Republic of North Macedonia

Ministry of Environment and Physical Planning

LONG-TERM STRATEGY ON CLIMATE ACTION AND ACTION PLAN

CONTENTS

EXECUTIVE SUMMARY

The Paris Agreement requires all countries to be part of the global effort to achieve the goal of limiting global temperature increase by 1.5-2ºC. This requires global net zero emissions to be reached by the middle of the 21st century.

As a candidate for European Union (EU) membership, the Republic of North Macedonia is obliged to transpose the EU legal framework into its national legal system, namely the 2030 Climate and Energy Framework and the 2050 Long-term Strategy / European Green Deal.

This Strategy defines contribution of the country to the global effort, through a pathway towards green, low carbon and climate resilient development, based on the best available information and in the context of the country's accession to the EU.

Addressing climate change requires a set of policies and measures across a wide spectrum of policy sectors, each with a precise contribution to the overall achievement of the national climate commitments. It is therefore fundamental that the vision and objectives of this strategy are mainstreamed in the agendas of line ministries and that they permeate to the relevant sectoral policies, through enhanced horizontal policy coordination. This coordination imperative is valid to both emissions reduction (mitigation) and to reduced vulnerability to impacts of climate change (adaptation) and is required at national level, but also at different levels of administration, namely at local self-government level.

A Long-term Vision

The Republic of North Macedonia is, by 2050, a prosperous, low carbon economy, following sustainable and climate resilient development pathways, enhancing competitiveness and promoting social cohesion through action to combat climate change and its impacts.

A long-term objective quantifying North Macedonia's contribution to the global effort

Reduction of national net GHG emissions (including Forestry and Other Land Use and excluding MEMO items*) of 72% by 2050 compared to 1990 levels (or GHG emission reduction of 42% by 2050 compared to 1990, excluding FOLU and MEMO items) and increased resilience of North Macedonia's society, economy and ecosystems to the impacts of climate change.

* MEMO items include emissions from aviation and electricity import

Specific objectives

Based on current sectoral greenhouse gas emissions and available measures and technologies, the contribution of each sector to the achievement of the overall national target, is defined through the adoption of the following sectoral GHG emissions reductions or limitations objectives to be achieved by 2050 compared to 1990:

- Energy sector: -64% (excluding MEMO items)

- Industrial Process and Product Use sector: +153%
- Agriculture sector: -34%
- Carbon sink in forests and other land uses: +1733% *
- Waste sector: -2%

Reducing Republic of North Macedonia's vulnerability to climate change impacts will require the definition and implementation of measures related to nearly every aspect of policy, including sectors as diverse as human health, cultural heritage and biodiversity. This strategy lays the ground for the immediate and urgent work required to address key technical barriers previously identified and to prepare a detailed cross-sectoral National Adaptation Plan (NAP), which will lay the grounds for international cooperation on the matter and set the country on course to a climate resilient sustainable development. The following objectives related to adaptation to climate change impacts are defined:

- Build solid systems for the regular and periodic collection data for the production and dissemination of scientific and technical knowledge
- Increase the resilience of climate change impacts of key socio-economic sectors and ecosystems

An additional cross-cutting objective to promote the green transition through capacity building, education, training for new skills and awareness rising is also defined.

Costs and Impacts

The implementation of the measures needed to meet the emissions reduction objectives will require cumulative capital investments of €35 billion in the period 2020-2050 (compared to €19 billion in the With Existing Measures (Reference) – WEM Scenario). The total energy system costs are €121billion for the same period, which represent an

Measures to achieve emissions reductions

Introduction of CO2 tax
Reduction of network losses
Large hydropower plants
Incentives feed-in tariff
Incentives feed-in premium
Biomass power plants (CHP optional)
Solar rooftop power plants
RES without incentives
Energy efficiency obligation schemes
Solar thermal collectors
Labelling of electric appliances and equipment
Increased use of heat pumps
Public awareness campaigns and network of EE info centres (Including Cost of investment in advanced technologies)
Retrofitting of existing residential, commercial, central government, and local self-government buildings
Construction of new buildings (at least class C)
Construction of passive buildings
Phasing out of incandescent lights
Improvement of the street lighting in the municipalities
Green procurements
Increased use of central heating systems
Energy management in manufacturing industries
Introduction of efficient electric motors
Introduction of more advanced technologies
Increased use of the railway
Renewing of the national car fleet
Renewing of other national road fleet
Advanced mobility (walking, cycling and electric scooters)
Construction of the railway to the Republic of Bulgaria
Electrification of the transport
Reduction of CH4 emissions from enteric fermentation in dairy cows by 3%
Reduction of N2O emissions from manure management in dairy cows by 20%
Reduction of NO2 emissions from manure management in swine farms by 13%
Reduction of N2O emissions from manure in dairy cows by 20% for farms below 50 Livestock Units
Establishing integrated management of forest fires
Afforestation
Conversion of land use of field crops above 15% inclination
Contour cultivation on areas under field crops on inclined terrains (5-15%)
Perennial grass in orchard and vineyards on inclined terrains (>5%)
Use of biochar for carbon sink on agricultural land
Photovoltaic irrigation
Landfill gas flaring
Mechanical and biological treatment (MBT) in new landfills with composting
Selection of waste - paper
Improved waste and materials management at industrial facilities

* The dramatic increase of the carbon sinks is owned to the extremely low level of carbon sinks in the reference year 1990. The reason behind the low level of carbon sinks in 1990 is statistical inconsistency in the reporting of the forest area for the year 1990 and the lack of other official national data regarding forests land for that specific year. The estimated carbon sinks for 2050 are on level very close to the reported sinks of the FOLU sector in the year 2016.

economy wide cost reduction of €16 billion compared to the WEM Scenario.

€	Investments (Bill. EUR) – 2020-2050	**35**
	Total system costs – Energy (Bill. EUR) – 2020-2050	**121**

Investment and Energy System Costs in the WAM Scenario

These investments create the highest number of green jobs in 2035: 10,000 green jobs, which represents 2.7 times more jobs than the current number of employees in the coal power plants in Republic of North MAcedonia.

Enabling environment for climate investments

The transition to a low carbon development will require a significant convergence of financial flows to green technologies and an immediate moratorium on brown technologies that may lock the country in a carbon intensive pathway for decades. There's an established consensus that the later the enabling environment for climate investments is set, the more expensive the transition will become.

Most of the measures are planned to be implemented by consumers, which makes them the largest investors, as such, these investments should be largely supported and encouraged by the central and local government.

Private investors (private and state-owned companies) also play an important role in this process of transition (mainly for construction of RES capacities), for which it is necessary to create sustainable policies and a stable investment climate.

Contribution to key Sustainable Development Goals

The implementation of this strategy will align Republic of North Macedonia with the Sustainable Development Goal (SDG) 13 – Take urgent action to combat climate change and its impacts. The implementation of the measures included in the WAM scenario for mitigation, will align key indicators for Republic of North Macedonia (such as emissions per capita and per unit of GDP), with those of neighbouring EU Member States. Additionally, this strategy is also directly contributing to SGD 7 – Ensure access to affordable, reliable, sustainable and modern energy for all, which is supported by the indicator Share of renewable energy sources in gross final consumption, which shows an increase from 23% in 2020 to 49% in 2050 in the WAM scenario.

Horizontal coordination for a successful implementation of the Strategy

The implementation of the policies and measures foreseen under this Strategy require comprehensive policy planning, coordination and implementation processes. This must be enabled by a comprehensive legal basis and legally established coordination instruments to facilitate cross-sectoral policy design and implementation, as well as mechanisms to monitor the implementation of the foreseen policies and measures. The draft Law on Climate Action provides an enabling environment for overarching policy coordination processes, and defines the legal mechanism for monitoring progress towards the achievement of the national sustainable development pathway.

Measures to achieve adaptation objective

Pilot project for the collection of data on water use in rural context for the purpose of ensuring effective adaptation to climate change

Promote Cooperation Among Scientific Institutions and Enhance the Science-Policy-Implementers Link

Define and develop an indicator system to monitor the impacts of climate change on biodiversity

Define a national research plan for biodiversity (including agrobiodiversity) and climate change

Restore and improve the system for the collection of air-climate-health data, including the platform for sharing it with the public (integrated system for weather extremes, air quality and human morbidity and mortality)

Define and develop a system to monitor socio-economic vulnerability to climate change

Prepare the National Adaptation Plan

The capacity need assessment* has also demonstrated that all line ministries need capacities and knowledge to be fully capable to integrate climate change aspects into their sectoral plans and programs. This means that climate consideration should be brought higher on the political agenda of the Government in order for the country to allocate resources to engage additional human capacities at all levels.

In addition, it is fundamental to mainstream climate change related aspects into future national strategic planning documents related to education, R&D, and innovation. The most important national strategic documents that should integrate climate related aspects are the future National Strategy for Education and the National Innovation Strategy. This will assure the systematic and harmonised integration of climate related aspects into the national educational, R&D, and innovation ecosystem, as well as increase educational and research capacities, and climate awareness among the general public.

Way forward

The adoption of this Strategy should mark a turning point for Republic of North Macedonia, with the country embarking on its pathway towards a low carbon, climate resilient sustainable development. This Strategy provides for a set of concrete measures aimed at achieving such results, but in particular, provides for a vision of the country's future, which should inspire and shape policy development across the many different relevant key sectors. In addition, policy makers need to recognize that despite the recent economic recession caused by the COVID-19 pandemic, investing in climate action is rather a need than a luxury. Several other countries have already prepared their economic recovery plans and the international community advocates these plans should consider climate action as a building block for sustainable economic development. Considering national circumstances, it can be concluded that the implementation of the Long-term Strategy on Climate Action would facilitate the recovery of some of the main economic sectors including services, tourism, construction and energy, and, at the same time, create new job opportunities. In addition, investing in resilience and building adaptation capacities is crucial for dealing with the adverse effects of climate change and developing an enabling and sustainable environment for investments and economic development.

The Long-term Strategy on Climate Action supports the sustainable economic recovery of the country and the policies and measures foreseen under the Strategy can be used as a steering wheel for investments and financial injections for the private and public sectors, which would ultimately bring economic, environmental and social benefits, and enable sustainable development in the country.

Taking this development pathway grants the people of the Republic of North Macedonia with cleaner air and a healthier environment, as well as greater reliance on climate as we now know it. This national effort, taken in tandem and in cooperation with our closest allies in the region, in the European Union and at the United Nations, should collectively lead us to a limitation of global temperature as established in the Paris Agreement.

* Report on institutional analysis and assessment of administrative capacity needs for climate action.

1. INTRODUCTION

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According to the World Meteorological Organisation, the global average temperature in 2019 was 1.1 degrees Celsius above the pre-industrial period, while the average temperatures for the five-year (2015-2019) and ten-year (2010-2019) periods are the highest on record. The current international commitments are insufficient to reduce the climate polluting emissions and address the temperature increase, so the projected global GHG emissions in 2030 are estimated to be twice what they should be to reach the global goal.

The EU has recognised that the current global efforts are insufficient to meet the GHG reduction targets and in November 2019 the Parliament declared a climate emergency asking the Commission to adapt all its proposals in line with a 1.5 °C target for limiting global warming and ensure that greenhouse gases emissions are significantly reduced. As a response, the European Commission has presented the Green Deal which is a roadmap for climate-neutrality of Europe by 2050. The European Green Deal has gained huge global attention as a ground-breaking initiative which should demonstrate that climate neutrality and the sustainable economic development can go hand by hand and can bring significant progress and benefits to the society and to the economy.

The 2020 global COVID-19 pandemic has brought additional challenges to Europe and to the rest of the world. Faced with the reduction of the economic activities and disturbed financial markets, the EU leaders are standing in front of another challenge, to set up a Green Deal which will respond to the social and economic crisis while transforming Europe into a sustainable and climate neutral economy. For that purpose, in April 2020, the European Parliament called to include the European Green Deal in the recovery program from the pandemic. Currently, the EU Member States are developing recovery plans as part of their existing strategies to address the COVID-19 pandemic, where the transition to a digital and carbon neutral economy are at the core.

As a candidate for European Union (EU) membership, the Republic of North Macedonia is obliged to transpose the EU legal framework into its national legal system. Although the country is small in terms of population and has a low impact on the global GHG emissions, the Government has recognized the importance of climate action and the need for the establishment of comprehensive climate policy aligned with the EU acquis to enable future sustainable development in the country.

In line with the main drivers of national GDP, the national Energy sector is by far the largest contributor to national greenhouse gas (GHG) emissions. This is owed to the fact that the national Energy sector is based on fossil fuels, primarily domestic coal – lignite is the main national resource for the production of electricity. The electric power generation capacity in Republic of North Macedonia in 2018 mainly consisted of two thermal power plants with a total of 824 megawatts (MW) installed capacity; eight large hydropower plants with 556.8 MW installed capacity; 96 small hydropower plants with 106.32 MW installed capacity; one wind power plant with installed capacity of 36.8 MW; and three Combined Heat and Power (CHP) plants with 287 MW installed capacity.

According to the latest national GHG inventory developed in the framework of the Third Biennial Update Report, the GHG emissions of 2016 are reduced by 34.6% compared to the emissions of 1990. The decrease was induced by the reduced electricity production from domestic lignite, the fuel switch (increased used of the natural gas), decreased industrial production, as well as the difference between the carbon sinks from the forestry sector due to the inconsistency in the statistical representation of the forest land and forest disturbances for the year 1990.

Republic of North Macedonia is a party of the United Nation Framework Convention on Climate Change (UNFCCC or Convention) (Official Gazette – 61/97), ratified the Kyoto Protocol (Official Gazette – 49/04) and its Doha Amendment (2019) and has associated itself with the Copenhagen Accord (2009). Republic of North Macedonia has signed (2015) and ratified (2017) the Paris Agreement. Under the Paris Agreement, the country became the twenty-third in the world to submit its Intended Nationally Determined Contribution for Climate Change (INDC) as per the Decision of the Government No. 42-17/91 of 28 July 2015. The country has developed three national communications and three biennial update reports, and it counts with extensive national expertise for reporting towards the UNFCCC. Furthermore, the country has adopted an enhanced Nationally Determined Contribution (eNDC) in April 2021.

The country is also a contracting Party of the Energy Community, which is rapidly advancing the implementation of EU regulations for energy governance and integrated climate and energy planning. In July 2020, the Republic of North Macedonia has finalised its National Energy and Climate Plan.

The Agenda 2030, the Paris Agreement and the forthcoming EU Green Deal on climate change require a transformational shift of the economy and society towards climate resilient and sustainable development. The current institutional capacities for climate mainstreaming in the country are low, and significant effort is required to establish the national system for climate action in the country. This refers not only to the national legal framework and institutional capacities, but also to a comprehensive enabling environment for climate action, to the allocation of public and private funding, and to public participation and education.

The Law on Climate Action (Law or LCA) is expected to set a profound change in the climate capacities of the country, as well as to enhance cross-sectoral policy coordination and climate mainstreaming in the country. However, the draft Law itself is not designed to be a tool for climate action, and additional planning documents are needed for cross sectoral and economy wide climate related actions.

The Project has also prepared an Action Plan for the 1st Stage of Implementation of the Strategy and Law (Action Plan). The Action Plan covers the period 2021-2030, contains all the measures envisaged in this Long-term Strategy on Climate Action (Strategy), plus measures for administrative and legal strengthening. Each measure envisages a period of implementation, indicators, budget, implementation powers and stakeholders.

This Strategy and its Action Plan will support the on-going process to climate action and climate resilience of the country. Moreover, the aim of the Strategy is to support the sustainable development of the country, to define the benefits and the co—benefits of the climate action, as well as to define the cost of transition and the necessary steps to meet the sustainable development pathway of the EU. The long-term objective of the Strategy is to serve as a basis for cross sectoral policy planning in the country, as well as to raise the climate awareness of all relevant stakeholders, starting from the national and the local authorities, the business sector, the academia, as well as the general public.

However, this Strategy is only the first milestone towards the transitional change required in every home, community, workplace, business and farm in the country. Moreover, the whole system for the provision of goods and services to the citizens – energy, transport, telecommunication, public service, and waste management will have to react quickly and adapt accordingly.

It is worth to be mentioned that the Strategy follows the requirements for minimum content of the Long term strategic planning for climate action as determined in the EU Energy Governance Regulation, contained in Annex 4 of the Energy Governance Regulation with enhanced chapters on Cross-sectoral aspects, Education, awareness raising, R&D and innovation, Key indicators and Institutional framework and modalities for implementation of the Strategy.

The adaptation measures contained in this Strategy are limited and mainly aimed at addressing the key barriers and gaps identified in the Third National Communication. The reason for this is the fact that the Strategy and its Action Plan would focus on climate change mitigation measures and policies, while the National Adaptation Plan (NAP), which is currently in final phase of application for funding by the Green Climate Fund, will focus on comprehensive adaptation policies and measures. In addition to this, sectoral adopted strategies in the fields of biodiversity and nature protection address climate adaptation measures, while the vulnerability assessments are already addressed in the national communications developed so far (water resources, agriculture, forestry, biodiversity, nature protection, tourism, cultural heritage).

The preparation of River Basin Management Plans is already an established legal obligation, and in accordance with the latest decisions at EU level to incorporate climate aspects into such plans, they will be implemented in the development of new or updated river basin management plans.

Taking all of this into account, the scope of the Adaptation chapter within the long term strategy, as decided by the PSC, is focused on addressing of key barriers and gaps and providing an enabling environment for further climate adaptation.

2. LEGAL AND POLICY CONTEXT

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2.1 Climate change mitigation policy framework

2.1.1 International policy framework

Republic of North Macedonia ratified the UNFCCC on the 28th of January 1998, and the Paris Agreement on the 9th of January 2018. Republic of North Macedonia has committed, under the Paris Agreement, throughout its first NDC submitted on 4th August 2015, to 'reduce the CO_2 emissions from fossil fuels combustion for 30%, that is, for 36% at a higher level of ambition, by 2030 compared to the business as usual (BAU) scenario.' Carbon dioxide (CO_2) emissions from fossil fuels combustion cover almost 80% of the total GHG emissions in the country with a dominant share of the following sectors: energy supply, buildings and transport. In the enhanced NDC submitted in 2021, the government has increased its ambition to 'reduce greenhouse gas emissions in 2030 by 51% compared to 1990 levels, resulting in an 82% reduction of net emissions in 2030 compared to 1990 levels'.

Up to now, climate change related activities in the country were mostly analysed and described under the national communications and Biennial Update Reports (BUR), as the reporting obligations of Republic of North Macedonia to the UNFCCC. However, the Paris Agreement establishes a new Enhanced Transparency Framework (ETF) providing for the reporting and review of information on GHG emissions; on progress made to implement and achieve the NDC (mitigation); on impacts and adaptation; and technology, capacity and financial support needed and received (or, were applicable provided and mobilized). Parties are now actively engaged in establishing the necessary arrangements to implement the ETF which will enhance the current measurement, reporting and verification system under the Convention and the Kyoto Protocol. With implementation of the Paris Agreement, Parties will be required to submit a Biennial Transparency Report (BTR) that contains a national GHG inventory and the information necessary to track progress made in implementing and achieving their NDCs. Each Party will also have to identify the relevant indicator(s) it will use to track progress made in implementing and achieving its NDC. All these new monitoring and reporting requirements, the 1st Global Stocktake in 2023, and the requirement for Parties to produce successive NDCs every five years (with each one being a 'progression' on the previous one), stipulates the need for the preparation of a national long-term strategic framework with a relevant climate change legal package to meet the long-term objective of the Paris Agreement.

Furthermore, the process of EU integration and approximation of national legislation with the EU climate acquis speeded up the development of the relevant climate legal framework which is to some extent transposing the EU climate legislation† providing, among else, a legal basis for development and updates of low-carbon development strategies that includes adaptation to climate change, monitoring, reporting of the GHG emissions and implementation of climate policies and measures.

However, as identified in the process of development of the third Biennial Update Report, there is still a lack of adequate mechanisms and instruments in place, especially financial ones (such as carbon taxation), as well as capacity constraints for fostering low carbon and climate resilient development.

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* Additional chapter on current situation regarding the GHG emission trends could be added, if needed, as a sub-chapter or self-standing chapter addressing historical trends of the GHG emissions in North Macedonia.

† Directive 2003/87/EC establishing a system for greenhouse gas emission allowance trading (EU-ETS); Decision 406/2009/EC-Effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments; Regulation 525/2013/EC on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change.

2.1.2 National policy framework for climate mitigation

The MoEPP is the body of the state administration responsible for climate change policymaking, a focal point for the UNFCCC and a nationally designated entity for the Kyoto Protocol.

The Office of the Deputy Prime Minister for Economic Affairs is responsible for the achievement of the Sustainable Development Goals, and a National Designated Entity for the Green Climate Fund (GCF).

Other ministries responsible for climate related issues are:

- Ministry of Economy, which is the body of the state administration responsible for the following climate related policies:
    - energy policy including the investments in the energy sector, fossil fuels, energy efficiency and renewable energy sources;
    - internal market policies under which the standards and policies for road transport vehicles and the technical conformity are regulated;
    - mining policies and geological aspects; and
    - industrial and investments policies.
- Ministry of Agriculture, Forestry and Water Economy, responsible for the design and implementation of agricultural and forestry related policies, as well as for economic use of the water resources.
- Ministry of Transport and Communications, responsible for transportation licences for freight and passenger transport, aviation activities and railways. In addition, this Ministry is responsible for physical planning and the management of construction land.
- Ministry of Health, responsible for public health policy. Its relevant areas of responsibility include the quality of water used for drinking, chemicals management and medical waste management. Its Institute of Public Health has a Department of Environmental Health, which gathers data from the 10 regional centres of public health, monitors and evaluates the environmental and climate health risks, identifies the priority issues and potential risk to health conditions at the national level and informs the Ministry of Health.
- Ministry of Finance, which manages the Treasury Single Account, receives all revenues and from which all payments are made on behalf of budget users at the central and local government levels.
- Energy and Water Services Regulatory Commission, which sets energy and water supply tariffs and tariffs for sewerage and wastewater treatment services.
- Local Self Governmental Units that organise the municipal utility services (such as waste collection and disposal, water supply and sewerage). These Units also determine the charges for waste services.

The National Climate Change Committee (NCCC) was established as an intergovernmental body to provide support and guidance for the overall climate change policies in the country. It was comprised of key stakeholder representatives from national institutions, academic institutions, the private sector and civil society, and of climate change coordinators appointed by ministries. The draft Law on Climate Change envisages the establishment of a National Climate Change Committee as a technical support body, or a National Climate Change Council as a political body as a second option, thus providing a legal basis for the work of the National Climate Committee or National Climate Council and enhanced climate coordination in the country.

The National Council for Sustainable Development (NSSD) was established in 2010 as an advisory body to the Government with a mission to create and maintain conditions for the implementation of the ‘National Strategy for Sustainable Development’ which provides guidance and roadmap for balanced economic, social and environmental development of the country in order to integrate into the EU.

The NCSD is chaired by the Deputy Prime Minister of Republic of North Macedonia in charge of economic affairs and coordination of economic sectors and includes representatives from all relevant ministries,

municipal executives, as well as representatives from academia and the private sector. The main task of the NSSD is to ensure compliance in the implementation and monitoring of the national Strategy for Sustainable Development, as well as the implementation of the United Nations Sustainable Development Goals in the country, through programs for sustainable development of individual Ministries.

The implementation of the SDGs in the Republic of Republic of North Macedonia is coordinated and monitored through the mechanism with the Technical Working Groups (TWGs) established in the National Council for Sustainable Development.

The main legal basis for climate change policymaking in Republic of North Macedonia currently is the Law on Environment (2005), where Article 187 refers to the National Plan for Climate Change Mitigation, and Article 188 refers to the National Inventory of GHG Emissions.

The draft LCA has been finalised and submitted to the Project Beneficiary in September 2020.

***Other policy documents that consider climate change mitigation aspects**:*

- National Energy and Climate Plan (drafted in July 2020 and expected to be adopted by the end of 2020);
- The Strategy for Energy Development of the Republic of Republic of North Macedonia until 2040 (adopted in December 2019);
- Law on Energy;
- Energy Efficiency Law compliant with Directive EU/2012/27 on energy efficiency and Energy Performance of Buildings Directive 2010/31/EU, Regulation on Labelling of energy-related products 2010/30/EU and Directive on Eco-design of energy related products 2009/125/EC;
- Bylaws for renewable energy;
- National strategy for sustainable development 2009-2030;
- Draft National transport strategy 2018-2030;
- National strategy for agriculture and rural development for the period 2014-2020;
- National strategy on water resource management;
- Law on water resource management;
- Waste management strategy 2008-2012;
- Law on waste management;
- Skopje Sustainable Energy Action Plan; and
- Resilient Skopje – Climate Change Strategy.

The country does not have a National adaptation strategy. The development of a National adaptation strategy will be initiated next year in the framework of a project implemented by UNDP.

The most relevant Strategic documents for the Long-term Strategy on Climate Action are the Strategy for Energy Development of the Republic of Republic of North Macedonia until 2040 and the Draft National Energy and Climate Plan. The Energy Development Strategy elaborates three different scenarios: reference (business as usual), moderate transition, and green (strong decarbonisation) scenario. The moderate transition and green scenario both foresee coal phase-out in 2025 which makes it the first country in the Western Balkans to layout concrete options for a pre-2030 coal phase-out. The Energy Strategy sees the green scenario as the ‘least cost option’ and this scenario was taken into consideration in the draft NECP, which should be considered as an instrument for implementation of the energy and the climate related policies in the country.

2.2 Climate change adaptation

Republic of North Macedonia is characterized by a variable climate, which combined with higher temperatures and extreme weather events (such as droughts, floods, heat waves and storms); fuelled by climate change, make it one of the most vulnerable countries in the world. Such vulnerability to climate change is exacerbated by the country's specificities, namely being landlocked; the diversity of the biomes (eight distinct ones), the geography including tall mountains and deep valleys; four main river basins and three large natural lakes.

From a socio-economic perspective, the country also shows high vulnerability, due to the relatively high, although decreasing, unemployment rates, in particular among the women and youngest, and a still relatively high share of population employed in the agriculture sector, itself extremely vulnerable to climate variability and climate change. Nonetheless, despite relatively low compared to neighbouring countries, including EU Member States, Republic of North Macedonia's GDP has been showing an increasing trend in the most recent decades, thus contributing to an increase in the capacity to adapt to the impacts of climate change.

Cognisant of such vulnerability, Republic of North Macedonia has been making significant efforts in ensuring that the best scientific and technical knowledge is available for an adequate and science-based policy decision making. In fact, Republic of North Macedonia has a wealth of information on climate impacts, vulnerabilities, and adaptation options, which is, to a great extent, reflected in the country's official national communications to the UNFCCC.

Very importantly, this scientific knowledge includes detailed analysis of current climate and of climate change scenarios. The climate scenario analysis performed in the scope of the preparation of the Fourth National Communication to the UNFCCC shows that 'Macedonia will face a hotter and drier climate in the future. The amplitude of this change will primarily be related to the future concentration of GHG. Associated with hotter climate in future, increase in hot extremes and decrease in cold extremes is expected. Despite drier condition being expected on average on annual level, analysis reveals potential increase in daily extreme precipitation that will introduce higher risk of flash floods. On the other hand, expected decrease in summer precipitation and extension in duration of consecutive dry days will increase the risk of drought. Finally, due to warmer climate, in general, the (agriculture) growing season length is expected to increase.

Predicted droughts and higher average temperatures pose risks that could lead to a reduction of the national water resources, and these should be taken into account when projecting the national hydropower potential.

The climate scenarios analysis covers the period from 2006 to 2100 and all changes are presented with respect to the reference period 1986-2005. According to the results, it is expected that temperature increase will continue in the future. The expected temperature increases for the middle of the century are 1ºC, 2ºC and 2.5ºC for *low*, *mid* and *high* scenario respectively. For the near future (period 2016-2035), for all three scenarios, the, expected increase of temperature is about 1ºC, compared to temperature in the reference period. The temperature increases are expected to be more significant in the summer months than in the winter months, and in some regions of the country more than in others.

The analysis of precipitation shows more complex patterns of change in comparison to temperature. In the case of the *low* scenario, there is no clear signal of precipitation change in the future, except precipitation increase during the September-October-November season. For the other two scenarios, annual precipitation decrease is expected, mainly driven by significant decrease in summer precipitation.

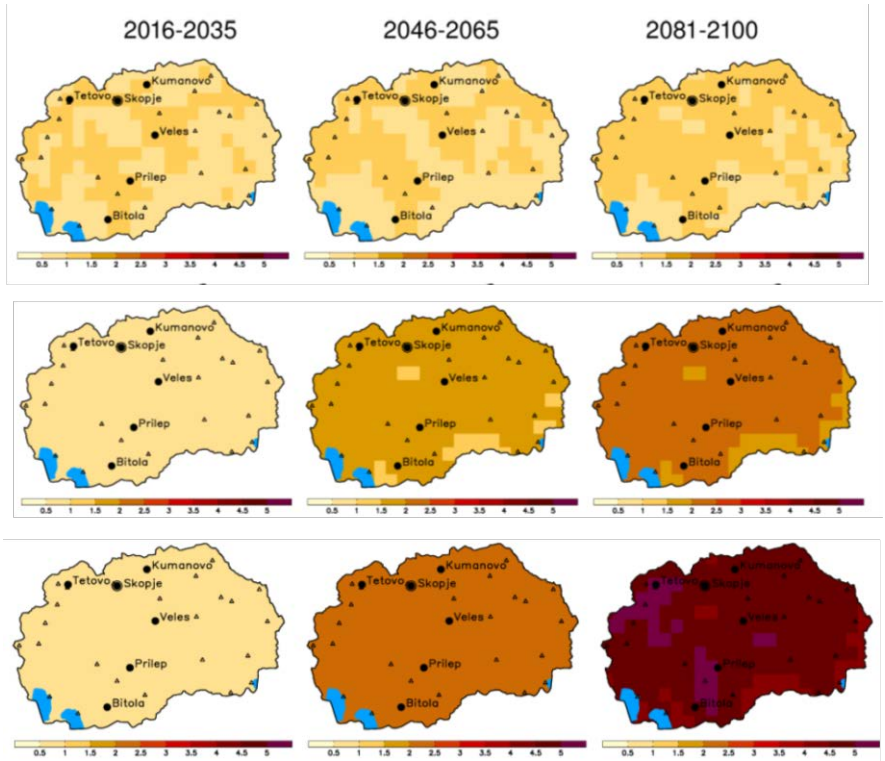


Figure 1 – Future daily mean temperature change, for three future periods, 2016-2035, 2046-2065 and 2081-2100 with respect to the period 1986-2005 for the low, mid and high scenarios (top, middle and bottom respectively).

Source: Adapted from the *Report on climate change projections and changes in climate extremes for the Republic of Republic of North Macedonia* (Project Fourth National Communication and Third Biennial Update Report on Climate Change under the UNFCCC)

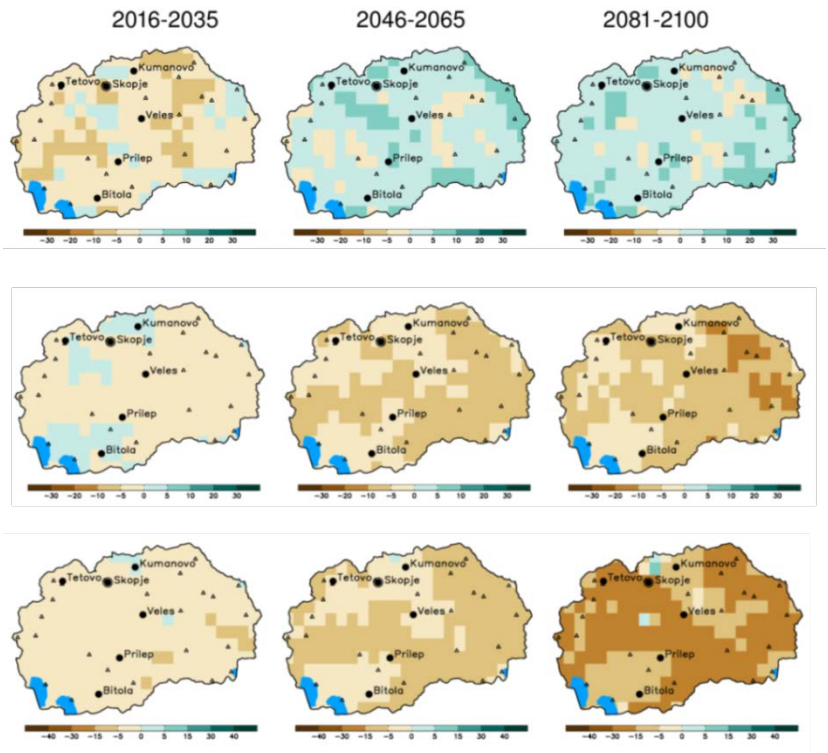


Figure 2 Future precipitation change, for three future periods, 2016-2035, 2046-2065 and 2081-2100 with respect to the period 1986-2005 for the low, mid and high scenarios (top, middle and bottom respectively).*

Given the climate variability and the information related to future climate change scenarios, Republic of North Macedonia has enacted specific sectoral policies which address some of the most important impacts of climate change in the country.

For the biodiversity sector, the National Biodiversity Strategy and Action Plan for the period 2018-2023, the National Strategy for Nature Protection (2017-2027) and the Nature Conservation Strategy have been adopted. These documents include measures to specifically promote adaptation to climate change. In the human health sector, Republic of North Macedonia leads in terms of preparedness to address extreme heat and cold, through the implementation of the National Climate Change Health Adaptation Strategy and the respective Heat Wave and Cold Weather action plans

For the remaining relevant sectors, namely water resources; agriculture; forestry, tourism and cultural heritage, the country's adaptive capacity is still low as the policy framework is still incipient.

Republic of North Macedonia has no binding international commitment to prepare a national strategy and action plan for adaptation to the impacts of climate change. However, given the future climate scenarios and the country's assessed vulnerability to climate change, it is in the best national interest to act urgently.

While there are no such commitments, the UNFCCC has a broad programme designed to support countries in the area of adaptation. This programme is composed of seven work streams: Adaptation Communication; Adaptation Registry; Loss and Damage; Nairobi Work Programme; National Adaptation Plans; National Adaptation Programmes of Action and Technical Examination Process on Adaptation.

* Source: Adapted from the *Report on climate change projections and changes in climate extremes for the Republic of North MACEDONIA* (Project Fourth National Communication and Third Biennial Update Report on Climate Change under the UNFCCC).

Of greater relevance to the scope of this Strategy and Action Plan are the adaptation communication and the national adaptation plans. In addition, it must also be considered the adaptation component of the NDC and the reporting on adaptation action in the National Communication to the UNFCCC, for which this Strategy must make a substantial contribution.

The adaptation communication and the adaptation component of the NDC are requirements under the Paris Agreement. As with other adaptation requirements, the communication and the adaptation component of the NDC are mostly of a voluntary nature.

The process for the adaptation component of the NDC should be linked with the process for the National Adaptation Plan to be prepared under umbrella of the UNFCCC and with the support of the international financing mechanism, in particular the GCF.

In this context, Republic of North Macedonia is in an advanced stage of harnessing the support from the GCF to prepare the National Adaptation Plan, which is to be mandated by this Strategy. This National Adaptation Plan is to identify medium- and long-term adaptation needs and develop and implement programmes to address those needs. It is a continuous, progressive and iterative process which follows a country-driven, gender-sensitive, participatory and fully transparent approach.

Despite the wealth of information and of the good practices in adaptation policy planning and implementation described above, Republic of North Macedonia still faces a set of important gaps and barriers which limit the country's capacity to effectively adapt to climate change. Such gaps and barriers have been studied in detail and are to be addressed by this Strategy. Two such major gaps and barriers can be identified: the institutional framework, including inter-sectorial coordination mechanism, which require strengthening; and the lack of solid systems for the regular and periodic collection data required for solid science-based decision making on adaptation.

In this context, the measures included in this Strategy and Action Plan will focus on addressing the gaps and barriers identified in the area of data availability, consistency and transparency, as well as in the areas of institutional capacity and climate scenario development and analysis.

The sectoral measures for adaptation to climate change will be developed in the scope of the National Adaptation Plan.

2.3 COVID-19 recovery and climate action

The COVID-19 pandemic induced vast and global economic and social problems. It is estimated that the economic impact of the pandemic will be more significant than that of the financial crisis of 2007-2008. Economic activity has been shut down in support of social distancing, leading to job losses at a pace that greatly exceeds the worst months of the Great Recession, reducing demand in the world economy, and disrupting supply chains.

According to the World Bank's latest Regular Economic Report (RER), the pandemic caused a huge hit to the Macedonian economy and the country is coping with its deepest recession in two decades. Despite the measures that the Government has introduced to reduce the economic impact of the pandemic, the unemployment rate increased to 16.7 per cent, 17,690 people lost their jobs in the second quarter of the year, while the national economic activity is forecast to decline by 4.1 per cent in 2020.

According to the predictions of national financial institutions, a stronger recovery and growth of economic activity in Republic of North Macedonia is expected in the mid-term, as life and economic activity return to normal, although the speed of economic recovery depends on the duration and intensity of the pandemic. Restoration of confidence of both consumers and investors is expected, as well as growth of private consumption and investment.

The implementation of policies and measures related to climate action will speed up the recovery of investments and activities in main economic sectors such as services, tourism, construction, and energy, and, at the same time, create new and green job opportunities. The COVID-19 recovery and the Strategy can play complementary roles in building a green, resilient, and inclusive future. Policymakers need to

recognize that climate action can drive the sustainable economic recovery of the country, by means of the implementation of policies and measures foreseen under the Strategy and other climate action mechanisms.

The implementation of the above-mentioned measures would also generate green jobs* and create training opportunities in fields including renewable energy, energy efficiency, energy access, improving household resilience, provision of infrastructure needed to support active transport and infrastructure for EVs, sustainable and resilient forestry and agriculture, etc.

In addition, it is essential to take proactive steps to build climate resilience and invest in adaptation measures, especially for society's poorest or most marginalized, as well as for the sectors most affected by the pandemic. Finally, investing in resilience and building adaptation capacities is crucial to deal with the adverse effects of climate change and to provide an enabling and sustainable environment for economic investments and development.

* According to the International Energy Agency (IEA) and other sources, investing $1 million in renewable energy or building efficiency creates more than twice as many jobs as investing $1 million in fossil fuels.

3. OVERALL VISION AND CLIMATE OBJECTIVES OF THE COUNTRY

3. OVERALL VISION AND CLIMATE OBJECTIVES OF THE COUNTRY

3.1 Overall vision

Considering the current situation regarding climate change in Republic of North Macedonia, the results of the modelling of the GHG emissions, including the respective social, economic and environmental impacts as described in the following chapters, and taking into consideration the *Paris Agreement,* and the *European Union's 2030 Climate and Energy Framework,* the *European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy,* the vision of this Strategy is as follows:

Republic of North Macedonia is, by 2050, a prosperous, low carbon economy, following sustainable and climate resilient development pathways, enhancing competitiveness and promoting social cohesion through action to combat climate change and its impacts.

