target				
		Comments		
Base year/ base period	1990			
Emission reductions target (% of base year/base period)				
Emission reductions target (% of 1990)	20%			
Period for reaching target	**BY-2020**			
Gases and sectors covered. GWP values.				
Gases covered	**Covered**	**Base Year**	**GWP reference source**	**Comments**
CO_2	Yes	1990	IPCC AR4	
CH_4	Yes	1990	IPCC AR4	
N_2O	Yes	1990	IPCC AR4	
HFCs	Yes	1995	IPCC AR4	
PFCs	No	NA	IPCC AR4	
SF_6	Yes	1995	IPCC AR4	
NF_3	No	NA	IPCC AR4	

Other gases (specify)				
Add a gas				
Sectors covered	**Covered**	**Comments**		
Energy	Yes			
Transport	Yes			
Industrial processes	Yes			
Agriculture	Yes			
LULUCF	NO			
Waste	Yes			
Other sectors (specify)	No			
Add a sector		**Comments**		
Aviation in the scope of the EU-ETS				
Role of LULUCF sector				
LULUCF in base year level and target	Excluded			
Contribution of LULUCF is calculated using				
Possible scale of contributions of market-based mechanisms		**Comment:**		
Possible scale of contributions of market-based mechanisms under the Convention	0			
CERs	0			
ERUs	0			
AAUs	0			
Carry-over units	0			
Other mechanism units under the Convention (specify)[d]	0			

No records to display.				
Add a record				
Other possible scale of contributions of market-based mechanisms	0			
No records to display.				
Add a record				
Any other information				
Any other information:				

Table 3 Progress in achievement of the quantified economy - wide emission reduction target: information on mitigation actions and their effects

Name of mitigation action	Sector(s) affected	GHG affected	Objective and/or activity affected	Type of instrument	Status of implementation	Brief description	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact, by gas CO_2 equivalent		
									2015	2020	2025
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/ education	Implemented	The financial support (particular programme of national Climate Change Financial Instrument) is provided from the receipts of the sale of GHG emissions (under procedures pursuant to Art.17 of UNFCCC Kyoto protocol). The support is available for publications in mass media for 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 establishments.	2011	MEPRD	IE	IE	IE
Latvia National Renewable Action Plan *	Cross-cutting	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	Planning	Planned	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).	2010	Ministry of Economy	NE	NE	20
Investment Support Programme for District Heating (DH) Systems	Energy	CO_2	Effective use of fuel in the DH systems, reducing energy loss and emissions, increasing the share of RES (both	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 period of 2007-2013 the support is	2010	Ministry of Economy	176	176	176

Name of mitigation action	Sector(s) affected	GHG affected	Objective and/or activity affected	Type of instrument	Status of implementation	Brief description	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact, by gas CO_2 equivalent		
									2015	2020	2025
			for heat and CHP production)			provided by the Cohesion Fund in the frame of National operational programme "Infrastructure and services", part „Energy" (activities No3521&3522).					
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) define the mandatory minimum energy efficiency (i) for new and reconstructed DH networks put into operation after 01.01.2010, and (ii) for existing DH networks starting from 01.01.2018. The minimum requirements are 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 Economy	IE	IE	IE
Preferential Feed-in Tariffs for Renewables	Energy	CO_2	Increasing RES utilization in the electricity supply	Economic	Expired	Application of RES feed-in tariffs in dependence of RES type and unit capacity	1996	Ministry of Economy	NE	NE	NE
Preferential Feed-in Tariffs for Combined Heat-Power Production	Energy	NO_2CH_4	Increasing CHP production in the electricity supply	Economic	Adopted	Application of CHP feed-in tariffs in dependence of fuel type and unit capacity	1996	MEPRD	IE	IE	IE
Investment Support in Industrial Buildings Energy Efficiency to Reduce GHG emissions	Energy	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) are earmarked national Climate Change Financial Instrument (CCFI). Part of them is allocated for CO2 emissions reduction in industrial/business sector entities. Eligible investments include energy efficiency investments of different kind both in buildings and technological equipment; installation of	2010	MEPRD	20	20	20

