

Informative Report
Strategy of Latvia for the Achievement of Climate Neutrality by 2050

2019

Table of Contents

Terms	3
Abbreviations	5
Introduction	6
1. Objective, Indicators, and Directions for Action.....	9
1.1. Overarching Objective and Intermediate Objectives of the Strategy	9
1.2. Indicators	10
1.3. Action Directions	11
1.4. General Principles for the Implementation of LCD and the Strategy	12
2. Basic Assumptions	14
3. Linkage of the Strategy with Existing Legal Acts and Policy Planning Documents	18
4. Current Progress of Latvia in Advancement Towards Climate Neutrality	21
4.1. Structure and Dynamics of GHG Emissions (Excluding the LULUCF Sector)	21
4.2. LULUCF Sector Net Emissions – Structure and Dynamics	24
4.3. Joint Progression of Latvia Towards Climate Neutrality	25
5. Most Significant Factors Affecting the Amount of Occurrence of GHG Emissions of Latvia in Different Sectors of National Economy	27
5.1. Potential of Innovations.....	27
5.2. Energy Sector	27
5.3. Transport	29
5.4. Agriculture and Land Use	30
5.5. Use of Resources	31
5.6. Role of Local Governments and the Urban Environment	34
6. Potential Solutions for Ensuring Low Carbon Development	36
6.1. Research and Innovations in Low Carbon Technologies	36
6.2. Comprehensive Energy Efficiency	38
6.3. Sustainable Energy	40
6.4. Resource-efficient and Environmentally Friendly Transport.....	41
6.5. Sustainable Land Management and Agriculture	44
6.6. Sustainable Consumption and Manufacturing	46
6.7. Sustainable Local Governments and Urban Environment	47
7. Implementation and Review of the Strategy	50
7.1. Parties Involved in the Implementation of the Strategy	50
7.2. Instruments to be Used in the Implementation of the Strategy	51
7.3. Review of the Strategy	54
8. Public Participation	55

Terms

Renewable energy sources	wind, solar, geothermal, wave, tidal, and water energy, as well as aerothermal energy (thermal energy accumulating in the air), geothermal energy (thermal energy under the surface of mainland), and hydrothermal energy (thermal energy in surface waters), gases from waste landfill sites and sewage treatment plants, biogas, and biomass.
Biomass	a resource of organic origin the energy of which is transformed into mechanical energy, thermal energy, and electricity as a result of chemical transformation.
Infrastructure	a component of the territorial structure of national economy consisting of the transport system, communications system, trade system, energy system, water management system, and waste management system, as well as dwellings, schools, health protection, cultural, and sports objects and other residential care objects and their layout in a territory.
Innovation	a process where new scientific, technical, social, and cultural ideas, developments, and technologies or ideas, developments, and technologies of another field are translated into a marketable and competitive product or service.
Kyoto Protocol	an international treaty (adopted in 1997, came into force in 2005) which has been adopted within the scope of the United Nations Framework Convention on Climate Change (UNFCCC), 1992. The Protocol provides for the countries (parties to the UNFCCC) to reduce greenhouse gas emissions based on the scientific consensus that (1) global warming is occurring and (2) it is extremely likely that man-made carbon dioxide emissions have predominantly caused it. The Kyoto Protocol and the Doha Amendment to the Kyoto Protocol adopted in 2012 lays down liabilities for its Parties until 2020.
Cluster	a cooperation network of merchants, research, educational and other related institutions which operates in a specific sector of national economy or in interrelated sectors, uses related technologies and labour resources of similar profile, consists of legally independent merchants which are competing with each other, and concurrently implements mutual cooperation.
Climate	long-term regime of weather conditions forming as a result of solar radiation, nature of the Earth's surface, and the atmospheric circulation processes related thereto. Climate is characterised by medium-term and long-term (at least 30 years) values of atmospheric physical indicators inherent to the Earth as a whole or to a specific territory (country or region).
Climate change	changes in the state of climate identified (for example, using statistical tests) by changes in the average values and/or the variability of such properties which are continuing for a longer period of time, usually for a decade or more. Climate change can occur as a result of different natural internal processes or also under the influence of external forces, for example, exposure to solar cycles, volcanic eruptions, and continuous anthropogenic changes in the atmospheric composition and land use.
Climate neutrality	the state where human activity causes net zero impact on the climate system. Greenhouse gas emissions need to be balanced against carbon dioxide removals to achieve such state.

Climate resilience	social and ecological capacity of the systems (1) to absorb stresses and maintain their functions in the face of external pressures imposed by climate change, as well as (2) to reorganise their activities in preparation for future impacts of climate change.
IPCC	Intergovernmental Panel on Climate Change the objective of which is to ensure objective, scientific opinion on climate change, its natural, political, and economic impact and risks, as well as the possible responses.
Low carbon development	sustainable ¹ economic, environmental, and social development which is based on both low anthropogenic (caused by human activity) greenhouse gas emissions and high level of carbon dioxide removals ² and resilience against climate change, reduction of the risks caused thereby, and use of the benefits created by climate change.
Organic soils	Soils with high content of organic matter.
Paris Agreement	the first general legally binding global agreement in the field of climate the objective of which is to strengthen global action for the prevention of climate change and to hold global warming well below 2 °C above the pre-industrial levels and to pursue efforts to limit the temperature increase to 1,5 °C. The Paris Agreement was adopted in the Conference of the Parties to the United Nations Framework Convention on Climate Change in December 2015.
Park & ride	system for parking vehicles and transfer which provides for the link-up of parking lots for vehicles with the public transport network in order to use the public transport more fully and to relieve the transport flow in the city centre.
Greenhouse gases	CO ₂ (carbon dioxide), CH ₄ (methane), N ₂ O (nitrous oxide), nitrogen trifluoride (NF ₃) and fluorinated gases or F-gases – SF ₆ (sulphur hexafluoride), PFC (perfluorocarbons), HFC (hydrofluorocarbons).
Greenhouse effect	the process of warming the atmospheric air occurring as the stratum created by the water vapour and the greenhouse gases in the atmosphere precludes the Earth from reflecting the heat received from the Sun (in the form of infrared radiation), therefore the heat accumulates in the lowest strata of the atmosphere, causing and facilitating climate change.

¹ The concept of long-term development is defined in the Report of the United Nations World Commission on Environment and Development *Our Common Future* (also called Report of the Brundtland Commission, 1987) and has been used internationally and extensively since the UN conference of 1992 in Rio de Janeiro *Environment and Development*. Sustainable development is defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. Sustainable development is characterised by three interrelated dimensions: environmental, economic, and social dimension. This means that strict environmental protection and climate resilience requirements does not preclude high economic indicators, that economic growth may not degrade the environment, and concurrently high living standard is ensured.

² Carbon dioxide (CO₂) removals are a process where as a result of photosynthesis organic matters, as well as oxygen are synthesised from inorganic carbon dioxide and water compounds, using light energy.

Abbreviations

RES – renewable energy sources
UN – United Nations Organization
CCS – carbon capture and storage
CCU – carbon capture and use
CO₂ – carbon dioxide
CNG – compressed natural gas
EC – European Commission
EC Communication – “A Clean Planet for all! A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy”
EU – European Union
ETS – EU Emissions trading scheme
HPP – hydroelectric power plant
GDP – gross domestic product
IPCC – Intergovernmental Panel on Climate Change
CEF 2030 – The 2030 climate and energy framework
Convention – The UN Framework Convention on Climate Change (UNFCCC)
UAA – utilised agricultural area
Cabinet – Cabinet of the Republic of Latvia
NACE – EU Statistical Classification of Economic Activities
NDC – Nationally Determined Contribution (here: for the implementation of the Paris Agreement)
OECD – Organisation for Economic Co-operation and Development
LCD – low carbon development
GHG – greenhouse gases
Strategy – Strategy of Latvia for the Achievement of Climate Neutrality by 2050
TEN-T – Trans-European Transport Network
MoEPRD – Ministry of Environmental Protection and Regional Development
WPP – wind power plant
LULUCF – land use, land use change and forestry sector
GPP – green public procurement

Introduction

The Strategy is a long-term policy planning document which has been developed to increase the economic competitiveness of Latvian national economy, as well as to ensure a safe living environment for inhabitants of Latvia concurrently with the restriction and mitigation of climate change.

As the LCD efforts unite the majority of the most influential economies of the world, the development of the Strategy at international and EU level is determined by the Paris Agreement of The United Nations Framework Convention on Climate Change, 1994 (hereinafter – the Convention) and Regulation 2018/1999³ of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action, whereas at national level – by the Declaration on the Intended Activities of the Cabinet Headed by Arturs Krišjānis Kariņš⁴.

Within the context of the international policy, the Strategy has been developed to promote:

- the fulfilment of GHG emission reduction commitments in accordance with the Paris Agreement in a cost-efficient manner;
- monitoring in relation to the actual and expected progress towards the reduction of GHG emissions⁵.

The Strategy also needs to be developed because LCD directions have not been developed in the national level policy planning documents of Latvia, as well as there is a lack of coherent policy for the limitation of GHG emissions.

Historically, in the middle of the 1750s, upon rapid development of the manufacturing and substantial increase in coal consumption, the atmospheric pollution caused by human activity and also GHG emissions, particularly carbon dioxide, started to increase dramatically, amplifying the greenhouse effect.

In 2018, in comparison to the 1880s, the increase in the global average air temperature was 1.1 °C⁶, however, in Latvia this increase has been more substantial – 1,5 °C. Nowadays, the current records in terms of both the average and maximum temperature and precipitation, the number and strength of storms, and other parameters are being continuously surpassed. The concentration of CO₂ which is closely linked to the increase in the average air temperature keeps increasing and already reached 412 ppm⁷ in June 2019.

International basic conditions of the climate change policy are included in the Convention. A new significant long-term document – the Paris Agreement – was adopted in the Conference of the Parties to the Convention in Paris in December 2015. The objective of the Agreement is to strengthen the global action for the prevention of climate change and to hold the global warming well below 2 °C in comparison with the pre-industrial level and to pursue efforts to limit the temperature increase to 1.5 °C as this would significantly reduce the risks and impacts of climate change. The Paris Agreement provides for promoting the allocation of investments according to low-carbon and climate-resilient development.

³ Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action. Available online: <https://eur-lex.europa.eu/legal-content/LV/TXT/?uri=CELEX:32018R1999>

⁴ Declaration on the Intended Activities of the Cabinet Headed by Arturs Krišjānis Kariņš. Available online: https://www.mk.gov.lv/sites/default/files/editor/kk-valdibas-deklaracija_red-gala.pdf

⁵ Greenhouse gases (GHG) are carbon dioxide (CO₂), methane (CH₄), nitrogen oxide (N₂O), hydrofluorocarbons (HFC), perfluorocarbons (PFC), nitrogen trifluoride (NF₃), and sulphur hexafluoride (SF₆). The most important GHGs are CO₂, CH₄, and N₂O.

⁶ Global Temperature Anomalies from 1880 to 2018. 6 February 2019. Available online: <https://svs.gsfc.nasa.gov/4626>

⁷ Ppm (parts per million) – a part per million, the relation of the mass of the substance against the whole mass of air, CO₂ concentration in the air. Available online: <http://climate.nasa.gov/vital-signs/carbon-dioxide/>.

The IPCC Report⁸ indicates that the current commitments of the world countries within the scope of the Paris Agreement for the climate change mitigation are insufficient and will not ensure restriction of global warming within the limits of 1.5 °C, therefore, the countries must enhance the level of ambitions in relation to the climate goals brought forward in order to land on the correct trajectory to achieve the objective.

Scientific evidence confirms that the global warming caused by human activity has already reached 1 °C above pre-industrial levels and continues to increase by approximately 0.2 °C per ten years. If sufficient work is not put into the field of the climate policy at international level, the global increase of temperature might reach 2 °C soon after 2060 and could keep rising.

The IPCC Report confirms that approximately 4 % of the global terrestrial land area is projected to be affected by ecosystem transformations at 1 °C of global warming, but such impact will affect already 13 % of the land area if global warming is to reach 2 °C. It is foreseeable that, if global warming will reach 2 °C, 99 % of the world coral reefs will disappear. Global warming of approximately 1.5 °C to 2 °C can initiate processes resulting in melting of the Greenland ice sheet. Under certain circumstances sea-level can rise even by 7 metres, and this will directly affect coastal territories throughout the world, including the low plains and islands of the coast of Europe. The Arctic ice is already melting rapidly during the summer, and it has a negative impact on the biological diversity of the Nordic countries and the livelihood of the local inhabitants.

The combat against climate change caused by the increase in GHG emissions is also one of the 17 UN Sustainable Development Goals. Climate change can cause problems related to food availability, human health, welfare, employment, national economic development, safety, spatial development, natural integrity, biological diversity, and other fields. The implementation of LCD is not just a challenge, but at the same time an opportunity, as upon its implementation benefits would arise not only in the environmental dimension, but also in the social and economic dimensions (see Figure 1).

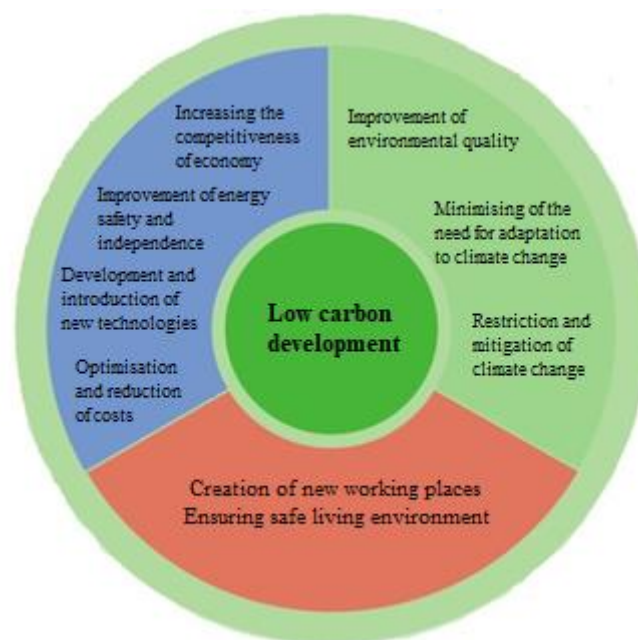


Figure 1. Low carbon development and dimensions of sustainable development

⁸ IPCC Special Report *Global warming of 1.5°C* (an IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty). Available online: <https://www.ipcc.ch/sr15/>.

The Strategy should be implemented as comprehensively, rapidly and efficiently as possible, thus both fulfilling the international goals and improving the living standard of inhabitants, and also strengthening the competitiveness of Latvian economy (by implementing such measures as improvement of energy efficiency, promotion of the use of local (renewable) energy sources, implementation of the circular economy and bioeconomy, promoting the development and manufacturing of climate technology innovations in Latvia).

The Strategy is a long-term strategic document to be introduced by horizontal integration of the GHG and climate resilience goals in all sectors of national economy. In parallel with the introduction of the Strategy, a periodic evaluation of the progress of the Strategy and the effectiveness of its implementation should be provided, ensuring achievement of the objectives of the Strategy.

The Strategy first sets out an outline of the key assumptions made during its development followed by the definition of the objective and performance-based indicators of the Strategy according to which progress could be determined. Afterwards the current information regarding the progress of Latvia in limitation of GHG emissions during the development of the Strategy has been provided and expanded in the following chapter, identifying the most essential factors of occurrence of GHG emissions which are specific to Latvia. Afterwards the potential solutions for the implementation of LCD have been offered, as well as a report on the implementation of the Strategy and indications regarding public participation are provided.

1. Objective, Indicators, and Directions for Action

1.1. Overarching Objective and Intermediate Objectives of the Strategy

LCD is a process that must be implemented by striving for climate neutrality.

The **overarching objective** of the Strategy: **climate neutrality** of Latvia in 2050.

As the final objective of the implementation of LCD is achieving climate neutrality of Latvia, it is essential not only to reduce GHG emissions, but also to increase CO₂ removals. Therefore there are two strategic objectives:

- 1) reduction of GHG emissions in all sectors of national economy;
- 2) increase of CO₂ removals.

The objective should be achieved in three stages of reduction of GHG emissions (in decades). The performance-based indicators to be achieved are presented in Table 1.

Table 1

Performance-based Indicators of the Strategy (Overarching Objective and Intermediate Objectives)

	Base year 1990 ⁹	Projection for 2020 ¹⁰	Objectives		
			2030	2040	2050
GHG emissions (without the LULUCF sector)	26 299 kt CO ₂ eq.	-55 %	-65 % (in comparison with 1990)	-85 % (in comparison with 1990)	Climate neutrality (non-reducible GHG emissions are compensated by removals in the LULUCF sector)
CO₂ removals and GHG emissions in the LULUCF sector	-9828 kt CO ₂ eq. (removals)	2094 kt CO ₂ eq. (emissions)	≤1047 kt CO ₂ eq. (emissions)	Net-zero emissions (removals of the sector compensated emissions of the sector)	
Transition towards climate neutrality (total GHG emissions, including the LULUCF sector)	16 471 kt CO ₂ eq.	-16 %	-38 %* (in comparison with 1990)	-76%* (in comparison with 1990)	

* the objective is deemed fulfilled if the deviation is ±5 %

The objectives for 2030 and 2040 encircled with a yellow frame in Table 1 may be changed if studies (the Protocol Decision of the Strategy provides for the conducting of research by sectoral ministries as to how to advance towards climate neutrality within the scope of their

⁹ According to the GHG inventory submitted to UNFCCC in 2019.

¹⁰ Indicative estimates regarding the advancement in the direction of achieving the objectives according to the data available in 2019.

liability/area) and discussions lead to an agreement on the most appropriate trajectory for achieving the objective of climate neutrality in 2050.