This vision of the Strategy is based on the recognition that, in the framework of the Paris Agreement, all countries will deliver their fair and ambitious contribution towards the global temperature goals inscribed in that agreement, which requires peaking of the global greenhouse gas emissions as soon as possible and achieving a balance between global emissions and global sinks in the second half of the century. The vision enshrines Republic of North Macedonia's sustainable development approach to fighting the causes and the impacts of climate change, in which a fairer and more equal society will be built , considering gender equality and female empowerment[*]; the economy will successfully compete with other economies under the same conditions; and the environment will be protected for the benefit of future, but also of the current generations.

3.2 General and specific objectives

On the basis of modelling results, the results of the Strategic Environmental Impact Assessment, the foreseen socio-economic benefits and the need to adapt to changed climatic conditions, the general objective is:

Reduction of national net GHG emissions (including Forestry and Other Land Use and excluding MEMO items) of 72% by 2050 compared to 1990 levels (or GHG emission reduction of 42% by 2050 compared to 1990, excluding FOLU and MEMO items) and increased resilience of Republic of North Macedonia's society, economy and ecosystems to the impacts of climate change

It should be noted that MEMO items include emissions from aviation and electricity import.

In order to support compliance with the general objective and with the implementation of sectoral measures, the general objective is disaggregated into specific mitigation, adaptation and crosscutting objectives, where specific mitigation objectives reflect the Intergovernmental Panel on Climate Change (IPCC) sectoral aggregation of GHG emissions and, therefore, to the extent possible, also correspond to the division of responsibilities for the achievement of specific objectives.

Specific mitigation objectives:

- Specific objective 1: To reduce GHG emissions by 64% in the Energy sector (excluding MEMO items) by 2050 compared to 1990.

[*] Preamble, Paris Agreement

The energy industries sector will deliver the greatest emissions reductions, namely through the implementation of the polluter pays principle (carbon taxation) and through the increased penetration of renewable energy sources (RES) in the energy mix. This will require an important transformation of the sector, given the current important reliance on the carbon intensive national lignite as a source of energy. The internalization of the cost of CO_2 in the price paid by the final consumer will provide an incentive for market participants to move to zero or lower emitting fuels (RES, natural gas); to adopting processes (in the industrial sector) which are less energy intensive and producing higher added value products; and/or promoting energy efficiency in order to reduce demand for electricity. The technological advancement of the RES technologies, especially the ones related to wind and solar generation, has substantially reduced the relevant installation and operation costs, making wind and solar capacity able to offer very competitive prices in the wholesale electricity markets. Market prices, nevertheless, assuming the internalization of the carbon prices in the bids of thermal power plants, are at adequate level and allow the cost recovery for wind and solar investments, reducing the need for subsidies and financial support.

Furthermore, on the side of consumption of energy, energy efficiency is at the core of the climate and energy policies and is fundamental to a competitive economy and a secure and resilient energy system. Attributing priority to energy efficiency is the only way to avoid wasting the costly energy produced and delivered to the final consumer. Investments in energy efficiency provide important cost-savings to businesses and households (in addition to enhanced thermal comfort, in particular in the residential sector), thus constituting an important incentive to participate in the efforts towards a carbon constrained economy. In addition to reductions achieved in households and tertiary sector, reduction of GHG emissions in the transport sector is to be achieved mostly through an increase of energy efficiency and through the renewal of the fleet. In this context, the introduction of hybrid and electric vehicles will play an important role, but, in the short term, not as important as the reduction of fuel consumption in traditional combustion vehicles, which will, by 2030, remain as the typical vehicle in Republic of North Macedonia.

- Specific objective 2: To reduce GHG emissions by 34% in the Agriculture sector by 2050 compared to 1990.

  Agriculture will contribute to GHG emissions reductions through the adoption of measures that contribute to sustainable agriculture, through increased carbon sequestration in the soil (as a result of increased organic matter in the soil), and increased efficiency in milk production and reduced fertilizer input through enhanced agriculture practices and implementation of new technologies.

- Specific objective 3: To increase carbon sinks by 1733% in the Forest and Other Land Use sector by 2050 compared to 1990.

  The Republic of North Macedonian forest has as important role to play in the transition to a low carbon economy, as it can provide a carbon neutral energy source and a great potential to increase the net carbon sink of the country. Afforestation and sustainable forest management will transform the forest sector in the country, providing great opportunities for job creation and to enhance resilience to climate change impacts. It should be noted that the afforestation and reforestation activities should be done in a professional manner, carefully selecting the tree species and diversity, taking into consideration preservation of old trees and grasslands, which are important for the ecosystems and the biodiversity.

- Specific objective 4: To reduce GHG emissions by 2% in the Waste sector by 2050 compared to 1990.

  Reduction of GHG emissions in the waste sector will take place through the implementation of the measures contained in the current waste policy framework which is already to some extend aligned with the EU acquis. Nonetheless, based on the assessment of the current situation[*], the

[*] North Macedonia 2019 Report, European Commission staff working document, Brussels, 29.5.2019 SWD(2019) 218 final.

implementation of the current existing measures is lagging behind and requires an important effort up to 2030 and beyond.

Specific adaptation objectives

- Specific objective 5: To build solid systems for the regular and periodic collection data for the production and dissemination of scientific and technical knowledge.

  Data collection system proves to be crucial for the appropriate and timely response to the effects of climate change. This is in particularly important in the field of water resource and the use of water for irrigation. Furthermore, adapting to climate change in agriculture requires the vertical integration of scientific knowledge creation and dissemination. In addition, climate change may have significant impacts on biodiversity which requires development of a national research plan for biodiversity and an indicator system to monitor the impacts of climate change on biodiversity. Above all, accurate real-time air-climate-health data is important for the whole society and significant improvement of the processes for collection and dissemination of such data is crucial for the adaptive capacity of the sector human health.

- Specific objective 6: To increase the resilience of climate change impacts of key socio-economic sectors and ecosystems.

  The preparation and adoption of the National Adaptation Plan is an important step for Republic of North Macedonia to identify adaptation needs and to develop and implement policies and measures and actions to address those needs; and enable actions to protect vulnerable communities.

Specific horizontal/crosscutting objective

- Specific objective 7: To establish comprehensive policy planning, coordination and policy implementation instruments for climate action.

This has to be enabled by a comprehensive legal basis and legally established coordination instruments for facilitation of the cross sectoral policy design and implementation, as well as mechanisms for monitoring of the implementation of the foreseen policies and measures.

- Specific objective 8: Mainstream climate change related aspects into the future national strategic planning documents related to education, research, and development, innovation, social inclusion and equal opportunities on women and men,

The most important national strategic documents that should integrate climate related aspects are the future National Strategy for Education and the National Innovation Strategy. This will assure systematic and harmonised integration of the climate related aspects in the national educational, R&D and innovation ecosystem, as well as will increase the educational and the research capacities and the climate awareness of the general public. At the same time, intersecting climate change and gender will ensure effectiveness of the climate resilience policies and measures.

- Specific objective 9: To promote the green transition through capacity building, training for new skills and awareness rising.

  The transition to a low carbon economy is based on technological innovation, on large scale investment and policy decisions, but is also based on decision and behaviours of the individual citizen. Well informed and aware citizens, of all ages, are more likely to actively engage in the effort to reduce GHG emissions. Additionally, reducing GHG emissions require new technical skills which can be acquired via education via the school system, but also, via adult training, thus facilitating the transfer of workers from sectors with job losses to sectors with job gains. Overall climate change framework needs to be managed and supervised by competent authorities where significantly enhanced capacity is needed as a pre-condition for sustainable implementation, monitoring and reporting of mitigation policies and measures.

4. GHG EMISSION PROJECTIONS AND MITIGATION POLICIES AND MEASURES

4. GHG EMISSION PROJECTIONS AND MITIGATION POLICIES AND MEASURES

In this Strategy, two scenarios for climate change mitigation were developed. One is a scenario that assumes transition using existing policies and measures (WEM), and the other considers a more radical transition using additional policies and measures (WAM). Having in mind that in 2019-2020 few documents in the field of Energy and Climate Change were prepared and adopted, these two scenarios are in accordance with the scenarios developed as part of the Strategy for Energy Development up to 2040 (adopted by the Government in 2019), 3rd Biennial Update Report on Climate Change (TBUR) - Mitigation report - 2020 and the final draft version of the National Energy and Climate Plan – 2020 (Table 1). In addition, the measures proposed in these documents are also applied in this Long-term Strategy on Climate Action (Strategy).

The scenarios developed in this Strategy, unlike the scenarios in all the previously mentioned documents, additionally consider the period 2040-2050. The main objective, key assumptions and a brief description of the mitigation policies and measures considered in each of the scenarios is presented in Table 2. It should be underlined that in the IPPU sector there are no measures considered, while in the AFOLU and Waste sectors the same measures apply for both WEM and WAM scenarios. Detailed description of the policies and measures is given in Appendix C.

Table 1. Correlation of scenarios in this Strategy with scenarios in other documents

	WEM	WAM
Strategy for Energy Development (only Energy sector)	Reference	Green
3rd Biennial Update Report on Climate Change	WEM	e-WAM
National Energy and Climate Plan	WEM	WAM

Table 2. General objective, assumptions and mitigation policies and measures assumed in WEM and WAM scenarios

				WEM	WAM
		General vision		Transition based on current policies	Transition based on enhanced policies
Assumptions		Main demand drivers	GDP	Average annual growth rate of 3.3%	
			Population	Decline by 0.3% in 2050 compared to 2017	
		Prices	Fuel prices	Based on 'Current Policy' scenario of WEO 2017	Based on 'Sustainable development' scenario of WEO 2017
			CO_2 tax introduced in (average up to 2050)	2027 (~35 €/tCO_2-eq)	2023 (~110 €/tCO_2-eq)
Mitigation measures		Energy	Power generation	Modernization of lignite TPP, intensified RES generation	Further intensified RES generation
			Industry	Energy management, introduction of efficient motors (IE3, IE4), introduction of more advanced technologies	Energy management, introduction of more efficient motors (IE4, IE5), higher rate of introduction of more advanced technologies (electrification of the industry, replacement of coal with natural gas and biomass)
			Transport	Electrification of the transport sector, higher penetration of biodiesel and CNG, advanced mobility	Further electrification of the transport, deployment of hydrogen for HDV, higher penetration of biodiesel and CNG, advanced mobility
			Households	Penetration of EE and RES (solar thermal collectors, heat pumps, modern biomass stoves) technologies, improvement of building performance, more CFL and LED lighting	Higher penetration of EE and RES (solar thermal collectors, heat pumps, modern biomass stoves) technologies, higher rate of building performance improvement, construction of passive houses, LED lighting
			Commercial and services	Similar as for households (WEM) + 70% of street lighting LED, green procurement	Similar as for households (WAM) + 100% of street lighting LED, enhanced green procurement
		IPPU		No existing or additional measures assumed (simple regression model applied)	
		AFOLU	Agriculture (Livestock)	Enteric fermentation in dairy cows, manure management in dairy cows, swine farms	Same as WEM
			Forestry	Integrated management of forest fires, afforestation	Same as WEM
			Other land use	Conversion of land use of field crops above 15% inclination, contour cultivation, Perennial grass on inclined terrains (5%-15%), use of biochar	Same as WEM
		Waste		Opening of regional landfills (mechanical and biological treatment, flaring), selection of paper, improved waste and materials management at industrial facilities	Same as WEM

Note: Detailed description of the measures is given in appendix

The summary of the obtained results for 2050 shows that the total net GHG emissions are projected to be reduced by 23% in the WEM scenario and 72% in the WAM scenario, compared to the 1990 level (Table 3). Having in mind that most of the emissions are coming from the Energy sector, the reduction of 72% in the total net GHG emissions can be achieved if the emissions in the Energy sector are reduced by 64% in 2050, compared to 1990 level. At the same time, GHG removals play an important role, especially towards the EU vision of carbon neutrality, and in Republic of North Macedonia it is projected that the removals will increase 18 times compared to the 1990 level. Although this increase looks drastic, it should be noted that according to the Greenhouse Gas Inventory (TBUR) compared to 2016, these removals represent an increase of only 17% in 2050.

As previously explained, in the IPPU sector, no measures are proposed, and only simple regression model is used, which leads to an increase of the GHG emissions by 153% in 2050 compared to 1990. Therefore, if this sector is excluded from the total net GHG emissions, the total reductions reach 90% in 2050 compared to the 1990 level in the WAM scenario.

For the realization of the WEM scenario 19 Bill. EUR are needed, while for the WAM scenario additional 16 Bill. EUR are needed, as investments. However, the total system costs in the WAM scenario are lower compared to the WEM scenario; for example, in the Energy sector the total system costs are lower for 16 Bill. EUR in the period 2020-2050.

Table 3. Summary of the results of the scenarios in the Strategy (2050)

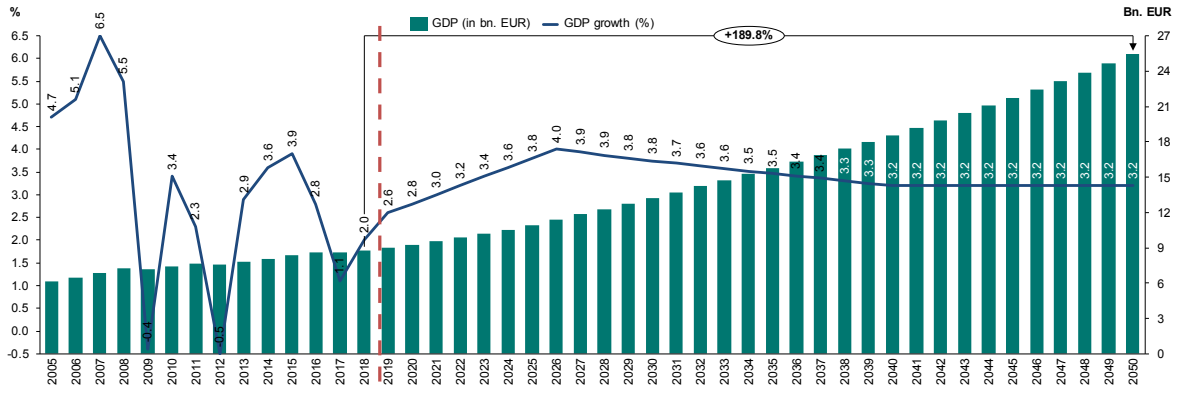
	WEM	WAM
Total GHG net emissions (compared to 1990)	**-23%**	**-72%**
Total GHG net emissions (compared to 1990) excluding IPPU sector	**-38%**	**-90%**
Energy	-2%	-64%
IPPU	+153%	+153%
Agriculture	-34%	-34%
FOLU (removals)	x18	x18
Waste	-2%	-2%
Investments (Bill. EUR) – 2020-2050	**19**	**35**
Total system costs – Energy (Bill. EUR) – 2020-2050	**137**	**121**

The rest of this chapter explains in detail the key assumptions and the results by sectors, which lead to these total GHG emission reduction results.

4.1 Key drivers

Given that there are certain input parameters used in most of the sectors (Energy, IPPU and Waste), and have a significant impact on the projections, especially for energy needs (useful energy), these parameters are referred to as key drivers.

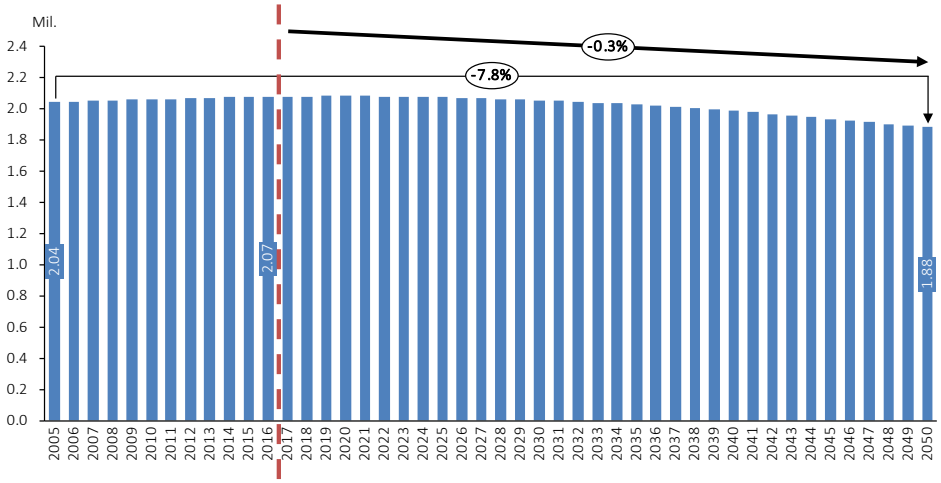
One of the key drivers for projections of the GHG emissions is the GDP growth. Using the same drivers as in the National Energy Development Strategy, the projection over the period 2018 - 2050 is that the real GDP will grow with an average rate of 3.3% (Figure 3). Such a GDP growth rate could position a developing country as Republic of North Macedonia in 2050 closer to the levels of GDP per capita that are common for developed Central and Eastern European countries today.



Source: SSO for historic values until 2017; for projections – IMF + Ministry of Finance + Project team estimations after 2024

Figure 3. GDP historical values and projections

Population growth is the other key driver, which is the same as in the National Energy Development Strategy, i.e. it is based on the UN population estimates and projections. The population is expected to decline by 0.3% in 2050 compared to 2017 (Figure 4).



Source: State Statistical Office, UN

Figure 4. Population historical values and projections

4.2 Energy system in transition

4.2.1 Key assumptions

In addition to key drivers, the Energy sector uses a number of other inputs, on which energy demand projections depend. The main input data and assumptions for the Households, Commercial and Services, Industry and Transport sector are given below in this section.

Households, Commercial and Services sector

For calculating the useful energy demand projections in the households, besides the key drivers, a number of other parameters are used. Number of persons in a household is one of them, which is projected to decline from 3.7 in 2017 to around 3 in 2050 (Figure 5). This decreasing of the number of persons per households is based on the average number at EU level (which is 2.4 in 2019), and the fact that none of the Member State has more than three persons per households in 2019. According to this number and the projected population, the number of households is estimated to around 635,000 in 2050. Based on the Household Survey conducted by the State Statistical Office in 2014, the distribution per type of households

is 42% apartments, 31% urban single houses and 27% rural single houses. In order to reduce the number of assumptions and uncertainties the same distribution is applied during the whole period.

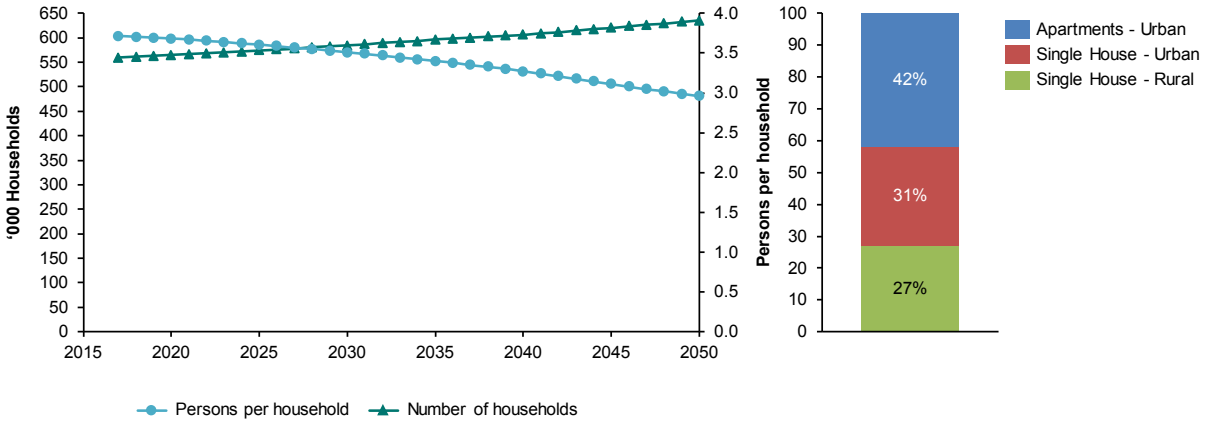


Figure 5. Number of persons per household, number of households, distribution of household types

For projecting the useful demand for heating and cooling, the size of the households is important which is projected to reach 100 m^2 for single houses and 80 m^2 for apartments in 2050 (Figure 5). The assumption for household size growth follows S curve, which has growth until 2035 when it reaches the average level of EU countries (in 2012). The size of the urban single houses is growing the most, because at the moment it stands out the most from the EU average. This assumption is additionally supported by the State Statistical Office data (Construction sector), where it is shown that in the period 2012-2018 the area of constructed dwellings has increased by 22%.

Additionally, the share of heated area is also projected to increase to around 90% for apartments, 53% for urban houses and 45% for rural houses in 2050. Based on the Survey conducted by the State Statistical Office on energy consumption in Households, it is obtained that the average specific consumption is around 160 kWh/m^2 in 2014 in the Households.

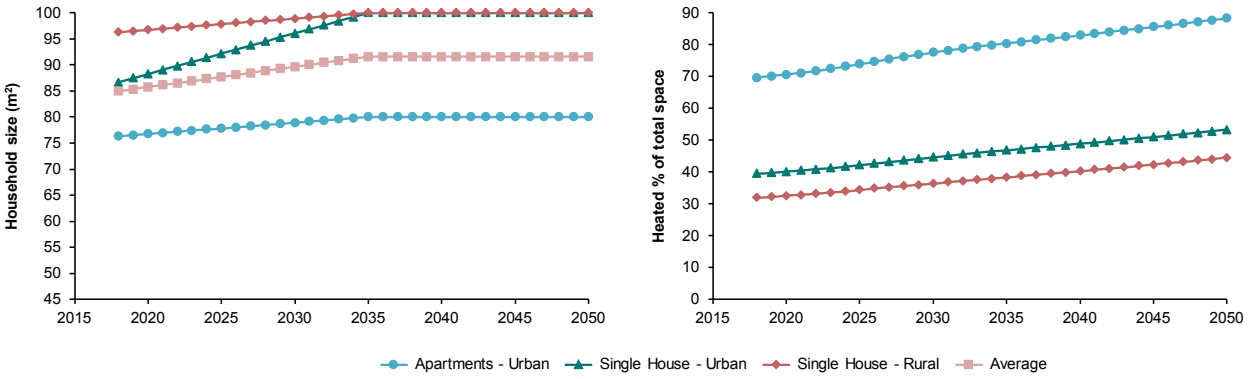


Figure 6. Size of households and share of heated area

For the commercial building stock, data according to third National Energy Efficiency Action Plan are used where the commercial building area is estimated to nearly 8 million m^2. For the public building stock, heated area of the building block from the National Program for EE in public buildings (Draft version) is considered (where the average specific consumption is 214 kWh/m^2).

Furthermore, for both the households and the commercial sector, the average heating and cooling degree days are calculated for the period 2000-2017, and this average is used for the period 2018 - 2050 (2005 heating and 1053 cooling degree days).

Industry sector

For the industry sector, based on the historical data, correlation between the GDP and the total industry growth rate is made, and these correlations together with the projections for GDP are used for projecting the value added of the Industry up to 2050. The projections of the energy demand in the Industry sector are based on the added value per industry type (Figure 7).

It is assumed that the overall Industry is correlated with the GDP growth and the share of each Industry in the total value added is similar as in 2018 (since there are no major differences in the shares in the historical data for the period 2011-2017, according to the State Statistical Office data).

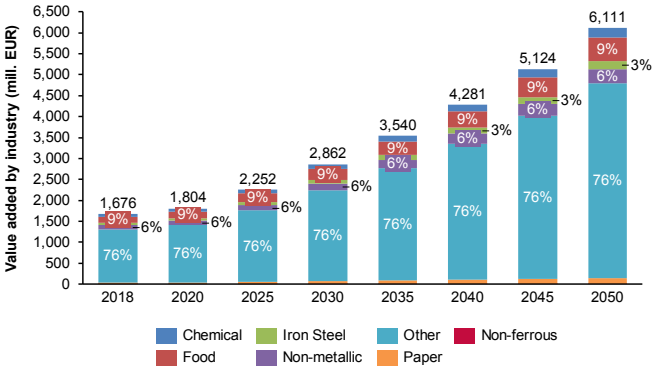


Figure 7. Value added by industry type

Transport sector

For the transport sector, the main drivers according to which the energy demand is projected are the passenger and freight kilometres. These parameters are calculated according to the GDP growth, number of vehicles, number of km per vehicle and number of passengers per vehicle (Figure 8). Additionally, the projections for the number of light duty vehicles are calculated using the relation between number of cars/capita and GDP/capita (i.e. ownership growth elasticity relative to income growth is calculated).

It is projected that up to 2050 the freight kilometres will be almost tripled, and the passenger kilometres will be almost doubled, following an S curve. Most of the passenger kilometres (around 79% in 2050) are from the light duty vehicles. It should be noted that the number of passenger kilometres presented on Figure 8**.** assumes no measures, so the number and distribution of the passenger kilometres in the WEM and WAM scenarios (after the measures are applied) is different.

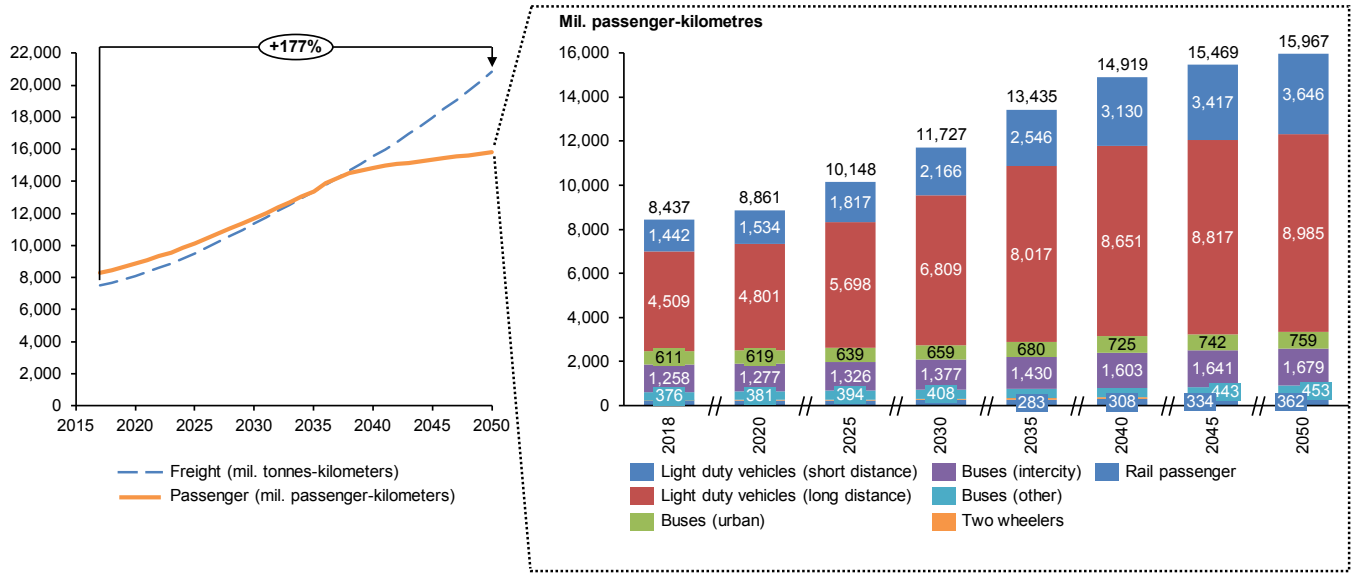


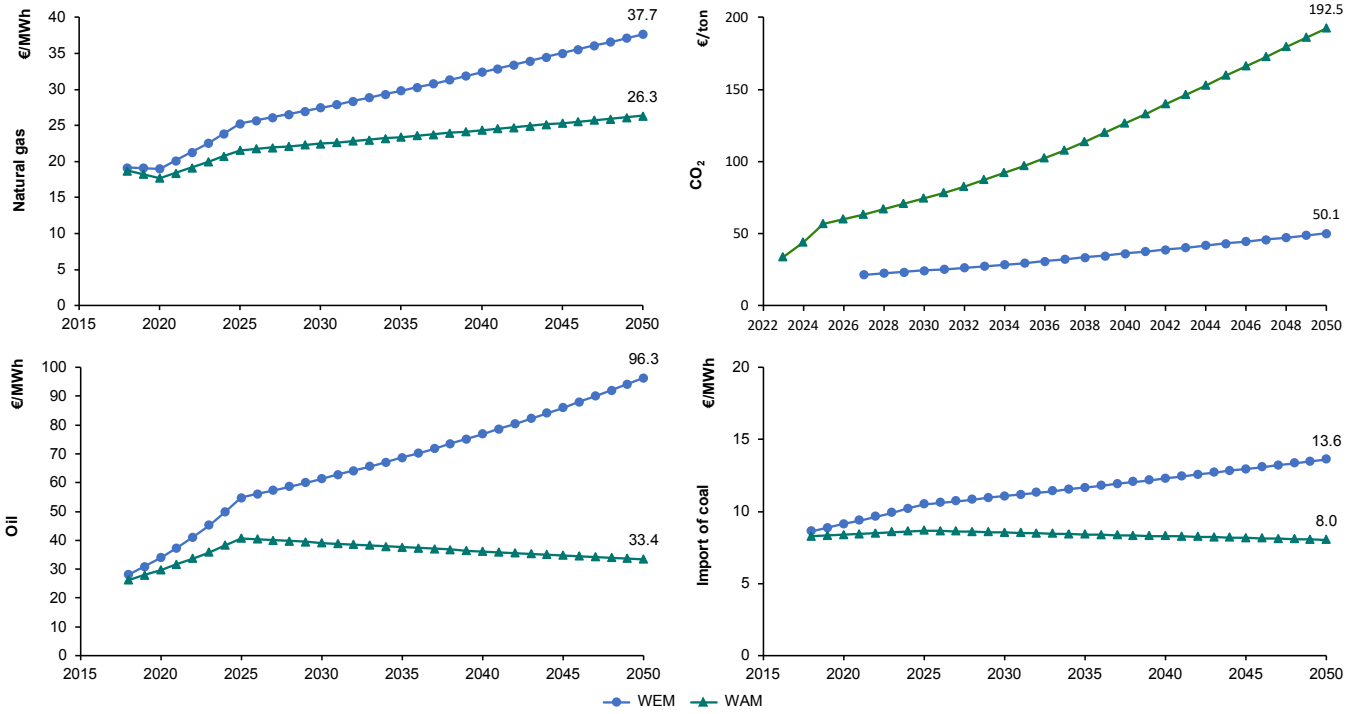
Figure 8. Passenger and freight kilometres projections

Fuel prices

The global trends of the fossil fuels prices are also very important for planning the energy system, and they show that the natural gas price will almost double in 2050 compared to 2018 in the WEM scenario, while in the WAM scenario it will be increased for around 40% in the same period (Figure 9). Additionally, the price of oil in the WEM scenario will be drastically increased by about 3.5 times, and in the WAM scenario it is increased for 30% in 2050 compared to 2018. The price of the imported coal is also increasing in the WEM scenario for 58%, and in the WAM scenario it remains at almost the same level as the price in 2017 for the whole planning period.

On the other hand, the CO_2 tax is projected to be introduced in 2027 in the WEM scenario with a moderate increase of 2.3 times in 2050 compared to 2027. In the WAM scenario the CO_2 tax is projected to be introduced much earlier (in 2023), with a higher increase rate of almost 6 times in 2050 compared to 2023.

The import price of electricity is based on HUDEX and in deep modelling on electricity price in Europe made as part of the Energy Strategy. In the first five years 2020-2025 the import price is around 45 EUR/MWh, after which it starts to increase, achieving maximum of 90 EUR/MWh.



Source: based on WEO 2017 data, EIB Energy Leading Policy (2019), ENTSO-E TYNDP 2020 – Scenario report.

Figure 9. Projected import fuel prices and price of CO_2

4.2.2 Power generation

In the case of the WEM scenario, the analysis shows that the electricity generation will increase by 76% in 2050 (Figure 10). Regarding the electricity generation, the key findings for this scenario are:

- The coal power plants will continue to operate over the period of analysis, with a slight reduction in their production from 2.8 TWh in 2017 to 2.5 TWh in 2050. This is mainly a result of the decommissioning of TPP Oslomej as well as lower production of TPP Bitola. In terms of total electricity generation, the share of coal power plants will drop from 39% in 2017 to 20% in 2050.
- The reduced production of coal power plants will be replaced with the electricity generation from power plants using natural gas, as well as RES. The production of the natural gas power plants will increase from 0.8 TWh in 2017 to 1.8 TWh in 2050, due to the increase in the generation capacity as a more cost-effective long-term option compared to new lignite power plants on imported coal,

considering the CO_2 tax as well. However, their share in the total electricity generation will slightly increase from 11% in 2017 to 14% in 2050.

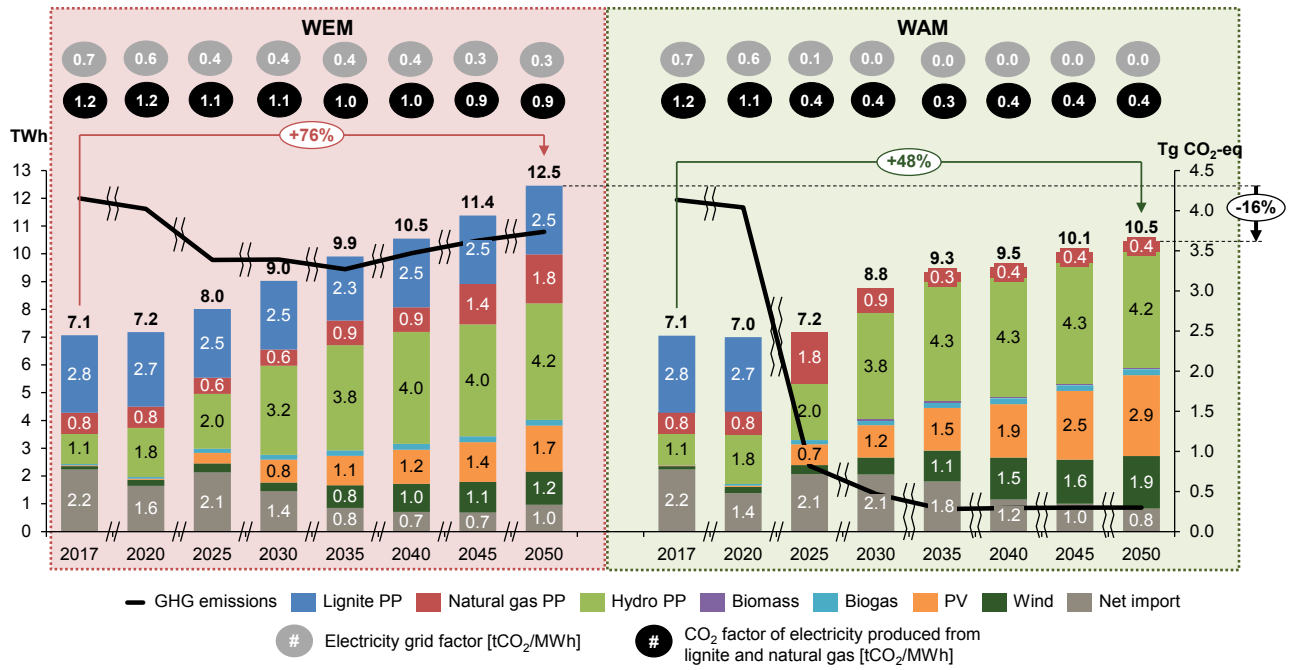
- The RES utilization will be intensified, mainly by increasing the production of the hydropower plant from 1.1 TWh in 2017 to 4.2 TWh in 2050 (normalized). A noticeable increase is also evident in the electricity generation from PV power plants (from 0.03 TWh in 2017 to 1.7 TWh in 2050) and wind power plants (from 0.12 TWh in 2017 to 1.2 TWh in 2050). Their share in the total electricity generation will increase from 15%, 0.4%, and 2% in 2017 to 34%, 13%, and 10% in 2050 for hydro, PV, and wind power plants, respectively.
- The intensified production from domestic resources will reduce the net import of electricity for 1.2 TWh in 2050 compared to 2017 (from 2.2 TWh in 2017 to 1 TWh in 2050). The electricity production will be mainly based on RES.

In the WAM scenario, the electricity generation will increase by 48% in 2050, or compared to the WEM scenario the 16% less electricity will be produced in 2050 (Figure 10). The key findings from the WAM scenario in terms of the electricity generation are:

- The coal power plants will stop their production after 2025. Their decommissioning is driven by the higher carbon tax introduced in the WAM scenario.
- By 2025, the electricity generation from power plants on natural gas will be more than doubled, compared to 2017. After 2030, with the increase of CO_2 price and the introduction of more RES the production of the gas power plants will not be cost-effective, thus reducing the level of production for 50% compared to 2017. This will also decrease their share in the total electricity generation from 11% in 2017 to 4% in 2050.
- Regarding the RES utilization, the production of the hydropower plant will increase at the same level as in the WEM scenario, and the introduction of the PV and wind power plants in the system will be more intensified. Their share in the total electricity generation will increase from 15%, 0.4%, and 2% in 2017 to 40%, 28%, and 18% in 2050 for hydro, PV, and wind power plants, respectively. The system flexibility in this case has to be ensured in order to balance the electricity produced by PV and wind power plants, mainly by the construction of (pump storage) hydro-power plants, biomass and biogas power plants, and implementation of demand response and electrification of the transport sector.
- In general, a decreasing trend of net import can be observed, i.e. from 2.2 TWh in 2017 to 0.8 TWh in 2050. After 2030, the net import of electricity is slightly higher compared to the WEM scenario, to satisfy the remaining part of the electricity consumption that could not be covered by the installed power generation capacities in the WAM scenario.

Mainly as a result of the intensified introduction of renewable energy sources and the decommission of the coal power plants in the WAM, compared to the WEM scenario, the GHG emissions are drastically reduced by almost 93% in 2050 compared to 2017 in the WAM scenario, while this reduction in the WEM scenario is only around 10%.

Based on the electricity generation from different energy sources and the final electricity consumption, the electricity grid factor is calculated up to 2050 and presented on Figure 10. It can be noticed that the electricity grid factor reduces to zero after 2025 in the WAM scenario. Additionally, in the mitigation analysis very often the CO_2 production factor of electricity generated from lignite and natural gas is needed, so these values are also calculated and presented for the period up to 2050 (Figure 10).



Note: the production from the Hydro Power Plants is normalized starting from 2018 (according to the RES Directive). It should be mentioned that 2017 is a hydrologically unfavorable year, with electricity production from hydropower plants much lower than average. For comparison, according to the SSO Energy Balance, in 2015, the production from hydropower plants is 1.9 TWh; in 2016, 1.9 TWh; and in 2018, 1.8 TWh.

Figure 10. Electricity generation by type of technology

Currently, the installed capacity of power plants in the country is 1.8 GW, out of which around 42% takes the lignite power plants, 38% hydropower plants, 16% are natural gas power plants, around 3% wind power plant, 1% is for PV, and biogas power plants have less than 1%. The growing electricity demand requires additional generating capacities. Therefore, in the WEM scenario, an additional capacity of 2.6 GW will be installed in the power system by 2050, while in the WAM scenario additional 3.2 GW is needed or 15% more compared to the WEM scenario in 2050 (Figure 10).

In the WEM scenario, lignite power plant Oslomej will be shut down by 2025, but TPP Bitola will remain in the system during the planning period. By 2050, an additional capacity of 0.2 GW of power plants on natural gas will be added to the system (conversion of HFO TPP Negotino to natural gas). Regarding the RES potential, the installed capacity of hydropower plants will increase for around 1 GW in 2050, which is more than double compared to 2017.