Name of mitigation action	Sector(s) affected	GHG affected	Objective and/or activity affected	Type of instrument	Status of implementation	Brief description	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact, by gas CO_2 equivalent		
									2015	2020	2025
						efficient lightning; heat supply switch from fossils to RES & installation of RES based heat supply system (up to 3 MW).					
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 / negotiated agreement	Adopted	The objective of the particular agreement is to achieve in the company the energy saving of at least 10%	2011	Ministry of Economy	IE	IE	IE
Investment Support Programmes to Increase Energy Efficiency in Apartment Buildings	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	Implemented	In financial period of 2007-2013 the investments in energy efficient building renovation are 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 has 2 target audiences: 1) apartments owners of multi-apartment residential buildings, and 2) tenants of municipal social residential buildings.	2010	Ministry of Economy	23	23	23
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	Economic / 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	2009	Ministry of Economy	IE	IE	IE
Informing Energy Consumers of	Energy	CO_2	To inform final energy consumers	Information	Implemented	The measure (i) motivates flats' owners to renovate them in the frame of the ERDF	2010	Ministry of	IE	IE	IE

Name of mitigation action	Sector(s) affected	GHG affected	Objective and/or activity affected	Type of instrument	Status of implementation	Brief description	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact, by gas CO_2 equivalent		
									2015	2020	2025
Residential Sector (Multi-apartment buildings)			of the energy efficiency measures and their economic benefits.			supported activity "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.		Economy			
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) is available from the receipts of the sale of GHG emissions (under procedures pursuant to Art. 17 of UNFCC Kyoto protocol). Eligible micro-generation technologies are: 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 are eligible. The support for 1 project may be up to 9960 EUR.	2011	MEPRD	16	16	16
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) is available from the receipts of the sale of GHG emissions (under procedure pursuant to Art.17 of UNFCCC Kyoto protocol). The support is available to improve heating and lightning energy efficiency as well as to	2011	MEPRD	27	27	27

Name of mitigation action	Sector(s) affected	GHG affected	Objective and/or activity affected	Type of instrument	Status of implementation	Brief description	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact, by gas CO_2 equivalent		
									2015	2020	2025
						realize fuel switch to RES in the public buildings					
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 is available from the receipts of the sale of GHG emissions (national Climate Change Financial Instrument). The eligible beneficiaries are both business sector entities (operators participating in EU ETS are non-eligible) and public sector institutions	2010	MEPRD	195	195	195
Investment Support to Produce Energy from Biomass of Agriculture and Forestry Origin	Energy	CO_2	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 is 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	51	51	51
Energy Performance of Buildings (Directive 2002/91/EC)	Energy	CO_2	Reducing final energy and emissions in buildings by increasing energy efficiency	Regulatory	Expired	The Law on the Energy Performance of Buildings (2008) in accordance with the requirements of the Directive 2002/91/EC introduced the general legal framework of setting the mandatory minimum energy performance requirements for new buildings and for buildings under reconstruction, the general principles of energy efficiency certification for these buildings, verification of buildings heating and ventilation systems	2008	Ministry of Economy	IE	IE	IE
Energy	Energy	CO_2	Reducing final	Regulator	Adopted	The recasted Law on the Energy Performance	2013	Ministr	IE	IE	IE