The relevant tiered approach for achieving the common overarching objective (climate neutrality in 2050) has been specified according to the so called innovation S-curve or Bass Diffusion Model which provides a mathematical description of the manner in which new innovations are adapted under the influence of interaction between the existing and potential user. According to this theory, the initial section of the curve of innovations is flat because initially innovations are used only by the innovators, afterwards also by imitators, whereas, in the middle section the number of users rapidly increases and the majority starts using the technologies. At the final section, the rate of increase in users of technology decreases once again and the increase in users is slow. Considering that the implementation of LCD largely depends on the speed in which “green” technologies and innovations are spreading, the objectives of the Strategy of Latvia have also been determined according to the abovementioned theory, i.e., the highest reduction of GHG emission (-38 %) must be achieved in the middle section (2030-2040).

1.2. Indicators

Indicators which point to the progression trends (moving closer or further away from the objective of climate neutrality) are important for the assessment of the progress made in the implementation of the Strategy.

1) Intensity of GHG emissions (t CO₂ eq.¹¹ per mill. EUR)

The Strategy not only provides for the economic development of Latvia and increase in GDP, but also for reduction of GHG emissions in all sectors of national economy simultaneously. The intensity of GHG emissions is an indicator based on which the extent to which economic growth is “linked” to the generated amount of GHG emissions can be established. Reduction in the intensity of GHG emissions points to the implementation of LCD which has also contributed to economic growth in the country.

2) Intensity of GHG emissions from the energy sector – GHG emissions per total consumption of primary energy sources (t CO₂ eq. per total consumption of energy sources)

Taking into consideration that the sector of service provision is relatively developed in Latvia, however, manufacturing is less developed (the sectors of Latvian national economy specialising in the field of service provision generate almost 65 % of the total added value), the indicator which is more related to the manufacturing processes and energy consumption is the intensity of GHG emissions of the energy sector per total consumption of primary energy sources. This indicator includes the consumption of energy sources in the production of thermal energy and electricity (transformation sector) and in the final consumption which, in turn, includes all sectors of national economy (manufacturing and construction, transport (transport services form the most essential part of the service export), agriculture, forestry), as well as households.

¹¹ CO₂ eq – the equivalent of carbon dioxide is a unit of measurement expressed in CO₂ emissions to which emissions of different greenhouse gases are compared on the basis of the global-warming potential created thereby.

3) Changes in the amount of GHG emissions in relation to the previous year on sectoral basis (kt CO₂ eq.)

In order to assess the dynamics and trends of GHG emissions in different sectors of national economy, each year (starting from 1990) in Latvia GHG emissions and removals within energy, transport, industrial processes and product use, agriculture, LULUCF, and waste management sectors are recorded. Annual assessment of changes in the amount of GHG emissions in each sector in relation to the previous period allows to ascertain that advancement towards climate neutrality is continuous and takes place in all sectors of national economy.

4) Total balance of emissions and removals of the land use, land-use change and forestry sector

As the LULUCF sector has a special role in advancement towards climate neutrality, this indicator shows whether/to what extent the whole LULUCF sector is able to compensate its own GHG emissions in the current year.

1.3. Action Directions

- **Two basic approaches to achieving climate neutrality**

Two basic approaches may be used to achieve climate neutrality:

- 1) technological solutions;
- 2) change of the lifestyle.

The technological solutions approach includes solutions primarily focusing on direct reductions of GHG emissions (technological and process solutions). Upon implementing this tactic, substantial investments should be provided:

- in direct reductions of GHG emissions (in energy, transport, agriculture, waste management, industrial processes, and other sectors);
- in development and commercialisation of “green” innovations which, in the optimum scenario, would also provide a possibility for the export of innovative technologies.

In turn, the approach of changing the lifestyle includes solutions primarily focusing on changing the lifestyle and indirect reductions of GHG emissions by implementing:

- extensive measures for informing and educating the public to ensure the awareness and interest of each inhabitant in the advancement towards climate neutrality;
- greening of the tax system by adapting the whole tax system so that the general long-term direction of the State would be clear both to the inhabitants and merchants (i.e., so that tax policy would not give contradictory signals), and economic stimuli to choose more environmentally friendly habits and technologies would be created for everyone.

- **Solutions for the implementation of LCD in different sectors of national economy**

To implement the Strategy successfully, it is necessary to plan appropriate actions which include both general (horizontal) implementation of the LCD principles and also actions in sectoral policies, including all sectors of national economy:

- ensure that LCD aspects are integrated in all studies, low carbon innovations and technologies are commercialised and transferred to all sectors of national economy;
- ensure comprehensive energy efficiency in every sector of national economy;

- ensure that only renewable energy sources are used for energy generation in all sectors (where it is technologically possible), and that local energy sources are used and the energy market is completely connected and freely accessible to everyone;
- ensure optimum transport infrastructure, to change the travel behaviour of inhabitants, to increase the use of resource-efficient and environmentally friendly types of vehicles;
- ensure sustainable land management, achieving high productivity in agriculture, as well as managing the forests of Latvia in a sustainable manner;
- ensure that inhabitants of Latvia are implementing environmentally friendly lifestyle and companies have adapted to the tendencies of the global market and are successfully implementing circular economy;
- ensure sustainable development of local governments, promoting smart, climate-neutral, and flexible urban environment, inter alia, choosing the green infrastructure in the development of urban environment.

More detailed description of action directions is provided further in the text (see Chapter 6).

Specific measures and the contribution of different sectors of national economy to achieving the objective of climate neutrality will be specified in subsequent NECPs, as well as in sectoral planning documents of a shorter term.

1.4. General Principles for the Implementation of LCD and the Strategy

Movement towards climate neutrality must go hand in hand with ensuring the economic welfare and social justice (see Figure 1).

General (horizontal) principles of LCD (determine *what* should be implemented):

- restructuring of national economy, optimisation of processes in a cost-efficient manner without reducing competitiveness (ensuring stable and increasing decoupling of GDP from GHG emissions);
- increasing the resource-efficiency, including energy efficiency (principle: energy efficiency first);
- promoting the use of renewable energy sources;
- the State does not subsidise the use of fossil energy sources;
- development and commercialisation of green innovations and research;
- creation of new green working places;
- promotion of mutual communication, cooperation, symbiosis, and networking;
- horizontal integration of the abovementioned principles into all policies of national economy and investments of the public funding is ensured.

General principles for the implementation of the Strategy (determine *how* the Strategy should be implemented):

- measures with the lowest costs are implemented first;
- impact of a particular measure is evaluated not only in short-term, but also in long-term;
- reliance on nationally available resources;
- economic development is not based on intense consumption of energy and resources¹²;

¹² Upon continuing the current development which is based on intense consumption of energy and resources, resources of the planet are being depleted and its sustainability is at risk. In order to sustain ourselves in 2050, taking into account the number of inhabitants and the current consumption trends, we will need the equivalent of more than two planets in total.

- socially just transition – social dialogue is ensured, the specific features and possibilities of each sector of national economy are taken into consideration;
- development is not in contradiction with the objectives of biological diversity, nature and environmental protection.

2. Basic Assumptions

Upon developing the Strategy and the vision included therein, as well as choosing the potential solutions, several assumptions in relation to trends in Latvia and in the world until the middle of this century were made – the macro-economic situation and the number of inhabitants in Latvia, climate change, economic progress of other countries of the world, the awareness of inhabitants of Latvia as to climate change, the development of green technologies and price trends, as well as the consequences of failure to act in relation to the reduction of climate change.

- **Macro-economic situation of Latvia**

GDP of Latvia will continue to increase¹³ and will reach EUR 42 billion in 2050 (at constant prices of 2010). The number of inhabitants will decrease to 1.5 mill.

- **Climate change**

The IPCC Report¹⁴ established that losses upon increase in the global air temperature by 2 °C would be significantly higher than at 1.5 °C, therefore, the need both to urgently reduce GHG emissions and to introduce thought-out measures for adaptation to climate change has been emphasised. Scientific research shows that the risks which were previously foreseen in relation to the increase of global temperature within the limits of 1.5 °C to 2 °C are much higher than assumed hitherto and the spiral of irreversible climate change might set in between the very limits of 1.5 °C and 2 °C.

According to the 2017 report of *valsts sabiedrība ar ierobežotu atbildību "Latvijas Vides, ģeoloģijas un meteoroloģijas centrs"* [limited liability company Latvian Environment, Geology and Meteorology Centre], *Klimata pārmaiņu scenāriji Latvijai* [Climate Change Scenarios for Latvia]¹⁵, the air temperature in Latvia will increase on average by 3.5 °C to 5.5 °C by the end of the century. The maximum annual air temperature in Latvia might even reach +35 °C by the end of the century. However, until 2100 the most significant increase will be in the minimum air temperature – on average by 9.3 °C to 13.5 °C.

The analysis of current climate conditions, as well as future scenarios of climate change graphically demonstrate that distinct climate change trends will continue throughout this century. The most significant changes will affect the extreme values of climate parameters indicating that weather conditions not characteristic to and extreme for Latvia will be a more frequent reality in the future.

Such risks as changes of seasons, i.e., changes of the vegetation period, increased fire hazard, proliferation of pests and pathogens, tree diseases, expulsion of local species, entering of new species, spread of diseases of the respiratory system, flood caused by precipitation, wind surges, extremely strong wind gusts, occurrence of disturbances in electricity supply, reduction of frost, black frost, drying of soil, eutrophication, damages to infrastructures, overheating of equipment, spread of infectious diseases, and heat strokes are anticipated as the most essential risks caused by climate change in Latvia. Thus, climate change will cause risks in Latvia and, therefore, also losses in the field of health and welfare, civil protection, agriculture and forestry,

¹³ Macro-economic forecast until 2030 of the Ministry of Economics (2018) extrapolated by the FEI until 2050.

¹⁴ IPCC Special Report *Global warming of 1.5°C* (an IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty). Available online: <https://www.ipcc.ch/sr15/>.

¹⁵ Latvian Environment, Geology and Meteorology Centre. Report *Klimata pārmaiņu scenāriji Latvijai* (2017). Available online in Latvian: <http://www2.meteo.lv/klimatariks/zinojums.pdf>.

tourism and landscape planning, construction and planning of infrastructure, as well as biological diversity and diversity of ecosystem services.

- **International context**

It is projected that the awareness of inhabitants regarding the need to act for the mitigation of climate change in Europe, as well as in other countries of the world will increase.

The Communication published by the EC on 28 November 2018, *A Clean Planet for all! A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy* (EC Communication), explains that only the full implementation of the agreed EU legislation will already ensure reductions of GHG emissions of around 45 % by 2030 and around 60 % by 2050. However, the EU should strategically strive towards climate neutrality in 2050 which, like by the majority of EU Member States, is also supported by Latvia¹⁶ believing that the EU must take the leadership role in the fight against climate change, as well as expressing readiness to review the NDC submitted to the EU for the implementation of the Paris Agreement or the goals for the reduction of GHG emissions for 2030.

As the Paris Agreement has been ratified by almost all countries of the world, it is assumed that all of them will move towards low carbon development. Different industries are already becoming aware of the advantages of circular economy, thus the demand for energy-intensive raw materials will decrease, while the productivity of materials will increase and the amount of generated waste will decrease.

Associations of different sectors have also expressed support and undertaken to take active measures in the field of climate change mitigation, voluntarily setting for themselves goals for climate change mitigation to be achieved by 2050, for example, the European Chemical Industry Council, the International Air Transport Association (IATA), and the Air Transport Action Group (ATAG).

- **Awareness of the inhabitants of Latvia of climate change**

Although the inhabitants of Latvia have had one of the lowest awareness of climate change as a global problem among the EU states, it is, however, increasing. More and more inhabitants of Latvia recognise that climate change is a very serious problem¹⁷. Convincing results have also been obtained in 2017 in the survey¹⁸ organised by Kantar TNS Latvia, resulting in a conclusion that 85 % of the inhabitants of Latvia (from 15 to 74 years of age) recognise that climate change is occurring and can be observed in Latvia. Moreover, the inhabitants have also become more socially active, the movement Fridays for Future Latvia has joined the global climate strike, organising several protests related to the green policy in which several hundreds of young persons¹⁹ had gathered, directing attention towards the need for more ambitious actions to achieve the goals of the Paris Agreement.

Taking into account the amplification of the consequences caused by climate change, as well as the political settings of the EU, the awareness and interest of the inhabitants of Latvia in climate change mitigation will keep increasing.

¹⁶ Position No. 2 of the Republic of Latvia of 11 June 2019. *On Communication of the European Commission: A Clean Planet for all! A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy*

¹⁷ Special Eurobarometer Report. *Climate change*, 2017. Available online: https://ec.europa.eu/clima/sites/clima/files/support/docs/report_2017_en.pdf

¹⁸ Baltic Environmental Forum, *Informētība un attieksme pret klimata pārmaiņām* [Awareness and Attitude Towards Climate Change]. Results of the survey of inhabitants of Latvia, 2016. Available online: http://www.bef.lv/fileadmin/Projektu_faili/SEG_emisijas/Petijums_SKDS_27_06_2016.pdf

¹⁹ The climate walk of 15 March 2019 gathered 650 participants; approximately 250 persons joined the Baltic Climate Road campaign of 12 April at the Cabinet, and approximately 300 persons participated in the walk of 24 May.

- **Development of green technologies make them more available and common**

In addition, extensive determination of policies for the promotion of LCD in the energy sector will create new working places in the energy sector, i.e., more extensive switch towards renewable energy sources will create more working places in the energy sector than working places that will be liquidated for the persons employed in the industry of fossil fuel, having an overall positive influence on economy at large by promoting a GDP increase²⁰.

Upon referring to that indicated in the report of the International Renewable Energy Agency, the Strategy assumes that energy transition will be based on a rapid price reduction for renewable energy sources, the prices for solar panels and wind energy will continue to decrease as it already can be seen. Also, in relation to the transport sector, it is assumed that in the future renewable electricity, developed biofuels, and different technologies of electrification, including electric cars, will dominate in the transport energy.

In order to implement LCD, it will be necessary to stimulate significant additional investments within the scope of modernisation and decarbonization of the EU economy. Today around 2 % of the EU GDP is invested in the EU energy system and related infrastructure (except for the investments related to replacement of vehicles). According to the EU Communication, the EU would have to increase this amount to 2.8 % or around EUR 520–575 billion per year in order to achieve a climate-neutral economy²¹.

Transformation of energy (transition from fossil energy sources to renewable ones) is economically feasible because additional costs will be covered from savings from reduced air pollution, health improvements, lower damages in comparison with the situation where nothing is done to mitigate climate change.

- **Failure to act in climate change mitigation causes economic losses and requires additional costs**

The environmental impact caused by climate change may have a significant impact on the productivity of the economy, infrastructure, public health, food availability, biological diversity, and political stability of Europe. The economic losses caused by disasters related to weather conditions in 2017 reached a record-high amount – EUR 283 billion.²² Currently such disasters directly affect 5 % of inhabitants of Europe, however, by 2100 their direct impact could be felt already by two thirds of Europeans.²³

The results of economic calculations show that, for instance, the annual increase of losses arising from damages to buildings caused by high tide in all towns alongside the sea coast in Latvia in the time period from 2040 to 2070 might be EUR 1.5 million per year, but in the time period from 2070 to 2100 it might reach EUR 3 million per year.²⁴

²⁰ According to the Eurofound study, *Energy scenario: Employment implications of the Paris Climate Agreement, Latvia has a very high potential for the increase of GDP upon implementation of the goals brought forward in the Paris Agreement*. Available online:

https://www.eurofound.europa.eu/sites/default/files/ef_publication/field_ef_document/fomeef18003en.pdf

²¹ European Commission. In-depth analysis in support of the commission Communication COM(2018) 773. *A Clean Planet for all A European long-term strategic vision for a prosperous, modern, competitive and climate neutral economy*, 2018. Available online: https://ec.europa.eu/clima/policies/strategies/2050_en

²² European Commission, Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee, the Committee of the Regions, and the European Investment Bank. *A Clean Planet for all! A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy*, 2018. Available online: <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2018:0773:FIN:LV:PDF>

²³ Ibid.

²⁴ Centre of processes analysis and research. *Risku un ievainojamības novērtējums un pielāgošanās pasākumu identificēšana Civiltās aizsardzības un ārkārtas palīdzības jomā*

In turn, the impact of increase in flood caused by rain and melting of snow under exposure to climate change on buildings in Latvia may cause annual economic losses in the amount of EUR 40–50 thousand (in the time period from 2020 to 2040) and around EUR 160–210 thousand in the time period from 2070 to 2100. Due to the increase of overload caused by snow accumulation on roofs the projected economic danger in the nearest future (until 2040) is around EUR 90 thousand per year, but at the end of the century (in the time period from 2071 to 2100) it will be around EUR 300–700 thousand per year.

Upon evaluating the days of delay occurring due to the degradation of tracks, the annual late losses in the time period from 2040 to 2070 will be around EUR 0.2 million with an increase of EUR 0.1 million, but in the time period from 2070 to 2100 – EUR 0.4 million and EUR 0.3 million accordingly. Studies show that for Latvia additional annual financial losses will also be caused by increase in the damages caused by high tide to roads alongside the sea coast and in towns of river estuaries, increase of damages caused by downpour flood to roads (together with decrease in the freeze-up period of roads), increased melting of asphalt, and other damages to the road surface, increased bending of tracks, depreciation of materials, and instability of banks due to the heat, increase of damages caused by high tide to ports²⁵.

[Risk and Vulnerability Assessment and Identification of Adjustment Measures in the Field of Civil Protection and Emergency Assistance]. Available online: http://petijumi.mk.gov.lv/sites/default/files/title_file/petijums_varam_2016_2017_risku_un_ievain_novert_un_pielago_pasak_identific_civilas_aizsardz_arkart_palidz_joma.pdf

²⁵*Risku un ievainojamības novērtējums un pielāgošanās pasākumu identificēšana būvniecības un infrastruktūras jomā* [Risk and Vulnerability Assessment and Identification of Adjustment Measures in the Field of Civil Protection and Emergency Assistance], final report, association *Zaļā brīvība* [Green Freedom], 2017. Available online: http://www.varam.gov.lv/lat/publ/petijumi/petijumi_klimata_parmainu_joma/?doc=23668

3. Linkage of the Strategy with Existing Legal Acts and Policy Planning Documents

The need for the development of the Strategy has been specified in several international and EU level documents, and in terms of content it includes the competences included in the national intersectoral policy planning documents.

- **International documents**

The Convention emphasises the need for the reduction of GHG emissions to reduce human impact on the climate system and to allow ecosystems to adapt to climate change.

The Paris Agreement which was adopted by the Conference of the Parties to the Convention at its twenty-first session in Paris, France, prescribes that Parties to the Convention should formulate long-term low GHG emission development strategies²⁶.

In 2015, the UN General Assembly adopted the resolution *Transforming our world: the 2030 Agenda for Sustainable Development* or Agenda 2030. 17 Sustainable Development Goals (SDG) are determined therein in order for poverty to be eradicated in the world and the global development to be sustainable. One of them is: “Take urgent action to combat climate change and its impacts.”

- **Documents of the European Union**

The European Council invites the Council of the European Union and the European Commission in the conclusions of 20 June 2019²⁷ to advance work on the conditions, the incentives and the enabling framework to be put in place in order to ensure a transition to a climate-neutral EU that will preserve European competitiveness, be just and socially balanced, take account of Member States’ national circumstances and respect their right to decide on their own energy mix. The conclusions of the Foreign Affairs Council of 18 February 2019²⁸ emphasize that climate change is a direct and existential threat the consequences of which the world is already witnessing, yet action to stem it remains insufficient.

The EU has included the development of the Strategy in its policy documents according to the international documents. Article 4 of Regulation (EU) No 525/2013 of the European Parliament and of the Council²⁹ already determined that EU Member States must prepare national low-carbon development strategies and report on the progress of development starting from 2015, in turn, the provisions of Regulation (EU) No 525/2013 are integrated in Regulation No 2018/1999, as well as it is specified that each EU Member State must prepare and submit its LCD strategy for 2050 to the European Commission by 1 January 2020.

A significant aggregate of action policies at EU level is the Policy Framework for Climate and Energy from 2020 to 2030 which includes the joint objectives of the EU for reduction of GHG emissions and the objectives for the reduction of GHG emissions of Member States for sectors of the EU emissions trading scheme and non-ETS sectors³⁰, as well as in the total final energy consumption of RES, and the energy efficiency objectives. Upon

²⁶Article 4(19) of the Paris Agreement.

²⁷Conclusions of the European Council of 20 June 2019. Available online: <https://www.consilium.europa.eu/media/39953/20-21-euco-final-conclusions-lv.pdf>

²⁸Conclusions of the Foreign Affairs Council of 18 December 2019. Available online: <http://data.consilium.europa.eu/doc/document/ST-6153-2019-INIT/en/pdf>

²⁹Regulation (EU) No 525/2013 of the European Parliament and of the Council of 21 May 2013 on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change and repealing Decision No 280/2004/EC.

³⁰Non-ETS – processes not included in the EU ETS, for instance, minor energy sector, industrial processes not included in the EU ETS (use of raw materials) and use of solvents and substances depleting the ozone layer (fluorinated gases), transport, agriculture, waste management.

implementation of the Strategy, Latvia should take into consideration the EU legal acts approved within the scope of the PFCE package and the objectives specified for Latvia (for ETS sectors (joint for the EU) and for non-ETS sectors (individual for each EU Member State)).

In addition thereto several aggregates (packages) of regulation have been developed in the EU, taking into consideration the LCD principles, for example, the Mobility Package³¹, the Circular Economy Package³², as well as the Action Plan for Sustainable Finance³³, and Clean Energy for All Europeans³⁴.

- **National policy planning documents**

At national level, the Sustainable Development Strategy of Latvia until 2030, as well as other policy planning documents of Latvia, including sectoral planning (see Figure 2), also provide for comprehensive sustainable development which is based on low GHG emissions.

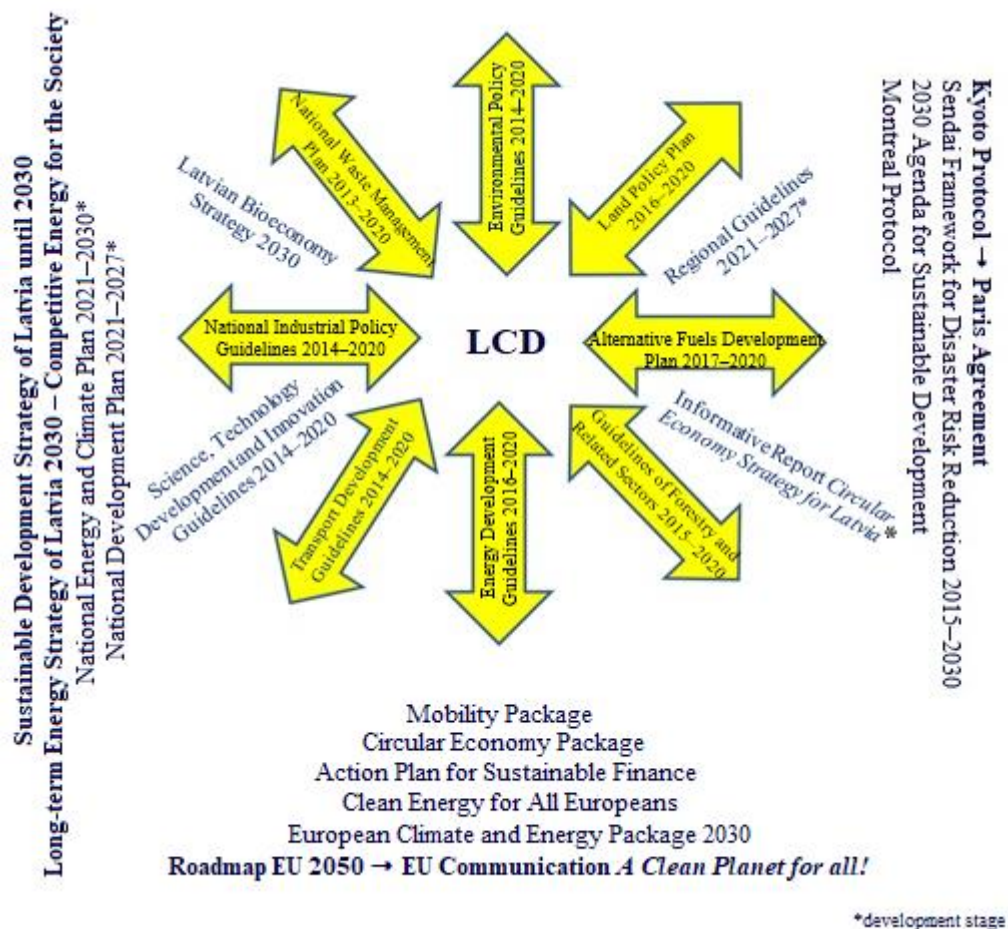


Figure 2. Policy planning documents supporting the Strategy

³¹ Europe in movement: The Commission supplements its agenda in relation to safe and clean mobility that ensures connectivity. https://ec.europa.eu/latvia/news/eiropa-kust%C4%ABb%C4%81-komisija-papildina-savu-darbak%C4%81rt%C4%ABbu-attiec%C4%ABb%C4%81-uz-dro%C5%A1u-t%C4%ABru-un_lv

³² On the Circular Economy Package. Available online:https://europa.eu/rapid/press-release_MEMO-15-6204_lv.htm Available online:

³³ Sustainable finance: Commission's Action Plan for a greener and cleaner economy. Available online:https://europa.eu/rapid/press-release_IP-18-1404_lv.htm

³⁴ Clean energy for all Europeans - Realization of the growth potential of Europe. https://ec.europa.eu/latvia/news/t%C4%ABra-ener%C4%A3ija-visiem-eiropas-iedz%C4%ABvot%C4%81jiem-%E2%80%94-eiropas-izaugsmes-potenci%C4%81la-realiz%C4%93%C5%A1ana-0_lv

As currently LCD directions are not sufficiently developed in the policy planning documents of national level of Latvia, as well as there is a lack of a unified action policy for the reduction of GHG emissions, the development directions for the promotion of LCD currently included in the policy planning documents of national level, as well as the planning documents of different sectors are compiled and supplemented in this Strategy.

4. Current Progress of Latvia in Advancement Towards Climate Neutrality

4.1. Structure and Dynamics of GHG Emissions (Excluding the LULUCF Sector)

GHG emissions in Latvia mainly occur in such sectors of national economy as energy, transport, industrial processes and product use, agriculture and waste management (Figure 3). The land use, land-use change and forestry sector is described in Chapter 4.2 as both the generator of GHG emissions and the facilitator of CO₂ removals.

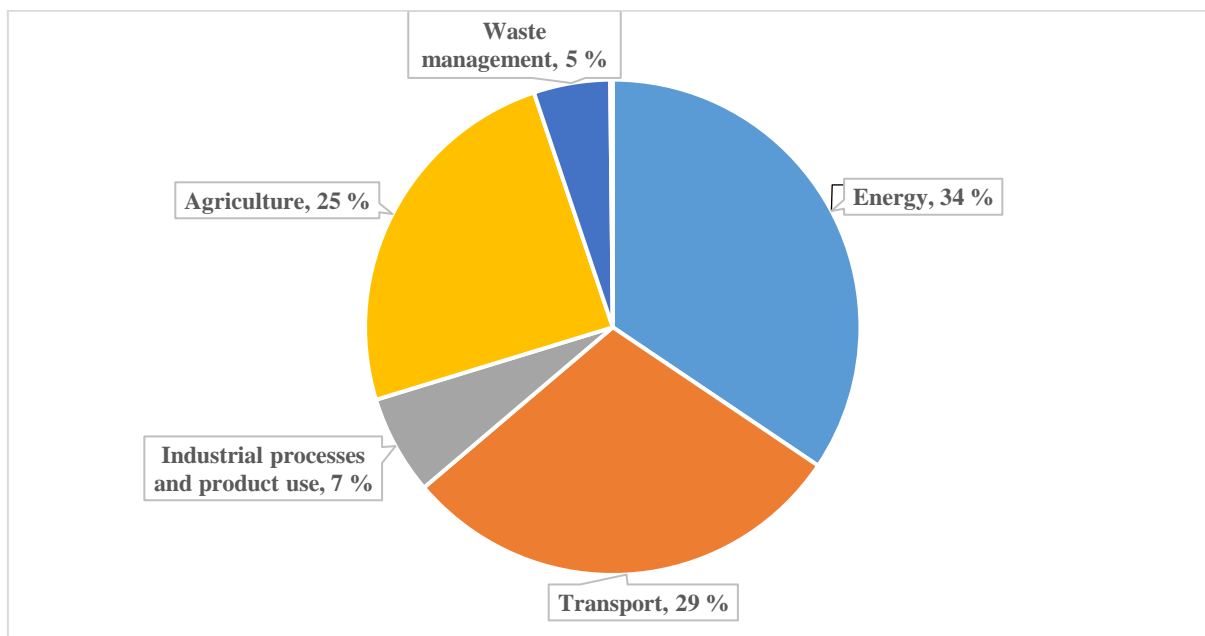


Figure 3. Main sources of GHG emissions in 2017³⁵ (excluding LULUCF)

Each of the sectors indicated in Figure 3 also includes more detailed sub-categories according to which corresponding economic activities³⁶ can be determined; the annual international reports on GHG emissions should be provided according to such division.

According to the GHG inventory of Latvia³⁷ submitted in 2019, the total emissions of Latvia in 2017 (without the LULUCF sector) were 11 325 kt CO₂eq. Therefore, the total GHG emissions of the State in the time period from 1990 to 2017, excluding the LULUCF sector, have decreased by approximately 57 %. The GHG projections of 2019 (hereinafter – the GHG projections) show that in 2050, excluding LULUCF, the potential GHG reduction could be 68 %³⁸ (in comparison with 1990). Only the current policy and measures are taken into consideration in the GHG projections for 2050, and the scenario only provides for the currently available commercial technologies.

³⁵GHG inventory of 2019, submitted within the scope of the Convention and the Kyoto Protocol. Available online: <https://unfccc.int/process-and-meetings/transparency-and-reporting/reporting-and-review-under-the-convention/greenhouse-gas-inventories-annex-i-parties/national-inventory-submissions-2019>

³⁶ In order for the statistics of different countries to be comparable, there are two classification system in effect in Europe – the European System of Accounts 1995 (ESA 95) and the EU Statistical Classification of Economic Activities (NACE) – according to which institutional units and sectors of national economy can be classified.

³⁷GHG inventory of 2019, submitted within the scope of the Convention and the Kyoto Protocol. Available online: <https://unfccc.int/process-and-meetings/transparency-and-reporting/reporting-and-review-under-the-convention/greenhouse-gas-inventories-annex-i-parties/national-inventory-submissions-2019>

³⁸GHG inventory of 2019, submitted within the scope of the Convention and the Kyoto Protocol, and expert evaluation. Available online: <https://unfccc.int/process-and-meetings/transparency-and-reporting/reporting-and-review-under-the-convention/greenhouse-gas-inventories-annex-i-parties/national-inventory-submissions-2019>

The *energy sector*³⁹ is the largest source of GHG emissions and generated 34 % of the total emissions of 2017 (Figure 3). Emissions from the combustion processes in all sectors of national economy are accounted in the energy sector. The majority of emissions is generated by the energy sector (public generation of electricity and thermal energy – 40 %), followed by the commercial, institutional, household, agriculture, forestry, and fisheries sectors (39 %), the remaining part is formed by the manufacturing industry and construction, military transport, and diffuse emissions from oil and natural gas. In comparison with 1990, the amount of emissions has decreased in all sub-sectors of the energy sector, but the largest reduction is observed in the manufacturing industry and construction (83 %), as well as in service, household, agriculture, fisheries, and forestry sectors (74 %). Emissions of the energy sector are fluctuating depending on the economic changes in the country and the significantly different average temperatures of winter. An essential factor for the reduction of GHG emissions from the energy sector in the total balance sheet is energy efficiency, switching of the heating fuel from liquid and solid fuels to natural gas, as well as the replacement of fossil energy sources with biomass and other types of RES. Important factors for the switching of energy sources are their price and availability, as well as national policy and measures, including support measures.

The total consumption of thermal energy in Latvia from 1990 has decreased. The largest decrease in consumption of thermal energy is attributable to the enterprises of industrial manufacturing⁴⁰, partly attributable also to the energy efficiency measures implemented in households. The energy consumed in households forms up to 40 % of all energy balance, therefore, the sector of buildings holds a significant potential for achieving the joint energy efficiency objectives.

Although the consumption of electricity has decreased in comparison with 1990, it keeps increasing in the time period from 2005. Changes can be explained by an improvement in the welfare and living standard of inhabitants, as well as by technological developments, as the number of electric and electronic appliances used in the service sector and households is increasing.

The reduction in the amount of energy produced in the transformation sector can be explained by the increase of electricity produced by HPPs and VPPS. Electricity produced by HPPs in 2017 was 4 381 GWh, whereas the amount of electricity produced by VPPs in 2017 was 150 GWh. Transformation sector mainly uses natural gas the share of which is gradually decreasing: in 2010 – 81.0 %, in 2016 – 60.1 %, and in 2017 – 53.7 %. Within five years, the share of RES consumed by the transformation sector has increased by 17.2 percentage points and exceeded 45.9 % in 2017. Electricity produced in biomass (woodfuel) cogeneration plants and power stations within the last five years increased from 215 to 525 GWh and in biogas cogeneration plants from 288 to 405 GWh.

According to the projections, emissions from the energy sector in the current situation will decrease in 2050 by approximately 34 % when compared to 2017, and by 86 % when compared to 1990.

³⁹The energy sector includes sources of emissions with the NACE sectoral codes: 05, 06, 07.21, 08.92, 09.1, 19.20, 35, 33, 36–39, 45–47, 52–96, 99, i.e., public electricity and production of thermal energy, production of solid fuel and other energy sectors, industrial sectors and construction, including manufacture of basic iron and steel, manufacture of non-ferrous metals, manufacture of chemical substances, manufacture of cellulose and paper, polygraphy, food processing, manufacture of beverages and tobacco, manufacture of non-ferrous minerals, manufacture, of wood and products of wood and cork (except for furniture), manufacture of articles of straw and plaiting materials, commercial and institutional sector, households, agriculture, forestry, fisheries, military transport, and diffuse emissions from oil and natural gas.

⁴⁰The consumption of thermal energy in industrial sectors in 2017 was only 11 % of the total consumption of thermal energy in the country.

*Transport*⁴¹ is the second largest source of GHG emissions and generated 29 % of the total emissions in 2017. In comparison with 1990, the amount of emissions in the transport sector has increased by 9.4 %.

The majority of GHG emissions from the transport sector in 2017 were generated from road transport (93.88 %), whereas the largest generator of emissions in the road transport sub-sector according to the groups of vehicles was passenger cars followed by freight vehicles and buses. Railway generates only 5.5 % of the total transport sector emissions, maritime transport – 0.48 %, and aviation – 0.14 %.

Although the number of motorised vehicles is lower than on average in OECD countries, as well as the number of inhabitants will most likely decrease in the future, it is projected that the number of motorised vehicles will increase in Latvia concurrently with the increase in the living standard of inhabitants, as well as increasing suburbanisation tendencies. According to the projections, it is anticipated that in 2050 transport sector emissions will decrease in total in relation to 2017 and 1990 (by 53 % and 47 % accordingly).

Such emissions are accounted in the sector of *industrial processes and product use*⁴² which are generated from industrial processes, use of raw materials in industrial production, use of chemical substances and use of heating fuel for non-energy needs. In 2017, 6.5 % of the total GHG emissions of Latvia were generated in this sector. Although the amount of emissions is relatively small, it has an increasing trend starting from 2009. In total, the largest amount of GHG emissions is generated from the manufacture of cement, glass, and bricks, forming 61 % of the total industrial process emissions in 2017. Although the quantity of fluorinated greenhouse gases (fluorinated gases⁴³) in the country and the amount of emissions therefrom are not high (in 2017 – 32 % of the total GHG emissions in the sector of industrial processes and product use and 2.1 % of the total GHG emissions of Latvia), they have a high global-warming potential which exceeds the CO₂ global-warming potential even several thousand times. Emissions of fluorinated gases have significantly increased since 1995 as their use for the replacement of ozone-depleting substances was commenced. Use of fluorinated gases also increases in relation to the increasing demand for air conditioning equipment in premises and vehicles, as well as upon increase in welfare and living standard of inhabitants. Taking into account the foreseeable trend of industrial development, it is currently projected that increase of GHG emissions from industrial processes will continue, generating 9 % increase of GHG emissions in 2050 in comparison with 2017 and 22 % increase in comparison with 1990.

*Agriculture*⁴⁴ is the third largest source of GHG emissions, generating 24.6 % of the total GHG emissions of Latvia in 2017. The most significant GHG emissions in this sector are generated by cultivation of agricultural land (60.8 %) and farming (31.2 %). Since 1990, the amount of GHG emissions in the agriculture sector has decreased by 50.5 % mainly as a result of restructuration of national economy, decrease of the rate of production in rural farms, as well as division of large-scale farms into smaller farms. The quantity of emissions is significantly affected by fluctuations in the number of farm animals and the quantity of mineral nitrogen

⁴¹The transport sector includes sources of emissions with the NACE sectoral codes: 49, 50, 51, 52, 53, i.e., inland aviation, road transport, railway, inland shipping.

⁴²The sector of industrial processes and product use includes sources of emissions with the NACE sectoral codes: 23, 24, 27, 28, 35, 43, 45, i.e., manufacture of minerals (includes manufacture of cement, lime, glass, bricks, and ceramic tiles), chemical manufacture, manufacture of metals (includes manufacture of iron and steel), use of heating fuel for non-energy needs (includes use of lubricants, paraffin wax, urea, covering of roads with asphalt and tar coating of roofs), use of solvents, manufacture of electronics, products used for replacement of ozone-depleting substances (includes use of fluorinated gases in cooling and air conditioning equipment, foam, fire safety articles, sprays, and solvents containing fluorinated gases), manufacture and use of other products (includes the use of sulphur hexafluoride in electric devices and the use of nitrogen oxide in medicine).

⁴³Fluorinated greenhouse gases – hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride, and other greenhouse gases containing fluorine or mixtures containing any of the abovementioned substances.

⁴⁴The agriculture sector includes sources of emissions with the NACE sectoral code: 0.1, i.e., emissions generated by farm animals (including fermentation in the alimentary tract, manure management), cultivation of agricultural soil, liming, and use of urea.

fertilisers applied. Increase of emissions from the agriculture sector has been observed during the last years, mainly from cultivation of agricultural land, upon increase in the use of mineral fertilisers containing nitrogen.

The main types of use of UAA are arable land, as well as grassland and pasture land. The majority of fields in Latvia (ha) are occupied by growing crops, green forage for fodder, as well as agro-industrial cropping.

The largest amount of uncultivated UAA territories is in Pierīga and Eastern Latgale, the smallest – in Zemgale. In 2017, the total yield of crops in Latvia was 2.6 million tonnes which is 42 % more than ten years ago. The significant increase in the total yield of crops was mainly influenced by the increase in areas sown with crops.

The total surface area under cultivation of agricultural crops treated with mineral fertilisers increased by 51 % in 2008, by 55 % in 2010, and 60 % of all surface areas under cultivation were fertilised in 2017.

The projections show that emissions from the agriculture sector will increase. Respectively, in 2050 they will increase by 15 % in comparison with 2017 and by 43 % – with 1990.

The *waste management* sector⁴⁵ generated approximately 5 % of the total emissions in 2017. The majority of emissions occurred from waste disposal at landfills (71 %) and from wastewater (20 %), the remaining part – from composting and incineration of waste (8 %). In comparison with 1990, GHG emissions from the waste sector have decreased by 19.2 %. Fluctuations of emissions are observed in the sector which may be explained by changes in the economic situation in the country.

The projections show that by 2050 GHG emissions from the waste management sector will reach a reduction of approximately 58 % when compared to 2017 and a reduction of 66 % when comparison with 1990.

4.2. LULUCF Sector Net Emissions – Structure and Dynamics

Unlike other sectors, the LULUCF sector generates not only GHG emissions, but also forms CO₂ removals (the carbon from the atmosphere is sequestered in the living woody biomass as a result of photosynthesis process). The LULUCF sector includes six categories of land: forest land, cropland, grassland, settlements, wetlands, and other land. The scope of the Strategy applies to the whole LULUCF sector, not just individual categories.

The total GHG balance is formed by the sum of GHG emissions of the abovementioned LULUCF sector categories. In the time period between 1990 and 2013, the total GHG emissions in the LULUCF sector were lower than CO₂ removals. However, starting from 2010 an increase of GHG emissions in the LULUCF sector has been observed, moreover, it is being projected henceforth (until 2050) that GHG emissions in the LULUCF sector will exceed removals. The largest changes in GHG emissions and CO₂ removals are in the category “Forest land” (see Figure 4).

The main cause for the decline in CO₂ removals and increase in GHG emissions in the LULUCF sector is the increase in the proportion of stands that have attained or surpassed the falling age which has promoted increase in the amount of exploitation of the forest and increase in emissions related to the natural mortality of trees. Another significant factor is deforestation occurring upon construction of new infrastructure objects. In the last decades, the proportion of forest stands which have attained and surpassed the age of economic use has increased in the age structure of forest stands for all main tree species in Latvia, particularly in stands of deciduous trees. Carbon sequestration in the live biomass is slowing down and CO₂ emissions increase in such forest stands upon mineralisation of the carbon accumulated in the dead wood as a result of which GHG emissions may exceed carbon removals in biomass of woody plants.

⁴⁵The waste sector includes sources of emissions with the NACE sectoral code: 38, i.e., disposal of solid waste, biological treatment of solid waste, incineration of waste, purification and discharge of wastewater.

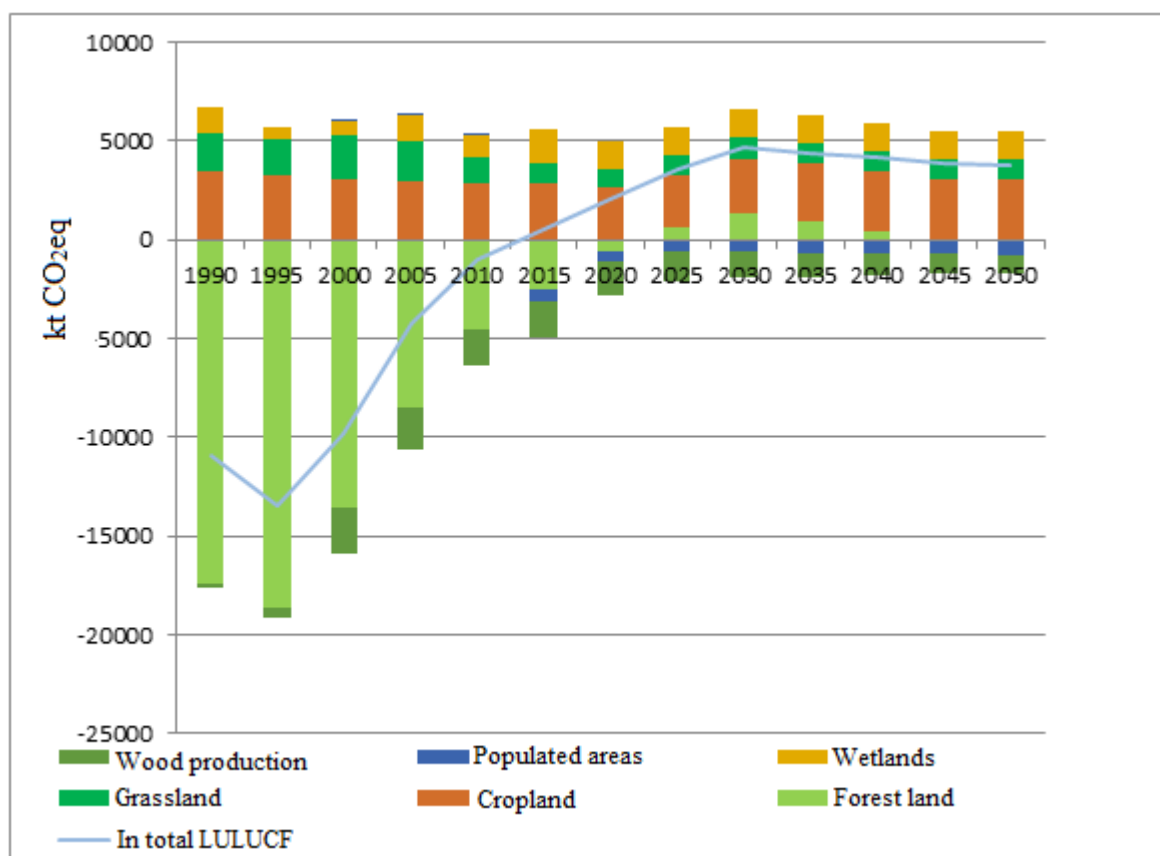


Figure 4. GHG emissions and removals of the LULUCF sector of Latvia (kt CO₂ eq.)⁴⁶

GHG emissions from cropland and grassland have been decreasing since 1990. The decrease in GHG emissions from cropland is mainly related to the mineralisation of organic soils, transformation of cropland into grassland, and afforestation.

The largest amount of GHG emissions from grassland is forming in organic soil. Substantial CO₂ and N₂O emissions in organic soil from cropland and grassland is forming regardless of the method of management, whereas the carbon stock in mineral soil is increasing or decreasing as a result of changing the type of land use or the method of management.

GHG emissions forming in the territories of peat extraction and emissions forming upon use of peat in horticulture are evaluated in the category of wetlands. According to the GHG inventory of 2019, emissions from wetlands in the time period from 1990 to 2017 have increased and GHG projections show an increase in GHG emissions also in the future the amount and area of peat extraction is projected to increase.

4.3. Joint Progression of Latvia Towards Climate Neutrality

The previous sub-chapters provides an overview of the current situation in relation to the first two objectives of the Strategy, applying to the reduction of GHG emissions (excluding the LULUCF sector) and the net emissions in the LULUCF sector only. However, as the objective of climate neutrality includes the joint performance of all sectors, information

⁴⁶GHG inventory of 2019, submitted within the scope of the Convention and the Kyoto Protocol, and expert evaluation. The GHG objectives reflected include both ETS and non-ETS emissions. Available online: <https://unfccc.int/process-and-meetings/transparency-and-reporting/reporting-and-review-under-the-convention/greenhouse-gas-inventories-annex-i-parties/national-inventory-submissions-2019>; the report on policies, measures, and GHG projections submitted to the EC in 2017. Available online: https://cdr.eionet.europa.eu/lv/eu/mmr/art04-13-14_lcds_pams_projections/projections/envws0bea/.

regarding the balance of the current annual net GHG emissions, as well as projections if only the measures provided for currently are to be implemented, including all sectors, also the LULUCF sector, is aggregated in this sub-chapter.

The total GHG emissions of Latvia (including the LULUCF sector) in 2017 were 9 618 kt CO₂ eq.⁴⁷. The total GHG emissions of the country in the time period from 1990 to 2017 have decreased by approximately 42 %. In 2050, the projected (only with the current policy and measures for the reduction of GHG emissions) reduction of GHG emissions is approximately 17 %⁴⁸ in comparison with 1990 (Figure 5).

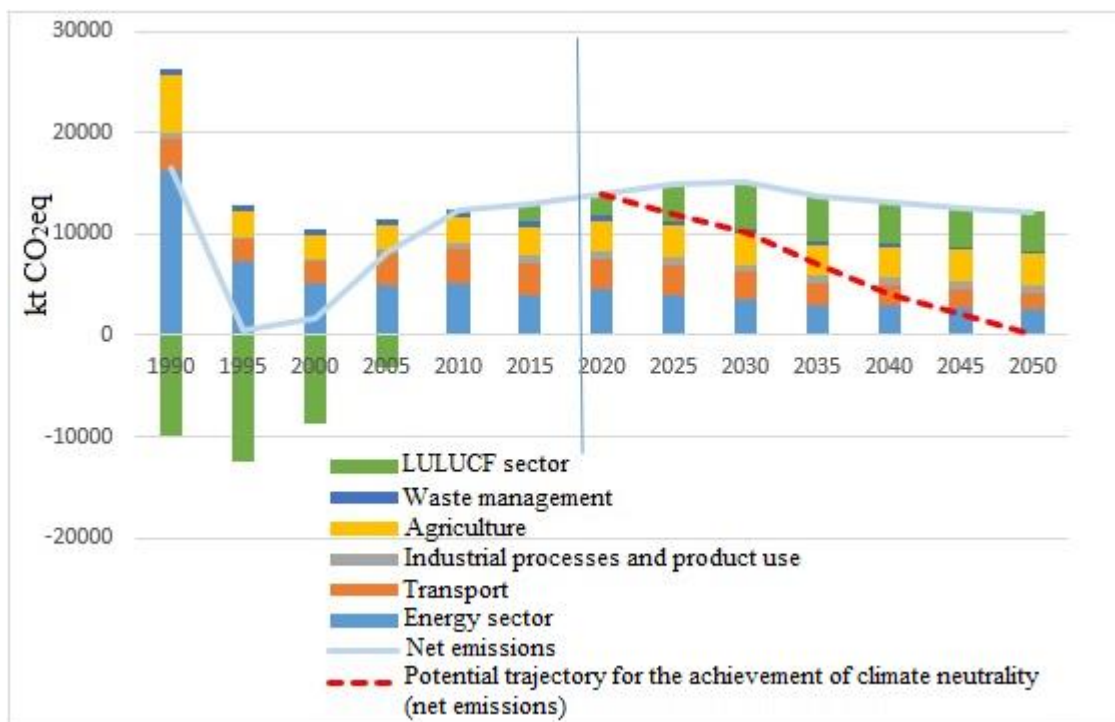


Figure 5. Total amount of GHG emissions of Latvia (until 2017) and projection (for 2018–2050) under the scenario “with the current measures” (1990–2050)⁴⁹

In Figure 5, a vertical line separates information regarding the current situation from future projections.

According to the initial indicative projections⁵⁰, the specified quantity of GHG emissions which will have to be compensated with removals in 2050 is approximately 3.6 million t CO₂ eq.

⁴⁷GHG inventory of 2019, submitted within the scope of the Convention and the Kyoto Protocol. Available online: <https://unfccc.int/documents/194812>

⁴⁸The report on policies, measures, and GHG projections submitted to the EC in 2019. Available online: https://cdr.eionet.europa.eu/lv/eu/mmr/art04-13-14_lcds_pams_projections/projections/envxk3aeq/ and expert evaluation.

⁴⁹The report on policies, measures, and GHG projections submitted to the EC in 2019. Available online: https://cdr.eionet.europa.eu/lv/eu/mmr/art04-13-14_lcds_pams_projections/projections/envxk3aeq/ and expert evaluation.

⁵⁰Initial evaluation of the study of the Institute of Physical Energetics *Latvijas tautsaimniecības attīstības iespējamo scenāriju līdz 2050.gadam izstrāde atbilstoši Eiropas Savienības ilgtermiņa attīstības redzējumam* [Drawing-up of the Potential Scenarios for the Development of National Economy of Latvia until 2050 according to the Long-term Development Vision of the European Union], November 2019.

5. Most Significant Factors Affecting the Amount of Occurrence of GHG Emissions of Latvia in Different Sectors of National Economy

The current structure of national economy of Latvia is characterised by the fact that non-ETS emissions of Latvia form a very high share (approximately 80 % of the total emissions of the country). As the proportion of non-ETS on average in the EU countries forms 60 %, the proportion of non-ETS emissions in Latvia is the second highest among the EU countries. This means that in Latvia the share of such emissions for the reduction of which more active national policy and involvement is necessary as they are not regulated by EU ETS is significantly higher.

5.1. Potential of Innovations

The development of innovations is one of the priorities of the national economy which will ensure a more rapid growth of Latvian national economy and will be the basis for the increase in productivity and products with added value both in medium-term and in longer term.

Currently, the level of the development of innovations in Latvia is low, however, growth caused by innovations in environmental development resulting from the initiative carried out in Latvia has been observed, particularly by supporting enterprises upon introduction of innovative goods and services, as well as upon acquisition of new manufacturing infrastructure.

Latvia has been included in the group of countries of “moderate innovators” in the reports on the European innovation scoreboards and regional innovation scoreboards, holding the 24th place in the competition amongst 28 countries, retaining an invariable position in comparison with the results of the scoreboards of 2017 and 2018. However, the third highest growth in the EU has been observed in Latvia with an increase in the performance in the scoreboard⁵¹ by 17.7 percentage points. There are comparatively low investments in the research and development activities of the private sector, as well as a low number of new graduates of post-graduate studies in Latvia.

5.2. Energy Sector

Energy efficiency indicators of buildings, energy security in the context of the use of local energy sources are essential factors affecting GHG emissions. Also, upon implementing LCD in the energy sector, such challenges as non-deterioration of air quality in the use of solid biomass in local solutions of heat supply, the potential of the use of non-emission types of RES technologies, as well as the assessment of the introduction of new technologies in relation to carbon capture and storage should be taken into consideration.

- **Energy efficiency in buildings**

In total, the fund of buildings⁵² in Latvia includes 1.37 million buildings with the total area of 204.7 million m² – in residential buildings (their area 45 %) and non-residential buildings, including manufacturing buildings (their area 55 %).

The majority of the residential fund of Latvia surpasses the age of 25 years (only 10–15 % of all residential buildings have been built during the last 10–15 years), moreover, the largest proportion of inhabitants are living in multiapartment buildings with low energy efficiency (the majority of buildings not restored according to the requirements for the classification of buildings currently conform to Classes E and F). Improvement of the energy

⁵¹The European Innovation Scoreboard created by the European Commission includes 10 dimensions, taking into consideration 27 indicators affecting innovations in such areas as human resources, attractive research system, innovation-friendly environment, finance and support, firm investments, innovators, linkage between science and entrepreneurship, intellectual assets, impact of innovation on employment, and impact of innovation on sale.

⁵²Data of the State Immovable Property Cadastre Information System provided by the State as of 1 January 2017.

efficiency indicators of residential buildings will also reduce the poverty risk, for example, 7.5 % of households were not provided with sufficient heat supply in 2018 (the indicator is twice higher than in other countries of the Northern Europe).

In State buildings, the most significant consumption of thermal energy is observed in the security and social area, particularly in regions where a higher number of prisons and social institutions are amassed in comparison with other regions.

Buildings that have been built before World War II are mainly located in the territory of urban construction monuments or also in the territory of architectural monuments, larger financial investments should be estimated for the implementation of energy efficiency measures in such buildings.

- **Energy security**

The indicator of energy dependence of Latvia was approximately 89 % in 1990, but it already was significantly lower in 2017 – 43 %.

The local energy sources ensuring the primary consumption of energy sources of Latvia are also concurrently RES – biomass (including wood and straws), water, wind, sun, gases from landfill sites and wastewater treatment facilities, biogas, as well as geothermal energy and hydrothermal energy, in turn, the energy resources imported – petroleum products, natural gas, coal – are fossil energy resources. Therefore, promotion of the use of RES will continue to reduce the dependence of Latvia on import of fossil energy resources, as well as increase the energy security of the country.

- **Air quality aspect**

Since Latvia joined the EU, the use of solid biomass in combustion installations has increased significantly. Starting from 2012, the proportion of the use of biomass in total consumption surpasses the use of natural gas. Currently one of the main LCD providers of the energy sector is biomass – wood, timber residues, wood briquettes, chips, granules, as well as bioethanol, biodiesel fuel, gases from landfill sites and wastewater treatment facilities, and biogas.

As increased air pollution has already been detected in individual zones of Riga, a challenge, particularly in urban environment, is caused by the use of such RES in local solutions of heat supply which do not have an adverse effect on air quality, for example, by using non-emission technologies or fuel gas purification filters (particularly in relation to emissions of solid dispersed particles).

- **Use of the types of non-emission RES technologies**

An additional solution for such challenge is an increase of the share of non-emission RES (sun, wind, water, geothermal energy, and hydrothermal energy).

The share of manufacture and use of RES in electricity has an increasing trend – 54.58 % (in 2017), however, such RES as water or wind energy formed only 8.5 % of the consumption of total primary energy resources in 2017, but this share has increased (in comparison with 1990 – by 5.2 %).

Theoretical acquisition of hydroenergy resources from medium and small rivers of Latvia is 900 GWh of electricity per year. Hitherto the hydroenergy resources of small rivers were claimed only in the amount of 70 GWh which is 23 % to 28 % from the potential capacity of past watermills and former small HPPs. Concurrently it should also be taken into consideration that claiming of the potential hydroenergy resources is permissible, only taking into account the objectives of environmental and nature protection, assessing and eliminating or reducing the potential negative impact on natural ecosystems, migrating fish, and biological

diversity. The quantity of the production of electricity in Latvia depends, to a large extent, on the flow of the River Daugava which depends on the precipitation volume in the relevant year. Cascade of the River Daugava – Riga HPP, Ķegums HPP, and Pļaviņas HPP – ensures on average 40 % of electricity consumed in Latvia.

The division of energy resources from wind in Latvia is distinctly uneven. Such areas inside the territory of Latvia are favourable for wind energy where the wind develops as a result of an elevation. The highest wind speed in Latvia is at the coast of the Baltic Sea and at the western coast of the Gulf of Riga, its northern part.

In 2017, approximately 330 MWh of electricity were generated from the sun which is almost 0.002 % of the total electricity supplied to end-users.

Implementation of national level RES projects, for example, construction of wind parks or switching from fossil energy resources to RES in heat supply enterprises of the large cities, is particularly important.

5.3. Transport

As regards the GHG emissions in the transport sector, the structure of the vehicle fleet, the choice of cars, and the habits of their use are factors characteristic to Latvia.

- **Structure of the existing vehicle fleet**

In Latvia, almost 80 % of the vehicles are older than ten years.

In the time period from 2010 to 2017, the number of diesel cars has increased from one third to more than half of all vehicles. Heavy traffic in which fossil energy sources are the dominating fuel is generating not only GHG emissions, but also has a negative impact on air quality, particularly in urban environment where increased concentration of NO₂ is an indicator attesting to pollution caused by vehicles. Although the new cars registered in Latvia generate less emissions, Latvia still is in the second place in the EU in relation to the use of most carbon-intensive cars.

During the last years a trend has been observed that carriage of passengers in public transport has decreased and people choose their personal vehicles instead.

- **Availability of the infrastructure for the refuelling of alternative vehicles**

The first stage of public fast charging network of national scale in Latvia was completed in 2018 and the second stage is planned in 2020. In total, it is planned⁵³ to install 150 fast charging stations for electric vehicles by the end of 2021, installing them on regional roads connecting TEN-T roads and in populated areas where the number of inhabitants exceeds 5000.

There was no passenger vehicle using hydrogen as fuel registered in Latvia (as of 2019), as well as there are no public hydrogen filling sites accessible in Latvia.

One CNG filling station (in Jēkabpils) accessible to the public has been opened (in 2019), and another two stations are planned to be opened in Riga. Biomethane can be introduced in the CNG infrastructure instead of natural gas.

- **Choice of cars and habits of their use**

GHG emissions can also be reduced by choosing a type of car which is appropriate for the planned type of use, for example, by not choosing cars with large engine capacity (cross-country vehicle) for driving in urban environment. In addition, GHG emissions and emissions of polluting substances in air occur due to the chosen driving style and also due to incomplete

⁵³Within the scope of the project co-financed by ERAF.

technical maintenance of vehicles (for example, whether the exhaust pipe has been equipped with a diesel particulate filter and whether it is being appropriately maintained and operated).

5.4. Agriculture and Land Use

Significant factors in the land and land use, land-use change and forestry sector in relation to GHG emissions and CO₂ removals are the use of mineral fertilisers, high proportion of organic soil in the territory of Latvia, as well as forestry coverage.

- **Use of mineral nitrogen fertilisers in treatment of agricultural land**

The total surface area under cultivation of agricultural crops treated with mineral fertilisers keeps increasing (in 2008 – 51 %, in 2010 – 55 %, and in 2017 – 60 % of all surface areas under cultivation were fertilised). In the last decade mineral fertilisation per 1 ha of areas under cultivation for all agricultural crops (recalculating in 100 % plant-based nutrients) has increased from 74 kg/ha to 110 kg/ha. The elementary nitrogenous fertilisers are still being used extensively as their prices are significantly lower than the prices of complex mineral fertilisers. The largest amount of mineral fertilisers per ha of area under cultivation was used for areas under cultivation for agro-industrial crops and cereal crops, but significantly less – in growing of open-field vegetables and potatoes.

- **Soil structure/composition – organic soils**

Organic soils have formed in Latvia mainly in soils with high level of humidity. Upon transforming wetland containing a thick layer of organic matter into utilised agricultural area, emissions of dinitrogen oxide (N₂O) increase under the influence of increase mineralisation of soil.

Such soil is found in smaller areas throughout the territory of Latvia and, to a larger or lesser effect, affects 48 % of households. In total, the quality assessment of organic soil in points is lower than on average in the country, thus affecting the indicators of productivity. 1 ha of unused organic soil to be used in agriculture generates as much GHG emissions as currently on average 10 ha of mineral soil producing agricultural products⁵⁴.

- **Forest area**

In comparison with the first half of the 20th century when 23 % of Latvia were covered in forests, this coverage has doubled over time until nowadays⁵⁵ and reaches almost 53 % (covers 92 % of the total forest land⁵⁶, 3 575 thousand ha from which forest area without restrictions of economic activity – 2 193 thousand ha). It is projected that the forest area will keep increasing because natural overgrowing of land not utilised in agriculture, as well as its reforestation is continuing. According to the current estimates, the annual total forest growth is approximately 26 million m³ per year. The cleared area in the last decade from 2007 to 2017 has decreased from 138 thousand ha to 94 thousand ha.

Wood resources in Latvia are acquired in order to produce and export different wood products (wood and its articles, wood furniture, structural timber products, paper and cardboard articles), in turn, wood by-products from wood processing and forestry processes are used as an energy source.

⁵⁴INTERREG EUROPE has the results of the BIO4ECO project of the interregional cooperation programme.

⁵⁵Data of the National Forest Monitoring 2018.

⁵⁶Also part of wetland (for example, a swamp with trees reaching the height of at least 5 m) and shrub land or heathland is considered forest land.

5.5. Use of Resources

Essential factors in relation to the use of resources are the potential of bioeconomy, the efficiency of the use of resources, the consumption habits of households, the use of industrial raw materials of manufacturing, as well as waste management.

- **Development of the potential of bioeconomy**

Bioeconomy ensures integrated approach towards inclusion of knowledge-based economic growth, social welfare, and environmental protection into agriculture, forestry, and fisheries, conforming to the basic principles of circular economy, more efficient use of natural resources. Some of the potential directions of the development of bioeconomy are reduction of the amount of waste in processing and replacement of fossil resources with bioresources, inter alia the use of biodegradable materials. Economy of Latvia depends, to a large extent, on non-renewable fossil resources and it affects not only the economic aspect, but also the environmental and national security aspects.

One of the principles in the development of sectors of bioeconomy is decoupling of manufacturing and GHG emissions in long-term (GHG emissions per unit of production manufactured decrease). Long-term actions for the optimisation of GHG emissions and CO₂ removals in the future is of significance in forest management.

Latvia is rich in wood resources. Wood production is one of the categories of the LULUCF sector which sequestrates CO₂ emissions. Concurrently with striving for climate neutrality, the fulfilment of bioeconomy objectives can be promoted and achieved, for example, by developing the use of wood resources for the manufacturing of products with high added value, including for export needs.

- **Consumption habits of households**

Consumption habits of households promote increase of GHG emissions to a large extent because, with the improvement of economic welfare, the demands of inhabitants for comfort also increases. Upon continuing the implementation of conventional economic development (i.e., without conforming to the LCD principles and striving for climate neutrality), the consumption of energy resources, the amount of fluorinated gases which are used as a refrigerant in cooling and air conditioning equipment, as well as the amount of waste generated will also increase concurrently with increase in economic welfare of inhabitants.

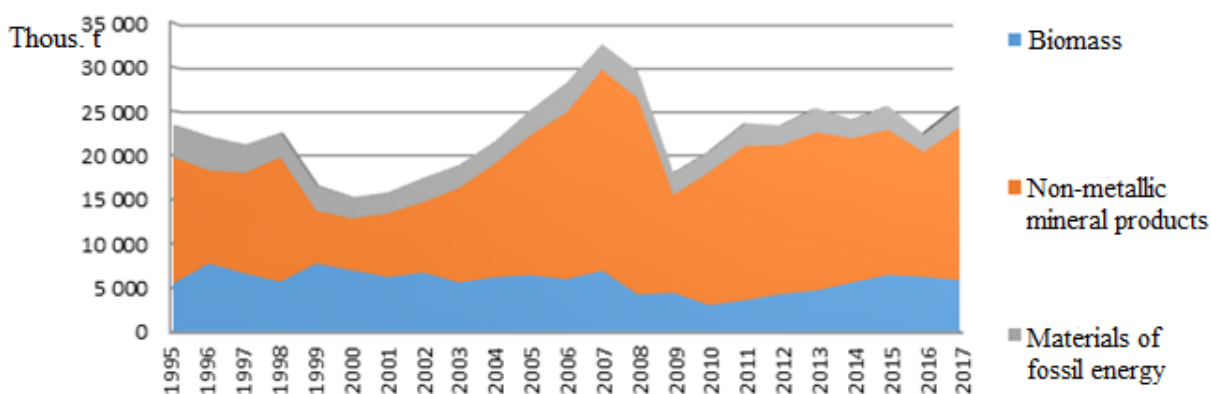


Figure 6. Consumption of inland resources⁵⁷ (in total) in Latvia⁵⁸, thous. t

The consumption level of households experienced the most rapid increase after joining the EU in 2004, reaching the highest level in 2008. Increase of consumption expenses was discontinued by the economic crisis when economic resources of households rapidly decreased in 2009 and 2010. Starting from 2011, consumption expenses gradually increased again, and it was related to both increase in the level of income of inhabitants and rapid increase in the level of consumer prices.

Not only the amount of consumption expenses is increasing, but also their structure is changing, gradually approaching the structure in countries with a higher living standard. This has been largely promoted by both the increase in remuneration and the extensive offer of leasing goods and credit resources as a result of which many households undertook credit liabilities for the purchase of consumer goods and services.

- **Efficiency of the use of resources**

The amount of manufacturing in the manufacturing industry have increased since the second half of 2009. Upon restoration of economic growth, the increase rates of manufacturing industry have become more rapid than the growth of joint national economy and currently it is the main driver of growth of national economy.

The increasing consumption of materials is affecting climate change, mainly via the increasing energy consumption which is necessary for the acquisition, use, transportation, and storage of such materials. Concurrently the amount of material resources and raw materials available keeps decreasing and becomes increasingly expensive. In turn, manufacturing and everyday life generates increasingly more waste the management of which requires more and more investments.

Trends of increase in consumption of materials are also observed in Latvia, and they are closely related to the indicators of economic welfare. Also the total flow of resources entering national economy – domestic consumption (see Figure 6) formed not only by the resources acquired inland (except for export), but also by imported resources (their amount is fluctuating in the amount of approximately 10 % in the total flow) – has increased

⁵⁷Materials/carriers of fossil energy – coal, lignite (brown coal), hard coal, oil shale and bituminous sand, peat, oil, and natural gas.

Non-metallic mineral products – marble, granite, sandstone, porphyry, basalt, other ornamental or construction rocks (except for slate), chalk and dolomite, slate, chemical mineral products and mineral fertilisers, salt, limestone and gypsum, clay and kaolin, sand and gravel, and other non-metallic mineral products not elsewhere classified. Biomass and biomass products (here) – cultivated species, residues of cultivated species (used), wood and wood products, fishing and other water animals, other animals and animal products (meat, milk, eggs, honey).

⁵⁸Databases of the Central Statistical Bureau. Accounts of material flow – indicators (thous. of tons). Available online: https://data1.csb.gov.lv/pxweb/lv/vide/vide__vide__ikgad/VIG100.px/chart/chartViewLine/

- **Use of raw materials of industrial manufacturing**

The number of large industrial manufacturing enterprises is relatively small in Latvia.

Large part of GHG emissions in the balance of Latvia is formed by incineration or melting of raw materials that are rich in carbon (carbonates) in the manufacture of cement, limestone, brick, steel, and glass products. Such local raw materials as dolomite, limestone, or clay from incineration of which the necessary industrial production is obtained are used in the manufacturing of such products. Metal scrap and carburizers (raw materials of carbonate origin for improving the quality of metal articles) are also used in manufacturing of steel products for the enrichment of final products with carbon.

Part of Latvian enterprises which are using carbonates in their manufacturing have changed the technologies and raw materials used to more energy- and emission-efficient technologies, thus providing their contribution to advancement towards climate neutrality.

Latvia holds one of the last places in the whole space of the EU economy according to its manufacturing efficiency indicators both in the primary production of agriculture and fish and in the subsequent processing chain until the product reaches the final consumer.

Decrease in the use of resources the use of which generates GHG emissions in the last decades has occurred because of the very discontinuation of industrial manufacturing.

- **Introduction of technologies for the storage and use of CO₂ emissions**

Upon advancing towards complete decarbonisation it is possible to develop carbon capture and storage (CCS), as well as carbon capture and utilisation (CCU) technologies in the future in addition to natural carbon capture systems and storage systems in the manufacturing sector (particularly in the sectors of manufacturing cement and chemical substances where direct methods for the reduction of emissions are not available or it is not possible to replace fossil energy resources due to special features of technologies).

Hitherto, upon determining the potential geological storage sites in Latvia and modelling prices, it was concluded that the efficiency of the creation of CO₂ storage sites (CCS) is too low and such solution would not be economically feasible at the moment. However, it is necessary to continue the research of the suitability and economic feasibility of CCS technologies in different industrial processes.

In turn, CCU technologies provide for the processing of the captured carbon for further use, for example, in manufacture of plastic, concrete, or fuel. The CCU potential in reduction of carbon should be evaluated throughout the life cycle.

- **Consumption of chemical substances and freezing agents**

Although the quantity of freezing agents (fluorinated gases) in the country and the amount of GHG emissions is not large, these gases have a very high global-warming potential.

Upon increase in the living standard and welfare of inhabitants, as well as upon increase of the significance of the service sector in the State economy (particularly for wholesale trade and retail trade), it is foreseeable that the consumption of freezing agents will also increase (the household consumption tendencies show that the number of refrigerators, air conditioners, as well as private cars undergoes a stable increase in households).

- **Waste management**

Waste generation is closely linked to the scale of consumption. The waste management policy should be viewed only in context of resource-efficiency and circular economy because the preclusion of materials from turning into waste (achieving the status of waste) will preclude

the necessity to consume new resources. Therefore, waste is not just an environmental problem, but also a loss for economy.

Each inhabitant of Latvia generated on average 438 kg of household waste in 2017 which is by 49 kg less than generated on average by an EU-28 inhabitant. However, the average quantity of household waste generated in comparison with 1995 per inhabitant in Latvia has increased by 65.7 % which is the largest increase in the EU in this period of time. The amount of the disposed household waste has a stable tendency to decrease as the amount of processed waste increases.

5.6. Role of Local Governments and the Urban Environment

Local governments, upon fulfilling the duties laid down in the current laws and regulations, have a key role in advancement of the country towards climate neutrality. The majority (68 % in 2018) of inhabitants in Latvia live in cities, however, an even larger proportion of inhabitants work in cities.

- **City as “superconsumer”**

As cities are characterised by a higher density of inhabitants and higher economic activity, inhabitants of cities are also the largest consumers – the majority of transport is used in cities, the majority of energy is consumed in cities, the majority of goods and services are purchased and/or consumed in cities, also the majority of waste is generated in cities.

- **Local governments include all inhabitants and the current functions of local governments include a significant potential for the achievement of climate neutrality**

Local governments have a high potential for influencing the contribution of the energy sector and transport sector to climate change mitigation because the autonomous functions specified for local governments already include such duties as management of heat supply, water supply, sewerage, and household waste, organisation of the public transport, spatial development planning, and determination of the procedures for land use and building, as well as lighting of the territories provided for public use, arrangement and maintaining of green zones.

The role of local governments as energy consumers is related to the management of local government buildings and provision of public utility services (lighting of streets, water supply, sewerage, etc.). In relation to the transport sector, local governments carry out coordination and provision of the public transport, service vehicles, public services. Local governments develop spatial development planning documents, including the sustainable development strategy, spatial plan, development programme. Within the scope of spatial planning the local government is planning the infrastructure of the building territory, public outdoor spaces, and transport, including street and road network, sidewalks and pathways, bicycle lanes. Measures promoting improvement of the level of awareness of inhabitants, as well as involvement of the society in the development of the energy and climate policy and continuous informing of inhabitants of the objectives to be achieved and the progress attained in achievement thereof are activities creating a motivating impact.

- **Level of local governments – significant for measures for the promotion of renewable energy sources**

Decisions made at the level of local governments can influence all sectors of final energy consumption, including ensure the most direct link with individual households which is one of

the largest priority target groups in achievement of energy efficiency and climate objectives. Issues of heat supply and electricity supply are topical for every household. The level of local governments is the very level where local challenges and specific nature, for example, the public sentiments, can be taken into consideration in the best way possible and it is possible to choose the most suitable ways and strategy for problem-solving and to promote the reduction of GHG emissions in an integrated manner.

- **Urban environment – most subject to the risks of climate change**

The urban environment is more subject to the risks of climate change than rural areas. Cities are more often subject to such risks of climate change as flood, sea-level rise, heat waves, insufficiency of drinking water, drought, extreme precipitation, and storms.⁵⁹

- **Cooperation between local governments**

Such cooperation between local governments which is offered by different local (national) and international initiatives based on the concept “local governments learn from local governments”, for example, Covenant of Mayors for Climate & Energy, is essential. This initiative was commenced 10 years ago and has turned out to be successful. It is rapidly expanding both geographically (it is not only within the scope of the EU anymore) and also topically (initially was oriented towards the development of energy strategies of local governments, however, over time the concept of adaptation to climate change, as well as the concept of a compact city has been added).

⁵⁹European Commission. *In-depth analysis in support of the commission Communication COM(2018) 773. A Clean Planet for all A European long-term strategic vision for a prosperous, modern, competitive and climate neutral economy, 2018*. Available online: https://ec.europa.eu/clima/policies/strategies/2050_en

6. Potential Solutions for Ensuring Low Carbon Development

Below a vision as to what development will have occurred in each sector in Latvia in 2050 is provided. In order to include fields and sectors where changes and significant improvements can potentially be made in order to achieve climate neutrality and sustainable sectoral development, the Strategy provides for the following division – energy, transport, land management, consumption, and manufacturing. In turn, research and innovations, comprehensive energy efficiency and solutions for local governments and urban environment are general and provide for horizontal inclusion in all sectors of national economy.

6.1. Research and Innovations in Low Carbon Technologies

The development of research and innovations has provided a significant contribution to the implementation of the Strategy. The necessary funding has been mobilised, a stable, globally competitive human capital employed in research has been established, including a system for knowledge and technology transfer to all sectors of national economy has been developed. The LCD principles are being integrated into all studies, particularly in relation to the development of new technologies.

Ambitious objectives have been brought forward for the promotion of innovations and extensive intersectoral cooperation is taking place, solutions existing in one sector can serve for the development of another sector.

Research and LCD initiatives are able to attract large investments from the private sector.

- **Principles of low carbon development are integrated into all State-funded studies**

Stable funding for studies, for the search and commercialisation of low carbon technological solutions is being ensured to achieve climate neutrality in Latvia. Upon implementing studies, the joint knowledge base of Latvia is being enriched, knowledge-intensive, innovative goods and services with high added value and export potential are being created. All sectors of national economy are proactively participating in and providing a contribution to the search for the most efficient solutions for the reduction of GHG emissions and energy consumption, as well as increasing the efficiency. State programmes for support to research provide for the defining of advancement of research development in priority sectors with the potential benefit in relation to achieving climate neutrality. Innovative ideas for increasing the use of new, alternative materials and technologies for the consumption of resources are being developed, working places are being created, goods and services with higher economic, ecological, and social added value are being created, ensuring the achievement of objectives of the Strategy as soon as possible.

- **Investments are being successfully attracted for the development of research and innovation, for the development of new and improved technologies and processes**

Sufficient funding is ensured not only from the State budget, but also external funding from the EU and another international scope for studies and scientific development, as well as private funding is being regularly attracted and efficiently utilised. Action policy measures of different sectors for the development of research and innovation are mutually integrated. Representatives of Latvia are active and trustworthy cooperation partners in international consortia and regularly participate, with excellent results, in implementation of programmes of different international studies.

Latvia has a high potential and mechanisms for the commercialisation of research results – innovative ideas, methods, and technologies which promote the implementation of objectives of the Strategy, are being tested and put into practice already at an early development phase thereof, promoting the manufacturing of sustainable products and technologies that can be exported, developing internationally competitive services.

- **High level of commercialisation and competitiveness of research results is attained**

After researching the technology market and assessing market perspectives, research and innovations are developed in prospective niches and results are commercialised to a wide extent and reach the market, stimulating rise in productivity in all sectors of national economy, concurrently providing a contribution to reduction of the amount of GHG emissions. Business incubators which promote achievement of the objectives of the Strategy are particularly supported.

Enterprises of Latvia have adapted to the trends of the world market and are successfully operating in niches of the development and manufacturing of technologies, ensuring stable increase in export volume.

- **Improvements in resource efficiency provide an opportunity for growth through eco-innovations and green working places**

More efficient use of resources and reduction of pollution is a significant driving force for economic growth.

LCD also provides an opportunity for new directions of economic development as it potentially allows to create new sectors of employment engaged in introduction and servicing of environmentally friendly technologies (the so called green working places).

Enterprises of Latvia are successfully using the opportunities provided by globalisation on the market of green technologies and innovations.

- **Well-developed research human capital, culture of shared use of the infrastructure and cooperation**

Stable and globally competitive research human capital with sufficient capacity and competitive remuneration is established. The infrastructure of research and innovations, including a network of laboratories with modern equipment for the implementation of technologically oriented projects, and mechanisms for the shared use thereof at national and international scale are well developed. Scientific institutions (higher education institutions and scientific institutes) are operating as centres for the creation of new ideas and knowledge and centres for the transfer of knowledge, skills, and competencies. At the same time, scientific institutions offer access to the infrastructure of research and innovations in the form of different research, technical, or advisory services.

Research objectives of scientific institutions, State administration, and local government authorities and the sector of entrepreneurship are coordinated among them and are being implemented in close cooperation between all parties, including the society. Cooperation in research and innovation is developed on the scale of Latvia, the Baltic States, and the countries of the Baltic Sea Region.

The contribution of research and innovation to achieving the objectives for the development of action policies, the society, and the joint objectives for the national development of Latvia in all sectors of national economy is mutually integrated and supplementary. Strong technology transfer centres are forming in research and development, promoting communication and stimulating joint investments and investments of the private

sector into research and development. The system for the transfer of knowledge and technologies which promotes the commercialisation of the results of both public and private research is well developed.

The State provides a significant contribution to the development of the skills and competencies of inhabitants for work with innovative technologies and ability to adapt to the requirements of the labour market and social environment. Introduction of and support to new technologies is paired with renewal and adjustment of the content of learning materials to the current situation.

Scientific organisations are working in close cooperation with the industry, the demand of the industry for studies and services of scientific organisations is high. The possibilities for mutual cooperation by forming clusters, as well as possibilities for industrial symbiosis among manufacturing enterprises are being researched.

- **Extensive and conveniently accessible base of practically applicable knowledge which promotes reduction of GHG emissions and ensures CO₂ removals is created**

Open science platforms which ensure open access both to the research data and results that can be used for the promotion and development of studies and innovations and monitoring of their success, as well as for the development of action policies and in political decision-making process have been established and are operating efficiently. Information and data are easy to find, view, are mutually compatible and usable. A convenient database or several mutually coordinated databases with regular synchronisation, updating, and exchange of information have been established where information regarding good practice in introduction of technologies, studies, methods, and other valuable information is being aggregated. The information and skills acquired are successfully transferred to sectors of national economy. The research and innovation results (goods, services, novelties and methods of processes) are quickly and efficiently made popular in the society and absorption of the new knowledge and technologies is being promoted.

6.2. Comprehensive Energy Efficiency

Increasing of energy efficiency and implementation of the horizontal principle “energy efficiency first” is one of the main factors of sustainable energy sector in Latvia as it reduces the demand for energy generation in different sectors of national economy, as well as in households.

Taking into consideration that one of the largest final energy consumers in Latvia is households, the most significant energy savings can be achieved in this very sector by improving energy efficiency of existing buildings, introducing new, stronger technical requirements for the construction of new buildings, and using energy-efficient equipment.

One of the solutions applied is energy marking (visual method for informing the public) and ecodesign (development of goods and services, taking into consideration their sustainability and reduction of environmental impact). The conditions for energy marking and ecodesign limit the manufacturing and placing on the market of products and equipment that are not energy efficient.

- **Principle “energy efficiency first” is introduced and implemented comprehensively**

Before planning the sectoral development of national economy, determining policies, and approving decisions on investments, evaluation whether the most efficient alternative for

the implementation of the particular policy which will bring the highest savings of final energy consumption has been selected is made.

The principle “energy efficiency first” is also being applied in the conditions for using the funding from the EU and public funds.

- **Construction of all new buildings conforms to the requirements for zero⁶⁰ energy consumption buildings**

Awareness of inhabitants regarding advantages of zero energy consumption buildings in terms of both energy savings and ensuring favourable microclimate of the interior premises has been raised.

Strict energy efficiency requirements are being applied in the construction of new buildings. It has been ensured until 2050 that all new buildings are constructed as zero energy consumption buildings.

In construction of zero energy consumption buildings attention is also paid to planning in relation to the placement of the buildings, the materials used, and internal engineering networks of the building.

- **Renovation and reconstruction of all buildings conforms to the requirements of zero energy consumption or almost zero energy consumption**

Reduction of emissions cannot happen without improvements in energy efficiency of existing buildings, concurrently also retaining the historic values. Renovation and reconstruction of buildings is carried out in good quality, using sustainable materials and efficient technologies and methods. All existing buildings are renovated or reconstructed according to the energy efficiency standards. As limited funding is one of the major current challenges for comprehensive restoration of buildings, additional financial instruments have been found (for example, see Chapter 7.2).

- **Manufacturing processes are energy efficient**

Energy-efficient and resource-efficient manufacturing processes ensure the competitiveness of Latvia in the world, offering goods and services for competitive prices, concurrently creating additional work places and promoting growth.

- **Only energy-efficient and resource-efficient products and equipment are available to the society**

Upon designing products and equipment, it is being taken into account that as less energy as possible would be used in the manufacture of products and equipment, as well as energy of another type would be obtained from the manufacturing process. Ecodesign is widely conformed to and developed, it promotes introduction of innovative and sustainable solutions.

According to the ecodesign requirements, products provide for convenient and efficient utilisation thereof which is accessible to everyone. The system is sustainable and conforms to the principles of circular economy.

The field of energy-efficient lighting is dominated by systems and solutions of a new generation which can be managed from distance, have a long term of service and high efficiency in consumption of resources – during both the product development and the use thereof.

⁶⁰In accordance with Paragraph 8 of and Table 1 of Annex to Cabinet Regulation No. 280, Regulations Regarding the Latvian Construction Standard LBN 002-19 “Heat Engineering of Divisions of Buildings” all new buildings must conform to the requirements of *almost* zero energy consumption from 2021.

Control and adaptation of energy consumption to particular needs is a service available to everyone and it is implemented from distance, using information and communication technologies.

6.3. Sustainable Energy

According to the initial indicative projections⁶¹ the total consumption of primary energy in Latvia in 2050 will be approximately 118 PJ.

Integration of RES and energy efficiency are the main fields for the achievement of the set objectives and undisturbed operation of internal market. Creation of suitable infrastructure ensures competitiveness, sustainability, and security of energy supply. Fossil energy sources have been replaced with renewable energy sources. In order to reduce emissions from the energy sector, a policy promoting sustainable and low carbon technology, including the use of RES, and introducing the most efficient technologies available on the market has been introduced. LCD is topical not only for climate change mitigation and environmental conservation, but also for diversification of energy sources and promotion of energy security. Low carbon technologies reduce the negative impact of price fluctuations of petroleum and gas products on economy and allow the development of green employment.

- **Use of renewable energy sources in the energy sector**

The share of fossil energy sources has decreased to the minimum (as low as technologically possible) and the use of technologies with renewable and innovative energy sources has developed at an increasing rate.

The use of RES in the energy sector has been promoted by supporting the obtaining of solar and wind energy. The most significant types of RES in Latvia are solar energy, hydroenergy, wind energy, and biomass, however, a significant amount of energy is also obtained from geothermal/hydrothermal energy. Upon increase in investments into innovative energy sources which reduce GHG emissions and the load on the environment at large, it is foreseeable that the use of RES in the energy sector will increase and they will replace fossil energy sources by 2050.

Sufficiently extensive use of liquid biological heating fuel in energy generation and use of bio-oils in equipment in the agricultural and forestry sectors is ensured. Such raw materials as residues of felling areas, wood residues, and straw, but not specially grown energy cultures are being used for the generation of such energy sources, first-generation biofuel is not being manufactured.

Solutions for concurrent use of several RES technologies have an essential role where, for example, electricity generated from RES is used for the ensuring of generation of thermal energy by RES technologies.

Hydrogen as energy carrier which has been manufactured using electricity obtained from different types of RES, different solutions for the storage of hydrogen, has an increasingly important role.

New technologies and methods for heat supply systems which ensure the use of innovative technologies and solutions for efficient operation of the heat supply system have been introduced in the centralised and local heat supply system. Private residences are mainly self-sufficient in terms of energy because decentralised zero-emission heat supply and electricity supply solutions are being used.

⁶¹Initial evaluation of the study of the Institute of Physical Energetics *Latvijas tautsaimniecības attīstības iespējamo scenāriju līdz 2050.gadam izstrāde atbilstoši Eiropas Savienības ilgtermiņa attīstības redzējumam* [Drawing-up of the Potential Scenarios for the Development of National Economy of Latvia until 2050 according to the Long-term Development Vision of the European Union], November 2019.

- **Completely connected energy market that is freely accessible to everyone**

Within the scope of progressing towards the Energy Union, the EU has paid more attention to integration of the countries into a joint energy network which allows to optimise the generation, supply, and use of energy, as well as increases the security and stability of energy.

Safe, flexible, efficient, and integrated approach to energy networks has been ensured, providing users with free access to energy generated from RES.

Biomass and other RES, including geothermal energy, ensure stability in the energy market and energy security, taking into consideration that the amount of energy generated from variable RES will have significantly increased and there is a potential necessity for reserve power.

The consumption of electricity has increased, and it is mainly related to the electrification of the transport system, the use of electricity in heat supply, and the increase of the living standard of inhabitants, i.e., an increased number of electric appliances. Taking into consideration the high-capacity technologies of variable RES (solar and wind energy) installed, electricity accumulation technologies are commercially developed and introduced.

6.4. Resource-efficient and Environmentally Friendly Transport

In 2050, the transport sector is decarbonised which is mainly achieved owing to different initiatives and innovations in the transport infrastructure and vehicle technologies, as well as owing to changes in everyday habits of the society.

- **Road transport is mainly electrified and charging infrastructure is widely accessible**

Convenient, fast, economically advantageous, environment-friendly vehicles, as well as safe transport connections among the countries and inside them are accessible to the society. Promotion of the use of non-fossil fuels is one of the main measures for reducing the negative environmental impact of the transport sector. In order to reduce the impact of the transport sector on climate change, as well as to reduce environmental pollution and consumption of fossil energy resources, transition of the private road transport to electric drive, the use of synthetic fuel, biofuel (not first-generation biofuel), biomethane, hydrogen, and other non-fossil fuels has taken place.

Upon advancing the country towards climate neutrality, the environmental, social, and economic interests are balanced.

Electric vehicles have become the dominating mode of transportation because they do not generate GHG emissions when operated and, owing to the development of technologies, allow covering of greater distances without charging.

The infrastructure for the charging of electric vehicles is available on TEN-T⁶² roads and in cities, allowing for the convenient and fast charging of electric vehicles. Fast charging stations are widely accessible, thus not causing inconveniences in relation to the length of charging to users of cars. Electricity generated from RES is used for the charging of electric vehicles.

The spread of electric vehicles has also promoted the development of the service infrastructure, ensuring accessible and developed service, profitable financial solutions for the purchase of electric vehicles, and link-up with the intelligent transport systems⁶³. The tax

⁶²TEN-T – European Transport Network

⁶³Intelligent transport systems – transport systems where information and communication technologies are used for improvement of efficiency and safety of the transport. For example, by using the Global Navigation Satellite Systems (GNSS), the Geographical Information System (GIS), data processing, wireless data transmission and

system completely conforms to the principle “polluter pays” which has reduced the use of vehicles operated with fossil fuel to the minimum.

State administration and local government authorities have renewed their fleet with environment-friendly vehicles, thus setting an example for the society.

- **Air transport efficiently uses modern biofuels and energy-efficient solutions are integrated into aircraft and airports**

High-performance fuels and biofuels have reduced GHG emissions from air transport. Owing to technological innovations and improvements of efficiency, the aviation sector has become more efficient and is using RES fuels (biopetrol and e-fuel). Air transport is efficiently using biofuels other than first-generation biofuels and alternative fuels, including possibilities of electric mobility, particularly in small-scale aviation and domestic aerial transport. Improvements of efficiency have been introduced both on aircraft and also at airports, allowing to reduce GHG emissions generated by the machinery servicing aircraft and airports. Efficiency and technological innovations have also reduced the noise caused by air transport, making the vicinity of airports more friendly to inhabitants and the environment.

- **Rail transport is mainly electrified and/or other alternative fuels are used for the performance of carriage**

The majority of rail lines are electrified. Electric trains and trains which can be operated using other alternative fuels are used for the carriage of both passengers and freights. Hydrogen or biofuel is mainly used on the non-electrified lines. Part of the rail lines are high-speed lines, ensuring fast, efficient, and environmentally friendly carriage of freights and passengers.

- **Alternative fuels and energy-efficient solutions for the reduction of fuel consumption are used in water transport**

GHG emissions in water transport are significantly reduced by using such tools as the hull design (which improves energy efficiency), different economies of scale resulting from capacity and drive solutions, optimum speed, determination of weather conditions and planning, alternative energy sources, and RES. E-fuel, hydrogen, biofuel in pure form or mixed with fossil fuel are used from RES, thus reducing both GHG emissions and environmental load. Electrification of ports reduces emissions from ships standing in ports, thus decreasing the negative impact of ports on the surrounding environment and climate.

- **Sustainable and environmentally friendly mobility of inhabitants has been ensured**

The public transport system is efficient and sustainable, thus successfully competing with the private transport. The public transport is co-modal⁶⁴ and sustainable, thus successfully competing with the private transport. It has reduced traffic jams and GHG emissions generated by road transport, significantly improved air quality in cities and the attractiveness of urban environment. The park and ride system has significantly expanded, the use of bicycles, scooters, segways, and other inventory has increased, and attractive circumstances for pedestrians have

sensors (road weather stations, video cameras, traffic counters, etc.), the intelligent transport systems are able to distribute traffic information (driving conditions, traffic restrictions and obstacles), as well as to perform adaptive traffic management (traffic lights, electronic road signs) and control. Global trends in the development of intelligent transport systems are moving towards introduction of autonomous vehicles.

⁶⁴Co-modality – combining of one or several modes of transport in order to use resources in an optimum and sustainable manner.

been created, introducing green infrastructure solutions in urban environment. Mainly railway is used in intercity carriage because it uses less energy per passenger-kilometre than road transport.

The public transport is conveniently linked to the international transport (connections with airports and ports).

The sharing culture has been developed, allowing to use vehicles individually or jointly for a specific fee.

- **Freight carriage is performed using an interlinked, efficient, and smart transport system, as well as multi-modal carriage**

The link-up of road transport with the rail and port infrastructures has reduced the fuel consumption and GHG emissions from road transport. Electric trains allow for faster and cheaper delivery of freights to logistics centres which are connected to carriers of the local government level. A developed port infrastructure allows for efficient servicing of the incoming freight ships. Logistics algorithms are widely used for planning of routes. The use of multi-modal carriage⁶⁵ allows to choose the most optimal and environmentally friendly mode of transport in individual distances.

- **Road infrastructure corresponds to the latest transport trends, integrating intelligent transport systems**

A unified and modern road network is ensured, allowing for safe and fast movement in the territory of Latvia and equipped with such charging/filling infrastructure of vehicles which has been integrated into the European transport system and conveniently allows continuation of the travel outside the country.

The use of intelligent transport systems both in the infrastructure and vehicles themselves allows for the reduction of GHG emissions, concurrently improving traffic safety. The data of such systems are available for re-use with the intermediation of the national access point of transport of traffic information.

- **The development of the road network is planned in a sustainable manner, taking into consideration the transport development trends, inter alia conforming to the safety of less protected road traffic participants and reducing the impact of road building on the environment and climate**

The road infrastructure is planned so that inhabitants can conveniently and safely arrive at their final destination using public transport, shared transport, bicycle, or on foot. Safety of less protected traffic participants is ensured, as well as attention is paid to reduction of the impact of road building on the environment and climate, including by introducing green infrastructure solutions.

Different new, sustainable, and environmentally friendly mobility solutions allow to increase efficiency and safety of transportation, concurrently without reducing economic attraction. The development of innovations allows the export of new technological solutions also in the field of transport, for example, the development of unmanned aircraft, etc.

⁶⁵Carriage of the same freight batch with different types of transport according to one joint bill of lading. Freight is reloaded from one type of transport to another, transport chains at different points, for example, consignor – road transport – warehouse – rail transport – warehouse – container – container ship – consignee.

- **Extensive use of digital solutions has reduced the necessity for business movement for inhabitants**

Movement of inhabitants has been optimised owing to the possibilities of remote work, studies, shopping, etc. High performance and safe Internet network throughout the territory of Latvia allows the inhabitants to fulfil their work duties fully also remotely. Comprehensive introduction of e-services has allowed to reduce the necessity for inhabitants to visit authorities for the receipt of services.

6.5. Sustainable Land Management and Agriculture

Sustainable land management policy has been developed and successfully introduced in Latvia. It is ensured that land management, including the LULUCF and agriculture sectors, provide contribution to achieving climate neutrality by using the newest technologies, sustainable management practice, and efficient planning, without restricting the development of national economy.

- **Sustainable balance among different types of land use has been achieved in conformity with the climate, nature protection, economic, and social aspects**

Sustainable land management is planned at both national and regional level, assessing and taking into consideration the special regional features. Local governments and other parties involved are participating in the planning and implementation process, using the integrated planning approach and assessing the joint benefits (ecosystem services) to the environment and society. The decisions are taken on the grounds of data-based information which has been obtained from the State monitoring programme regarding the type of land use, including soil monitoring.

The necessity for land transformation from one type of use to another is under serious evaluation. For example, a non-sustainable arrangement of crop plantations, expansion of agricultural land for the growing of bioenergy crops which are deemed as a serious threat to biological diversity and the ability of ecosystems to withstand climate change is limited. Similarly use of land that hitherto has been irrational is limited.

Support is provided to reforestation of degraded land and renaturalisation of deposits from which mineral resources have been extracted. The development of the infrastructure and building is being carefully planned in a long-term manner, reducing the foreseeable impact on environment and facilitating progression towards climate neutrality as much as possible. The aspect of adaptation to climate change is also taken into consideration in the use of land resources.

The amount of support and the procedures for granting it are carefully evaluated in agriculture and forestry, taking into consideration all aspects of sustainability, including impact on the achievement of the objectives of the Strategy.

- **All forests of Latvia are managed in a sustainable manner**

Forest and its products and services are a significant source of public welfare, as well as a significant strategic resource of Latvia for sustainable rural and joint national development. State forests, as well as private forests are managed in a sustainable manner.

Forest productivity, its resilience against different natural disturbances, including spread of pests, has been increased and sustainable age structure of the forest has been established.

The forest ensures timber for construction and furniture, residues of its processing – heating fuel for the generation of energy, moreover, forest is a recreational resource.

Timber industry is oriented towards more diverse processing of timber and manufacturing of internationally competitive final products with high added value.

Optimum proportion of protected areas has been evaluated and ensured, achieving a balance between environmental protection, economic, and social needs.

- **Agriculture and forestry provides a significant contribution to bioenergy, concurrently not endangering provision of food and CO₂ removals**

Timber from forests of Latvia is obtained in a sustainable manner, carefully planning the amount of acquisition thereof. Balance between deforestation and afforestation is ensured. It is ensured that forests of Latvia have sustainable age structure⁶⁶. The total amount of timber resources in the country does not decrease. Biomass is primarily obtained in order to sell it on the local market, thus ensuring achievement of the national objective of the proportion of renewable energy. Concurrently, upon implementing the forest management, it is also taken into account that forest stands that have been purposefully renewed with high-quality reproductive material are more resistant towards extreme weather conditions arising from climate change.

Without endangering the biological diversity, new varieties which are more resistant towards climate change and ensure optimum CO₂ removals are being bred and used.

Biofuels of the newest generation which reduce the risks that the crops to be used in food and the soil fit for growing food is being used for the acquisition of bioenergy have been developed.

The cleanest technologies and methods are used in agriculture and forestry in all stages of the management process, choosing sustainability, impact on the environment, climate, and health as the essential criteria.

- **Agriculture and forestry of Latvia is resource-efficient – high productivity has been achieved, products with high added value are produced**

Land is used efficiently, in conformity with sustainability of the use of bioresources and giving preference to such types of use in the use of bioresources which results in higher added value (i.e., in conformity with the principle of cascading). Timber industry is oriented towards diverse processing of timber and manufacturing of internationally competitive final products with high added value.

Good agronomy and livestock husbandry practice is implemented in agriculture, thus ensuring the preservation of land resources for the next generations. Improved varieties and accurate use of fertiliser dosage are selected for increasing the productivity, as well as rotation of crops is conformed to, involving perennial crops and leguminous plants therein, as well as maintaining the soil cover throughout the year in places where erosion is possible. The use of mineral fertilisers is being carefully planned – the use of leguminous plants in the crop rotation has allowed to reduce the dosage of the synthetic nitrogen fertiliser and the growing of catch crops ensures that the nitrogen not used by the cover crops does not reach the environment. Innovative technologies are used for precise drainage of the fertiliser to plants, allowing to reduce the consumption of the fertiliser and its negative environmental impact. Maintaining of the soil fertility – increase of the carbon supply in the soil – is essential. The use of manure, ensuring the fastest possible application thereof to the soil, helps avoiding the soil compaction and deep ploughing.

Livestock farming is planned, taking into account the latest scientific knowledge. Only such fodder is used which ensures optimum digestion processes for animals, without harming their health. Manure depositories are established, their use is efficiently controlled. Biogas from

⁶⁶Sustainable forest age structure – levelled age structure when the proportion of adult stands, stands of medium age, and young stands in the cut of economically most significant species is equivalent.

the processing of manure and other organic waste is obtained in households where it is economically feasible. Health and welfare of farm animals is ensured.

Innovations have been successfully introduced in agriculture and forestry, as well as in other sectors of national economy. The newest scientific knowledge is used. Decisions on the introduction of new policies and measures are taken sustainably by analysing the benefits and losses, as well as their impact on other policies. Thus emissions from the agricultural production unit are reduced.

- **Research of organic soil has been conducted and corresponding use is applied thereto**

Awareness of the processes taking place in organic soil, their impact on and relation to the surrounding environment is developed. The current situation has been surveyed, including areas of organic soil have been surveyed, information regarding soil is regularly updated.

Suitable choice of the type of land use for the areas of UUA organic soil which are not actively used for the production of agricultural products due to different reasons (for example, low qualitative value of soil, extensive resources for the renewal of amelioration systems are necessary, non-existence of access roads, configuration and location of fields) is ensured.

6.6. Sustainable Consumption and Manufacturing

The acquisition and use of material resources are sustainable, ensuring high resource-efficiency in Latvia. This allows to achieve better and higher results using less resources.

Economic development is not based on intense consumption of energy and resources. Upon implementation of LCD, such action policy and support mechanisms, including product policy and tax mechanisms, are ensured in Latvia which ensure that the use of natural resources is economic and sustainable as a result of which continuous increase of manufacturing efficiency and resource productivity is achieved, reaching the average indicators of the EU states in long-term and persistently striving towards even higher result.

The society has reached such level of maturity and environmental awareness that it understands the idea of sustainable development and is participating in its implementation. The buying and consumption habits of the society are sustainable, environmentally friendly and prudent in terms of natural resources. Efficient models of sharing economy are operating, and they are supplemented with forms of diverse social entrepreneurship and community economy.

Economic development is shaped in a way to use the raw materials, as well as any manufacturing by-products and residues as much and completely as possible. The objective is achieved not only by using the technologies, but also non-economic manufacturing and non-sustainable lifestyle of the society (in relation to consumption habits) both in the public and private sectors is prevented. More thought-out design solutions and efficient processing of materials have improved re-use of resources and has reduced the total consumption of resources.

- **Only climate and environmentally friendly alternatives of chemical substances are used**

The chemical substances which are harmful to the climate and are used both in manufacturing and provision of services, as well as in everyday life have been substituted with friendlier alternatives.

The amount of household chemical substance use in households has been reduced as much as possible.

- **No waste, just raw materials**

The manufacturing models implemented by enterprises are based on innovations, they are directed towards efficient use of resources throughout the life cycle of the product, ensuring that resources return into economic circulation. Enterprises implement mutual cooperation in the use of resources (the solutions of industrial symbiosis have been developed, as well as industrial clusters are being formed).

- **The society has changed its habits, the demand of inhabitants promotes more extensive offer of environmentally friendly goods and services on the market**

Not just the manufacturers, but also the society at large are responsible for sustainable development because the latter creates the demand for the relevant goods or services.

Each individual, collective (school, institution, office, etc.), family, and household are aware of the impact of their choices on the climate, environment, and consumption of resources, thus they have evaluated their attitude towards consumption of resources – how they use water and energy, how much and what waste is generated by them and where does such waste end up, how they consume food, what their movement and buying habits are, what goods they purchase and how they use them, what services they use.

Households, upon using tools accessible to the public, have specified their “carbon footprint”⁶⁷ – the amount of CO₂ emissions generated by each individual or product within a year and diligently follows this indication in order to prevent its increase.

Changing the consumption habits (behaviour) of private and public buyers helps to achieve resource-efficiency and also provides fiscal benefits. This, in turn, promotes demand for services and goods which are more efficient in terms of resources. Consumers can save costs by precluding the occurrence of waste themselves and by buying goods that can be used for a more extended period of time or which are easier to repair or recycle. Such services which offer repair, service, and lease are extensively available and used.

Social movements, information and education campaigns, as well as civic initiative have a large significance. There are many mechanisms for the transfer of private initiatives/skills where people share their personal experience regarding the possibilities of re-use of materials (textile, etc.) by recycling them into household products with their own hands.

Taking into consideration the latest scientific studies, a database of the laws and regulations, as well as guidelines and other methodological materials for the application of GPP and green procurement have been developed. The GPP component is applied in all public procurements.

6.7. Sustainable Local Governments and Urban Environment

Without initiatives and active actions of local governments for climate change mitigation at regional level, the achievement of the national objectives is endangered. Upon performing the mandatory functions specified in the laws and regulations, local governments have many opportunities for the promotion of achievement of the national objectives for the reduction of GHG emissions.

⁶⁷For the purposes of nature balance, undisturbed renewal of resources, and prevention of climate change (assuming that stabilisation of the average increase of global temperature must be ensured within the limits of 2 °C with a far-reaching goal within the limits of 1.5 °C) the “carbon footprint” per inhabitant may not exceed 3 t CO₂ eq.

- **Cities and municipalities provide a contribution to climate change mitigation, being aware of their actual impact on climate change, as well as their key role in achieving the national objectives for GHG emissions**

Each local government, upon using the tools accessible to the public for the evaluation of GHG emissions, has specified the quantity thereof generated in its administrative territory. Local governments are aware of the potential of reducing GHG emissions and are implementing it, as well as regularly make evaluation compare their performance with the (benchmark) indicators of other local governments on the basis of the information obtained.

- **Local governments are taking an active part in different local and international initiatives “local governments learn from local governments”, being aware of their possibilities in climate change mitigation, as well as bringing forward ambitious GHG objectives and mutually exchanging experience in the achievement thereof**

By participating in voluntary international initiatives for climate change mitigation⁶⁸, local governments gain access to an extensive network for the exchange of information, receive current information, including regarding the planned measures, funding opportunities, good practice and examples, as well as the results of initiatives implemented by other local governments. The capacity of local governments is strengthened in mutual cooperation, as well as assistance is received and provided for the monitoring, evaluation, and reporting on meeting the objectives brought forward. Cooperation initiatives are supported in planning documents of local governments.

Upon cooperation between the local governments and the State, the local governments develop a coordinated approach in the field of climate change mitigation and prevention, introducing solutions for climate change mitigation and climate resilience in their development planning documents.

- **Local governments plan and implement such spatial planning measures which promote the creation of comprehensively organised and complex urban surroundings**

Local governments, upon developing and reviewing the spatial planning which includes both the determination of the functional zoning and the development of the conditions for the use and building of the territory, integrate complex solutions therein for the availability of services in conformity with the technological development and changes in habits of inhabitants, promoting that more extensive range of the goods and services necessary in everyday life is offered in the vicinity of cities, thus reducing the distance covered due to movement of transactions.

- **Transport infrastructure in cities and municipalities is smart and optimised**

A developed park and ride infrastructure, as well as multi-modal centres provide an opportunity to choose the mode of transportation that is most appropriate for the distance and route necessary. The route network of the public transport system is extensive and comprehensive, it offers the necessary level of comfort to the customers and is extensively used.

Streets in cities are planned so that people have convenient and safe alternatives for reaching the final destination with public transport, shared vehicle, bicycle, on foot, leaving the private vehicle at a conveniently available site in case of necessity.

⁶⁸For example, Compact of Mayors, Covenant of Mayors, Non-state Actor Zone for Climate Change (NAZCA).

The infrastructure of non-motorised vehicles is being developed and pedestrian zones are being expanded. The infrastructure of bicycle routes is available and extensively used.

- **The urban environment is smart, digital solutions are used**

The use of the Internet of things (IoT), concurrently taking into consideration cybersecurity and without violating the privacy of inhabitants, allows to supervise and control different systems (energy supply, public utilities, transport, security, etc.) efficiently and with a reduced consumption of resources in a remote manner, as well as to respond adequately to changes therein without delay. The concept of smart local government, i.e. complex solutions, combining investments into infrastructure with ICT, environmentally and climate friendly solutions, is also being extensively implemented for efficient provision of services.

- **The urban environment is flexible, the city as a system has high capacity of resistance in case of different anthropogenic and natural shocks**

Local governments are aware that the urban environment is more subjected to climate change risks (flood, sea-level rise, heat waves, insufficiency of drinking water, drought, extreme precipitation, and storms) than rural areas and are ready for successful overcoming thereof, are able to implement positive adaptation because they have surveyed their strengths, weaknesses, opportunities and threats, for example, the solutions of the green infrastructure are extensively used for the prevention and mitigation of the urban “heat island” effect.

In order to take decisions in relation to the measures for climate change mitigation and adaptation to climate change, local governments are using the current publicly available meteorological data characterising the micro-climate and its changes in the relevant administrative territory. Local governments attract different interested parties from amongst scientific, entrepreneurial non-governmental organisations in order to assess and develop both short-term and long-term solutions for climate change mitigation and adaptation thereto which are suitable for the particular administrative territory. Local governments have performed a vulnerability risk assessment to climate impact, the planning and introduction, as well as monitoring and assessment of measures for adaptation to climate change.

- **The use of local RES non-emission technologies in urban environment has been developed**

Local governments are aware that increasing the proportion of RES non-emission technologies is not just a liability, but also a possibility to optimise energy supply, to use the lowest cost price of local energy resources and to reduce dependence on energy import, to improve the environmental quality, and to increase self-assurance of inhabitants.

Smart RES technologies of urban environment are increasingly used for energy generation in urban environment, combining cultural and historical elements of the architecture and innovative building solutions and materials, promoting autonomous energy generation using non-emission technologies. The use of low-capacity, economically feasible, and visually attractive RES technologies is an integral part of every city.

A constant informative support provided by the local government to households in relation to the solutions and possibilities of energy efficiency and use of RES encourages and motivates the households to choose the solutions of energy supply which are individually most suitable to them and most friendly to the environment.

7. Implementation and Review of the Strategy

Implementation of the Strategy is a long-term challenge to every socially and economically active inhabitant. The Strategy is the first policy planning document for such a long period of time in Latvia. Successful implementation thereof will require understanding and involvement, as well as consistent actions not only from the State, but also from local governments, non-governmental organisations, merchants, researchers, and every inhabitant of the State. In order to evaluate the introduction of the Strategy, a periodic report on the progress of the Strategy and evaluation of the efficiency of introduction thereof must be ensured.

7.1. Parties Involved in the Implementation of the Strategy

- **State administration (each ministry within the scope of its competence) has improved and developed policy planning documents and laws and regulations of each sector of national economy so that they conform to the objectives declared in the Strategy**

The Strategy is implemented by preparing and introducing national climate and energy plans (the first of them by 2030, taking into consideration the objectives of 2050 and the vision for 2050 laid out in the Strategy) the necessity of which is determined by the Energy Union. These plans consist of 5 dimensions: energy security, solidarity, and trust; fully-integrated European internal energy market; energy efficiency (including in transport); decarbonising the economy; research, innovation, and competitiveness.

As extensive involvement of the society as possible is necessary for the achievement of the objectives of the Strategy. Education has an essential role in shaping the awareness of the society regarding climate change processes and the actions necessary for their mitigation. The principles of low carbon development are included in the content of the education system. All educational institutions also implement the LCD principles in their everyday work, providing a contribution to reduction of energy consumption, resources, and waste amount and increase of energy efficiency.

Research-based higher education ensures integration of the newest scientific knowledge in the study process and in the preparation of new specialists.

Inhabitants of Latvia at large are aware of the climate change processes and the logic of climate policy measures and make their individual choices and actions, taking into consideration the principles of low carbon development. Every inhabitant of Latvia is aware of the activities of the global market and the mechanisms for the circulation of resources, and chooses to adapt his or her consumption habits to the principles of sustainable development. Every inhabitant of Latvia has access to clearly understandable and justified information regarding objectives of the Strategy.

- **Local governments develop in a sustainable manner and have reduced GHG emissions in regions, as well as have promoted the development of low carbon enterprises (green employment)**

Local governments set their objectives for the reduction of GHG emissions and show progress in achievement of such objectives by regularly informing the inhabitants thereof.

Local governments, upon organising their work, set an example to the private sector, as well as inform and educate the society of solutions for climate change mitigation.

Planning regions also have a significant role as they develop long-term and medium-term development planning documents, including taking into consideration the national objectives for the reduction of GHG emissions, in cooperation with local governments and State administration institutions.

- **Merchants have actively engaged in the development of new, innovative, and sustainable products and establish environment-friendly enterprises**

The Strategy must promote reduction of GHG emissions of Latvia, without reducing economic competitiveness of Latvia. The Strategy creates an environment for the stability and growth of existing enterprises, as well as promotes the establishment of new, innovative, sustainable, and environment-friendly enterprises. An increasing number of inhabitants is employed in green work places which are producing climate and environmentally friendly goods and services. An increasing number of private enterprises applies GP in their activity in order to reduce their environmental impact. The State and local governments provide an enhanced support to new entrepreneurs in order to promote LCD and advancement towards climate neutrality. Funding from different State, EU, and private financial authorities and mechanisms is available for the support to sustainable entrepreneurship.

Stable and sustainable development of entrepreneurship is a pre-condition for the welfare of inhabitants of Latvia and arranged environment.

- **Households are actively applying the LCD principles for the achievement of climate neutrality**

The joint advancement of the State towards climate neutrality is shaped by everyday choices of each inhabitant. Each household is responsible for energy efficiency of the dwelling, the technologies and devices used, as well as the habits of use of the selected energy resources, reducing the negative impact on climate and environment. Households mutually exchange good practice and experience in attempts of changing their environmental impact.

7.2. Instruments to be Used in the Implementation of the Strategy

The instruments to be used for implementation of the Strategy may be divided into groups according to both their essence and the objective to be achieved. On the basis of the current experience it is useful to distinguish five groups of instruments: public information, legal acts and regulatory framework, market mechanisms, fiscal instruments, and financial instruments.

- **Public information and raising of awareness**

Regardless of conclusive evidence⁶⁹ of climate change and its negative impact on the environment and human health, many inhabitants of Latvia are still not sufficiently informed of climate change, the risks caused thereby, as well as actions to be taken for the mitigation thereof. Public information and raising of awareness regarding climate change processes is one of the most significant measures for increasing interest and motivation of inhabitants to become involved in solving of the issues related to climate change, therefore, it should be provided for in the development of new documents of action policy what measures for raising awareness of the society will be implemented.

- **Legal acts and regulatory framework**

Legal acts and regulatory framework should include all other instruments to be used in the implementation of the Strategy. Legal acts are one of the ways of governing the operation

⁶⁹IPCC, Climate Change 2014: Synthesis Report, 2014. Available online: https://www.ipcc.ch/pdf/assessment-report/ar5/syr/SYR_AR5_FINAL_full.pdf

of all other instruments and characteristics of different elements thereof may be specified in such legal acts. In addition such conditions, standards, requirements, and processes may be specified in legal acts which are not included in the instruments referred to in this Sub-chapter. Legal acts and regulatory framework may be based not only on laws and regulations developed and approved by the public sector, but it may also be created based upon the voluntary agreement principle between different parties.

- **Market mechanisms**

Introduction of different new market mechanisms, as well as development and improvement of market mechanisms already existing have a significant importance in advancement towards climate neutrality. Participation in the EU ETS is currently topical for Latvia. The existing system has been established, however, work on further improvement thereof must be continued in order to be able to help to achieve the climate objectives in a wholesome manner. The EU ETS is able to carry out its task – to stimulate operators to take measures reducing GHG emissions – only if the emission quota is relatively high. Taking into consideration that the amount of allowances to be traded and their price on the market have an essential role in planning new market mechanisms, the amount of allowances in circulation and their impact on other market mechanisms should be planned in detail. In addition to the EU ETS, several emissions trading schemes are operating in the world, for example, in China, USA, Korea, Switzerland, New Zealand, Canada, and Japan. Therefore, a national emissions trading scheme could also be established in Latvia by 2050 according to the national interests, for example, in the forestry sector. Furthermore, there is a high probability that a single international market mechanism will be established in the nearest future within the scope of the Paris Agreement.

- **Fiscal instruments**

The main fiscal instruments for the introduction of the Strategy are taxes and subsidies. Tax groups of two types may be distinguished: taxes having direct impact on the reduction of GHG emissions and taxes which indirectly promote the reduction of GHG emissions. Taxes reducing GHG emissions or taxes in which, for example, CO₂ is a tax component with direct impact are the best means for the introduction of the polluter pays principle. The tax system as a whole should be restructured by 2050 so that the promotion of climate change mitigation and adaptation to climate change would become an integral part of objectives of the taxes of the relevant categories. In turn, taxes with indirect impact promote reduction of GHG emissions by having an effect on resources, goods, and services which are used in the processes of significant importance to the generation of GHG emissions. In such a way their consumption is reduced, concurrently stimulating the use of RES.

Subsidies, reliefs, tax refunds should also be used to achieve the climate neutrality. Subsidies to fossil heating fuels should be denounced completely, focusing on and shifting towards support to RES.

- **Financial instruments**

Financial instruments are loans, funds, securities, risk capital, etc. Financial instruments are an efficient resource through the use of which the maximum extent of private capital can be attracted and activated with public funding. From the perspective of the beneficiary, traditional grants where the public funding is allocated for a programme or project are attractive, however, in such a way part of the public funding is withdrawn from circulation. In the future, greater focus should be put on different friendly types of loans, for example, by creating a national energy efficiency fund which will provide long-term and low-interest loans, ensuring special

insurance against the failure to fulfil loan obligations or offering a specific rebate for the repayment of the common costs if energy savings have been proven, or also by providing interest-free loans to low-income households. Potentially, the blending financial instrument which includes both the grant and the loan part could be an efficient way for the attraction of private investments.

The principle of rotation funds which is becoming increasingly popular in the financing of energy efficiency projects may also be used. Loans and rotation funds ensure the return of the public capital into circulation as a result of which new projects can be funded. Development of the financing of third parties should also be continued, for example, by attracting energy service companies (ESCO) or local government energy service enterprises (LGESCO) which invest into energy-saving measures and recovers the made investments from the energy savings achieved in long-term.

The development of public-private partnership (PPP) should be continued in a purposeful manner for successful and sustainable provision of public services, development and maintenance of the infrastructure by joining and jointly using the resources available thereto in a long-term cooperation – the property, financial resources, knowledge, and experience, dividing also the risks, investments, and benefits related to the implementation of PPP. Moreover, the public sector should closely link the planned activities with the inventory of GHG emissions when working on planning the budget of financial instruments.

The development of green obligations also has an essential role in combat against climate change as through them funding can be attracted for projects which contribute to the combat against climate change or such projects can be re-financed. The way in which the financial resources obtained from obligations are used is becoming increasingly important for investors, and green obligations is the way of making sustainable investments.

In order to advance towards climate neutrality in 2050, the funding available within the scope of the multiannual financial framework for the implementation of climate activities will have a significant role, taking into consideration the priorities specified in the policy planning documents. The LCD principles as a horizontal issue should be taken into account when making contributions in introduction of the funding from EU funds.

The costs of energy systems consist of the costs of the maintenance and operation of systems, investments in technologies and energy efficiency, as well as the costs for the heating fuel consumed. As costs are foreseeable also in the base scenario because in any case for the system to be able to ensure consumers with the necessary services it is necessary to maintain and update it continuously, additional investments and additional costs are used for the characterisation of the costs of the climate neutrality scenario in comparison with the implementation of the base scenario.

According to the initial indicative projections⁷⁰ the additional investments for the implementation of the target scenario (achievement of climate neutrality) in comparison with the base scenario in the time period up to 2050 are approximately EUR 16 billion (in constant prices of 2010) or 1.35 % on average per year from GDP in the time period (2020–2050).

However, owing to these investments, benefits also arise, for example, from reduction of the costs for heating fuel (also due to the increase in efficiency of the use of resources) and other savings of operation costs. Therefore, the total additional costs for the implementation of the target scenario in the time period until 2050 in comparison with the total costs of the base scenario according to the initial indicative projections⁷¹ are EUR 13.5 billion (in constant prices of 2010) or 1.1 % on average per year from GDP in the time period (2020–2050).

⁷⁰Initial evaluation of the study of the Institute of Physical Energetics *Latvijas tautsaimniecības attīstības iespējamo scenāriju līdz 2050.gadam izstrāde atbilstoši Eiropas Savienības ilgtermiņa attīstības redzējumam* [Drawing-up of the Potential Scenarios for the Development of National Economy of Latvia until 2050 according to the Long-term Development Vision of the European Union], December 2019.

⁷¹Initial evaluation of the study of the Institute of Physical Energetics *Latvijas tautsaimniecības attīstības iespējamo scenāriju līdz 2050.gadam izstrāde atbilstoši Eiropas Savienības ilgtermiņa attīstības redzējumam*

The funding necessary for the implementation of the objectives specified in the Strategy will be evaluated upon development of new sectoral planning documents.

7.3. Review of the Strategy

The Strategy shall be reviewed by 1 January 2029 and later after every 10 years⁷². The Strategy may be reviewed more often by submitting a justification (informative report) to the Cabinet.

The MoEPRD shall submit an informative report on the progress of the implementation and achieving of the performance-based results of the Strategy to the Cabinet for the evaluation of the Strategy.

[Drawing-up of the Potential Scenarios for the Development of National Economy of Latvia until 2050 according to the Long-term Development Vision of the European Union], December 2019.

⁷²The next review of the Strategy must be submitted to the European Commission by 1 January 2029.

8. Public Participation

In order to promote public awareness of LCD and to ensure public participation in the creation of the Strategy, the MoEPRD has been actively implementing different publicity measures and measures for shaping public opinion since 2016 – public consultations, public discussions (several of them could also be watched online), publications on the website of the MoEPRD were also prepared, as well as brochures (electronically and in paper form) in order to distribute them at general secondary institutions and higher education institutions and at non-governmental organisations working on climate issues.

A public discussion organised by the MoEPRD regarding the future of Latvia in the new climate reality also took place in Riga at the time of signing the Paris Agreement (on 22 April 2016), and high-level officials of the OECD also participated therein amongst others.

In order to involve local governments, regional branches of State institutions, leaders of local public groups and merchants, academic staff, as well as other interested persons, five interactive seminars regarding climate change mitigation and LCD by 2050 were implemented in all planning regions of Latvia in autumn 2016 and at the beginning of 2017.

In summer of 2019, the MoEPRD organised the visit of the Director of Climate Strategy of the EC Directorate-General for Climate Action in Latvia in order to discuss achieving of climate neutrality within the context of the EC Communication. Meetings with the social partners (representatives of the Employers' Confederation of Latvia, the Association of Large Cities of Latvia, the Latvian Agricultural Organisation Cooperation Council, and youth movement Fridays for Future), as well as representatives from sectoral ministries and the *Saeima* were held during the visit.

During the development stage, the draft Strategy was published on the website of the MoEPRD for public consultation, and it was also announced in the meeting of State Secretaries.

Minister for Environmental Protection and Regional Development

J. Pūce