Construction of new hydro power plants is not foreseen in the period 2040 – 2050.

The installed capacity of large hydropower plants in the analyzed 2017 is estimated at 556.8 MW, while the WAM scenario envisages the installed capacity of the large hydropower plants to increase by an additional 808 MW by 2040/2050.

It is important to note that construction of new hydro power plants is not foreseen in the period 2040 – 2050. By 2040, it is planned to have a total of 160 MW small hydropower plants with feed-in tariff (same as planned in the adopted Energy Strategy of 2019). According to the data from the Energy Regulatory Commission, as of December 2020, of these 160 MW, a total of 115 MW have already been built (have the status of preferential producer) or are under construction (have the temporary status of preferential producer). This means that in the period until 2040/2050 additional 35 MW should be built, plus approximately 10 MW on the already existing Zletovica hydro system.

The construction of new hydropower plants should avoid the disproportionate environmental impact compared to electricity generated. The selection of locations for construction of hydropower plants should be carefully assessed to avoid adverse environmental impacts and should take into considerations the legal framework for environmental protection, biodiversity protection, nature conservation, as well as

Governmental decisions. In addition, it is recommended the capacity of the water supply systems to be used for small hydropower plants if justified according to economic and technical assessments.

The highest increase is estimated for the installed capacity of the PV power plants, or around 1.2 GW of additional capacity will be included in the power system by 2050. A significant increase of 0.5 GW by 2050 is also noticeable for wind power plants. Hence, in 2050 the share of the RES in the total installed capacity will be 81%, or 40% for hydropower plants, 27% for PV, 13% for wind, and almost 1% for biogas power plants.

In the case of the WAM scenario, the operation of lignite power plants will no longer be a cost-effective option after 2025. The main reason is the higher carbon price in the WAM scenario which makes TPP Bitola and TPP Oslomej an economically not viable option. Because of the decommissioning of the coal power plants, around 0.14 GW additional capacity of power plants on natural gas is estimated to enter the power system by 2030 (conversion of HFO TPP to natural gas), besides the RES capacity. The analysis shows that the natural gas units will be used mainly for balancing of the grid having in mind the RES installed capacity (especially after 2030). Same as in the WEM scenario, the highest increase is estimated for the installed capacity of RES. By 2050 the installed capacity of hydropower will increase for around 1 GW, the capacity of PV power plants for 2.1 GW, and the capacity of wind power plants for 0.9 GW. In terms of their share in the total installed capacity, hydropower plants will participate with 35%, PV power plants with 41% and the wind power plants with 19%.

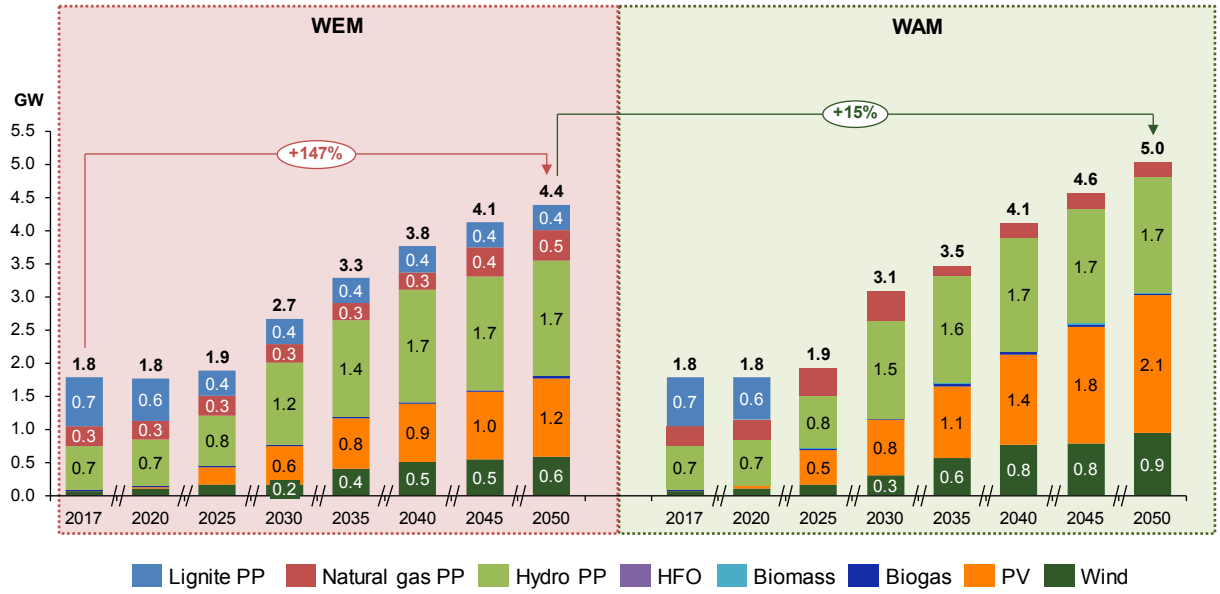


Figure 11. Installed capacity by type of technology

The price of electricity in both WEM and WAM scenarios increases as a result of the increase of the CO_2 tax and investments in new capacities, primarily on renewable energy sources (Figure 12). While the price for each type of consumers is almost doubled in this period, it should be noted that at the same time the GDP/capita is increased for almost three times. Additionally, the realization of the WAM scenario, where there is a drastically greater penetration of renewable energy sources, does not lead to a significant increase in the price for consumers. The biggest difference appears in the period 2025-2030 when the decommission of TPP Bitola in the WAM scenario is foreseen, and to ensure the security of the system there is construction of a new gas power plant that operates at a higher price compared to the price in the WEM scenario.

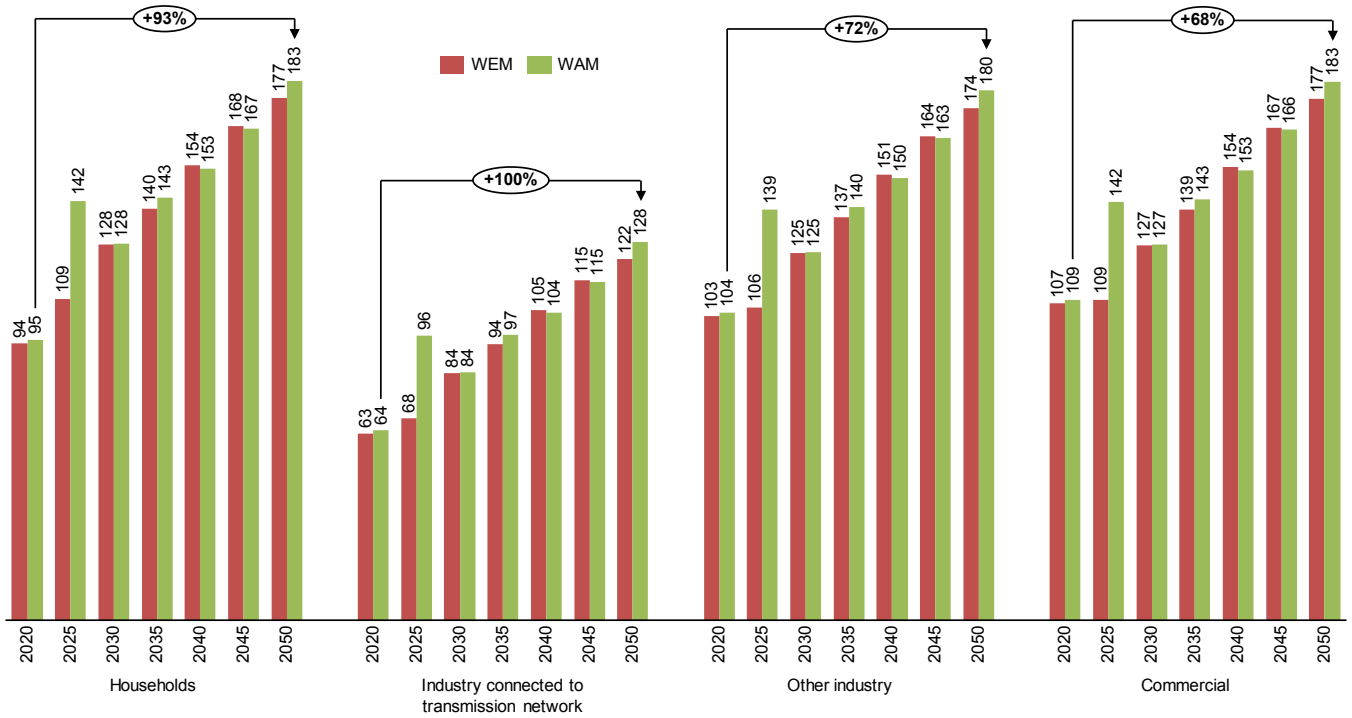


Figure 12. Price of electricity by type of consumer (EUR/MWh)

4.2.3 Industry

The total final energy consumption in the Industry in the WEM scenario increases by 0.8 Mtoe in 2050 compared to 2017 (Figure 13). Although this increase appears to be drastic, it should be noted that due to the World Crisis, European Crises and introduction of environmental standards in the Industry sector, there was closing and reopening of some of the major industry capacities in Republic of North Macedonia in the recent period (2012-2017). However, it is assumed that all these capacities will restart and in 2025 the final energy consumption will be at the 2012 level, and in 2030 it will be at 2007 level. Because the mix of fuels used in Industry in the WEM scenario is similar throughout the planning period, emissions increase accordingly at a similar rate, reaching 2.8 Tg CO2-eq in 2050.

On the other hand, the higher price of the CO_2 tax in the WAM scenario contributes to the change of the fuel mix, primarily for the decommissioning of coal, which at the same time contributes to the introduction of more advanced technologies (using mainly natural gas, biomass and electricity) which together with the industrial energy management measures and the introduction of more efficient electric motors contribute to a 25% reduction in energy consumption in the WAM scenario compared to the WEM scenario in 2050. At the same time, the change in the fuel mix leads to a drastic reduction in GHG emissions of about 60% in the WAM scenario compared to the WEM scenario in 2050.

However, despite the introduction of these measures in the WAM scenario, it is obvious that after 2030 GHG emissions start to increase slightly, mainly due to the Industrial growth on the one hand and on the other hand because the proposed improved technologies reach their maximum technical efficiency. To prevent the growth of emissions after 2030 or 2040, it is necessary to introduce new technologies that will use low-carbon fuels, such as hydrogen, or electricity (which in that period will be primarily produced from renewable energy sources).

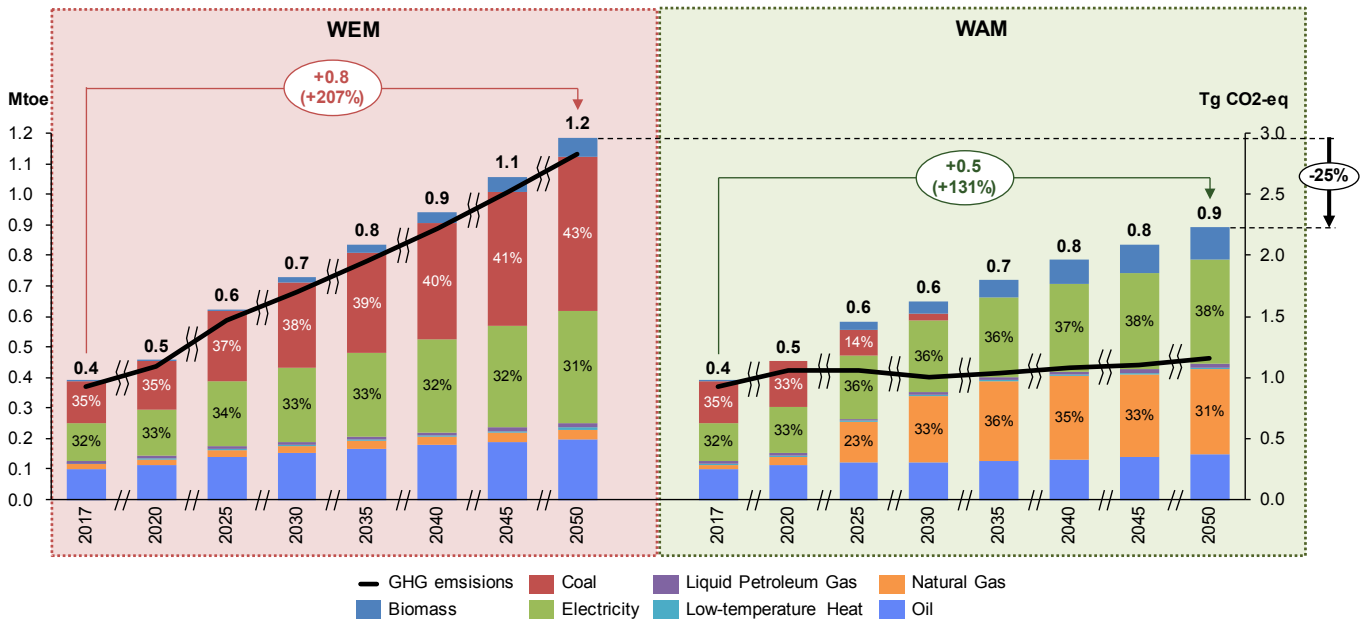


Figure 13. Final energy consumption by fuels in the industry sector

4.2.4 Transport

After industry, transport is projected to be the second fastest growing sector in terms of final energy consumption. In the WEM scenario, the consumption increases by about 60% in 2050 compared to 2017. The gradual introduction of biofuels in the period from 2020 to 2030 (when they reach a maximum of 10%) is the main reason for reducing GHG emissions in this period, although there is an increase in energy consumption. In the period after 2030, GHG emissions increase, but at a slower rate than the increase in final energy consumption, as a result of: biofuels and the introduction of vehicles that use fuels with lower emission factors, such as CNG and electricity.

In the WAM scenario, the growth of final energy consumption is almost twice lower compared to the WEM scenario. Unlike the WEM scenario, WAM in the period until 2030 has a reduction in greenhouse gas emissions and energy consumption primarily due to the penetration of hybrid vehicles and electric vehicles. In the period from 2030-2040, the trend of vehicle electrification continues, but as a result of freight transport there is a slight increase in emissions. Additionally, at the beginning of this period, another minor trend of import of used diesel and gasoline vehicles is expected to occur, having in mind that the efficiency of the imported used vehicles is close to the efficiency of the new vehicle sold on the market in that specific period. This growth of emissions will stop after 2040, primarily due to the introduction of hydrogen, greater penetration of CNG, as well as greater penetration of hybrid vehicles in light and heavy freight transport. At the same time, the trend of electrification and purchase of hybrid vehicles continues with light duty vehicles. All this leads to a gradual reduction of the share of diesel fuel in transport, which allows a downward trend in emissions.

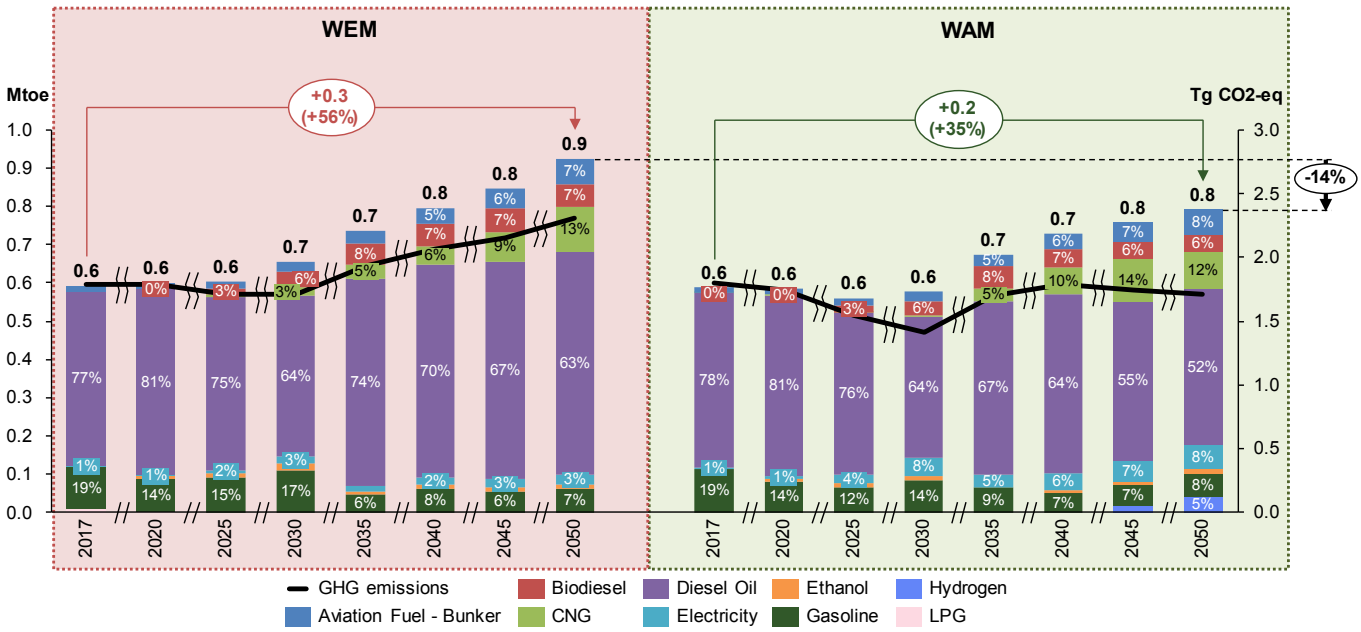


Figure 14. Final energy consumption by fuels in the transport sector

4.2.5 Households, commercial and services

In the WEM scenario, household energy consumption is projected to increase by 13% in 2050 compared to 2017, but emissions are reduced by about 21%, primarily due to reduced use of oil and LPG, improved energy efficiency and higher share of natural gas and renewables in the household (Figure 15). On the other hand, in the WAM scenario the introduction of more efficient technologies, class A, A+, A++ and A+++ (primarily for heating and hot water, but also other devices), more efficient lighting, the improvement of building performance (through their insulation and windows replacement) leads to a reduction in the consumption of final energy of 8% in 2050 compared to 2017. Correspondingly, there is a reduction of GHG emissions by about 52% in the same period. However, direct GHG emissions from the household sector are very small considering that biomass and electricity have the largest share in the final energy consumption.

Compared to the, for example, Industrial sector where there is high impact from the international prices (oil, gas, coal), in the households sector the biomass and electricity which are mainly domestic are expected to remain the main energy sources during the whole planning period in both scenarios. Therefore, the share of fuels in households generally remains similar in both scenarios, so that in 2050 compared to 2017 there is an increase in the share of electricity, a decrease in the share of biomass, and in the WAM scenario there is a larger share of renewables compared to WEM scenario. The decrease of the biomass consumption is driven by the replacement of inefficient biomass stoves with high efficient biomass stoves (for example, pellet stoves), as well as their replacement with heat pumps, due to the air pollution problem in the cities and the current strong policy of the Government for subsidizing heat pumps and more efficient biomass stoves. At the same time, there is also increase of the heat (district heating) as a result of the Government policy for decreasing the value added tax from 18% to 5%. The introduction of heat pumps with higher COP in the WAM scenario, the increased solar thermal collectors for hot water, as well as increased District heating will reduce the gas consumption compared to WEM scenario.

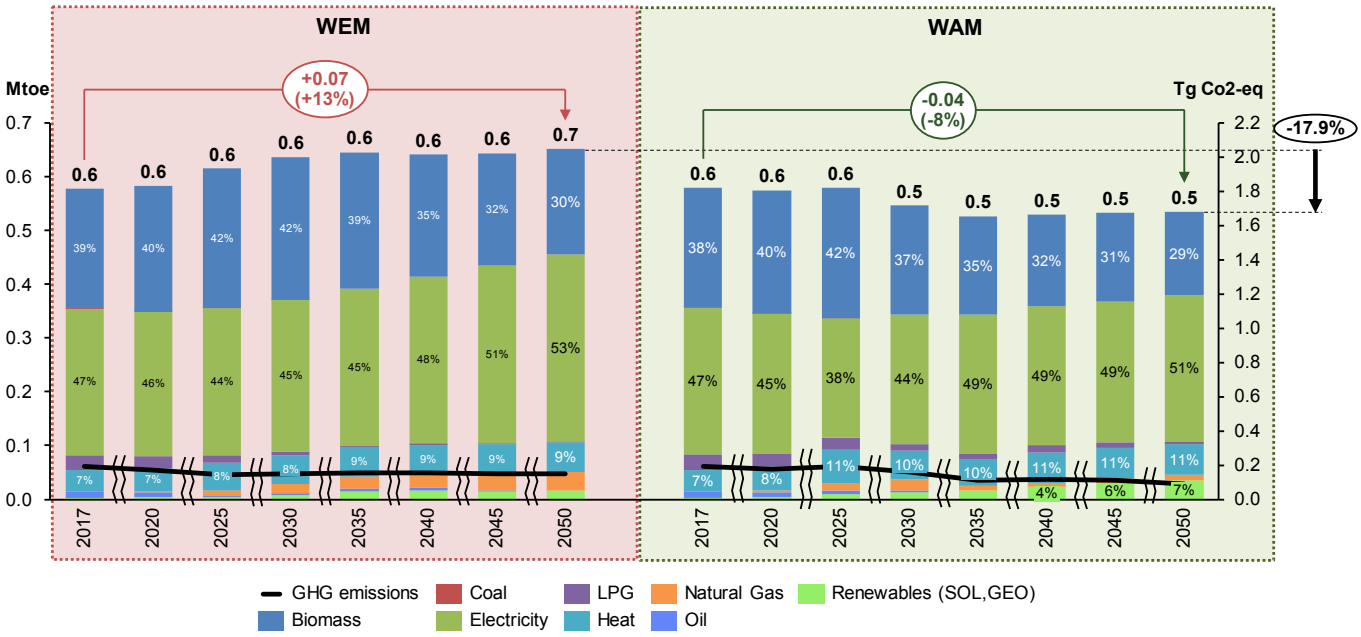


Figure 15. Final energy consumption by fuels in the household sector

As a result of the macroeconomic drivers, in the commercial and services sector in the WEM scenario there is an increase in final energy consumption by 38% in 2050 compared to 2017 (Figure 15). Nevertheless, greenhouse gas emissions in the same period decreased by about 20% due to greater penetration of natural gas technologies, renewable sources, greater use of district heating, but also the electrification of this sector, which is accompanied by an increase of RES for the production of that electricity. On the other hand, the improvement of the energy efficiency through the implementation of measures in this sector in the WAM scenario contributes to a final energy consumption of 27% lower in 2050 compared to the WEM scenario, so the final energy consumption remains at the same level during the planning period. The emissions in the WAM scenario have a drastic reduction of about 46% in 2050 compared to 2017 which is also a result of more intensive penetration of fuels with lower emission factors (electricity, natural gas and RES) and reduced use of oil in this sector. As is the case for the household sector, the direct emissions from the commercial and services sector are very small considering that electricity is the main energy source.

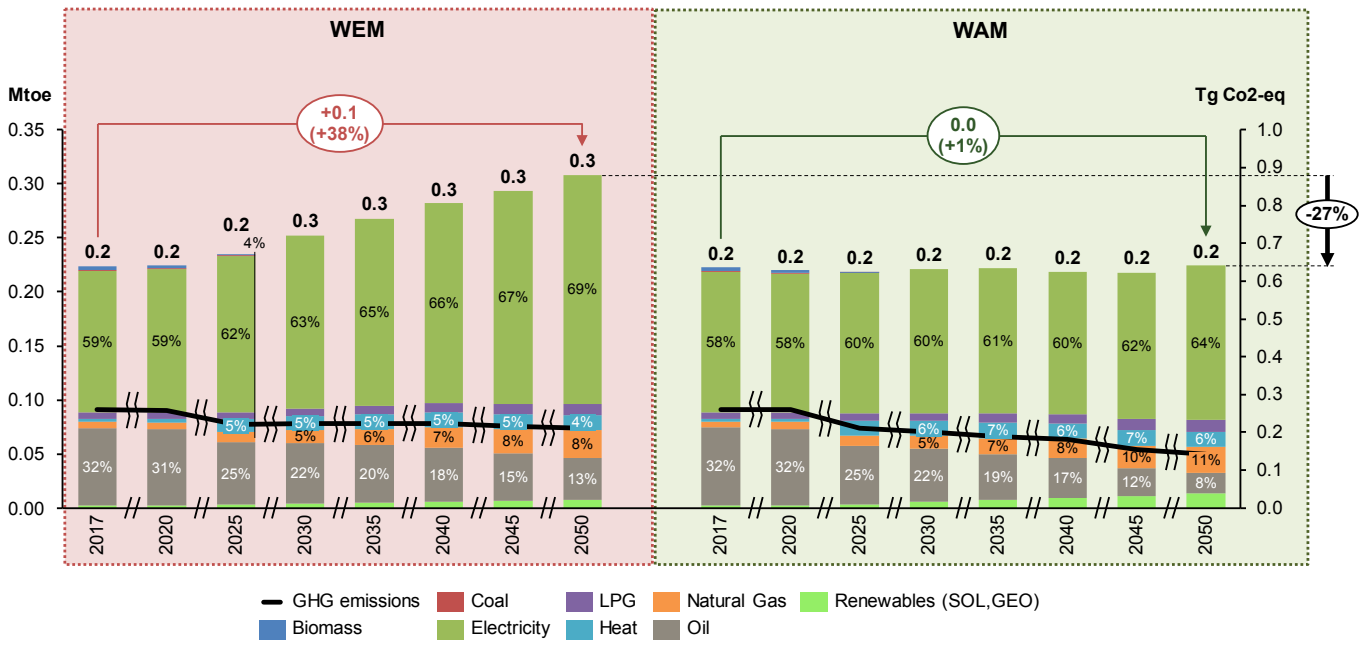


Figure 16. Final energy consumption by fuels in the commercial and services sector

4.2.6 Total energy results

The analysis shows that the final energy consumption in the WEM scenario will grow for 1.3 Mtoe by 2050 or by 73% compared to 2017 (Figure 17). Currently, 1/3 of the final energy is consumed by the transport sector, another third by the residential sector, 21% by the industry, 12% by the commercial sector, and around 1% in agriculture. By 2050, the highest increase is estimated for consumption in the industry sector (from 0.4 Mtoe to 1.2 Mtoe), which is related to the GDP growth projections. Over the analysed period, a significant increase of 55% (around 0.3 Mtoe) is also estimated for the consumption in the transport sector. The consumption in the commercial sector will grow for 0.08 Mtoe and in the residential sector for 0.07 Mtoe, which represents an increase of 38% and 13%, respectively, over the period 2017 - 2050. In terms of the share in the final energy consumption in 2050, the highest share will have the industry sector – 38%, followed by the transport sector – 30%, then the residential sector with 21% and commercial sector with 10%, while the remaining 1% will be for the agriculture sector.

In the case of the WAM scenario, the total final energy demand will rise by 38% (or 0.7 Mtoe) over the analysed period, but it will be 20% lower compared to the WEM scenario in 2050. This is mainly a result of the introduction of more advanced and highly efficient technologies at the demand side. The consumption in the industry will again have the highest increase, from 0.4 Mtoe in 2017 to 0.9 Mtoe in 2050, while the consumption in the transport will grow for almost 0.2 Mtoe (or 33% increase relative to 2017). The consumption in the commercial sector will remain almost at the same level, while in the residential sector it is estimated that will drop for 0.04 Mtoe (or 8% compared to 2017). Regarding their share in the final energy demand in 2050, the industry sector will participate with 36%, the transport sector will account for 32%, the residential sector will represent 21%, and the commercial sector 9%, while the remaining 2% will be for the agriculture sector.

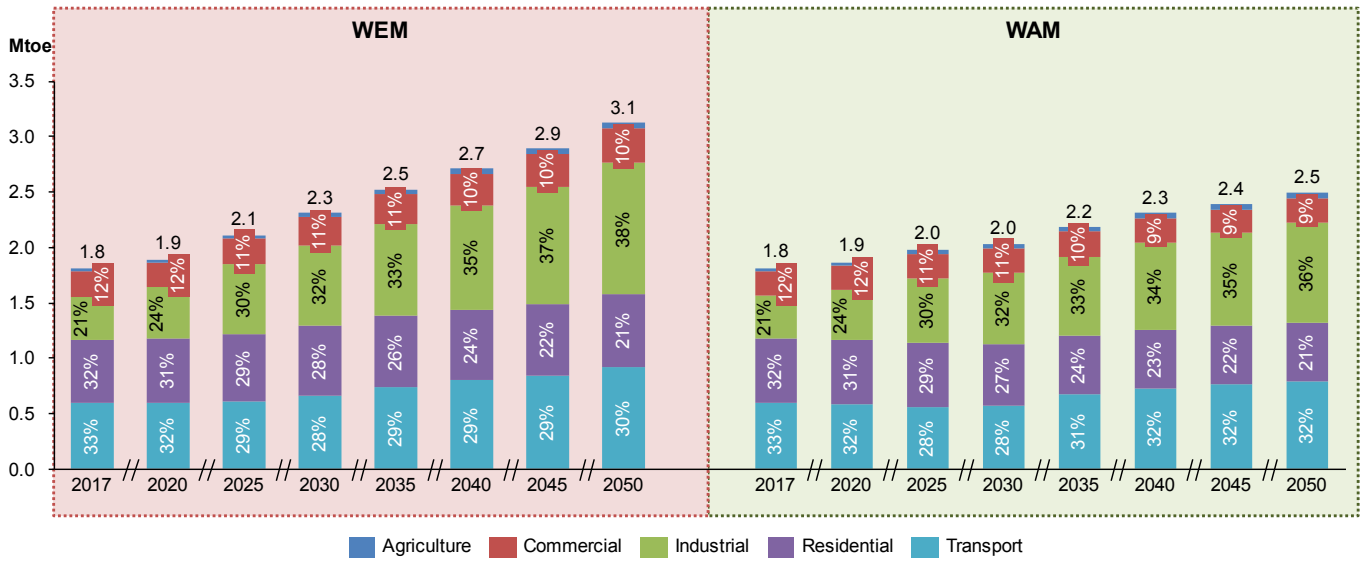


Figure 17. Final energy consumption per sector

Considering the final energy demand by fuel, in the WEM scenario, the electricity and diesel will predominate, and after 2030, the utilization of natural gas and coal will gradually increase. The biomass consumption will slightly increase. The share of electricity in the total final energy consumption is around 30% over the entire period, while the share of the diesel will drop from 32% in 2017 to 23% in 2050. On the other hand, the shares of natural gas and coal will increase from 1% and 8% in 2017 to 7% and 16% in 2050, respectively. The share of the biomass will decrease from 13% in 2015 to 9% in 2050. The other fuels, mainly oil products (like gasoline, LPG, HFO, etc.), will account for remaining less than 20% (Figure 17).

The electricity and diesel will also dominate the final energy consumption in the WAM scenario, and the natural gas will be used instead of coal. In absolute values, the demand for all fuels will be at a lower level compared to the WEM scenario. Regarding their share in the total final demand, in 2050 the electricity will account for 33%, the diesel 20%, natural gas 17%, biomass 11%, and the remaining less than 20% will comprise the other fuels.

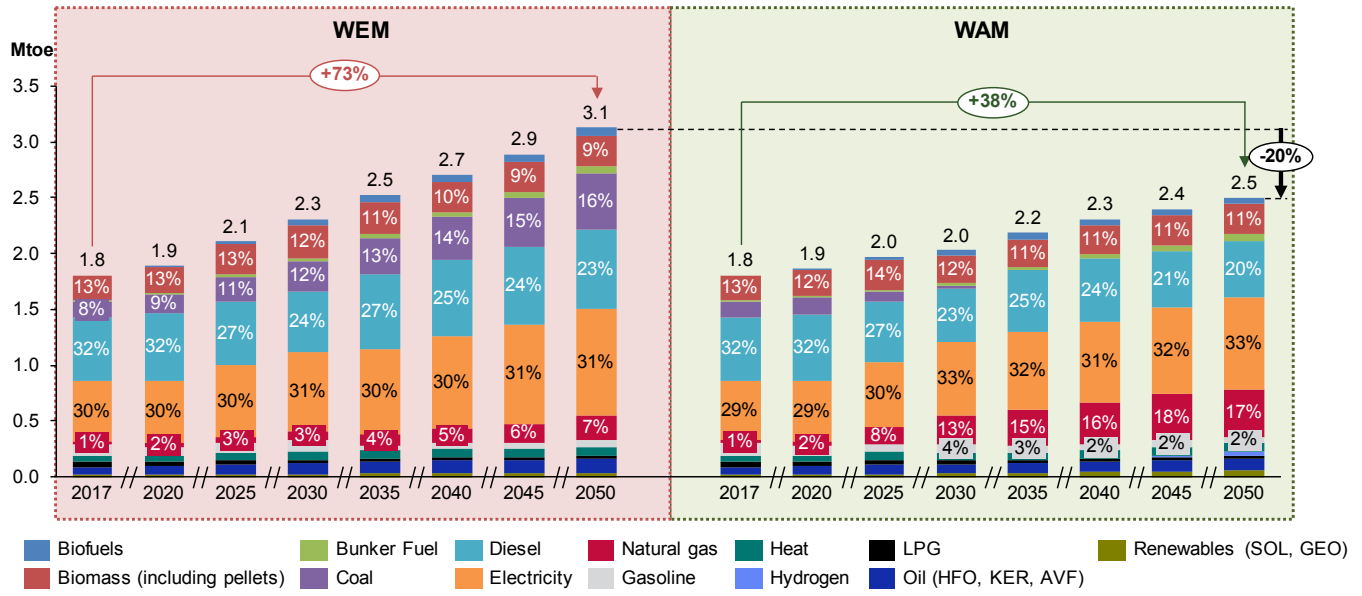


Figure 18. Final energy consumption per fuel

GHG emissions by sectors are presented in two ways. One is in terms of IPCC methodology. The disadvantage of this methodology is that emissions from electricity imports are not taken into account, which is of great importance for an import-dependent country like Republic of North Macedonia. According to this methodology, with the introduction of the measures, it can happen that there is no reduction of emissions in Republic of North Macedonia because the import of electricity would be reduced (which is not considered in the total emissions anyway). To overcome this shortcoming, the results are presented in a way that includes emissions from both aviation and electricity import (considered as Memo items).

Analysing the GHG emissions by sector, including the emissions for the international aviation and the electricity import , in the WEM scenario, the total emissions are rising from 9 Mt in 2017 to 10.6 Mt in 2050 (or 18%), mainly as a result of the increase in the emissions from the industry and transport (Figure 18). In 2017, almost half of the total GHG emissions (46%) originated from electricity and heat production, 20% came from the transport sector, 10% from the industry and around 16% are related to the electricity import. The emission level estimated for the electricity import is also relevant, albeit it reduces over the period due to the increased domestic electricity production. Regarding the sectoral contribution to the total GHG emissions in 2050, electricity and heat production account for 35%, followed by industry with 27%, transport with 22%, electricity import with 9%, and the other sectors contribute the remaining 7%.

In the WAM scenario, the total emissions are estimated to drop by 46% in 2050 compared to 2017, or by 54% compared to the WEM scenario. The decommissioning of the lignite power plants due to the high carbon price and their replacement with RES will result in a 93% reduction of emissions from the electricity and heat production sector. Although the emissions from the industry sector are estimated to rise over the analysed period (for 26%), their level is lower compared to the WEM scenario. On the other hand, the emissions from the transport sector are estimated to slightly reduce as a result of the introduction of more advanced technologies using less carbon-intensive fuels.

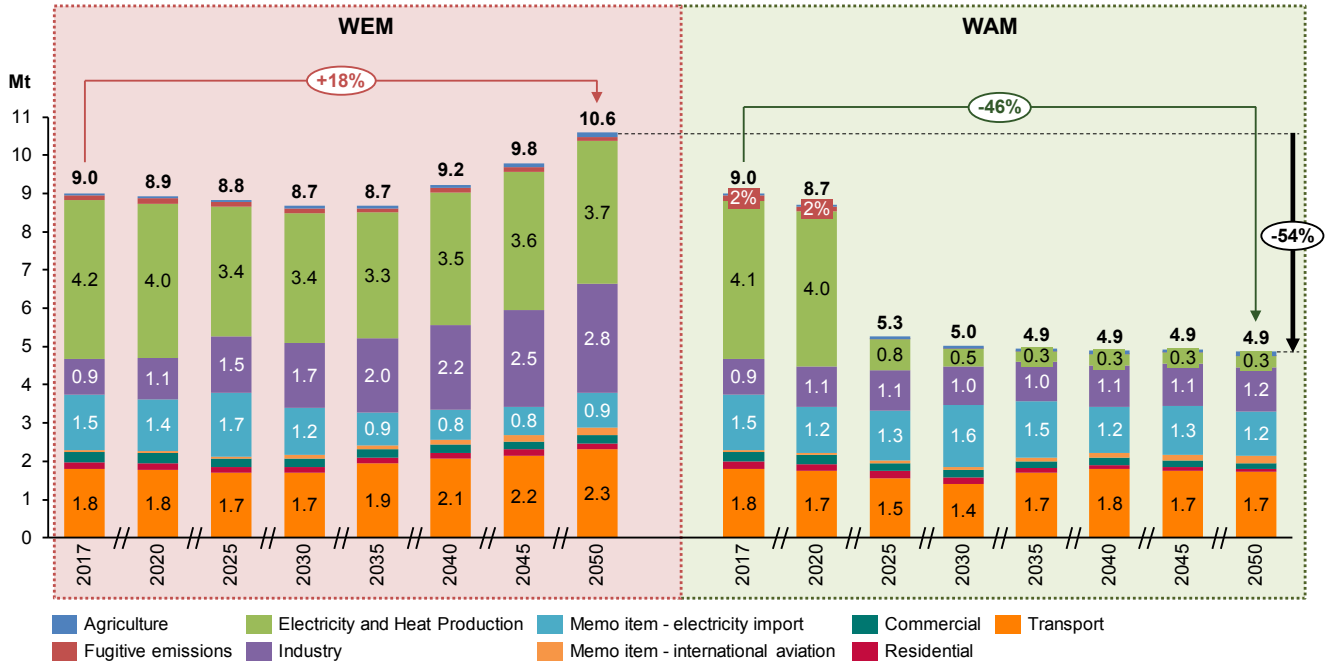


Figure 19. GHG emissions development by sector including MEMO items (import + aviation)

If the Memo items are not included in the total GHG emissions, the emissions in the WEM scenario are estimated to increase by 26%, while in the WAM scenario to decrease by 53% (Figure 20). Therefore, in 2050 the emissions in the WAM scenario are estimated to be 3.5 Mt, which is 63% lower compared to the WEM scenario (9.5 Mt).

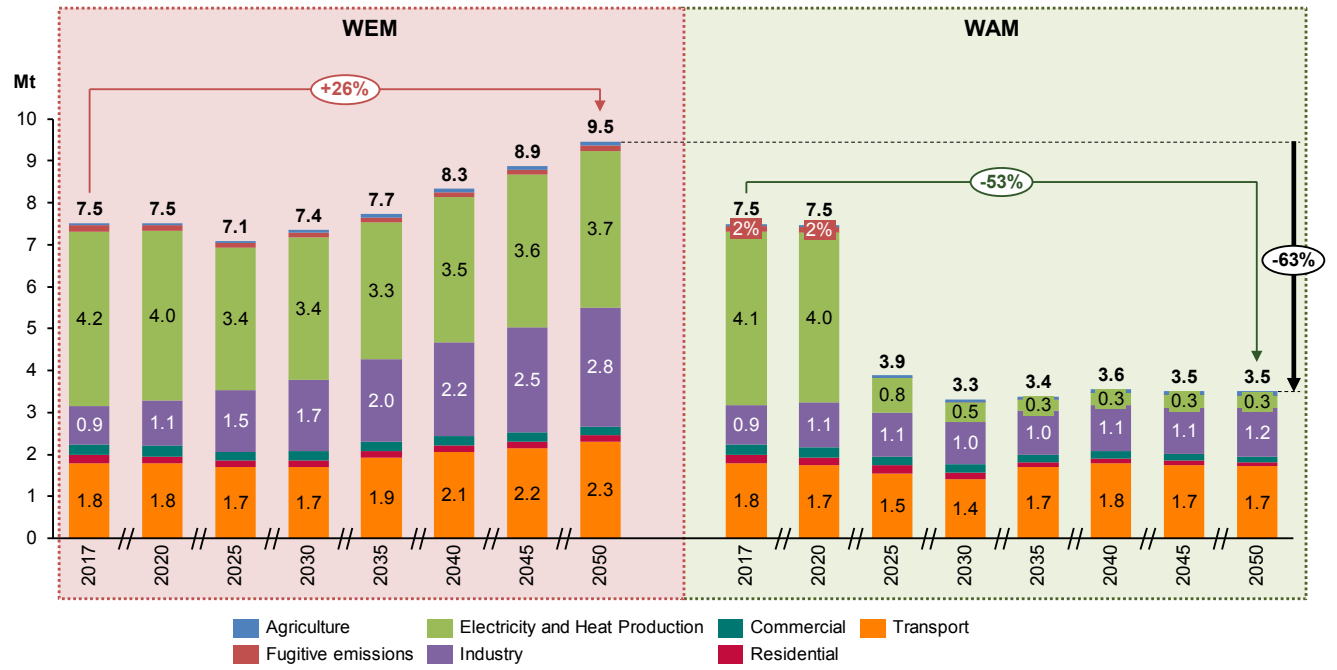


Figure 20. GHG emissions development by sector without MEMO items (import and aviation)

Considering the GHG emissions by gas, in both cases, the CO_2 emissions dominate with around 95% of the total emissions (Figure 21). When compared to the level of emissions in 1990, the emissions (including Memo items) in 2050 are estimated to increase by 10% in the case of the WEM scenario and to decrease by 50% in the WAM scenario.

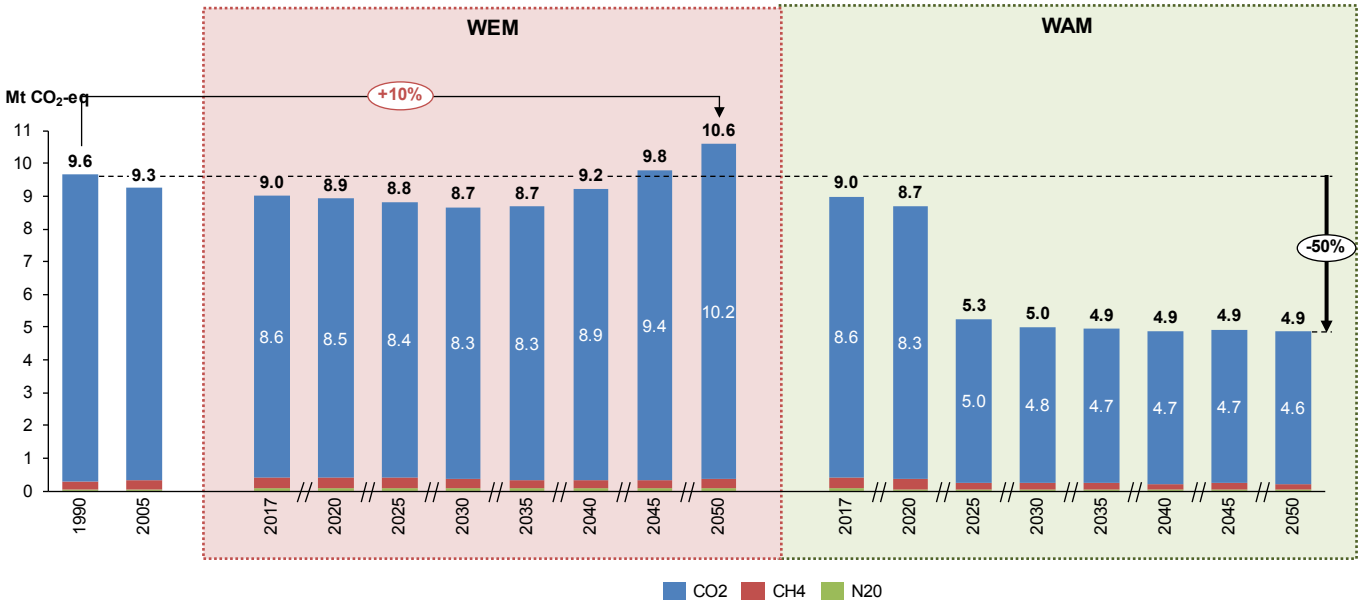


Figure 21. GHG emissions reduction by gas (including MEMO items)

4.3 IPPU

4.3.1 Key assumptions

For projection of the emissions of the Industrial Processes, the main assumption is that they depend on the added value of the corresponding industry type. Therefore, a correlation between the historical data

for the added value and the GHG emissions from each industry type is made. As the emissions from the Product Use as substitutes for ODS mainly depend on imported appliances (such as refrigerators and air-conditioners) it is assumed that these emissions depend on the GDP. Again, a correlation of the historical values for the GHG emissions from the Product Use and the GDP in the same period is made. Using the obtained equations for the correlation and the projections for the added values in each industry and the GDP (the macroeconomic drivers), projections for the GHG emissions from this sector are made for the period up to 2050. No mitigation measures are proposed for this sector due to the time constrains and the absence of previous work on mitigation aspects in the sector IPPU. The definition of policies and measures in the IPPU sector requires detailed assessments on technological production processes which will be gradually gathered by the introduction of the EU ETS scheme which is foreseen under the Draft Law on Climate Action.

4.3.2 Total IPPU results

The results for the total GHG emissions for the IPPU sector show that there will be an increase for 143% in 2050 compared to 2017 in this sector, which is expected as there are no measures assumed for their mitigation. The highest increase is in the emissions from Product Use as Substitutes for ODS, which increase for almost four times.

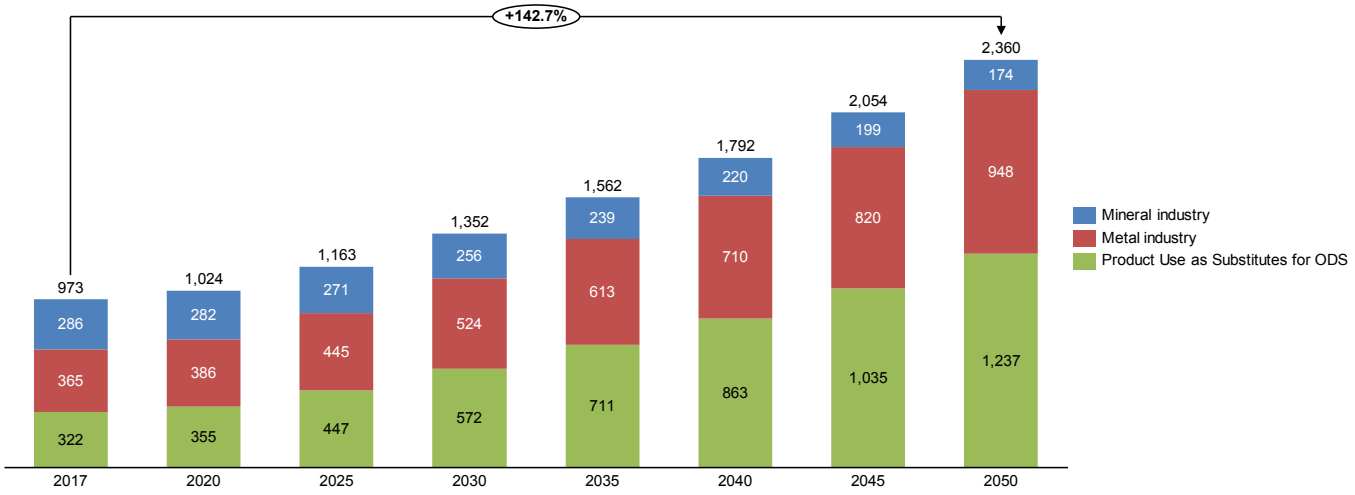


Figure 22. Total GHG emissions in Industrial Processes and Product Use sector by categories (in Gg CO_2-eq)

4.4 AFOLU in transition

4.4.1 Key assumptions

For livestock, the main assumption is that the number of livestock will keep the same trend as in the period until 2040, except for goats which have a sharp downward trend until 2040 and whose number is projected to remain at the same level as in 2040. As noted in the TBUR, it is difficult to make long-term forecasts for land change from one type to another. Therefore, in the TBUR it is assumed that the trend from 2000-2016 will continue in the period until 2040. In this Strategy the same trend is assumed until 2050.

4.4.2 Total AFOLU results

The AFOLU sector is of great importance because it is the only sector in which there are GHG removals and it includes a natural carbon-caption reservoir mainly from the Forestry. Projections until 2050 show that in the AFOLU sector the GHG removal will be increased for about 35% in 2050 compared to 2016 and this removal is mainly originating from Forestland (Figure 23). The use of biomass for Energy purposes is within the principles of sustainable use of biomass, i.e. there is less consumption of biomass than is the annual growth rate of the biomass in the forests. This is one of the reasons for the increase in sinks in this sector. The greatest problems in this sector are the forest fires that in certain years in the past caused the sector FOLU to become significant source of GHG emissions. The proposed measures for afforestation and integrated management of forest fires will contribute the GHG removals in 2050 to remain at similar level as in 2020.

Furthermore, in the WAM scenario the emissions from the livestock will decrease by about 23% in 2050 compared to 2016. The reduction is a result of implementation of measures for improved manure and nutrition management, as well as from the downward trend in the livestock population (especially the number of dairy cows that have the most significant role in the emissions). In addition, the measures proposed in the category Land use contribute to reduction of the emissions from this sector by about 28% in 2050 compared to 2016.

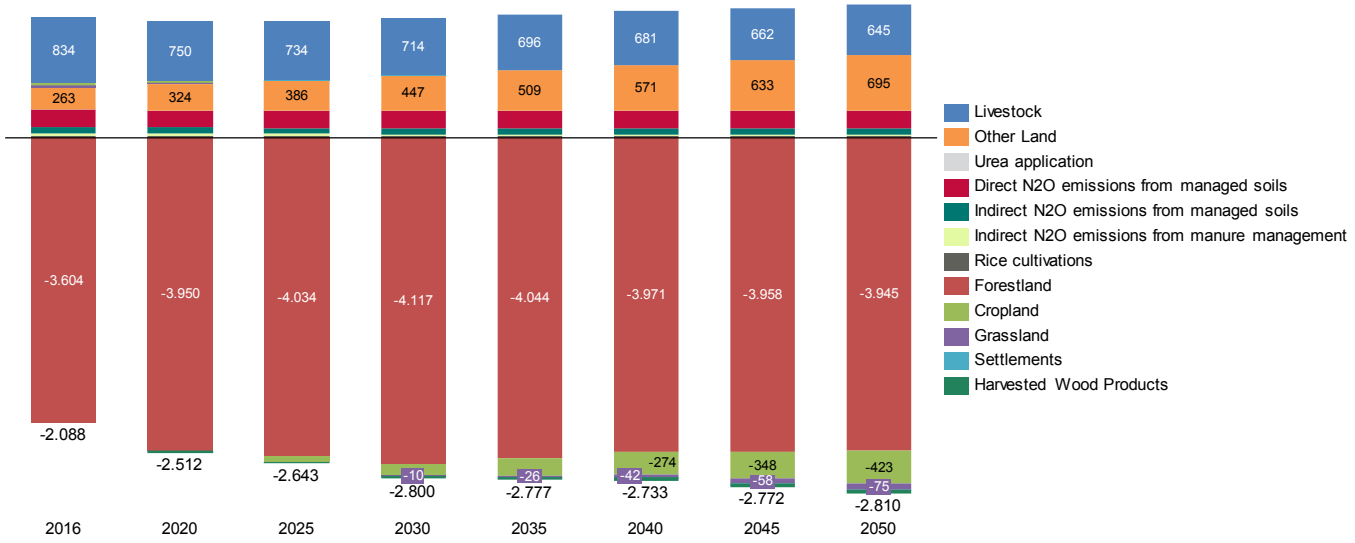


Figure 23. Total GHG emissions in AFOLU sector by subcategories (in Gg CO2-eq)

4.5 Waste in transition

4.5.1 Key assumptions

The major assumptions according to which the projections in this sector are made are based on the key drivers GDP and the population. Besides the population, another very important assumption for projecting the Municipal Solid Waste Disposal is the waste per capita (Figure 24). The projections for this variable are based on the data for the countries in the region, as well as the EU28 data. The major assumption is that the waste per capita in Republic of North Macedonia will increase linearly until it reaches the same amount of waste per capita as the linear projections of EU28 in 2035. Afterwards, in the next few years the increasing rate will slow down, and after 2038 it will start decreasing.

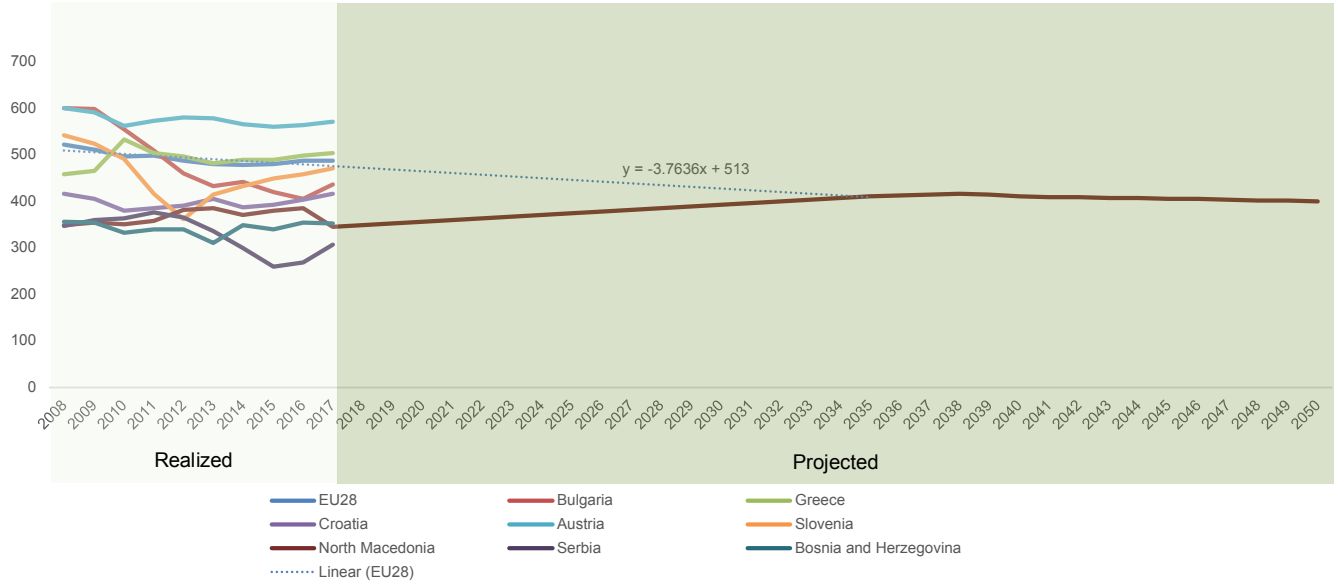


Figure 24. Waste per capita projections

The composition of Municipal solid waste is assumed to remain the same during the whole period as it is for 2016, i.e. food – 36.7%, garden – 10.7%, paper – 10.8%, wood – 0.4%, textile – 3.7%, nappies – 5.0% and plastic, other inert – 32.6%. It is also assumed that the distribution of waste by waste management treatment will be equal to the distribution in 2016, for the whole period.

For calculating the waste from the Industry, besides the GDP, for the Industrial wastewater, the data for the value added for the industry from the MARKAL model are used. For that purpose first the correlation between the Total organic degradable material in the wastewater from the Industry with the Industry value added is calculated (Figure 25) and using the obtained equation and the projection for the Industry value added, the projections for the Total organic degradable material in the wastewater from the Industry up to 2050 are calculated (Figure 26).

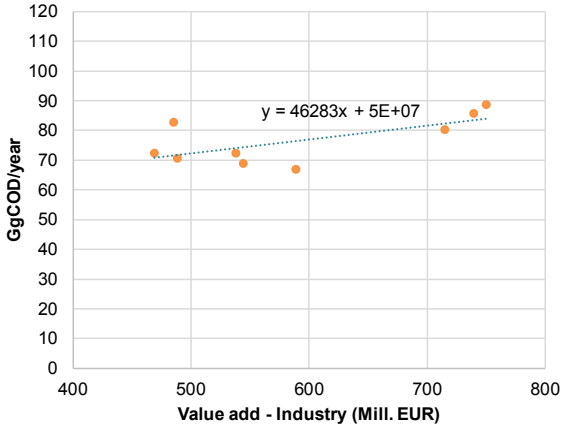


Figure 25. Correlation between Total organic degradable material in wastewater from Industry and the Industry value added

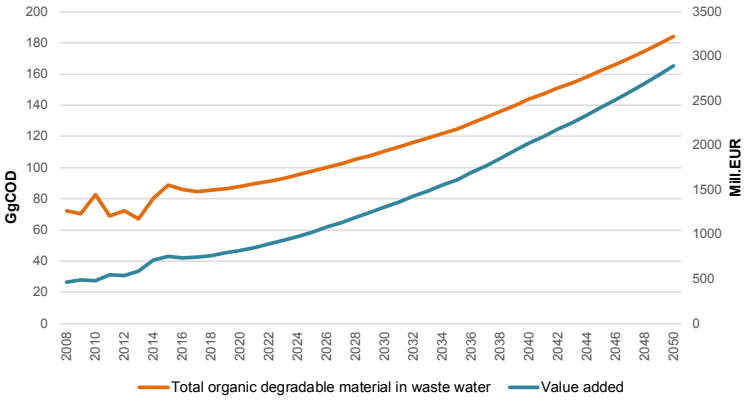


Figure 26. Projections for the Total organic degradable material in wastewater from Industry and the Industry value added

In the WEM and WAM scenarios four measures are proposed for the Waste sector, and the following assumptions were made for their modelling:

- The existing illegal ('wild') dumpsites with very high, high and medium risk will be rehabilitated (covering and gas extraction and flaring) and new landfills will be opened by waste management regions in the following order:

- Skopje – 2023
- East and Northeast – 2025
- Polog – 2026
- Southeast – 2029
- Pelagonija and Southwest – 2029
- Vardar - 2029

- Mechanical and biological treatment will be made in the new regional landfills with composting (from the Garden solid waste);
- Paper selection will gradually increase from 2% in 2021 up to 60% in 2050 of the total paper waste (this will change the Municipal Solid Waste composition, by reducing the share of paper);
- By including circular economy in the Industry, the waste treatment in this sector will increase from 0.1% in 2021 up to 50% in 2050

4.5.2 Total waste results

The results show that the highest GHG emission reduction will be achieved by covering the existing wild dumpsites and the opening of the regional landfills in the period 2023- 2029 (Figure 27). By gas extraction and flaring in the existing dumpsites the CO_2 emissions will increase in the following period , but the total GHG emissions will be drastically reduced. By Mechanical and biological treatment of the Garden waste, the emissions for Biological treatment will be increased, but at the same time the solid Waste Disposal emissions will be reduced compared to a situation without this measure. Although the measures Selection of waste - paper and the Improved waste and materials management at industrial facilities reduce the emissions in the period from 2020-2050 compared to a scenario with no measures, the total emissions after 2030 start to increase. This is mainly due to the waste from the Industry. On one hand, as the GDP grows, the emissions from the Industrial Wastewater increase as there is no measure proposed for this sector. Although there is a measure in the solid waste from the Industry, the emissions from this sector also increase, because the emissions in a certain year are based on the accumulated waste from the previous years. Thus, the effect of the reduction of solid waste from the Industry is even more visible in the period after 2050. However, the increase in the period 2020-2050 is with a much slower rate compared to a scenario with no measure.

The emissions from the Domestic Wastewater and from Open burning will decrease mainly as a result of the decrease of the population and the waste per capita.

Most of the GHG emissions from the Waste sector are emissions of CH4, but after 2025 the CO_2 emissions start to increase due to introduction of the process of flaring (**Figure 28**).

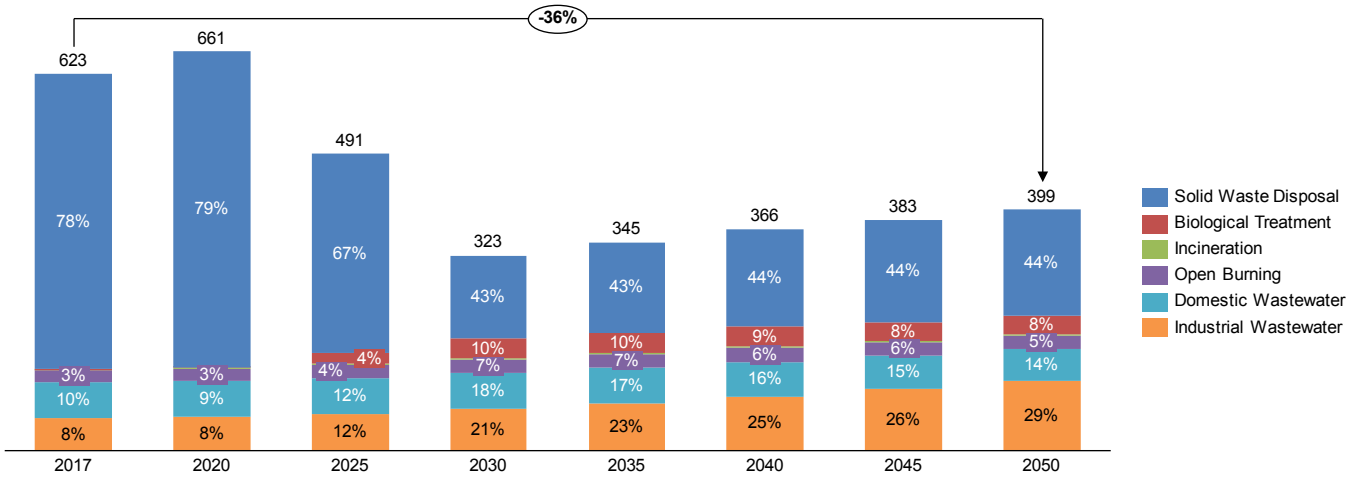


Figure 27. Total GHG emissions in the Waste sector by subcategories (in Gg CO_2-eq)

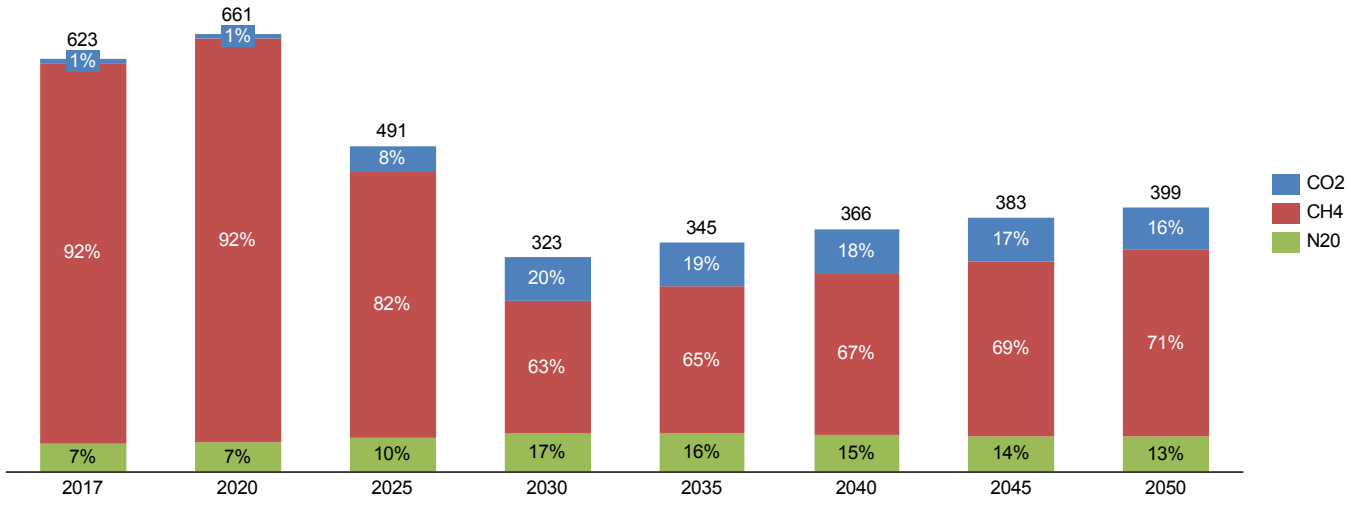


Figure 28. Total GHG emissions in the Waste sector by gases (in Gg CO_2-eq)

4.6 Total results

The total emissions in the WEM scenario are reduced by about 14% in 2050 compared to 1990 (Figure 29). Even though the emissions from the Energy and IPPU sectors increase, the emissions reduction is a result of GHG removals by the FOLU sector. The total emissions in the WAM scenario are reduced by 61% in 2050 relative to 1990. This is primarily a result of the decommissioning of TPP Oslomej and TPP Bitola.

If emissions from electricity imports are excluded (Figure 30), and given that there was no electricity imports in 1990, the reduction in total emissions is even greater (around 23% in WEM and 72% in WAM in 2050 compared to 1990).

Despite all the measures proposed in the WAM scenario, still, after 2030, an upward trend of emissions is maintained, which is primarily due to the IPPU sector in which, as previously emphasized, no mitigation measures are proposed. Therefore, if this sector is excluded from the total net GHG emissions, the total reductions reach 90% in 2050 compared to the 1990 level in the WAM scenario.

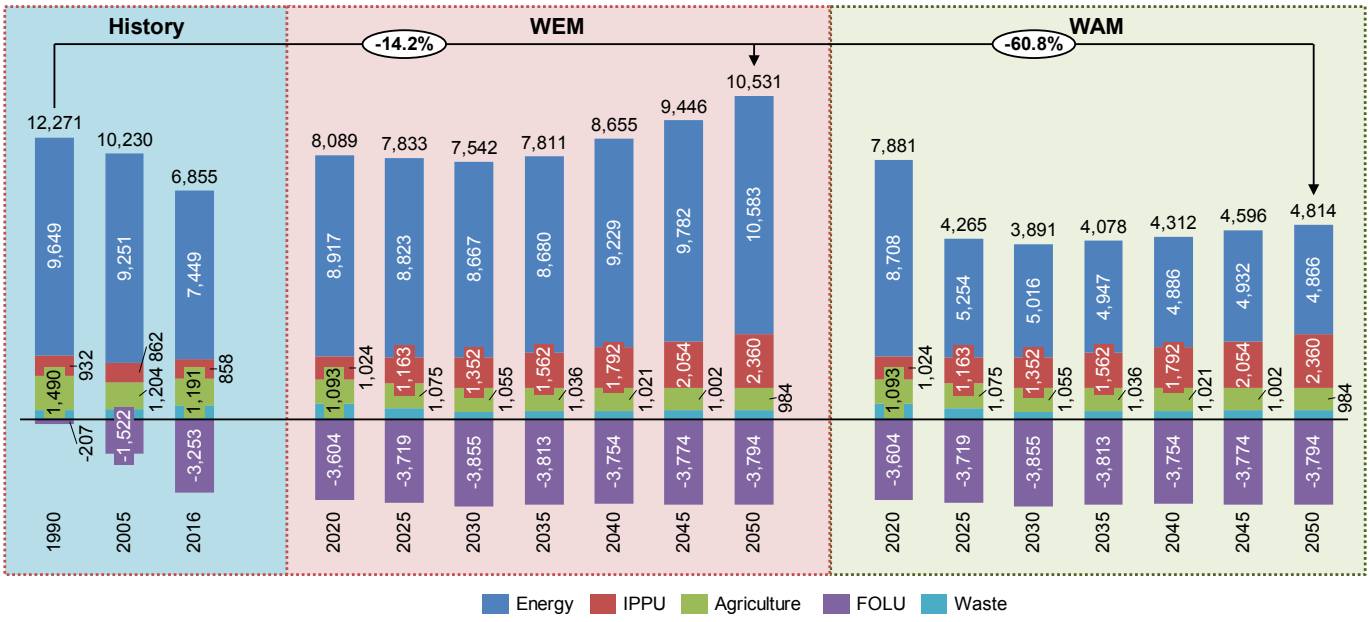


Figure 29. Total net emissions by sectors with MEMO items – WEM and WAM scenario (Gg CO2-eq)

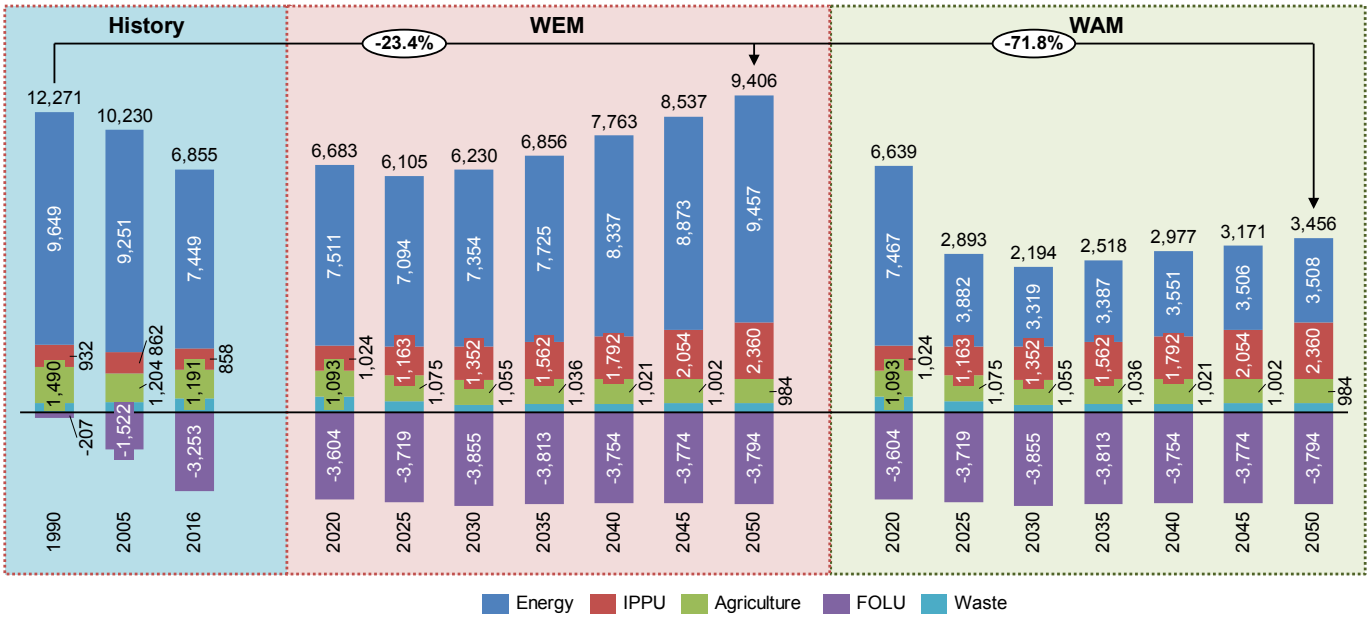


Figure 30. Total emissions by sectors without MEMO items – WEM and WAM scenario (Gg CO2-eq)

A reduction of net emissions by at least 82% in **2030** compared to 1990 in the WAM scenario requires:

- Reduction of emissions from the Energy sector by 66%
- Increase of emissions from the IPPU by no more than 45%
- Reduction of emissions from the Agriculture by 29%
- Increase of the removals from the FOLU sector by about 18 times (which although appears to be drastic, should be noted that it is an increase of only around 17% in 2030 compared to 2016 (reported in the Inventory-TBUR)) and
- Reduction of the emissions from the Waste sector by 21%

A reduction of net emissions by at least 72% in **2050** compared to 1990 in the WAM scenario requires (Figure 31):

- Reduction of emissions from the Energy sector by 64%
- Increase of emissions from the IPPU by no more than 153%
- Reduction of emissions from the Agriculture by 34%
- Increase of the removals from the FOLU sector by about 18 times (which although appears to be drastic, should be noted that it is an increase of only around 17% in 2050 compared to 2016 (reported in the Inventory-TBUR)) and
- Reduction of the emissions from the Waste sector by 2% (which in turn represents a reduction of emissions by 36% compared to 2017).

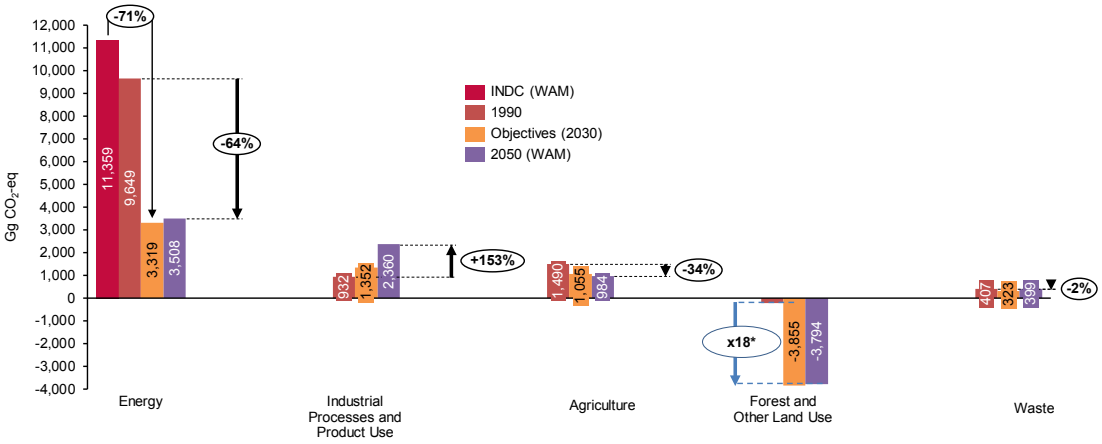


Figure 31. Emission reduction in 2030 and 2050 by sectors compared to 1990 and INDC

5. ADAPTATION MEASURES

5. ADAPTATION MEASURES

A wealth of information on climate change impacts as well as on measures to adapt and reduce vulnerability to such impacts is available in the country. However, the line between adaptation and maladaptation* may be fine when the subject matter in on the intersection of ecosystems and human activity.

For most situations, specific adaptation interventions need to be defined at the lowest level possible, so as to ensure the full integration of all relevant aspects (such as exposure and vulnerability to the climate impact of a given system, taking into consideration physical aspects, including geography and location; socio-economic parameters such as demography, health and cultural dimensions; as well as economic aspects). Up to date, solid and regularly collected data (before, during and after implementation) is in most such cases crucial for successful adaptation action.

The adaptation measures contained in this Strategy are limited and mainly aimed at addressing the key barriers and gaps identified in the Third National Communication. The reason for this is the fact that the PSC decided the Strategy and its Action Plan to focus on climate change mitigation measures and policies, while the NAP, which is currently in final phase of application for funding by the Green Climate Fund, will focus on comprehensive adaptation policies and measures. In addition to this, sectoral adopted strategies in the fields of biodiversity and nature protection address climate adaptation measures, while the vulnerability assessments are already addressed in the national communications developed so far. In addition, link between water and climate sector is already addressed in the Law on waters, as well as in the proposals for development of new or updated river basis management plans. Taking all of this into account, the scope of this chapter within the long term strategy is focus on addressing of key barriers and gaps and providing an enabling environment for climate adaptation.

Despite the fact that Republic of North Macedonia has put a lot of effort on scientifically sound information, there are still gaps that constitute barriers to the full understanding required for adaptation planning and action in key sectors such as water resources, agriculture, biodiversity, human health and socio-economic development. For these sectors, specific data and information gaps, including fragile cooperative mechanism for sharing and dissemination, have been identified, mostly related to the granularity and detail of the data, which allows for the definition measures at a lower level and that will allow for a regular monitoring and impact of the measures, once implemented. The objective of this strategy is to address and close such data gaps, to contribute to the country's readiness to define, implement and monitor measures to adapt to climate change impacts through the National Adaptation Plan.

In order to achieve the **specific objective 5 of this strategy**: To build solid systems for the regular and periodic collection data for the production and dissemination of scientific and technical knowledge, the following measures are defined:

- Water resources: Pilot project for the collection of data on water use in rural context for the purpose of ensuring effective adaptation to climate change
- Agriculture: Cooperation Among Scientific Institutions and Enhance the Science-Policy-Implementers Link
- Biodiversity: Define and develop an indicator system to monitor the impacts of climate change on biodiversity and to define a national research plan for biodiversity and climate change
- Human Health: Restore and improve the system for the collection of air-climate-health data, including the platform for sharing it with the public

* Maladaptation: when the implementation of an adaptation measures results in the increase rather than on the decrease of vulnerability to a certain climate change impact.

- Socio-economic Development: Define and develop a system to monitor socio-economic vulnerability to climate change

Water resources

Pilot project for the collection of data on water use in rural context for the purpose of ensuring effective adaptation to climate change

This measure specifically aims at addressing the following needs and gaps identified in the Third National Communication:

- Lack of knowledge about the extent of groundwater irrigation, and there is an urgent need for mapping/inventory of existing irrigation wells
- There are no reliable data on water consumed for irrigation. Most irrigation schemes do not have measuring devices at the level of intakes, river diversions or canal outlets

Taking into consideration the Water Strategy for the Republic of Republic of North Macedonia – Final Draft Version (2010) and the Law on Waters, in particular its section VI – Water Monitoring, a pilot project for the collection of data on water use in rural context, for the purposes of ensuring effective adaptation to climate change is to be implemented. The information available on ground water aquifers; the number of wells and of its use (it is not sufficient to know the number of wells, but whether or not water is actually extracted from them); the areas of irrigation using surface and underground water; and on the amount of irrigation water lost through evaporation and leakages is insufficient for a rigorous assessment of vulnerability and to the definition of sound policies for the management of water resources in the context of climate change.

The lack of this information makes it impossible to actually determine the vulnerability of specific geographic locations to the impacts of climate change, taking into account the climate scenarios downscaled to the level of the country. While there is sufficient information on the exposition to the climate change impact (mostly provided through historical and projected precipitation patterns), the actual vulnerability can only be assessed with site specific data on water needs, water use and water availability to meet the needs.

In the scope of this measure, the following activities are to be implemented:

1. Define the boundaries of the pilot, in particular in terms of geographic coverage
2. Inventory and map wells, including the identification of its main use (irrigation or other). For this, good practices shall be considered, such as
   a) digital field mapping, where the relevant features are observed, analysed, and recorded in the field, producing spatially referenced maps
   b) field work aided by and to complement / validate the results of the digital field mapping, with a view to collecting/validating, for example, data on: well location, status (operational / non-operational), depth to groundwater, groundwater quality.
3. Identify needs and determine measures for the improvement of the monitoring of irrigation water use in order to
   a) Determine the area under irrigation with surface and groundwater
   b) Enhance the coverage of measuring devices at the level of intakes, river diversions or canal outlets
   c) Set up a system / methodological approach to estimate irrigation water losses through leakage and evaporation
4. Define and implement a methodological approach for the monitoring of groundwater aquifers within the boundaries of the pilot project.

Agriculture

Promote Cooperation among Scientific Institutions and Enhance the Science-Policy-Implementers Link

This measure specifically aims at addressing the following needs and gaps identified in the Third National Communication:

- Weak networking and an insufficient level of cooperation between scientific institutions

Adapting to climate change in agriculture requires the vertical integration of scientific knowledge creation and dissemination. It is of the utmost importance that the research community answers the policy making needs for scientific knowledge and that the results of this policy-driven research reach the most important agents in this sector: the farmers.

The work undertaken under this measure should be mindful of the work being done under measure *Define a national research plan for biodiversity (including agrobiodiversity) and climate change*, namely on what agrobiodiversity is concerned.

In the scope of this measure, the following activities are to be implemented:

1. Identify the institutions performing research on agriculture and climate change
2. Define and establish a coordination, communication and knowledge management mechanism, including web-based, that promotes synergies among research institutions and enhances the link and communication among research institutions, policy makers, extension services and farmers, including civil society organizations

This coordination and communication mechanism shall, to the extent the availability of the technology and expertise in Republic of North Macedonia, rely on artificial intelligence technologies, which facilitate the collection and dissemination of relevant information, including matching information demand with supply. The core of this mechanism is to be a database aimed at managing knowledge, and a communication / interaction mechanism that, using artificial intelligence technologies, may be based on a ChatBot (a software programmed to typically perform repetitive tasks, such as answering frequently asked questions) or SocialBot (running over social media platforms). These artificial intelligence BOTs are able to deliver results in a more integrated manner by using algorithms, then by simply searching for key words.

Biodiversity

Define and develop an indicator system to monitor the impacts of climate change on biodiversity

This measure specifically aims at addressing the following needs and gaps identified in the Third National Communication:

- Lack of data for precise distribution of different species, population density and abundance; Vegetation map - communities and habitats; Insufficient definition of biogeographical characteristics of Macedonian territory;
- Lack of data on vulnerable biodiversity components to climate change;
- A monitoring system of climate change impacts on biodiversity does not exist;
- Lack of good intersectoral cooperation (partially)
- Insufficient capacities (human and knowledge); (partially)

Climate change may have significant impacts on biodiversity. Indicators can help illustrate this impact and make it more easily understandable for policy makers and the general public.

Data availability for indicator development is insufficient, not only in Republic of North Macedonia, but in most countries. Therefore, the indicator system under this measure needs to be mindful of such constraints. With that in mind, the following aspects shall be determinant in the choice of indicators to monitor the impacts of climate change on biodiversity:

- Purpose: what aspect of vulnerability / adaptation is the indicator to monitor?

- Relevance: the indicator is to provide relevant information for the decision-making process and / or for the monitoring of a specific adaptation action.
- Resources and capacities are to be available for the regular and accurate collection, management, and analysis of the data for the indicator. This includes choosing indicators for which data is more readily available over indicators for which greater data collection efforts will be required.
- Alignment and synergies with data collected for any other relevant purposes.

In the scope of this measure, the following activities are to be implemented:

1) Define policy relevant key indicators for evaluation of impacts of climate change on biodiversity
   a) Assess data needs and data availability and gaps, including resources needed to address needs and gaps
2) Design and establish monitoring system for the impacts of climate change on biodiversity, including institutional responsibilities

Define a national research plan for biodiversity and climate change

This measure specifically aims at addressing the following needs and gaps identified in the Third National Communication*:

- Lack of data for precise distribution of different species, population density and abundance; Vegetation map - communities and habitats; Insufficient definition of biogeographical characteristics of Macedonian territory;
- Lack of good intersectoral cooperation (partially)
- Insufficient capacities (human and knowledge); (partially)

Biodiversity's vulnerability to climate change is well established globally and in Republic of North Macedonia. More so than for other sectors, the vulnerability assessment and definition of adaptation measures is greatly dependant on scientific knowledge. Ensuring that the research community answers the policy making needs for scientific knowledge is of the utmost importance. In order to promote such science-policy link, a research plan for biodiversity, including agrobiodiversity, and climate change is to be elaborated.

The goals of the research plan for biodiversity, including agrobiodiversity, and climate change are to include:

- Identification of important gaps in the information needed by sectoral decision-makers to respond to climate change in ways that reduce the vulnerability of biodiversity to the impacts of climate change;
- Set adaptation research priorities based on these gaps;
- Identify capacity that can be harnessed or that needs development in order to perform priority adaptation research.

In defining research priorities, the following criteria shall be taken into consideration:

- Severity of potential impact or degree of potential benefit
- Immediacy of required intervention or response
- Need to change intervention or practicality of intervention
- Potential for co-benefit

* The needs and gaps addressed by these measures are partially the same as those addressed by the previous measure.

- Potential to address multiple, including cross-sectoral, issues

In addition, the engagement of all relevant stakeholders in the definition of the research priorities shall be assured, following a collaborative research approach, in which the priority research topics will help meet key stakeholder information needs. In this context, as for the definition of indicators in the previous measure, the policy relevance and the materiality of the purpose of the research shall be crucial in the definition of priorities.

The work undertaken under this measure should be mindful of the work being done under the Measure *Promote Cooperation among Scientific Institutions and Enhance the Science-Policy-Implementers Link*

In the scope of this measure, the following activity is to be implemented:

1. Elaborate a research plan for biodiversity, including agrobiodiversity, and climate change

Human Health

Restore and improve the system for the collection of air-climate-health data, including the platform for sharing it with the public

This measure specifically aims at addressing a need identified during the elaboration of this strategy, related to the unsustainability of the solution previously implemented for assuring a real time communication among the key health-meteorology organizations.

Accurate real-time or close to real-time data and the capacity to make information (such as alerts for events such as heat or cold waves or exceeding of air quality thresholds) available to the wider public is key for the adaptive capacity in the human health sector.

Republic of North Macedonia's capacity in the area of interaction between climate change and human health is high, nonetheless efforts are required to restore it to previous levels, namely through bringing back online the communication platform among the Hydrometeorological Service, the Public Health Institute and the general public.

Furthermore, the integration of relevant meteorological/climatological, air quality and health data (including morbidity and mortality) is fundamental to allow for an adequate response to the public health emergencies accruing from climate change in the present and in the future.

In the scope of this measure, the following activities are to be implemented:

1. Define technical specifications for the server required to restore the existing automated platform
2. Define the technical specifications for improving the platform, including:
    a. Selection of meteorological, air quality and public health parameters
    b. Identify data needs and gaps
    c. Identify needs to strengthen the system for data collection, analysis and dissemination (including weather and air quality stations and procedures for the reporting and morbidity and mortality associated with weather events)
3. Prepare a roll out plan, including, if relevant, the definition of a phased approach for implementation
4. Prepare the Terms of Reference for the acquisition of hardware and software

Socio-economic vulnerability

Define and develop a system to monitor socio-economic vulnerability to climate change

This measure specifically aims at addressing the following needs and gaps identified in the Third National Communication:

- Inaccurate statistical data for some statistical units, particularly at the settlement level, because the Census of Population, Households and Dwellings was not conducted in 2011.

- Certain data in the field of health, social care, employment, etc., are not available at the municipal level due to the method of processing and disclosure of relevant institutions. The above information is processed and disseminated at the level of 30 centres. The official statistical data on incomes and expenditures of households, poverty, socially excluded groups and related indicators are available only as totals for the Republic of Republic of North Macedonia as a whole and are not disaggregated.
- Comparability of data over time is not possible due to changes in applied methodology and changes in the administrative divisions in which the census data are published.
- Limiting factors meant that the composite socio-economic index could not include indicators on the economic situation of the population, such as the unemployment rate and the level of household income.

The assessment of socio-economic vulnerability to climate change involves assessing the vulnerability of a region to a hazard based only on its social and economic status. It is the probable vulnerability of a place and its people to a hazard. It is assumed that better the socio-economic status of a place (meaning, of a people, of a community), lesser will be its vulnerability towards disasters, and better and faster will be its coping mechanisms.

An index-based vulnerability assessment is a comprehensive tool that helps in comparing and ranking areas, cities, regions or communities in terms of vulnerability, thus facilitating priority setting and the definition of adaptation measures targeted at the specific vulnerabilities of each community. These rankings are to be developed by combining indicators, to which different weights may be attributed depending on its contribution to the community's vulnerability. These composite indices reduce complex information from multiple variables to a single variable, thus facilitating the policy and decision-making process.

Indicators of social and economic status can include the region's per capita income; demographic structure (e.g. percentage of less privileged or dependent population like women, children, elderly and disabled); availability and extent of access to public amenities (e.g. institutional stability and strength of public infrastructure).

The collection of the required data needs to be done in a systematic way, ensuring that priority is given to key indicators to be identified in the scope of the activities to be performed under this measure.

Activities

1) Define policy relevant key indicators for evaluation of the socio-economic vulnerability to the impacts of climate change
2) Define parameters and rules for the establishment of community-specific indexes
3) Determine data needs and gaps for the accurate socio-economic characterization of the impacts of climate change
4) Identify data providers
5) Establish a system for the periodic, systematic and consistent collection of data

In order to achieve Specific objective 6: To increase the resilience of climate change impacts of key socio-economic sectors and ecosystems, the following measure is defined.

Prepare the National Adaptation Plan (NAP)

The preparation and adoption of the National Adaptation Plan, in accordance with the technical guidelines for the national adaptation plan process prepared under the United Nations Framework Convention on Climate Change (UNFCCC), will endow Republic of North Macedonia with the required tools to implement key adaptation measures to reduce vulnerability and increase resilience to climate change.

The NAP should take into consideration the climate scenarios, vulnerability and impact assessment and the adaptation measures contained in the most recent national communication to the UNFCCC.

The activities for the preparation of the NAP are to be planned and implemented in accordance with the international requirements under the UNFCCC and in accordance with the project submitted to the Green Climate Fund.

6. EDUCATION, AWARENESS RAISING, RESEARCH, DEVELOPMENT AND INNOVATION

6. EDUCATION, AWARENESS RAISING, RESEARCH, DEVELOPMENT AND INNOVATION

6.1 Legal and policy framework

The national educational, research and development (R&D), and innovation aspects are defined in the following legal acts:

- Law on the Scientific and Research Activities (2016) with National Programme for Scientific, R&D Activities,
- Law on Encouragement and Support of Technological Development with National Programme, for Encouragement and Support of Technological Development (2012-2015), repealed wit Law of Innovation Activity (2015),
- Law on Higher Education (2018), with National Strategy for Education (2018-2025).

Issues related to innovation and technology transfer (TT) policy goals are regulated by the following legal acts:

- Law of Innovation Activity of the Republic of Republic of North Macedonia (2015),
- Innovation Strategy of the Republic of Republic of North Macedonia (2012-2020),
- Industrial Policy of the Republic of Republic of North Macedonia (2009-2020),
- Strategy of competitiveness (2016-2020),
- Policy of Small and Medium Enterprises of the Republic of Republic of North Macedonia (2018-2022),
- Industrial Strategy of the Republic of North Macedonia (2018-2027),
- Regional Strategy for Innovation R&D of Western Balkans (2014).

The Ministry of Education and Science is the nationally designated entity for R&D policy, as well as responsible national entity for financing, development and promotion of science, R&D, technological development and informatics.

6.2 Overview of the state of climate mainstreaming in the educational system, R&D, and innovation

Climate change and some aspects of sustainable development are, to a certain extent, incorporated in the educational curriculum of some national academic institutions. However, climate is still not adequately incorporated in the overall national educational system. Four public universities and their faculties, as well as some private universities, have undergraduate and postgraduate programmes related to climate change and sustainable development.

The interest for these studies is continuously growing. National authorities should aim at continuously improve the educational curriculum and to establish links with foreign educational institutions working on climate and sustainable development issues. This would enable the exchange of good practices, improve the national educational curriculum, as well as create opportunities for Macedonian faculty and students to spent time working or studying in internationally recognised academic centres.

Education, R&D and innovation are very important national drivers to mainstream climate action. Currently, there is no systematic approach to foster climate aspects on all levels of the educational system. However, the country has made significant investments to support national academic institutions and the scientific community dealing with climate research.

It is fundamental to mainstream climate change related aspects into future national strategic planning documents related to education, R&D and innovation. This would assure the systematic and harmonised integration of climate related aspects into the national educational, R&D and innovation ecosystem, as well as increase educational and research capacities and climate awareness. The most important national strategic documents that should integrate climate related aspects are the future National Strategy for Education and the National Innovation Strategy.

The strategic integration of climate change at all levels of the educational system should include the provision of additional funding for climate related research activities, to raise public awareness, and to establish centres of excellence and research institutes.

The country is considered the most prominent and experienced in the region when it comes to national capacities for reporting towards the UNFCCC. Besides, Republic of North Macedonia was the first country of the Energy Community Contracting Parties to submit its National Energy and Climate Plan. The MoEPP and the UNDP, as a supporting partner of the Ministry when it comes to reporting towards the UNFCCC, made efforts to institutionalize cooperation with certain research and educational institutions in order to assure a long-term partnership and continuous support to the government regarding climate change issues.

However, a lot more has to be done to assure that the R&D community will be well positioned to support national authorities in the processes of informed decision making and evidence-based policy creation. Climate mainstreaming in the country may be significantly improved by enhanced institutional capacities and the establishment of sound mechanisms for inter-sectoral cooperation. Currently, the climate capacities of the MoEPP are limited, especially in terms of technical expertise for reporting towards international organisations, as well as for monitoring and reporting of policies, measures and projections.

When it comes to innovation in the field of climate change, many things have been initiated and implemented in the last few years. The Fund for Innovation and Technology Development was established in 2017 and a Support Instrument of the Fund was launched in order to support innovative and improved technologies, know-how and technology processes, and to encourage different forms of collaboration among small and medium enterprises (SMEs), business associations, clusters and/or chambers of commerce.

However, the capacity need assessment* done in the framework of the Project has also demonstrated that all line ministries need capacities and knowledge to be fully capable to integrate climate change aspects into their sectoral plans and programs. This means that climate consideration should be brought higher on the political agenda of the Government in order for the country to allocate the necessary funds to engage additional human capacities at all levels.

6.3 Climate awareness in the country

According to the Third Environmental Progress Review of Republic of North Macedonia, and in line with the observations of the Project team, overall climate awareness in the country remains limited. The lack of financial and human capacities for the systematic support of climate awareness raising in the country limit the outreach of the MoEPP. Currently, most climate related awareness raising activities are supported by donor funded initiatives.

Awareness-raising should be a horizontal priority in all policies and measures used to promote climate action in Republic of North Macedonia. Growing societal awareness and appreciation can drive enhancement of socio-cultural and/or environmental values in the context of climate change and build up momentum for overarching climate mitigation and adaptation action.

The Project team considers that climate awareness is exceptionally low among the general public, but sufficient at institutional level. The comparatively higher degree of awareness among institutions might be

* Report on institutional analysis and assessment of administrative capacity needs for climate action.

explained by the extensive efforts of national authorities, the donor community and NGOs, which have worked on issues related to climate in the country for more than 10 years.

Climate action is necessary to promote nature conservation, innovation, and sustainable development. The awareness-raising process should be systematic and build society and policy-makers' knowledgebase, contributing to mainstreaming climate action and ensuring that policy options are optimised.

Climate action's success ultimately depends on the engagement of all stakeholders. Intensive science-policy dialogues and new approaches and tools to involve the public and business sector are essential to raise climate awareness and successfully implement climate action in the country.

The Strategy defines measures for climate mitigation and adaptation directed to the public. These measures aim to make climate change education a central and visible element of the international response to climate change. Climate change education would increase climate literacy, raise awareness, and strengthen relevant national capacities.

6.4 Measures for enhanced climate mainstreaming in the education, R&D, innovation, and awareness raising

The Third Environmental Performance Review of Republic of North Macedonia was published in 2019. This review report made a comprehensive evaluation of the state of climate mainstreaming and climate awareness of the country, as well as the state of the education sector regarding the integration of sustainable development aspects.

This Strategy reiterates the Recommendation 7.7 of the Third Environmental Performance Review of Republic of North Macedonia, as it follows:

The Government should:

(a) Regularly and systematically implement measures aimed at raising awareness on climate-change-related issues;

(b) Ensure that climate-change-related issues are integrated into primary, secondary and tertiary curricula.

In addition, this Strategy recommends the implementation of an expanded list of measures for enhanced climate mainstreaming in the sector Education, R&D, innovation and awareness rising. The additional measures are divided among the following two categories:

a) Primary set of measures to be implemented by the Government and relevant Ministries

- Mainstream climate change related aspects into the forthcoming National Strategy for Education.
- Mainstream climate change related aspects into the forthcoming National Innovation Strategy.
- Mainstream climate change related aspects into the forthcoming National Strategy for Gender Equality.
- Implement the capacity building activities foreseen under the draft Action Plan for Administrative Capacity Strengthening for Climate Action.
- Develop an action plan for the introduction of climate related education into the curricula of all education levels and in lifelong learning, teacher education and in-service training.
- Develop a national programme for climate awareness raising.
- Establish a coordination mechanism on climate change education among all relevant stakeholders.
- Allocate resources for the implementation of climate change education activities on all educational levels.

- Allocate resources for the implementation of climate change awareness raising activities in which a number of behavioural measures will be promoted, such as sustainable food production, vegan diet and lifestyle, environment and climate friendly consumer practices, primary waste selection, local waste composting, promotion of local and low carbon products, etc.
- Assure regular financial allocations for climate change projects through the Fund for Innovations and Technology Development.

b) Secondary set of measures to be implemented by the Government, relevant Ministries, Academia and NGOs

- Provision of strategic guidance to the donor community to support projects related to climate action and climate awareness rising in the country.
- Promote the Long-term Strategy on Climate Action and facilitate the participation of the general public and the NGO sector in its implementation.
- Develop a programme for strengthening climate action capacity of national and local institutions.
- Implement campaigns to raise climate awareness.
- Support the development of a legal framework and funding mechanism to protect climate vulnerable groups, including women, children, eldery and people with disablilities.
- Facilitate active participation of affected communities in climate change decision-making and equal participation of women and men.
- Provide training on climate relates aspects for journalists and media representatives.
- Produce promotional materials such as publications, atlases, audio-visuals and graphics that might be widely disseminated among the general public and civil society.
- Involve the private sector and the economic chambers in the elaboration and implementation of programmes for climate awareness raising (e.g., electricity distribution companies, waste collection utilities, etc.).
- Provide guidance and support for the development and implementation of skill building programmes related to sustainable technologies (professional upgrading, vocational training, lifelong learning) in order to unlock potential for the creation of green jobs and a low-carbon economy.
- Support the development of an enabling legal framework and incentive mechanisms for domestic producers of sustainable technological solutions and climate friendly technologies, which will support the implementation of the Strategy (as solar panels, solar boilers, EE appliances and construction items, batteries, etc.).
- Provide coaching and capacity building on Industrial Energy Management aspects and on the introduction of climate friendly technologies in the Industry sector.
- Support the development of an enabling legal framework and incentive mechanisms for business dealing with sustainable waste management and climate friendly agricultural practices.
- Provide guidance to banks and other financial institutions to offer financial products for enhanced investments in climate friendly technologies.
- Establish research exchange programmes and networks between national and international academic institutions dealing with climate related issues.
- Provide support to national experts to be involved in global climate related reviews and relevant scientific activities, for example the IPCC Assessment Reports.

7. KEY INDICATORS

7. KEY INDICATORS

The Strategy, with its policies and measures, supports the implementation of the UN 2030 Agenda of Sustainable development and its Sustainable Development Goals (SDGs). SDG13 is devoted to Climate Action and has an impact in the achievement of all other SDGs goals. Despite the challenges, climate action presents a huge economic opportunity, having in mind that that green economic policies have to ensure a 'Just Transition'* for workers coming from less environmentally friendly industries so no one is left behind. Since **electricity generation and the use of primary energy are the biggest contributors to GHG emissions in Republic of North Macedonia**, the transformation of the Energy sector is on a critical pathway on the transition towards carbon neutrality enshrined in the Strategy's vision. It is very notable that the country is making significant progress towards the achievement of the national energy efficiency and renewable energy targets, which at the same time brings a number of co-benefits including improved economic indicators, improved air quality and reduced health impact caused the local pollution.
In order to present the combined effects of the policies and measures included in the Strategy's WAM scenario on SDGs, specific indicators addressing SDGs 7 (Affordable and clean Energy) and 13 (Climate action) have been developed. Besides, an additional set of indicators that evaluate the low carbon development and carbon transition of Republic of North Macedonia (NM-WAM) in the context of and in comparison with the EU 2016 Reference scenario† are presented.
The key indicators for comparison are as follows:

a) GHG emissions per capita (t of CO_2-eq./capita)
b) GHG emissions to GDP (t of CO_2/Mil.Euro)
c) Energy CO_2 Emissions/Capita (t of CO_2/capita)
d) Energy CO_2 Emissions to GDP (t of CO_2/Mil.Euro)
e) Carbon intensity (t of CO_2/toe of Gross Inland Consumption)
f) Gross Inland Consumption to GDP (toe/Mil.Euro)
g) Renevable energy sources in gross final energy demand (%)
h) Renevable energy sorurces in transport (%)
i) Import Dependency (%)
j) Final energy consumption in households per capita (toe/capita)

Macro indicators

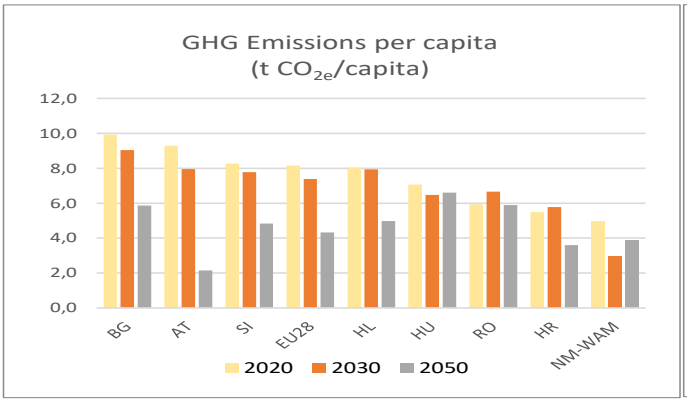


Figure 32. GHG emissions per capita for 2020, 2030 and 2050 – WAM scenario

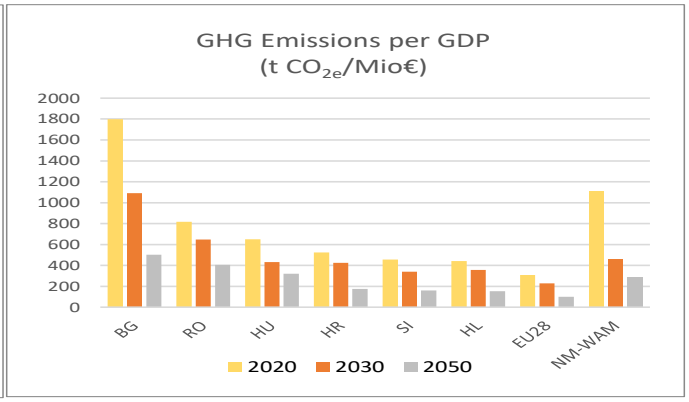


Figure 33. GHG emissions per unit of GDP for 2020, 2030 and 2050 – WAM scenario

* Just Transition is a framework developed by the trade union movement to encompass a range of social interventions needed to secure workers' rights and livelihoods when economies are shifting to sustainable production, primarily combating climate change and protecting biodiversity.

† The EU Reference Scenario is a projection of where EU's current set of policies (EU Climate/Environmental/Energy Acquis) coupled with market trends are likely to lead. EU Member States for comparison were selected according to geographical relevance (EU Member States in the Balkan: BG-Bulgaria, RO-Romania, HL-Greece and HR-Croatia), size of population (SI-Slovenia), and ability to invest (AT-Austria).

The GHG emissions per capita indicator of Republic of North Macedonia is 4,9 t CO_2eq./capita, well below the EU28 average, which is 8 t CO_2-eq./capita. With the implementation of the measures included in the WAM scenario, the indicator is projected to further decrease to 3,0 t CO_2-eq./capita by 2030, and to increase to 3,9 t CO_2-eq./capita by 2050.

While GHG emissions per capita are well below the EU28 average, the GHG emissions pre unit of GDP is almost 4 times higher than the EU28 average and is comparable with the GHG emissions per unit of GDP of Bulgaria. With the implementation of the measures included in the WAM scenario, this indicator is projected to significantly decrease and reach the levels of EU Member States from the region by 2030 and 2050. The most significant contributions to the reduction of emissions considered by this indicator are related to the foreseen mitigation measures and structural changes related to the Energy sector.

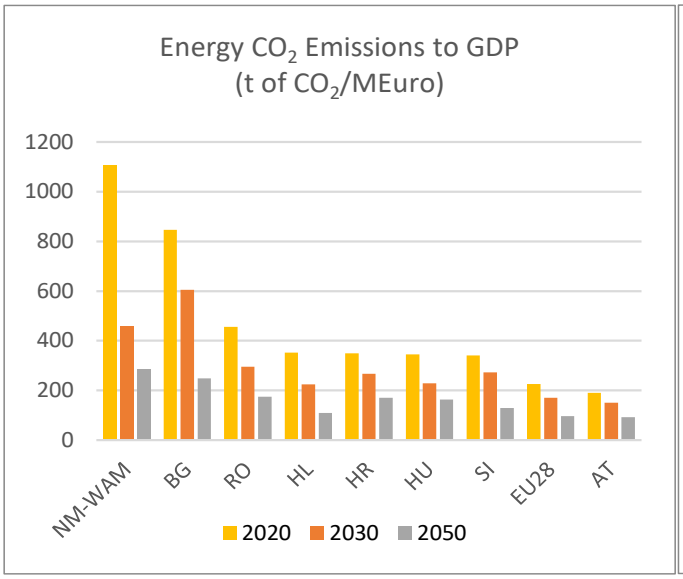


Figure 34. Energy sector CO_2 emissions per unit of GDP for 2020, 2030 and 2050 – WAM scenario

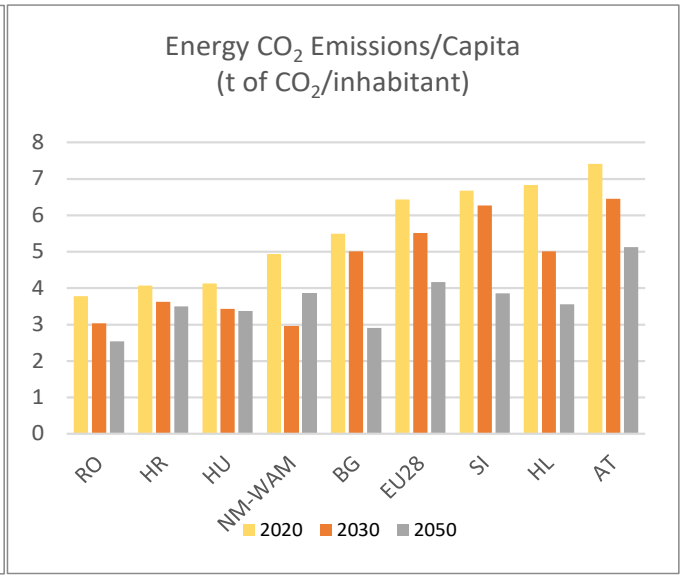


Figure 35. Energy sector CO_2 emissions per unit of GDP for 2020, 2030 and 2050 – WAM scenario

As highlighted before, projected structural changes in the Energy sector in the WAM scenario (closing down the Bitola TPP by 2027) will, by 2050, bring the energy CO_2 emissions per unit of GDP to the comparable EU levels, while energy related CO_2 per capita is projected to remain below the EU28 average and comparable with the neighbouring EU countries such as Greece and Bulgaria.

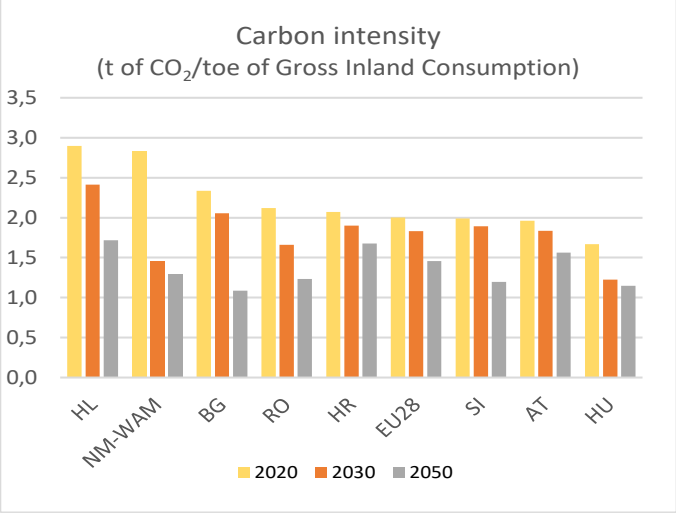


Figure 36. Carbon intensity of energy consumption for 2020, 2030 and 2050 – WAM scenario

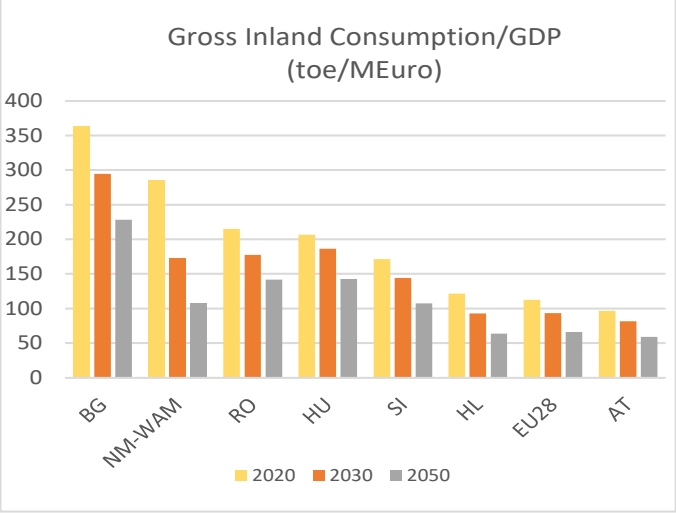


Figure 37. Energy intensity of GDP for 2020, 2030 and 2050 – WAM scenario

The phasing out of the coal power plants, stronger penetration of renewables and, to some extent, natural gas, as well as increased energy efficiency by 2030 is well reflected in the carbon intensity of the gross inland energy consumption. This indicator is projected to decline below the EU28 levels and to be in the same range as comparable EU Member States from the region. In parallel to this indicator, the Gross inland consumption per GDP is also projected to decrease and be in the same range as comparable EU Member States from the region.

The increase in the use of renewable energy sources is also one of the indicators showing the transition to low carbon society and contributing to the achievement of the SDG – Affordable and clean energy.

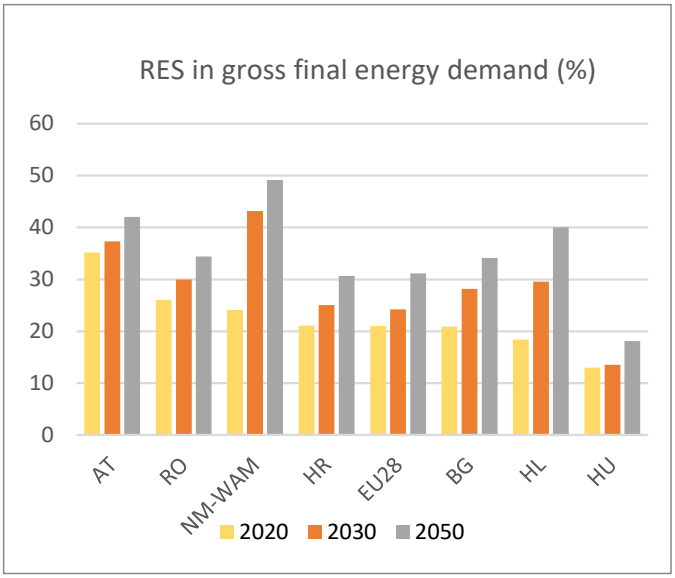


Figure 38. Share of renewable energy sources in gross final consumption for 2020, 2030 and 2050 – WAM scenario

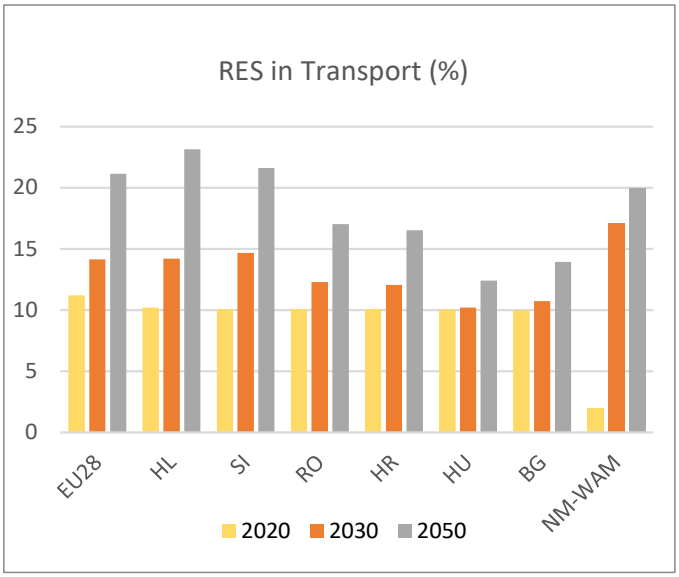


Figure 39. Share of Renewable energy sources in Transport sector for 2020, 2030 and 2050 – WAM scenario

In the WAM scenario, the RES share in gross final energy consumption is estimated to reach 23% by 2020, 43% by 2030, and 49% by 2050. The projected RE share is much higher than any of the comparable countries and well above the EU28 Reference scenario target value set under the 2030 Climate and Energy Framework (32%).

Regarding the penetration of RES in the Transport sector, the country is currently well behind the EU28 average of 11%, which is projected to increase to 14%. by 2030. The RES share of the Transport sector of Republic of North Macedonia is projected to sharply increase from 2% in 2020 to 17% by 2030, and 20% by 2050. Taking into account that the projected RES share above 10% is predominately driven by the penetration of electric and hydrogen powered vehicles, and considering the fact that the penetration of these technologies is driven by consumer purchase power, it can be concluded that the achievement of the RES goal for the Transport sector will be challenging.

Energy security and households' consumption indicators

Taking into account the carbon transition and the decarbonisation of electricity production, import dependency is an important indicator to measure the exposure of the country to the price of external energy commodities such as oil & petroleum products, natural gas and electricity. The current import dependency of Republic of North Macedonia is slightly below the EU28 and above the import dependency of Bulgaria and Romania, which is an important consideration from the regional market perspective.

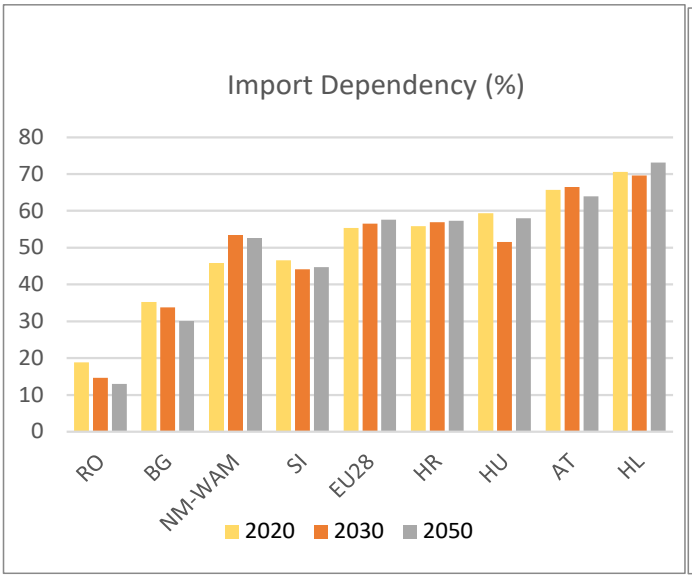


Figure 40. Energy import dependency for 2020, 2030 and 2050 – WAM scenario

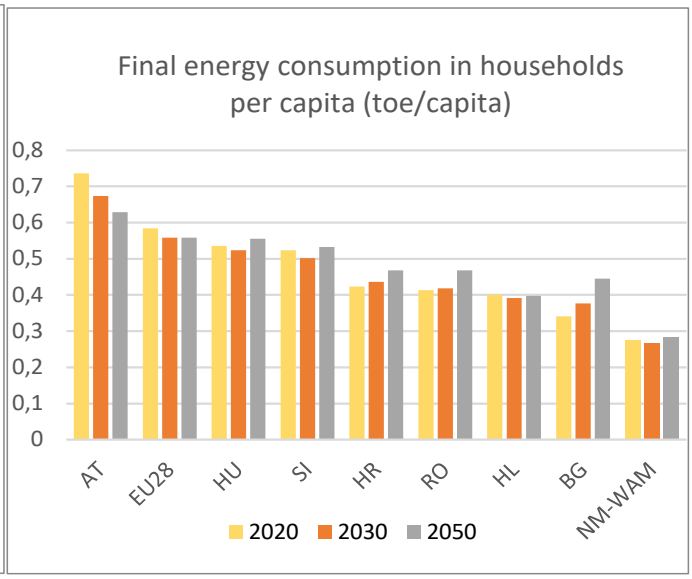


Figure 41. Final energy consumption in households per capita for 2020, 2030 and 2050 – WAM scenario

It is projected that the import dependency will slightly increase to 53,5% by 2030 and to 52,6% by 2050. The domestic phasing out of lignite, which is extensively replaced with RES, is also reflected in the projected reduction of electricity imports by 63%, by 2050, compared to 2017 levels.

On the other hand, the final consumption of imported energy commodities such as oil and natural gas are projected to increase by 2030 tenfold and by 2050 more than seventeen-fold compared to 2017 levels, while total final consumption is to increase by 38,3% by 2050 compared to 2017 levels. In households, final energy consumption is projected to decrease by 5,7% by 2030 and by 7,7% by 2050 compared to 2017 levels. Since the demographic projection by 2050 also have a declining trend, the final energy consumption in households per capita will be maintained at about 270-280 toe per capita, which is among the lowest consumption among the EU Member States* with the exception of Malta.

* For this purpose, Member States for comparison have been amended to account, to the extent possible, for specific climatic conditions reflected in heating and cooling degree days. The countries for comparison are BG-Bulgaria, HL-Greece, ES-Spain, P-Portugal, CY-Cyprus, and MT-Malta.

8. COSTS OF THE TRANSITION AND EXPECTED SOCIO-ECONOMIC EFFECTS OF MITIGATION MEASURES

8. COSTS OF THE TRANSITION AND EXPECTED SOCIO-ECONOMIC EFFECTS OF MITIGATION MEASURES

8.1 Detailed analysis of the costs of implementation of the WEM and WAM scenarios

For realization of a transition towards low-carbon society in Republic of North Macedonia around 19 Bill. EUR of cumulative capital investments are needed in the period 2020-2050 (WEM scenario), while for an enhanced transition (WAM scenario) around 35 Bill. EUR are needed (Figure 42). The Energy sector (supply and demand side + infrastructure) accounts for about 99% of the total investments in both WEM and WAM scenarios. The total cumulative investments in the AFOLU sector are about 115 mil. EUR, while the total investments in the Waste sector are about 67 mil. EUR in both scenarios. As stated in Chapter 4, no measures are proposed in the IPPU sector, so no capital investments are assumed in this sector. It can be noted that the total investments in the WAM scenario are almost doubled compared to the WEM scenario.

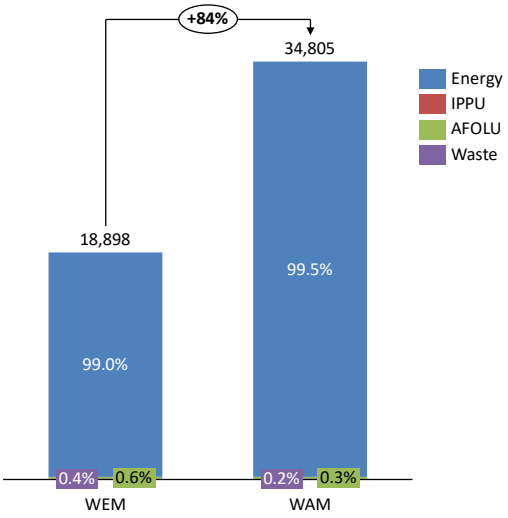
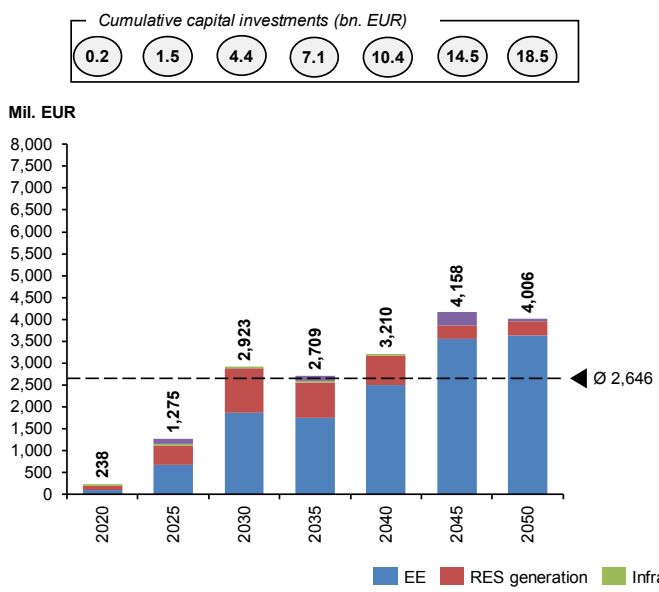
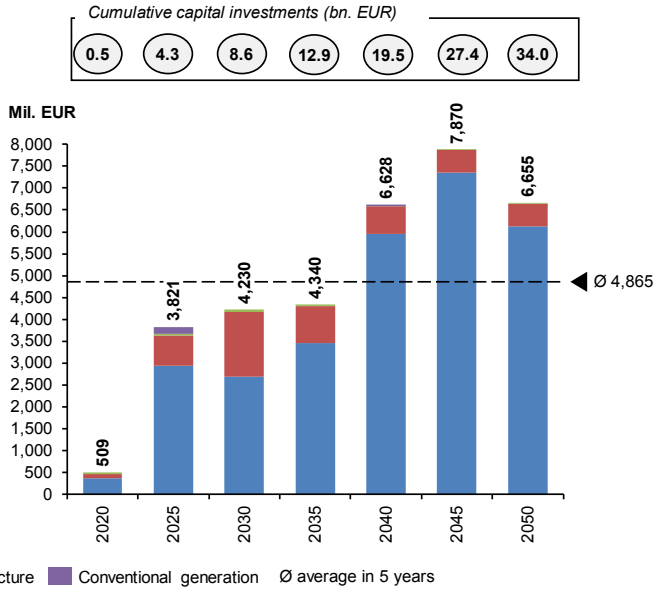


Figure 42. Total investment costs in WEM and WAM scenario – 2020-2050 (mil. EUR)

As the Energy sector has the highest share in the investments needed for realization of the both scenarios, more detailed data on investments in this sector by category is provided in Figure 43 and Figure 44. For implementation of the WEM scenario, the Energy system would need a cumulative capital investment of 18.5 bil. EUR until 2050, while the WAM scenario can be implemented with cumulative capital investment of 34.1 bill. EUR. . The focus in both scenarios is on the capital investments in energy efficiency, followed by investments in RES generation. To accept the increased use of RES in the WAM scenario capital investments would be also needed in the energy system infrastructure. Detailed investments per measure in the WAM scenario are given in Table 4.





*Note: Additional 720 Mil. EUR are planned for the railway to Republic of Bulgaria (in the period 2020-2030)

Figure 43. Aggregated capital investments per category on 5 years period in Energy sector – WEM scenario

Figure 44. Aggregated capital investments per category on 5 years period in Energy sector – WAM scenario

However, in order to calculate the cost of transition, the total Energy system costs are very important, which besides the investments, also include the operation and maintenance costs (at both supply and demand side), fuel supply + carbon costs and delivery costs (Figure 45). In the Energy sector, it is estimated that in the WEM scenario the annual system costs would increase from 2.6 bil. EUR in 2018 to 6.2 bil. EUR in 2050. The majority of the expenditures are fuel supply costs and investments in technologies on the demand side, both comprising 67% of the total annual costs in 2020 and increasing their share to 69% in 2050.

The most important results for the transition of the Macedonian Energy system is that in the case of WAM scenario, the cumulative system costs are for 12% lower compared to the WEM scenario. Although the investment costs in the WAM scenario are higher, the significantly lower cost of fuel supply makes this scenario more cost-effective than the WEM scenario. Additionally, in the WAM scenario, the higher utilization of RES potential (especially on the supply side) and more efficient fuel consumption would only slightly change the annual fuel supply costs over the period, while the annualized investments on the demand side are estimated to grow significantly due to the introduction of advanced (more energy efficient) technologies. The operation and maintenance costs in the Power sector in the WAM scenario are reduced (cumulative for around 11%) compared to WEM as a result of the decommissioning of the TPP Bitola. At the same time, the annualized investments in the Power sector in WAM scenario are increased for around 20% compared to WEM, as a result of the increased investments in RES capacities.

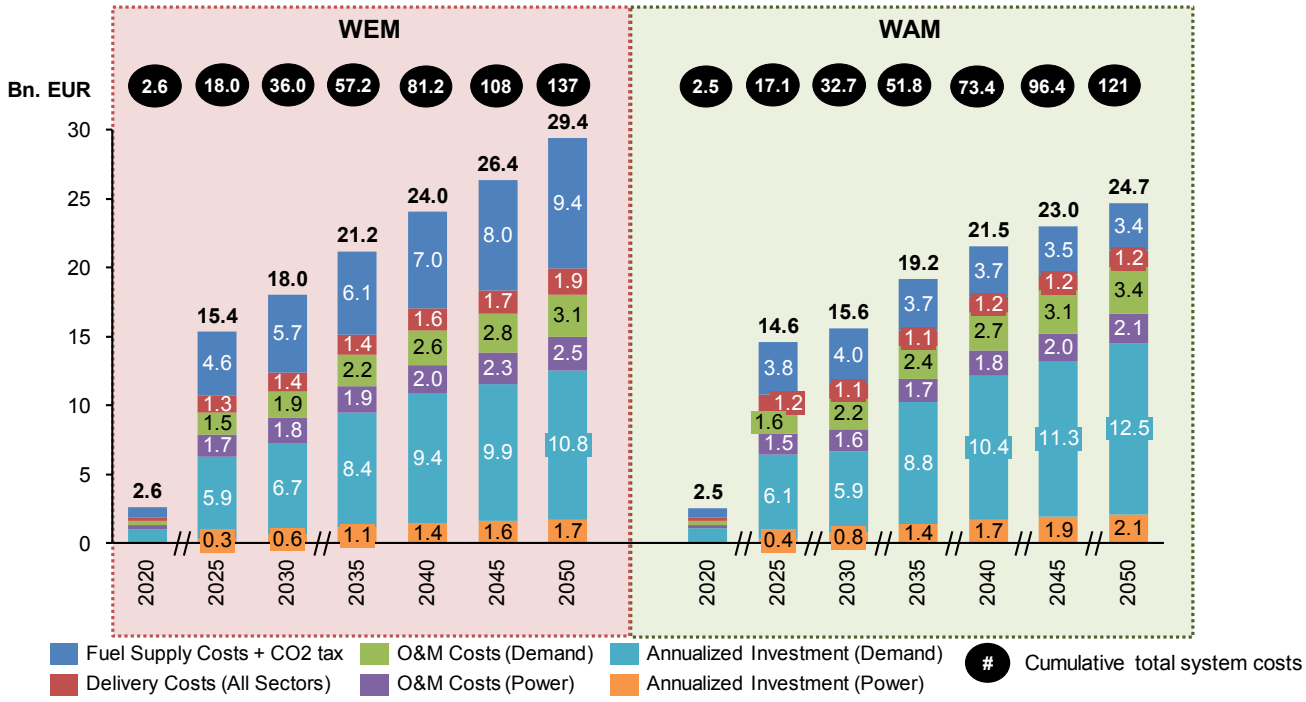


Figure 45. Evolution of annual system costs (aggregated on 5 years period) – Energy sector

8.2 Assessment of social aspect

For a sustainable transition, besides the economic and environmental, the social aspect is also very important. According to the years in which the proposed measures and policies are implemented, for some of them, the number of domestic green jobs is calculated at yearly level for the WAM scenario. The highest number of around 10,000 green jobs is achieved in 2035 (Figure 46), which represents 2.7 times more jobs than the current number of employees in the coal power plants in Republic of North Macedonia (TPP Bitola around 2700 and TPP Oslomej around 1000). Retrofitting contributes to the most for the opening of new jobs (around 58%), followed by construction of new houses, including passive houses (with around 19% share). Because of the gradual increase of the standard for renovation and construction of new buildings up to 2035, the number of the new green jobs from these measures is increasing in that period. Additionally, the measures with the highest share is Retrofitting of existing residential buildings (50% in 2035), Construction of passive buildings (18% in 2035), RES without incentives, Solar thermal collectors, Retrofitting of existing commercial buildings and Solar rooftop (Figure 47). Furthermore, it is shown that more than 27% of the new domestic green jobs in 2050 can be assigned to women.

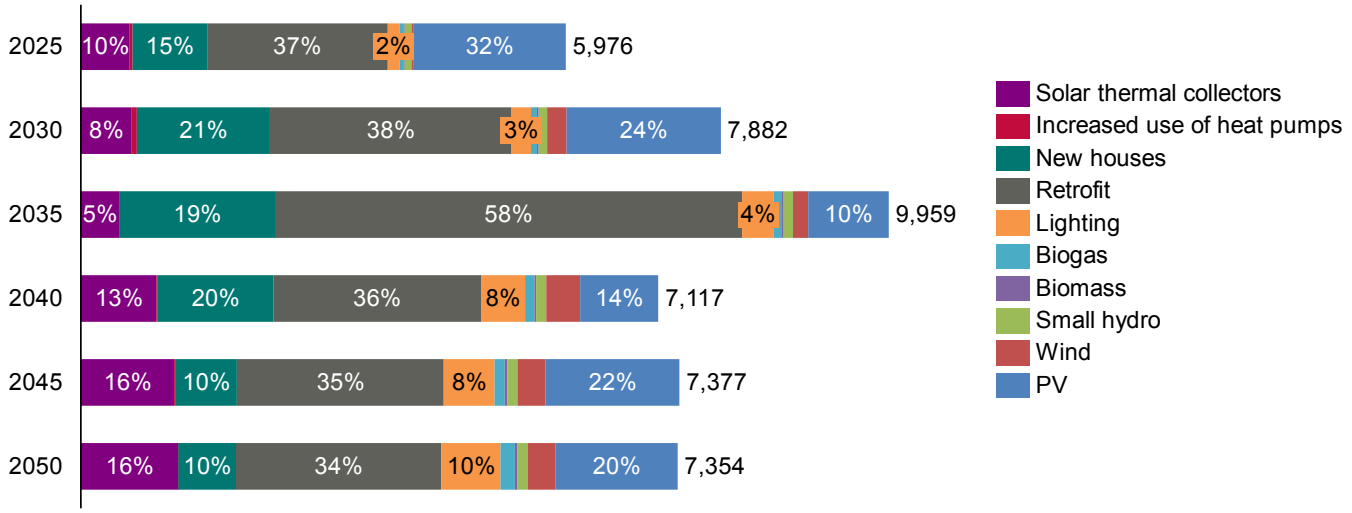


Figure 46. Number of domestic green jobs by technology in WAM scenario

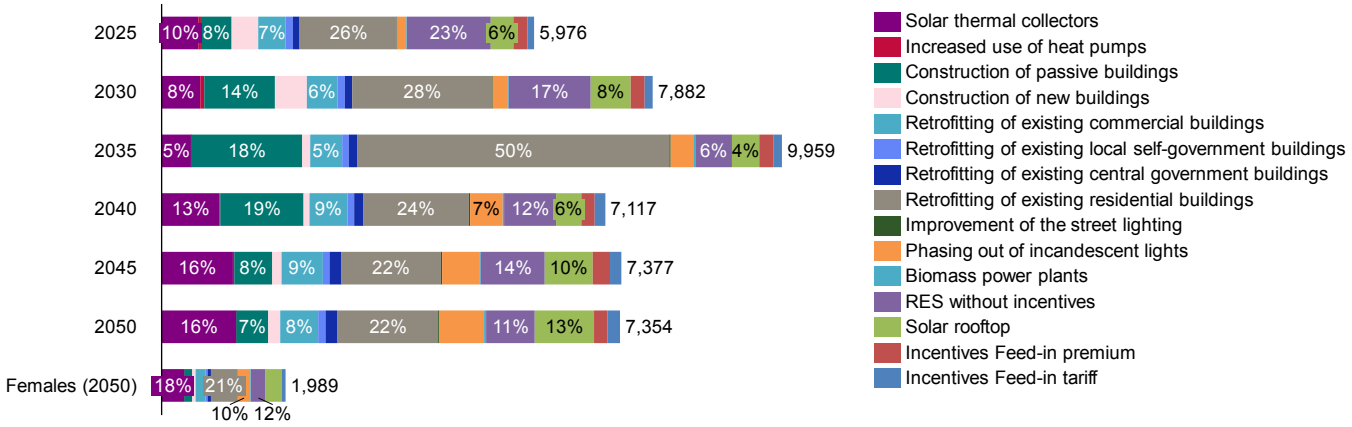


Figure 47. Number of domestic green jobs by measure in WAM scenario

8.3 Recommendations on provision of enabling environment and investments in climate action

The implementation of the transition measures requires involvement of all stakeholders (Table 4). Most of the measures are planned to be implemented by consumers, which makes them the largest investors. This primarily refers to households and transport, but also consumers from the commercial, industry and agriculture sectors. However, these investments should be largely supported and encouraged by the central and local government, which through the implementation of measures intended for them should set an example in the implementation of energy efficiency and RES measures. In this regard, funding should be provided by an EE fund, donor funding or the funding should be supported by ESCO companies. This is especially relevant for the vulnerable consumers which will depend on provision of financial support. Private investors (private and state-owned companies) also play an important role in this process of transition (mainly for construction of RES capacities), for which it is necessary to create sustainable policies and a stable investment climate.

Table 4. Investment costs per measure in WAM scenario, including source of finance

Sector/Category	Policy/ measure	Investment cost (Mil. EUR)	Source of finance

		2020 - 2050	
Energy	***Introduction of CO_2 tax***	***n/a***	*n/a*
Energy/Infrastructure	***Reduction of network losses***	***232.0***	*Distribution and transmission companies*
Energy/RES generation	***Large hydropower plants***	***1627.3***	*Public private partnership, ESM, Independent power producers*
	Incentives feed-in tariff	***373.3***	*Independent power producers, incentives through consumer bills*
	Incentives feed-in premium	***399.2***	*Independent power producers, incentives from the central government budget*
	Biomass power plants (CHP optional)	***32.3***	*Independent power producers, incentives through consumer bills*
	Solar rooftop power plants	***627.6***	*Independent power producers, donors, subsidies from central government and local budget, EE fund*
	RES without incentives	***1726.0***	*Public private partnership, Independent power producers, ESM*
Energy/Energy Efficiency	***Energy efficiency obligation schemes***	***145.7***	*Consumers through their bills*
	Solar thermal collectors	***200.7***	*Private, EE fund, incentives from the central government budget, donors*
	Labelling of electric appliances and equipment	***70.2***	*Private, EE fund*
	Increased use of heat pumps	***330.1***	*Private, EE fund, incentives from the central and local government budget, donors*
	Public awareness campaigns and network of EE info centres (Including Cost of investment in advanced technologies)	***249.3***	*Private, donors, central and local self-governments*
	Retrofitting of existing residential buildings	***2606.6***	*Private, donors through commercial EE loans, EE fund*
	Retrofitting of existing central government buildings	***261.3***	*Central government budget, donors*
	Retrofitting of existing local self-government buildings	***218.2***	*Local self-government budget, donors*
	Retrofitting of existing commercial buildings	***979.0***	*Private, donors through commercial EE loans, EE fund*
	Construction of new buildings (at least class C)	***284.7***	*Private, donors through commercial EE loans, EE fund*
	Construction of passive buildings	***1196.6***	*Private, donors through commercial EE loans, EE fund, financial support for construction of new buildings at municipality level*
	Phasing out of incandescent lights	***889.9***	*Private, central government budget*
	Improvement of the street lighting in the municipalities	***41.6***	*Central and local government budget, ESCO*
	Green procurements	***11.3***	*Central and local self-government budget*
	Increased use of central heating systems	***47.8***	*Private, EE fund, incentives from the central and local government budget*
	Energy management in manufacturing industries	***n/a***	*Private, donors through commercial EE loans*
	Introduction of efficient electric motors	***180.6***	*Private, donors through commercial EE loans*
	Introduction of more advanced technologies	***1040.7***	*Private, donors through commercial EE loans, EE fund*
	Increased use of the railway	***329.0***	*Central government budget*
	Renewing of the national car fleet	***4924.0***	*Private, EE fund, incentives from the central government budget*
	Renewing of other national road fleet	***6437.0***	*Private, Public enterprises*
	Advanced mobility (walking, cycling and electric scooters)	***n/a***	*Private, EE fund, incentives from the central and local government budget, donors*
	Construction of the railway to the Republic of Bulgaria	***720.0***	*Central government budget*

	Electrification of the transport	***8440.0***	*Private, EE fund, incentives from the central government budget*
AFOLU/Livestock	***Reduction of CH4 emissions from enteric fermentation in dairy cows by 3%***	***0.3***	*Private sector, IPARD programme*
	Reduction of N2O emissions from manure management in dairy cows by 20%	***1.5***	*Private sector, IPARD programme*
	Reduction of NO2 emissions from manure management in swine farms by 13%	***1.5***	*Private sector, IPARD programme*
	Reduction of N2O emissions from manure in dairy cows by 20% for farms below 50 Livestock Units	***1.5***	*Private sector, IPARD programme*
AFOLU/Forestry	***Establishing integrated management of forest fires***	***1.5***	*PE 'National forests', other forest enterprises*
	Afforestation	***11.7***	*PE 'National forests', other forest enterprises*
AFOLU/Other Land Use	***Conversion of land use of field crops above 15% inclination***	***2.3***	*Private sector, IPARD programme*
	Contour cultivation on areas under field crops on inclined terrains (5-15%)	***1.5***	*Private sector, IPARD programme*
	Perennial grass in orchard and vineyards on inclined terrains (>5%)	***1.5***	*Private sector, IPARD programme*
	Use of biochar for carbon sink on agricultural land	***45.0***	*Private sector, IPARD programme*
	Photovoltaic irrigation	***47.0***	*Private sector, IPARD programme*
Waste	***Landfill gas flaring***	***24.6***	*Local self-government through Public Utilities, Public Private Partnership, EU funds*
	Mechanical and biological treatment (MBT) in new landfills with composting	***39.7***	*Local self-government through Public Utilities, Public Private Partnership, EU funds*
	Selection of waste - paper	***3.0***	*Local self-government through Public Utilities, Public Private Partnership, EU funds*
	Improved waste and materials management at industrial facilities	***n/a***	*Ministry of Environment and Physical Planning, Municipalities and city of Skopje, Industrial facilities, EU funds*
	Total	***34805***	

Note: This table does not include the investments in conventional generation (190 Mil. EUR)

Regarding the individual measures, it can be noticed that the largest investments are in the transport measures, i.e. the measure for electrification of the transport, followed by the measures for renewing of national car fleet and other national road fleet (Figure 48). Significant investments are also needed in the measures for renovation and construction of new buildings in the households and the commercial sector. Large hydropower plants and the RES without incentives are the measures with the highest investment costs from the electricity generation measures.

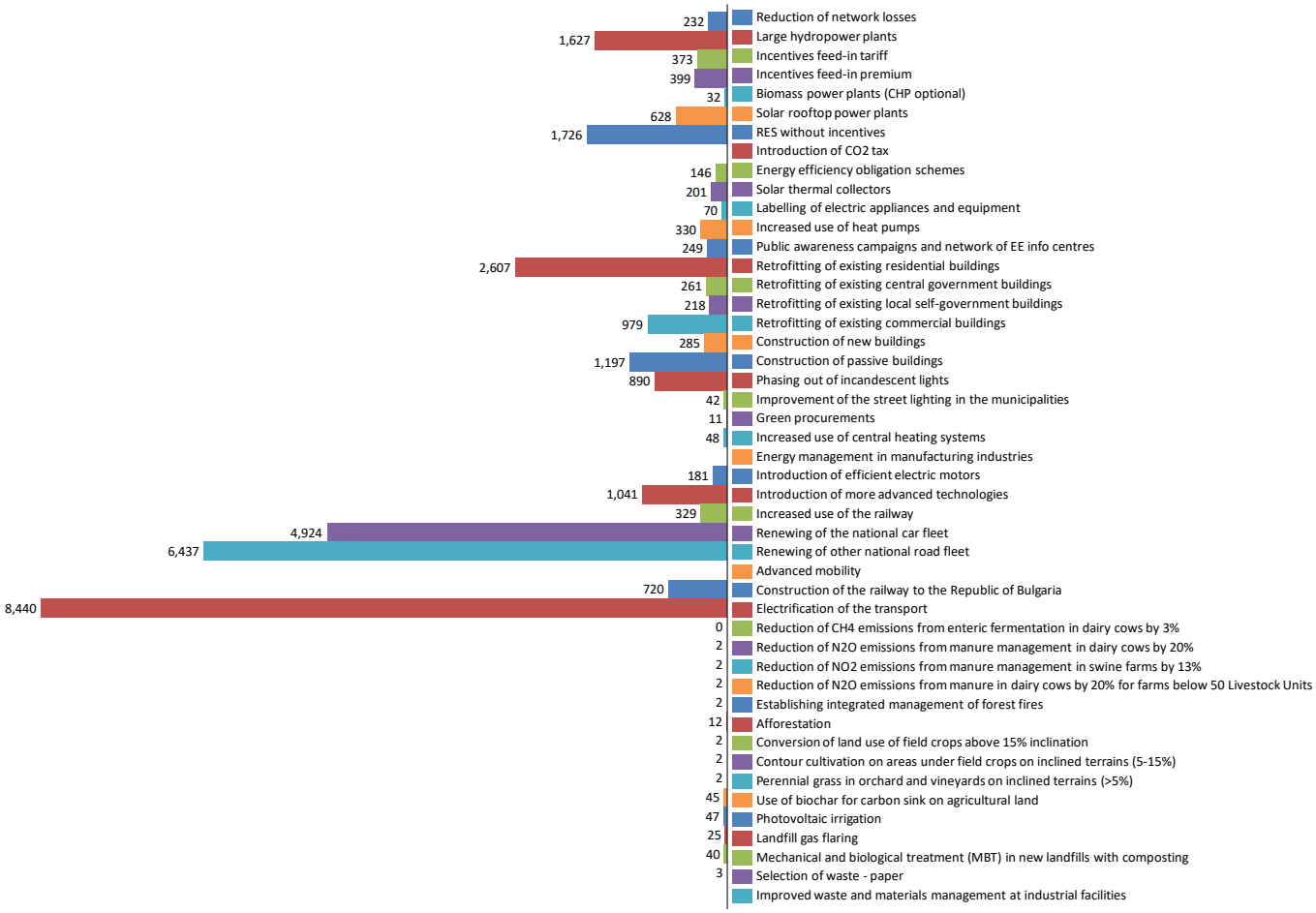


Figure 48. Investment costs per measure for the period 2020-2050 in WAM scenario (Mil. EUR)

9. CROSS CUTTING ASPECTS

9. CROSS CUTTING ASPECTS

9.1 Climate mainstreaming in Environmental Impact Assessments (EIA)

The EIA Directive requires Member States to ensure that projects likely to have significant effects on the environment because of their nature, size or location are subject to an assessment of their environmental effects. This assessment should take place before development consent is given, i.e. before the authority/ies decide(s) that the developer can go ahead with the project.

The Directive harmonises EIA principles by introducing minimum requirements, in particular for the types of projects that should be assessed, the main obligations of developers, the assessment's content and provisions on the participation of competent authorities and the public.

The Rulebook on the form and the content and the procedure and the manner for elaboration of the Environmental Impact assessment (Official Gazette of RNM 33/2006 from 20.03.2006) defines the minimum content of the EIA in the national context. The national legal provisions for the elaboration of EIAs do not foresee the assessment of the short and long-term climate impact specific projects might have.

The latest Guidance materials published by the European Commission recommend implementation of the climate consideration in the EIA procedures and using EIAs as tools to ensure that future plans and projects doesn't significantly increase greenhouse gas (GHG) emissions and support better adaption to climate change.

The bullet points below summarise the EC recommendations on how to incorporate climate change into EIA:

- Consider climate change impacts into the assessment process at an early stage (screening and scoping);
- Tailor how you incorporate biodiversity and climate change to the specific context of the project:
- Bring together all the relevant stakeholders who need to be part of climate change-related decision-making;
- Understand how both climate change interacts with other issues to be assessed in the EIA, as well as with each other;
- Consider the impact that predicted changes in climate will have on the proposed project, potentially over a long timescale, and the project's resilience and capacity to cope.
- Consider long-term trends, with and without the proposed project, and avoid 'snapshot' analyses.
- Manage complexity.
- Consider the complex nature of climate change and the potential of projects to cause cumulative effects.
- Be comfortable with uncertainty, because you can never be sure of the future.
- Base your recommendations on the precautionary principle and acknowledge assumptions and the limitations of current knowledge.
- Be practical and use your common sense. When consulting stakeholders, avoid drawing out the EIA procedure and leave enough time to properly assess complex information.
- Consider climate change scenarios at the outset;
- Analyse the evolving environmental baseline trends;

- Take an integrated approach to planning and assessment, investigating relevant thresholds and limits.
- Seek to avoid climate change effects from the start, before considering mitigation or compensation.
- Assess alternatives that make a difference in terms of climate change.
- Use ecosystem-based approaches and green infrastructure as part of project design and/or mitigation measures.
- Assess climate change and biodiversity synergies and cumulative effects, which can be significant.

The integration of the climate consideration in the EIA procedures should be also supported by amendment of the EIA legislation, more specifically amendment of the Rulebook defining the form and the content and the procedure and the manner for elaboration of the Environmental Impact assessment. In addition, specific training for the staff of the MoEPP is essential to support and evaluate the process of the integration of the climate considerations in the EIA.

9.2 Climate considerations in the SEA (Strategic Environmental Assessments)

Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment ('Strategic Environmental Assessment' — 'SEA Directive') requires certain public plans and programmes (PPs) to undergo an environmental assessment before they are adopted.

The Law on Environment regulates the requirements and the details for elaboration of SEA (Official Gazzete 53/05; 81/05; 24/07; 159/08; 83/09; 48/10; 124/10; 51/11; 123/12; 93/13; 187/13; 42/14; 44/2015; 129/15; 192/15; 39/16 и 99/18), and the national legal provisions for elaboration of EIAs don't foresee extensive assessment of the short and the long term climate impact that the specific strategic planning document might have.

To address the above mentioned, the EC has prepared a Guidance on Integrating Climate Change into Strategic Environmental Assessment with aim to improve the consideration of these issues in strategic environmental assessments (SEAs) carried out across the EU Member States.

The bullet points below summarise the EC recommendations on how to address climate change into SEA:

- Build them into the assessment and PP from the earliest stage and follow them throughout — start at the screening and scoping stages to build these issues into the mindset of all the key parties: competent authorities and policymakers, planners, SEA practitioners and other stakeholders. The SEA can be used as a creative process to support learning amongst all these parties.
- The consideration of climate change issues must be tailored to the specific context of the PP. It is not simply a checklist of issues to tick off. Each SEA can potentially be different.
- Be practical and use your common sense. When consulting stakeholders, avoid drawing out the SEA procedure and leave enough time to properly assess complex information.
- Use the SEA as an opportunity to address key issues regarding different types of projects or specific infrastructure projects. At this time, many options are still open (e.g. the location of motorways versus Natura 2000 network sites) and you can avoid problematic situations at the EIA/project level.
- Consider long-term trends both with and without the proposed PP and avoid 'snapshot' analyses.
- Assess the PP against the future baseline and key trends and their drivers taking into account other PPs.
- Consider the impact that predicted changes in the climate and biodiversity will have on the proposed PP, potentially over a long timescale, and its resilience and capacity to cope.

- Manage complexity; consider whether implementation of part of a PP e.g. climate change mitigation, that might otherwise be positive in its impact, could have a negative impact on climate change adaptation.
- Consider what existing climate change and biodiversity objectives and targets need to be integrated into the PP.
- Consider the long-term and cumulative effects on climate change and biodiversity of PP as these will be potentially significant given the complex nature of these topics.
- Be comfortable with uncertainty. Use tools such as scenarios to help deal with the uncertainty inherent within complex systems and imperfect data. Think about risks when impacts are too uncertain and factor this into monitoring to manage adverse effects.
- Develop more resilient alternatives and solutions based on 'win-win' or 'no regret'/'low regret' approaches to PP development, given the uncertainty inherent in climate change
- Prepare for adaptive management and monitor to improve adaptive capacity.
- Base your recommendations on the precautionary principle and acknowledge assumption and limitations of current knowledge.

As in the case with EIA, the extensive assessment of the climate considerations in the SEA procedures should be also legally supported by amendment of the SEA legislation, as well as enabled by specific training activities for the staff of the MoEPP that should mainstream and evaluate the process of enhanced assessment of the climate aspects in the SEA processes.

9.3 Climate finance

According to UNFCCC, climate finance refers to local, national or transnational financing—drawn from public, private and alternative sources of financing—that seeks to support mitigation and adaptation actions that will address climate change.

As a non-Annex I country to the Convention, Republic of North Macedonia is a recipient of international support and is therefore required to report the amount of support received in the subsequent two-year period (in the Biennial Update Report to UNFCCC). According to the TBUR, the bilateral support from the European Union has the highest contribution to financing climate activities in the last two year period. In particular, the Instrument for Pre-Accession Assistance has development of number of technical assessments, legal and policy instruments, as well enabled many municipalities, NGOs and ministries to implement projects, predominantly on climate change mitigation, and thus contribute to the global efforts to reduce greenhouse gas emissions and mitigate the adverse effects of climate change. However, the TBUR emphasizes that the amount of support received is far from sufficient to meet the needs of undertaking other significant mitigation and adaptation activities.

In the framework of the CBIT Project implemented by UNDP, the country has initiated the process of preparation of a MRV tool that will keep track of the progress regarding the national climate targets and the implementation of the mitigation and the adaptation policies and measures, and will also record and present the climate investments in the country. This tool will significantly improve the transparency of the allocation of resources for climate action, and will act as a tool for coordination and prioritisation of climate finance.

It is also important for the government to realize that climate change has already impacted various aspects of the economy, and some of them are already being addressed by allocating resources in relevant sectors as part of regular annual development plans. Likewise, promoting climate-resilient development and reducing Greenhouse Gas (GHG) emissions are national commitments made in the Paris Agreement and expressed through the NDCs. The Enhanced NDC of Republic of North Macedonia contains the same set of mitigation policies and measures as the Strategy. Since its adoption in April 2021, the country has an

obligation to implement the policies and measures foreseen under the enhanced NDC, as well as to continuously report the progress towards the implementation of the policies and measures, as well as the climate finance as the main marker for climate action. In the same time, the Draft Law on Climate Action foresees the country to start implementation of the reporting requirements foreseen under the MMR in 2025, which again underlines the need of establishment of an integrated system for transparent and overarching MRV of the national climate action.

However, climate change is a cross-cutting issue and public and private sector activities relevant to climate change adaptation and mitigation are often scattered across a number of ministries and governmental entities (MoE, MAFAWE, MoF, MTC, LSGUs, etc.). This dispersion makes the process of tracking the climate finance difficult, as well the process of tracking the progress towards the national climate targets, In addition, the scattered competences and investments makes difficulties to the Public Financial Management (PFM) system to facilitate planning, identifying, and reporting on climate change expenditure. These challenges can be overcome by introducing Climate Budget Tagging (CBT), which will enable mainstreaming climate change in PFM system by identifying, classifying, weighting, and marking climate-relevant expenditure in the budget system. By marking budget lines, the CBT will enable systematic monitoring and tracking climate-related proportion of government expenditures and investments.

9.4 Just transition and socio-economic context

The energy sector of Republic of North Macedonia is based on coal run power plants and carbon intensive fossil fuels, while in the same time the country is unable to meet their own electricity needs and is strongly depended on the imported electricity. The Government is fully aware of the need to boost the quantity and quality of its infrastructure and services, in order to improve its ability to compete in the process of joining the EU and later on as a member state. A less carbon intensive energy sector will allow for greater competitiveness, economic growth and security of supply, and is, at the same time, an important prerequisite for economic integration within the Western Balkans.

The energy sector in the country and the economy more broadly, has to deliver on the Green Deal, supporting EU initiative in making Europe a climate neutral continent. The European Green Deal (EGD) focuses on boosting efficient use of resources and restored biodiversity, i.e.: clean sources of energy, circular economy and cut of pollution. The EGD underlines that: “A power sector must be developed that is based largely on renewable sources, complemented by the rapid phasing out of coal and decarbonising gas. At the same time, the EU's energy supply needs to be secure and affordable for consumers and businesses. For this to happen, it is essential to ensure that the European energy market is fully integrated, interconnected and digitalised, while respecting technological neutrality.”

The Western Balkan Green Deal paper underlines the needs of all WB6 countries to follow the rest of the countries on the European continent and apply these policies by 2050. As the EU 26, the WB6 countries will be part of the Just Transition Mechanism that will provide financial support and technical assistance to help those most affected by the move towards a green economy – while also ensuring that the entire society will be in a position to access the substantial benefits.

In the national context, this means closing or modernising the coal fired thermo power plans, investing in renewables and environmentally friendly technologies, energy efficiency, reduction of the network losses and provision of enabling environment and affordable prices of renewable energy. This is also foreseen under the WAM scenario of the Strategy, as well as in the Enhanced NDC and the NECP of RNM.

The two existing coal-fired power plants in Republic of North Macedonia are both owned and operated by JSC “Power Plants of Republic of North Macedonia” (ESM), the national energy utility. The 125MW thermal power plant in Oslomej now operates primarily as reserve capacity due to the near total depletion of the nearby lignite mine. The 675MW thermal power plant at Bitola provides around 50% of the country’s electricity with lignite from two mines – Suvudol and Brod-Gneotino. According to the 2019 Annual Report of JSC ESM, the TPP Oslomej and TPP Bitola with their mines employ 3588 employees. A key question

is what will be the impact of any coal closure in these regions – where they will have large impacts on local employment and significant socioeconomic impact. Some workers will be able to transfer to new activities in ESM linked to new energy sources – be it renewables or linked to gas.

According to the Just transition mechanism, any transition from coal and the broader opportunities that will come should be seen in the context of economies of the geographic regions they are located. The Government of RNM has already identified the challenges of the green transition of the energy sector and has initiated the process of detailed assessment of the socio-economic implications of the closure of the TPPs in the regional and local context, as well as development of a Just transition action plan for the Southwest and Pelagonija region. This activity will be funded by EU and is expected to be implemented in the period April 2021 – January 2022.

9.5 Youth and gender aspects

The potential accumulated in the climate action generated and supported by young people in the Republic of Republic of North Macedonia is unprecedented. The challenge of building trust and long lasting cooperation between young people and the public administration is a strategic one. A very good demonstration case for youth engagement in climate related decision making processes was the process of revising Macedonia's Nationally Determined Contributions. The input received and the interaction with the youth was of essential importance and has provided a fresh and open-minded view of the policy design processes. Youth and their engagement in climate action have been fully considered in the design of the policies and measures related to education and awareness rising, as well in the foreseen mitigation and adaptation policies and measures considered in this Strategy.

Neither the impacts of climate change on people nor the ways in which people respond to climate change are gender-neutral. Gender inequalities and different gender roles, needs and preferences which vary over space and over time influence the different ways in which young, adult and elderly males and females experience the impacts of climate change and develop strategies to adapt to or mitigate them.

On the other hand, climate change negative impacts are increasing the already existing gender inequality. As a mater of fact, gender inequality increases the vulnerability. In this context, gender inequality should be emphasized in social, cultural, social, economic, but also in terms of practicing the services and services provided by the state in the area of mitigation and adaptation to climate change.

Following the Paris Agreement (preamble), as well as the Enhanced Lima Work Programme on Gender (LWPG), this Strategy considers the gender perspective as a cross-cutting issue of a crucial importance for achieving transparency and effectiveness as well as a sustainability of climate policy and action.

At national context, under the support and guidance of the Global Support Programme (GSP) as part of climate change projects implemented by the Ministry of Environment and Physical Planning and UNDP, the Republic of Republic of North Macedonia has taken serious steps towards intersecting gender and climate change at policy and administrative level and has been recognized as a positive example and a good practice in the region.

On the other hand, the already highlighted gender inequality in context of climate change sectors is confirmed by the gender indicators, with lower (or very low) female participation in decision making processes in the climate change related sectors and low employment rate of women in the high GHG emitting sectors. Women are also less represented as employees at individual agricultural holdings and business entities which reflects their economic dependence and lower capacity to decide on the usage of measures related to mitigation/adaptation. In addition, the access to resources is more limited since women are dominating the category of unpaid family workers in the agricultural holdings and therefore they are not provided approach to the financial instruments in terms of developing "climate resilient" practices. At the same time, female usage of the governmental subsidies for mitigation practices (purchasing pellet stoves 2018 - 2020, installed PVC or energy efficient windows in households, solar panels etc.) is significantly lower than male`s.

An Action Plan on Gender and Climate Change has been prepared under the support and guidance of the Global Support Programme (GSP) as part of climate change projects implemented by the Ministry of Environment and Physical Planning and UNDP. In that direction, for the first time the topic of gender and its intersection with climate change was introduced in the region, by the GSP efforts and its comprehensive approach by sharing knowledge, best practices and most effective models of plans development and finding best solutions for their effective implementation in the Western Balkan countries. In the period from June 2019 to February 2020, within the project "Macedonian Fourth National Communication and Third Biennial Update Climate Change Report" the country developed measures and models for systematic implementation of a Draft Action Plan on Gender and Climate Change. The Action Plan foresees systematic approach and measures and models for increasing the knowledge and awareness of all relevant gender and climate change stakeholders will build institutional capacity for specific actions in this area, both at policy and implementation level. These efforts were translated into separate strategic aspects on gender and Climate Change within the new Strategy on gender Equality which is currently in process of development.

The Action Plan on Gender and Climate Change recommends implementation of the following actions that will increase the knowledge, awareness and climate mainstreaming in the country:

- take a stronger lead on gender equality in the climate change arena by promoting gender-inclusive policy dialogue and accountability, as well as Platform for Action in national climate change planning processes, international climate change negotiations and the emerging climate finance architecture;
- create enabling organisational environments for effective gender mainstreaming by addressing ‘mainstreaming fatigue’, institutionalising the application of existing gender commitments to climate change portfolios, providing gender and climate change tools covering the entire project or programme cycle, and addressing institutional disconnects between gender and climate change responsibilities;
- fill knowledge and best practice gaps in participatory ways that capture men’s, women’s and young people’s ideas and knowledge, particularly in areas where the gender dimensions of climate change impacts and responses are not immediately obvious, such as transport and infrastructure, energy access, housing, and formal or informal employment;
- improve the understanding of gendered impacts of climate change and of climate change policy and programme impacts by establishing monitoring and evaluation frameworks that disaggregate participation in policy and programme design and implementation by gender and age, and measure the impacts of climatic variations as well as adaptation and low-carbon development strategies on gender relations and inequalities – particularly for strategies at the national and regional levels – and for low-carbon development;
- promote gender-responsive international climate negotiations by facilitating multistakeholder processes that are inclusive in a horizontal and vertical sense, promoting the inclusion of marginalised voices and making gender a core issue as opposed to a ‘side event’;
- address the gender disconnect in project and programme cycles by ensuring that thorough gender analyses of the gender inequalities and women and men’s, girls’ and boys’ different roles, preferences, needs and capacities underlying each context are better entrenched in implementation, monitoring and evaluation;
- promote equal access to decision-making processes and new opportunities created by responses to climate change by promoting the reduction of legal, infrastructural and other barriers to women’s participation in decision-making, markets and particularly processes related to new technologies, by making climate change decisions and funding processes transparent and accessible, and by training women’s organisations to take part in and lead such processes;
- promote gender-responsiveness in emerging funds and policies for adaptation and low-carbon development by integrating gender into results frameworks and xii disbursement processes,

supporting the development of best practice for gender responsiveness in clean technology and transport choices and processes, and by bundling and thereby reducing the transaction costs of small-scale initiatives that tend to have more gender co-benefits

9.6 Inclusion of the general public in the implementation of the Strategy

The majority of the policies and measures foreseen under this Strategy are foreseen to be implemented by the general public and the private sector, so it will be essential to ensure a stable and competitive regulatory framework, that guarantees the involvement and commitment of the main actors, public and private, with implementation of the measures necessary to achieve the defined objectives, thus providing stability for investors in the most diverse sectors.

In addition, the Government should encourage the grater citizen involvement in the climate change decision making processes though awareness raising campaigns, dialogue platforms and debates, as well as provision of funding for citizen engagement in the climate action. The civil society organisations should facilitate this process and act as a mediator between the government and the public sector.

The inclusive approach to climate action seeks to overcome the lack of community engagement, while simultaneously changing the mind-set of the general public and raising the awareness about the importance of the climate action. Engaging a variety of stakeholders within the country provides an accurate representation of existing vulnerabilities that future policies should address. By involving groups that have been previously inactive and not introduced with the national climate policies, the climate authorities will find out more about the needs on the ground and the needs for adjustment of specific policies or measures, or the needs for creation of additional policy packages that should support specific needs and problems of the population. The same can be said for development planning and its impact on disaster risk reduction. Communities vulnerable to disasters often suffer from both poor planning and limited response, therefore it is important that these communities are involved in policymaking so that they can address long-term risks in a proactive way rather than address short-term risks in a reactive way.

10. INSTITUTIONAL FRAMEWORK AND MODALITIES FOR IMPLEMENTATION OF THE STRATEGY

10. INSTITUTIONAL FRAMEWORK AND MODALITIES FOR IMPLEMENTATION OF THE STRATEGY

10.1 Institutional framework for coordinating climate action and monitoring its implementation

The implementation of the policies and measures foreseen under this Strategy require comprehensive policy planning, coordination and implementation processes. This must be enabled by a comprehensive legal basis and legally established coordination instruments to facilitate cross-sectoral policy design and implementation, as well as mechanisms for monitoring the implementation of the foreseen policies and measures. The draft Law on Climate action provides an enabling environment for overarching policy coordination processes, and defines the legal mechanism for monitoring progress towards the achievement of the national sustainable development pathway. The draft Law on Climate Action, its supporting secondary legislation, and the Strategy should be perceived as a package of enabling instruments for climate action in Republic of North Macedonia.

The draft Law on Climate Action, which was developed by the Project, defines the MoEPP as the leading institution to coordinate climate related activities as well as to establish the National inventory system and the System for reporting on policies, measures and projections of Republic of North Macedonia. Besides, the Law outlines the institutions in Republic of North Macedonia, which must submit activity and other data to the MoEPP. These institutions collect and hold relevant activity and other data, which is necessary for the determination of inventories and for the preparation of reports.

A coherent monitoring and evaluating system, as defined in the draft Law, should be established in order to ensure an efficient and effective achievement of the Strategy goals.

The overall coordination of activities in relation to the Strategy is under the responsibility of the MoEPP. The draft Law foresees the establishment of an intergovernmental body – National Climate Change Council, which will assess the progress in the implementation of national strategies and plans related to climate change.

Monitoring climate action is closely related to the implementation of the MMR Directive. The draft Decree on National Inventory System developed by the Project contains an EU guided template for monitoring and reporting the implementation of the policies and measures. The template can be further upgraded in a digital solution for user friendly monitoring and reporting of national progress towards the implementation of the Strategy.

Finally, an ex-post evaluation should focus on the overall assessment of the relevance, efficiency, effectiveness, impact and sustainability of inter-sectoral Strategy interventions, on the analysis of factors influencing the effectiveness and impact of the Strategy, and on lessons learned. The results of the ex-post evaluation will be used for planning and reviewing of future climate strategies and other climate policy documents.

10.2 Links to other documents for planning climate action

In the last few years, climate aspects have gained attention among national policy makers and a number of policy documents have been streamlined, developed and adopted.

The most updated and relevant climate action documents are as follows:

- The Vulnerability and Adaptation Assessments developed in the framework of the Third National Communication (2013). The Vulnerability Assessment which was done in the framework of the TNC has identified the following sectors as extremely vulnerable to the climate change: Cultural Heritage, Health, Biodiversity, Tourism, Water Resources, Agriculture, Forestry and DRR;
- The Strategy for Energy Development of the Republic of Republic of North Macedonia until 2040 (adopted in December 2019);
- The Climate Change Mitigation Assessment prepared in the framework of the TBUR (2020);
- The National Energy and Climate Plan (finalised in July 2020);
- The Forth National Energy Efficiency Plan (under preparation).

The Long-term Strategy on Climate Action is fully coherent and aligned with all national planning documents related to climate action. Furthermore, the modelling work done in the framework of the development of the scenarios for the Strategy has been based and has extended the WEM and the eWAM scenarios which have been used for the development of the Energy Strategy up to 2040, the National Energy and Climate Plan and the Climate Change Mitigation Assessment under the TBUR.

APPENDIX A:

SECTORAL BREAKDOWN OF ENERGY CONSUMPTION AND EMISSIONS BY 2050

APPENDIX A: SECTORAL BREAKDOWN OF ENERGY CONSUMPTION AND EMISSIONS BY 2050

The following tables present disaggregated data on GHG emissions and removals per sector for both scenarios (WEM and WAM) up to 2050, as well as projections for 2030 and 2050 relative to 1990, 2000 and 2016.

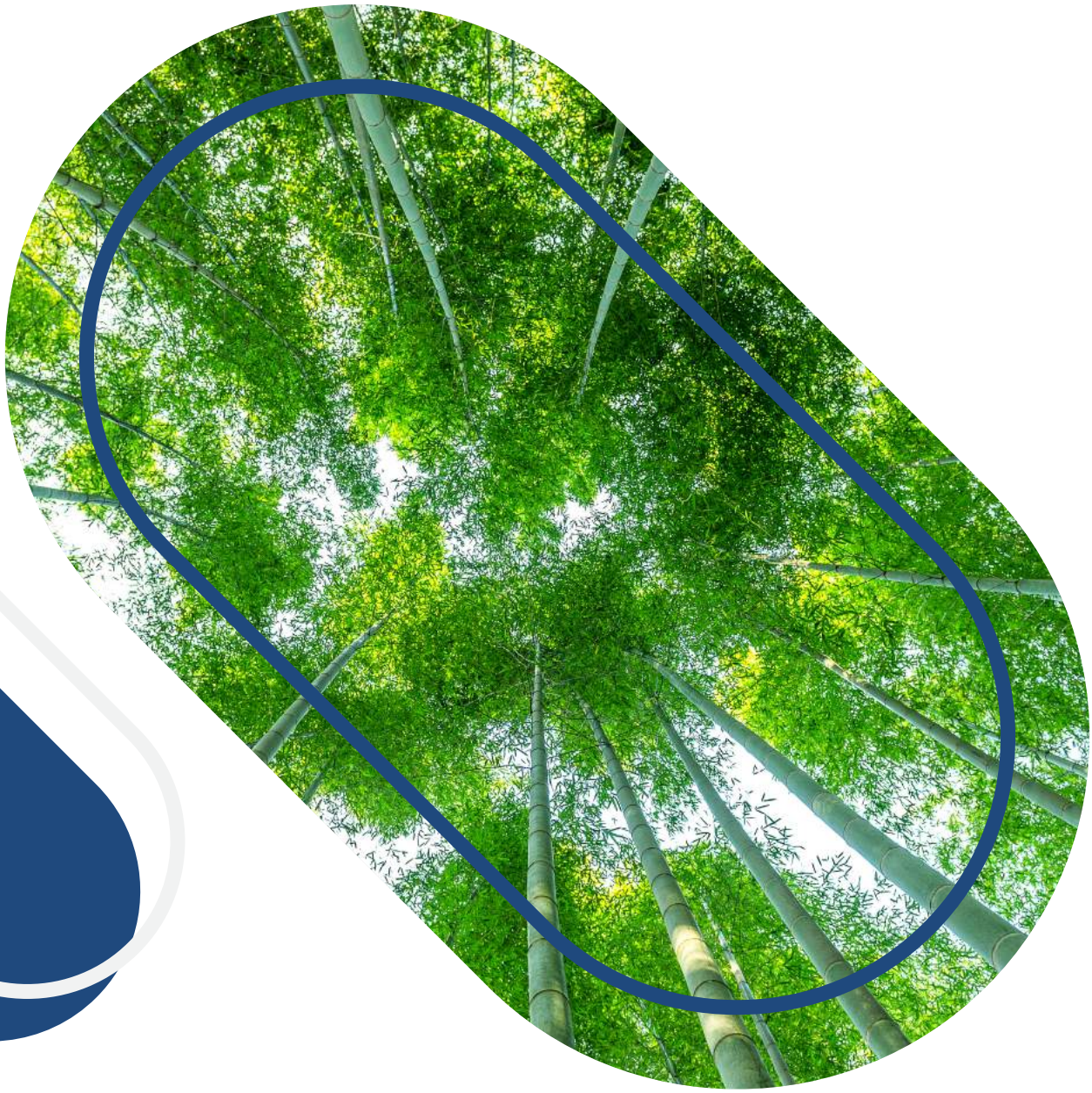
WEM (Gg CO2-eq)		1990	2005	2016	2020	2025	2030	2035	2040	2045	2050	2030/ 1990	2050/ 1990	2030/ 2005	2050/ 2005	2030/ 2016	2050/ 2016
Energy	*Agriculture*	142	82	46	51	57	66	74	82	90	100	-54%	-29%	-20%	22%	42%	117%
	Fugitive emissions	193	191	142	137	117	117	110	117	117	117	-39%	-39%	-38%	-38%	-18%	-18%
	Electricity and Heat Production	6,205	5,941	3,801	4,022	3,386	3,391	3,270	3,469	3,627	3,736	-45%	-40%	-43%	-37%	-11%	-2%
	Industry	1,797	1,356	1,037	1,087	1,463	1,700	1,958	2,223	2,518	2,829	-5%	57%	25%	109%	64%	173%
	Commercial	25	418	222	257	222	223	223	224	217	210	778%	728%	-47%	-50%	0%	-5%
	Residential	495	220	104	169	143	147	155	155	150	151	-70%	-69%	-33%	-31%	42%	46%
	Transport	791	1,044	2,097	1,787	1,706	1,710	1,936	2,066	2,153	2,312	116%	192%	64%	122%	-18%	10%
IPPU		932	862	858	1,024	1,163	1,352	1,562	1,792	2,054	2,360	45%	153%	57%	174%	58%	175%
Agriculture		1,490	1,204	1,191	1,093	1,075	1,055	1,036	1,021	1,002	984	-29%	-34%	-12%	-18%	-11%	-17%
Waste		407	435	610	661	491	323	345	366	383	399	-21%	-2%	-26%	-8%	-47%	-35%
TOTAL (without FOLU)		**12,478**	**11,752**	**10,108**	**10,287**	**9,824**	**10,084**	**10,669**	**11,517**	**12,311**	**13,200**	**-19%**	**6%**	**-14%**	**12%**	**0%**	**31%**
FOLU		-207	-1,522	-3,253	-3,604	-3,719	-3,855	-3,813	-3,754	-3,774	-3,794	1762%	1733%	153%	149%	18%	17%
TOTAL with FOLU		**12,271**	**10,230**	**6,855**	**6,683**	**6,105**	**6,230**	**6,856**	**7,763**	**8,537**	**9,406**	**-49%**	**-23%**	**-39%**	**-8%**	**-9%**	**37%**

WAM (Gg CO2-eq)		1990	2005	2016	2020	2025	2030	2035	2040	2045	2050	2030/ 1990	2050/ 1990	2030/ 2005	2050/ 2005	2030/ 2016	2050/ 2016
Energy	*Agriculture*	142	82	46	50	56	65	74	83	94	107	-54%	-25%	-21%	30%	41%	131%
	Fugitive emissions	193	191	142	137	0	0	0	0	0	0	-100%	-100%	-100%	-100%	-100%	-100%
	Electricity and Heat Production	6,205	5,941	3,801	4,040	820	470	280	293	297	298	-92%	-95%	-92%	-95%	-88%	-92%
	Industry	1,797	1,356	1,037	1,060	1,056	1,007	1,033	1,084	1,105	1,155	-44%	-36%	-26%	-15%	-3%	11%
	Commercial	25	418	222	260	212	202	188	182	154	142	696%	458%	-52%	-66%	-9%	-36%

WAM (Gg CO2-eq)		1990	2005	2016	2020	2025	2030	2035	2040	2045	2050	2030/ 1990	2050/ 1990	2030/ 2005	2050/ 2005	2030/ 2016	2050/ 2016
	Residential	495	220	104	176	195	161	112	118	109	92	-68%	-81%	-27%	-58%	55%	-11%
	Transport	791	1,044	2,097	1,743	1,544	1,414	1,699	1,792	1,747	1,715	79%	117%	36%	64%	-33%	-18%
IPPU		932	862	858	1,024	1,163	1,352	1,562	1,792	2,054	2,360	45%	153%	57%	174%	58%	175%
Agriculture		1,490	1,204	1,191	1,093	1,075	1,055	1,036	1,021	1,002	984	-29%	-34%	-12%	-18%	-11%	-17%
Waste		407	435	610	661	491	323	345	366	383	399	-21%	-2%	-26%	-8%	-47%	-35%
TOTAL (without FOLU)		**12,478**	**11,752**	**10,108**	**10,244**	**6,611**	**6,049**	**6,331**	**6,731**	**6,945**	**7,251**	**-52%**	**-42%**	**-49%**	**-38%**	**-40%**	**-28%**
FOLU		-207	-1,522	-3,253	-3,604	-3,719	-3,855	-3,813	-3,754	-3,774	-3,794	1762%	1733%	153%	149%	18%	17%
TOTAL with FOLU		**12,271**	**10,230**	**6,855**	**6,639**	**2,893**	**2,194**	**2,518**	**2,977**	**3,171**	**3,456**	**-82%**	**-72%**	**-79%**	**-66%**	**-68%**	**-50%**

APPENDIX B:

INDICATORS OF THE PROGRESS ON TRANSITION TO LOW GHG EMISSION ECONOMY



APPENDIX C:

MEASURES FOR CLIMATE CHANGE ADAPTATION

APPENDIX B: INDICATORS OF THE PROGRESS ON TRANSITION TO LOW GHG EMISSION ECONOMY

The following table presents the expected effect of the policies and measures proposed under the WAM scenario on relevant indicators of the progress on transition to low GHG emission economy.

Indicator	2016	2020	2030	2050
GHG/capita (t CO2-eq/capita)	4.86	4.93	2.95	3.86
GHG/GDP (kg CO2-eq/EUR)	1.17	1.11	0.46	0.28
RES share in gross final energy consumption without heat pumps	21%	23%	39%	46%
RES share in gross final energy consumption with heat pumps	21%	24%	43%	49%
Final energy consumption/capita (toe/capita)	0.88	0.90	0.99	1.33
Final energy consumption/GDP (kgoe/EUR)	0.21	0.20	0.15	0.10
Primary energy consumption/capita (toe/capita)	1.21	1.27	1.12	1.45
Primary energy consumption/GDP (kgoe/EUR)	0.29	0.28	0.17	0.11

Sector	Water Resources
Measure	*Pilot project for the collection of data on water use in rural context for the purpose of ensuring effective adaptation to climate change*
Type[15]	Technological/Technical
Impact addressed	Water stress / drought

Activities	• Define the boundaries of the pilot, in particular in terms of geographic coverage
	• Inventory and map wells, including the identification of its main use (irrigation or other). For this, good practices shall be considered, such as
	  ○ digital field mapping, where the relevant features are observed, analysed, and recorded in the field, producing spatially referenced maps
	  ○ field work aided by and to complement / validate the results of the digital field mapping, with a view to collecting/validating, for example, data on: well location, status (operational / non-operational), depth to groundwater, groundwater quality.
	• Identify needs and determine measures for the improvement of the monitoring of irrigation water use in order to
	  ○ Determine the area under irrigation with surface and groundwater
	  ○ Enhance the coverage of measuring devices at the level of intakes, river diversions or canal outlets
	  ○ Set up a system / methodological approach to estimate irrigation water losses through leakage and evaporation
	• Define and implement a methodological approach for the monitoring of groundwater aquifers within the boundaries of the pilot project.

Responsible Entity	Ministry of Environment and Physical Planning; Ministry of Agriculture, Forestry and Water Economy
Other Stakeholders	Water Utilities, Farmers Associations
Timeframe	3 years
Estimated costs (Million Euro)	N.d.
Source of Financing	State budget
Constraints	Institutional arrangements for water resources management, with competences shared between MoEPP and MAFWE

[15] Regulatory; Financial; Technological/Technical; Infrastructural; Informational/Educational; Organizational/Managerial/Institutional

International cooperation needed	Financial support for the acquisition and maintenance of the monitoring devices
Potential cooperation partner	IPA, IPARD
Monitoring	Inventory of wells within project boundaries conducted: YES/NO Measures for the improvement of the monitoring of irrigation water use determined: YES/NO Methodological approach for the monitoring of groundwater aquifers defined: YES/NO

Sector	Agriculture
Measure	Promote Cooperation Among Scientific Institutions and Enhance the Science-Policy-Implementers Link
Type	Informational/Educational; Organizational/Managerial/Institutional
Impact addressed	Extreme weather events, including droughts, floods, heat waves, storms (including wind and hail)
Activities	1. Identify the institutions performing research on agriculture and climate change 2. Define and establish a coordination, communication and knowledge management mechanism, including web-based, that promotes synergies among research institutions and enhances the link and communication among research institutions, policy makers, extension services and farmers, including civil society organizations
Responsible Entity	Ministry of Agriculture, Forestry and Water Economy
Other Stakeholders	Universities and research institutions, farmers association
Timeframe	2 years
Estimated costs (Million Euro)	1 million euro (for set up)
Source of Financing	State Budget, International cooperation
Constraints	Lack of financial resources, with greater risk associated with post-set up financing (sustainability)
International cooperation needed	The mechanism foreseen in this measure could be set up as a regional mechanism, as the research it is to perform can be of interest to the different countries in South East Europe
Potential cooperation partner	IPA; USAID and other bilateral and multilateral cooperation
Monitoring	Coordination and communication mechanism defined: YES/NO

Sector	Biodiversity
Measure	Define and develop an indicator system to monitor the impacts of climate change on biodiversity
Type	Technological/Technical

Impact addressed	Temperature increase, changes in precipitation patterns, extreme events
Activities	• Define policy relevant key indicators for evaluation of impacts of climate change on biodiversity ○ Assess data needs and data availability and gaps, including accessibility to climate data by relevant stakeholders including research institutions • Design and establish monitoring system for the impacts of climate change on biodiversity, including institutional responsibilities (for example, through signing of memorandum of understanding among the relevant entities)
Responsible Entity	MOEPP – Department of Nature Protection
Other Stakeholders	Hydrometeorological Service; Protected areas; Universities and Research Institutes; NGOs;
Timeframe	1 year
Estimated costs (Million Euro)	The costs associated with designing and establishing are close to zero. In addition, this biodiversity/climate change indicator system is to build upon the monitoring that should already be done by the protected areas. As such, the additional costs should be minimized. (Approximate cost for monitoring of 1 area/3 species/1year is estimated at 3000 euros.)
Source of Financing	State budget GCF IPA GEF
Constraints	Resources (financial and human)
International cooperation needed	For some taxonomic groups there are no national experts. Some training and technical assistance is required in addition to financial support
Potential cooperation partner	Swedish, Austrian and Swiss cooperation
Monitoring	Indicator System Established: YES/NO

Sector	Biodiversity
Measure	Define a national research plan for biodiversity (including agrobiodiversity) and climate change
Type	Informational/Educational; Organizational/Managerial/Institutional
Impact addressed	Temperature increase, changes in precipitation patterns, extreme weather events
Activities	• Elaborate a research plan for biodiversity, including agrobiodiversity, and climate change
Responsible Entity	MOEPP (Institute for Nature Conservation, if established in the meantime)
Other Stakeholders	Hydrobiology Institute; Universities and Research Centres
Timeframe	1 year
Estimated costs (Million Euro)	Near to zero (costs associated with implementation of the plan cannot be pre-determined)
Source of Financing	N.a.
Constraints	N.a.
International cooperation needed	N.a.
Potential cooperation partner	N.a.
Monitoring	Plan prepared: YES/NO

Sector	Human Health
Measure	Restore and improve the system for the collection of air-climate-health data, including the platform for sharing it with the public (integrated system for weather extremes, air quality and human morbidity and mortality)
Type	Technological/Technical; Informational/Educational
Impact adressed	Extreme weather events: heat and cold waves

Activities	• Define technical specifications for the server required to restore the existing automated platform
	• Define the technical specifications for improving the platform, including:
	  ○ Selection of meteorological, air quality and public health parameters
	  ○ Identify data needs and gaps
	  ○ Identify needs to strengthen the system for data collection, analysis and dissemination (including weather and air quality stations and procedures for the reporting and morbidity and mortality associated with weather events)
	• Prepare a roll out plan, including, if relevant, the definition of a phased approach for implementation
	• Prepare the Terms of Reference for the acquisition of hardware and software

Responsible Entity	Institute of Public Health
Other Stakeholders	Hydrometeorological Service and the Medical Emergency Service
Timeframe	Restoration of current system: urgent Improvement: within two years (roll out in accordance with plan foreseen in activities)
Estimated costs (Million Euro)	
Source of Financing	State Budget International Cooperation
Constraints	Capacity to maintain system
International cooperation needed	Financial support

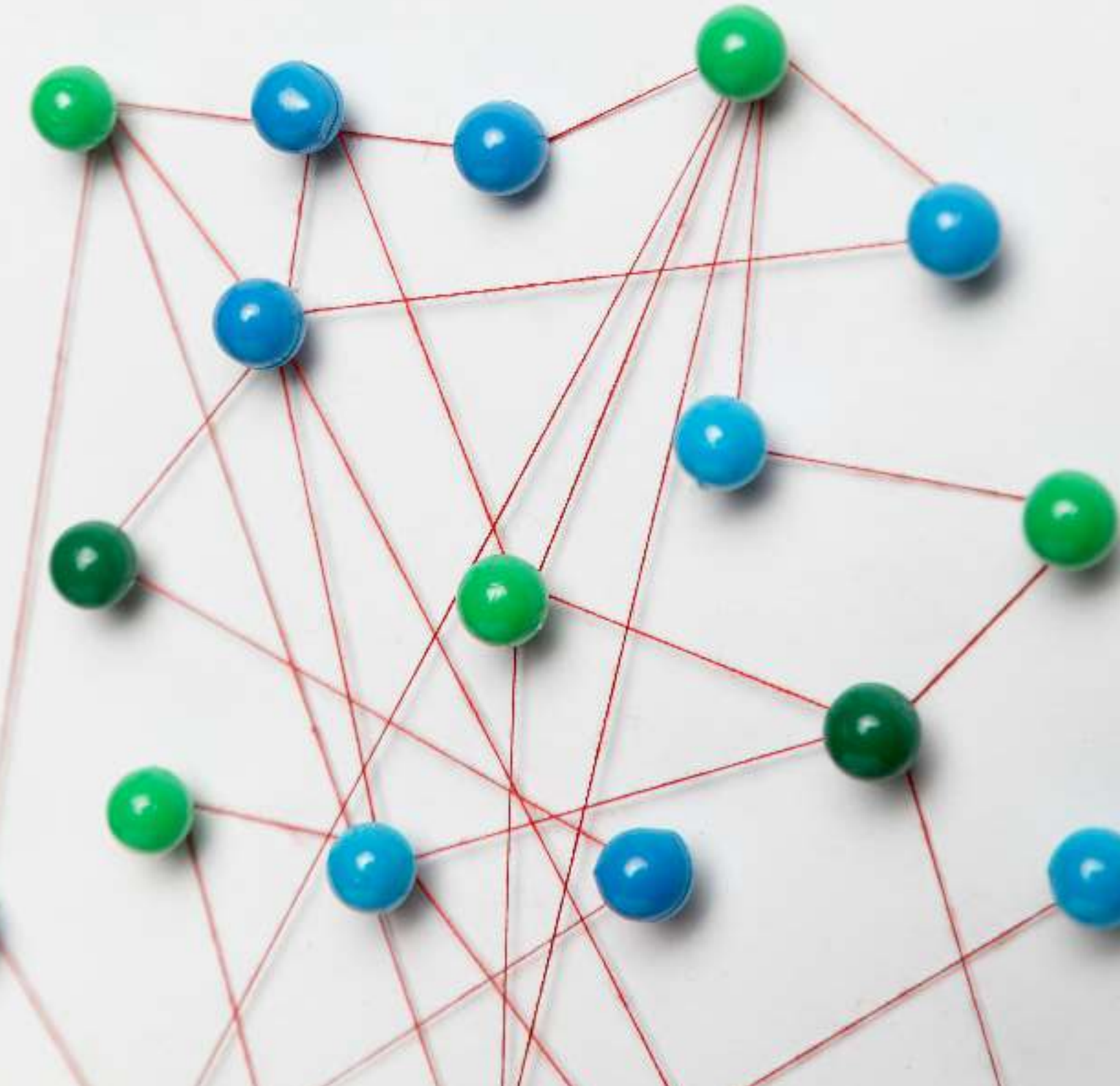
Potential cooperation partner	WHO / European Centre for Environment and Health GCF
Monitoring	Terms of Reference prepared: YES/NO

Sector	Socio Economic Vulnerability
Measure	Define and develop a system to monitor socio-economic vulnerability to climate change
Type	Technological/Technical
Impacts addressed	All impacts
Activities	• Define policy relevant key indicators for evaluation of the socio-economic vulnerability to the impacts of climate change • Define parameters and rules for the establishment of community-specific indexes • Determine data needs and gaps for the accurate socio-economic characterization of the impacts of climate change • Identify data providers • Establish a system for the periodic, systematic and consistent collection of data (for example, through signing of memorandum of understanding among the relevant entities)
Responsible Entity	MoEPP; Office of the Vice-Prime Minister for Economic Affairs
Other Stakeholders	Statistical office; Ministry of Local Self-government; Local Self-governments; Ministry of Information Society and Administration; Universities; NGOs; Ministry of Finance; Ministry of Agriculture, Forestry and Water Economy; Ministry of Health; Ministry of Labour and Social Policy
Timeframe	1 year
Estimated costs (Million Euro)	N.d.
Source of Financing	State budget
Constraints	Human, financial and institutional constraints are present and cannot be expected to be fully removed in the near future. As such, the system needs to be built taking such constraints into consideration. A careful selection of key indicators and the definition of priorities should contribute to overcoming these constraints. In addition, the system should be built in such a way that its benefits are clear to all involved. This system should be set up in a way to build upon and reinforce existing systems.
International cooperation needed	Financial and capacity building (training and technical assistance)

Potential cooperation partner	N.a.
Monitoring	System established: YES/NO

Sector	**Cross-cutting**
Measure	Prepare the National Adaptation Plan (NAP)
Type	Organizational/Managerial/Institutional
Impacts addressed	All impacts
Activities	
Responsible Entity	Office of the Vice-Prime Minister for Economic Affairs
Other Stakeholders	Ministry for Environment and Physical Planning; Ministry of Economy; Ministry of Finance; Ministry of Agriculture, Forestry and Water Economy; Ministry of Health; Ministry of Labour and Social Policy; Ministry of Local Self-government; Ministry of Culture; Ministry of Education and Science; Ministry of Information Society and Administration; Local Self-governments; Universities; Crisis Management Centre, NGOs;
Timeframe	4 years
Estimated costs (Million Euro)	N.d.
Source of Financing	International cooperation
Constraints	Financial resources
International cooperation needed	Financial support
Potential cooperation partner	Green Climate Fund
Monitoring	Approval of the financing by the Green Climate Fund: YES/NO

ACTION PLAN FOR THE FIRST PHASE OF IMPLEMENTATION OF THE STRATEGY AND THE LAW



1. ACTION PLAN

1.1 Scope, Objective, and Structure of the Action Plan

Activity 6 "Development of the draft Action Plan on Climate Change" focuses on (1) the identification of actions to be carried in a first phase of implementation of the Long-term Strategy on Climate Action (Strategy), which was developed under Activity 3; (2) drafting the Action Plan for the 1st Stage of Implementation of the Strategy and Law on Climate Action (Action Plan); and (3) the elaboration of concept notes for proposals to attract international climate finance for the implementation of specific actions identified in the Action Plan.

Following the Terms of Reference of the Project, this Action Plan contains specific climate actions identified in the Strategy and Law on Climate Action (Law or LCA), and prescribes responsible institutions, time frames, and an estimation of the resources necessary for their implementation. The Action Plan does so in a step-by-step approach, dividing each action in sub-activities that contribute to the achievement of the main action. The Action Plan also provides a framework to monitor and evaluate its implementation.

While there are similarities between this Action Plan and the action plan to implement the Strategy described in the Law, it is important to differentiate the two instruments.

This Action Plan is broader in scope than that regulated in the Law, as it contains actions to implement the Law itself.

The action plan regulated in the Law finds its legal basis in Article 16 of the Law and should not contain actions necessary to implement the Law. In fact, the adoption of the Law is a prerequisite for its development.

The actions contained in this Action Plan are segregated as follows:

- Actions that support the implementation of the mitigation objectives of the Strategy (A-M);
- Actions that support the implementation of the adaptation objectives of the Strategy (A-A);
- Actions that support the cross-sectoral coordination objectives of the Strategy (A-C); and
- Actions that support the implementation of the legal framework for climate action and the strengthening of institutional capacity (A-L).

In consultation with the main Beneficiary of the Project, the "first stage" or phase of implementation of the Strategy and Law have been defined as the period 2021-2030.

1.2 Vision and climate objectives of the country

Considering the current situation regarding climate change in the Republic of Republic of North Macedonia (Republic of North Macedonia), the results of the modelling of the greenhouse gas (GHG) emissions, including the respective social, economic and environmental impacts as described in the following chapters, and taking into consideration the *Paris Agreement*, the *European Union's 2030 Climate and Energy Framework,* the *European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy,* the vision of the Strategy is as follows:

Republic of North Macedonia is, by 2050, a prosperous, low carbon economy, following sustainable and climate resilient development

pathways, **enhancing competitiveness and promoting social cohesion through action to combat climate change and its impacts.**

This vision of the Strategy is based on the recognition that, in the framework of the Paris Agreement, all countries will deliver their fair and ambitious contribution towards the global temperature goals inscribed in that agreement, which requires peaking of the global GHG emissions as soon as possible, and achieving a balance between global emissions and global sinks in the second half of the century. The vision enshrines Republic of North Macedonia's sustainable development approach to fighting the causes and the impacts of climate change, in which a fairer and more equal society will be built, considering gender equality and female empowerment; the economy will successfully compete with other economies under the same conditions; and the environment will be protected for the benefit of future generations.

Based on modelling results, the results of the Strategic Environmental Impact Assessment, the foreseen socio-economic benefits and the need to adapt to changed climatic conditions, the general objective of the Strategy is:

Reduction of national net GHG emissions (including Forestry and Other Land Use and excluding MEMO items) of 72% by 2050 compared to 1990 levels (or GHG emission reduction of 42% by 2050 compared to 1990, excluding FOLU and MEMO items) and increased resilience of Republic of North Macedonia's society, economy and ecosystems to the impacts of climate change.

MEMO items include emissions from aviation and electricity import.

To support compliance with the general objective and with the implementation of sectoral measures, the general objective of the Strategy is disaggregated into specific mitigation, adaptation, and crosscutting objectives, where specific mitigation objectives reflect the Intergovernmental Panel on Climate Change (IPCC) sectoral aggregation of GHG emissions and, therefore, to the extent possible, also correspond to the division of responsibilities for the achievement of specific objectives.

Specific objective 1: To reduce GHG emissions by 64% in the Energy sector (excluding MEMO items) by 2050 compared to 1990.

The energy industries sector will deliver the greatest emissions reductions, namely through the implementation of the polluter pays principle (carbon taxation) and through the increased penetration of renewable energy sources (RES) in the energy mix. This will require an important transformation of the sector, given the current important reliance on the carbon intensive national lignite as a source of energy. The internalization of the cost of carbon dioxide (CO_2) in the price paid by the final consumer will provide an incentive for market participants to move to zero or lower emitting fuels (RES, natural gas); to adopting processes (in the industrial sector) which are less energy intensive and producing higher added value products; and/or promoting energy efficiency to reduce demand for electricity. The technological advancement of the RES technologies, especially the ones related to wind and solar generation, has substantially reduced the relevant installation and operation costs, making wind and solar capacity able to offer competitive prices in the wholesale electricity markets. Market prices, nevertheless, assuming the internalization of the carbon prices in the bids of thermal power plants, are at adequate level and allow the cost recovery for wind and solar investments, reducing the need for subsidies and financial support.

Furthermore, on the side of consumption of energy, energy efficiency is at the core of the climate and energy policies and is fundamental to a competitive economy and a secure and resilient energy system. Attributing priority to energy efficiency is the only way to avoid wasting the costly energy produced and delivered to the final consumer. Investments in energy efficiency provide important cost-savings to businesses and households (in addition to enhanced thermal comfort, particularly in the residential sector), thus constituting an important incentive to participate in the efforts towards a carbon constrained economy. In addition to

reductions achieved in households and tertiary sector, reduction of GHG emissions in the transport sector is to be achieved mostly through an increase of energy efficiency and through the renewal of the fleet. In this context, the introduction of hybrid and electric vehicles will play an important role, but, in the short term, not as important as the reduction of fuel consumption in traditional combustion vehicles, which will, by 2030, remain as the typical vehicle in Republic of North Macedonia.

Specific objective 2: To increase GHG emissions by not more than 153% in the IPPU sector by 2050 compared to 1990.

Specific objective 3: To reduce GHG emissions by 34% in the Agriculture sector by 2050 compared to 1990

Agriculture will contribute to GHG emissions reductions through the adoption of measures that contribute to sustainable agriculture, through increased carbon sequestration in the soil (because of increased organic matter in the soil), and increased efficiency in milk production and reduced fertilizer input through enhanced agriculture practices and implementation of new technologies.

Specific objective 4: To increase carbon sinks by 1733% in the Forest and Other Land Use sector by 2050 compared to 1990.

The Republic of North Macedonian forest has an important role to play in the transition to a low carbon economy, as it can provide a carbon neutral energy source and a great potential to increase the net carbon sink of the country. Afforestation and sustainable forest management will transform the forest sector in the country, providing great opportunities for job creation and to enhance resilience to climate change impacts.

Specific objective 5: To reduce GHG emissions by 2% in the Waste sector by 2050 compared to 1990.

Reduction of GHG emissions in the waste sector will take place through the implementation of the measures contained in the current waste policy framework which is already to some extend aligned with the EU acquis. Nonetheless, based on the assessment of the current situation, the implementation of the current existing measures is lagging behind and requires an important effort up to 2030 and beyond.

Specific objective 6: To build solid systems for the regular and periodic collection data for the production and dissemination of scientific and technical knowledge.

Data collection system proves to be crucial for the appropriate and timely response to the effects of climate change. This is in particularly important in the field of water resource and the use of water for irrigation. Furthermore, adapting to climate change in agriculture requires the vertical integration of scientific knowledge creation and dissemination. In addition, climate change may have significant impacts on biodiversity which requires development of a national research plan for biodiversity and an indicator system to monitor the impacts of climate change on biodiversity. Above all, accurate real-time air-climate-health data is important for the whole society and significant improvement of the processes for collection and dissemination of such data is crucial for the adaptive capacity of the sector human health.

Specific objective 7: To increase the resilience of climate change impacts of key socio-economic sectors and ecosystems.

The preparation and adoption of the National Adaptation Plan is an important step for Republic of North Macedonia to identify adaptation needs and to develop and implement policies and measures and actions to address those needs; and enable actions to protect vulnerable communities.

Specific objective 8: To establish comprehensive policy planning, coordination and policy implementation instruments for climate action.

This must be enabled by a comprehensive legal basis and legally established coordination instruments for the facilitation of cross sectoral policy design and implementation, as well as mechanisms for monitoring the implementation of the foreseen policies and measures.

Specific objective 9: Mainstream climate change related aspects into the future national strategic planning documents related to education, research, and development, innovation, social inclusion and equal opportunities on women and men.

The most important national strategic documents that should integrate climate related aspects are the future National Strategy for Education and the National Innovation Strategy. This will assure the systematic and harmonised integration of the climate related aspects in the national educational, research and development, innovation ecosystem, as well as increase the educational and research capacities and the climate awareness of the public. At the same time, intersecting climate change and gender will ensure effectiveness of the climate resilience policies and measures.

Specific objective 10: To promote the green transition through capacity building, training for new skills and awareness rising.

The transition to a low carbon economy is based on technological innovation, on large scale investment and policy decisions, but is also based on decision and behaviours of the individual citizen. Well informed and aware citizens, of all ages, are more likely to actively engage in the effort to reduce GHG emissions. Additionally, reducing GHG emissions require new technical skills which can be acquired via education via the school system, but also, via adult training, thus facilitating the transfer of workers from sectors with job losses to sectors with job gains. Overall climate change framework needs to be managed and supervised by competent authorities where significantly enhanced capacity is needed as a pre-condition for sustainable implementation, monitoring and reporting of mitigation policies and measures.

1.3 Role of the Law on Climate Action and secondary legislation developed by the Project

The LCA provides the legal basis for the development and implementation of actions needed to achieve the climate long-term vision and objectives of Republic of North Macedonia. The Strategy, one of the basic planning documents for climate action in the country, reflects these vision and objectives. The implementation of the Law and Strategy is central to achieving the climate goals of Republic of North Macedonia.

The LCA is conceived as a general law establishing the legal framework for climate action without regulating all details of climate action in all climate-relevant sectors. The LCA will need implementation through secondary legislation and through sectoral legislation and related by-laws. Climate action is cross-sectoral and, thus, builds upon climate-specific and sectoral legislation at the same time. Sectoral legislation is not replaced but rather contributes for its respective area to climate action. The LCA reflect this concept in its objectives which are (according to Article 4 of the current draft):

1) To contribute to the mitigation of climate change and to the adaptation to its adverse effects;
2) To establish the policy, planning and administrative framework necessary to mitigate and adapt to climate change in a cost-effective manner;
3) To provide for the rules to ensure that mitigation of climate change and adaptation to its adverse effects are taken into account and are complied with in sectoral policies, plans and administrative practices;

4) To reduce greenhouse gas emissions in order to contribute to the achievement of reductions that are considered scientifically necessary to avoid the adverse effects of climate change;
5) To establish the framework for policies, planning and administrative measures necessary to reduce greenhouse gas emissions from sources to the level considered scientifically necessary and maintain and enhance removals by sinks, taking into account the commitments and obligations under the international agreements in the field of climate change, ratified by the Republic of Republic of North Macedonia; and
6) To establish the monitoring and reporting mechanisms necessary for timely, transparent, accurate, consistent, comparable, and complete reporting and verification of information on specified anthropogenic greenhouse gas emissions by sources and removals by sinks, and on climate change adaptation actions.

As can be seen from the objectives of the LCA, the core of the framework legislation are the rules on the nature of climate action as a state obligation, the definitions that govern the understanding of the complex task of climate action, institutional arrangements to coordinate and mainstream climate action, the rules on the basic planning instruments, which must direct and provide an orientation for climate action long-term, mechanisms to regulate GHG emissions from industry and aviation, and—of central importance—the rules on the establishment of a monitoring and reporting system for GHG.

2. ACTIONS TO BE CARRIED IN A FIRST PHASE OF IMPLEMENTATION OF THE STRATEGY AND THE LAW (2021-2030)

2.1 Actions that support the implementation of the mitigation objectives of the Strategy

<table>
<tr><th colspan="3">A-M-1: Reduction of network losses</th></tr>
<tr><td colspan="3">Main objective: Reduction of network losses</td></tr>
<tr><td colspan="3">Description: Technical interventions will reduce the electricity transmission and distribution losses from 12% to 8%, while the district heating system losses will be reduced from 12% to at least 7%. Technical measures for reducing distribution electricity losses comprise of overhead lines replacement with underground (where possible), transition to 20 kV voltage level, installation of new transformation stations to shorten the low voltage lines, as well as automation and remote network management. All these improvements will contribute to better SAIDI and SAIFI indicators. For the heating sector, technical measures include continuous replacement of existing heat pipelines with pre-insulated ones and optimization of the substation operations through automatic control</td></tr>
<tr><td>Implementation period:</td><td colspan="2">2020 2050</td></tr>
<tr><td>Type of policy instrument:</td><td colspan="2">Economic</td></tr>
<tr><td>Link to the EU policies (where applicable):</td><td colspan="2">Energy efficiency directive 2010/31/EC, Regulation 714/2009</td></tr>
<tr><td>Relevant national planning documents, legal and regulatory acts:</td><td colspan="2">• Strategy for Energy Development up to 2040
• Development plan of EVN Macedonia, AD
• Development plan of Balkan Energy Group (BEG)</td></tr>
<tr><td>Implementing entity:</td><td colspan="2">• Electricity distribution companies
• Heat distribution companies</td></tr>
<tr><td>Monitoring entity:</td><td colspan="2">Energy Agency, Ministry of Economy</td></tr>
<tr><td>GHG(s) affected (if applicable):</td><td colspan="2">CO2, CH4, N2O</td></tr>
<tr><td rowspan="2">Quantified objective /Indicators used to monitor and evaluate progress over time:</td><td>Description:</td><td>Percentage of network losses (%)</td></tr>
<tr><td>Values in 2030:</td><td>10.5% for electricity and 10% for heat</td></tr>
<tr><td>Actions to support the implementation of the objective:</td><td colspan="2">• Allocation of financial resources for implementation of investments in the electricity distribution network
• Development of a General investment plan in heat distribution network for the next 20 years
• Development of a Short-term investment plan for the heat distribution network for the next 5 years
• Allocation of financial resources for implementation of investments in the heat distribution network
• Provision of governmental support/mechanisms for enhanced utilisation and territorial expansion of the heat distribution network, with aim of improved efficiency of the system and reduction of the losses from the central heat distribution systems
• Provision of favourable financial instruments for funding of the investments in the electricity and the heat distribution network
• Replacement old electric transformer with new transformers at 20 kV voltage level
• Reduction of the reactive power in the power network</td></tr>
</table>

	• Rehabilitation of the hot water distribution network, replacement of the existing pumps in the heating substations with new energy efficient pumps and other measures for energy efficiency improvement (modernization of the SCADA system, integration of the distribution networks) • Installation of modern equipment for regulation and monitoring in the heating substations for control and reduction of the consumed heat	
Finance:	Budget:	170 M€
	Source of finance:	Electricity and heat distribution companies
Progress monitoring:	Activities implemented: Objective achieved:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	Energy Strategy up to 2040, NECP, 3rd BUR, NDC	
Assumptions/ General comments:	Technical interventions will reduce the electricity transmission and distribution losses from 12% to 8%, while the district heating system losses will be reduced from 12% to at least 7%	

A-M-2: Large hydro power plants		
Main objective: Increase of the domestic generation capacity from renewable energy sources		
Description: Construction of new large hydro power plants taking into account environmental and social impacts		
Implementation period:	2025 - 2035	
Type of policy instrument:	Technical	
Link to the EU policies (where applicable):	• RES Directive 2009/28/EC • Energy Law and RES By-laws	
Relevant national planning documents, legal and regulatory acts:	• Strategy for Energy Development of the Macedonia up to 2040 • Strategy for utilization of renewable energy sources in the Republic of North Macedonia • Development plan of ESM AD (JSC Macedonian Power Plants)	
Implementing entity:	• ESM AD (JSC Macedonian Power Plants) • Ministry of Environment and Physical Planning • Energy Agency, Ministry of Economy	
Monitoring entity:	Energy Agency, Ministry of Economy	
GHG(s) affected (if applicable):	CO_2, CH_4, N_2O	740.7 kt CO2-eq.
Quantified objective /Indicators used to monitor and evaluate progress over time:	Description:	Additional installed capacity (MW)
	Values in 2030:	808
Actions to support the implementation of the objective:	• Feasibility/pre-feasibility studies developed for HPP Chebren (already implemented) • Prequalification tender for Chebren published (already implemented) • Feasibility/pre-feasibility studies developed for HPP Vardar Valley • Prequalification tender for Vardar valley published • Invitation for tenders for the construction of the new hydropower plants, selection of the best bidder and commencement of the construction • Construction of large hydro power plant Vardar valley – 2025-2030	

	• Construction of large hydro power plant Chebren – 2029 • Construction of the tunnel Vardar – Kozjak, Veles and Gradec	
Finance:	Budget:	1716.2 M€
	Source of finance:	Public private partnership, ESM
Progress monitoring:	Objective achieved: Actions implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	Energy Strategy up to 2040, NECP, 3rd BUR, NDC	
Assumptions/ General comments:	The construction of new hydropower plants should avoid the disproportionate environmental impact compared to electricity generated. The selection of locations for construction of small HPPs should be carefully assessed to avoid adverse environmental impacts and should take into considerations the legal framework for environmental protection, biodiversity protection, nature conservation as well as Governmental decisions.	

A-M-3: Incentives, feed-in tariff		
Main objective: Incentives, feed-in tariff		
Description: Construction of new small hydro power plants, wind and biogas with feed-in tariffs that will stimulate the construction.		
Implementation period:	2020 - 2030	
Type of policy instrument:	Economic, Fiscal	
Link to the EU policies (where applicable):	RES Directive 2009/28/EC Energy Law and RES By-laws	
Relevant national planning documents, legal and regulatory acts:	• Strategy for Energy Development of the Republic of North Macedonia • Strategy for Utilization of Renewable Energy Sources in the Republic of North Macedonia • Renewable Energy Action Plan • Law on Energy • By-laws for renewable energy	
Implementing entity:	• Government of the Republic of Republic of North Macedonia • Energy Regulatory Commission • Ministry of Environment and Physical Planning • Ministry of Economy, Energy Agency • Private investors	
Monitoring entity:	Energy Regulatory Commission	
GHG(s) affected (if applicable):	CO_2, CH_4, N_2O	149.5 kt CO_2-eq
Quantified objective /Indicators used to monitor and evaluate progress over time:	Description: Values in 2030:	Additional installed capacity (MW) 159
Actions to support the implementation of the objective:	• Regulation on feed-in tariffs (adopted 17.04.2013) • Decree on the measures for support of electricity generation from renewable energy sources (adopted 05.04.2019).	

	• Decision on the total installed capacity for preferential producers of electricity (adopted 05.04.2019) • Provision of favourable financial mechanisms for investments in renewable energy • Organisation of awareness raising campaigns and events that will promote the enabling environment and options for investments in renewable energy • Construction of power plants	
Finance:	Budget:	356.9 M€
	Source of finance:	Private, incentives through consumer bills
Progress monitoring:	Objective achieved: Actions implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	Energy Strategy up to 2040, NECP, 3rd BUR	
Assumptions/ General comments:	The construction of new small hydropower plants should avoid the disproportionate environmental impact compared to electricity generated. The selection of locations for construction of small HPPs should be carefully assessed to avoid adverse environmental impacts and should take into considerations the legal framework for environmental protection, biodiversity protection, nature conservation, as well as Governmental decisions. In addition, it is recommended the capacity of the water supply systems to be used for small hydropower plants if justified according to economic and technical assessments. Through stimulation with feed-in tariffs, it is envisaged that by 2040 additional capacity will be constructed: • 86 MW wind power plants • 13 MW biogas power plants • 92.5 MW small hydro power plants	

A-M-4: Incentives, feed-in premium		
Main objective: Increase of the domestic generation capacity from renewable energy sources		
Description: Construction of solar and wind power plants with feed-in premium tariffs to stimulate the construction		
Implementation period:	2020 – 2040	
Type of policy instrument:	Technical, regulatory	
Link to the EU policies (where applicable):	RES Directive 2009/28/EC	
Relevant national planning documents, legal and regulatory acts:	Energy Strategy up to 2040, NECP, 3rd BUR, Energy Law and RES By-laws	
Implementing entity:	• Government of the Republic of North Macedonia • Energy Regulatory Commission • Ministry of Economy • Private investors	
Monitoring entity:	Energy Regulatory Commission	
GHG(s) affected (if applicable):		149.5
Quantified objective /Indicators used to monitor and evaluate progress over time:	Description:	Installed capacity (MW)
	Values in 2030:	264 MW (additional installed capacity)

Actions to support the implementation of the objective:	• Decree on the measures for support of electricity generation from renewable energy sources as well as decision on the total installed capacity for preferential producers of electricity adopted (05.04.2019) • Public call on awarding an agreement for right to use premium for electric power produced from photovoltaic power plant constructed on land owned by the Republic of North Macedonia (21.07.2019) • Public call on awarding the right to use a premium for electricity generated and sold from photovoltaic power plants built on land not owned by the Republic of North Macedonia or on land owned by the Republic of North Macedonia on which right to use has been established (02.10.2019) • Electronic auction for both tenders (already implemented) • Public call on awarding an agreement for right to use premium for electric power produced from photovoltaic power plant constructed on land owned by the Republic of RN Macedonia (already implemented) • Public call on awarding the right to use a premium for electricity generated and sold from photovoltaic power plants built on land not owned by the Republic of North Macedonia or on land owned by the Republic of North Macedonia on which right to use has been established • Provision of favourable financial mechanisms for investments in renewable energy • Organisation of awareness raising campaigns and events that will promote the enabling environment and options for investments in renewable energy • Construction of solar power plants • New public call on awarding an agreement for right to use premium for electric power produced from photovoltaic power plant constructed on land owned by the Republic of North Macedonia • New public call on awarding the right to use a premium for electricity generated and sold from photovoltaic power plants built on land not owned by the Republic of North Macedonia or on land owned by the Republic of North Macedonia on which right to use	
Finance:	Budget:	240.6 M€
	Source of finance:	Private, incentives from the central government budget
Progress monitoring:	Objective achieved: Actions implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	Energy Strategy up to 2040, NECP, 3rd BUR	
Assumptions/ General comments:	Through stimulation with feed-in premium, it is envisaged that by 2040 additional capacity will be constructed: • 200 MW solar power plants • 64 MW wind power plants	

A-M 5 Biomass power plants (CHP optional)	
Main objective: Increase of the domestic generation capacity from renewable energy sources	
Description: This measure considers construction of distributed small sized biomass power plants (CHP optional) with stimulation through feed-in tariffs. Beside increasing the RES share with this CHPs, they should also contribute in increasing the flexibility of the electricity system and ensuring the security of supply. It is envisioned that waste biomass will be used, taking into account the sustainability of the biomass at national level	
Implementation period:	2020 – 2040
Type of policy instrument:	Technical, regulatory

Link to the EU policies (where applicable):	RES Directive 2009/28/EC, Energy efficiency directive 2010/31/EC	
Relevant national planning documents, legal and regulatory acts:	Energy Law and RES By-laws and Energy Efficiency Law	
Implementing entity:	• Government of the Republic of North Macedonia • Energy Regulatory Commission • Ministry of Environment and Physical Planning • Ministry of Economy, Energy Agency • Private investors	
Monitoring entity:	Ministry of Economy, Energy Agency	
GHG(s) affected (if applicable):		21
Quantified objective /Indicators used to monitor and evaluate progress over time:	Description:	Installed capacity (MW)
	Values in 2030:	10
Actions to support the implementation of the objective:	• Decree on the measures for support of electricity generation from renewable energy sources adopted (05.04.2019) • Decision on the total installed capacity for preferential producers of electricity adopted (05.04.2019) • Provision of favourable financial mechanisms for investments in renewable energy • Organisation of awareness raising campaigns and events that will promote the enabling environment and options for investments in renewable energy	
Finance:	Budget:	24.3 M€
	Source of finance:	Private, incentives from the central government budget
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	Energy Strategy up to 2040, NECP, 3rd BUR	
Assumptions/ General comments:	Through stimulation with feed-in tariffs, it is envisaged that by 2040 biomass power plants with capacity of 15 MW will be constructed	

A-M-6: Solar rooftop power plants	
Main objective: Increase of the domestic generation capacity from renewable energy sources	
Description: Construction of solar rooftop power plants, on private as well as public buildings, either prosumers or systems from which the overall produced electricity will be used for own purposes or will be stored. One of the possibilities for increasing the installed capacity of solar roof-top systems is through renewable energy communities	
Implementation period:	2020 – 2040
Type of policy instrument:	Technical, regulatory
Link to the EU policies (where applicable):	RES Directive 2009/28/EC, Energy efficiency directive 2010/31/EC
Relevant national planning documents, legal and regulatory acts:	Energy Law and RES By-laws and Energy Efficiency Law

Implementing entity:	• Government of the Republic of North Macedonia • Energy Regulatory Commission • Ministry of Economy, Energy Agency • Elektrodustribucija Skopje • Suppliers of electricity • End-users of electricity	
Monitoring entity:	Ministry of Economy, Energy Agency	
GHG(s) affected (if applicable):		164.3
Quantified objective /Indicators used to monitor and evaluate progress over time:	Description:	Installed capacity (MW)
	Values in 2030:	256
Actions to support the implementation of the objective:	• Rulebook on renewable energy sources (adopted) • Distribution grid code (implemented) • Provision of favourable financial mechanisms for investments in renewable energy • Provision of financial subsidies for households that will invest in solar PVs • Organisation of awareness raising campaigns and events that will promote the enabling environment and options for investments in renewable energy	
Finance:	Budget:	263.4 M€
	Source of finance:	Private, donors, subsidies from national and local budget, EE fund
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	Energy Strategy up to 2040, NECP, 3rd BUR	
Assumptions/ General comments:	400 MW solar capacities are envisioned to be constructed by 2040	

A-M-7: RES without incentives	
Main objective: Increase of the domestic generation capacity from renewable energy sources	
Description: Construction of wind, solar and biogas power plants on different location in RN Macedonia carefully selected in order to avoid the impact on environment compared to benefits of generated electricity	
Implementation period:	2020 – 2040
Type of policy instrument:	Technical, regulatory
Link to the EU policies (where applicable):	RES Directive 2009/28/EC, Energy efficiency directive 2010/31/EC
Relevant national planning documents, legal and regulatory acts:	• Strategy for Energy Development of the RN Macedonia up to 2040 • Law on Energy • By-laws for renewable energy
Implementing entity:	• Government of the Republic of North Macedonia • Energy Regulatory Commission • Ministry of Economy, Energy Agency • JSC Macedonian Power Plants (ESM AD) • Private investors

Monitoring entity:	Ministry of Economy, Energy Agency	
GHG(s) affected (if applicable):		202.8
Quantified objective /Indicators used to monitor and evaluate progress over time:	Description:	Installed capacity (MW)
	Values in 2030:	515
Actions to support the implementation of the objective:	• Decree on the measures for support of electricity generation from renewable energy sources adopted (5.04.2019) • Decision on the total installed capacity for preferential producers of electricity adopted (5.04.2019) • Electricity grid code adopted • Construction of 10MW Oslomej PV started • Tender for Public Private Partnership for PV Oslomej of at least 80 MW • Development of methodology for selection of best for location construction of solar and wind PP	
Finance:	Budget:	1325.4 M€
	Source of finance:	Private, ESM
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	Energy Strategy up to 2040, NECP, 3rd BUR	
Assumptions/ General comments:	The following capacities by scenario without incentives are envisioned to be constructed by 2040: • Wind – 600 MW • Solar – 750 MW • Biogas – 10 MW	

A-M-8: Development of the biofuels market		
Main objective: the RES share in the transport sector is almost zero and it is the main reason for not achieving the country 2020 target. In order to fulfil the 2030 RES target in the transport sector, but also the overall RES target it is necessary to have a functional biofuels market		
Description: Increase the share of biofuels in line with the requirement of the recast on the RES Directive (2018/2001)		
Implementation period:	2020 – 2040	
Type of policy instrument:	Regulatory, policy	
Link to the EU policies (where applicable):		
Relevant national planning documents, legal and regulatory acts:	• Strategy for Energy Development of the RN Macedonia up to 2040 • Biennial report on the progress of increased utilization of renewable energy sources	
Implementing entity:	• Government of the Republic of North Macedonia • Ministry of economy • Companies that sell oil products	
Monitoring entity:	Ministry of economy	
GHG(s) affected (if applicable):		211.0

Quantified objective /Indicators used to monitor and evaluate progress over time:	Description:	% of biofuels
	Values in 2030:	10
Actions to support the implementation of the objective:	• Draft version of the Action Plan for Biofuels developed • Draft version of the Law on Biofuels developed • Development of study on RES target in transport in 2030 in EnC countries • Development of study on biofuels in RN Macedonia • The previous draft is from 2015, Development of law on biofuels started • Adoption of the Law on biofuels • Development of new draft action plan for biofuels	
Finance:	Budget:	
	Source of finance:	Central government budget, consumers
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	Energy Strategy up to 2040, NECP, 3rd BUR	
Assumptions/ General comments:	• Law on biofuels as well as action plan will be adopted in line with the requirements of the RES Directive (2018/2001) • The share of biofuels in 2030 will be 10%	

A-M-9: Energy efficiency obligation schemes		
Main objective: Fulfilment of the obligation under Article 7 of the EE Directive		
Description: To set up the scheme the average annual final consumption for the period 2014 – 2016 is used. The measure implements the possibilities from the Article 7 of the EE Directive to exclude the transport sector consumption (paragraph 1) from the sum of the average annual consumption and reduce the consumption in the industry sector (paragraph 2)		
Implementation period:	2020 – 2040	
Type of policy instrument:	Technical, regulatory	
Link to the EU policies (where applicable):	Energy efficiency directive 2010/31/EC	
Relevant national planning documents, legal and regulatory acts:	• Law on energy efficiency • Directive for EE	
Implementing entity:	• Ministry of economy • Distribution system operators • Suppliers and traders of electricity and gas	
Monitoring entity:	Ministry of Economy	
GHG(s) affected (if applicable):		162.8
Quantified objective /Indicators used to monitor and evaluate progress over time:	Description:	Final energy savings (ktoe) Primary energy savings (ktoe)
	Values in 2030:	44.4 67.8

Actions to support the implementation of the objective:	• Law on Energy Efficiency (adopted) • Development of a Decree for obligation scheme • Adoption and implementation of a Decree for obligation scheme	
Finance:	Budget:	182 M€
	Source of finance:	Consumers through their bills
Progress monitoring:	Objective achieved:	Yes/No
	Activities implemented:	Yes/No
Reference to assessments and underpinning technical reports:	Energy strategy up to 2040, NECP; 3rd BUR	
Assumptions/ General comments:	1. Final energy savings targets of: • 0.5% in 2017 • 0.7% in 2018 – 2020 • 0.35% in 2021 – 2030 • 0.2% in 2031 – 2040 of the average annual energy sales to final customers in the period 2014 – 2016 excluding the customers in the transport sector as well as industries of Annex I of the Directive 2003/87/EC 2. Up to 30% of the costs will be covered through subsidies by the distribution companies or suppliers	

A-M-10: Solar thermal collectors		
Main objective: Reduction of the energy costs and improvement of the efficiency		
Description: Hot water electric heaters are one of the biggest energy consumers with a major impact on bills. On the other hand, the reduced investment cost for purchasing and installation of solar thermal collectors is of great importance because it can drop consumer bills for hot water. Also, these systems serve for energy savings and can satisfy at least 50% at annual level, depending on the hot water needs. Furthermore, solar thermal collectors can be used in combination with electricity and district heating systems		
Implementation period:	2020 – 2040	
Type of policy instrument:	Technical	
Link to the EU policies (where applicable):	Energy efficiency directive 2010/31/EC	
Relevant national planning documents, legal and regulatory acts:	• Strategy for Energy Development of RN Macedonia up to 2040 • Law on Energy • Law on Energy Efficiency • By-laws for renewable energy • Program for the promotion of renewable energy	
Implementing entity:	• Ministry of economy, Energy Agency • End-users	
Monitoring entity:	Ministry of Economy, Energy Agency	
GHG(s) affected (if applicable):		21.5
Quantified objective /Indicators used to monitor and evaluate progress over time:	Number of new installed solar collectors	
	Final energy savings (ktoe) in 2030:	7.5
	Primary energy savings (ktoe) in 2030:	10.7

Actions to support the implementation of the objective:	• Program for promotion of RES for 2020 adopted • Continuation of the incentive measures for solar thermal collectors installation	
Finance:	Budget:	70 M€
	Source of finance:	Private, EE fund, incentives from the central government budget, donors
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	Energy strategy up to 2040, NECP; 3rd BUR	
Assumptions/ General comments:	Share of solar thermal collectors in hot water useful demand by 2040 to be 45% in household sector and 30% in commercial sector	

A-M-11: Labelling of electric appliances and equipment		
Main objective: Penetration of appliances with higher efficiency (class A++, A+, A, B)		
Description: Labelling of electric appliances and equipment to provide relevant information on the energy consumption of the products. The application of the labelling and eco-design of the products is necessary to ensure that the products sold in RN Macedonia comply with the EU regulations		
Implementation period:	2020 – 2040	
Type of policy instrument:	Regulatory	
Link to the EU policies (where applicable):	Energy efficiency directive 2010/31/EC	
Relevant national planning documents, legal and regulatory acts:	• Strategy for Energy Development of RN Macedonia up to 2040 • Law on energy efficiency • Third Energy Efficiency Action Plan • Rulebook on labelling consumption of energy and other resources on devices using energy • Regulation on eco-design of products	
Implementing entity:	• Ministry of economy, Energy Agency • Producers and suppliers of electrical equipment and household appliances • End-users	
Monitoring entity:	Ministry of Economy, Energy Agency	
GHG(s) affected (if applicable):		56.3
Quantified objective /Indicators used to monitor and evaluate progress over time:	Number of devices sold (A+++, A++, A+, A)	
	Final energy savings (ktoe) in 2030:	19.0
	Primary energy savings (ktoe) in 2030:	28.1
Actions to support the implementation of the objective:	• Rulebook on labelling consumption of energy and other resources on devices using energy adopted in September 2016 by the Ministry of Economy • Draft version of the new Regulation on eco-design of products developed • Adoption of the new Regulation on eco-design of products developed	
Finance:	Budget:	71 M€
	Source of finance:	Private, EE fund

Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	Energy strategy up to 2040, NECP; 3rd BUR	
Assumptions/ General comments:	As a result of this measure, it is expected that by 2040 the share of energy efficient technologies will be 6% in the overall stock	

A-M-12: Increased use of heat pumps		
Main objective: More efficient use of electricity		
Description: Phasing out heating devices with resistive heaters, as well as inefficient biomass stoves and their replacement with heat pumps in compliance with EU Climate and Energy Policy		
Implementation period:	2020 – 2040	
Type of policy instrument:	Regulatory	
Link to the EU policies (where applicable):	Energy efficiency directive 2010/31/EC	
Relevant national planning documents, legal and regulatory acts:	• Strategy for Energy Development of RN Macedonia up to 2040 • Law on energy efficiency • Third Energy Efficiency Action Plan • EU Climate and Energy Policy	
Implementing entity:	• Ministry of Economy, Energy Agency • End-users	
Monitoring entity:	Ministry of Economy, Energy Agency	
GHG(s) affected (if applicable):		369.5
Quantified objective /Indicators used to monitor and evaluate progress over time:	Number of heat pump sold	
	Final energy savings (ktoe) in 2030:	139.3
	Primary energy savings (ktoe) in 2030:	186.1
Actions to support the implementation of the objective:	Adopting a Decision to ban the sale of heating devices with resistive heaters	
Finance:	Budget:	474.4 M€
	Source of finance:	Private, EE fund, incentives from the central and local government budget, donors
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	Energy strategy up to 2040, NECP; 3rd BUR	
Assumptions/ General comments:	It is assumed that heating devices with resistive heaters will be gradually replaced with heat pumps. The share of heat pumps in useful heat demand in 2040 is 55%	

A-M-13: Public awareness campaigns and network of energy efficiency (EE) info centres

<table>
<tr><td colspan="3">Main objective: Implement information campaigns that will raise public awareness about the importance, effects and benefits energy efficiency</td></tr>
<tr><td colspan="3">Description: Although a large number of campaigns for the promotion of energy efficiency by different stakeholders are provided, still there is a lack of knowledge about the benefits of the EE. Article 12 of the EE Directive stipulates that the country should takes appropriate measures to promote and facilitate an efficient use of energy by small energy customers, including domestic customer. This can be done using different mechanisms. One of them is the establishment of EE info centres in the local self-governments. Following the examples from the EU, besides this measure, several others should be implemented such as:
• Education, starting from the kindergarten
• Training of the employees in the public institutions at the central and local level
• Creation of calculation tool that will show the financial and environmental effects from the implementation of a certain measure</td></tr>
<tr><td>Implementation period:</td><td colspan="2">2020 – 2040</td></tr>
<tr><td>Type of policy instrument:</td><td colspan="2">Information</td></tr>
<tr><td>Link to the EU policies (where applicable):</td><td colspan="2">Energy efficiency directive 2010/31/EC</td></tr>
<tr><td>Relevant national planning documents, legal and regulatory acts:</td><td colspan="2">• Strategy for Energy Development of RN Macedonia up to 2040
• Law on energy efficiency</td></tr>
<tr><td>Implementing entity:</td><td colspan="2">• Ministry of Economy, Energy Agency
• Energy suppliers
• End-users</td></tr>
<tr><td>Monitoring entity:</td><td colspan="2">Ministry of Economy, Energy Agency</td></tr>
<tr><td>GHG(s) affected (if applicable):</td><td></td><td>201.5</td></tr>
<tr><td rowspan="3">Quantified objective /Indicators used to monitor and evaluate progress over time:</td><td>Number of devices sold (A+++, A++, A+, A)</td><td></td></tr>
<tr><td>Final energy savings (ktoe) in 2030:</td><td>67.8</td></tr>
<tr><td>Primary energy savings (ktoe) in 2030:</td><td>99.7</td></tr>
<tr><td>Actions to support the implementation of the objective:</td><td colspan="2">• Platform for energy efficiency, for education of the population and journalists and experience sharing of the private sector for successfully implemented EE measures implemented
• Info Centre for Energy of the City of Skopje opened
• Free advices to the customers for reasonable consumption of electricity enabled by EVN’s Customer Service Centre
• Broadcasting of TV spots, announcements, campaigns and documentary films
• Extension of the Platform for energy efficiency
• Continuous work of the existing and opening new information centres</td></tr>
<tr><td rowspan="2">Finance:</td><td>Budget:</td><td>8 M€ + 704 M€ (investment in advanced technologies)</td></tr>
<tr><td>Source of finance:</td><td>Private sector, donors, central and local governments</td></tr>
<tr><td>Progress monitoring:</td><td>Objective achieved:
Activities implemented:</td><td>Yes/No
Yes/No</td></tr>
<tr><td>Reference to assessments and underpinning technical reports:</td><td colspan="2">Energy strategy up to 2040, NECP; 3rd BUR</td></tr>
</table>

Assumptions/ General comments:	Investment in public awareness rising campaigns that will increase the share of more efficient appliances (with higher class of efficiency), in the overall stock, by 2040 to 40%

A-M-14: Retrofitting of existing residential buildings		
Main objective: To meet the requirements under the Energy Efficiency Law		
Description: The measure considers reconstructions of residential buildings including windows replacement, initiated by the owners and/or supported by commercial banks and funds. This measure will provide issuing of certificates for energy performance of buildings, as a prerequisite for putting the reconstructions into operation		
Implementation period:	2020 – 2040	
Type of policy instrument:	Technical, regulatory	
Link to the EU policies (where applicable):	Energy efficiency directive 2010/31/EC, Directive of energy performance of buildings 2010/31/EC	
Relevant national planning documents, legal and regulatory acts:	• Strategy for Energy Development of RN Macedonia up to 2040 • Law on energy efficiency	
Implementing entity:	• Ministry of Economy, Energy Agency • Donors and financial institutions • Households	
Monitoring entity:	Ministry of Economy, Energy Agency	
GHG(s) affected (if applicable):		73.0
Quantified objective /Indicators used to monitor and evaluate progress over time:	Final energy savings (ktoe) in 2030:	42.0
	Primary energy savings (ktoe) in 2030:	50.4
Actions to support the implementation of the objective:	• 31 buildings for collective housing were renovated (EE measures implemented) under the USAID/Habitat Project for residential energy efficiency • Financial support for rehabilitation of buildings for collective housing with implementation of EE measures provided by some municipalities • Call for applications for reimbursement of 50% of the costs for windows replacement and installation of PVC and aluminium windows, but not more than 500 €, provided by the Ministry of Economy • Law on Energy Efficiency adopted • National Building Renovation Strategy to be developed and adopted • Establishment of an Energy Efficiency Fund	
Finance:	Budget:	1708.2 M€
	Source of finance:	Private, donors through commercial EE loans, EE fund
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	Energy strategy up to 2040, NECP; 3rd BUR	
Assumptions/ General comments:	The existing residential buildings, while meet the standard for at least C class (90 kWh/m2). The annual renovation rate considered is 2%	

A-M-15: Retrofitting of existing central government buildings		
Main objective: Retrofitting of existing public buildings with aim to meet the objectives of the EE Directive and the Energy Efficiency Law		
Description: Having in mind the situation with the energy performance of the public buildings at central level and the role that they should play, it is essential to boost their renovation. Article 5 of the EE Directive is of great importance because it can be a starting point for the retrofit expansion. In absence of recent information about the public building stock, in the calculations the heated area of building stock from the National Program for EE in public buildings (Draft version) is considered (including health care sector, universities, student dormitories, science institutions, social care institutions, centres for social affairs, as well as state administrative sector – Ministry of Economy, Ministry of Education and Science, Ministry of Environment and Physical Planning and Ministry of Transport and Communications). In addition, the specific consumption given in the same document is used (average 214 kWh/m2). This measure considers reconstruction including windows replacement of existing public buildings under jurisdiction of the central government. The measure will provide issuing of certificates for energy performance of buildings, as a prerequisite for putting the reconstructions into operation.		
Implementation period:	2020 – 2040	
Type of policy instrument:	Technical, regulatory	
Link to the EU policies (where applicable):	Energy efficiency directive 2010/31/EC, Directive of energy performance of buildings 2010/31/EC	
Relevant national planning documents, legal and regulatory acts:	• Strategy for Energy Development of RN Macedonia up to 2040 • Law on energy efficiency	
Implementing entity:	• Ministry of Economy, Energy Agency • Ministry of Finance • Local self-government • Municipal public enterprises • Donors and financial institutions	
Monitoring entity:	Ministry of Economy, Energy Agency	
GHG(s) affected (if applicable):		19.2
Quantified objective /Indicators used to monitor and evaluate progress over time:	Final energy savings (ktoe) in 2030:	4.8
	Primary energy savings (ktoe) in 2030:	6.6
Actions to support the implementation of the objective:	• Draft National Program for energy efficiency in public buildings in the RN Macedonia (Phase I) was developed under the GEF Sustainable Energy Project • "Resilient Skopje" – Climate Change Strategy for the City of Skopje developed • National Building Renovation Strategy to be developed and adopted • Establishment of an Energy Efficiency Fund	
Finance:	Budget:	170 M€
	Source of finance:	Central government budget, donors
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	Energy strategy up to 2040, NECP; 3rd BUR	
Assumptions/ General comments:	Annual renovation rate of 3% of the existing central government buildings	

A-M-16: Retrofitting of existing local self-government buildings		
Main objective: Retrofitting of existing public buildings with aim to meet the objectives of the EE Directive and the Energy Efficiency Law		
Description: Local self-government should be encouraged by the central government renovation strategy, so they can put special attention on buildings under their competence. For the calculations, the heated area of building stock from the National Program for EE in public buildings (Draft version) is considered (including primary and secondary schools, kindergartens, pupils' dormitories, municipalities and the City of Skopje buildings). In addition, the specific consumption given in the same document is used (average 214 kWh/m2). This measure considers reconstruction including windows replacement of existing public buildings under jurisdiction of the local self-government. The measure will provide issuing of certificates for energy performance of buildings, as a prerequisite for putting the reconstructions into operation.		
Implementation period:	2020 – 2040	
Type of policy instrument:	Technical, regulatory	
Link to the EU policies (where applicable):	Energy efficiency directive 2010/31/EC, Directive of energy performance of buildings 2010/31/EC	
Relevant national planning documents, legal and regulatory acts:	• Strategy for Energy Development of RN Macedonia up to 2040 • Law on energy efficiency	
Implementing entity:	• Ministry of Economy, Energy Agency • Ministry of Finance • Local self-government • Municipal public enterprises • Donors and financial institutions	
Monitoring entity:	Ministry of Economy, Energy Agency	
GHG(s) affected (if applicable):		19.8
Quantified objective /Indicators used to monitor and evaluate progress over time:	Final energy savings (ktoe) in 2030:	4.7
	Primary energy savings (ktoe) in 2030:	6.7
Actions to support the implementation of the objective:	• Draft National Program for energy efficiency in public buildings in the RN Macedonia (Phase I) was developed under the GEF Sustainable Energy Project • "Resilient Skopje" – Climate Change Strategy for the City of Skopje developed • Law on Energy Efficiency adopted • National Building Renovation Strategy to be developed and adopted • Establishment of an Energy Efficiency Fund	
Finance:	Budget:	150 M€
	Source of finance:	Local self-government budget, donors
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	Energy strategy up to 2040, NECP; 3rd BUR	
Assumptions/ General comments:	Annual renovation rate of 1.5% of the existing local self-government buildings	

A-M-17: Retrofitting of existing commercial buildings		
Main objective: Retrofitting of existing commercial buildings with aim to meet the objectives of the EE Directive and the Energy Efficiency Law		
Description: There is lack of data for the commercial building stock, but according to third NEEAP the commercial building area is estimated to nearly 8 million m^2. This measure considers reconstructions of existing commercial buildings including windows replacement initiated by the owners and/or supported by commercial banks and funds. The measure will provide issuing of certificates for energy performance of buildings, as a prerequisite for putting the reconstructions into operation		
Implementation period:	2020 – 2040	
Type of policy instrument:	Technical, regulatory	
Link to the EU policies (where applicable):	Energy efficiency directive 2010/31/EC, Directive of energy performance of buildings 2010/31/EC	
Relevant national planning documents, legal and regulatory acts:	• Strategy for Energy Development of RN Macedonia up to 2040 • Law on energy efficiency	
Implementing entity:	• Ministry of Economy, Energy Agency • Ministry of Finance • Commercial building owners	
Monitoring entity:	Ministry of Economy, Energy Agency	
GHG(s) affected (if applicable):		98.2
Quantified objective /Indicators used to monitor and evaluate progress over time:	Final energy savings (ktoe) in 2030:	26.5
	Primary energy savings (ktoe) in 2030:	35.7
Actions to support the implementation of the objective:	• Law on Energy Efficiency adopted • Annual renovation rate of 1% for the existing commercial buildings	
Finance:	Budget:	530 M€
	Source of finance:	Private, donors through commercial EE loans, EE fund
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	Energy strategy up to 2040, NECP; 3rd BUR	
Assumptions/ General comments:	Annual renovation rate of 1.5% of the existing commercial buildings	

A-M-18: Construction of new buildings
Main objective: Construction of new buildings that will meet the minimum criteria set in the Rulebook of energy performance in buildings
Description: An energy efficient building reduces maintenance and utility costs, but, in many cases, improves durability, lessens noise, increases comfort and creates a healthy and safe indoor environment. A further goal of energy efficient construction is to limit damage to the ecosystem and reduce the use of natural resources like energy, land, water, and raw materials. This measure will provide issuing of certificates for energy performance of buildings, as a prerequisite for putting the building into operation

Implementation period:	2020 – 2040	
Type of policy instrument:	Technical, regulatory	
Link to the EU policies (where applicable):	Energy efficiency directive 2010/31/EC, Directive of energy performance of buildings 2010/31/EC	
Relevant national planning documents, legal and regulatory acts:	• Strategy for Energy Development of RN Macedonia up to 2040 • Law on energy efficiency	
Implementing entity:	• Ministry of Economy, Energy Agency • Donors and financial institutions • Investors (households)	
Monitoring entity:	Ministry of Economy, