Pursuant to Article 109 of the Rules of Procedure of the National Assembly (Official Gazette of the Republic of Slovenia [*Uradni list RS*], Nos. 92/07– official consolidated text, 105/10, 80/13, 38/17, 46/20 and 105/21 – Constitutional Court Decision), the National Assembly adopted at its session on 13 July 2021 the following

R E S O L U T I O N

ON SLOVENIA'S LONG-TERM CLIMATE STRATEGY UNTIL 2050 (ReDPS50)

1 INTRODUCTION

With the Resolution on Slovenia's Long-Term Climate Strategy Until 2050 (hereinafter: Climate Strategy) being adopted to implement paragraph one of Article 15 of 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, amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council (OJ L 328, 21.12.2018, p. 1), the Republic of Slovenia sets a clear objective, i.e. to attain net zero emissions or climate neutrality by 2050.By setting the climate objective, the Climate Strategy is determining the goal of attaining net zero emissions by 2050 to other sectors and their sectoral policies. It also sets the strategic sectoral objectives for 2040 and 2050, which individual sectors must observe consistently and incorporate in their sectoral documents and plans.

Because the Climate Strategy is a commitment and a task of all ministries, the entire government and the country as a whole, immediate implementation of the already adopted policies and measures to reduce greenhouse gas emissions (hereinafter: GHG), their upgrade and the suspension and adoption of policies and measures that are contrary to the reduction in GHG emissions is essential in all competent sectors.

2 STRUCTURE

For the period up to 2030, the document is based on the already adopted decisions defined in Slovenia's Development Strategy 2030 (hereinafter: SDS 2030), the Integrated National Energy and Climate Plan of the Republic of Slovenia (hereinafter: NECP), the Resolution on the National Programme for the Development of Transport of the Republic of Slovenia until 2030 (Official Gazette of the Republic of Slovenia [*Uradni list RS*], No. 75/16; hereinafter: ReNPRP30), the Resolution on the National Environmental Action Programme 2020–2030 (Official Gazette of the Republic of Slovenia [*Uradni list RS*], No. 31/20; hereinafter: ReNPVO20-30) and other sectoral documents. The Climate Strategy upgrades the relevant documents, sets the vision and long-term objectives by 2050 and provides the guidelines for its attainment.

The Climate Strategy is a strategic document and does not contain specific measures. The action plan for implementing the Climate Strategy by 2030 is the NECP. The documents were drafted in coordination and based on the same expert bases.

The guidelines in the Climate Strategy were provided on the basis of projections in the expert bases that analyse possible approaches for the attainment of the objectives based on certain assumptions. The projections observe the state of technologies, the expected development

and information when drafting the projections. Based on the foregoing, the projections of the economic development, energy prices, technology prices and assumptions regarding the implementation of measures were formed.

Written guidelines indicate the path towards climate neutrality by 2050 while bearing in mind that these may also change in the given unpredictable situations. An example of such a situation is the impact of the COVID-19 epidemic, which was not observed in the projections as the latter were drafted before the onset of the epidemic.

For the most part, the guidelines were recorded as technologically neutral because technological development may significantly change the price ratios and the applicability of individual technologies for attaining decarbonisation.

3 STARTING POINTS

3.1 Legal framework and starting points

The Climate Strategy observes the commitments of the Paris Agreement (Official Gazette of the Republic of Slovenia [*Uradni list RS*], International Treaties, Nos. 16/16 and 6/17 – amended; hereinafter: Paris Agreement) and was drafted in compliance with the Framework of Slovenia's Long-Term Climate Policy "Slovenia and A Healthy Planet" and 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, amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council (OJ L 328, 21.12.2018, p. 1), last amended by Commission Delegated Regulation (EU) 2020/1044 of 8 May 2020 supplementing Regulation (EU) 2018/1999 of the European Parliament and of the Council with regard to values for global warming potentials and the inventory guidelines and with regard to the Union inventory system and repealing Commission Delegated Regulation (EU) No 666/2014 (OJ L 230, 17.7.2020, p. 1) (hereinafter: Regulation (EU) 2018/1999).

The Paris Agreement, concluded in December 2015 and applicable since 4 November 2016, is the first universal and legally binding global climate agreement concluded between nation states. By ratifying and implementing the Paris Agreement (Slovenia ratified it in November 2016), the international community undertook to keep global warming below 2°C compared to the pre-industrial era and to limit global warming to 1.5°C. For the first time, the Paris Agreement defines in a legally binding manner the importance of enhancing the resilience and reducing the vulnerability of countries to the impact of climate change while ensuring financial flows to reduce GHG emissions and for the climate-resilient development of countries, which also coincides with the objective of the 2030 Agenda for Sustainable Development. Following the adoption of the Climate Strategy, Slovenia will forward it to the European Commission (hereinafter: EC) and the United Nations Framework Convention on Climate Change (hereinafter: UNFCCC).

3.2 Principles, vision and guidelines

3.2.1 Principles

The Climate Strategy is based on the principles of reducing GHG emissions, efficient energy use and energy consumption reduction, climate justice, just transition and scientific advances. The objectives and measures are founded on the latest and internationally acknowledged scientific findings and are based on the principles of the act governing

environmental protection, which incorporates the main principles of sustainable development, integration, cooperation, prevention, precaution and the polluter-pays principle. Other incorporated principles also include the principle of competition, the principle of respecting sectoral objectives to facilitate the integration of sectoral policies, the principle of cost effectiveness, the principle of ensuring Slovenia's active role in the international community and the principle of habitat conservation, which are important for biodiversity conservation and the condition of which is also worsening due to climate change, and the principle of cultural heritage conservation.

Realisation of the Climate Strategy promotes measures and the development of technologies that have a positive impact on biodiversity or those that impact it the least.

3.2.2 Vision

In 2050, Slovenia will be a climate-neutral and resilient society based on sustainable development. It will efficiently manage energy and natural resources, and simultaneously maintain a high level of competition in a low-carbon circular economy. The society will be based on well-preserved nature, the circular economy, renewable and low-carbon energy sources, sustainable mobility and healthy locally-produced food.

It will be well-adjusted and resilient to the impact of climate change. Slovenia will be a society in which the quality and safety of life will be high, and the opportunity arising from the altered climate conditions will also be exploited.

The transition to a climate neutral society will be inclusive and the principles of climate justice will also be observed. The costs and benefits of the transition will be distributed in a fair way due to the most vulnerable groups of citizens being enabled to implement mitigation and adaptation measures.

The attainment of climate neutrality means that Slovenia will achieve net zero emissions by 2050, which means that removals of emissions will be balanced with an equivalent amount of anthropogenic GHG emissions. The removals include sinks in the sector of land use, land use change and forestry (hereinafter: LULUCF) and direct capture of GHG emissions.

The Climate Strategy is founded on analytical bases which reveal that Slovenia can attain climate neutrality by 2050 with the technologies known and tested today and numerous other measures. Based on the analysed scenarios (presented in more detail in the expert bases), Slovenia can attain climate neutrality by means of at least two scenarios, i.e. the ambitious nuclear scenario (hereinafter: WAM NU) and the ambitious scenario with the use of synthetic natural gas (hereinafter: WAM SNG).

Slovenia is already intensively developing, monitoring and investing in research, new technologies and development in order to form final solutions for reaching the objective of climate neutrality and it will also continue to do so in the future.

An important element of the climate-neutral transition is the inclusion, as early as possible, of the interested and expert public, which contributes to the quality of regulations and programmes, the fulfilment of obligations and the reduction of costs for their implementation.

The Climate Strategy incorporates guidelines for the sectors responsible for most GHG emissions. The sectors are classified in accordance with the methodology of the International Panel on Climate Change (hereinafter: IPCC) unless determined otherwise. Attainment of the objective of the climate-neutral society adapted to climate changes requires radical alterations in the economy and society, which will occur over a period of one generation. Numerous technological and social innovations throughout the entirety of society will be

necessary. Many opportunities will arise for Slovenia from the transformation into a climate neutral society that such a transformation will generate for individuals, society and the economy. Slovenia will make use of these opportunities resulting from climate change or changed environment (e.g. extended growing seasons of plants). Its size, favourable educational structure and well-preserved nature will be used in favour of an efficient, competitive, inclusive and sustainable transition to a climate neutral society.

3.2.3 Guidelines

The main guideline being realised by the Climate Strategy is the reduction of GHG emissions. The horizontal guidelines applicable for all sectors also include greater material efficiency, promotion of low-carbon resources, energy efficiency, sustainable spatial development, sustainable construction, promotion of digitalisation and public administration setting an example. Slovenia will not adopt policies and measures and will not invest funds in a manner which would contravene the commitments of the Paris Agreement. The horizontal guidelines also include the fact that in addition to climate change we are also experiencing a biodiversity crisis, which is why synergies between both have to be sought when looking for solutions. Any activities in the environment must be carried out with a minimum impact on the environment.

To enhance the integration of climate policy in sectoral policies, Slovenia will improve the verification of compliance of documents, policies, regulations and other acts regarding climate policy and further strengthen this component in the procedure of comprehensive environmental impact assessment (hereinafter: CEIA) or the environmental impact assessment (hereinafter: EIA). The criteria for assessing document compliance with the policy of climate change adaptation and mitigation will also be prepared.

Other guidelines are discussed in individual chapters.

3.3 Public consultation

In the beginning of November 2019, an online consultation was published regarding the preparation of Slovenia’s Climate Strategy. Interested stakeholders were invited to participate in the formation of the Climate Strategy. Some 159 individuals and organisations (98 individuals and 61 organisations among which 30 were non-governmental organisations) attended the online consultation. The responses received were peer reviewed and observed accordingly in the draft Climate Strategy.

Public discussion of the document took place between 1 September 2020 and 30 September 2020. More than 400 comments were submitted, which were peer reviewed and incorporated in the Strategy as appropriate. Two public presentations of the draft document or communication workshops were also carried out during the public discussion, which were intended for additional consultation and dialogue regarding specific strategy content. The public presentations took place on 18 September 2020 (presentation for broader public) and 25 September 2020 (presentation for the business sector at the Chamber of Commerce and Industry of Slovenia). Due to public assembly restrictions during the COVID-19 pandemic, the option was provided to watch both presentations online and ask questions.

Before the Strategy was designed, several workshops with different stakeholders were held within the LIFE Climate Path 2050 project for the preparation of analytical bases of the Climate Strategy.

3.4 Analysis of the situation and scientific advances relating to climate change in Slovenia

Exceptionally fast climate changes, which we have witnessed in particular in the last four decades, have had a significant impact on the situation and trends in other vital natural systems. Due to the long lifetime of GHG, the current climate changes will be expressed even more intensively and frequently in the coming decades.

In the 1961–2011 period, the most prominent climate change in Slovenia was the increase in mean air temperature (by approximately 0.36°C per decade). Temperature began to increase very sharply in the mid-1980s (Figure 1). Between 1961 and 2019, the mean air temperature increased by some 2°C in Slovenia. In the same period, surface water temperature increased by 0.2°C per decade.

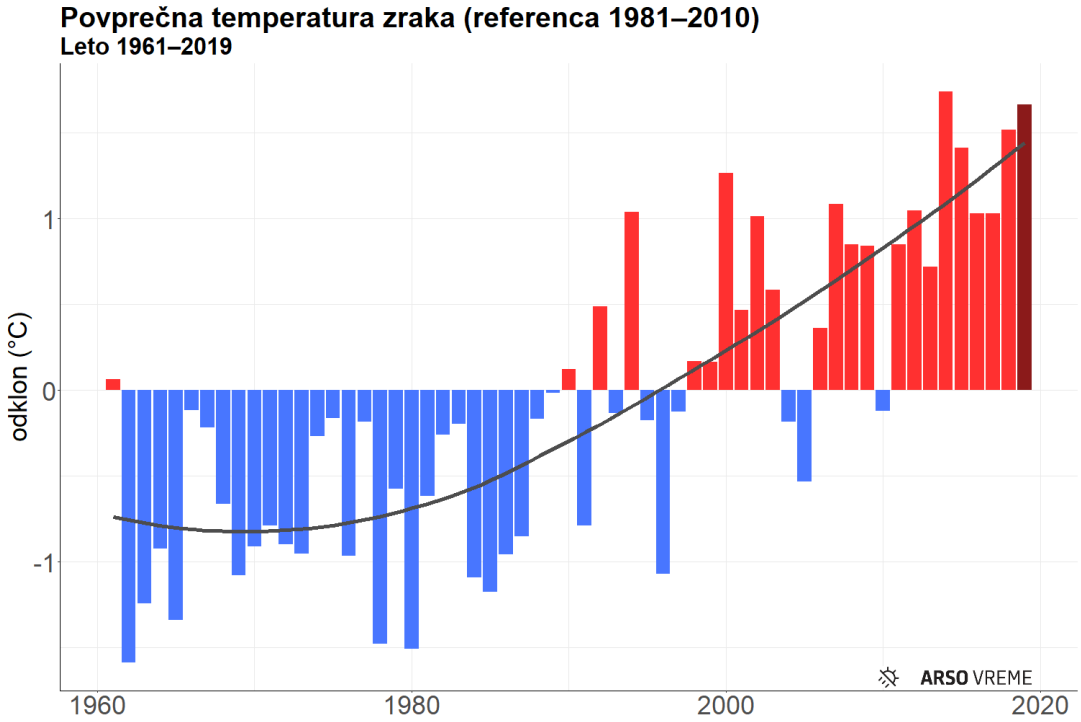

Figure 1: Deviation of the mean annual air temperature from the long-term average for Slovenia 1981–2010. Blue columns mark the years with negative and red columns the years with positive mean deviation from the 30-year average 1981–2010. The black curve shows the smoothed deviation average (source: the ARSO).

Inter-annual precipitation variability is much higher than inter-annual temperature variability, which is why possible changes in precipitation are more difficult to detect and prove. In the 1961–2011 period, precipitation in the western half of the country reduced statistically significantly by up to 20 per cent and the trend in precipitation decrease has stopped at the national level in the last decade (Figure 2). The snow cover in the highlands and high mountains reduced significantly as well, halving in the last sixty years. Water evaporation, which is measured by means of the reference evapotranspiration, also increased. This represents all water that evaporates through the reference vegetation cover (grass) if the water supply in the surface layer of soil is sufficient throughout. The reference evapotranspiration increased the most in spring and summer, and the linear trend amounted to between 3 and 6 per cent per decade at the annual level in the 1961–2011 period.

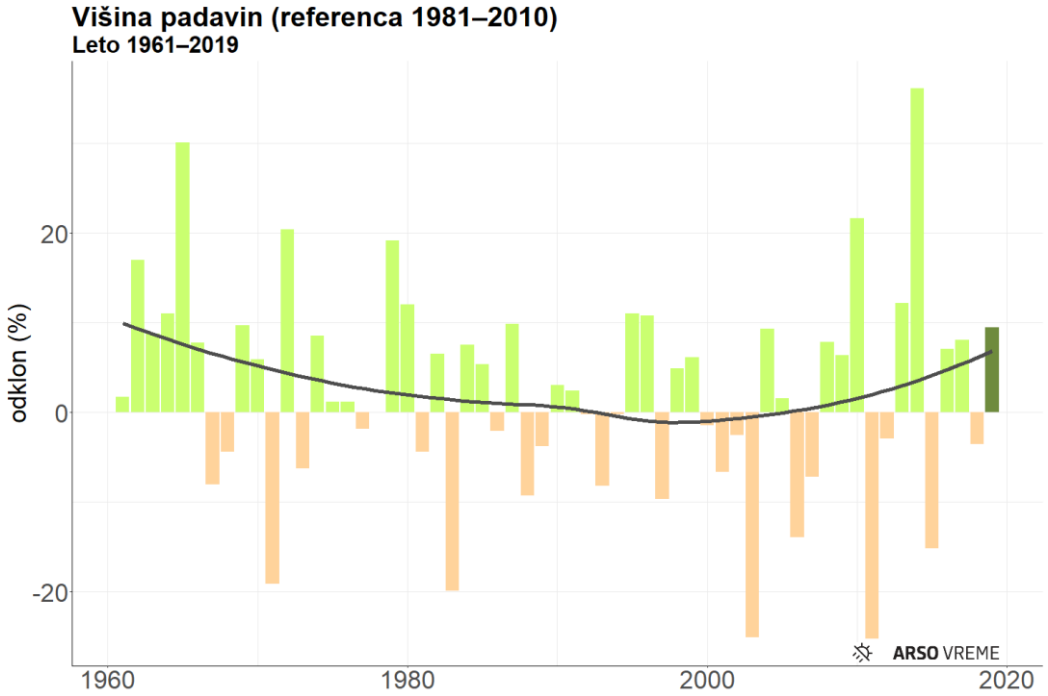

Figure 2: Deviation of the mean annual precipitation from the long-term average for Slovenia 1981–2010. Brown columns mark the years with negative and green columns the years with positive mean deviation from the 30-year average 1981–2010. The black curve shows the smoothed deviation average (source: the ARSO).

Climate change detected by means of measurements in the past six decades will continue in the coming decades. The scope of the forthcoming change also depends on the success of policies for limiting GHG emissions.

The air temperature will continue to rise in any case in Slovenia until the end of the century. In the event of the optimistic emissions scenario (RCP2.6), the temperature will increase on average by an additional 1.3°C by the end of the century if compared to the 1981–2010 period; in the event of the moderately optimistic emissions scenario (RCP4.5), it will increase by an additional 2°C, and in the event of the most pessimistic emissions scenario (RCP8.5), the temperature will increase by an additional 4.1°C (Figure 3) with regard to the already measured temperature increases in the period up to 2010.

The rise in temperature will severely increase the heat load, especially in summer. The frequency, intensity and duration of heat waves will increase. With the increase in temperature, the surface layer of soil will heat up, too, and that will affect the phenological development of plants, which will be early, and the length of growing period, which will be prolonged. The frequency of spring frost will remain at a similar level as in the current climate.

The temperature of surface water will increase in accordance with the air temperature. In the event of the optimistic scenario (RCP2.6), the temperature of surface water will increase by about 0.5°C by the end of the century in comparison with the 1981–2010 period; in the event of the moderately optimistic emissions scenario (RCP4.5), it will increase by about 1°C and in the event of the most pessimistic emissions scenario (RCP8.5), the temperature will increase by more than 2°C.

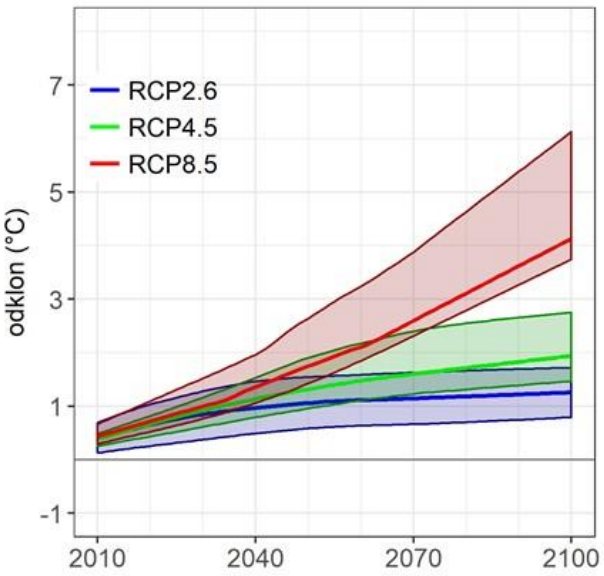

Figure 3: Timeline of the change in the mean annual air temperature in Slovenia by the end of the 21st century, including deviation ranges. Deviation of the mean in the 1981–2010 period is displayed (source: ARSO).

Although measurements reveal a decline in precipitation on the annual level (Figure 2), all models of scenarios show that the trend will reverse in the coming decades. In the event of all emissions scenarios, mean annual precipitation will have increased by up to 20 per cent by the end of the century if compared with the 1981–2010 period. For the most part, this increase will be the result of an increase in winter precipitation which will be more prominent in the eastern part of the country. Already by mid-century, winter precipitation is predicted to increase by 40 per cent in eastern Slovenia and by 15 per cent at the national level. In the event of the pessimistic emissions scenario (RCP8.5), there will be up to 60 per cent more precipitation in the east and up to 40 per cent at the national level (Figure 4) by the end of the century. In the remaining seasons, all changes will be within the limits of natural rainfall variability. The indicators of extreme precipitation reveal that the intensity and frequency of extreme precipitation events will increase, which will be most prominent in the event of the pessimistic emissions scenario (RCP8.5). An increase in temperature must be added to the increase in intensity and frequency of extreme precipitation events, which means that there will be less precipitation in the form of snowfall resulting in lower water retention in the cold part of the year. The risk of torrential floods and landslides will also increase due to greater precipitation intensity.

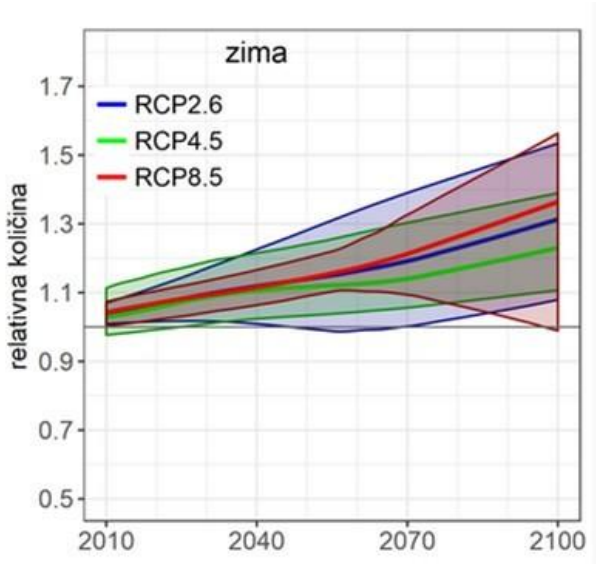

Figure 4: Timeline of the change in winter precipitation in Slovenia by the end of the 21st century, including deviation ranges. Relative quantity as per the mean in the 1981–2010 period is displayed (source: ARSO).

An increase in reference evapotranspiration will continue in Slovenia in accordance with the increase in air temperature by the end of the century. In the event of the moderately optimistic emissions scenario (RCP4.5), the reference evapotranspiration will increase by 8 per cent if compared to the 1981–2010 period and it will increase by 16 per cent in the event of the most pessimistic emissions scenario (RCP8.5). The intensity and frequency of droughts will increase due to accelerated evaporation and a changed precipitation regime. Drought is a complex phenomenon displayed at several levels (meteorological, agricultural, hydrological). We frequently detect an exceptional lack of rainfall (meteorological drought) and drought in the surface layer of the soil (agricultural drought), while we do not notice a significant deviation from normal conditions in watercourses and groundwater reserves. On the contrary, a precipitation event may immediately improve the condition of the surface layer of soil which retains the majority of rainfall after a longer dry period, while watercourses and aquifers remain dry. Despite an increase in annual precipitation, problems will occur in the future, particularly regarding short-term, but extremely severe droughts in the surface layer of soil. Such droughts will be the result of a longer gap between precipitation events, and they will be accompanied by extremely high temperatures in the warm part of the year. Major escalation of drought conditions is not expected on rivers, but the flow regime of rivers will change. Rainfall intensity after extensive drought periods will increase, which will fill up watercourses and groundwater reserves. Sufficient and even increased winter precipitation will also fill up watercourses. River flows will also increase additionally in winter due to a lower proportion of snow which represents a natural water retainer. As a result, this will significantly increase the risk of flooding in winter. Groundwater recharge will also increase due to the expected increase in winter precipitation. According to the projections, low flow rates will change significantly, i.e. they will increase in the second half of the century, but only on the watercourses in eastern Slovenia and those flowing into the Sava River in its middle section.

Slovenia is considered a country rich in water sources and the climate projections reveal that it will remain as such in the future. Precipitation will increase in the cold half of the year when the need for water is not great. Simultaneously, the impact of snow cover, which is a natural water retainer, will be greatly reduced. So, less water will be available, particularly in the surface layer of soil and surface watercourses at the beginning of the vegetation period when evaporation will also increase. Despite an increase in annual precipitation, Slovenia will experience drought in the surface layer of soil in the warm part of the year. The relevant changes will also affect groundwater, the restoration of its dynamics and the drinking water supply. The thusly altered

water and river regime and an increased heat load will be the most important effects of future climate change, which will directly and indirectly affect activities such as health care, agriculture, forestry, energy, manufacturing and tourism.

3.5 Situation of GHG emissions in Slovenia in 2018

Total GHG emissions in Slovenia amounted to 17,502 kt of CO_2 equivalent (excluding the LULUCF sector) in 2018 and were somewhat higher than the year before. Slovenia has set binding targets for 2020 only for GHG emissions which are not included in the emissions trading scheme (hereinafter: non-ETS) and these objectives will likely be attained. The objectives for the non-ETS sectors were set at the time when no broad political consensus on firmer action against the global climate crisis existed, which means that Slovenia is currently not managing the long-term emissions trajectory. A cause for concern is particularly the growth in GHG emissions in transport.

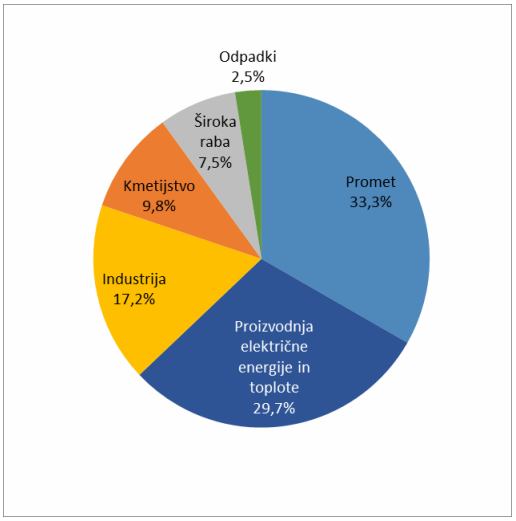

Figure 1: Sector shares in total GHG emissions for 2018 (source: Energy Efficiency Centre of Jožef Stefan Institute)

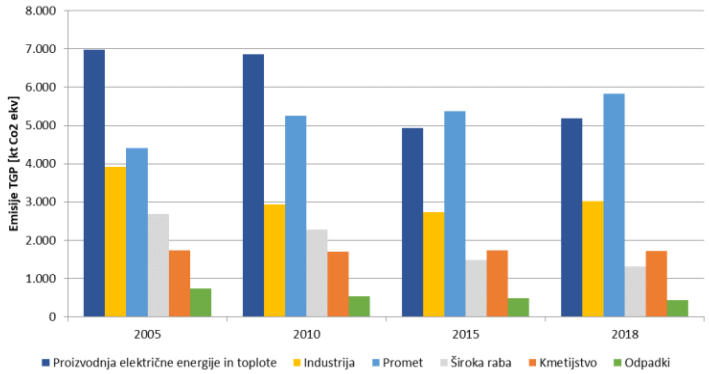

Figure 2: Quantity of emissions by sectors in different years (source: Energy Efficiency Centre of Jožef Stefan Institute)

3.6 Guidelines for biodiversity protection for mitigating and adapting to climate change

Processes of climate change, which endanger all living beings in a way not yet experienced, warn us that we are part of nature and highlight the importance of their protection. The latest findings of

the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), i.e. the Summary for policymakers of the global assessment report on biodiversity and ecosystem services (pp. 12–13, A.2.), and the European Environment Agency (The European Environment – State and Outlook 2020) point out that the crisis in the field of biodiversity is inherently connected to the climate crisis. Climate changes accelerate the occurrence of frequent drought, flooding and wildfires in nature. The loss of the natural environment and its unsustainable exploitation are the key negative factors of climate change. Nature is also the key factor in the combat against climate change because it regulates climate and provides solutions that incorporate the conservation and restoration of wetlands, peatlands and coastal ecosystems, sustainable management of marine areas, sustainable management of forests, grassland and agricultural land, which are important measures for the adjustment to climate change and the reduction of GHG emissions.

Political specifications in global objectives of preserving biodiversity in the European Green Deal (hereinafter: EGD) and in the ReNPVO20-30 at the national level emphasise the significance of biodiversity for climate change adaptation. Furthermore, preserved biodiversity also contributes to their mitigation. The importance of maintaining biodiversity is recognised in the light of adapting to climate change and is also incorporated in national strategies and planning policies of other sectors, such as agriculture and forestry, but less in others, which will have to be upgraded.

Climate change and biodiversity decline are two inseparable processes that have to be considered together. Climate change has a severe negative impact on biodiversity and thus the stability of ecosystems, which also affects people's health and well-being. Their solutions are also intertwined, which is why these two inseparable processes must be discussed in unison. Nature is our key ally in the combat against climate change because well-preserved ecosystems and subsequent ecosystem services can contribute significantly to the adjustment to, and mitigation of, climate change.

3.6.1 Situation and challenges to preserve biodiversity

Biodiversity means the variability of living organisms on the genetic, species and ecosystemic levels. Its conservation is implemented by means of ecosystem and natural habitat protection, preservation of landscape characteristics, and the maintenance and enhancement of populations which are capable of continuing the development of species in their natural environment. The Natura 2000 Network is crucial for ensuring the habitats of species endangered at the EU level. Almost 38 per cent of Slovenia's territory is included in the Natura 2000 Network, which is the largest share among all EU member states. Biodiversity is declining in Slovenia despite the measures implemented for its preservation (the 2017 Environmental Report of the Republic of Slovenia).

The condition of important European species and habitat types, whose habitat is agricultural landscape, is worsening in the lowlands due to accelerated agriculture and the abandonment of land use in hilly and remote areas. Many habitat types linked to water, including wetlands, are also poorly preserved. The condition of forests is relatively good, including certain typical species living in them (e.g. wolf, bear). Exceptions to this are specific species with specialised ecological requirements and minority habitat types (e.g. in lowland flooded forests). The 2017 Environmental Report states that construction with urbanisation and industrialisation, transport and agriculture acceleration are among the salient and recorded pressures upon, and threats to, the species and habitat types in Slovenia that are important for Europe. Climate change and the spread of invasive alien species further worsen the situation. Very similar findings also arise from the Report on the Conservation Status of Habitat Types and Species as per Article 17 of the Habitats Directive for the 2013–2018 period (Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (OJ L 206, 22.7.1992, p. 7)). The Natura 2000 protected areas represent living and changing areas, which is why it is reasonable to implement an expert revision of determining or changing these areas with the objective to particularly protect areas where this is scientifically justified and to ensure their efficient management.

The research reveals that climate change impacts the spread of invasive alien species by generating more hospitable conditions for such species due to extreme weather phenomena and an increased accessibility of certain areas to people. Forests and their biodiversity, functions and ecosystem services are exposed to greater risks due to climate change, such as wildfires, extreme weather events, increased spread of invasive alien species, diseases and pests. Broader analyses of the contribution of individual habitats to retaining GHG in connection with their conservation status have not yet been implemented in Slovenia.

Climate change also has a negative impact on pollinators, which has severe consequences for biodiversity and the provision of food safety. Climate change significantly affects marine and coastal ecosystems because it causes ocean warming and acidification, and oxygen depletion.

3.6.2 Implementation of measures for conserving biodiversity to mitigate and adapt to climate change

The measures to preserve biodiversity are recognised globally and at the EU level as measures that specifically contribute to the mitigation of, and the adaptation to, climate change. These are the measures for improving the status of biodiversity in forests, wetlands, grasslands and water and waterside lands. Some examples include measures for the removal of invasive alien species, renaturation of wetlands and water areas, leaving sections of forests to undergo natural processes, and extensive mowing while observing target species or habitat types. These measures simultaneously contribute to increased carbon retention and prevention of GHG emissions, for which the terms of natural climate solutions or nature based solutions are used. According to the latest assessments, natural climate solutions can make up 37 per cent of cost-efficient prevention of CO_2 emissions by 2030 and thus contribute significantly to the attainment of the objectives of the Paris Agreement.

The 2030 Agenda for Sustainable Development cites objectives 2, 11, 13, 14 in 15 as the objectives most connected to the adjustment to climate change (EEA Report No. 1/2017). Objectives 14 and 15 focus on the conservation and sustainable use of seas and inland water ecosystems. In particular, objective 15 highlights the halt of biodiversity loss by means of the protection, restoration and promotion of sustainable ecosystem use.

To preserve biodiversity and related ecosystem services, the Strategic Plan for Biodiversity 2011–2020 incorporates measures to improve and restore at least 15 per cent of degraded ecosystems and explicitly states the related contribution to the mitigation of, and the adaptation to, climate change (Aichi Target 15). Aichi Target 10 is also linked directly to the mitigation of climate change and calls on the state parties to reduce as much as possible the anthropogenic pressures on coral reefs and other vulnerable ecosystems which are affected by climate change or ocean acidification, so that their integrity and functioning will be preserved.

The foregoing global commitments are also summarised in Target 2 of the EU Biodiversity Strategy to 2020 and in the Action Plan for nature, people and the economy (actions 5, 6 and 10).

The EU Biodiversity Strategy for 2030 determines a number of specific commitments and measures for protection and restoration of nature and degraded ecosystems in the EU by 2030 and their sustainable management, especially of those with the greatest potential for carbon capture and storage and the prevention and reduction of the impact of natural disasters. Among other measures, the Strategy proposes an increase in the proportion of protected areas on land and at sea, binding objectives for restoration of damaged ecosystems and rivers, improvement of the conservation status of protected habitats, species and pollinators on agricultural land, pollution reduction, greening of cities, promotion of organic farming and other nature-friendly agricultural practices and the improvement of the condition of European forests. High biodiversity, healthy ecosystems, ecosystem services and nature-based solutions can contribute significantly to greater resilience against climate change.

According to the latest assessments, climate change negatively affects 14 per cent of habitats and 13 per cent species in Europe (EEA Report, No. 1/2017). The impact is expected to double in the near future. Due to climate change, many species in the Natura 2000 network are said to lose suitable climate niches. The effects of climate change on the European biodiversity are already displayed in different ways, e.g. by changed species distribution, changes in plant development cycles, shorter hibernation periods and changed animal migration patterns. There is insufficient data regarding the impact of climate change on species and habitats in Slovenia because the study of these effects is in the initial phase. The possible impact of climate change on certain species and habitats was examined only exceptionally in the territory of Slovenia. It was acknowledged that an increase in extreme events was identified due to climate change in marine and coastal ecosystems, which have a negative impact on the already spatially limited coastal habitats and the species living in these habitats. Within the framework of reporting as per the Habitats Directive and the Birds Directive (Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds; OJ L 20, 26.1.2010, p. 7), climate change was recognised as a threat, particularly for the species that depend on inland water ecosystems, such as crustaceans, fish, shellfish and amphibians. It is evident from the current research on wild pollinators that, in addition to intensive agriculture, climate change is considered one of the main reasons for their rapid decline. For example, climate change will be unfavourable for the majority of bumblebee species in Europe; on the basis of models, it is expected that almost one half of all bumblebee species could lose 50 to 80 per cent of the current areas of distribution by 2100. By means of the target research programme, the Design of the Methodology for the Monitoring of Wild Pollinators in Slovenia, which is underway, Slovenia establishes the monitoring of their condition, determines reasons for its deterioration, and suggests proposals for improvement. Biodiversity will be more resilient against climate change if it is preserved and will thus ensure healthy ecosystems. This will also be one of the key adjustments of humankind to climate change because we all depend on ecosystem services (The Natura 2000 Newsletter, 2007).