Name of mitigation action	Sector(s) affected	GHG affected	Objective and/or activity affected	Type of instrument	Status of implementation	Brief description	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact, by gas CO_2 equivalent		
									2015	2020	2025
Performance of Buildings			energy and emissions in buildings by increasing energy efficiency and public informing	y		of Buildings (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 shall be introduced by Governmental Regulations.		y of Economy			
Energy Labelling on Household Appliances	Energy	CO_2	Reducing energy consumption and emissions in households	Regulatory/ information	Implemented	The mandatory energy labelling for household electrical appliances is established by the set of Governmental Regulations. Implementing 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.	2001	Ministry of Economy	NE	NE	NE
Fuel Taxation – Other sectors	Energy	CO_2	To provide economic incentives for effective use of fossil fuels and promote use of RES fuel thus reducing emissions	Fiscal	Implemented	The procedure regarding oil products (from 1997) and natural gas (from 2010) taxation is established by the Law "On Excise Duties" (the duties are not applied for those products which are utilises in another way as fuel), regarding coal (from 2007)– by the Natural Resource Tax. Zero tax rate is defined for pure biofuel, the reduced rate – for fuel with 5% biofuel mix. In addition, the range of exemptions is made for certain consumers groups and certain types of fuels.	1997	Ministry of Economy, Ministry of Finance	NE	NE	NE
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. The exemptions are made 1) for the electricity obtained (i) from renewable energy sources, (ii) in hydro	2007	Ministry of Economy, Ministry of	NE	NE	NE

Name of mitigation action	Sector(s) affected	GHG affected	Objective and/or activity affected	Type of instrument	Status of implementation	Brief description	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact, by gas CO_2 equivalent		
									2015	2020	2025
						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.		Finance			
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 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 2.846 EUR (01.2013).	2005	Ministry of Economy, Ministry of Finance	NE	NE	NE
Taxation on Noxious Air Polluting Emissions	Energy	CO_2	To provide economic incentives to reduce noxious air emissions (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	NE	NE
Performance of Heat Generators for Space Heating	Energy	CO_2	Reducing energy and emissions by prescribing	Regulatory	Implemented	The Governmental Regulations prescribe the essential energy efficiency requirements for water heating boilers, fuelled by gaseous or	2004	MEPRD	NE	NE	NE

Name of mitigation action	Sector(s) affected	GHG affected	Objective and/or activity affected	Type of instrument	Status of implementation	Brief description	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact, by gas CO_2 equivalent		
									2015	2020	2025
and the Production of Hot Water			essential requirements for heat boilers			solid fuels with nominal heat capacity in the range of 4-400 kW and used for heat supply					
Implementation of the EU Emissions Trading Scheme	Energy	CO_2	Reduction of CO2 emissions emitted by EU ETS operators	Regulatory/ Economic	Expired	Limited amount of emission quota allocated for Latvia as a whole and for everyone of ETS operators in Latvia	2005	Ministry of Economy	IE	IE	IE
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 has 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 obligatory for the gasoline of "95" trademark. 4.5-5% (volume) biodiesel mix is obligatory 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. It is planned from 01.04.2014 to introduce 6.5-7% (volume) biodiesel mix.	2010	Ministry of Economy	125	125	125
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 following biofuels produced in Latvia or imported from EU member states: (1) gasoline with 70-85% (volume) of ethanol produced from agriculture origin raw materials, (2) diesel (gas oil) with at least 30% (volume) mix of biodiesel, (3) pure biodiesel is exempted from taxation. To promote the competitiveness of agriculture sector the exempt from taxation is made for certain amount of diesel which is	1993	Ministry of Economy, Ministry of Finance	NE	NE	NE

Name of mitigation action	Sector(s) affected	GHG affected	Objective and/or activity affected	Type of instrument	Status of implementation	Brief description	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact, by gas CO_2 equivalent		
									2015	2020	2025
						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.					
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 Transport Vehicle Circulation Tax and Business Entities Owned Cars Taxation" establishes 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 1 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	41	NE
New Passenger Cars Labelling on Fuel Economy Rating	Transport	CO_2	To motivate car owners to choose fuel consumption and CO2 emissions efficient car	Regulatory/ 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 Economy	56	205	205
Systematic inspection of the technical conditions of motor vehicles	Transport	CO_2	To provide exploitation of transport vehicles in accordance with the technical	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	NE	NE	NE

Name of mitigation action	Sector(s) affected	GHG affected	Objective and/or activity affected	Type of instrument	Status of implementation	Brief description	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact, by gas CO_2 equivalent		
									2015	2020	2025
			requirements of the manufacturer thus reaching improvements in fuel consumption and reducing emissions					Safety Directorate			
Development of public transport network	Transport	CO_2	To decrease fuel consumption by further development and optimisation of public transport network	Planning	Adopted	The given measure, included in Latvia 2nd NEEP, envisages the improvement of the system of public transport network planning; 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; organisation of harmonised public transport network in accordance with new administrative borders of municipalities (established as a result of administrative territorial reform in year 2009).	2011	Ministry of Transport	NE	NE	NE
Implementation of Nitrates Directive	Agriculture	NO_2	Arrangement and construction of manure storage facilities. Reduced water pollution and reduced emissions when fertilisers are applied to the soil.	Regulatory	Implemented	Providing for construction of manure storage facilities with sufficient volume for ensuring storage of collected manure. Requirements incorporated in regulatory acts promote gradual reduction of GHG emissions, for instance, requirements to arrange storage facilities and animal stalls where 10 or more animals are held or 5 animals in nitrate vulnerable territories. In vulnerable territories, more stringent requirements are applied for protection of water and soil against pollution caused by nitrates from agricultural sources, mandatory measures and restrictions are stipulated.	2011	Ministry of Agriculture	NE	NE	NE
National	Agricultu	NO_2	Maintain of the	Voluntary	Planned	Expanding area used for organic farming leads	2014	Ministr	NE	NE	NE

Name of mitigation action	Sector(s) affected	GHG affected	Objective and/or activity affected	Type of instrument	Status of implementation	Brief description	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact, by gas CO_2 equivalent		
									2015	2020	2025
Development Plan of Latvia for 2014–2020*	re		natural capital as the basis for sustainable economic growth and promote its sustainable uses while minimising natural and human risks to the quality of the environment.	/ negotiated agreement Planning		to reduce the use of synthetic fertilizers.		y of Agriculture			
Reduce disposal of Biodegradable wastes	Waste	CH_4	Reducing biodegradable waste disposal in landfills.	Regulatory/ Planning	Planned	Reducing of biodegradable waste in landfills, directly reducing CH4 emissions from disposal.	2010	MEPRD	IE	IE	IE
Promotion of recycling of municipal solid waste *	Waste	CO_2	Promotion of recycling of municipal solid waste	Regulatory/ Planning	Planned	50% (by weight) of Municipal solid wastes must be recycled by 2020. All these wastes will not be disposed in landfills and thus will not emit CH4 after disposal.	2016	Ministry of Economy	NE	NE	NE
Regulations for the reporting of the F–gases activities	Industry/ Industrial processes	HFC PFCSF6	Contain, prevent and thereby reduce emissions of the fluorinated greenhouse gases covered by the Kyoto Protocol.	Regulatory	Implemented	Regulations of ozone depleting substances and fluorinated greenhouse gases that are freezing agents with whom producers, importers, exporters and operators need to report their activities with the F–gases for previous year till next year 1st February.	2007	MEPRD	NE	NE	NE

Table 4(a)I Progress in achieving the quantified economy-wide emission reduction targets - further information on mitigation actions relevant to the contribution of the land use, land-use change and forestry sector in 2011

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Net GHG emissions/removals from LULUCF categories	Base year/period or reference level value	Contribution from LULUCF for reported year	Cumulative contribution from LULUCF	Accounting approach
	(Gg CO2 eq)	(Gg CO2 eq)	(Gg CO2 eq)	(Gg CO2 eq)	(Gg CO2 eq)
Total Land-Use Categories					
A. Forest Land					
1. Forest Land remaining Forest Land					
2. Land converted to Forest Land					
B. Cropland					
1. Cropland remaining Cropland					
2. Land converted to Cropland					
C. Grassland					
1. Grassland remaining Grassland					
2. Land converted to Grassland					
D. Wetlands					
1. Wetlands remaining Wetlands					
2. Land converted to Wetlands					
E. Settlements					
1. Settlements remaining Settlements					
2. Land converted to Settlements					
F. Other Land					
1. Other Land remaining Other Land					
2. Land converted to Other Land					
G. Other (please specify)					
Harvested Wood Products					

Table 4(a)II Progress in achievement of the quantified economy-wide emission reduction targets - further information on mitigation actions relevant to the counting of emissions and removals from the land use, land-use change and forestry sector in relation to activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

GREENHOUSE GAS SOURCE AND SINK ACTIVITIES	BY	Net emissions/removals					Accounting Parameters	Accounting Quantity
		2008	2009	2010	2011	Total		
		(Gg CO_2 equivalent)						
A. Article 3.3 activities								
A.1. Afforestation and Reforestation								-3 929,79
A.1.1. Units of land not harvested since the beginning of the commitment period(2)		-908,49	-1 007,09	-1 007,09	-1 007,12	-3 929,79		-3 929,79
A.1.2. Units of land harvested since the beginning of the commitment period(2)								NA,NO
Harvested lands		NA,NO	NA,NO	NA,NO	NA,NO	NA,NO		NA,NO
A.2. Deforestation		1 079,89	1 067,95	1 044,78	1 042,65	4 235,27		4 235,27
B. Article 3.4 activities								
B.1. Forest Management (if elected)		-19 093,16	-17 774,32	-14 603,09	-14 851,39	-66 321,95		-6 538,81
3.3 offset							305,48	-305,48
FM cap							6 233,33	-6 233,33
B.2. Cropland Management (if elected)	0,00	NA	NA	NA	NA	NA	0,00	0,00
B.3. Grazing Land Management (if elected)	0,00	NA	NA	NA	NA	NA	0,00	0,00
B.4. Revegetation (if elected)	0,00	NA	NA	NA	NA	NA	0,00	0,00

Table 4 Reporting on progress

	Kyoto Protocol units (Gg CO_2 eq)										Other units (Gg CO_2 eq)			
	AAUs		ERUs		CERs		tCERs		lCERs		Units from market-based mechanisms under the Convention		Units from other market-based mechanisms	
	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012
Quantity of units	3 011	2 848	18	22	212	54	NO	NO	NO	NO		NO		
Total	3 011	2 848	18	22	212	54	NO	NO	NO	NO		NO		

Year	Total emissions excluding LULUCF (Gg CO_2 eq)	Contribution from LULUCF (Gg CO_2 eq)	Quantity of units from market based mechanisms under the Convention (number of units and Gg CO_2 eq)	Quantity of units from other market based mechanisms (number of units and Gg CO_2 eq)
Base year/ base period 1990	26 312,45	-22 306,06	NO	NO
2009	10 940,78	-19 864,82	NO	NO
2010	12 097,07	-16 410,78	NO	NO
2011	11 545,28	-17 179,20	NO	NO

Table 5 Summary of key variables and assumptions used in the projections analysis

	Historical						Projected			
Key underlying assumptions	**1990**	**1995**	**2000**	**2005**	**2010**	**2011**	**2015**	**2020**	**2025**	**2030**
Number of inhabitants, thous.	2 668	2 501	2 382	2 250	2 121	2 075	1993	1950	1940	1945
GDP growth rate			5.6	8.2	-0.7	5.3	5.1	4.4	3.7	3.2
International coal price, € (2000) / GJ					3.05		4.23	4.41	4.56	4.69
International oil import prices, € (2000) / GJ					9.41		12.6	14	15.1	15.95
International gas import prices, € (2000) / GJ					8.78		9.34	9.9	10.71	11.34

Table 6(a) Information on updated greenhouse gas projections under a "with measures" scenario

		GHG emissions and removals CO2 equivalent (Gg)						GHG emission projections CO2 equivalent (Gg)	
CO_2 equivalent (Gg)	**Base year**	**1990**	**1995**	**2000**	**2005**	**2010**	**2011**	**2020**	**2030**
Sector									
Energy	16 137	16 137	7 442	5 173	5 019	5 228	4 716	5772	6215
Transport	2 999	2 999	2 073	2 168	3 060	3 259	3 142	3 401	3 550
Industry/industrial Processes	650	650	202	224	322	651	769	1014	1205
Agriculture	5 931	5 931	2 308	1 956	2 174	2 327	2 321	3142	4625
Land-Use, Land-Use Change and Forestry	-22 306	-22 306	-21 618	-19 243	-17 992	-16 411	-17 179	-18 333	-13 526
Waste management/ waste	595	595	575	583	582	633	599	471	439
Other (specify)	0	0	0	0	0	0	0	0	0
Gas									
CO_2 emissions including net CO_2 from LULUCF	-3433	-3433	-12775	-12472	-10399	-8085	-9261	-8984	-3605
CO_2 emissions excluding net CO_2 from LULUCF	19042	19042	9036	6993	7790	8529	8088	9652	10390
CH_4 emissions including CH_4 from LULUCF	3486	3486	2063	1765	1759	1780	1641	1709	1972
CH_4 emissions without CH_4 from LULUCF	3467	3467	2026	1706	1724	1740	1632	1698	1961
N_2O emissions including N_2O from LULUCF	3953	3953	1693	1562	1769	1905	1891	2604	3929
N_2O emissions without N_2O from LULUCF	3804	3804	1535	1400	1607	1743	1730	2312	3471
HFCs	IE,NA,NE,NO	IE,NA,NE,NO	1	5	28	72	83	119	185
PFCs	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
SF_6	NA,NE,NO	NA,NE,NO	0	1	8	13	12	19	27
Other (specify, e.g. NF3)									
Total with LULUCF	**4006**	**4006**	**-9019**	**-9139**	**-6835**	**-4314**	**-5634**	**-4533**	**2508**
Total without LULUCF	**26312**	**26312**	**12599**	**10105**	**11157**	**12097**	**11545**	**13800**	**16034**

Table 6(b) Information on updated greenhouse gas projections under a "without measures" scenario

		GHG emissions and removals CO_2 equivalent (Gg)						GHG emission projections CO_2 equivalent (Gg)	
CO_2 equivalent (Gg)	**Base year**	**1990**	**1995**	**2000**	**2005**	**2010**	**2011**	**2020**	**2030**
Sector									
Energy	16 137	16 137	7 442	5 173	5 019	5 228	4 716	NE	NE
Transport	2 999	2 999	2 073	2 168	3 060	3 259	3 142	NE	NE
Industry/industrial Processes	650	650	202	224	322	651	769	NE	NE
Agriculture	5 931	5 931	2 308	1 956	2 174	2 327	2 321	NE	NE
Land-Use, Land-Use Change and Forestry	-22 306	-22 306	-21 618	-19 243	-17 992	-16 411	-17 179	NE	NE
Waste management/ waste	595	595	575	583	582	633	599	NE	NE
Other (specify)	0	0	0	0	0	0	0	NE	NE
Gas									
CO_2 emissions including net CO_2 from LULUCF	-3433	-3433	-12775	-12472	-10399	-8085	-9261	NE	NE
CO_2 emissions excluding net CO_2 from LULUCF	19042	19042	9036	6993	7790	8529	8088	NE	NE
CH_4 emissions including CH4 from LULUCF	3486	3486	2063	1765	1759	1780	1641	NE	NE
CH_4 emissions without CH_4 from LULUCF	3467	3467	2026	1706	1724	1740	1632	NE	NE
N_2O emissions including N_2O from LULUCF	3953	3953	1693	1562	1769	1905	1891	NE	NE
N_2O emissions without N_2O from LULUCF	3804	3804	1535	1400	1607	1743	1730	NE	NE
HFCs	IE,NA,NE,NO	IE,NA,NE,NO	1	5	28	72	83	NE	NE
PFCs	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
SF_6	NA,NE,NO	NA,NE,NO	0	1	8	13	12	NE	NE
Other (specify, e.g. NF3)									
Total with LULUCF	**4006**	**4006**	**-9019**	**-9139**	**-6835**	**-4314**	**-5634**	**NE**	**NE**
Total without LULUCF	**26312**	**26312**	**12599**	**10105**	**11157**	**12097**	**11545**	**NE**	**NE**

Table 6(c).Information on updated greenhouse gas projections under a "with additional measures" scenario

		GHG emissions and removals CO_2 equivalent (Gg)						GHG emission projections CO_2 equivalent (Gg)	
Sector	**Base year**	**1990**	**1995**	**2000**	**2005**	**2010**	**2011**	**2020**	**2030**
Energy	16 137	16 137	7 442	5 173	5 019	5 228	4 716	5201	5627
Transport	2 999	2 999	2 073	2 168	3 060	3 259	3 142	3350	3449
Industry/industrial Processes	650	650	202	224	322	651	769	1014	1205
Agriculture	5 931	5 931	2 308	1 956	2 174	2 327	2 321	3128	4505
Land-Use, Land-Use Change and Forestry	-22 306	-22 306	-21 618	-19 243	-17 992	-16 411	-17 179	-19025	-14944
Waste management/ waste	595	595	575	583	582	633	599	442	358
Other (specify)	0	0	0	0	0	0	0	0	0
Gas									
CO_2 emissions including net CO_2 from LULUCF	-3433	-3433	-12775	-12472	-10399	-8085	-9261	-10309	-5719
CO_2 emissions excluding net CO_2 from LULUCF	19042	19042	9036	6993	7790	8529	8088	9019	9693
CH_4 emissions including CH_4 from LULUCF	3486	3486	2063	1765	1759	1780	1641	1677	1880
CH4 emissions without CH_4 from LULUCF	3467	3467	2026	1706	1724	1740	1632	1666	1869
N_2O emissions including N2O from LULUCF	3953	3953	1693	1562	1769	1905	1891	2602	3828
N_2O emissions without N_2O from LULUCF	3804	3804	1535	1400	1607	1743	1730	2310	3370
HFCs	IE,NA,NE,NO	IE,NA,NE,NO	1	5	28	72	83	119	185
PFCs	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
SF_6	NA,NE,NO	NA,NE,NO	0	1	8	13	12	19	27
Other (specify, e.g. NF_3)									
Total with LULUCF	**4006**	**4006**	**-9019**	**-9139**	**-6835**	**-4314**	**-5634**	**-5892**	**201**
Total without LULUCF	**26312**	**26312**	**12599**	**10105**	**11157**	**12097**	**11545**	**13134**	**15145**

Table 7 Provision of financial support: Summary information in 2011 and 2012

Allocation channels	Domestic currency (LVL)					USD				
	Core/ general	Climate-specific				Core/ general	Climate-specific			
		Mitigation	Adaptation	Cross-cutting	Other		Mitigation	Adaptation	Cross-cutting	Other
2011										
Total contribution through multilateral channels:										
Multilateral climate change funds										
Other multilateral climate change funds										
Multilateral financial institutions, including regional development banks					7028,04					13489,52
Spezialized United Nations bodies										
Total contributions through bilateral, regional and other channels:										
Bilateral agreements		7029					13491,36			
Total	0	7029	0	0	7028,04	0	13491,36	0	0	13489,52
2012										
Total contribution through multilateral channels:										
Multilateral climate change funds										
Other multilateral climate change funds										
Multilateral financial institutions, including regional development banks					7028,04					13489,52
Spezialized United Nations bodies										
Total contributions through bilateral, regional and other channels:										
Bilateral agreements		7273,64					13960,92			
Total	0	7273,64	0	0	7028,04	0	13960,92	0	0	13489,52

Table 7 (a) Provision of financial support: Contribution through multilateral channels

Donor funding	Total amount		Status	Funding source	Financial instrument	Type of support	Sector
	Core/ general	Climate-specific	Provided, Committed, Pledged	ODA OOF Other	Grant, Concessional loan Non-concesional loan Equity Other	Mitigation Adaption Cross-cutting Other	Energy Transport Industry Agriculture Forestry Water and sanitation Cross-cutting Other
	Domestic Currency (LVL)	USD					
2011							
Multilateral financial institutions, including regional development banks:							
European Bank for Reconstruction and Development	7028,04	13489,52	Provided	ODA	Grant	Other	Energy
2012							
Multilateral financial institutions, including regional development banks:							
European Bank for Reconstruction and Development	7028,04	13489,52	Provided	ODA	Grant	Other	Energy

Table 7(b). Provision of public financial support: contribution through bilateral, regional and other channels in 2011 and 2012

	Total amount		Status	Funding source	Financial instrument	Type of support	Sector	Additional information
	Climate-specific		Provided, Committed, Pledged	ODA OOF Other	Grant, Concessional loan Non-concesional loan Equity Other	Mitigation Adaption Cross-cutting Other	Energy Transport Industry Agriculture Forestry Water and sanitation Cross-cutting Other	
	Domestic Currency (LVL)	USD						
2011								
Recipient country/ region/ programme:								
Bilateral agreement between LV and Georgia	7029	13491,36	Provided	ODA	Grant	Mitigation	Other	
2012								
Recipient country/ region/ programme:								
Bilateral agreement between LV and Azerbaijan	881,97	1692,84	Provided	ODA	Other	Mitigation	Other	
Bilateral agreement between LV and Georgia	1470,44	2822,34	Provided	ODA	Other	Mitigation	Other	
Bilateral agreement between LV and Moldova	4921,23	9445,74	Provided	ODA	Other	Mitigation	Other	

Table 8. Provision of technology development and transfer support

Recipient country and/or region	Targeted area	Measures and activities related to technology transfer	Sector	Source of the funding for technology transfer	Activities undertaken by	Start year of implementation	Additional information
	Mitigation Adaptation Mitigation and adaption		**Energy Transport Industry Agriculture Water and sanitation Other**	**Private Public Private and public**	**Private Public Private and public**	**Implemented**	
NA	NA	NA	NA	NA	NA	NA	NA

Table 9. Provision of capacity-building support

Recipient country/ region	Mitigation Adaptation Technology development and transfer Multiple areas	Programme or project title	Description of programme or project
Iraq	Multiple areas	Training course for the Ministry of Environment of Iraq Kurdistan Region representatives	The training took place in Latvia 15 – 25 October 2009 and representatives of Kurdistan were introduced with environmental institutional framework and legislation of Latvia as well as implementation experience of a number of environmental projects was shared.[53]
Georgia **Armenia**	Multiple areas		Exchange of experience with the Representatives of Georgian Ministry of Environmental Protection and Natural Resources and Ministry of Nature Protection of Armenia and about Kyoto commitments, including emissions trading.
Georgia	Multiple areas		Exchange of experience and training for Representatives of Georgian Ministry of Environmental Protection and Natural Resources
Georgia	Mitigation	Bilateral agreement	Under agreement action aims to build the capacity of public administration and experts and provide methodological support in receiving country. The skills gained will be used during the project for creating instruments for raising public awareness and to promote climate change mitigation actions and technologies. Exchange of the experience (2011).
Azerbaijan **Georgia** **Moldova**	Mitigation	Bilateral agreement	Under agreement action aims to build the capacity of public administration and experts and provide methodological support in receiving country. The skills gained will be used during the project for creating instruments for raising public awareness and to promote climate change mitigation actions and technologies. Exchange of the experience (2012).

[53] http://varam.gov.lv/lat/aktual/preses_relizes/?doc=9636

Annex 2

Summary of reporting of the Supplementary information under Article 7, paragraph 2, of the Kyoto Protocol

Information reported under Article 7, paragraph 2		
National systems in accordance with Article 5, paragraph 1		Chapter 3.2.
National registries		Chapter 3.3.
Supplementarity relating to the mechanisms pursuant to Articles 6, 12 and 17		Chapter 5.4.
Policies and measures in accordance with Article 2		Chapter 4.3.
Domestic and regional programmes and/or legislative arrangements and enforcement and administrative procedures		Chapter 4.2.
Information under Article 10		
	Art 10a	Chapter 3.2.
	Art 10b	Chapter 4.2., 6.
	Art 10c	NA
	Art 10d	Chapter 8.
	Art 10e	Chapter 9.