Healthy ecosystems will be preserved, or damaged ones improved, in such a way that the use of the existence of populations of key species and their habitats will be abandoned or reduced and renaturation measures will be implemented.

The significance of the Natura 2000 areas as a mechanism for conserving biodiversity while adapting to climate change is defined in the EU Guidelines on climate change and Natura 2000 (2013). The guidelines emphasise that the Natura 2000 areas play a crucial role as natural carbon storage sites (provision of natural capacities for storing carbon), a user of carbon dioxide (increasing the capture of carbon dioxide in natural ecosystems), a risk reducer regarding the effect of extreme events and a reducer of impact caused by the sea level rising. Forests and wetlands (marshes) are particularly important for carbon storage in the Natura 2000 areas. The existing Natura 2000 network covers almost 30 per cent of European forest areas and a great proportion of European marshland. The assessments reveal that some 9.6 billion tonnes of carbon is stored in the Natura 2000 areas, which equals 35 billion tonnes of CO_2 (Guidelines on climate change and Natura 2000, 2013).

Total Natura 2000 areas in Slovenia amount to 7,681 km^2, of which 7.675,5 km^2 is inland and 5.5 km^2 by the sea, and cover 37.46 per cent of Slovenian territory. Forests cover 71 per cent of Natura 2000 areas. Some 5 per cent of agricultural land is above the tree line and 23 per cent of land is being overgrown. There is 1 per cent of water and 2 per cent of built-up area. In protected areas (in Triglav National Park, regional and landscape parks, and reserves and natural monuments), 29 per cent of the areas are Natura 2000 areas.

Slovenia is striving to conserve biodiversity by maintaining habitats and species in a favourable condition to mitigate and adapt to climate change. Several activities, which are part of systemic measures and many target projects (Convention on Biological Diversity – Sixth National Report of the Republic of Slovenia, 2019), have been implemented in this field or are still underway. For

example, measures for the renovation of degraded habitats and improvement of the status of specific species in Natura 2000 priority areas are being carried out in accordance with the Natura 2000 Management Programme (2015-2020), which includes projects within Natura 2000 financed with funds from the European Cohesion Policy (e.g. PoLJUBA: Rehabilitation and Conservation of Wetland Habitats in the area of Ljubljana Marsh Nature Park), and within the framework of the LIFE integrated project for enhanced management of Natura 2000 in Slovenia.

Activities are also taking place with regard to the provision of connectivity between individual areas of nature through green infrastructure. Their purpose is to establish and ensure the favourable condition of the Natura 2000 areas and protected areas. Measures to prevent the introduction and spread of invasive alien species and their removal and management are also being implemented. Detailed objectives and measures to obtain a favourable condition of species and habitat types of European interest are determined in the Natura 2000 Management Programme. Responsible holders of measures and the anticipated financing (e.g. within the framework of implementing public services in various sectors or projects) were also determined.

The ReNPVO20-30 highlights the importance of nature and biodiversity conservation and recognises thus related risks: mitigation and adaptation to climate change, use of degraded surfaces and maintenance of ecosystem services, approaching net zero building, etc. Relating to international environmental commitments at the global level, implementation of the ReNPVO20-30 will particularly support the commitments related to the conservation of biodiversity and mitigation of climate change. The guidelines of the National Nature Protection Programme (hereinafter: NNPP), which is an integral part of the ReNPVO20-30, also include informing the broader public about connections between climate changes and their impact on ecosystems and biodiversity. In connection with the measures of the Programme for conservation of wild fauna and flora, their habitats and ecosystems, the appertaining Strategic Plan for Biodiversity until 2030 defines specific measures for attaining these guidelines and subordinate objectives, including research on the connection between biodiversity and climate change or ecosystem services.

Since 2019, Slovenia has been implementing measures for the adaptation to climate change in the field of conserving biodiversity which are financed from the Climate Change Funding Programme (Ordinance on the Climate Change Funding Programme for the period 2020–2023; Official Gazette of the Republic of Slovenia [*Uradni list RS*], No. 14/20), i.e. measures for prevention and management of the introduction and spread of invasive alien species and measures for management of climate change impact on saline ecosystems of the Sečovlje and Strunjan salt-pans and other wetlands in protected and Natura 2000 areas. In particular, the measures are intended for the implementation of specific activities in the field for improving the status of species and habitat types, adaptation of habitats to climate changes and the implementation of other action to prevent and manage invasive alien species. The measures are incorporated in management plans and work plans of protected areas, annual work programmes of public institutions, concessionaires, public utility units and providers of contractual and custodial care.

As per the data on the decline in biodiversity and related negative consequences for people at the national, EU and global levels, Slovenia will enhance its efforts to preserve biodiversity in the period after 2020. National objectives of the biodiversity protection for the 2020–2030 period are defined in the NNPP within the framework of the ReNPVO20-30. The set objectives, which also contribute to the adaptation to, and mitigation of, climate change, include the preservation of a favourable status of native wildlife species, preservation of a favourable status of the scope and quality of habitat types, especially those located in ecologically important and Natura 2000 areas, prevention of the introduction and spread of invasive alien species or management of their introduction and spread, establishment and maintenance of key green infrastructure, establishment of new protected areas, primarily in the most sensitive areas regarding nature conservation, and the enhancement of knowledge about biodiversity and its significance at all levels of society. With the largest proportion of Natura 2000 areas in the EU (almost 38 per cent of its total territory), Slovenia has great potential for sustainable climate solutions contributing to the adaptation to, and mitigation of, climate change. In September 2019, Slovenia became a member

of the Nature-Based Solutions Coalition at the UN Climate Action Summit in New York and it committed itself to implement four manifesto priorities. Active care for green infrastructure is particularly important for Slovenia, whose key framework in the EU is the Natura 2000 network, which was also highlighted upon the accession to the NBS coalition. Slovenia will ensure the attainment of objectives for a favourable status of species and habitat types in the Natura 2000 areas and will also improve the ecological connectivity of these areas (e.g. by means of underpasses for amphibians at the most critical crossing points, the arrangement of green overpasses on older sections of the motorway network and at important road crossing points of large carnivores and other mammals).

The most important challenge of preserving biodiversity will be the incorporation of biodiversity conservation objectives in the policies of key sectors. Care for biodiversity conservation when tackling climate change within various sectors, such as agriculture and fisheries, is also highlighted in the European Green Deal. The EGD stresses the urgency of restoration of ecosystems which are not in good condition, especially those rich in carbon, and plans to contribute significantly through nature conservation, sustainable use and restoration of biodiversity to the economic benefits and generation of sustainable jobs, growth and development in the EU member states, including Slovenia.

3.6.2.1 Guidelines and measures adopted until 2030

By implementing the objectives and measures of the ReNPVO20-30 and the already existing measures (e.g. for improving the status of wetlands and reducing invasive alien species), Slovenia will also dedicate its attention to the broader implementation of measures in the field of biodiversity conservation with an emphasis on the improvement and restoration of ecosystems, primarily of those measures which are recognised by the experts as urgent and scheduled for the respective governmental Natura 2000 Management Programme. To improve the state of nature and implement measures introducing natural climate solutions that will result in positive effects for biodiversity, Slovenia will primarily reinforce the public service of nature conservation and expert services of other sectors. Sufficient funds from various sources will be provided. Progress will be attained on agricultural, forest and water land owned by the state and privately. With the improvement and restoration of ecosystems, mitigation of, and adaptation to, climate change will also improve. To evaluate the contribution to the mitigation of climate change in Slovenian territory with implemented biodiversity conservation measures, Slovenia will ensure additional studies. Slovenia will also obtain knowledge on habitat contribution to GHG retention in connection with their conservation status, which will be beneficial in further decision-making when defining priority activities from the aspect of natural climate solutions on the priorities of nature conservation. Slovenia will direct its spatial development by harmonising economic, social and environmental aspects and ensure biodiversity conservation when planning the green system of urban areas and green infrastructure at municipal, regional and national levels. It will use instruments, such as the assessments of plans and programmes for implementing the policies of other sectors, more efficiently and it will ensure that measures for conserving biodiversity, which are defined in the plans and programmes, will also be carried out in practice.

4 OBJECTIVES

4.1 Reduction of GHG emissions and enhancement of removals by sinks

Slovenia's objective, compliant with the Paris Agreement, is to attain net zero emissions by 2050 (removals equalling the remaining anthropogenic GHG emissions) or the attainment of climate neutrality. By 2050, Slovenia will reduce GHG emissions and improve sinks. It will reduce GHG emissions by 80 to 90 per cent in comparison to 2005 and simultaneously accelerate the implementation of climate change adaptation policies and the provision of climate safety for the public.

The year 2005 was selected as the base year as emissions in 2005 were higher in that year only by 0.44 per cent than in 1986. The data for 2005 also enables division into emissions in the sectors included in the emissions trading system and those not included in this system.

Table 1: Strategic sectoral objectives of reducing GHG until 2050 (source: Energy Efficiency Centre of Jožef Stefan Institute)

	Annual GHG emissions [kt of CO_2		Strategic sectoral objectives of reducing GHG as per 2005
	2005	2018	2050 Climate Strategy
Transport	4,416.5	5,824.0	90–99%
Energy	6,974.5	5,189.6	90–99%
Industry	3,912.5	3,014.4	80–87%
Agriculture	1,732.8	1,721.7	5–22%
Broad use	2,680.0	1,310.8	87–96%
Waste management	740.5	441.7	75–83%
TOTAL	20,456.8	17,502.1	80–90%
LULUCF	*-7,120.8*	*243*	*Sink of at least –2,500* kt of CO_2
TOTAL	*13,336*	*17,745.1*	*Attaining net zero GHG emissions*

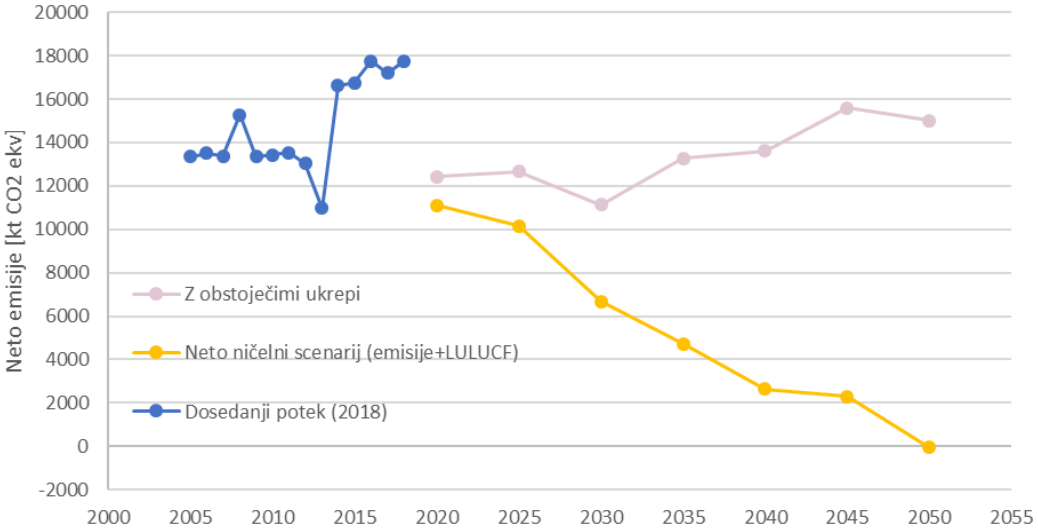

Figure 7: Course of net zero emissions in Slovenia in accordance with projections. The graph displays net emissions, i.e., emissions and taking into account sinks/emissions from the LULUCF sector. By enabling sinks, Slovenia will attain net zero emissions by 2050 as per projections (source: Energy Efficiency Centre of Jožef Stefan Institute).

Net emissions in the LULUCF sector amounted to 243 kt of CO_2 equivalent in 2018, which means that emissions were recorded in the sector and not sinks. The objective of the LULUCF sector in 2050 is a net sink of at least –2,500 kt of CO_2 equivalent. It must be ensured that sinks in the obtained timber products will increase by 100 per cent, while the emissions due to settlement growth or built-up and similar land will reduce by 100 per cent in 2050 in comparison to the level recorded in 2005. (See chapter 6.6.)

4.1.1 National objectives for 2030 and indicative milestone for 2040

The Climate Strategy and the NECP were drafted in coordination, which means that the projections used for GHG emissions were identical for both documents. The NECP objectives until 2030 are compliant with the Strategy's long-term perspective. The Climate Strategy summarises key guidelines and measures of the NECP, which is the Climate Strategy's action plan. The NECP was adopted by the Government of the Republic of Slovenia on 27 February 2020 and a comprehensive environmental impact assessment was also carried out for it.

For 2030, the NECP sets the national objective for non-ETS sectors and anticipates that GHG emissions will reduce by at least 20 per cent in comparison to 2005. The objective of reducing all GHG emissions by 36 per cent until 2030 is consistent with the NECP. The strategic objective or the state's indicative milestone for 2040 is a 55- to 66-per cent reduction of total GHG emissions if compared to 2005.

With regard to 2005, the NECP also sets sectoral objectives for 2030 when reducing GHG emissions,
i.e.:

- transport: +12%,
- broad use (buildings): –76%,
- agriculture: –1%,
- waste management: –65%,
- industry*: –43%,

- energy*: –34%.

(*Only for the part of the sector which is not included in the ETS.)

To prevent damage due to climate change and in accordance with the new EU objectives, Slovenia will further tighten the objectives until 2030. In the shortest time possible (possibly in 2021), it will analyse additional potential by sectors and design suitable additional measures in order to reduce its total emissions by 2030 in comparison to 2005 in compliance with the joint EU target, i.e. –55 per cent.

The upgrade is anticipated to primarily incorporate mostly measures from the transport field: the plan for reducing needs for motorised transport (including an analysis of work from home, the impact of a 4-day workweek on transport, Slovenia's decentralisation and the impact of the latter to transport), measures and plans for sustainable consumption and production, decarbonisation and development of industry-intensive sectors, greening of public finances to support climate politics and preparation of the funding model for implementation, decarbonisation of the energy sector and measures for a just transition for the most vulnerable groups and regions.

Feasibility of the set objectives involving the reduction of GHG emissions, and the attainment of climate neutrality requires immediate implementation of policies and measures already adopted and the cessation of the implementation and adoption of measures that are contrary to the reduction of GHG emissions.

4.2 Energy efficiency

4.2.1 Situation

In the field of energy efficiency, Slovenia set an objective that the primary energy consumption would not exceed 7.125 Mtoe in 2020.In 2018 and 2019, it was still within the boundaries of the indicative annual objective. The fulfilment of the objective for 2020 is expected, which is partly the result of implementing measures and partly due to external factors. The fuel price ratio in Slovenia and neighbouring countries has a great impact on energy use. The shrinking of economic activities in 2020 due to the coronavirus epidemic had a severe effect, but it is estimated that the objective of efficient energy use (hereinafter: EEU) would have been attained in 2020 in similar circumstances to those of recent years. The EEU measures also planned due to other positive effects, such as reduced air pollution and energy costs and the attainment of the mandatory share of renewable energy sources (hereinafter: RES), were not fully implemented. (See also sectoral chapters 5.1 to 5.4.)

4.2.1.1 Guidelines and measures adopted until 2030

The SDS 2030 highlights that the efficient use of materials contributes to a reduction in energy consumption at least as much as energy efficiency measures.

As a target, the NECP sets the systematic implementation of adopted policies and measures so that the use of final energy in 2030 does not exceed 54.9 TWh (4.717 ktoe), and that the calculated use of primary energy does not exceed 73.9 TWh (6.356 ktoe) (Figure 8). For measures of efficient use of energy as per the NECP, see chapters 6.1 to 6.4.

4.2.2 Vision

Energy efficiency, the circular economy and other sustainable practices to reduce energy demand will be the priority action areas which will contribute significantly to emission reduction until 2050. Many concurrent positive effects will thus be attained, including the reduction of environmental impact and energy import dependency, costs management and subsequent energy poverty and an increase in the competitiveness of enterprises.

The vision in the field of energy efficiency is supplemented by the vision in the area of circular economy and waste management.

4.2.3 Objective by 2050

The objective is to ensure that final energy consumption does not exceed 40 TWh in 2050 and 47 TWh in 2040. The aim is also to reduce primary energy consumption, so that it will not exceed 65 TWh in 2040 (Figure 8).

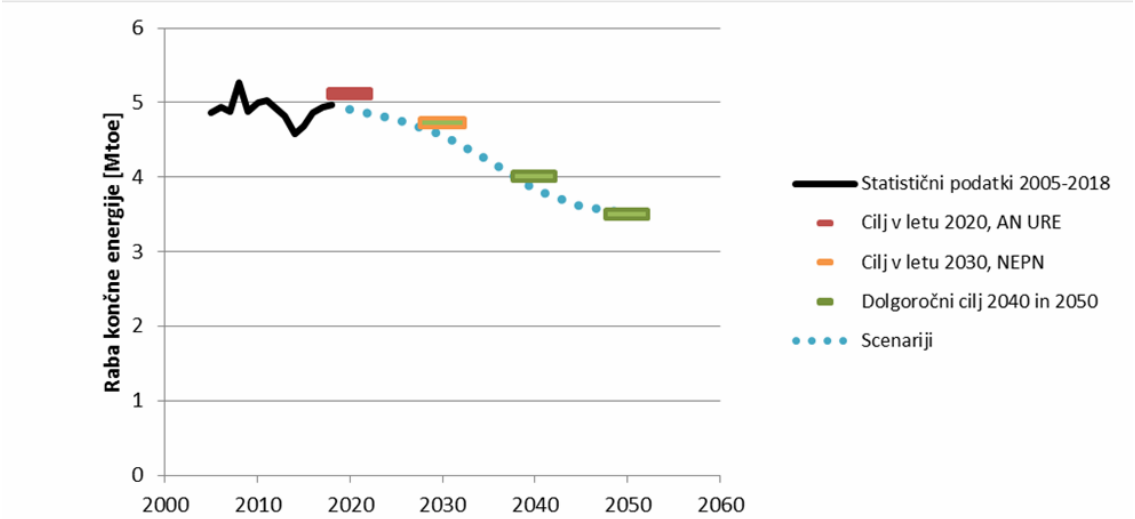

Figure 8: Movement of final energy consumption and objectives: current movement in the 2005–2018 period, objectives adopted for 2020 and 2030, anticipated course and long-term objectives for 2040 and 2050 (source: Energy Efficiency Centre of Jožef Stefan Institute)

4.2.4 Main orientations by 2050

Giving priority to the measures that reduce energy consumption and improve energy efficiency before the construction of new facilities for energy supply is the fundamental orientation harmonised with the principles of Slovenian legislation and strategic guidelines in the EU. As a rule, these measures are the most cost-efficient.

Slovenia will actively strive to improve energy efficiency and reduce primary and final energy consumption by means of a broad range of measures. Sustainable practices (circular economy, digitalisation, sustainable consumption, planning, sustainable practices in the field of transport, etc.) will manage the needs for energy services: heating, cooling, transport or its accessibility, functioning of information and communications devices, mechanical parts, lighting, etc. Energy services will be provided with minimum energy consumption in an efficient and sustainable manner. Efficient use of energy and materials will be simultaneously

promoted because the strategies for increasing material efficiency contribute to a reduction in energy consumption at least to the same extent as the energy efficiency measures. (Also see chapter 7.1.)

Slovenia will arrange a support environment for further development of the offer of EEU products and services and the reduction of energy demand. It will build upon current successful practices, promote further development of high-quality services and products and related jobs. Based on comparable investment, green jobs have better effects on employment, while educational structure and economic effects grow.

Energy efficiency is also crucial due to strategic reliability of supply or reduced energy import dependency and lower costs for imported fuels.

Slovenia will also promote the improvement of energy efficiency with the aim of increasing the competitiveness of enterprises and managing price risks when expecting higher and more variable prices of energy products in the European and global markets (see also chapter 6.2). The implementation of measures for households exposed to the risk of energy poverty will be particularly promoted.

As a priority, Slovenia will promote measures of efficient energy use, which simultaneously contribute to the adaptation to climate change, e.g. energy efficient renovation of buildings, which is also a measure of adaptation to heat waves.

For the transition to a low-carbon circular economy and attainment of the Strategy's objectives, Slovenia will promote digitalisation, which will be the key element of efficient use of energy and other sources in logistics, construction, production, services, agriculture and other sectors. Digitalisation will also be crucial for decarbonisation of the energy supply when connecting the systems of supply and demand, provision of flexibility and reliability of energy supply, development of active consumers, etc. Digitalisation will be the key element in introducing a circular economy directed towards the improvement of material efficiency and longer product life cycles (connecting services and production, product design, etc.) and energy efficiency. The sector of information communication technologies (hereinafter: ICT) and users will be directed towards sustainable digitalisation.

4.2.5 Key factors for attaining the objectives in 2050

The key factors for attaining the objectives include:

- an increase in energy efficiency in the sectors of final energy consumption and transformations, and integration between them (integration between sectors is also discussed in chapter 6.1);
- a decrease in energy demand when providing energy services and
- introduction of sustainable practices that contribute to a lesser demand for energy services and subsequently energy.

(Other factors are defined in more detail in chapters 6.1, 6.4 and 7.1.)

4.3 Energy from renewable energy sources

Energy from renewable energy sources denotes energy from renewable non-fossil sources, i.e. wind, solar (solar thermal and solar photovoltaic sources) and geothermal energy, ambient energy, tidal energy, wave energy and other ocean energy, water energy, energy from biomass, landfill gas, sewage treatment plant gas and biogas.

4.3.1 Situation

With a 21.14-per cent share of RES in gross final energy consumption in 2018, Slovenia is below the annual target value and is 3.9 percentage points away from the 25-per cent target share in 2020. Since 2010 when the National Renewable Energy Action Plan for the 2010–2020 Period was adopted, the RES share increased only by a 0.9 percentage point.

According to the National Renewable Energy Action Plan for the 2010–2020 Period, problems in the attainment of indicative sectoral RES objectives in 2020 lie in the sectors of transport (5.5 per cent attained; the objective for 2020 was 10 per cent) and electricity generation (32.2 per cent attained; the objective was 39.3 per cent), while the objective was exceeded in the field of heating and cooling (31.6 per cent attained; the objective was 30.8 per cent).

Financial incentives and regulations were crucial among the current measures, which include the support scheme promoting electricity generation from RES, the act governing the conditions of a concession for harnessing the energy potential of the lower Sava River, investment incentives for measures of the use of RES as a source of heat in households and heat production in district heating systems using RES, regulations governing efficient use of energy in buildings (PURES) and a mandatory minimum share of the use of RES, cogeneration and excess heat or their combinations in district heating systems. A minimum mandatory share of RES in motor fuels is also prescribed, but not met. In the recent period, the promotion of energy self-sufficiency from RES is also exhibiting positive effects.

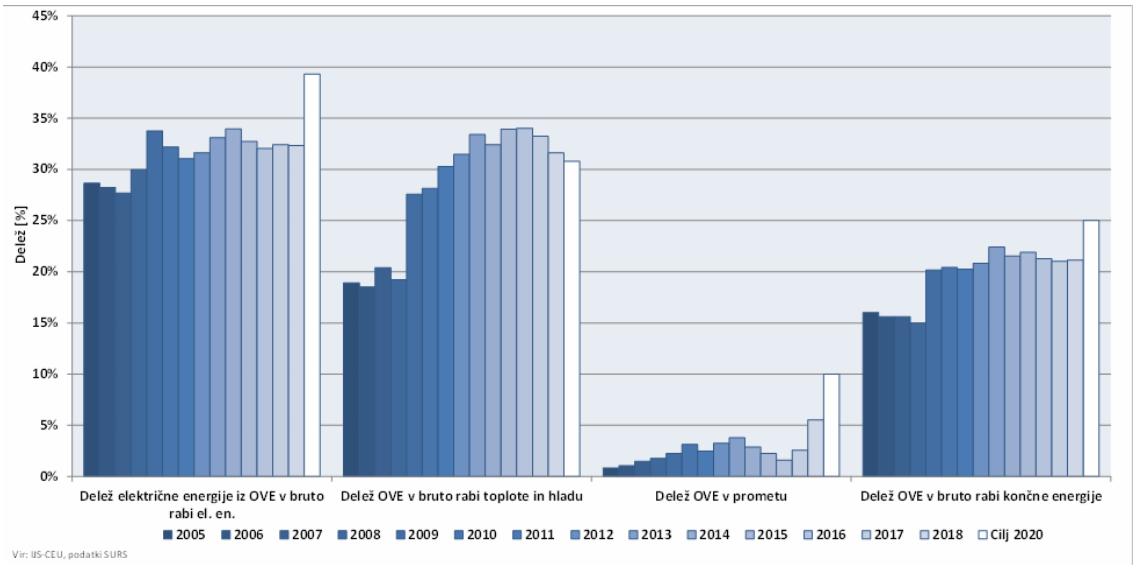

Figure 9: Attainment of RES target shares in Slovenia in the 2005–2018 period (source: Energy Efficiency Centre of Jožef Stefan Institute)

RES is an important domestic energy source; Slovenia's import dependency amounted to 48 per cent in 2018 and domestic energy production was 52 per cent, to which RES contributed 16 percentage points. Nuclear contributed 22 percentage points to domestic production and solid fuels 13 percentage points. RES is even more important in electricity generation as it covers 32 per cent of gross final energy consumption.

4.3.1.1 Guidelines and measures adopted until 2030

As a target value for 2030, the NECP determines at least a 27-per cent share of renewable

sources in gross final energy consumption and the following indicative sectoral objectives: a 43-per cent share in the electricity sector, a 41-per cent share in the sector of heating and cooling, and a 21-per cent share in transport (the share of biofuels is 11 per cent).

The key measures defined in the NECP for promoting RES are financial supports: investment supports for households and district heating systems, and the support scheme promoting decentralised electricity generation from RES. Other measures, which were already adopted in previous documents (AP RES), but have not yet been implemented, include the promotion of RES integration in networks and the state's proactive role in siting facilities in space (spatial definition of areas for RES production facilities on the basis of studies, improvement of legislation, accelerated preparation and financing of spatial plans, supplementation of regulations for more effective and sustainable siting of facilities in space, etc.). The NECP also plans accelerated drafting of spatial plans for public multi-purpose strategic infrastructure and energy projects, harmonisation of regulations governing the prevalence of public benefit in protected areas in accordance with the EU legislation and practice, and the enhancement of capacities for project preparation and implementation. See also chapter 6.1 Energy supply.

Measures in the field of local energy communities and RES communities for the exploitation of RES in the field of heating and cooling are also new. Measures for multi-purpose geothermal energy exploitation are also planned. The NECP determines that the ban on the purchase of new oil boilers will enter into force in 2023. The implementation of the measure of a mandatory RES share in motor transport continues and will be directed towards advanced sustainable biofuels in the future and the introduction of RES gases in filling stations with compressed natural gas (hereinafter: CNG) and liquefied natural gas (hereinafter: LNG).

The SDS 2030 determines the same target share of RES by 2030 as the NECP.

4.3.2 Vision

By 2050, the use of energy will, for the most part, be based on the supply of energy from renewable energy sources in addition to other low-carbon sources. RES will be well-integrated in the energy system by connecting all types of networks and energy systems, including energy conversion and storage.

In addition to decarbonisation, the development of RES will also be directed towards the attainment of synergies, especially the improvement of energy security, provision of green jobs and coherent regional development. Multi-purpose use of facilities will be promoted.

4.3.3 Objectives by 2050

Slovenia will increase RES shares in final energy consumption in all sectors, i.e. transport, consumption of electricity, heating and cooling. The total share of RES will reach at least 60 per cent by 2050. Indicative objectives in individual sectors comprise at least a 65-per cent share of RES in transport, at least a 50-per cent share of RES in heating and cooling and at least an 80-per cent share of RES in gross final electricity consumption.

4.3.4 Main orientations by 2050

To attain the objective of net zero emissions and systematic abandonment of fossil fuels, Slovenia will increasingly promote a broad selection of technologies and sources and the expansion of RES in compliance with the principles and requirements of environmental legislation.

Slovenia will focus on greater exploitation of RES, which present a domestic source of energy and have a positive effect on the reliability of supply because they reduce import dependency, contribute to the diversification of sources, etc. By abandoning the use of domestic coal, the strategic significance of RES will further increase.

Slovenia will further promote sources already used traditionally and will also provide conditions for the exploitation of a broad variety of RES (solar, water, geothermal, wind energy and energy from wood biomass, etc.) in accordance with the principles and requirements of environmental and safety legislation. It will promote knowledge development and production of technologies and services for the exploitation (conversion) of RES and it will support RES development, particularly measures for mutual integration of energy systems and better connectivity or integration of RES in the network and energy storage, and the expansion of solutions to export markets.

Slovenia will promote the self-sufficiency of buildings, neighbourhoods and broader communities which exploit RES in connection with energy storage and optimisation of connected energy systems. A support environment for the implementation of measures will be established, particularly at the local level. A comprehensive stimulating support environment will be set up, including suitable regulations for the development of active consumers and self-consumers and the communities which rely on these players as they will be of key importance when attaining objectives in the field of RES. For efficient implementation of the adopted measures and the attainment of consumer benefits, this field will be regulated.

Financial incentives functioning as a support scheme for electricity generation from RES, investment incentives for all sectors and new potential incentives will be proportionate to the impact on the environment, the energy system, the environment and other public benefits of projects. Major incentives will be earmarked for development solutions and entry into markets. Slovenia will also intensively promote pilot projects for RES exploitation. (Also see chapter 8.)

Simultaneously with RES, the development of system flexibility will also be promoted, as this is necessary for the functioning of the electricity system with an increased RES share. Whereby special attention will be dedicated to the establishment of short-term and seasonal energy storage facilities. While supported by various storage technologies, advantage will be given to energy storage facilities based on RES. Energy networks will be developed which will be able to simultaneously support intensive RES growth and altered energy consumption patterns while also ensuring the reliability of supply to all consumers. Integration of all energy systems will be promoted, i.e. electricity and gas networks, district heating systems and others. The development of low-carbon system services will be promoted, too. Due to cost optimisation, an upgrade of planning and qualitative steering of the development in this field will be required, including sectoral integration. (See chapter 6.1.)

For energy purposes, Slovenia will further exploit wood biomass where the economic aspect is also significant as the exploitation of low-quality wood for energy improves the economics of wood processing chains and energy systems. Smaller local systems with a completed wood biomass supply will be particularly promoted. When exploiting wood, the principles of circular bioeconomy, forest coverage conservation and sustainable forest development are observed, which will be adjusted to the consequences of climate change and the objectives of ensuring CO_2 sinks in forests (see chapter 6.6 LULUCF). As a priority, the use of wood as a raw material for products will be promoted, as the processing of wood, wood waste and other lignocellulosic sources takes precedence over energy exploitation. The enhancement of the sector of wood processing production will be of key importance as it is based on the sector's strategic guidelines and incentives for the wood processing industry to increase added value by integrating value chains, introducing premium design, marketing and

enabling sector internationalisation. Within this framework, the development of collection centres will be imperative. Long-term policies and measures of the circular economy will be drafted to enable a cascading use of wood and energy exploitation of wood products at the end of their lifespan (at the actual end and by observing the cascading use of wood) with no significant environmental impact. With regard to the foregoing, the scope of biomass suitable for energy use will also increase.

The exploitation of RES in district heating and cooling systems will be promoted as a priority in order to attain synergies between climate policy and air protection policy. When defining new locations, the main criteria include the demand density for heating and cooling and the accessibility of renewable sources, whereby such development will also be supported by spatial planning. The objectives of reducing the environmental burden, including the transport of wood biomass, will also be considered. The promotion of wood biomass use in individual heating systems will be further directed at the areas where the use of other RES is not practical. By educating consumers, chimney sweeps and installers and the replacement of combustion plants, a decrease in emissions of dust particles will be achieved, which will result in better air quality. As per the NECP, the Heating and Cooling Strategy will be drafted to promote and steer such systems, and legislative instruments will strive for a continued increase of the RES share in heat production, while financial supports will stimulate the preparation and realisation of projects, which will exceed the standards.
By supporting pilot projects, Slovenia will also become actively involved in the development and use of sustainable technologies for the production of synthetic fuels from wood biomass and other lignocellulosic sources. Furthermore, it will actively support the development of policies at the EU level in this field as economies of scale will be required. (Also see chapter 6.1.)

Slovenia will continue to intensively increase the use of solar energy, especially for electricity generation, and also the passive use of solar energy. To this end, it will modify and adjust the planning of neighbourhoods, buildings and infrastructure to solar energy, which will be primarily exploited in urban, infrastructural and degraded areas (e.g. quarries). For better efficiency of measures, the adaptation and mitigation measures will be integrated.

Slovenia will also focus on the construction of large solar power plants in degraded, industrial and infrastructural areas for the optimisation of the costs of integrating RES into electricity networks. (See chapter 6.1.)

Slovenia recognises the importance of hydropower for decarbonisation of the electricity sector and the advantages of hydroelectric power plants in comparison with the electricity generation technologies from other low-carbon sources, which is especially evident in the provision of system services. Hydroelectric power plants thus enable greater inclusion of other power plants using RES and other low-carbon sources in the electricity system. The exploitation of hydropower will be integrated into a broader context of water management on watercourses, as defined in the Spatial Development Strategy of Slovenia 2050 which is being drafted, and it will realise the related objectives (flood safety, biodiversity conservation and ecosystem services of wetlands as water reservoirs, etc.).

As a result, all hydroelectric power plant construction projects will be multi-purposed. Slovenia will nurture and further develop knowledge for the planning and construction of hydropower facilities as part of the multi-purpose use of space.

It will increase its ambition relating to wind power exploitation and develop programmes for incorporating local communities in this development.

Use of renewable energy sources and siting of the necessary infrastructure for its exploitation will observe spatial and other (conservation) conditions. Power plants using renewable energy sources (solar, wind, hydro, etc.) will be constructed with minimum impact on the environment and in accordance with the principles and requirements of environmental,

conservation and spatial legislation, and consistent implementation of projects with all mitigation measures will be ensured. As planned in the NECP, mechanisms compliant with the European legal order for siting power stations in protected areas will be established. Slovenia has a large proportion of Natura 2000 areas (approx. 38 per cent) and it can be expected that the environmental impact of the planned RES facilities with above 10 MW of installed power (water, wind and others) on these protected areas will be assessed as significant within the procedures for drafting national spatial plans (NSP) or that the impact of hydroelectric power plants on watercourses will be assessed as significant. In such cases and at the complainant's proposal within the procedures of outweighing public benefit over other public benefit or in the interests of conserving nature and good water status as per the Slovenian and European legislation, Slovenia will assess and decide which public benefit will prevail in the specific case.

The construction of large hydroelectric power plants of above 10 MW is compliant with the objectives of this Strategy and is in the public interest or represents public benefit due to the simultaneous environmental benefits of reducing GHG emissions, reliability of energy supply by means of low-carbon system services, low-carbon electricity generation and attainment of economic benefits. These are also the key crucial reasons for implementing the procedure of public interest or benefit prevalence.

Geothermal energy is classified as an RES potential not yet sufficiently exploited, which is why Slovenia will accelerate the promotion of its exploitation. It will primarily focus on sustainable and efficient exploitation of geothermal heat from thermal water in geothermal aquifers and shallow geothermal energy. Priority fields and directions of geothermal energy use will be determined in the action plan of the Heating and Cooling Strategy, which is being drafted. Initially, analyses of cost efficiency of deep geothermal energy exploitation will also be made and
specific objectives and measures for its exploitation will be adopted.

The use of biofuels will concentrate on the development, production and application of advanced sustainable biofuels while observing food safety. In doing so, Slovenia will consistently observe and simultaneously develop the most advanced principles for regulating material and energy flows in a circular bioeconomy.

It will promote research and development of new RES sustainable technologies and business models, including the quality and efficiency of siting RES in space. It will intensively encourage the development and operations of local energy communities. It will also accelerate investment in promising, but not yet economically feasible, projects involving RES in companies, promote necessary research, innovation and pilot projects and raise awareness of the public about the importance of the transition to RES. Based on pilot project results, Slovenia will determine new priority guidelines for promoting RES, such as efficient cascaded use of deep geothermal energy, exploitation of solar energy, heat storage, etc.

When adopting measures in the field of RES, Slovenia will dedicate suitable attention to debureaucratisation and integration of RES into buildings, space and the energy system. Among other things, it will change the procedure for the issue of all necessary permits in order to accelerate and facilitate administrative procedures for RES integration.

4.3.5 Key factors for attaining the objectives in 2050

- Increase in electricity generation from RES,
- increase in heat and cold supply from RES in buildings and industry;
- large proportion of heat and cold supply from RES in district heating and/or cooling systems;
- increase in the proportion of RES in transport;

- breakthrough technologies and systems to support RES (energy storage, system integration, system flexibility, increase of network capacities for distribution and electricity transmission, etc.).

4.3.6 Human resources and planning

Slovenia will establish an organisational structure for efficient management of measures promotion and implementation.

The promotion of RES is now carried out by more than four institutions (Ministry of Infrastructure, the Eco Fund, Borzen, the Ministry of the Environment and Spatial Planning (hereinafter: MOP), etc.). The models for greater concentration of knowledge and more efficient functioning will be examined, and the majority of tasks related to investment financing will be transferred to one of the organisations (the Eco Fund).

The exploitation of RES in local communities and enhancement of capacities for the preparation and implementation of projects at this level will be promoted systematically. Measures to enhance human resources at the local level and in their support institutions and to integrate local communities at all levels of preparation and implementation of projects will be implemented.

Integration of various stakeholders who will promptly and effectively harmonise the best solutions and suitably supervise the course of these projects is crucial, resulting in the acceleration of all required administrative procedures (acquisition of environmental, building and other permits and consents).

Slovenia will implement training at all levels to support planning and implementation of measures and further development of the field.

For efficient and qualitative siting in space, human resources capacity will be ensured and mechanisms for resolving disagreements between spatial developers and holders of projects or plans will be established in addition to other measures.

5 ADAPTATION POLICIES AND GUIDELINES

5.1 Situation

We are witnessing great climate changes and their variables in Slovenia. In the 1961–2011 period, the average air temperature increased by 1.7°C and precipitation dropped by some 15 per cent in the western half of the country and by 10 per cent in the eastern half at the annual level in the same time period. The assessment of climate change in Slovenia until the end of the 21st century drafted by the Slovenian Environment Agency (*Ocena podnebnih sprememb v Sloveniji do konca 21. stoletja, Sintezno poročilo - prvi del.* (Assessment of Climate Change in Slovenia Until the End of the 21st Century, Synthesis Report, Part 1), Ministry of the Environment and Spatial Planning, the Slovenian Environment Agency, 2018) reveals that the climate will continue to change in Slovenia and adjustments will be necessary. (See chapter 3.4.) Adaptation to climate change is inextricably linked with success in the field of climate change mitigation; the more humankind is successful in reducing GHG emissions, the lesser will be the impact of climate change and less adaptation will be required. The effects of climate change are no longer avoidable, which is why adaptation is of key importance to manage the risks they entail and intensify the response to climate change. Extreme weather phenomena (drought, torrential rains, heat waves, etc.) are already occurring more frequently and alien species are also present, proving that our environment is changing. It is only by joint mitigation measures (reduction of GHG emissions and climate change) and adaptation (measures and policies for systematic vulnerability reduction and an increase in resilience against detected or expected climate change impacts)

that a society resilient to the impact of climate change can be created.

As stated in the proposed European Climate Law (Proposal for a regulation of the European Parliament and of the Council establishing the framework for achieving climate neutrality and amending Regulation (EU) 2018/1999 (European Climate Law)), member states will have to adopt comprehensive national strategies and plans for adaptation, as the latter is the key component of the long-term global response to climate change. In 2016, Slovenia adopted the Strategic Framework for Climate Change Adaptation, which incorporates guidelines for better mainstreaming of adaptation in policies, measures and actions. The action plan has not yet been drafted, but the inter-ministerial working group was very active at the time the Strategic Framework was being adopted. The sectoral adaptation strategy was adopted in agriculture and forestry in 2008 and two action plans were prepared (2009–2011 and 2010–2011), which were carried out. Due to the subsequent cessation of funds, the measures were no longer implemented. In the 2014–2020 period, the discussion of climate change was among the strategic objectives of the Common Agricultural Policy and the adaptation is highlighted as one of the central objectives in the new agricultural policy 2021–2027.Adaptation measures also include certain other sectoral policies, especially pertaining to water (e.g. Flood Risk Reduction Plan 2017–2021, water management plans).

The draft report on the implementation of the Strategic Framework for Climate Change Adaptation in the 2016–2020 period (from its adoption in December 2016) shows different success levels when implementing individual steps. The incorporation of climate change adaptation in strategic planning, European and international activities, provision of climate services and steps made relating to the production of situation analyses in the field of education proved to be the most successful. Implementation of certain steps was assessed as only partly successful, e.g. enhanced application of EIA and CEIA instruments, inter-ministerial cooperation, interconnection of databases and communication activities. Integration between local and regional levels (national contact point was not established) and the private sector, and the activities of establishing regular cooperation between researchers and decision makers (climate portal was not established) was assessed as unsuccessful for the most part. The key achievement was a significant increase in funds earmarked for adaptation purposes and the greatest failure was the lack of progress in preparing the vulnerability indicator and assessments. With the adoption of the ReNPVO20-30, these activities were postponed to later years, which is compliant with the expected obligations within the framework of the new EU legislation in the field of climate rules.

5.2 Vision

By 2050, Slovenia will become a resilient society adapted to the climate change impact and characterised by a high quality of life and a high degree of safety of life, while taking full advantage of the changed climate on the basis of sustainable development. (Vision from the Strategic Framework for Climate Change Adaptation, 2016.)

5.3 Objective by 2050

From the Strategic Framework for Climate Change Adaptation: "The objective in the field of climate change adaptation is to reduce Slovenia’s exposure, sensitivity and vulnerability to climate change impact and increase the climate resilience and adaptive capacity of society."

Slovenia will accelerate and implement more comprehensively the adopted documents and measures related to the adaptation and simultaneously promote the acquisition of expert bases. It will monitor its exposure to climate change, enhance society’s adaptive capacities and thus improve the preparedness and responsiveness of Slovenian society to climate

change. Priority will be given to sustainable solutions and measures. Adaptation measures will be cost-efficient and the most vulnerable groups of citizens will also be able to access them.

5.4 Main orientations by 2050

Slovenia is already adapting to new climate changes that are unavoidable but is doing so too slowly. So, it will immediately accelerate the activities in the field of adaptation to climate change. Timely response is crucial for the efficient attainment of adaptation objectives, as timely adjustments are also more cost-efficient.

Numerous activities must be enhanced in Slovenia when adapting to climate changes. In particular, Slovenia will continue and further upgrade the knowledge regarding the impacts of climate change on individual sectors (by preparing vulnerability assessments) and on this basis plan priority measures. It will draft an analysis and a plan for acquiring missing data and expert bases and thus establish a systematic method for obtaining information (research). Slovenia also somewhat lags behind when implementing documents and plans adopted in the field of adaptation (also relating to the implementation of the Strategic Framework for Climate Change Adaptation), which is why it will accelerate the implementation of the adopted Strategic Framework.

Online consultation for the preparation of this Strategy revealed that knowledge of adaptation (and also measures) to climate change is poorer among the broader public than the knowledge of mitigation, which is why Slovenia will (as per the Strategic Framework for Climate Change Adaptation) enhance dissemination, education and training in this field.

The field of adaptation is, in common with the field of mitigation of climate change, one in which horizontal and individual sectors intertwine and integrate with each other. As a result, strategic, integrated and inclusive cooperation in all fields is mandatory for the formation of efficient measures, including a well-organised structure and development of knowledge and competence in the field of adaptation.

When planning adaptation measures, Slovenia will prioritise sustainable solutions, which will ensure ecological connectivity and conservation or revitalisation of ecosystems and consequently contribute to the improvement of the biodiversity status. With the largest proportion of Natura 2000 areas in the EU (almost 38 per cent of surface), Slovenia has great potential when it comes to sustainable solutions that contribute to the adaptation to, and mitigation of, climate change. Active care for the green infrastructure is particularly important for Slovenia because the Natura 2000 network represents its key framework in the EU. An important part of green infrastructure, especially in urban and densely populated areas, is also green spaces in urban environments, which Slovenia will further maintain and also increase in accordance with other sectoral objectives. Additional mechanisms for maintaining and enhancing green spaces in public and private areas (provision of sufficient green spaces, arrangement of a uniform management and maintenance) will be established.

When adapting to climate change, Slovenia will prioritise water-friendly solutions, which will contribute to the attainment of substantive objectives of water protection, use and management with suitable measures. More intensive incorporation of water protection and sustainable management in other policies, such as local and regional development, spatial planning, energy, transport, agriculture, fisheries and tourism, is vital for a successful adaptation to climate change. The objective of sustainable water use, which enables various types of use while observing long-term protection of available water resources and their quality, must be pursued accordingly when adapting to climate change. Protection, enhancement and restoration of groundwater bodies must be ensured, including maintenance of a balance between its abstraction and recharge. The attainment of the objectives of the Water Framework Directive in regard to other water bodies must also be

improved.

Slovenia will systematically and also financially promote the preparation of necessary expert bases, while knowledge of adaptation will be incorporated in all sectoral policies, especially the policies of sustainable spatial management and spatial planning. Long-term spatial planning will be linked to environmental protection, changing of the climate and suitable adaptation to it, and will be set into a suitable strategic development situation. Slovenia will ensure the overcoming of sectoral, disciplinary and organisational boundaries, while maintaining the harmonisation of sectoral strategies and plans as measures can otherwise be in contravention, whereby preserved nature, healthy environment and sustainable spatial development will be given priority.

In the future, Slovenia will only promote and support investments which will be climate-resilient or more resilient to climate change in view of infrastructure. It will also efficiently utilise new opportunities resulting from climate change (e.g. extension of the growing season of plants, possibility of growing new plant species, new opportunities in tourism).

Whenever possible, measures of mitigation and adaptation will be implemented together because most measures contribute to the objectives of reducing GHG emissions and increasing resilience. Such fields also include an increase in the energy efficiency of buildings, food self-sufficiency, restoration of degraded ecosystems and green urban infrastructure, which contributes to lower temperatures and subsequent lesser energy need for cooling. Green urban infrastructure also has a positive effect on biodiversity and reduces the urban heat island effect.

5.5 Main fields of action

Since the adoption of the Strategic Framework for Climate Change Adaptation, numerous new research and expert bases in the field of adaptation to climate change have been established and new documents were issued at the EU level calling for more decisive action relating to climate change, which is why Slovenia will re-evaluate the Strategic Framework within one year and supplement it accordingly if necessary.

It will immediately address the gaps and continue with the preparation of suitable expert bases for the adaptation to climate change. Insufficient expert bases will be supplemented and gaps relating to the lack of knowledge and organisation for implementation will be filled. (See chapter 9.)

Slovenia will produce vulnerability assessments for the fields of water (or the field of water will be integrated into other sectors), agriculture, forestry, public health, tourism, biodiversity, buildings, energy, transport, spatial planning, industry, urban and rural areas, coastal areas, sea and fisheries, cultural heritage, etc. Vulnerability assessments for agriculture, forestry, public health, nature and tourism will be drawn up with priority.

Water management plans will also incorporate vulnerability assessments regarding climate change (surface water, groundwater and also drinking water). To draft the vulnerability assessment for water, Slovenia must first fill in the gaps with regard to expert bases and studies (e.g. prepare projections for rising sea levels, flood studies: identification of areas, monitoring, intensity of flooding) and also adjust land use in accordance with the results.

The preparation of vulnerability assessments will be methodologically harmonised as much as possible, and the system of objectives and measures will be designed in a way that will enable synergies and exclusion of measures which worsen the situation or possibilities for attaining objectives in any of the sub-fields.

Short-term adaptation activities have already been planned in the ReNPVO20-30.

Table 2: Planned activities relating to adaptation (source: ReNPVO20-30)

Type of measure	Measure	Measure indicator	Holder	Deadline
Provision of data	Provision of climate services by ensuring and forwarding information on climate conditions and expected climate change adjusted to the needs of users (sectors, public, researchers) and in a user-friendly form which enables simple further application	Functioning information point	MOP – ARSO	Ongoing task
Planning and guiding activities	Vulnerability assessment by municipalities	Drafted assessments, strategies, plans, guidelines	MOP – ARSO	2021
	Municipal adaptation strategies		Municipalities	2022
	Vulnerability assessment by sectors		Sectors	2020
	Action plans for adaptation measures		MOP	2022
	Guidelines for climate change impact assessment in administrative procedures		MOP	2020

For their implementation, Slovenia will enhance capacities, empower stakeholders and systemically arrange financing in the field of adaptation. (See chapter 8.) It will also enhance knowledge with regard to adaptation and regulate organisational structure. (See chapter 9.) Adaptation will be closely incorporated in the organisational structure of mitigation because synergies occur frequently between the measures of mitigation and adaptation.

5.6 Key factors for attaining the objective by 2050

Suitable expert bases, human resources (their number and competence) and organisational structure.

5.7 Human resources

Training and education about the adaptation to climate change at all levels is essential for the implementation of adaptation measures. Slovenia will accelerate the development of knowledge and competence in the research, academic, expert and professional spheres with formal and informal education. Environmental studies of natural sciences, engineering, social sciences and humanities are also important, as interdisciplinarity will be promoted. Additional funds will be earmarked for research and at least five target research projects on the topic of climate change adaptation will be tendered by no later than 2023 (of which at least two will be interdisciplinary) or funds will be earmarked for (somewhat) longer projects relating to adaptation (e.g. LIFE). The pool of experts and people working in the field of climate change adaptation will thus be expanded, while simultaneously striving to limit the brain drain. The existing research and pedagogical programmes will be integrated, and the field of finance systemically arranged.

Financial resources for immediate commencement of implementation of the already known eligible adaptation measures will also be necessary, which will allow the education of experts in the operational section.

Slovenia will provide support and knowledge to local communities for the preparation or implementation of adaptation measures. The establishment of a contact point for coordination and promotion of measure implementation at regional and local levels is also planned.

5.8 Proposed progress monitoring indicators

Degree of Slovenia's vulnerability at the national and municipal levels (selection of indicators for degree of vulnerability) (Indicator showing Slovenia's vulnerability to climate change, 2016).

6 STRATEGY BY SECTORS

6.1 Energy supply
6.1.1 Description of emission status and key measures

With 29.7 per cent, energy supply comes second in total GHG emissions among the sectors, whereby 87 per cent of emissions come from coal power plants or combined heat and power plants.

The decarbonisation process is already underway; between 2005 and 2018, emissions decreased by 25.6 per cent, to which the closure of Trbovlje thermal power plant and the reduced use of coal in Šoštanj thermal power plant contributed the most. With the construction of hydro power plants on the lower Sava River, solar power plants and other dispersed units in this period, the electricity generation from RES increased by 0.8 TWh, which is five per cent with regard to gross final energy consumption.

So far, the energy system has very successfully managed the risks and ensured a high level of strategic and operational reliability due to a balanced energy mix, diversification of production locations, reliability of units and provision of high-quality system services. Energy prices in Slovenia do not deviate significantly from the average level in the EU.

6.1.1.1 Guidelines and measures adopted until 2030

A decision was made in the NECP regarding the gradual phasing out of coal for energy purposes before 2050. A detailed timeline will be adopted in 2021 in accordance with the principles and within the framework of the fair transition programme. The use of coal will reduce by 30 per cent by 2030 in comparison to 2005. Coal will only be used at one location after 2030. In the field of nuclear energy, the NECP plans the continuation of exploitation in Slovenia and a comprehensive examination of options for the long-term use of nuclear energy and the adoption of a decision relating to the construction of a new nuclear power plant by 2027. An increase in electricity generation from RES is planned and the attainment of a 43-per cent share of RES by 2030 in gross final electricity consumption, to which solar power plants will contribute the most.

An accelerated development of an electricity distribution network is anticipated with the objective of increasing the capacity, resilience to disturbances and flexibility to support electrification, especially in transport, and to increase a dispersed electricity generation from RES by 2030.

The key instruments defined in the NECP for the attainment of set objectives include the European emissions trading scheme (ETS), financial and other incentives for a dispersed electricity generation from RES, the upgrade of planning and decision-making about large hydro power plants, the aforementioned plan for phasing out coal, the restructuring of regions and a set of incentives for network development of electricity distribution. Successful development of district heating and cooling systems is planned, including a one-per cent annual increase in the share of RES and excess heat and cold in district heating and cooling systems, and a continuation of existing instruments for measure promotion.

6.1.2 Vision

The attainment of minimum GHG emissions in the energy supply sector by 2050 while maintaining a high level of reliability and safety and ensuring the competitiveness and accessibility of energy services. The sector's objective by 2050 is to establish sufficient production capacities for Slovenia's self-sufficiency in energy supply. To attain climate objectives, Slovenia will enhance the role of RES and other low-carbon energy sources and systematically abandon fossil energy sources.

The development of Slovenia's energy supply will be harmonised with environmental objectives, whereby the objectives involving the minimum of adverse effects on the environment in the entire life cycle of energy services will be attained.

6.1.3 Objectives by 2050

The objective in the energy supply sector is to attain minimum emissions by 2050. Interim strategic objectives include a 32-per cent reduction by 2030. The emission reduction by 2040 will depend on the decision regarding the closure of Šoštanj thermal power plant or its upgrade with devices for CO_2 capture and storage.

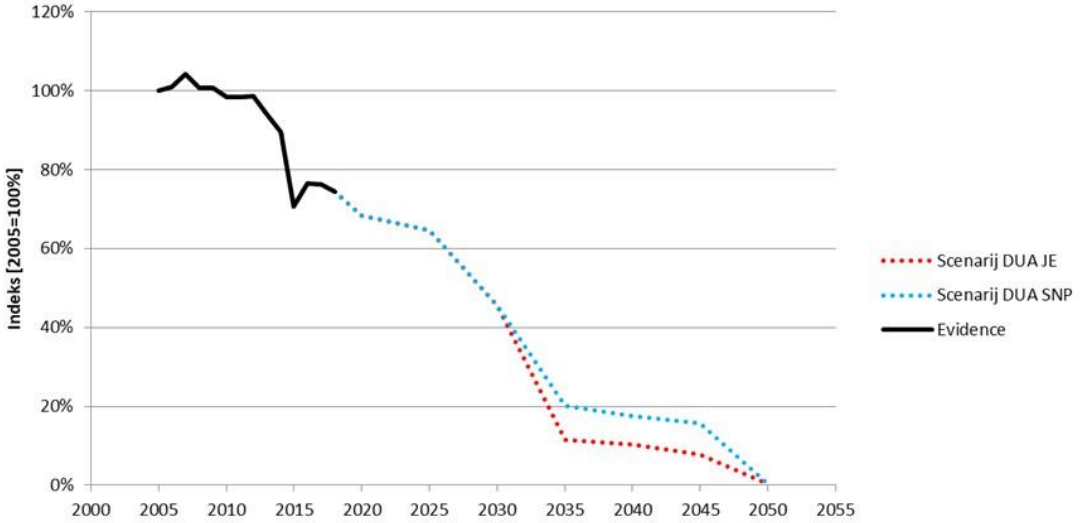

Figure 10: Emission trends in the 2005−2018 period and the anticipated course as per projections until 2050 for two scenarios (source: Energy Efficiency Centre of Jožef Stefan Institute)

The sector's objectives by 2050 relating to energy supply reliability include a reduction in import dependency for all energy products and diversification of sources and locations to ensure self-sufficiency in unforeseen and critical conditions with simultaneous risk

management in uncertain circumstances, and the attainment of positive benefits of new development opportunities on common energy markets.

6.1.4 Main orientations by 2050

Fundamental orientation for energy management in Slovenia gives preference to the measures of efficient use of energy rather than the construction of new energy supply capacities.

To ensure the strategic reliability of energy supply or supply of energy services, the process of decarbonisation will also take place after 2030 in a way that allows the electricity system to provide the utmost coverage of use or self-sufficiency in electricity by means of competitive electricity generation and system services in Slovenia to manage risks in unpredictable and critical circumstances. The majority of older larger power plants will be decommissioned, which will be a great challenge for attaining the reliability objectives after 2030. The objectives also include a minimum dependency on energy imports by energy products and energy use purposes and an enhancement of flexibility and adaptability (robustness) of the electricity system to expected, more dynamic operating conditions.

Further diversification of primary sources, supply routes, locations and technologies for electricity generation, including the diversification of locations for systemic electricity generation, will be ensured. Due to altered patterns in energy consumption in the future, efforts will be invested in the provision of operational reliability: available quantities of electricity, power (local and temporal) and other system services, especially in critical conditions.

In addition to the reliability and low-carbon objectives, the sectoral objectives of competitiveness were also set. International developments in this sector will have a great impact on the development in Slovenia, particularly electricity prices in the European market. In the medium- and long-term, higher electricity prices are expected and significantly altered price ratios between seasons. To ensure the competitiveness of the energy supply, it will be crucial to manage risks, which is why a highly adaptable energy system must be ensured in the long term (also see chapter 6.2.6). Together with the exploitation of new development opportunities, risk management will serve as the basis for ensuring the competitiveness of society, the economy and the energy sector.

The guideline for directing the sector’s development to attain competitiveness will be the optimisation of social costs (all costs, excluding external), which will give precedence to the competitiveness of society over the competitiveness of the sector, for which suitable steering mechanisms will be drafted, i.e. economic and fiscal instruments, which will supplement mechanisms at the level of the EU, EU ETS and others. It is also important to maintain the competitiveness of public service activities. Slovenia will also promote the development of new business opportunities, including advanced energy services. It will steer the construction of new units, particularly for those low-carbon sources which have a great impact on the Slovenian economy, are economically viable and have a minimum impact on the environment.

In addition to measures for the efficient use of energy, measures for a circular economy and other measures for the reduction of the need for energy presented in chapters 6.2 to 6.4 and 7, the following fields of action will be relevant for Slovenia in order to attain the objective:

- decarbonisation of electricity generation by abandoning the use of fossil fuels no later than by 2050;
- phasing out the use of coal in compliance with the timeline adopted by Slovenia in the National strategy for phasing out coal and restructuring coal regions in line with the principles of a just transition by the end of 2021, in which the principle of a just transition will be observed when determining the timeline;
- priority implementation of all necessary steps in accordance with the regulations for

ensuring long-term operations of the existing nuclear power plant, which contributes significantly to low-carbon electricity generation;
- considerable increase in electricity generation from RES;
- utilisation of the energy potential of water, wind, geothermal and other RES as per the principles and requirements of the environmental and conservation legislation. The application of procedures of public interest prevalence is also anticipated for siting RES facilities in space (see chapter 4.3.4);
- increase in flexibility of the electricity system to support electrification, particularly in transport, and an increase in low-carbon electricity generation with an accelerated development of networks for electricity distribution and transmission, energy storage facilities, low-carbon system services, and integration of energy systems and sectors;
- in the field of nuclear energy, Slovenia is planning a long-term use of nuclear energy. To this end, administrative procedures will be implemented and documentation for investment decision-making drafted.

To attain the policies and objectives set by the sector, a complementary spatial policy, which harmonises all components of spatial development, is of key importance. The Spatial Development Strategy of Slovenia 2050 is being prepared. It is important to maintain existing energy locations and develop new environmentally and spatially acceptable locations. More systematic, timely and proactive siting of potential energy facilities in space is also relevant for further development of the energy sector, e.g. also by protecting transmission corridors, strategic assessment and decision-making regarding possible locations for energy exploitation, including a prompt preparation of national spatial plans.

6.1.5 Main fields of action

In the period up to 2050, it is expected that final energy consumption will drop by almost 30 per cent, while electricity consumption will increase by almost 40 per cent in comparison to 2017. The share of electricity in final electricity consumption is anticipated to increase by 50 per cent until 2050 because electrification will be an important decarbonisation factor in the sectors of final energy consumption.

In this period, Slovenia will tackle a number of uncertainties, which is why the selection of an energy mix in 2050 will greatly depend on further development of technologies, their competitiveness and new opportunities. All countries are faced with the same or similar issues. Irrespective of the detected uncertainties, which are always present when drafting long-term strategies, the objective of decarbonisation of the sector by 2050 can be set because the expert bases show that such transition is possible. The routes to attain the objectives set may differ. Due to the uncertain future situation, it is necessary to maintain a certain degree of flexibility today regarding new units and future energy resources. Along the way, it will be necessary to make decisions several times and choose between the alternatives for low-carbon electricity generation, so that all system functions of electricity supply will be ensured. When making choices, the following guidelines and criteria will have to be observed:
- climate objectives;
- minimum environmental impact or environmental acceptability of projects;
- competitiveness and financial feasibility;
- strategic and operating aspects of reliability of energy supply.

To manage the risks, Slovenia will have to maintain high adaptability to changing conditions and provide all necessary bases for strategic and investment decision-making. (Also see chapter 6.1.5.)

To maintain a stable electricity system with all functions, Slovenia will have to build two or more system power plants. According to the current analyses, the choice will also involve one or a combination of several of the following options: construction of a new reactor in the

nuclear power plant, several smaller nuclear power plants, or power plants using carbon neutral synthetic gases. The possibilities for exploiting hydropower, wind energy, biomass and geothermal energy for electricity generation are limited in Slovenia, while the electricity generation in solar power plants must be combined with seasonal energy storage. Suitable reliability of the electricity supply must be ensured throughout the year; December and January are the most critical months as it is then that energy consumption is highest. Carbon-neutral synthetic gas is an option as this enables the storage of surplus electricity generated from RES and its exploitation when such generation is not available. Nuclear energy is an option that enables baseload generation throughout the entire year and must be supplemented with additional generation from other resources in winter. Part of the solution is also the cogeneration of heat and electricity by means of carbon-neutral resources in district heating systems and active consumers, which was already taken into account in the analysed scenarios. With further technological development, the options will be upgraded and developed. It can be expected that the actual course of attaining net zero emissions and other objectives will likely combine all the measures mentioned; for better cost-efficiency, the system and scenarios of its development will have to be adjusted promptly to new circumstances as much as possible. Current analyses unequivocally show that an ambitious objective in the field of electricity supply may be set and that the latter will play a significant role in the decarbonisation of other sectors.

To decarbonise personal transport and other consumers and increase dispersed production and thus a new structure of supply and demand in the electricity market, Slovenia will enhance the flexibility of its electricity system and ensure a coherent development of systems. The development of solutions for energy storage will be intensive, i.e. short-term and seasonal storage will be attained with solutions within the electricity system (on the consumer side), by integrating electricity systems with district heating systems and gas network, and the enhancement of international connections and the introduction of digitalisation. In these fields, intensive development efforts have been underway throughout the world with the objective to reduce the storage costs of various technological options, and Slovenian knowledge is an integral part of this. Great flexibility of the operating regimes of conventional power plants will be required as this will be important for price risk management and ensuring the operational reliability or all necessary system solutions. In addition to other options, it is important to exploit the existing infrastructure for short-term electricity storage, such as hydroelectric reservoirs (also see chapter 4.3). Slovenia will develop the electricity transmission and distribution systems in a way that will allow the concept of electric vehicle charging to be optimised and harmonised with local electricity generation, and so that the transmission and distribution network will enable the supply of greater power during demand peaks, especially locally. Due to cost optimisation, good harmonisation between the development of self-sufficiency, energy storage systems, charging infrastructure and network or energy system development will be necessary. Sectoral integration of the electricity system and transport will lead to a rational concept of charging vehicles, which will require less investment and will ensure greater stability of the electricity supply.

District heating and cooling systems already have a lesser share in GHG emissions when supplying electricity, but to further reduce GHG emissions in the future, they will primarily be based on the exploitation of excess heat and renewable and other climate-neutral energy sources (e.g. climate-neutral synthetic gas). The expansion of networks is anticipated for their sustainable development, particularly in areas with greater population density where great potential for the expansion of the existing, and new, systems was defined, which will enable further decarbonisation of final consumption for new consumers. The amount of energy in the existing areas will reduce due to better energy efficiency of final consumption in buildings. As a result, systems must adjust their business models and upgrade technologically by implementing measures to reduce losses, switch to lower temperature regimes when distributing heat, increase capacities for heat storage, optimise heat (and cold) generation, automatise and digitalise operational management, incorporate small dispersed sources, connect with the electricity sector (heat generation from electricity when prices are

negative), upgrade business models and develop additional service for energy consumers. The share of RES in district heating and cooling systems (hereinafter: DHC) will increase intensively; in addition to wood biomass, especially through the installation of larger shallow geothermal heat pumps (also see chapter 4.3), solar energy (in new smaller DH systems or within pilot projects to a greater extent) and all other available renewable sources and waste heat sources (from industry, services, municipal infrastructure, etc.). Pilot projects will be carried out to support the introduction of these and other, not yet established, technologies. An increase in co-generation of heat and electricity, particularly from RES, remains an important development direction for DHC systems, which will contribute additionally to the greater flexibility and reliability of the electricity system and lower prices in winter. It will thus be mandatory to coordinate the planning of both systems. The national heating and cooling strategy and its action plan will serve as the key basis for efficient implementation of measures at national and local levels. Although the amount of heat from district heating systems will be reduced, Slovenia will double the share of buildings using district heating and cooling systems by 2050. The DHC systems will be important for decarbonisation of heating and cooling and for the synergies between climate policy and air protection policy.

Slovenia will become actively involved in the current development of the generation and supply of synthetic, carbon-neutral, gaseous and liquid fuels (also known as "e-fuels": H_2, CH_4, NH_3, methanol, motor fuels, etc.). By producing these fuels, particularly from surplus electricity generated from RES, Slovenia will contribute significantly to the stable functioning of the electricity system and the storage of surplus electricity. It will thus ensure the upgrade of gas and other infrastructure, implementation of pilot projects and reliable and competitive supply of these energy products in the future.

The preparations to introduce new technologies have commenced in Slovenia, but activities will have to be intensified. In the short-term, it will be necessary to accelerate the promotion of pilot projects, key analyses of options for the introduction of new technologies, the analyses of options for seasonal and other energy storage, etc. The development in Slovenia is also important for business opportunities in the broader region.

When adapting to climate change, Slovenia will ensure the resilience of the energy system, especially of electricity transmission and distribution networks, to the consequences of climate change, i.e. natural disasters and floods. Resilience to climate change will be the primary consideration when planning district heating and cooling systems (reduced need for heating, increased need for cooling). Connections in the energy exploitation of water are particularly complex and all potential synergies (flood safety, water retention) and risks (water heating, reducing biodiversity, attaining objectives for water, etc.) will have to be observed accordingly. Climate change will also affect the availability of biomass.

6.1.6 Key factors for attaining target emissions by 2050

To decarbonise the sector and support decarbonisation in other sectors, the following factors will be crucial:

- higher energy efficiency of all systems;
- gradual phasing out of coal and other fossil fuels;
- significant increase in electricity generation from low-carbon energy sources;
- significant increase in electricity generation from carbon-neutral gaseous fuels;
- establishment of a supply system with alternative fuels to allow the phasing out of fossil fuels in freight transport;
- decarbonisation and expansion of district heating systems;
- development of systems, especially networks, towards greater flexibility and integration of systems or sectors;
- construction of systems for storage of electricity and other energies;
- new technologies.

6.1.7 Human resources

Key decisions on future options in the electricity sector require the observance of the need for human resources to implement individual solutions and their long-term perspective in order to contribute to the generation of added value in Slovenia. Within this framework, Slovenia will systematically promote the acquisition of:

- development knowledge which will be strengthened by promoting the implementation of pilot projects;
- knowledge regarding project implementation, including knowledge of project management, financing, technical aspects of implementation, conduct of administrative procedures, etc.;
- knowledge about project planning;
- knowledge of efficient management and maintenance of energy facilities;
- knowledge of qualitative and efficient siting of energy facilities in space, also with the objective of exporting such knowledge;
- knowledge relating to adaptation or resilience to climate change (e.g. in the field of water management).

6.1.8 Proposed progress monitoring indicators

- GHG emissions in the energy supply sector;
- RES shares in gross final energy consumption, electricity, energy in transport and energy for heating and cooling;
- shares of carbon-neutral sources in the supply of liquid fuels, gaseous fuels and in electricity generation;
- specific emissions per unit of generated electricity in the supply of liquid fuels and gaseous fuels;
- share of buildings being heated from district heating systems;
- share of RES and excess heat in district heating and cooling systems;
- average specific emissions per unit of generated district heating in all systems in Slovenia.

6.2 Industry

6.2.1 Description of emission status and key measures

Total GHG emissions from fuel combustion in manufacturing, construction and industrial processes amounted to 3,014 kt CO_2 equivalent in 2018. In the 2005–2018 period, emissions dropped by 23 per cent, whereby the emissions from fuel combustion decreased by 26 per cent and process emissions by 17 per cent (Figure 12). In 2018, process emissions amounted to 39 per cent of total emissions in the industry sector.

The largest share of CO_2 emissions in manufacturing and construction – when excluding direct emissions from electricity consumption – is ascribed to the manufacture of non-metallic mineral products (38 per cent share of process emissions), followed by manufacture of basic metals (20 per cent), manufacture of paper and paper products (12 per cent) and manufacture of chemicals and chemical products (5 per cent). Other industries together account for approximately a 25-per cent share of emissions in manufacturing and construction. In comparison to the EU, the Slovenian business sector has a large proportion of energy-intensive value-added activities and a relatively low number of companies accounting for the majority of energy consumed and emissions generated in manufacturing.

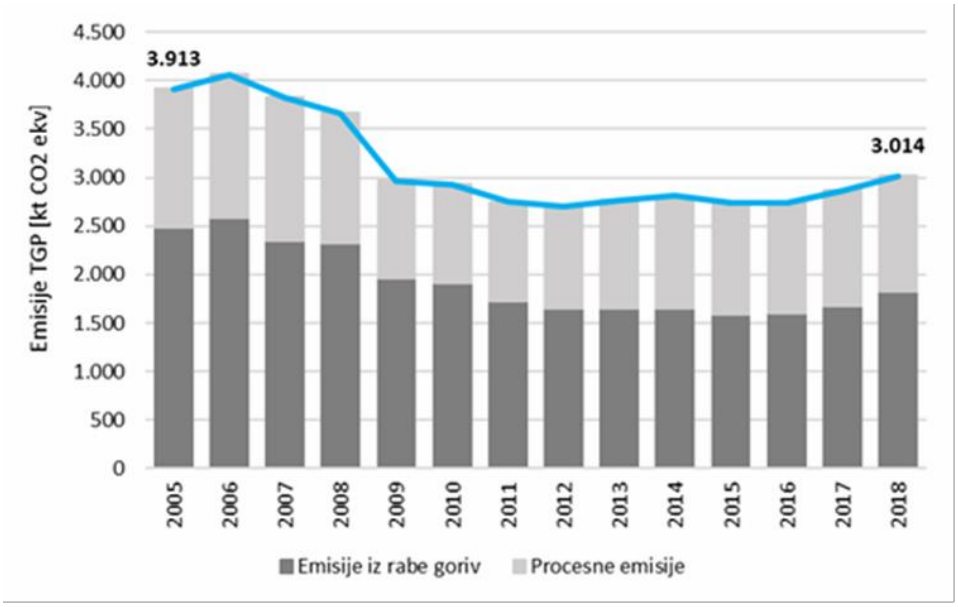

Figure 11: Analysis of GHG emission trends in the industry sector in the 2005–2018 period (source: Energy Efficiency Centre of Jožef Stefan Institute)

Emissions from the industry sector represent 17 per cent of total GHG emissions; as per the amount of emissions, this sector comes third.

The process of reducing emissions in the industry sector is already underway, but its intensity must be enhanced. The reduction of GHG emissions is the result of various factors, particularly environmental commitments, enforcement of charges on carbon dioxide emissions, emissions trading and implementation of measures for efficient use of energy, exploitation of renewable sources, improvement of industry productions processes and restructuring within individual industries.

6.2.1.1 Guidelines and measures adopted until 2030

The NECP plans a gradual reduction of GHG emissions by 2030 to an extent greater than that determined by Regulation (EU) 2018/842 of the European Parliament and of the Council of 30 May 2018 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2013 (OJ L 156, 19.6.2018, p. 26; hereinafter: Effort Sharing Regulation), i.e. by at least 20 per cent as per 2005 by attaining indicative sectoral objectives. For industry (only for the part of the sector not included in the emissions trading system), the NECP anticipates a 43-per cent reduction in GHG emissions by 2030 (as per the base year of 2005). By 2017, the industry sector reduced GHG emissions by 26 per cent.

The NECP plans an increase to at least a 30-per cent share of RES in the industry sector while observing the exploitation of excess heat, whereby it also anticipates a 1.3-per cent annual increase of RES share in heating and cooling in industry, including waste heat and cold, which is compliant with the requirements of Article 23 of recast Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources (OJ L 328, 21.12.2018, p. 82; hereinafter: Directive (EU) 2018/2001).

As per the NECP, it will be necessary to reduce the use of fossil energy sources and dependency on the import of fossil energy sources by supporting the implementation of pilot

projects for the production of synthetic methane and hydrogen (indicative objective is a 10-per cent share of methane or hydrogen from a renewable source in the transmission and distribution network by 2030).

Electricity is becoming an ever more important energy source for the business sector. The energy competitiveness and low carbon footprint of the business sector will be largely based on domestic low-carbon sources in the period until 2030, including water and nuclear energy. In accordance with the NECP guidelines, diversification of primary sources for electricity generation will improve, the use of RES will increase and so will, in part, the use of natural gas in high-efficiency co-generation of heat and electricity, which will reach at least 5 per cent of electricity generation in Slovenia by 2030.

An increased use of biomass in collective and industrial heating devices is also anticipated, as is integration with district heating. Electricity and heat generation is important for Slovenia because it improves the reliability and competitiveness of energy provision, the reduction of GHG emissions and environment protection.

Key NECP instruments in this field include the European emissions trading scheme, financial and other incentives for measures for the efficient use of energy, dispersed electricity generation from RES and high-efficiency combined heat and power (hereinafter: CHP), support for the implementation of pilot projects for the production of synthetic methane and hydrogen and the technologies CCS (carbon capture and storage) and CCU (carbon capture and utilisation). The plan for restructuring of regions, a new Slovenian industrial policy and the use of resources from the Just Transition Fund will also play an important role. The NECP also plans non-reimbursable financial incentives for measures for reducing process emissions in industry.

The NECP anticipates the reduction of the quantity of generated waste, the promotion of re-use and recycling and the utmost observance of circular economy objectives, especially with regard to construction and industrial waste. Support is also anticipated for the construction of missing infrastructure for the treatment of municipal, industrial and hazardous waste to promote the use of recycled materials as raw materials.

The establishment of suitable incentives or economic signals is crucial for network integration of RES, local adaptation of generation and demand, and the cooperation of industrial companies in system services. The NECP measures also anticipate incentives (technical and personnel support) for promoting local energy communities and RES communities in which industry can also be incorporated.

6.2.2 Vision

To attain minimum emissions in the industry sector by 2050 while maintaining a high level of competitiveness and the transition to a low-carbon circular economy. By observing the Energy Union dimensions, Slovenia will actively strive to gradually decarbonise the industry and ensure financial incentives to restructure production processes by introducing green technologies and business models.

6.2.3 Objective by 2050

The goal is to reduce GHG emissions to between 80 to 87 per cent in comparison to 2005 or attain minimum emissions by 2050. Slovenia’s strategic objective by 2030 is to reduce GHG emissions in industry by 41 per cent if compared to 2005 and to between 60 and 70 per cent by 2040.

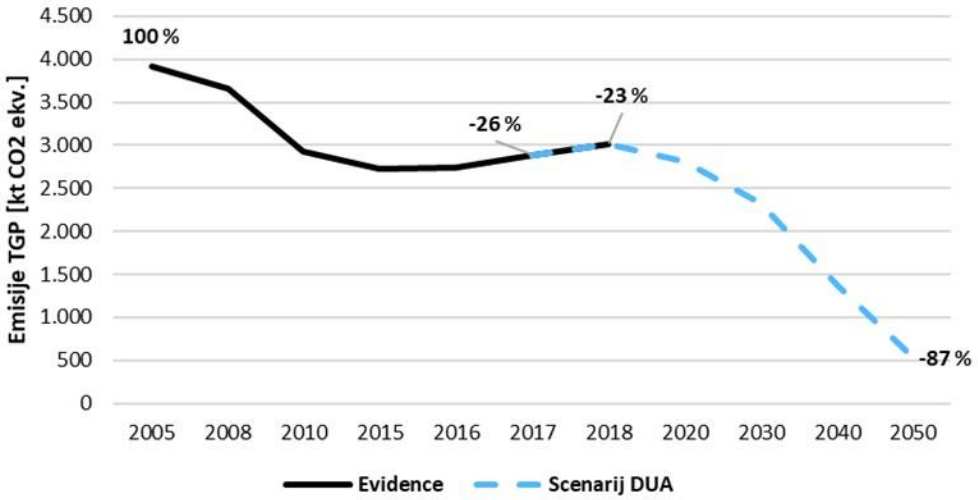

Figure 12: Indicative trajectory of reducing GHG emissions in the industry sector and the emission trends in the 2005–2018 period relating to emissions in 2005 and guidelines until 2050 (source: Energy Efficiency Centre of Jožef Stefan Institute)

6.2.4 Main orientations by 2050

The objective of attaining minimum emissions in industry requires extensive and long-term changes which will be structural (transition to lower energy intensity in industry), technological (technological renewal) and taking into account the circular economy throughout the value chain and between them, from production to use. The activities for reducing emissions in the sector will be intensified and special attention in the forthcoming years will be dedicated to the preparation of a suitable framework designed to capture all the elements necessary for a transition to climate neutrality. Despite great and extensive changes, the transition to a low carbon economy must not decrease the competitiveness of the economy, which is why various measures will specifically target the elimination or mitigation of impacts on competitiveness. The characteristic structure of the Slovenian economy continues to be a large proportion of energy-intensive industry, which represents more than 50 per cent of energy use in the sector, while this proportion is much smaller in regard to the share of gross domestic product (hereinafter: GDP) and the share of persons employed. Energy-intensive industries will play a decisive role when realising the EGD as the transition to a climate-neutral society will not be attained without radical change and innovations in these industries, which is why Slovenia will deal with them accordingly within the new industrial strategy.

Energy transition is a vital element in enhancing the competitiveness of the economy as it contributes greatly to the management of energy costs. In common with the rest of Europe, Slovenia is heavily dependent on the import of fossil fuels. Energy costs are high for companies and imported fuels have a large share in the EU balance of trade and directly impact the economic performance of nation states. In the long-term, the prices of imported fuels are expected to rise and fluctuate, further intensifying the pressure on costs. Furthermore, a growth in emission allowances is expected at the EU level. The third element of the price pressure on the economy is the further development of electricity prices. Current market prices do not reflect overall production costs, but usually only the operating costs of production. The electricity price from new units, which will define future prices, severely exceeds current market prices and consumer readiness to pay energy at these rates. Energy efficiency and other measures for reducing energy use are thus measures which will be very important for Slovenian companies and the state as they will result in direct economic benefits by means of energy cost management and contribute to the economic performance. It will also be very important that, simultaneously with the tightening of its climate policy, the

EU also enforces the carbon border adjustment mechanism for specific economic sectors, which will be efficient and compliant with the rules of the World Trade Organization, as anticipated in the EGD for countries with less strict objectives. In this way, the maximum economic effects of energy efficiency measures, the circular economy and other decarbonisation measures will be achieved. Slovenia will commence the transition on time and will prevent all stranded investments in unsustainable practices and subsequent unmanageable energy costs.

Slovenia will prepare well for the transition and particularly support energy-intensive industry. The transition will be fair, i.e. linked to the programme for the safeguarding and development of new jobs in the most affected regions and areas. For the most part, the transition may take place within the existing companies with a gradual transition to energy or emission-less intensive products and the establishment of circular economy principles, but there are also other options. To this end, Slovenia will draft a clear incentive policy within the framework of the industrial policy currently being prepared. A fair transition in Slovenia will not only be limited to coal mining regions, but will also include energy-intensive industry, for which a support environment is yet to be prepared. The foregoing must also include the following elements: financial incentives from EU and domestic sources, tax policy measures (clear signals relating to the development of taxes that direct the transition) and other measures for active directing of investments (taxonomy, etc.).

The fundamental principle of energy management in Slovenia is to prioritise the measures of efficient energy use with an emphasis on renewable sources, which also applies to industry. The energy efficiency measures enable more effective energy management, and they subsequently reduce final energy consumption as per the principles of the low-carbon circular economy. It is necessary to highlight the use of excess heat generated in thermal processes, which may be captured and reused through various technologies. The use of excess heat is anticipated throughout industry and to a greater extent in energy-extensive industries, particularly in the manufacture of metals, paper, cement and chemicals.

In industry and in certain energy-intensive branches where technologies allow this, the replacement of gas technologies with electric ones is anticipated in heat treatment processes. Possibilities for applying these types of technologies are found in the manufacture and processing of glass, steel and aluminium, but this is balanced by investments in changing technologies. Slovenia will also support the integration of industrial companies with district heating systems, which could utilise excess heat from industry for the heating of other consumers (households, service and agricultural sectors).

Branches with a marked need for heat (paper and chemical industries) or cold (food industry) may, in addition to heat generation with cogeneration technologies or tri-generation (cold generation), simultaneously generate electricity for their own needs or transmission to the network. With the use of biomass or biogas, GHG emissions will also decrease.

To decarbonise the industry sector, it is critical to increase the use of RES in the field of electricity and heat generation. Within the framework of development priorities, Slovenia will examine the use of synthetic gas or hydrogen as a substitute energy product for natural gas in pilot projects by 2040 or sooner in order to reduce emissions in the industry sector. A 10-per cent substitution of natural gas with synthetic gas is anticipated in 2030, a 25-per cent substitution is anticipated in 2040, and replacement of the entire quantity of natural gas with synthetic gas or hydrogen is anticipated by 2050.

The RES share in the industry for heating purposes will be significantly increased, i.e. from 11 per cent in 2017 to 26 per cent in 2050. Differences between individual branches of the processing industry will remain, whereby energy-intensive industries will have a key role in increasing the share of RES. In other industries, the wood processing industry will further maintain its leading position with regard to the scope and share of RES. An increase in direct RES use for heating purposes will be based until 2030 on the exploitation of wood biomass in

boilers and CHP systems, the use of low-temperature heat from geothermal energy and the use of RES from waste. A more extensive breakthrough in the industry after 2030 will be indirect and will particularly rely on synthetic gaseous biofuels and electricity acquired from RES, which is not included in the regular proportion.

In the industries emitting process emissions, Slovenia anticipates the application of technologies for storage and reuse of carbon after 2040 as per the most optimistic scenarios of CCU development. As this is a new field, it is necessary to ensure a suitable support environment for pilot projects, appropriate infrastructure and a regulatory framework for the application of such technologies. Process CO_2 emissions could be captured with such technologies by means of electricity generated from RES and used for the generation of synthetic gas at suitable locations. The use of CCU technologies is especially anticipated in the cement industry and the manufacture of metals.

In the next few years, the economy will focus on green, creative and smart development in accordance with the Slovenian Industrial Policy 2021–2030.From the aspect of green, sustainable and circular development, it is vital to introduce measures of material efficiency, which are crucial for the transition to a circular economy. As per the EU plans (e.g. Circular Economy Action Plan), Slovenia will incorporate the principles of the circular economy in its regulations and procedures. Inclusion of the circular economy will be a decisive factor when contributing to the attainment of climate neutrality by 2050 and the disengagement between economic growth and the use of sources and energy, which will guarantee a positive impact on the long-term competitiveness of a sustainable economy, i.e. with support for decarbonisation, transition to circular business models in all industries and specifically in key sectors: forestry/wood chain, manufacturing, mobility, food and the built environment.

For correct evaluation of sustainability-oriented industrial production, Slovenia will support the introduction of evaluation of goods as per the life cycle cost analysis or a comparable indicator (carbon footprint), which will enable the recognition of more acceptable products in the market with regard to sustainability.

Ensuring the competitiveness of industry and the economy will be one of the key tasks when drafting a business and financial framework for Slovenian economy. In the future, prices of energy products will increase, and it will thus be necessary to request and harmonise European polices in the field of taxation of energy products, emissions trading, access to competitive energy products in the international European market and product environmental labelling.

Due to the complexity of the transition to climate neutrality, the management of development activities of research organisations and industrial companies will present a great challenge, so Slovenia will provide appropriate guidance for development incentives with the objective of ensuring research and infrastructural support for the transition.

Industry in the narrow sense encompasses only manufacturing, but industry in the broader sense is observed in the draft Slovenian Industrial Policy 2021–2030, i.e. also services related to industry, which are fewer than one fourth (logistics, trade, etc.). Furthermore, jobs in the manufacturing industry generate up to two jobs in other activities. While supported by digitalisation, the transition to a low-carbon circular economy will result in additional jobs in related services (the significance of repair, re-design, reuse, introduction of digital platforms, etc. is increasing).

6.2.5 Main fields of action

To attain the decarbonisation objective in the economy, the industry sector and particularly the energy-intensive industry branches will be further committed to reducing energy and emissions intensity. At the same time, a comprehensive support environment for

restructuring production processes to energy and emissions-less intensive processes will have to be established which will be based on the accelerated introduction of green technologies. Within industrial, taxation and other economic policies, Slovenia will promote investment in efficient energy use, a low-carbon circular economy, self-sufficiency and RES supply. These industries are not only energy intensive, but also materially intensive and may contribute crucially to the transition to a low-carbon circular economy. They are also important from the viewpoint of value chains because they ensure raw materials for further industry, e.g. aluminium for major appliances, food and cosmetics industries, etc. Special discussion is required from this aspect, particularly to prevent industry movement to third countries ("carbon leakage") and a subsequent increase in emissions at the global level.

Due to the increasing need for harmonisation of various policies, each future economic strategy will harmoniously and simultaneously address several fields such as innovations, competitiveness, financing, energy, waste, state aids and other aspects linked to the transition to a low-carbon circular economy. We are also witnessing the beginning of a new industrial era, the so-called new industrial paradigm, Industry 4.0, the backbone of which is ICT and subsequent universal device connectivity (Internet of Things).These challenges will be discussed in the Slovenian Industrial Policy, which encompasses the years 2021 to 2030. Within the chapter on green development, the Strategy in particular highlights energy-intensive industry.

Slovenia will promote the development of technologies, which include the upgrades of gasification technologies, excess heat use technologies, waste recovery technologies for energy purposes (but only after all possibilities of material use have been exhausted), "Power-to-X" technologies, energy digitalisation, energy storage, emissions capture and reuse, synthetic gas generation, etc. The technologies proposed will serve as the basis for enhancing the competencies of industrial companies in the field of competitiveness and technological development. When transferring the development of new products, production processes, services and solutions in the economy, research in the field of EEU and RES and a climate-neutral and circular economy will play an important role.

In the recent period, the industry received only limited financial incentives to increase energy efficiency and apply RES technologies, which is why most measures were implemented on a smaller scale than anticipated, which means that Slovenia will intensify the implementation until 2050. In addition to the foregoing measures, Slovenia will also support the measures which will contribute to the transition to a circular economy. As per the EGD, Slovenia will participate in the formation of a mechanism for carbon border adjustment to prevent the so-called carbon leakage.

The support scheme for electricity generated from RES and in CHP will play an important role when introducing RES technologies. Stable and predictable conditions for industry investors must be ensured.

To use synthetic gas and hydrogen in the industry, Slovenia will promote technology development and provide suitable conditions for the establishment of infrastructure and an appropriate regulatory framework for the application of synthetic gas and hydrogen. It will draft guidelines for safe use, suitable fuel sources (RES), certification, inspections, etc.

Slovenia will promote the necessary connectivity of industrial companies with district heating systems, which will be addressed in further detail in the District Heating Strategy, which is being drafted. This measure supports the reduction of heat consumption and enables greater exploitation of excess heat.

To accelerate the development and generation of low-carbon or green technologies, the activities will further intensify. In the short-term, Slovenia will enhance pilot projects, particularly with regard to excess heat use, the circular economy and low-carbon

technologies. The development in Slovenia is also important for business opportunities in the wider region. This will take into account the broader legislative and administrative framework for the promotion of development, demonstration and marketing activities.

Slovenia will dedicate special attention to the promotion of small and medium-sized enterprises and the establishment of start-ups, which can be visible players in the green and digital transformation of the economy. To this end, Slovenia will also focus on the development of suitable knowledge in the support environment. A group of experts for mentorship will be set up to support start-ups, including a system of financial and other supports for the realisation of low-carbon/circular ideas. A system for monitoring the effects on emissions and access to financing sources will also be established. Micro, small and medium-sized enterprises will obtain support through expert assistance and in the form of support for the implementation of circular business models. Slovenia will further strive to reduce administrative burdens and eliminate market access barriers, while improving access to various financing methods for the transition.

6.2.6 Key factors for attaining target emissions by 2050

To decarbonise the industry sector and support climate neutrality, the following factors will be crucial:

- enhancement of the transition to a low-carbon circular economy which, according to the assessments of the International Resource Panel, is supposed to contribute at least 60 per cent to the reduction of GHG emissions in the global economy or to decarbonisation;
- establishment of incentives which will help companies to update production processes;
- establishment of an efficient support environment for pilot project implementation, targeted incentives for small and medium-sized enterprises relating to the transition to a low-carbon and digitalised economy (by eliminating administrative barriers), improvement of access to various financial sources;
- development, production and introduction of new sustainable products and services and business models (energy and material efficient technological solutions), establishment of a support environment for the development of an offer of comprehensive services for energy management;
- support for the development of a market for technologies with low emissions with the introduction of various mechanisms (e.g. a product's lower carbon footprint as a criterion in the public procurement procedure);
- harmonisation between the implementation of a low-carbon transition in energy and industry, particularly from the aspect of ensuring a sufficient proportion of fuels from renewable sources for industry use, such as synthetic gas and hydrogen;
- increase in efficiency of energy use, use of effective technologies with maximum efficiency (best available technologies – BAT), increase in the exploitation of RES and excess heat and integration with DH systems;
- competitiveness of low-carbon energy products;
- establishment of infrastructure and suitable legislative framework for the use of synthetic gas and hydrogen;
- promotion of digitalisation in companies and the introduction of Industry 4.0. which also enables the transition to a low-carbon circular economy.

6.2.7 Human resources

The industry sector is undoubtedly faced with a lack of suitable staff for energy and raw materials management. To increase competence and provide suitable staff in the industry sector, it is necessary to implement and monitor target-oriented training for preparation and implementation of projects relating to EEU, RES, material efficiency and the transition to a circular economy. The training of staff to manage energy and raw materials in industry will

also play an important role. The foregoing activities must commence immediately, and training must be carried out systematically, including the promotion of pilot project implementation in industry.

The scope of anticipated activities addresses a broader selection of development policies related to research and innovation; a close link with industrial, entrepreneurial and educational policies is particularly important. To transition to a climate-neutral society, fields promoting green and digital transition must become priority areas of research, development and innovation. Investments in research and innovation promotion in the field of low-carbon technologies and energy efficiency do not only contribute to sustainable development, but also to reliable and competitive operations of the energy sector, which contributes significantly to the competitiveness of the entire economy.

6.2.8 Proposed progress monitoring indicators

- GHG emissions in the industry sector, separate for ETS and non-ETS;
- separate monitoring of emissions in energy-intensive industries as per the adopted methodologies at the EU level;
- RES share in gross final energy consumption (Directive 2018/2001/EU);
- final energy consumption;
- emissions and material productivity.

6.3 Transport and mobility

6.3.1 Description of emission status and key measures

GHG emissions from the transport sector amounted to 5,824 kt CO_2 equivalent in 2018, which is 32 per cent more than in 2005, whereby emissions in road transport presented 99.4 per cent of all emissions in the transport sector and less than one per cent was attributed to remaining transport (railway, air, etc.). Transport is the sector with the largest share of GHG emissions in Slovenia.

GHG emissions in the transport sector have been increasing in recent decades as a result of economic development, Slovenia’s geographical position as a transit country, settlement structure and, for the most part, neglect in the development of alternative methods of passenger and goods transport. Personal transport, which is based on transport using passenger cars and is the result of major investments in road infrastructure between 1991 and 2010 and partly of unsuitable spatial development, which failed to respond to the prevailing dispersed settlement in the past, causes daily congestion at peak periods, especially around Ljubljana. Congestion is noticeably increasing and further contributes to growing emissions. The growing external costs incurred by Slovenia and its citizens due to transport also require action outside the framework of the fight against climate change.

In the past, Slovenia had sectoral national programmes for various modes of transport (road, railway, aviation, maritime), which were not well coordinated with each other and of which the motorway programme was the most successful. Since 2015, we have a comprehensive Transport Development Strategy of the Republic of Slovenia Until 2030 (with incorporated sustainable mobility), but the implementation of the measures planned is too slow (development of public passenger transport, introduction of a single ticket and harmonised timetables, time-consuming upgrade of the existing, or siting and construction of new, railway lines, etc.).Based on the foregoing, progress in the reduction of GHG emissions depends primarily on the technological progress of vehicles. Slovenia is heavily involved in international transport corridors and the common EU market, which is why it has little impact on transit transport. As of 1995, priority has been given to the construction of a motorway network and thus the enhancement of European and interregional connectivity along the

Mediterranean and Baltic-Adriatic TEN-T corridor, while the remaining network of state roads was only maintained and preserved. In 2008, emissions from transport exceeded the emissions from 1986 by more than 200 per cent. They somewhat reduced at a later time, but transport nevertheless remains the only sector with such a large increase in emissions.

6.3.1.1 Guidelines and measures adopted until 2030

The NECP highlights that a correct and efficient approach to resolving the transport problem and its contribution to GHG emissions is of key importance. Rail transport and measures of sustainable mobility are put to the forefront, which will reduce GHG emissions in the transport sector and reduce traffic density. To implement this objective, Slovenia will:

- upgrade the railway infrastructure (preparation by 2025, implementation by 2030);
- upgrade and enhance capacities on the corridors Kamnik–Ljubljana (including electrification), Ljubljana–Kranj (double track), corridor south-east of Ljubljana, area of Ljubljana railway stations and stop facilities;
- upgrade tracks to attain TEN-T standards and increase the capacities on the lines Koper–Ljubljana (new Koper–Divača line, upgrade of the Divača–Ljubljana section), Maribor–Šentilj, Pragersko–Maribor (increase in permissible loads), Zidani Most–Pragersko, Ljubljana–Jesenice (the Karavanke Tunnel);
- further develop integrated public transport (harmonisation of timetables, integration of urban transport, establishment of a single/suitable public passenger transport operator, development of shared mobility, introduction of prioritisation of public transport vehicles, integration of cableway installations);
- promote sustainable modes of transport within the calculation of travel costs;
- reduce the needs for personal vehicle usage (work from home, change in parking policy, etc.): this will improve the integration of spatial and transport planning (legal arrangements of comprehensive planning, reduce the suburbanisation trend, improve the management of daily migrations in broader urban areas and other functionally linked areas, enhance the compactness of towns, enhance the renovation and reactivation of poorly utilised or degraded areas in rural settlements for activities enabling an increase in local employment and a reduction in daily migrations to towns) and accordingly arrange micromobility hubs on city arterial roads and along motorways;
- actively promote the construction of an infrastructure for walking and cycling for daily users, including suitable infrastructure for charging stations and promotion of the use of electric bicycles;
- change the excise duty policy and adjust the toll policy in accordance with the guidelines of the EU legislation:
- ensure suitable support environment for a comprehensive electrification of the Port of Koper;
- provide suitable support environment for the use of alternative fuels such as electricity, liquefied and compressed natural gas, which will be gradually replaced by synthetic gas (syngas), hydrogen (H_2) and liquefied petroleum gas (LPG) which is of transitory nature, and biofuels, and
- simplify administrative procedures in transport electrification.

6.3.2 Vision

The attainment of minimum emissions in transport by 2050 will be adapted to society's needs and have a minimum environmental impact. Efficient public passenger mobility will be implemented by modern means of transport. A modern railway network will be established which will enable regulated, frequent and fast rail transport between city centres. The prevailing modes of mobility in urban areas will be cycling and walking. Suitable spatial and transport planning, application of modern technologies and the transition to a low-carbon circular economy will reduce the need for mobility and the use of motor vehicles. For the most part, freight transport will be implemented by rail. Vehicles will be mostly powered by electricity, supplemented by renewable or synthetic gases which are low-carbon.

6.3.3 Objective by 2050

The target in the transport sector is to reduce emissions by 90 to 99 per cent by 2050 in comparison to 2005. The reduction by 2050 represents emissions lower than current ones by more than two magnitudes, which demands a thorough transformation of transport from how it is known today. This will not only pose a financial, but also a social challenge with a complex timeline. As per the NECP, transport emissions may only increase by 12 per cent by 2030. The strategic objective by 2040 is to reduce emissions in the transport sector by between 55 and 65 per cent (in comparison to 2005).

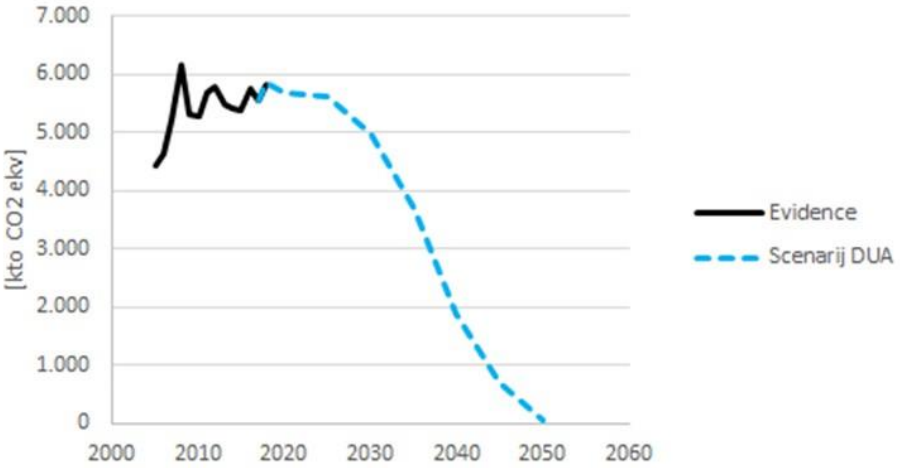

Figure 13: Trend in reduction of GHG emissions as per the WAM scenario (with additional measures – ambitious) in the transport sector and the emission trends in the 2005–2018 period as per the emissions in 2005 (source: Energy Efficiency Centre of Jožef Stefan Institute)

6.3.4 Main orientations by 2050

In addition to the main orientations of the sector to attain the objective of reduced GHG emissions by 2050, Slovenia will also observe other development objectives (e.g. rural development, traffic safety, adjustment to demographic changes with automation of vehicles, enabling access to functions (jobs and services)). It is thus practical to divide the sector into reduction of mobility demand, intensive promotion of active sustainable mobility, improvement of public passenger transport and an increase in its use, increase of freight transport by rail, improvement of vehicle efficiency, technological improvement of vehicles, and promotion of the transition to alternative fuels.

Until 2050, Slovenia will dedicate special attention to changes which will reduce the need for everyday mobility (e.g. work from home, reduced number of working days). Both are anticipated and enabled by technological progress. Certain practical social studies were also carried out, but the issue of social acceptability and broader consequences remains. Furthermore, Slovenia will actively raise its citizens' awareness that their everyday decisions affect significantly the scope of transport and thus the environment, e.g. choice of the place of residence, work, means of transport and purchase of new products. The transition to a low-carbon circular economy will have an important impact on the scope of freight flows, which will have a positive effect on the reduction of the need for freight transport.

Within the scope of reducing mobility demand, Slovenia will improve the local attractiveness of cities and towns by providing basic (e.g. supply of food, health care, education) and advanced (cultural and sports activities, localisation of jobs) necessities of life. With advancing technologies (mobility as a service, autonomous vehicles, digitalisation, car sharing), the network's burdens will be arranged more optimally. Technology advances must be further utilised in logistics to reduce transport needs.

The future of efficient passenger transport requires the decisive modernisation of public passenger transport, especially rail transport, which has potential in the surrounding area of large towns (e.g. Ljubljana, Maribor). The railway network will be upgraded and expanded. Railway stations will be connected with suitable feeder bus lines or the infrastructure to enable transferring or transition between various passenger transport modes (e.g. park and ride, bike sheds). Passenger bus transport will be adjusted to the current and future needs of users. By 2050, the use of public passenger transport would have to more than double (increase by 120 per cent) in comparison to the current situation. The modernisation of the railway network, which must enable good connection with the EU network, is also crucial for efficient freight transport.

For the most part, transport prices will include external costs, which will decrease the attraction of motorised transport in the road network. The share of lorry transport, especially in transit transport, will decrease and so will the proportion of cars, whereby the priority will not be given to passenger cars, but the road will be shared more fairly by all transport users. This will stimulate the increase in walking and cycling, which will, in addition to mobility demand management, stop the growth in passenger car activity after 2030.Slovenia will also promote high occupancy of passenger cars (e.g. use of additional lanes for vehicles with several persons on motorways and expressways, change in the calculation of travel costs) and also freight vehicles. The occupancy of passenger cars must increase by at least 25 per cent.

Access to restricted city centres will be limited to the most sustainable forms of transport. In broader urban and suburban areas, cycling will become an obvious form of mobility, while a combination of bus and rail transport will also be promoted. Sustainable mobility in the form of walking and cycling will also have health benefits in the form of necessary exercise. It will also contribute to lower noise emissions, less congestion and an increase in quality of the living environment. Cycling with e-bikes will also become an attractive mode of transport for long distances and for travelling between settlements.

Slovenia will continue to implement alternative fuels in transport. Battery electric vehicles are becoming more popular, and the growing number of such vehicles must also be supported by an adequate charging infrastructure. By 2050, passenger transport will be electrified. A possible alternative to electrification, especially in freight transport, are bio- and synthetic fuels, which are in certain aspects of their production CO_2 neutral, and also hydrogen vehicles based on suitable technological development. By 2050, Slovenia will completely substitute fossil fuels in transport with low-carbon alternatives. All technologies for the attainment of this objective, particularly in freight transport, have not yet been developed

technologically to the extent that they are competitive with regard to price, but the EU commitment to reduce GHG emissions in transport serves as a stable framework for further intensive development of these technologies.

Slovenia will promote research and development in the field of environmentally friendly transport. There are numerous companies and individuals who have actively contributed to the development of national and international mobility in the past and present, which is why Slovenia will further invest in research and development.

In addition to the development of infrastructure and services in comprehensive transport planning, Slovenia will establish a support system of restrictions (travel costs, parking policy, etc.) and incentives (financial, etc.), which will also be supported by taxation policy. This will be the only way to change public habits. Slovenia will develop smart cities and communities. National transport systems and infrastructure will be adjusted to support new services of sustainable mobility by means of which it will be possible to reduce congestion and pollution, especially in the areas of cities and local communities. Users would thus be put first and enabled cost-efficient or affordable, healthier and cleaner alternatives.

For efficient and qualitative siting in space, human resources capacity will be ensured and mechanisms for resolving disagreements between spatial developers and holders of projects or plans will be established.

In the field of civil aviation, Slovenia cooperates in the formation and implementation of the resolution of the International Civil Aviation Organization (ICAO) on the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). The ICAO commitment represents an establishment of the emission trading system in international aviation. Until the establishment of a comprehensive system at the global level, Slovenia is harmonising legislative frameworks for monitoring, reporting and verifying emissions in air transport. Further important incentives include improvement of air transport, introduction of new technologies, aircraft operational improvements and electrification of ground support equipment, which will significantly enhance energy efficiency in aviation. To reduce GHG emissions in maritime transport, the International Maritime Organisation (IMO) adopted the Strategy on reduction of GHG emissions from ships. The Republic of Slovenia supports the adopted strategy and participates in the preparation of an action plan for its implementation.

6.3.5 Main fields of action

Slovenia will promote changes in public behaviour by providing alternatives to motor transport and through active raising of awareness about the impact of our everyday decisions on the environment and society with the objective of reducing the demand for transport and motor transport.

In personal transport, Slovenia will promote walking, cycling and the use of public passenger transport for short distances through planning and the construction of a suitable infrastructure. For longer distances, the emphasis will be on the use of public passenger transport, for which a suitable infrastructure will be provided, including the use of alternative fuel vehicles. Railway hubs will be modernised, and high-capacity and regional lines will be constructed in accordance with Slovenia's needs. Key measures in rail transport include:

- upgrade of railway corridors (main lines) for increasing capacity and attaining the TEN-T standards;
- upgrade of regional railway lines for shortening travel times and increasing the attraction of rail passenger transport (electrification and double-track lines in accordance with need);
- construction of a railway infrastructure to remove freight transit transport from city centres and urban settlements due to noise, social and economic reasons, spatial aspects, etc.;
- construction of a railway infrastructure for the establishment of competitive railway

connections on potential routes;
- construction of a railway infrastructure for integrated public passenger transport and multimodal freight transport.

Integrating rail and road transport (bus and personal) and providing the assurance of integration with the cycling culture (by establishing safe and covered bike sheds at railway and bus stations) within layovers or hubs are necessary components of transport in the future. Due to dispersed settlements, Slovenia will also introduce free-of-charge transport for older people in rural areas and seek synergies between various providers. With regard to passenger cars, Slovenia will promote electrification and other alternative fuels, higher vehicle occupancy, more efficient vehicles (improved engines, reduced size or weight of vehicles, energy-efficient driving). Harmonised operations and suitable, as well as soft, guidance for users (information dissemination, tax incentives, etc.) are important in connection with incentives. Road capacity intended for road transport will be expanded only when it is not possible to ensure a suitable level of public mobility or supply to the economy in another way (existing road infrastructure, rail transport, public passenger transport, etc.). Parking areas outside the park and ride system will be gradually reduced, particularly in town centres. Planning and construction of large parking areas will be limited in town centres (e.g. next to shopping centres).

In addition to public passenger transport, cycling and walking will be at the forefront in towns and cities. Slovenia will ensure a suitable infrastructure for active sustainable mobility in towns and in the countryside. Safe, direct and comfortable cycling paths will be arranged in towns, between towns and between towns and rural areas. Bicycle rental schemes will be promoted at the national level, especially in combination with railway hubs, including the use of bikes in public sector institutions and the use of cargo bicycles.

Slovenia will transfer freight transport to railway lines to the greatest extent possible, in readiness for which it will upgrade the existing railway network. Road freight transport will be decarbonised with the application of electric drives (battery vehicles, hydrogen) and bio- and synthetic fuels. Slovenia will stop subsidising the use of diesel fuel in freight transport and promote the transition to alternative fuels. The charging of tolls for freight transport will be adjusted accordingly by taking into account to a greater extent the various detrimental effects caused by GHG and other emissions.

Biofuels are significant substitutes for liquid fossil fuels, which is why Slovenia will increase the proportion of biofuels in liquid fuels for road transport, while the proportion of biofuels produced from raw materials that are also used for food production will be gradually reduced. The biofuels used will meet sustainability criteria.

6.3.6 Key factors for attaining target emissions by 2050

To attain significant emission reduction in transport, the following factors are of key importance:
- incentives for changing behaviour from the aspect of selecting the mode of transport, purchasing decisions, selection of the place of residence, work, etc.;
- attractive public passenger transport system based on rail passenger transport with integrated public passenger transport points;
- modern railway infrastructure to ensure services for passenger and freight rail transport;
- safe and comfortable infrastructure for sustainable mobility (cycling infrastructure, layovers or hubs);
- integration of sustainable mobility into spatial, transport and building legislation;
- integrated spatial and transport planning which promotes concentration of settlements and mixed use of space, and ensures accessibility standards with sustainable mobility, etc.;

- incentive measures for sustainable mobility (e.g. tax relief, soft measures, technological measures) and restrictive measures for reducing personal motor transport (e.g. parking policy, travel costs);
- substitution of technologies in passenger and freight transport with technologies that have no direct CO_2 emissions, and the introduction of renewable and low-carbon synthetic gases.

6.3.7 Human resources

For overall transport and spatial planning, Slovenia will establish an efficient decision-making culture based on expert bases while ensuring the provision of sufficient human resources. It will also draft expert bases within public administration and support the application of expert bases with external providers and organisational and other measures.

A single integrated public passenger transport operator will be established to competently harmonise the interests of various stakeholders in this sector with the objective of providing high-quality services for all users.

Slovenia will establish planning at the regional level as current practice revealed that Slovenian municipalities are frequently too small to efficiently implement the measures and the state is too rigid.

Urban transport has a great impact on GHG emissions. Through comprehensive transport strategies, municipalities can greatly reduce air pollution in sensitive areas by using various traffic arrangements (traffic-calming zones, parking prohibition, traffic ban in certain urban areas, environmental zones) and the origin-destination transport prohibition regime. Due to the foregoing, Slovenia will ensure the suitable competence of stakeholders at the municipal and regional levels. The number of persons working in the field of comprehensive transport planning will be increased.

6.3.8 Proposed progress monitoring indicators

- GHG emissions in transport;
- passenger transport structure;
- freight transport structure;
- proportion of RES in transport;
- electrification share in transport;
- time spent.

6.4 Buildings – households and service activities

6.4.1 Status of emissions and current measures

Total GHG emissions from fuel combustion in the building sector amounted to 1,065 kt CO_2 equivalent in 2018, which is 6.1 per cent of all national GHG emissions. The energy consumption in the building sector, which is divided into households and service sector buildings, was 28.9 per cent of total energy consumption in 2018 and thus represented one of the main sources of CO_2 emissions. In the 2005–2018 period, emissions from the service sector buildings reduced by 57.5 per cent and 55 per cent from households.

The reduction in GHG emissions is the result of various factors, especially environmental commitments, implementation of measures for efficient energy use, application of technologies that exploit renewable sources, and an increase in centralised heating systems in densely populated areas. In the 2005−2018 period, emissions in buildings dropped

particularly due to the investments in efficient energy use measures and switching to more efficient technologies and other energy sources (replacement of fuel oil contributed the most to this). When reducing GHG emissions in households, the financial instrument of grants was utilised, while public buildings underwent energy renovation exclusively based on cohesion funds, particularly the mechanism of energy performance contracting, in which municipalities were especially successful.

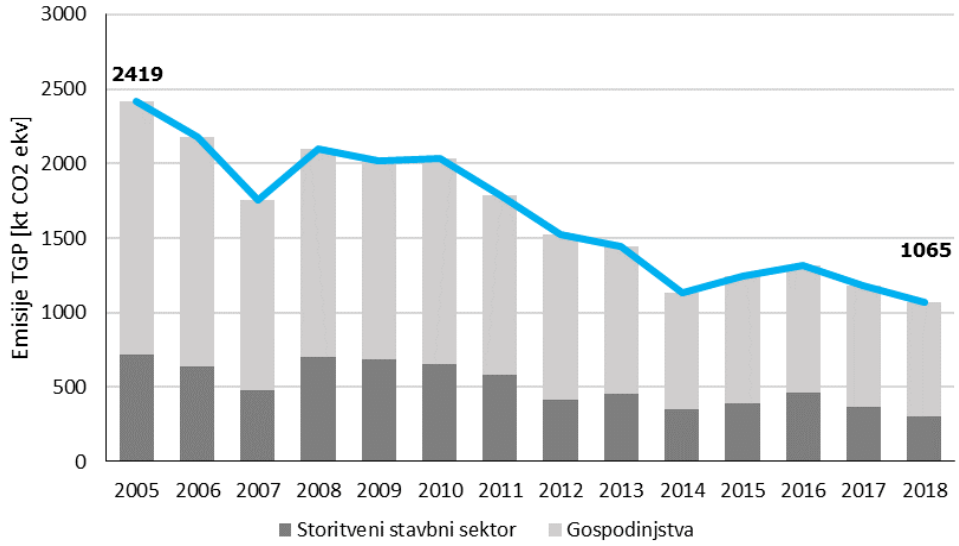

Figure 15: Analysis of GHG emission trends in the building sector in the 2005–2018 period (source: Energy Efficiency Centre of Jožef Stefan Institute)

6.4.1.1 Guidelines and measures to be adopted by 2030

The NECP plans a higher rate of energy renovation, greater emphasis on RES technologies for heating and hot water supply, higher number of connections to district heating systems and considerable growth of their number in areas where this is economically justified. In 2030, final energy consumption will drop by 21 per cent in comparison to 2017 and will amount to 1,339 ktoe, while it will decrease by 26 per cent in 2040 and amount to 1,249 ktoe.

The NECP also plans a gradual prohibition of the purchase of new heating devices using fossil fuels as the ban on the purchase of new fossil fuel boilers will enter into force in 2023. In sparsely populated areas, the heating technologies are directed towards heat pumps and biomass-fired boilers, which remain an important low-carbon source in Slovenia. In towns where district systems are present, the NECP prioritises centralised systems.

Key instruments of the NECP in the field of buildings include amendments to the regulations on energy efficiency of buildings, energy contracting, aid scheme for energy efficiency of low-income households, financial incentives for energy efficiency and RES use in residential buildings, energy management in the public sector, non-repayable investment and financial incentives for energy renovation of buildings in the public sector (while observing the Guidelines for energy renovation of cultural heritage buildings) and the project office for energy renovation of public buildings.

The Long-Term Strategy to Promote the Energy Renovation of National Building Stock and the Heating and Cooling Strategy, which follows the set vision of the NECP, will be exceptionally important for the building sector.

6.4.2 Vision

To attain minimum emissions in the building sector before 2050 by maintaining a high level of energy renovation of buildings with low-carbon and renewable materials and directing the manner of heating towards centralised heating systems and RES technologies.
To direct renovation and new construction towards attaining almost zero emissions throughout the entire life cycle. Promote broader building renovation to attain energy-efficient, safe and healthy buildings. The field of building construction will be a priority field of the transition to a low-carbon circular economy.

6.4.3 Objective by 2050

The objective is to attain minimum GHG emissions by 2050. Interim strategic objectives are to reduce the emissions by 82 per cent in comparison to 2005 and to between 85 and 95 per cent by 2040.

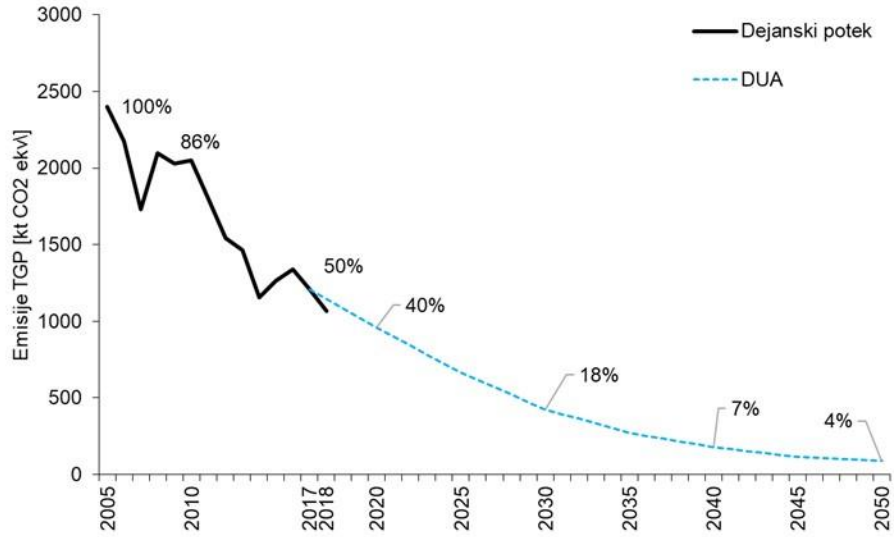

Figure 16: Objective of reducing GHG emissions in the building sector, current emissions/emission trend in the 2005−2018 period and anticipated course until 2050 (source: Energy Efficiency Centre of Jožef Stefan Institute)

6.4.4 Main orientations by 2050

Orientations towards minimum emissions in buildings by 2050 lead to significant change in the structure of fuels. Fossil fuel technologies will be replaced by technologies using RES or combined heat and power stations and connections to district heating systems.

The efficiency of energy use in buildings does not depend only on construction and renovation, but also on the methods of application, management, raising of awareness and education of the users.

Based on the act governing the efficient use of energy, Slovenia must annually renovate three per cent of total floor area in buildings owned and used by the government, which poses a challenge Slovenia cannot currently attain. For all public buildings, Slovenia will draft incentive instruments and financial incentives to (1) promote the so-called broader renovation of public buildings, which improves safety and construction and technical condition of

buildings (incorporation of seismic, fire and other aspects of renovation) and observes the health and living comfort of building users (incorporation of air quality and other aspects), and (2) enable the suitable treatment of buildings with a special status (e.g. cultural heritage).

The projections made take into account the growth in final energy consumption in buildings in regard to (1) an increased share of heat pumps as the heating technologies in newly constructed buildings and when replacing old inefficient systems; (2) an increased use of electricity by other technical systems in buildings (lighting, cooling), and (3) an increased use of electricity by interior fittings where the service sector is a large consumer. The NECP also plans a larger share of replacement and use of heat pumps, efficient lighting, rational use of interior fittings, suitable addressing of energy poverty and gives priority to comprehensive energy renovations before partial measures.

6.4.5 Main fields of action

By 2050 in the light of the objectives set in the field of GHG emissions in the general use sector (households, agriculture, forestry and other use, which also includes the service sector), Slovenia will attain minimum emissions. The objective is exceptionally challenging because Slovenia will continue with energy renovation of buildings for its attainment and promote technologies that use RES and centralised heating systems. The use of fossil fuels will decrease significantly in buildings and district systems will be utilised to the maximum as they enable greater flexibility and connectivity with other sectors, e.g. electricity generation through heat storage, while RES will be used elsewhere.

Until 2030 and onwards, Slovenia will maintain the level of comprehensive energy renovation above two per cent annually. The foregoing will particularly be a great challenge for the public sector because more challenging renovations will be carried out due to economic, technical and other reasons. Slovenia will establish a comprehensive approach to the renovation of buildings in which other renovation aspects will also be included (e.g. earthquake, fire and air quality). The process of construction and renovation design will be supported by mandatory building information modelling, which will increase the design efficiency, reduce the investment value and contribute to the optimisation of time needed for the implementation of works. Slovenia will train experts in sustainable construction, building and renovation and experts for cultural heritage renovation supported by building information modelling (BIM) to ensure the high-quality implementation of construction and renovation.

Regulations regarding construction and renovation of buildings will further tighten. The regulations regarding efficient use of energy in buildings will become stricter with the introduction of a nearly zero-energy building (hereinafter: NZEB) and incorporation of a sustainable evaluation of buildings, which will impact the scope of renovations and energy efficiency of buildings. The introduction of sustainable construction criteria when building and renovating will focus on reduction of the carbon footprint of the materials used and a positive impact of the circular construction concept on the emissions. Construction and renovation of buildings as per the NZEB requirements began to be implemented at the end of 2020 and the requirements centre on highly energy efficient buildings which will meet their heating needs by means of the technologies exploiting RES.

The measures aimed at decarbonisation of buildings will require a substantial financial injection. Financial incentives for households will be further provided from the contribution for EEU and the Special Climate Change Fund, while grant resources for energy renovation of public buildings have not been provided. Furthermore, financial instruments will have to be developed to promote overall renovation of buildings, which will ensure greater efficiency of investments (e.g. provision of anti-seismic fortification before buildings' energy renovation).

The measures in this sector have significant synergistic and multiplicative effects and enhance economic competitiveness and employment in the long term. The implementation or promotion of urgent, but not always economically viable, measures is involved in this case;

some of these measures are more challenging, having a relatively long period of return and a long lifespan. The measures also affect user health and wellbeing, which results in a broader social benefit due to lower health costs and improved labour productivity on the behalf of better working and living conditions. The measures relating to buildings are also important for fast growth of economic activity and recovery from the economic and financial crisis. Energy renovation of buildings also contributes to reduced emissions of other harmful substances into the air, which has an indirect positive impact on health. Implementation of the relevant measures is vital for the adaptation to climate change as well.

6.4.6 Key factors for attaining target emissions by 2050

To decarbonise the sector and support decarbonisation in other sectors, the following factors will be crucial:

- renovation of buildings from energy and other aspects;
- RES share in centralised and de-centralised heating systems;
- information-supported construction;
- sustainability assessment of buildings;
- sustainable construction and renovation and promotion of comprehensive renovation of buildings;
- recognising examples of good practice and their promotion, and
- raising awareness of users and their behaviour.

6.4.7 Human resources

For a successful implementation of measures in buildings, it is necessary to ensure the ongoing education of human resources for efficient construction and renovation of buildings and training in developing fields, e.g. sustainability assessment of buildings and construction planning supported by BIM. Systematic training and the promotion of pilot project implementation must commence immediately. When renovating cultural heritage, experts in cultural heritage protection must be engaged.

6.4.8 Proposed progress monitoring indicators

- Reduction in CO_2 emissions with measures in public buildings;
- area of energy-renovated public buildings;
- intensity of CO_2 in public buildings and buildings of private service sector;
- improvement of energy efficiency in the building sector;
- RES proportion in the use of fuels in general use;
- leverage and specific GHG emissions in the housing sector.

6.5 Agriculture

In the agricultural sector, the methane emissions produced by ruminants and released from manure are dealt with, including the emissions of nitrous oxide generated during the storage of livestock manure and due to fertilisation of agricultural plants with mineral fertilisers, livestock fertilisers and other organic fertilisers. The agricultural sector also deals with indirect nitrous oxide emissions, which are the result of leakage of nitrogen compounds from agriculture into air and water (particularly ammonia and nitrates). The majority of these emissions are generated in the natural environment and attributed to agriculture. Carbon dioxide released in agriculture due to the use of fossil fuels is discussed in chapter 6.7, while sinks or carbon dioxide emissions generated from the use and changed use of agricultural land are discussed in the chapter on LULUCF (see chapter 6.6).

6.5.1 Status of emissions and current measures

In 2018, agriculture contributed 9.8 per cent of all GHG emissions. The contribution from agriculture was 15.6 per cent in accordance with the decision outside the EU ETS scheme (Decision 406/2009/EC). The largest share of GHG in agriculture is attributed to methane produced by ruminants (53.9 per cent) and storage of livestock fertilisers (14.7 per cent), followed by nitrous oxide released due to the fertilisation of agricultural plants with livestock fertilisers and grazing (9.1 per cent), and fertilisation with mineral fertilisers (7.4 per cent). Agriculture pursues the objective set in the Operational Programme for Reducing Greenhouse Gas Emissions by 2020 (hereinafter: OP GHG 2020), which determines that GHG emissions will remain at the level of no more than + 5 per cent in comparison to 2005 with a simultaneous increase in self-sufficiency in food by 2020. In 2017, emissions were 0.6 per cent lower than the baseline in 2005.

In the past, in the area of GHG emissions in agriculture, Slovenia implemented measures to increase efficiency of animal husbandry, increase the share of grazing, and to more efficiently circulate nitrogen in agriculture. The greatest effect is attributed to the implementation of breeding programmes for cattle, sheep and goats, and the public agricultural advisory service and rural development programmes. Within the latter, incentives for investments which promote efficiency of agricultural holdings and incentives for above-standard farming methods, which contribute to the reduction of GHG emissions, are highlighted.

6.5.1.1 Guidelines and measures to be adopted by 2030

Slovenia improved the ambitiousness of the OP GHG 2020 (+ 5 per cent by 2020 as per 2005) and determined the indicative sectoral objective to - 1 per cent by 2030 as per 2005 in the NECP while observing the anticipated improvement of food safety. To attain this objective, Slovenia will intensify the efforts in the field of efficient animal production. It will promote the construction of microbiogas devices for biogas production from livestock fertilisers and the grazing of cattle, sheep and goats, and improve nitrogen recovery from livestock and mineral fertilisers. Long-term guidelines of Slovenian agriculture are determined in the resolution, "Our food, rural areas and natural resources beyond 2021" (Resolution: Our food, rural areas and natural resources after 2021; Official Gazette of the Republic of Slovenia [*Uradni list RS*], No. 8/20), which was adopted by the National Assembly on 29 January 2020. Four groups of objectives in the resolution also include "Sustainable management of natural resources and provision of public goods". Within this group of objectives, climate change is addressed as a specific objective, "Climate change mitigation and adaptation". The resolution determines that technological measures which reduce GHG emissions in crop and animal production and measures that increase carbon sinks will be supported in the environment and climate schemes from direct payments. The measures will be defined in more detail in the Strategic Plan of the Common Agricultural Policy 2021–2027 (strategic plan CAP), which is being drafted. Measures to mitigate climate change will be programmed separately within the specific objective, "Contribute to climate change mitigation and adaptation, as well as sustainable energy". Based on the analysis of the situation and needs assessment, the strategic plan CAP will incorporate an intervention strategy to attain the relevant objective. The strategic plan CAP will be harmonised with all national documents and strategies in this field, including the NECP and this Strategy.

6.5.2 Vision

To reduce GHG emissions while observing natural conditions for agriculture, improvement of food safety and an increase in self-sufficiency in food and the pursuit of other objectives of multifunctional agriculture, such as the reduction of negative impact on water, soil and air, biodiversity protection, conservation of cultural landscape, ensuring animal welfare and maintenance/increase of carbon stocks in agricultural soil.

6.5.3 Objectives by 2050

By 2050, agriculture will reduce GHG emissions by 22 per cent if compared to 2005. The interim objective by 2030 is a 1-per cent reduction in GHG emissions and the strategic objective by 2040 is an 8-per cent reduction.

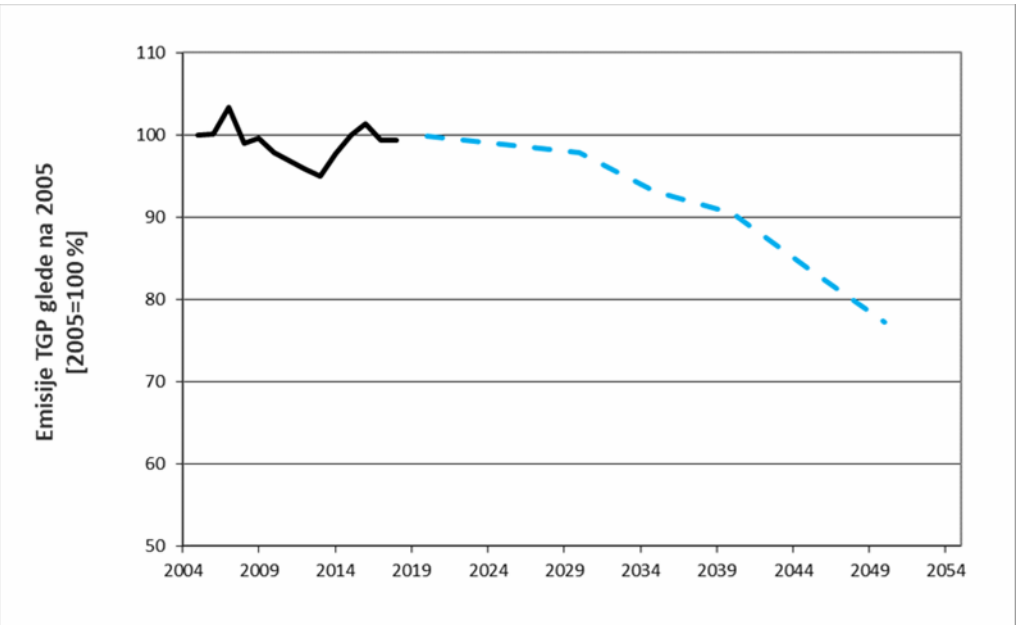

Figure 17: Emission trends in the 2005−2018 period and the anticipated course until 2050 (source: Agricultural Institute of Slovenia)

6.5.4 Main orientations by 2050

Main orientations in agriculture include:

- emissions reduction with simultaneous improvement of self-sufficiency in food, which means a reduction of emissions per unit of food produced;
- action in all areas with an emphasis on the most important emissions sources;
- introduction of solutions which also enable the attainment of other environmental, social and economic objectives or even contribute to their realisation (competitiveness of agriculture, water, air, soil and biodiversity protection, conservation of agricultural landscape, preservation of farming in hilly and mountainous areas and other less favoured areas, welfare of farm animals, etc.);
- avoidance of solutions which increase emissions in other sectors locally and globally (emissions related to energy use in agriculture, emissions related to land use and land use change, emissions in the production of mineral fertilisers and plant protection products, emissions related to transport of food and feed, emissions related to the construction of agricultural facilities and production of agricultural machinery and

equipment).

The objectives will be attained with the reduction of methane emissions by approximately 33 per cent and nitrous oxide by one per cent. Emissions from livestock will be reduced by approximately 31 per cent. Despite measures to improve nitrogen circulation, emissions in crop production will remain at the level of 2005 due to an increase in physical scope of production.

6.5.5 Main fields of action

Priority areas of action:
- methane emissions from the digestive system of farmed animals, especially in cattle farming;
- methane emissions from the storage of livestock fertilisers;
- efficient nitrogen circulation in agriculture, including organic farming and thus indirect reduction of direct nitrous oxide emissions from storages of livestock fertilisers and agricultural land, and indirect emissions due to the leakage of nitrogen compounds into the environment (especially of ammonia into the air and nitrates into water).

Measures to reduce GHG emissions in agriculture:

Measures from the agricultural policy:

The Rural Development Programme of the Republic of Slovenia 2014–2020 is a programming document which represents the programme basis for drawing financial resources from the European Agricultural Fund for Rural Development (EAFRD). The programme reflects the national priorities defined by a member state based on an analysis of the situation in agriculture, food production and forestry. In the next programming period of 2021–2027, the measures to mitigate climate change will be programmed within the strategic plan CAP with an emphasis on:
- investments in buildings and equipment which contribute to the reduction of GHG emissions and the quantity of food waste in primary production (biogas devices, equipment for precision fertilisation and fertilisation with low emissions, arrangement of pastures, stables and storage for livestock fertilisers, storage for agricultural products, etc.);
- the promotion of agricultural practices, which contribute to the reduction of methane and nitrous oxide emissions while observing the principles of a circular economy and including the techniques of precision agriculture and digital technology (improvement of voluminous feed quality, planned feeding of farmed animals based on fodder analysis results and calculated feed rations, preventive measures for improving animal health and welfare, planned fertilisation of agricultural plants based on soil analysis results, efficient and environmentally friendly plant protection against diseases and pests, fertilisation with low emissions, acquisition of biogas from livestock manure, grazing of cattle, sheep and goats, greening of stubble, growing legume crops (grain legumes and clovers), practices to reduce quantities of waste food or fodder during its production and storage, etc.);
- enhancement of supply chains with local food of plant origin, which will enable a gradual transition from cattle farming to plant production with high added value in areas with favourable agricultural conditions.

Agricultural policy will support implementation of the foregoing measures particularly through the measures of agri-environment-climate payments and organic farming. The criteria for selection of investments will include their contribution to the reduction of GHG emissions. Other measures from the strategic plan CAP 2021–2027, especially those for air and water protection, will also contribute to the reduction of GHG emissions.

Starting points for action relating to the mitigation of climate change and agriculture

adaptation will be determined within Specific objective 4: Contribute to climate change mitigation and adaptation, as well as sustainable energy, while the starting points for action relating to water protection will be defined within Specific objective 5: Foster sustainable development and efficient management of natural resources such as water, soil and air.

Breeding programmes

Breeding programmes contribute to the reduction of GHG emissions through the selection of more efficient animals by passing traits on to succeeding generations and by means of semen donors to the herds not participating in the breeding programmes. Slovenia will ensure further implementation of breeding programmes. More attention will be dedicated to:

- secondary traits which, in addition to the primary ones, impact GHG emissions (exploitation of feed ration energy, reproduction characteristics, longevity, accumulation of body reserves, etc.),
- introduction of direct and more reliable indirect methane emissions measurements at the level of an individual animal and the application of modern selection methods for low emissions (e.g. genomic selection).

Functioning and efficient AKIS system

A functioning and efficient AKIS (Agricultural Knowledge and Innovation System) system is crucial for the reduction of GHG emissions in agriculture. In the field of AKIS functioning, Slovenia will:

- ensure the creation of new knowledge and innovations relating to emissions and emission-related fields;
- ensure maintenance, exchange and transfer of knowledge with regard to emissions, whereby it will observe particularities such as a large number of agricultural holdings, unfavourable age, size and education structure;
- intensify the integration of content related to emissions in the programmes of agricultural secondary schools and high education institutions;
- ensure operations of the public advisory service and increase the scope of its functioning relating to climate change mitigation.

6.5.6 Key factors for attaining target emissions by 2050

The volume of emissions is highly dependent on the behaviour of individuals, who need a considerable amount of knowledge to reduce them. Efficient knowledge transfer and exchange are critical for emissions reduction and are particularly challenging due to a large number of small and non-specialised agricultural holdings in Slovenia. The effect of investments in low emissions technologies is smaller than on large agricultural holdings because of the fragmentation of agricultural land. Due to natural features and fragmentation, it is also more difficult to introduce grazing, which generally reduces emissions, but also results in risks linked to increased erosion of agricultural land and increased emissions in the event of lower breeding efficiency. Preservation and expansion of pasture grazing will also depend on the success of managing the issue of large carnivores. Faster progress relating to GHG emissions in the areas of important grassland habitats is limited with the requirements for preserving traditional methods of farming, such as late mowing. Certain methods of breeding, which are introduced to provide better animal welfare (e.g. free range cows and barn rearing of hens) are also unfavourable from the aspect of GHG emissions. Certain new solutions for reducing emissions are questionable from the viewpoint of their social acceptability (e.g. inhibitors of rumen methanogenesis).

The attainment of objectives with regard to reducing GHG emissions will also depend on the success of adjusting agriculture to climate change. Adjustment in the field of crop production and animal production is relevant. Disruptions in the growth of agricultural plants linked with

climate change affect the exploitation of nitrogen and subsequent emissions of nitrous oxide. To this end, measures that prevent the consequences of drought (irrigation, sowing of drought-tolerant plants, etc.), measures that prevent the consequences of frost and adverse weather events (sprinkler systems, hail protection, etc.) and measures that prevent plant diseases and pests linked to climate change are important. Climate change also affects farm animals and methane and nitrous oxide emissions through reduced breeding efficiency. Measures that ensure sufficient quantities of high-quality fodder and prevent heat stress and the spread of diseases in farm animals are crucial in this area.

To attain the target emissions by 2050, Slovenia must specifically:

- enhance human resources in the field of GHG emissions in agriculture;
- intensify knowledge exchange and transfer in the public agricultural advisory service and in agricultural holdings;
- examine the positive and possible negative effects of new technologies for the reduction of GHG emissions in agriculture with regard to the attainment of other social, economic and environmental objectives and their timely communication to the public;
- collect data and develop methods for assessing the carbon footprint of agricultural products and livestock products.

6.5.7 Human resources

The availability of human resources is among the important aspects of the successful implementation of the measures of the Climate Strategy. Planning of measures at the level of the state and individual agricultural holdings requires specific technological knowledge and a comprehensive approach. The lack of suitable human resources is evident at all levels, from the planning of measures to their introduction at agricultural holdings. To provide human resources, it is necessary to:

- motivate and educate young generations of farmers and provide lifelong learning for heads of agricultural holdings;
- systematically finance jobs in the field of GHG emissions in agricultural education, research organisations and public agricultural advisory service based on plans and targets;
- implement lifelong learning for heads of agricultural holdings.

6.5.8 Proposed progress monitoring indicators

- Total GHG emissions in agriculture, overall and individually for livestock and crop production;
- intensity of GHG emissions in production of cow milk (emissions per unit of milk produced);
- intensity of GHG emissions in beef production (emissions per unit of beef finishing meat produced);
- gross nitrogen balance surplus in agriculture;
- area of agricultural land in organic farming, overall and fields individually;
- area of agricultural land in measures of the strategic plan CAP, which contribute to more efficient nitrogen circulation;
- number of farmed animals in measures of the strategic plan CAP, which contribute to a reduction in methane emissions.

6.6 Land use, land use change and forestry

6.6.1 Status of emissions and current measures

The LULUCF sector (land use, land use change and forestry) includes emissions and sinks generated particularly due to the use of forest land being managed and also the use of fields, grasslands, wetlands, settlements and other land. Net emissions in the LULUCF sector reduced by 243 kt CO_2 equivalent in 2018, which represents 1.4 per cent of all national

emissions (excluding LULUCF).In the sector's total balance of emissions and sinks in 2018, forest land, settlements, other land and wetlands generated emissions in the amount of 900 kt CO_2 equivalent, while grasslands, fields and the obtained timber products generated sinks in the amount of –662 kt CO_2 equivalent (Figure 18).In the LULUCF sector's total balance of emissions and sinks, it is necessary to observe indirect N_2O emissions (5 kt CO_2 equivalent in 2018) due to nitrogen runoff and leaching, which are the result of soil management. Since 2014, a sharp decline in the sector's sink has been noted, particularly due to the increased felling and mortality of forests resulting from natural disasters (glaze ice in 2014, bark beetles between 2015 and 2016, and windstorms in 2017 and 2018), which affected Slovenian forests. The share of salvage harvesting in the 2010–2019 period amounted on average to 45 per cent of the entire felling. Net sinks in the LULUCF sector decreased by 103 per cent in 2018 compared to 2005. Natural disturbances reduce the forest's potential as a depository of CO_2 and increase GHG emissions from forests into the atmosphere. In addition to felling, natural mortality due to bark beetles, which tripled in the 2012–2018 period if compared to the 2007–2012 period, also contributed to increased emissions in forests.

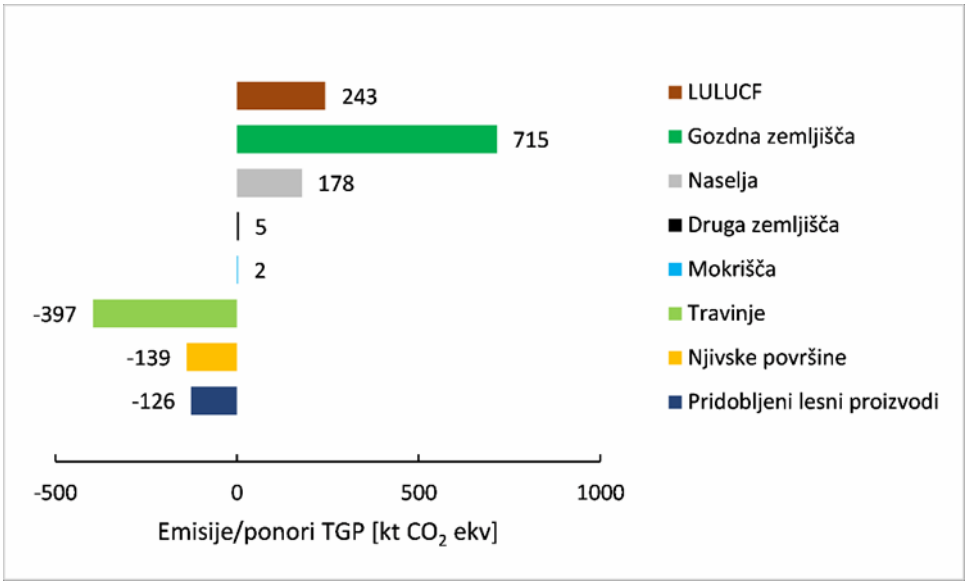

Figure 18: Balance of GHG emissions and sinks in the LULUCF sector in 2018 (source: Slovenian Forestry Institute)

Forestry and agriculture are the key factors in the LULUCF sector and are, on the one hand, directly dependant on climate conditions, while, on the other hand, their role as the providers of environmental (ecosystem) services increased specifically due to climate change. In particular, forests carry out a type of ecosystem service with which they mitigate and contribute to the adaptation to climate change. The role of climate is displayed in carbon sequestration, mitigation of temperature differences, increase in relative humidity and cooling of the air and reduction in wind speed and force. Its role is exceptionally important for filtering and retaining water, fixation of soil and prevention of soil erosion, and protection of settlements and infrastructure from avalanches, landslides and falling rocks. Forests also clean the air and decrease noise levels in the surrounding area. Due to climate change, it can also be expected that natural ecosystems will adjust to new conditions to a certain extent (e.g. phenological development of plants, length of the growing period, tree line). If the atmosphere continues to grow warmer and the frequency of extreme weather phenomena increases, the adaptation to climate change in the use of agricultural land will become even more important (e.g. plant breeding, irrigation systems).

In the past, an increase in the area of managed forest land, including the accumulation of

growing stock, which was prominent in 2007, most affected the flow of net emissions in the LULUCF sector. Furthermore, the overgrowing of permanent grassland also affected the sink trend. After 2007, sinks in forest land have reduced as the possible and realised felling has gradually increased. This was first dictated by an amendment in forestry policy, which observed the guideline of the Resolution on National Forest Programme (Official Gazette of the Republic of Slovenia [*Uradni list RS*], No. 111/07) that the planned possible felling should reach 75 per cent of the increment. In recent years, natural disasters had quite an impact on the amount of the actual felling in forests.

6.6.1.1 Guidelines and measures to be adopted by 2030

The NECP highlights mindful forest management and improvement of sustainable cascading use of wood, whereby it must be ensured that the LULUCF sector will not produce net emissions by 2030. It is anticipated that the sink in this sector will increase by 6.4 Mt of CO_2 until 2030 according to the NECP scenario. To attain these objectives, the NECP plans an improvement of the system for monitoring carbon stock in all land uses, an upgrade of the existing measures, adjustment of the objectives as per growing stock, felling and accumulation while observing forest adjustment to the expected climate change, provision of state incentives and education of forest owners. The NECP emphasises greater processing of Slovenian wood and the use of wood of poorer quality for energy purposes, whereby wood should be incorporated accordingly in the system, sustainable construction indicators and green public procurement. Furthermore, the NECP focuses on agricultural practices which increase carbon stock in the soil.

The NECP's key instruments in the field of LULUCF include the upgrade and implementation of forest inventories, development of the methodology for monitoring of sinks, upgrade of measures in the sectoral policy, forest management plans of forest management areas (2021–2030), state incentives for forest owners for forest care and protection, and education and workshops regarding sustainable forest management for forest owners.

The NECP plans the starting points for the formation of additional measures: Resolution: Our food, rural areas and natural resources after 2021, the Strategic plan CAP 2021–2027, and the Forest Management Plans and Hunting Management Plans for Regions (2021–2030).

6.6.2 Vision

Preservation of sinks and reduction of GHG emissions in forest, agricultural and other land by 2050 while observing the ecosystem approach in accordance with the principles of multifunctional and sustainable management. Slovenia will promote management methods and good practices which accelerate the production of food, fodder, fibres and wood biomass in accordance with the carrying capacity of forest sites or agricultural land, ensure food safety and enhance the stability of forest, agricultural and other ecosystems.

6.6.3 Objective by 2050

The objective of the LULUCF sector in 2050 is a net sink of at least –2,500 kt of CO_2 equivalent. Whereby it must be ensured that the carbon stock change (calculated as a sink) in harvested wood products (i.e. sawn timber, wood panels and paper) is increased by 100 per cent or to –370 kt of CO_2 equivalent. Emissions due to expanding settlements or built-up and similar land are to be reduced by 100 per cent or to 0 kt of CO_2 equivalent in 2050 as per the level in 2005.

The LULUCF sector will gravitate in the long term towards sustainable use of land and natural resources and the conservation of carbon stock in forests. As per the National Forest Programme, the objective is for the possible felling planned in forests at the level of the

Republic of Slovenia to attain 75 per cent of the increment. The orientation of the same programme is to also increase growing stock, which will not be possible in the long term. The forest cover and growing stock in Slovenian forests are among the largest in the EU territory. Therefore, Slovenia has limited possibilities to increase the sink, which is the result of an increase in forest areas or growing stock, in comparison to other EU member states. To balance the development phases due to forest ageing, to achieve forest resilience and to transform deforested forests into more suitable habitats, felling is planned in the coming decades, with forests still providing sinks (e.g. increase in forest floor carbon stock, leaf litter and deadwood). Slovenia will maintain and improve the exploitation of the production potential of forest sites or agricultural land, while ensuring the capacities for wood processing with an emphasis on Slovenian wood, production of wood products and food safety.

Climate change can also significantly impact the trends in emissions and sinks in the LULUCF sector. Extreme weather events, such as disasters in forests, may severely affect the short-term increase in emissions or the reduction of sinks in the sector. Changes in average air temperature, quantities, temporal and spatial arrangement of precipitation, CO_2 concentrations in the air, etc. affect the growth and development of plants, which may in the long-term cause changes in their productivity, species composition and diversity. Changes of these environmental parameters may affect the balance between emissions and sinks in the sector either negatively or positively. This sector has good potential to contribute to the attainment of climate objectives with the approaches of mitigation and adaptation for a comprehensive and sustainable land management, including forests.

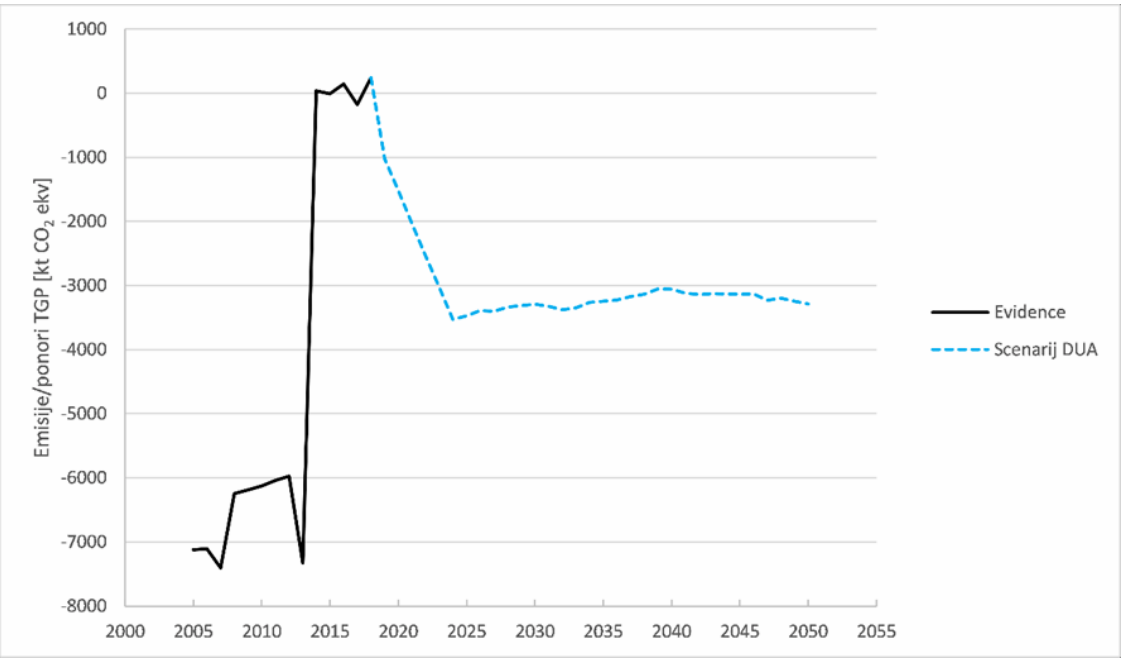

Figure 19: Emission/sink trends in the 2005−2018 period and the anticipated flow until 2050 (source: Slovenian Forestry Institute)

Current LULUCF projections reveal that net sinks in the sector will increase until 2030. In accordance with the WAM scenario, it would be possible to maintain net sinks at –3.1 Mt of CO_2 equivalent by 2040 or increase them by at least –2.5Mt of CO_2 equivalent by 2050 (Figure 19). It may also be expected as per the WAM scenario that sinks in the LULUCF sector would gradually decrease in the 2025–2040 period, especially due to increased realisation of possible felling in forests. The LULUCF sector will not be the source of emissions by 2030 and also by 2050, but it must be pointed out that the calculation rules, which are applicable now, are not observed herein.

6.6.4 Main orientations

Main orientations of the LULUCF sector are:
- preservation and enhancement of carbon stock in forest land in order to ensure sustainable forest development as an ecosystem and the largest possible sink;
- increase in carbon stock in agricultural soil, conservation of permanent grassland and the reduction of emissions generated due to the change in land use, whereby high-quality agricultural land must be permanently protected and maintained;
- promotion of domestic wood processing and production of wood products (e.g. chairs, windows), particularly those with a good potential to substitute for non-renewable materials and the use of wood waste and low-quality wood, which can be used for energy purposes;
- debureaucratisation of forestry and agricultural policies and amendments/harmonisation of the existing regulations;
- education and training of staff in the sector in the area of mitigation of, and adaptation to, climate change;
- acquisition of knowledge, transfer of good practices and introduction of technological solutions, which contribute to the reduction of GHG emissions relating to forestry and agriculture;
- implementation of suitable measures in biodiversity protection with an emphasis on the improvement and restoration of ecosystems, primarily of those measures which are planned in the governmental Natura 2000 Management Programme and which do not contribute to GHG emissions.

The main objectives and sub-objectives in the LULUCF sector are:
- maintenance and increase of sinks and carbon stock in biomass and soil;
- processing of domestic wood and production of wood products;
- food and fodder production;
- reduction in the spread of settlements or the level of development;
- conservation of biodiversity;
- exploitation of the potential to store carbon in forest and agricultural soil;
- provision of biomaterials to substitute for fossil and carbon-intensive materials.

When designing methodologies and determining rules or methods for calculating emissions and sinks in the LULUCF sector, Slovenia must be more active in its approach to international cooperation at the level of the UNFCCC and provide permanent representatives when negotiating at the EU level.

6.6.5 Main fields of action

Slovenia will continue with sustainable forest management until 2050 while observing and ensuring all forest functions with an emphasis on maintaining and increasing sinks and carbon stock in biomass, soil and harvested wood products. Key measures for forest land include:
- enhancement of forest resilience by optimising age structure and tree composition of forests, including the converting of spruce monocultures, protection of forest soil and removal of invasive alien species;
- prevention of deforestation in suburban and agricultural landscapes;
- preventive measures and forest fire protection;
- enhancement of natural climate solutions by identifying reserves, eco-cells and habitat trees, and the conservation of water biotopes in forests;
- establishment of nurseries to ensure suitable planting material of native and provenance-appropriate tree species for artificial reforestation;
- provision of high-quality wood in the entire forest-wood chain.

With regard to use of agricultural land, Slovenia will strive to implement agricultural practices which contribute to the increase of sinks and the reduction of carbon dioxide and nitrous oxide emissions while observing food safety. Key measures for agricultural land include:

- use of farming systems which increase carbon stock in the soil (e.g. conservation tillage, use of cover crops) and those that preserve agricultural areas which have large quantities of stored carbon (marshes, wetlands, etc.);
- use of agricultural land which ensures resilient and biodiverse ecosystems (e.g. hedges, diverse meadows, high-trunk orchards, riparian vegetation);
- investments in agricultural technologies and modernisation of farming systems for efficient use of nutrients and improvement of agricultural resilience to climate change (e.g. erosion reduction, irrigation systems, precision farming by optimising the application of fertilisers and plant protection products);
- adjustment of tillage technologies by observing the relief, including spatial optimisation of agricultural land (e.g. rearrangement of fields on flat areas and grasslands to steeper sections);
- prevention of plant cultivation for biofuel production.

Other important measures in the LULUCF sector are:

- modernisation of technologies in the entire forest-wood value chain, including investments in primary wood processing, financial incentives and support for farmers and foresters (as key stakeholders) that are linked to results;
- substitution of carbon-intensive materials with wood (e.g. construction with wood) and production of new and sustainable biological products, such as biochemicals (e.g. textile, bioplastics and composite materials);
- protection of wetlands and revitalisation of wet meadows which are not managed;
- smart spatial planning, including the observance of land quality;
- financing of research involving new bio-based materials;
- inclusion of climate objectives in sectoral policies (the national forestry programme is being drafted).

6.6.6 Key factors for attaining target emissions by 2050

To attain target emissions in the sector, the following factors are of key importance:

- maintenance and increase in carbon stock and sinks in forests for which it will be necessary to:
  a) optimise the age structure and tree composition of forests;
  b) expedient introduction of mature tree stands into revitalisation, including the shortage of production periods of carrier or key tree species;
  c) restore degraded forests and rehabilitate those damaged in natural disasters;
  d) improve the realisation of forest management plans, including a more active implementation of silvicultural and protection works, especially in private forests;
- increase carbon stock in harvested wood products, which will only be possible by increasing investments in the wood processing industry, particularly in primary wood processing, such as sawmills, wood processing centres and veneer mills;
- manage the expansion of settlements or the scope of growth of built-up land and promotion of renovation.

6.6.7 Human resources

For efficient preservation or increase of sinks and mitigation of climate change in the LULUCF sector, it is necessary to increase management and expert capacities. The transfer and exchange of knowledge, experience, data and information in Slovenia and with other countries must be enhanced. The content of syllabuses or studies within educational and study programmes must be adjusted, so that more topics will be intended to enhance

knowledge regarding the possibilities for mitigation of, and adaptation to, climate change in the sector. When forming vocational and expert education in the field of agriculture and forestry, the competent ministries play an important role, as they are responsible for education planning and implementation in Slovenia. The state will have to incorporate additional content in the programmes of informal education and training (e.g. the Employment Service of Slovenia, the Chamber of Agriculture and Forestry of Slovenia, the Slovenia Forest Service) in a sensible way to enhance knowledge and skills when implementing specific measures for increasing sinks and reducing emissions in practice. To enhance human resources and attain long-term effects, investment and a systemic approach at all levels of formal and informal education will be required. Forest owners have an important role when implementing measures and with regard to rural development. As a result, their education and training involving sustainable forest management and use of wood are extremely important. From this aspect, Slovenia will strive for the acquisition of knowledge and competence in the area, such as forest management, promotion of the use of wood and competitiveness of the forest-wood chain, sustainable and environmentally friendly use of land, smart spatial planning and circular bioeconomy.

6.6.8 Proposed progress monitoring indicators

- Net GHG emissions,
- net GHG emissions due to land use change with sub-indicators:
  a) GHG emissions due to deforestation;
  b) GHG emissions due to land use change into built-up and similar land;
- area of restored forests as per the type of restoration;
- ratio of forest development phases;
- area of restored forests with an improved biodiversity status.

6.7 Other sectors: waste, agricultural machinery

6.7.1 Waste

Emissions from waste will reduce by 81 per cent in 2050 in comparison to 2005.The attainment of reduced emissions in the waste sector is linked to further implementation of measures included in the already existing documents, the Operational plan for waste management from 2016, which already governs the field of generation, handling and disposal of solid waste, the Operational programme for the discharge and treatment of urban waste water and the ReNPVO20-30. These documents will be supplemented as per the guidelines in the national environmental protection programme. The reduction in emissions from waste disposal will be attained with the cessation of disposal of biodegradable waste. The second largest emissions source in the waste sector is wastewater treatment, in which emissions will be reduced by households' connection to the sewage network with wastewater treatment plants and replacement of septic tanks with small wastewater treatment plants. GHG emissions are also generated in the waste sector through thermal treatment of waste in which mostly hazardous waste is treated, as the emissions from thermal treatment of waste for energy purposes are included in the energy sector, and from waste composting in which emissions are low.

Waste management requires the realisation of other objectives included in the ReNPVO20-30: reduction of the quantity of waste generated, its maximum reuse, which results in lower emissions in production and the attainment of self-sufficiency when ensuring waste management, which includes increased capacities of thermal treatment of the remaining waste for energy purposes, resulting in lower emissions due to fuel combustion because of fossil fuels replacement and reduction in emissions linked to waste transport.

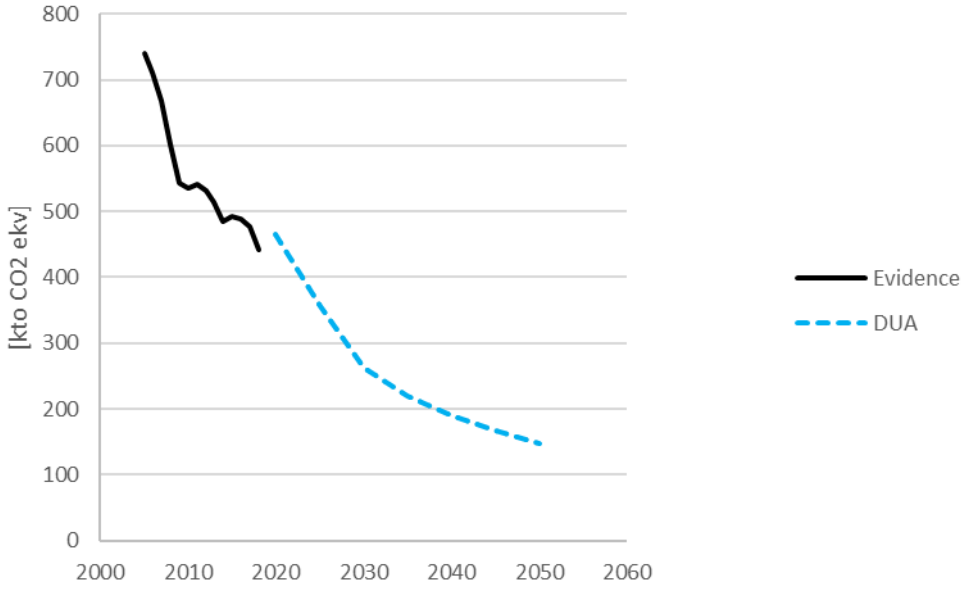

Figure 20: Actual emissions in the 2005−2018 period and the indicative trajectory of emissions until 2050 as per the WAM scenario (source: Energy Efficiency Centre of Jožef Stefan Institute)

6.7.2 Agricultural machinery

GHG emissions arising from the use of machinery in agriculture are reduced by 94 per cent in the projection with ambitious additional measures until 2050, which is significantly more than in the projection with the existing measures in which the emissions are lower by 30 per cent. The reduction of emissions is the result of a number of measures. The energy use in machinery will drop by 30 per cent as a result of more efficient machinery, new technologies and minimised tillage. The structure of fuels will also change. Today, diesel fuel represents a 100-per cent share, which will be reduced by 58 per cent by 2050. It will be replaced by biodiesel (30 per cent), biomethane (7 per cent) and compressed natural gas (6 per cent). As in other sectors, liquid and gaseous fossil fuels will be replaced with synthetic fuels which will be CO_2 neutral.

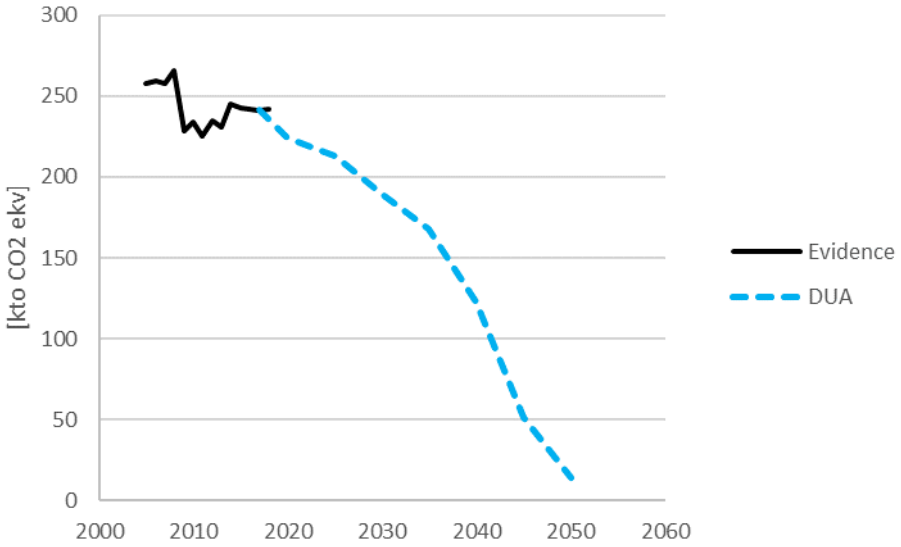

Figure 21: Actual emissions in the 2005−2018 period and the indicative trajectory of

emissions until 2050 as per the WAM scenario (source: Energy Efficiency Centre of Jožef Stefan Institute)

7 HORIZONTAL ISSUES

7.1 Consumer and production processes for a low-carbon circular economy

The attainment of climate neutrality and a circular economy requires an overall mobilisation of society because the transition's success is possible only with radical and systemic changes of consumer and production patterns, low-carbon technologies, extensive digitalisation of the economy and the prominent sustainable orientation of society.

With the exception of wood, there is lack of natural resources in Slovenia; on average, we import 71 per cent of raw materials, which makes imports dependant on availability and quite vulnerable to change. Resource productivity is below the EU average in Slovenia. The Slovenian economy depends on the import of raw materials; aggravated access to the latter and price volatility on global markets could significantly lead to Slovenia lagging behind when implementing measures for the transition to a circular economy. The foregoing combined with import dependency on natural resources and low reuse of waste material in the long term denote a relatively great pressure on the competitiveness of Slovenian companies.

Slovenia has placed a circular economy among strategic development priorities. Certain guidelines for Slovenia's transition to a circular economy were drawn. The circular economy is linked with the objectives of sustainable development and is observed in key national documents (Slovenia's Vision 2050, SDS 2030 and the Smart Specialisation Strategy). The justification for the urgency of the circular transition was summarised in the Slovenian Framework Programme for the Transition to a Green Economy from October 2015. Incentives observing the application of the 2013–2020 cohesion funds included a large number of economic operators but were carried out with no clear monitoring and the evaluation of effects with suitable indicators by means of which the effectiveness of the transition to a low-carbon circular economy could be assessed.

A new Circular Economy Action Plan (2020) was drafted within the EGD, which together with A New Industrial Strategy for Europe (2020) will contribute to the upgrade of the EU economy and the exploitation of opportunities provided by a circular economy. The key objectives are to promote the development of leading markets for climate-neutral and circular products in the EU and beyond, encourage new business models, ensure support for the circular design of re-usable, sustainable and repairable products, reduce the quantity of materials used and reuse them before recycling. The concept of extended producer responsibility will be enhanced and the 'right to repair' will be enforced. Consumer policy will contribute to the empowerment of consumers so they will be able to make thoughtful decisions and play an active role in the sustainable transition.

The key challenge is thus a green, sustainable and circular development of the economy by establishing measures which enable a development with greater resource efficiency and reduction of GHG emissions, and to simultaneously improve competitiveness with efficiency and innovations and promote development and employment.

As the circular economy is about horizontal connectivity between various sectors, the harmonisation between those various sectors will be crucial for a successful transition to a low-carbon society. Slovenia will thus form a systemic approach which will mutually integrate and enrich various programmes and projects, and seek necessary synergies between various sectors and fields and with regard to financing. Slovenia will establish suitable conditions for an integrated (co)operation of all relevant stakeholders in research, innovation, education and entrepreneurship. The key players in this transition will be the competent ministries, business (industry) associations, consumer organisations, industrial and service

sector, financial institutions, research and development institutions and society as a whole because, for the most part, changes in people's habits are involved.

The systemic approach will include suitable multilevel management with an installed feedback loop of ongoing learning and adjusting to the implementation and will be based on own experience and will draw from new global scientific findings. To help attain such a systemic transition, Slovenia will apply services in the field of systemic innovations, which is why it has connected with European technological institutions (EIT Climate-KIC and JRC – Joint Research Centre) and is drafting a concept proposal for the comprehensive decarbonisation of Slovenia through the transition to a circular economy.

7.1.1 Guidelines and measures adopted until 2030

The circular economy is mentioned in several strategic documents as one of the main carriers of sustainable economic development in the future. Within its eighth development objective, i.e. transition to a low-carbon circular economy, the SDS 2030 determines three adopted objectives for monitoring the attainment of the objective set:

- material productivity – to attain the target value of 3.5 of purchasing power standard (PPS)/kg by 2030 (in comparison to the baseline value of 1.79 PPS/kg in 2015);
- proportion of renewable sources in final energy consumption – attain the target value of 27 per cent by 2030 (in comparison to the baseline value of 22 per cent in 2015);
- emission productivity – attain the EU average in 2030 (in comparison to the baseline value of 2.9 PPS/kg of CO_2 in 2105).

In September 2015, the Government of the Republic of Slovenia adopted the Slovenian Smart Specialisation Strategy (S4), which is the implementation plan for the transition to a high-productivity economy by enhancing innovation capacities, promoting transformation and diversification of industries into new activities and the growth of new and fast-growing companies. The S4 defines three priority pillars (the second pillar is circularity) and nine areas of application in which Slovenia can reach a critical mass of knowledge, capabilities and competence, and thus possess the innovation potential for positioning in global markets.

In the NECP, a circular economy is incorporated in the scope of "reducing emissions" with the key commitment to support companies for an efficient and competitive transition to a climate-neutral and circular economy by improving energy and material efficiency in all sectors (and thus reduce the use of energy and other natural resources), as the first and key measure for the transition to a circular low-carbon economy and climate-neutral society with measures and policies in the economy, including non-reimbursable financial incentives for measures of reducing process emissions in industry and non-reimbursable financial incentives for measures of reducing GHG emissions in industry with the measures of a circular economy.

Regarding the circular economy, the funds anticipated for the implementation of NECP measures are included in the measures intended in the economy for direct implementation of activities for the transition to a circular low-carbon economy and educational and research activities.

The measures anticipated continue and spread the support for the renovation of the economy and society in the direction of a low-carbon circular economy. Various incentive measures being implemented in the present and which will also be implemented in the future will direct incentives towards a circular economy by adapting conditions and criteria.

7.1.2 Vision

Contributing to a significant reduction of emissions in all economic activities by means of a transition to a low-carbon circular economy and changes in social behaviour and habits. Contributing to a sustainable social transformation of consumer habits. The framework of sustainable policies will include the sustainable design of products, enhancing the role of consumers and buyers through public procurements and circularity of production processes, which will result in significant savings along entire value chains, the supervision of resource tracking and the promotion of green technology application.

7.1.3 Objective by 2050

The objectives of the transition to a low-carbon circular economy by 2050 are included in common and sectoral targets. The circular economy is a horizontal area and as such it provides the framework for implementing activities and attaining the objectives for emissions reduction by 2050.

7.1.4 Main orientations and fields of action by 2050

The transition to a low-carbon circular economy will only be possible with radical changes in society and the economy and innovations in current approaches and a simultaneous approach at different levels of society.

The transition to a low-carbon circular economy is not a task Slovenia could tackle on its own, but one which requires a joint engagement of the international community, especially the EC, in the drafting and guiding of legislative policies and various international programmes, e.g. Horizon Europe, bilateral programmes and future comparable programmes of various institutions.

The transition to a circular economy is already underway in Slovenia, the EU and elsewhere in the world, and the activities for an overall transition to a low-carbon circular economy are actually a continuation and expansion of existing activities which are more comprehensively managed and integrated into broader economic and social flows. Slovenia will join in with and implement activities proposed by the new European circular economy action plan, i.e.:

- participate in the formation and adoption of binding legislative requirements about sustainable products in the EU;
- enhance the role of consumers and observe the circular economy in public procurement;
- focus on the sectors that use the most resources and in which circulation potential is great;
- limit the generation of waste and allow its transformation into high-quality secondary resources;
- integrate the efforts for circular operations and integration of people, regions and towns;
- participate in global efforts in the field of the circular economy.

Considering the fact that the EC will, in accordance with the EGD, enhance the monitoring of national plans and measures to accelerate the transition to a circular economy, Slovenia will update such a programme and gradually integrate it with other strategic documents, i.e. industry (or economic) policies, promotion of companies and particularly small and medium-sized enterprises, and green public procurement.

The measures will focus on sustainable consumption and production, research and innovation support and will provide new opportunities for eco-innovative companies. Slovenia will tackle the greatest challenges in the field of production patterns, particularly when abandoning unsustainable products and improving the general environmental efficiency of products throughout their entire life cycle.

The transition to a low-carbon circular economy in Slovenia will be systemic, thorough and transformative. Due to the complexity of the approach and inclusion of all social sectors and players, the approach will have to incorporate all aspects and make sure that burdens are distributed fairly. Slovenia will promote the harmonisation and cooperation of all interested parties at all levels, i.e. international, the EU, national, regional and local levels. Furthermore, the transition to a circular economy also has important benefits for health (less pollution), quality of life, competitiveness and resilience of the economy and society to external impact. Successful implementation of a circular economy also has positive effects on transport (reduced
transport sector).

Slovenia is aware of the challenge of transforming society and the economy into a low-carbon circular economy and understands it is one of the essential available instruments for the sustainable use of natural resources and emission reduction. Together with the EIT, its knowledge and innovation communities and the EC (JRC), Slovenia approached the formation of the Comprehensive strategic project of the decarbonisation of Slovenia through a transition to a circular economy. In the multi-annual process involving all key ministries, a project is being drafted which is also unique in the European sphere and requires the harmonised functioning of the entire Government of the Republic of Slovenia and numerous stakeholders from all sectors and at all levels. Relating to the transition to a low-carbon circular economy, the project will establish synergies between funds and instruments at the EU and national levels which will enhance and systemically connect the efforts and incentives already carried out in Slovenia in the field of the transition to a low-carbon circular economy, and will introduce new innovative approaches and solutions in Slovenia by means of which the challenges of this transition will more easily transform into opportunities and establish a development model compliant with environmental objectives and the attainment of net zero emissions by 2050.

The content of the proposed solutions will be structured in multilayer sets composed of several vertical and horizontal programmes which will be mutually connected and will enhance and upgrade one another:

- awareness and competence for the transition to a circular society;
- drafting of education programmes of knowledge centres and development programmes, and the promotion of elements of the circular economy and society in communities at national, regional and local levels with a special emphasis on the transformation of consumer patterns;
- direct promotion of the circular economic development in all economic branches with a special focus on energy-intensive processes and circularity, intensive support for small and medium-sized enterprises and the preparation of bases for the development of new entrepreneurial ideas and public-private partnership;
- formation of policies and organisation of the circular low-carbon society with a preparation of legislative and incentive mechanisms which will directly steer circularly oriented purchasing processes and simultaneously address the functioning of public structures, private investors and research and academic institutions;
- formation of new business models and promotion of market development by introducing sustainable business models to expand the offer of services related to the offer of products and thus enhance the added value and competitiveness in these activities.

When directing its efforts towards a low-carbon circular economy, Slovenia will focus on several economic systems or value chains which were recognised in the process of expert and political assessment as crucial for the transition to a low-carbon circular economy. The advantage of value chains lies in the possibility of integrating different activities into comprehensive programmes and in the application of various innovative incentive mechanisms. Key value chains recognised include:

- wood chain,

- sustainable construction,
- mobility,
- manufacturing,
- food chain.

For successful implementation, Slovenia will establish various methods of ensuring and combining financial resources from all available sources (European, international and national resources, either public or private). Furthermore, it will update the framework for monitoring a circular economy. New indicators, which will be based on the European statistics to the greatest degree possible, will observe the main fields from the circular economy action plan and links between circularity, climate neutrality and zero pollution. To this end, Slovenia will determine indicators on resource use, including consumption and material footprints, to observe the use of materials and environmental impact relating to production and consumption patterns. These indicators will play an important role when monitoring and assessing the progress in separating economic growth from resource use and its impact in the EU and outside of it.

7.1.5 Key factors of a circular low-carbon economy by 2050

Key factors and instruments for the attainment of objectives relating to the transition to a low-carbon circular economy are:

- increase in material efficiency with the use of less materials, design of products with a longer lifespan, possibility of repair and longer product life, use of materials produced with fewer emissions and which can be recycled, reuse of materials and recycling, and product sharing;
- reduce waste in production, packaging and the entire supply chain from "the cradle to the grave" and throughout the entire lifespan, and integration and cooperation between various industries in which one industry's waste is a raw material for another industry. Arrangement of special legislation in the field of secondary raw materials;
- social research of consumer habits with a focus on a circular economy;
- establishment of suitable price signals and integration of external costs in product prices, such as product evaluation as per its environmental and social footprint (CO_2 footprint);
- preparation and implementation of measures from strategic documents, such as preparation of a comprehensive plan for planning, introducing, financing and monitoring the transition to a circular economy, including a preparation of the national circular economy plan in compliance with the European Circular Economy Action Plan, strategic plans for industrial and economic policies, strategic development plans and financing methods in all sectors connected through a circular economy;
- transposition of the EC's legislative orientations relating to the elements of the transition to a circular economy and supplementation/harmonisation of regulations regarding green public procurement and taxonomy towards the observance of the circular economy's principles;
- efficient drawing of funds from various resources (EU funds, the Climate Change Fund, bilateral agreements, research and development projects).

7.1.6 Human resources

Slovenia is aware of the lack of human resources in the field of the circular economy, which encompasses an exceptionally heterogeneous field and which must be considered as such. To this end, a comprehensive strategic project of Slovenia's decarbonisation through the transition to a circular economy is already being formed, the important part of which is an increase in awareness, education and attainment of competence of a broad circle of players and systems from the public and private education system to public and private business organisations, public administration, and the academic and research sphere. Based on comparable investment, green jobs have better effects on employment, while the educational

structure and economic effects grow. Within the framework of implementing activities on the basis of strategic orientations, several pilot cases of education, awareness raising and other activities will be carried out in the coming years, which will serve as the basis for future human resources development as per the experience obtained.

7.1.7 Proposed progress monitoring indicators

Due to the complexity of the influential parameters indicating the effectiveness of the transition to a low-carbon circular economy, Slovenia will establish an efficient and comprehensive monitoring system which will be based on several parameters and indicators. It will become involved in the preparation of the framework for monitoring a circular economy at the EU level and thus harmonise national and European circularity indicators which the EC will adopt for monitoring the key trends and samples of the circular economy's elements in order to comparatively define the success factors in member states and assess whether the measures adopted are suitable.

- Production and consumption indicators (use of raw materials and energy products, self-sufficiency in the field of raw materials and materials, municipal waste, other waste (food, agriculture));
- waste management (recycling rate, recycling rate of specific waste flows, packaging);
- secondary raw materials (proportions of recycling materials in input material, shops with recycling materials, etc.);
- competitiveness, innovation, economy (private sector investment, jobs, added value, start-up companies, patents and innovations, etc.);
- monitoring indicators of the legislative sustainability framework (effectiveness of implementation of circular economy policies).

7.1.8 Food consumption patterns

In 2018, agriculture contributed almost 10 per cent of all GHG emissions. The largest share of emissions in agriculture is attributed to methane produced by ruminants. The majority of emissions arising from agriculture cannot be addressed by technological solutions. Their reduction can only be attained by changing patterns of food consumption and thus our habits or consumption patterns.

Slovenia will promote the consumption of food of plant and animal origin as per the health guidelines of the National Institute of Public Health (NIJZ), which means the consumption of less meat because Slovenians on average consume too much meat, and especially too many meat products.

As stated by the NIJZ, "a varied diet also includes meat in moderate quantities because meat is an important source of protein of high biological value. Because meat products also consist of substances that may be harmful to health, their consumption should be limited." According to the latest data of the NIJZ, adult Slovenians consume on average 1.23 kg of meat and meat products a week. The NIJZ recommends a consumption of between 300 and 500 grams of various types of high-quality lean meat per week and occasionally meat products. The NIJZ also warns that the consumption of more than 300 grams of meat products and red meat each week already poses a risk for health. Slovenia will promote the replacement of meat particularly with legumes, which can be substituted accordingly for other non-meat food of animal origin, e.g. milk, dairy products and eggs.

Locally grown food will also be supported as it is more accessible when in season. It ensures food self-sufficiency and is of better quality because fruit and vegetables can be harvested at the time of optimum maturity due to short transport routes, resulting in better flavour and higher nutritional value.

Slovenia will support an increase in local supply and thus the supply to households, public institutions, etc. of sustainably produced food, which ensures a diet compliant with dietary guidelines. Such incentives will indirectly improve food variety, reduce the environmental burden, contribute to rural development, ensure jobs and directly impact the health and social and economic situation of the economy.

7.2 Education and training

Education (formal and informal) and training at all levels are the key to an efficient transition to climate neutrality. For the most part, individual sectoral chapters already highlight and address the lack of necessary knowledge in Slovenia. It is also evident that suitable human resources are crucial for the implementation of measures. New knowledge is also necessary for new green jobs. New diverse knowledge will be necessary for the transition to climate neutrality, which will be based on a large number of disciplines, and new, different skills will be required. Slovenia will acknowledge this, and it will enhance and promote climate content in education programmes of natural, technical, social sciences and humanities studies. Interdisciplinarity will be particularly encouraged. It will promote and actively participate in the development of competence for sustainable development and climate change anticipated in the EGD.

Learning and the importance of climate change will be systematically integrated at all educational levels, i.e. primary, secondary and tertiary education and also in informal education.

The topic of climate change is included in the broader concept of education called the education for sustainable development (ESD). The current White Paper (from 2011) highlighted that sustainable development "requires a change in the paradigm of knowledge and values" and the principle of sustainable development should become one of the key principles of education in Slovenia. As stated in the ReNPVO20-30, it is assessed that these recommendations were not observed accordingly.

The update of the ESD national guidelines is anticipated no later than by 2022. In the processes of updating syllabi, curricula and knowledge catalogues with an emphasis on digital and green (sustainable) content planned within the framework of the national recovery plan 2021–2026, Slovenia will make significant progress when observing the representation of content and objectives in the field of climate change in the entire educational vertical.

In the broader context of objectives and principles of education for sustainable development, climate objectives and content will be integrated in an institutional manner and as comprehensively as possible in educational institutions in the future (also including changes at the level of everyday life habits and work in kindergartens and schools, school infrastructure, etc.). To this end, a three-year development project, Climate Objectives and Content in Education, is being planned within the expenditure programme of the Climate Change Fund 2020–2023 in cooperation with the Ministry of the Environment and Spatial Planning and all key public institutions in the field of education (the National Education Institute of the Republic of Slovenia, the Institute of the Republic of Slovenia for Vocational Education and Training, the Slovenian Institute for Adult Education, the Centre for School and Outdoor Education, and the National School of Leadership in Education). The project’s main task is to draft and test the comprehensive programme of awareness and education regarding climate objectives and content within the context of ESD. Each public institute will prepare and test the programme in accordance with their level or field of education. This project is connected with two new projects in the field of primary and secondary schools, adult education and lifelong learning, i.e. "Circular schools" and "Circular learning and resources," which are planned in Slovenia within the coordinated initiative for the transition to a low-carbon circular economy. All anticipated activities will also integrate the content relating to climate change. At the end of 2020, Slovenia joined the GLOBE international educational

programme intended to integrate the educational and research spheres when determining the condition of the environment and climate change. The competent ministries will further support and organise cooperation with various expert associations, including educators' associations (from primary to tertiary level).

A development and strategic document in the field of education is also being contemplated in which the green agenda will be one of the important ministerial orientations and contents in education. Special and systematic care will be dedicated to the field of climate change in the future.

The training plan for the transition to a low-carbon society will be drafted within the LIFE IP CARE4CLIMATE project (in progress). Within this project, the capacities for the transition to a low-carbon society in the field of high and higher education are also being enhanced.

7.2.1 Awareness-raising and information dissemination

The 2019 public opinion survey, Eurobarometer, revealed that citizens of the European Union believe that climate change should be the main priority of the European Parliament. Slovenians put the combat against climate change and environmental conservation in third place (24 per cent) of the Parliament's priorities. Slovenians defined climate change as the second largest environmental challenge (37 per cent). Some 76 per cent of citizens understand climate change as a severe problem. The results revealed that Slovenians see climate change as important and their support when adopting policies and measures for a transition to climate neutrality is necessary. As a result, Slovenia will continue to inform and raise awareness about climate change and the transition to climate neutrality at all levels. It will raise awareness and disseminate information about the latest scientific findings, individuals' impact on the climate and how they can reduce their impact, the changes in consumer patterns, etc. Based on information, people will be able to demand that decision-makers adopt decisions that are beneficial for the environment.

7.3 Guidelines for cultural heritage protection for the adaptation to, and mitigation of, climate change

Current findings reveal that climate change has a direct effect in the conservation of cultural heritage. As emphasised by the European Agenda for Culture, cultural heritage is a priority of the European cultural cooperation and a strategic resource for a sustainable Europe.
The Sendai Framework for Disaster Risk Reduction 2015–2030 also places heritage protection among the priorities and calls on the national authorities to become aware of its endangerment. The European Cultural Heritage Strategy for the 21st Century (2017) emphasises the new role of heritage and innovative approaches which contribute to the improvement of the environment and the quality of life of Europeans. Guidelines for its management set challenges and recommend measures which should be observed by governments, local communities, civil society, the business sector and experts.

The Davos Declaration (2018) supports a joint and comprehensive European policy to attain a high-quality sustainably built environment. The objectives include cultural heritage and contemporary architecture.

The ICOMOS document of the Climate Change and Cultural Heritage Working Group (2019) highlights the importance of a comprehensive heritage discussion, especially of the issue of migrations in connection with climate change and identity loss. The principles of an inclusive society and participation, formation of new approaches and the provision of equality and climate justice are crucial for the realisation of heritage objectives of sustainable development.

Slovenia adopted the Cultural Heritage Strategy 2020–2023 (2019). The Strategy is based on the principle of comprehensive heritage conservation as the foundation for Slovenia's national identity and cultural diversity with an exceptional landscape and biodiversity. As per Article 5 of the Constitution of the Republic of Slovenia, the state is responsible for preserving natural wealth and cultural heritage, and it creates opportunities for a balanced civilisational and cultural development of Slovenia.

7.3.1 Situation and challenges for cultural heritage conservation

Some 30,000 immovable heritage units of various types, such as cultural landscape, archaeological sites, buildings, settlements, machines and devices, industrial complexes, monuments and memorials, parks and gardens are entered in the Register of Slovenian Cultural Heritage. The Register of Intangible Cultural Heritage consists of 86 units and 238 holders of intangible heritage. Slovenia's heritage is an important part of UNESCO World Heritage. Two areas are entered in the World Heritage List and dry stone walling is, among other things, on the UNESCO Representative List of the Intangible Cultural Heritage of Humanity.

Despite the institutional division of treatment and responsibilities, cultural and natural heritage are inseparable and should be understood as such and addressed within climate change measures.

In recent decades, devastating natural disasters (e.g. floods, high tides, storms) have also affected cultural heritage more and more frequently.

Sustainable resource management includes energy efficiency and heritage protection. Examples of good practice include energy renovation of schools and other public buildings from cohesion funds, including heritage buildings. Energy renovation of buildings constructed before 1940 can contribute to savings of up to 180 million tonnes of CO_2 emissions a year, which amounts to 3.6 per cent of all emissions. Comprehensive energy renovations of heritage buildings are carried out in compliance with the Rules on efficient use of energy in buildings with a technical guideline (PURES) and the requirements stipulated by the Energy Performance of Buildings Directive.

Knowledge from natural sciences, social sciences and humanities must be observed for a comprehensive, balanced and sustainable heritage conservation and management. A multidisciplinary approach is a challenge, condition and necessity when designing heritage and climate sciences.

7.3.2 Measures in the field of cultural heritage for the adaptation to, and mitigation of, climate change

Measures which develop innovative and preventive mechanisms are vital for overall heritage protection and conservation within the framework of climate change. In the process of climate change, three fields are crucial:

- Society: intersectoral and interministerial integration, awareness raising and inclusion of the public.
- Development: observance of the sustainability aspect, quality of the environment and space, and innovations.
- Knowledge: identification, planning, research, knowledge transfer, integration and implementation.

Slovenia will strive to support substantive and financial mechanisms which will observe cultural heritage when reducing the concentration of greenhouse gas emissions, risks of accidents and other impacts of climate change. It will promote research for monitoring the impact of climate and socially economic changes on heritage communities and research of

preventive conservation procedures. Slovenia will support identification and digitalisation of endangered cultural heritage.

It will further strive to ensure financial incentives for the renovation of architectural heritage and advocate the advantage of renovation before new construction. It will promote measures for maintaining the settlement pattern, ratios between developed and undeveloped areas, preservation of use or reuse of buildings, improvement of fire and seismic safety, and energy efficiency.

The measures of cultural heritage protection and conservation must also be observed when promoting mobility. Slovenia will pursue the improvements of spatial attractiveness of settlements and cultural landscape by providing basic and advanced living needs. It will strive for a balanced urban and rural development with digitalisation, social innovations and smart specialisation which upgrade the inherited cultural heritage values.

8 FINANCING

8.1 Assessments of required investments

To attain the objective of climate neutrality, Slovenia will direct earmarked investments in a suitable and timely manner. Such an objective cannot be attained solely by means of the existing measures. The NECP sets the foundation for the Strategy by 2030. The key emphasis is on the implementation of measures whose continuity must be ensured by 2050 and onwards.

Required investments

The short-term objectives set by the NECP until 2030 are the basis or the foundation on which the attainment of net zero emissions by 2050 is possible. The investments assessed do not include a full transition to the attainment of net zero emissions, but provide a framework of necessary investments.

Table 3: Assessed scope of investments for the scenarios with ambitious additional measures (2021–2050) (source: Energy Efficiency Centre of Jožef Stefan Institute)

Sector	Scenario with existing measures 2021–2050 (million EUR)	Scenarios with ambitious additional measures 2021–2050 (million EUR)	Difference as per the scenario with existing measures (million EUR)
Households[1]	9,897	10,273	376
Services[1] (public and private sector)[2]	3,363	3,932	569
Industry[3]	2,232	5,711	3,478
Transmission of electricity[4]	1,120	1,290	170
Distribution of electricity[4]	10,819	13,605	2,786
Central supply[5]	1,471	from 3,746 to 8,956[6]	from 2,276 to 7,486[6]
Local supply[7]	632	6,149	5,517
Transport[8]	15,508	21,686	6,178
Total	45,041	from 66,391 to 71,601[6]	from 21,349 to 26,559[6]

NOTES TO THE TABLE:

[1] Investments in building renovation and systems for heating and sanitary hot water preparation.

[2] In the service sector, the public sector represents approximately 40 per cent and the private sector about 60 per cent of the entire scope of investments.

[3] Investments in new technologies, procedural improvements and transition to a circular economy with an emphasis on efficient energy use and inclusion of RES.

[4] Investments in the renovation of the transmission and distribution network for energy transmission and storage. The table consists of investment costs and also includes the costs of meeting the needs for flexibility and partly for systemic services. Overall costs, including the costs of operating and maintaining the energy system, are discussed in expert bases. Various financing models (chapter 8.2) also impact the organisation and arrangement of the investments defined by sectors.

[5] Investments in new energy generation facilities in the transmission network (the energy sector only).

[6] Scope of investments for two scenarios with additional measures: WAM SNG and WAM NU.

[7] Investments in new devices within the local supply sector (solar power plants, wind farms, etc.).

[8] Investments for the development of efficient public transport, modernisation and construction of railway hubs and high speed lines, cycling networks, etc.

The scenario with ambitious additional measures (WAM) includes EUR 21 to 27 billion more investments than the scenario with the existing measures (Table 3). The amount EUR 21 billion refers to the WAM SNG scenario, and EUR 27 billion to the WAM NU scenario. It is evident from the table that a total of between EUR 66 to 71 billion of investments must be governed for the attainment of climate objectives in the 2021–2050 period, whereby only

investments in energy efficiency and low-carbon energy sources are included in the field of buildings. If observing the entire scope of investments for new construction (the sector of households and services), the total investment that must be steered increases by more than EUR 23 billion (which is a total of EUR 90 billion in the SNG scenario or EUR 95 billion in the NU scenario).

A significant renovation of the entire system is before the transport sector, which anticipates EUR 6.5 billion of investments for the ambitious scenario (investments in sustainable mobility, rail and road transport) (source: NECP). The foregoing denotes almost EUR 1 billion more than in the scenario with the existing measures. The scope of investments for this field in accordance with the ambitious scenario is estimated to be EUR 22 billion by 2050 (additionally in comparison to the existing scenario – somewhat more than EUR 6 billion). A suitable infrastructure and support environment are pivotal for the transition to sustainable forms of transport.

8.2 Green financing for the transition to a low-carbon society

The chapter discusses the entire financing model for the transition to a low-carbon society which, in addition to funding sources for climate measures, also includes measures of a financial nature for the transition promotion. An important part of the greening of public and private finances is also the prevention of financing activities that are harmful to climate objectives.

8.2.1 Situation

Today, Slovenia earmarks private and public funds for climate measures. Specifically, public funds are obtained from the following sources: the Special Climate Change Fund; contribution for energy efficiency and electricity generation from high-efficiency cogeneration and from RES; funds from the EU structural and investment funds, especially the Cohesion Fund and the Rural Development Fund; sources from other EU programmes; budget sources for ensuring Slovenian participation in the implementation of the European cohesion policy, and sources for financing transport infrastructure development. In 2019, EUR 71 million worth of incentives were earmarked for subsidising measures which contribute to the attainment of the national objective of reducing emissions; the major part was earmarked for measures of energy renovation of buildings and fewer incentives were earmarked for industry.

Slovenia promotes the reduction of GHG emissions with two key measures of green tax policy, i.e. environmental tax on air pollution with CO_2 emissions, which taxes fossil fuels regarding their carbon content, and the vehicle tax, the level of which also depends on CO_2 emissions. Nevertheless, tax measures, which are contrary to the objectives of emission reduction, apply simultaneously in Slovenia. The reimbursement of excise duties on fossil fuels stands out the most with regard to the amount of funds. A project of green budgetary reform was also carried out in the 2017–2018 period, which was completed with the publication of recommendations.

8.2.1.1 Guidelines and measures adopted until 2030

The NECP defines further activities for greening the budget, while the SDS 2030 does not state its position on this issue. The NECP plans an increase in public financial resources for promoting and accelerating investments and the implementation of other measures to reduce the GHG emissions, particularly for:

- a comprehensive development of the electricity distribution networks;
- investments in the railway infrastructure and other forms of sustainable mobility;
- investments in research and development in order to increase GDP to 3 per cent (involving investments) by 2030;
- implementation of EEU and RES measures in all sectors: comprehensive renovation of buildings, development of a circular economy, renovation and expansion of DH systems, generation of electricity and heat from RES, etc.

The environmental tax on air pollution with CO_2 emissions will gradually increase to equalise its amount as soon as possible and then harmonise it with the price of emission allowances (at the level of at least 30 EUR/t of CO_2 by 2030). The reimbursements of excise duties on energy products, which are contrary to the objectives of GHG emission reduction, will gradually reduce: they will be abolished in transport by 2025 or as per the development of the EU legislation and in industry by 2030, or the reimbursements of excise duties will be conditioned by the implementation of emission reduction measures (certificate obtained in accordance with standards ISO 50001 or ISO 14001, which contributes to an increase in energy and material efficiency, etc.). In compliance with the planned amendments to the EU legislation (within the EGD), the process of greening the national budget for the formation of harmonised and efficient solutions will continue in the field of taxes and duties in all sectors vital for the attainment of climate neutrality objectives.

8.2.1.2 Starting points in the European Green Deal

The legislative bases which are being drafted or prepared within the EGD that significantly affect the definition of financing in this Strategy, include:

- the Just Transition Mechanism proposed by the EC together with the Just Transition Fund, which will ensure a just and inclusive manner of transition and will steer towards the formation of the user-adjusted and practical assistance to help workers with investments in the most affected regions due to the transition. Transition management will require significant structural changes to business models relating to the requirements on competence and relative prices;
- at least 30 per cent of resources from the InvestEU Fund will be earmarked for climate measures, and project sustainability will be examined as well (in the sense of economic, environmental and social sustainability). It is necessary to define the method of cooperation between national banks when drafting instruments at the national level and the budgetary planning of measures;
- when drafting the sustainable financing strategy, the EC will observe Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088 (OJ L 198, 22.6.2020, p. 13);
- inclusion of the sustainability aspect into the framework of company management and reporting to the investors about the attainment of all three aspects of sustainability. Special attention is dedicated to the list of criteria for technical screening;
- design of the EU green bond standard, which will enable the implementation of sustainable investments in an efficient manner which determines eligible projects, manner of applying taxonomy at the project level, design of a framework for green bonds, manner of reporting and legislative requirements for disclosure and verification method at the EU level and outside of it;
- integration of climate and environmental risks in the financial system and their

management within the system (inclusion in the prudential framework, increase in resilience against climate and environmental risks, especially from the viewpoint of financial risks).

8.2.2 Vision

Slovenia will steer investments and consumption (private and public) towards a low-carbon circular economy and the adaptation to climate change. The principles of climate justice will be observed accordingly: the costs and benefits of the transition will be distributed fairly, and the most vulnerable groups of citizens will be enabled to implement measures to mitigate and adapt to climate changes.

Climate measures also have multiple benefits because they contribute to the attainment of environmental, social and economic strategic objectives pertaining to water and energy management, food security, environmental and nature protection, protection and conservation of cultural heritage, and other strategic sources.

8.2.3 Objective by 2050

To support climate policy, Slovenia will thoroughly reform public finances and, in doing so, will greatly depend on the EGD. Taxes and other leverage in the field of green priorities will be redirected in a way intended to steer public and private investment and consumption towards a low-carbon circular economy and adaptation to climate change. An important objective is to ensure the transition in a fair and inclusive manner.

At the onset of the 2021–2027 period, Slovenia is providing resources (see sub-chapter on financing sources) for the implementation of measures. By 2023, a comprehensive system will be designed and a financing model for investments and other measures for the transition to a climate-neutral society by 2050 will be defined, whereby a support environment for the promotion of financing private and public investments and other measures for the transition to a low-carbon circular economy and the adaptation to climate change will be built and enhanced.

8.2.4 Main orientations and fields of action by 2050

Slovenia recognises the key role that financing has in the attainment of climate neutrality and adaptation to climate change. It will promote the transition to a low-carbon circular economy, whereby significant improvement of material efficiency, as the connecting element between the environmental and competitive objectives, will be crucial, too.

As stated in the EGD, the reduction of GHG emissions will require extensive public investment and enhanced efforts for private capital to be directed towards climate and environmental action, while preventing attachment to unsustainable practices. To meet these ambitions, the majority of investments in public and private sectors, which will be implemented until 2050, will have to be guided. The scope of investments will be larger than the present ones; energy costs will be lower, especially for imported energy and that will release private resources for investment on a larger scale.

In compliance with the EGD, Slovenia will strengthen the integration of the sustainability aspect into the corporate governance framework and report to its investors on the achievement of all three sustainability aspects. It will give priority to promoting the integration of climate risks in the management of financial companies.

When managing the state and local communities, the progress criteria will, in addition to the

currently established economic criteria, also include the assessment of social and environmental wellbeing and risks, which will be exceptionally important for climate change management.

8.2.4.1 Financing model

By 2023, Slovenia will form a system and determine the financing model to implement investments for the transition to a climate-neutral society by 2050. The system will be based on a harmonised utilisation of non-refundable and refundable public funds and financing sources provided by financial institutions and funds. The system will be intended for the activation of private sources in low-carbon solution investments. The financial model will serve as the backbone of the investment promotion system and will incorporate a number of tax and legislative instruments and instruments for planning, information dissemination, etc., which will ensure a faster transition and the cost- and environmentally-efficient implementation of investments.

The formation of the financing model will be harmonised between all stakeholders in order to generate an efficient financial support environment (formation of platforms necessary for a uniform assessment, project financing and knowledge concentration) and design project offices which will enable high-quality preparation (also aggregation of dispersed projects), project treatment and a high degree of combination of various funding sources. Slovenia will prepare the model in two phases:

- programming of the use of EU funds for ensuring a just transition by 2027 is underway, while the state will also rely on earmarked EU funding for the period until 2027. Furthermore, Slovenia will also programme the application of national funds as listed in the sub-chapter on financing sources;
- by 2023, Slovenia will design, and by 2027, establish a comprehensive support system for the implementation of large and small investment and other projects for the transition to a low-carbon circular economy and society. The system will be designed harmoniously and in coordination with the ministry responsible for finance for the entire financial incentive sector.

Within the system, Slovenia will enable the formation of funds through the implementation of public infrastructure investments for the transition to a low-carbon society. It is reasonable to participate in the financing of infrastructural investments of topical initiatives and packages of anti-crisis measures of the Recovery and Resilience Facility (RRF), the InvestEU, payment of a contribution to the European Guarantee Fund and use of the guarantee for infrastructure projects and elimination of COVID-19 consequences (if Slovenia fails to pay the funds to the European Guarantee Fund, it will provide them from the budget), and utilisation of sources from the Just Transition Fund (JTF) to form a fund for financing infrastructural investments in the Zasavje and Šalek regions. In the period after 2027 (next financial framework), the funds will be formed in harmonisation and coordination with the ministry responsible for finance for the entire financial incentive sector (entire incentive system of the Republic of Slovenia) with the utilisation of EU guarantees and other sources as listed in the sub-chapter on financing sources. To finance a sustainable transport infrastructure, Slovenia will examine and provide additional financing sources.

When designing the financing model, the starting points are as follows:

- the funding is based on grants to finance public and private investment in a low-carbon and circular economy. At present, a sufficient number of incentives to redirect investments exists, so a significant increase is not necessary. The earmarked funds collected represent about one sixth of the funds that will be needed in the future to carry out the anticipated scope of investments necessary for a successful transition to a climate-neutral society by 2050;
- private financial funds will be engaged to a greater extent (five sixths) to carry out the transition to a climate-neutral society by 2050; private sector investment opportunities

vary;
- the funding gap will be covered through the prioritised application of the EU funds available and financing through financial instruments which rely on EU sources. The planning and formation of financial instruments (refundable funds, guarantees, capital injections) will be based on cohesion funds and the utilisation of the EU budgetary resources (see also sub-chapter on financing sources);
- however, the development of financial instruments that depend merely on the EU resources will not suffice for the steering and implementation of necessary investments. Slovenia will have to engage additional mechanisms to steer private resources into investments by engaging additional budgetary resources for the redirection of investments and for the development of instruments through the implementation of financial engineering. The provision of additional budgetary resources will be necessary as a condition for co-financing projects from the programmes or EU funds, which is also a condition for drawing resources from the EU Just Transition Fund.

8.2.4.1.1 Financing sources

To promote climate measures, Slovenia will further earmark resources from the following own public funds:
- the Climate Change Fund;
- contribution for energy efficiency;
- contribution for electricity generation from high-efficiency cogeneration and from RES;
- resources marked for financing of transport infrastructure development.

Until 2027, at least 30 per cent of the EU long-term budget resources and the NextGenerationEU instrument will be earmarked for the promotion of climate measures. As per the EC's guidelines, Slovenia will incorporate climate content in the programmes for use of these resources and will exploit the opportunities within the EU to finance the transition to a low-carbon society (hereinafter: LCS) to the greatest extent possible, which is an important element of recovery. It will be possible to promote certain measures from this Strategy and the NECP within the framework of EU funding intended for the development of digitalisation (20 per cent of structural funds and the recovery mechanism) within the foregoing mechanisms.

The key mechanisms within the EU are:
- the Recovery and Resilience Facility; 37 per cent of funds within this framework are intended for climate measures;
- structural and investment funds of the 2021–2027 multiannual financial framework (the Cohesion Fund, the Rural Development Fund, the European Regional Development Fund, the European Social Fund, the European Territorial Cooperation, etc.), in which at least 30 per cent of funds are earmarked for climate measures;
- the Just Transition Fund, in which the funds are also anticipated for the EGD measures;
- the InvestEU Fund for implementation of the EGD and the recovery plan;
- payment of a contribution to the European Guarantee Fund and use of the guarantee for infrastructure projects and elimination of COVID-19 consequences (note: if Slovenia fails to pay its contribution to this fund, it will provide resources from the budget);
- resources within the EU programmes (LIFE, H2020, etc.).

In this field, it is possible to attract investment capital from the funds and other dedicated financing resources of international financial institutions, but the activation of private financing resources is of key importance.

8.2.4.2 Reform of tax and budgetary policies

Slovenia will plan its reform and the greening of tax and budgetary policies well. They will be designed to promote sustainable development and resilience to climate shocks, as well as to

enable a fairer transition and the state's other development priorities, as this is very important for achieving climate goals at the lowest possible cost. Adjustment in the structure of taxes will not only be necessary for the attainment of environmental, but also of fiscal, objectives because of the change in the use of energy products and other changes related to the transition to a low-carbon society. When drafting measures, Slovenia will try to realise the long-term competitiveness objectives of the business sector. When planning and reforming the budgetary and tax policies, Slovenia will apply suitable tax solutions to provide appropriate incentives for the sustainable conduct of producers, users and consumers. The tax policy will support the climate policy and a fair transition. It will use tax measures to discourage GHG emissions and direct tax measures to stimulate action to increase climate resilience. The social and development aspects will be observed, too. Fiscal and environmental objectives and the social and development components will also be discussed and considered accordingly. In doing so, the decisions already made in Slovenia will be taken into consideration, and measures adopted at the EU level will support the policy reformation. Slovenia will:

- gradually reduce reimbursements of excise duties on liquid fossil fuels (complete abolishment by 2030 or in accordance with EU legislation), as already stipulated by the NECP;
- increase the environmental tax on air pollution with CO_2 emissions and harmonise it with the price of emission allowances or marginal costs to attain the objectives of the Paris Agreement, as already stipulated by the NECP;
- promote climate action with other tax measures, i.e. tax relief, different tax rates, etc.;
- take environmental factors and risks into account in annual budgets and medium-term fiscal plans;
- participate in the formation of an efficient measure at the EU level, i.e. a carbon border adjustment mechanism for selected sectors to reduce the risk of relocating CO_2 sources and enable the competitiveness of low-carbon production;
- direct the resources of the European structural and investment funds and other EU sources in Slovenia to support sustainable development to the greatest extent possible;
- condition state aid for the business sector with the criteria of a low-carbon transition, promote the activation of private capital when financing projects and attaining the objectives set in the NECP and this Strategy;
- upgrade the system of green public procurement (several criteria related to the reduction of GHG emissions, more categories of products in the green public procurement system) and greatly increase the proportion of green public procurements until 2030 and by 100 per cent until 2040.

The fiscal policy will not suffice, but it will represent one of the support pillars for the new financing model. It will also be accompanied by package target instruments (legislative, information, etc.).

8.2.4.3 Ensuring a just transition

The EGD states: "The transition can only succeed if it is conducted in a fair and inclusive way. The most vulnerable are the most exposed to the harmful effects of climate change and environmental degradation. At the same time, managing the transition will lead to significant structural changes in business models, skill requirements and relative prices. The public, depending on their social and geographic circumstances, will be affected in different ways. Not all Member States, regions and cities start the transition from the same point or have the same capacity to respond. These challenges require a strong policy response at all levels."

Within the framework of climate policy, Slovenia will ensure that:

- the costs of benefits of the transition are divided fairly;
- no one will be overlooked in the transition to a low-carbon society;
- the most vulnerable groups of the population will be enabled to implement measures for mitigation of, and adaptation to, climate change;

- the entities affected the most by the transition will receive prompt assistance for necessary action.

To ensure a just transition, it will be very important to draft and implement other policies which contribute to the reduction of inequality in society.

In accordance with the EGD, Slovenia will steer support in the regions affected most by the transition towards restructuring into a low-carbon economy and low-carbon activities, which will be resilient to climate change and will enable a generation of new and stable jobs with higher added value. To this end, it will prepare regional plans for a fair transition for the two regions that will be affected the most by the loss of jobs in production and the use of fossil fuels, and possibly for another three regions due to the needs for a transformation of production processes in industrial facilities with the highest GHG intensity. Grants of the Just Transition Fund represent one of the pillars of the mechanism for a just transition; the drawing conditions will be determined in the proposal for a Regulation of the European Parliament and of the Council establishing the Just Transition Fund (COM/2020/22).

Slovenia will prepare and support job transition strategies for other activities.

Slovenia will ensure that the most vulnerable groups of the population are able to carry out measures for the transition to LCS and, in particular, that the measures do not worsen the financial situation of citizens in the first and second income quintile groups. The measures (e.g. increase in the amount of CO_2 tax for fossil fuels), which would affect the most vulnerable groups will be compensated for these groups with suitable mechanisms (e.g. options to apply tax revenue to reduce the rate of social security contributions, increase in household social benefits, targeted measures of EEU and RES for the prevention of energy poverty). As per the adopted measures and acts (Energy Act (Official Gazette of the Republic of Slovenia [*Uradni list RS*], Nos. 60/19 – official consolidated text, 65/20 and 158/20 – ZURE; hereinafter: EZ-1) and the NECP), Slovenia will implement the measures for mitigation and reduction of energy poverty within social and housing policies and the targeted measures of EEU and RES. Measures to adapt to climate change will be designed within the framework of the housing policy and will be amended, if necessary, with targeted measures for the most vulnerable groups upon the reform of the national housing programme and when reviewing the NECP. Slovenia will draft measures to prevent mobility poverty resulting from higher personal transport costs (more expensive vehicles) within the new transport strategy and the spatial development strategy, whereby the measures of harmonious regional development, digitalisation of services and public passenger transport will be crucial. The measures will also be carried out at the local level, and energy and mobility poverty will be discussed in local community plans as well. (Also see chapter 11.)

8.2.4.4 Providing green financing of investments and other measures

To meet these ambitions, the majority of investments in public and private sectors, which will be implemented until 2050, will have to be steered. The scope of investments will be larger than at present; energy costs will be lower, especially for imported energy and that will release resources for investments of a larger scale. In particular, the investors face the following obstacles: high initial investment costs and the ability to finance and manage risks related to the transition to LCS. Incentives will focus on the overcoming of these barriers: provision of funds with the offer of financial instruments. Financial incentives will be proportionate to the effects on the reduction of GHG emissions and other public benefits for sectors (strategic reliability, food security, cultural heritage conservation, etc.), the environment (flood safety, etc.) and other benefits of multi-purpose measures. Major incentives will be intended for development solutions and when entering markets.

Buildings. It is assessed that 60 per cent of households can implement a comprehensive

energy-saving building renovation with their own sources and borrowing (Cirman et al. *Analiza dejavnikov, povezanih s finančnimi sposobnostmi gospodinjstev, ki vplivajo na odločanje o investicijah za učinkovito rabo energije, poročilo v okviru projekta LIFE Podnebna pot 2050* (Analysis of factors related to households' financial abilities affecting decision-making regarding investments for efficient energy use, Report within the LIFE Climate Path 2050 project, 2018). Incentives for the groups that are unable to implement renovation on their own will be prepared (e.g. guarantee scheme, energy contracting and "payment incorporated in electricity bills"). Furthermore, it was estimated that the welfare of citizens of the first and second quintile groups worsens in the scenarios of the transition to a low-carbon society. As a result, measures for these groups of citizens will be enhanced: in addition to other measures of general social policy (see chapter 11), incentives for the energy renovation of buildings and other measures of efficient energy use will be reinforced to encourage investment for the most vulnerable groups of citizens.

The objectives of the transition to a low-carbon circular economy will be attained by enforcing sustainable construction and renovation of buildings. In addition to energy efficiency, construction or renovations will be based on materials with a low carbon footprint. Renovation will also include other measures designed to improve the condition of buildings (seismic and fire safety, resilience against climate risks, etc.; the so-called broader renovation). Simultaneous energy and broader renovation is an important element of a circular economy, with significant effects on material efficiency and subsequent GHG emissions during the lifespan of a building. Special emphasis will be put on the construction of wooden buildings. A financing model of sustainable and broader renovation for multi-dwelling buildings in Slovenia, which are at highest seismic risk, will be established. Slovenia will thus define additional dedicated financial resources within the housing policy. For efficient implementation, the competencies and tasks of the institutions will be defined in more detail and will be enhanced if necessary (e.g. housing funds, the Eco Fund, the SID Bank).Slovenia will ensure additional dedicated financial resources for special groups of buildings, whereby a particular priority will focus on steering financial resources for broader renovations of cultural heritage buildings.

Transport. In the field of transport, the priority focus of measures will be on a sustainable transport infrastructure with an emphasis on railway infrastructure, public transport and active mobility. Infrastructural projects in transport are typically large-scale projects which require a longer and stable financing period. Stable systemic resources for financing transport measures are vital because they enable players at the state and municipal level to realistically plan and implement measures. As stated in chapter 8.2.4.1, Slovenia will establish a comprehensive support system and will form funds for the implementation of large infrastructural investments. It will also enhance the financing of sustainable mobility measures from the Climate Change Fund and the European funds from the Multiannual Financial Framework, particularly the Cohesion Fund and the Recovery and Resilience Facility. It will also consistently direct all investments for transport infrastructure development and resources earmarked for this purpose in compliance with the objectives for the reduction of GHG emissions. Systemically stable, long-term and predictable financial resources will thus be established and ensured for measures with clearly set objectives of emission reduction, the promotion of sustainable transport infrastructure development in the jurisdiction of municipalities (public passenger transport, offer of new services, non-motorised forms of transport, the park-and-ride system, promotion of charging infrastructure for e-mobility and other alternative sources, etc.) and the state (rail transport, etc.). The development of transport hubs, new logistics approaches and the circularity principle in logistics, including digitalisation and other measures for reducing GHG emissions in transport and mobility, will be promoted (see also chapter 6.3).

Industry. Industry will deal with high prices of emission allowances and energy products. Prices will be mainly influenced by European markets and not so much by the supply and demand for low-carbon resources in the country. The industry will require support with the transition to a low-carbon circular economy to prevent stranded investments and focus on

green investments (energy efficiency, material efficiency, RES, etc.).The decarbonisation of energy-intensive activities or the transition to the use of materials or products which do not require energy-intensive production will be particularly challenging. At the same time, these industries are materially intensive, so it is necessary to enhance the use of secondary raw materials and introduce other circular economy concepts. Slovenia will promote industrial modernisation, especially research and development and the application of the latest high-tech solutions. It will carry out measures to ensure the competitiveness of low-carbon production and co-design measures at the EU level (e.g. mechanism for carbon border adjustment, product-service development for a circular economy). In the long-term, the modernisation will focus on the management of price and other expected risks. Slovenia will enable a gradual transition within the framework of the EU policy.

In the transition to a low-carbon circular economy, it will be crucial to introduce sustainable business models to expand the offer of products in addition to the offer of services related to relevant products and thus enhance the added value and competitiveness in these activities. Special emphasis will be put on the promotion of new investments in the wood industry. The support environment will be compliant with the EGD starting points and incorporated in Slovenia's new industrial strategy by 2030 and the comprehensive strategic decarbonisation project for the transition to a circular economy, which is being drafted in cooperation with the European Institute of Innovation and Technology and the Joint Research Centre of the European Commission. The renewed Smart Specialisation Strategy will play a crucial role within this framework.

Energy. Major challenges will be the financing of electricity supply development and the implementation of large-scale investments; in the period leading to 2030, financial resources will be needed in particular for the development of electricity distribution and transmission networks, the provision of flexibility, systemic services and energy production from RES. Financing of the network development is for the most part anticipated from the network charge or a special contribution, i.e. by observing the polluter- or user-pays principle. European funds for mitigation of climate change and digitalisation will also be available in this area. The flexibility services will generate additional revenue. The formation of network charges must observe the future development of the energy market (particularly the dispersion of production, energy storage facilities and implementation of demand response services).

Major investments in competitive and dispersed electricity generation from RES are anticipated in accordance with the guidelines outlined in previous chapters. Investments must be steered in such a way that simultaneous growth of employment in the sectors of green low-carbon technologies and services is ensured and that the state's other strategic environmental and economic objectives are met.

In the period until 2050, presumably in the 2035–2045 period, electricity generation from the majority of current facilities will have to be substituted, with the exception of hydroelectric power plants. Based on expert, high-quality and independent analyses of economic, environmental, spatial, social and economic feasibility, it is necessary to assess methods for substituting these sources to facilitate decision-making. All legal aspects of the necessary administrative procedures (national spatial plans, licensing, etc.) must be examined minutely and drafted accordingly. Timely investments in the development of new environmentally acceptable energy locations and preservation of the existing ones are also envisaged.

Within the framework of increasing network charges (and expected higher electricity prices), special attention will be paid to vulnerable groups of consumers (energy poverty) for which targeted measures for reducing energy costs will be available (see chapter 8.2.4.3).

8.2.5 Climate change adaptation

Slovenia has available adaptation funds (the Climate Change Fund, the European Agricultural Fund for Rural Development, and the European structural and investment funds (CF, ERDF), which for now exceed the demand. Investments relating to the adaptation have not been assessed because possible action scenarios for this field have not yet been drafted (see also chapter 5). Judging from the experience of countries which are better prepared for climate change, we expect that additional funds will be required. Many measures will be implemented by the municipalities themselves or in cooperation with the institutions at the state level (e.g. in the field of flood safety, the majority of measures is undertaken by the Slovenian Water Agency, while many measures are or will be carried out by the municipalities in cooperation with the Agency). Necessary expert bases, instructions and training must be ensured beforehand for the projects to be of sufficient quality.

For better cost efficiency, Slovenia will prioritise the implementation preparation of preventive measures (e.g. activities outside flood risk areas). An action plan and investment programmes (see chapter 5) will be drafted for other measures. Until 2023, necessary methodologies for assessing the climate risk of projects and their resilience to climate change will be established and incorporated in the criteria for financing, guarantees, insurances, issue of permits, etc.

For the adaptation to climate change with sustainable solutions, Slovenia will primarily ensure financial resources for the investments which have the largest potential for carbon capture and storage and those which will ensure the improvement of natural habitats and the implementation of sustainable solutions.

National multi-purpose strategic projects for attaining strategic objectives in the supply of water, food and electricity will also be of key importance because their synergies will contribute greatly to the cost efficiency of attaining the objectives.

8.2.6 Consumption patterns

Slovenia will define responsible institutions for promoting changes in consumption patterns. For the most part, measures in this field will be new and are yet to be developed, resulting in few or as yet unestablished incentives for such measures. Most measures refer to the generation of markets, supply and demand promotion, accessibility of the green products offer and also the promotion of reuse and sharing (libraries of things, financing of e.g. "recharge" machines) and other new consumption patterns. A number of measures involving mobility are also included in this framework (calculation of travel costs) and other measures (e-services, e-state, etc.) for lesser mobility needs (lower transport or travel costs for the same service accessibility, etc.).A set of instruments (green public procurement, taxation of resource use, financial incentives, product labelling, which will be prepared at the EU level, etc.) will be drafted.

8.2.7 Efficiency of resource usage, governance and management

Slovenia will concentrate knowledge and human resources capacity for the efficient management of public resources to promote the transition to a low-carbon circular economy and adaptation to climate change. At present, the incentives are dispersed in more than four institutions. The resource management of the Climate Change Fund will be upgraded.

8.2.8 Financial reporting

Also see the chapter on implementation monitoring. At the annual level, Slovenia will draft the climate finance report, which will include:

- resources for incentives (total and by sources, by IPCC sectors, by line ministries and by groups of measures) and their effect – realisation and comparison with plans (all missing financing plans will be drafted beforehand);
- promoted investments and activities (jobs) – total and by IPCC sectors, by sectors in accordance with emissions responsibility, and by groups of measures);
- general government revenue arising from environmental taxes.

8.2.9 Proposed indicators

- Total funds for incentives;
- specific cost of GHG emissions reduction per incentive unit;
- leverage.

8.3 Policies and measures for research, development and innovations

In the scope of "research, innovations and competitiveness", the NECP anticipates an increase in investments for research and development, i.e. at least 3 per cent of GDP by 2030 (of which at least 1 per cent of GDP will be derived from public resources), more investments in the development of human resources and new knowledge for the transition to a climate-neutral society, support to companies for a competitive and efficient transition, promotion of targeted research projects and multidisciplinary development and research programmes and demonstration projects; the climate objectives must also be observed by the Research and Innovation Strategy of Slovenia (RISS), steering of companies towards financing and participation in development and research projects with an active tax policy, promotion of new, and enhancement of the already existing, development and research programmes compliant with the NECP objectives. The NECP also promotes the application of digitalisation in climate measures and an enhancement of cybersecurity in all strategic systems, research and development activities between the public and private sectors, and the establishment of competitive conditions for innovative research work in public undertakings.

8.3.1 Objective and orientations by 2050

Numerous innovations (social and technological) will be necessary for the transition to a climate-neutral society, which Slovenia will support and promote. Slovenia will also further encourage and enforce the NECP orientations. It will increase resources for research and development, i.e. the proportion of funds will amount to at least 4 per cent of GDP (of which at least 2 per cent will be derived from public resources). Research and innovation are vital for a successful transition to a climate-neutral society. Due to its small size, Slovenia cannot carry out all the necessary innovations and research on its own and will thus strive for the active participation of Slovenian development and research institutions and the business sector in international research and projects and will simultaneously attempt to stop the brain or knowledge drain abroad. Slovenia will continue to promote interdisciplinary studies and projects and will further earmark funds more intensively in applied projects (technological and social) and eco-innovations which will ensure the transition to a climate-neutral society and the utmost efficiency of these innovations. This field will be determined as one of the priority areas of application of research, development and innovations in Slovenia.

Slovenia will be further actively involved in European initiatives promoting innovations for a low-carbon society, and in RES technologies and other fields. Furthermore, it will accelerate

research, development and innovations in promising (but commercially not yet economical) projects such as RES and other low-carbon technologies.

A lack of social science analyses and research is noted in Slovenia regarding the transition to climate neutrality; without such knowledge, a challenging social transition is not possible. In cooperation with the ministry responsible for the environment and climate change, the ministry responsible for research will prepare an analysis of required social science research in the shortest time possible or until the update of the NECP and determine priority fields or topics. Such research is necessary for the consolidation of a social agreement.

Research, development and innovation are a horizontal component of all sectors mentioned in previous chapters. Further provision of connectivity between research, development and innovation work will be crucial, including a connection with the business sector and education.

Slovenia will also provide resources for the development of necessary climate models for studying and monitoring climate change and its subsequent effects and for the formation of climate policies.

9 IMPLEMENTATION ORGANISATION

9.1 National level, inter-ministerial coordination

For an efficient, successful and coordinated implementation of Slovenia's long-term climate policy, the state and public administration must be governed and organised accordingly. They must also be competent to undertake the successful and efficient implementation of such a large, overarching and long-term project.

Organisation of the state and public administration will logically observe the organisation at the EU level and good practices in this field in other EU member states.

Efficient, successful and coordinated implementation of a long-term climate policy primarily necessitates the establishment of a body under the direct authority of the Government which will be responsible for climate policy coordination or Slovenia's climate agreement. This also includes superiority over the sectors for coordination of climate policy, strategies and other documents, measures and content of Slovenia's climate agreement. Based on the Climate Strategy, climate policy and all other relevant policies and Slovenian and EU policies, the authority will, together with all other competent sectors, coordinate the preparation of a suitable plan for Slovenia's climate agreement (hereinafter: SCA), which will be drafted after the adoption of the Climate Strategy. The green financial plan for implementing the climate agreement will also be an important element of SCA. The established authority's expert team will have sufficient members and expertise to draft and efficiently coordinate at a high level all relevant sectors and necessary joint works, tasks and drafts of documents, measures and decisions of the Government of the Republic of Slovenia to implement, monitor and report on the results of the Slovenian climate policy and SCA.

An independent scientific expert council will also be established to support the Government when monitoring and forming climate policies.

The anticipated organisation will serve Slovenia to establish an appropriate stable structure at the highest level to manage the climate agreement and implement tasks in the field of climate change. A stable structure and organisation also enable an early inclusion of stakeholders and the broader interested and expert public in the preparation of policies, planning and implementation of measures in this field. The section of the newly established authority which will be involved in EIA and CEIA procedures relating to the adaptation, mitigation and monitoring of sectoral policies will also be enhanced.

9.2 Local policies and fields of action

To enhance resilience to climate change and the transition to a climate-neutral society, one of the key roles will be played by local communities or municipalities; there are 212 municipalities in Slovenia. Municipalities carry out numerous tasks with regard to spatial planning, economic development, public utility services (local energy, waste collection, public transport, etc.), transport planning and management, management of public buildings, concern for the environment, nature conservation, cultural heritage protection, etc. Slovenia does not have an official regional division, but the municipalities are already working together for the needs of various projects and other purposes. Many Slovenian municipalities joined various initiatives to reduce GHG emissions at the municipal or even regional level, and various municipal projects are also being implemented in the field of adaptation to climate change. In some areas, the municipalities are one step ahead of the state when it comes to implementing measures.

At the local and regional levels, climate measures are quickly visible. Slovenia will thus enhance good and inclusive planning of measures at the local level as this enables an integration of climate objectives in various sectoral targets, while providing new jobs and new innovative solutions. A comprehensive regional transition is necessary; from climate, social and economic measures which result in the economic and social benefits of the transition.

Due to the lack of regional division, Slovenia will plan climate change orientations at the level of the so-called functional regions because municipalities are frequently too small for planning or forming certain measures (e.g. sustainable transport planning, which exceeds municipal borders) and they also experience insufficient human resources and knowledge. For the needs of planning or implementing local climate measures, the state will enable municipalities access to all public data (studies, bases) collected in one place.

Slovenia will promote energy efficiency, self-sufficiency in consumption and electricity generation from RES at the local level, exploitation of alternative energy sources, energy storage and development of digital energy platforms or technology systems and digital platforms for the development of smart energy systems.

Slovenia will also promote the application of digitalisation at the local level (e.g. fewer meetings in person in town centres, which will reduce transport or mobility needs). Implementation of innovative solutions and digital technologies will also be promoted with regard to smart cities and communities (e.g. sustainable construction in towns and communities in connection with the promotion of entrepreneurship and the circular economy (BIM), energy renovation of buildings, energy self-sufficiency of towns and communities, digitalisation of public lighting with smart light management and light allocation and sustainable materials, construction of new, and expansion of the already existing, district heating and cooling networks, which primarily rely on RES). At the local level, high-tech digital solutions for adaptation to climate change, risk prevention and disaster resilience enhancement will be promoted.

Slovenia will stablish support points for the transition to a climate-neutral society at regional and local levels. These will use human resources and knowledge of the already existing institutions (e.g. regional energy agencies, regional development agencies) or local energy groups. They will be intended for drafting projects, documentation, consulting, sharing of good practice examples, raising awareness, etc. At the local level, Slovenia will promote education, training and dissemination of information about the transition to a low-carbon society. The circular economy will be systemically promoted through smart and circular communities.

Following the adoption of this Strategy, the ministry responsible for the environment will produce a brief handbook for local communities which will include main orientations and

fields of action for municipalities on the basis of which they will be able to prepare local strategies and plans. The handbook will be amended and updated in accordance with new findings and guidelines.

9.3 Monitoring plan of climate policy implementation

This chapter discusses the monitoring system of climate policy implementation and is not limited to monitoring the implementation of this Strategy.

Slovenia will establish monitoring as a compulsory element in climate policy implementation. The monitoring will serve two purposes:

- a process of ongoing improvements (plan–do–check–act) will be established which will enable the adjustment of measures to changed circumstances and their upgrade if necessary, resulting in a more efficient realisation of the objectives set;
- monitoring will ensure the provision of data on the effects of implementing measures on the reduction of GHG emissions, which is needed for various reporting purposes at the national, European and global levels.

Within the framework of monitoring, various indicators will be used for assessing the attainment of objectives and the effects of implementing climate policy. The indicators will be defined by individual sectors and will be upgraded and supplemented accordingly with additional indicators if necessary. The indicators will be allocated a defined target value. Key indicators for monitoring the implementation of climate policy include:

- annual GHG emissions (kt of CO_2 equivalent) used for monitoring the attainment of the national objective regarding the reduction of GHG emissions by 2030;
- monitoring of sinks and emissions in the ETS sector (emissions outside the national objective);
- amount of financial resources (EUR) earmarked for the implementation of measures to reduce GHG emissions and the reduction in CO_2 emissions (kt of CO_2) thus attained, to be used for monitoring the efficiency of financial resources usage;
- key sectoral indicators IPCC for sectors mitigating climate change: energy supply (transformation), transport, broader use (buildings, other sectors), industry, agriculture, LULUCF and for adaptation.

9.3.1 Monitoring system of climate policy implementation

The monitoring system of climate policy implementation will be established by an authority responsible for climate change in cooperation with the authority responsible for implementation of the comprehensive national energy and climate plan (NECP) and other line ministries by means of a suitable act, which will define their organisation and content in more detail. The system will be incorporated accordingly in the organisational structure for implementing climate policy. Its purpose will not only include monitoring the attainment of objectives from this Strategy, but also monitoring the implementation of climate change as defined in the NECP and other relevant documents. The monitoring system will:

- build on the current experience and content of monitoring the implementation of climate measures. The Climate Mirror will present the basis for monitoring the implementation of climate, energy and other measures for the low-carbon and energy efficiency arrangements;
- be upgraded accordingly for an overall monitoring of implementation of the NECP and other relevant documents in all their aspects;
- introduce monitoring as a process of ongoing improvements and will integrate monitoring in the management or governance of climate policy;
- ensure provision of the data necessary for reporting at the national and international levels.

Within the monitoring system, it will be possible to incorporate all significant stakeholders in

the processes of improvement and upgrade of climate measures as a section of the process of ongoing improvements. Ministries, the Government Office for Development and European Cohesion Policy, the Eco Fund, etc. are responsible for implementing individual measures at the national level, while other authorities include representatives of the expert public, NGOs, etc.

9.3.2 Reporting about climate policy implementation

Reporting on the climate policy implementation and the attainment of objectives will take place at the national and international levels and will be the responsibility of the authority in charge of climate change. The authority competent for climate change will ensure timely and qualitative reporting, which is a significant part of joint global efforts for a long-term reduction of GHG emissions.

Together with the authority responsible for energy (the NECP holder) and at the national level, the authority responsible for climate change will annually draft a report on the implementation of measures for reducing GHG emissions and attaining the climate policy objectives by individual sectors as part of monitoring the NECP implementation. The report's content and deadlines for its preparation will be defined in more detail in the act establishing the monitoring system for the implementation of climate and energy policies. For the field of GHG reduction, the report will include at least the assessment of attaining joint and sectoral objectives, the analysis of implementing measures with the help of indicators, review of instrument implementation, recommendations for improving the implementation of existing measures or the introduction of new ones, including the updated projections of GHG emissions at least biennially.

Participation of the public is possible while the report is being drafted. The National Assembly is informed about the adopted annual report. The adopted annual report is made public.

At the international level, Slovenia is obliged to report to the EC and the United Nations Framework Convention on Climate Change (UNFCCC). The obligations towards the EC currently arise from Regulation (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 the national and Union level relevant to climate change and repealing Decision No 280/2004/EC (hereinafter: Regulation (EU) No 525/2013).As of and including 2021, member states are obliged to report as per Regulation (EU) 2018/1999, which has a reporting format that is almost identical to that of Regulation (EU) No 525/2013.In accordance with Regulation (EU) No 525/2013, Slovenia is obliged to establish a system for reporting measures, orientations and projections which includes institutional, legislative and procedural arrangements. Slovenia has not yet done so, as a contract is concluded for each new reporting. It is mandatory to arrange the foregoing as soon as possible for high-quality reporting. Deadlines within which Slovenia is obliged to report to the EC are:

- emission records: first version of records (15 January) and final version of records (15 March) for the year preceding the previous year and assessment of records for the previous year (31 July);
- report on measures and emission projections: by 15 March every odd-numbered year.

Obligations towards the UNFCCC Secretariat derive from the Convention itself. Deadlines by which Slovenia is obliged to report to the Secretariat are:

- emission records: final version of records for the year preceding the previous year (15 April); this report must also consist of data requested within the framework of Article 7 of the Kyoto Protocol;
- national report on the implementation of commitments from the Convention and the Kyoto Protocol by the end of every fourth odd-numbered year and a biennial report on quantitative objectives and measures for attaining the objectives and on projections by the end of every second odd-numbered year. Reporting will be gradually harmonised

with the Paris Agreement and its content will closely resemble the existing biennial reports.

10 INTERNATIONAL OUTLOOK

10.1 EU

The European Union, of which Slovenia is a member, is striving to become the first climate-neutral continent, and also the leading continent in the fight against climate change at the global level by providing an example and assuming responsibility. To this end, the European Council endorsed the objective of making the EU climate-neutral by 2050 in December 2019 (Decision of the European Council of 12 December 2019).

The vision for a socially just and cost-efficient attainment of net zero GHG emission levels in the EU was presented by the EC in November 2018 in a communication entitled "A clean planet for all: a European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy". In December 2019, the EGD was issued. It consisted of an initial plan for ensuring the compliance of EU policies with the Paris Agreement and the sustainable development goals of the 2030 Agenda, formation of an efficient circular economy, fight against biodiversity loss and conservation of environmental systems. The EC proposal anticipates a just and inclusive transition to carbon neutrality and puts the health and wellbeing of citizens first.

Slovenia welcomes the EGD and assesses that it represents a framework for an overall and ambitious arrangement of the key environmental issues of our time. In the field of climate change, the circular economy and biodiversity, Slovenia has also set itself ambitious objectives.

It commends the integration of an external dimension when realising the EGD as the realisation of the goals of the 2030 Agenda and the Paris Agreement requires a strong response from the EU at the global level. Action relating to the Green Agenda for the Western Balkans is particularly supported and Slovenia will actively participate in its preparation because more attention must be paid to the countries in the immediate vicinity.

Through the Green Diplomacy Network in Brussels, Slovenia is actively involved in discussions on the enhancement of EU climate diplomacy, which focus on the support and persuasion of other countries to assume their share of responsibility for climate change, including within the UNFCCC framework. While noting that climate change has a great impact on water and the water cycle, Slovenia particularly highlights the significance of synergies between water diplomacy and EU climate diplomacy.

10.2 Slovenia’s international activities

The Republic of Slovenia is actively and at the highest levels participating in international activities to fight climate change, in which it represents the vision of climate neutrality by 2050 and immediate action to limit temperature rises to no more than 1.5°C. It supports the work of various international and regional organisations in their fight against climate change and is actively involved in climate negotiations under the auspices of the UNFCCC (conferences of the Parties). It highlights that an approach at the level of the whole of society (international, national, regional and local levels, public and private sectors and civil society) is needed to efficiently deal with the consequences of climate change and a just and inclusive transition to a climate-neutral society. In particular, Slovenia advocates the importance of including the civil society and young people in the formation of climate policies and discussions at the international level.

Special attention is dedicated to intertwining the environment and human rights, links between climate, security, development and the consequences of climate change regarding water. Slovenia stresses that the fight against climate change will only be successful if the transition from a linear to a circular economy is ensured.

Slovenia strives to promote climate and environmental content and the circular economy within the Green Group of six countries (Slovenia, Costa Rica, Singapore, United Arab Emirates, Cape Verde and Iceland), which has been operating since 2009 at Slovenia's initiative. In the light of the growing climate crisis, Slovenia gave new impetus to the work of the Green Group in September 2019.

10.2.1 International initiatives to which Slovenia has acceded

Core Group on Human Rights and the Environment

Together with Costa Rica, Maldives, Morocco and Switzerland, Slovenia is part of the Core Group on Human Rights and the Environment, which operates in Geneva. The group has been operating since 2011 and is striving for the acknowledgement and enhancement of connections between a clean, safe and sustainable environment and the enjoyment of all human rights. The group put forward the Resolution of the UN Human Rights Council on Human Rights and the Environment (at its session in March) and supported the mandate of the Special Rapporteur in this field. The group regularly participates in the work of the UN Human Rights Council with joint statements and at side events.

Group of Friends on Water and Peace

At the initiative of Slovenia, Switzerland, Senegal, Costa Rica and the Geneva Water Hub organisation, the Group of Friends on Water and Peace was established on 14 April 2016. Among four co-chairs, Slovenia assumed the role of chair on 1 January 2020.The group's purpose is to address issues related to water and peace and the challenges and opportunities enabled by water diplomacy and cooperation in the field of water, including promotion of recommendations from the report "A Matter of Survival" of the Global High-Level Panel on Water and Peace chaired by Dr Danilo Türk. The presidency's priorities include water and armed conflicts, water and data, preparations for the 2023 UN Conference on the Water Action Decade and transboundary water cooperation with an emphasis on groundwater.

Green Group

This informal group was established in 2009 at Slovenia's initiative or the initiative of the then Minister of Foreign Affairs and combines six countries at the foreign minister level, i.e. Slovenia, Iceland, Costa Rica, Singapore, United Arab Emirates and Cape Verde. It was founded to promote issues of water, climate change and sustainable development in international relations. Regular meetings took place once a year at the level of foreign ministers, usually on the sidelines of the UN General Assembly's sessions in New York. The group published joint articles and statements and implemented certain activities. The group's operations died down after 2014 but were revived again at the ministerial meeting on the sidelines of the UN General Assembly's session in New York in September 2019. This was followed by a joint statement at COP25 in Madrid in December 2019, a ministerial meeting on the sidelines of the Future Sustainability Summit in Abu Dhabi in January 2020 and a joint statement on the occasions of world water, bees and oceans days and the UN Secretary General's event, "Climate Moment".

Geneva Pledge

Arising from the aforementioned initiative for human rights and the environment, the so-called Geneva Pledge advocates the recognition and enhancement of connections between human rights and climate change. Its signatories, which also include the Republic of Slovenia, have committed to promote the enhancement of synergies between both fields, including through the mutual cooperation of national experts in both fields. The Pledge, the initiators of which

were the Office of the UN High Commissioner for Human Rights and Costa Rica, has so far been endorsed by 33 countries.

Blue Group

The Blue Group (Germany, Spain, France, Slovenia, Croatia, Brazil, Uruguay, Egypt, Bangladesh, Morocco and Maldives) is involved in human rights to clean drinking water and access to sanitation. The group is active in the UN Human Rights Council and other international forums and events addressing issues related to the rights to clean drinking water and sanitation. The Group put forward two resolutions of the UN Human Rights Council and the General Assembly on the rights to drinking water and sanitation.

Group of Friends on Climate Change

This group composed of more than 40 countries was founded at the initiative of France and Morocco within the UN in New York in 2014 as part of preparations for the COP21 Climate Change Conference. The group promotes national ambitions when addressing climate change within the preparations for annual climate negotiations. Slovenia joined this group in October 2019.

At COP24 in Katowice, Poland in December 2018, Slovenia supported the statement of the High Ambition Coalition about the need to step up the climate ambition by 2020 as per the long-term objectives of the Paris Agreement.

Within the Climate Action Summit convened by the UN Secretary-General in September 2019, the Republic of Slovenia joined the youth engagement and public mobilisation coalition led by Ireland and the Marshall Islands. Slovenia engaged in several commitments within the summit: initiative of Greece/UNESCO regarding the impact of climate change on cultural and natural heritage; initiative of Ireland and the Marshall Islands regarding youth engagement and public mobilisation (Kwon Gensh); appeal of Turkey/Kenya/UN-Habitat regarding action at the level of cities; initiative of Spain and Peru regarding the increase in air quality for a better standard of living; initiative of China and New Zealand within the coalition for nature-based solutions (Climate Manifesto).

At COP25 in December 2019, the Republic of Slovenia joined the San Jose Principles for High Ambition and Integrity in International Carbon Markets, which combines 32 climate-ambitious countries advocating an efficient arrangement of rules within Article 6 of the Paris Agreement and the completion of the Rulebook.

The Republic of Slovenia also joined the Declaration on Children, Youth and Climate Action by means of which countries strive for

inclusive and children-friendly climate policies and ensure the participation of young people in decision-making processes relating to climate change at national and global levels.

International Resource Panel (IRP)

Slovenia (i.e. the Ministry of the Environment and Spatial Planning) participates in the Steering Committee of the International Resource Panel, which is one of the most important and renowned global research networks. This expert and scientific forum was established in 2007 within the United Nations Environment Programme (UNEP) with the intention of leading people from overconsumption, waste and ecological damage to a more sustainable future. The panel points to the connection between the exploitation of natural resources and the fight against climate change.

Within the UN Summit on Biodiversity in September 2020, Slovenia acceded to the Leaders' Pledge for Nature initiative.

10.3 International development cooperation and humanitarian assistance of the Republic of Slovenia

Climate change and sustainable development are closely intertwined. Climate change consequences cause increasing inequalities within and between countries and are thus considered the key obstacles to progress in realising the 2030 Agenda. The consequences of climate change are most evident in developing countries. Simultaneously, these countries possess the fewest capacities to tackle the consequences of climate change to their environment and economic and social system. As a developed country, Slovenia is obliged to help developing countries in their social and economic development and provide support when implementing the measures of their climate policy. Furthermore, Slovenia is also obliged to leverage financial assistance for implementation of climate measures in developing partner countries. In doing so, it applies all available modalities and contributes its share to the realisation of the developed countries' commitment adopted at the climate conference in Copenhagen in 2009 to mobilise together USD 100 billion annually from various resources until 2020 and dedicate it as assistance to developing countries when tackling the effects of climate change. Within the framework of the Paris Agreement, this commitment was further upgraded with the commitment that this assistance will be further intensified in the coming years.

In accordance with international commitments, Slovenia will strive to increase official development aid to 0.33 per cent by 2030.By putting climate measures to the forefront of Slovenia's international development cooperation, the scope of the so-called climate financing will gradually increase, and Slovenia will ensure the meeting of international commitments particularly with the suitable mobilisation of earmarked funds from the Climate Change Fund.

10.4 Human rights and the environment

Slovenia strives for the international proclamation of the right to a healthy living environment, which is laid down in Article 72 of the Constitution of the Republic of Slovenia. The Republic of Slovenia has already entered the right to drinking water in its Constitution, and this field is governed by the Environmental Protection Act. The human right to a healthy environment means that the objectives and measures observe an individual's right to live in a healthy, clean, safe and sustainable environment. Today, this right is recognised in various forms in numerous countries and the highest UN representatives are also striving for its proclamation at the global level.

11 IMPACT ASSESSMENT OF THE SOCIO-ECONOMIC ASPECTS

The impact assessment of the socio-economic aspects will only be prepared by 2030.The GreenMod Slovenia model was used for the assessment of macroeconomic and sectoral effects of scenarios for implementing measures in Slovenia until 2030. GreenMod Slovenia is the first energy CGE model designed especially for Slovenia. Its functioning and initial results are considered a technical basis for adjusting and upgrading the model in the future, particularly in the sense of replacing or introducing new energy resources and economic instruments for attaining emission objectives and the testing of various scenarios or the evaluation of specific projects (a detailed description of the model is to be found in expert bases).

The macroeconomic effects of scenarios with additional measures (moderate – WEM and ambitious – WAM) by 2050 and the effects by individual sectors were assessed consistently. Below, we provide the results of simulations of macroeconomic and sectoral effects by 2030, whereby the results for the WAM scenario comply with the NECP scenario.

- Additional energy investments increase energy efficiency and thus lower the

consumption of energy inputs per production unit in individual economic activities or reduce final energy consumption in households. Lower input costs have a beneficial effect on the growth in workforce demand, unemployment rate reduction and production growth. The final impact on consumer prices is positive as these are expected to drop somewhat as per the WOM scenario (by –0.2 per cent in the WEM scenario in 2030 and by –0.3 per cent in the WAM scenario). An increase in disposable income of households is reflected in higher final private consumption. In the WEM scenario, the latter is higher by 0.4 per cent in 2021 and by 1.5 per cent in 2030 if compared to the scenario with no additional measures. In the WAM scenario, private consumption is higher by 0.9 per cent in 2021 and by 2.2 per cent in 2030 if compared to private consumption in the WOM scenario.

The positive effects of additional measures are also reflected in increased savings by companies and households with a simultaneous reduction in the current budget deficit of the state, which will increase its revenue due to enhanced economic activity. Increased total savings are reflected in higher total gross investment, which is said to be higher by 2.8 per cent in 2021 and by 1.1 per cent in 2030 in the WOM scenario; in the WAM scenario, it is anticipated to be higher by 4.5 per cent in 2021 and by 4.0 per cent in 2030 in accordance with investment in the WOM scenario.

Increased economic activity is followed accordingly by employment in the Slovenian business sector, which is higher by 0.4 per cent in 2021 and by 1.5 per cent in 2030 as per the WEM scenario than in the WOM scenario. The WAM scenario displays a 0.7- and 1.4-per cent increase respectively. Changed investment structure also affects the change in production structure of the Slovenian business sector, which will be evident most significantly after 2030.

Increased energy efficiency and subsequent lower consumption of energy inputs impact the increase in international competitiveness of domestic production and higher increase in exports (the WEM scenario: by 0.37 per cent in 2021 as per the WOM scenario and by 0.6 per cent in 2030; the WAM scenario: by 0.8 per cent in 2021 as per the WOM scenario and by 1.2 per cent in 2030) if compared to imports (which is in the WAM scenario higher by 0.5 per cent after 2021 as per the WOM scenario in an individual year up to 2030 and by 0.2 per cent in the WEM scenario).

Positive results of the additional measures planned within both scenarios with additional measures are finally reflected in an increased GDP. As per the WEM scenario, GDP is said to be higher by 1.2 per cent in 2021 if compared to the WOM scenario, and by 1.1 per cent in 2030. As per the WAM scenario, GDP is said to be higher by 1.8 per cent in 2021 if compared to GDP in the WOM scenario, and by 2.1 per cent in 2030.

- Both scenarios with additional measures have an unfavourable effect on real household disposable income in the first quintile group. With such a policy, it would be sensible to adopt suitable mitigation measures for the 20 per cent of households with the lowest income. Despite the foregoing, it must also be highlighted that real household consumption through all quintile groups does not decrease in the scenarios with additional measures.

- Sectoral effects are oriented in the same direction for both scenarios (WAM and WEM); the only difference is that the effects as per the WAM scenario are stronger or the magnitude of change is somewhat larger. With regard to specific activities, we assess that the chemical industry, manufacture of non-metallic mineral products and other mostly non-energy intensive activities would not suffer a deterioration of their competitive situation due to additional measures despite a price increase. Competitiveness of the paper industry worsens despite the lower cost of capital and subsequent increase in capital demand in the paper industry relatively as per the price and demand in the WOM scenario. The situation in the manufacture of coke and refined petroleum products is quite similar.

- It is assessed that the supply of, and demand for, chemical products, non-metallic

mineral products, metal products and products from non-energy intensive activities would not decrease relatively due to additional measures, and neither would their foreign trade. This applies to both scenarios with additional measures. Quite the opposite applies to the supply of, and demand for, coke, refined petroleum products and paper.

From the aspect of a fair transition to a climate-neutral society, the WAM scenario is (after 2022) and the WEM scenario is (throughout) unfavourable for the 20 per cent of households with the lowest income (and only the WEM scenario for the second quintile group from 2024 onwards), which is why Slovenia will adopt mitigation measures for them (see chapter 8.2.4.3). If we decide to increase tax on fossil fuels in order to reduce emissions despite an increase in economic welfare in scenarios with additional measures, it would be sensible to combine this financial instrument with the application of a tax revenue to reduce the rate of social security contributions or with an increase in household social benefits.

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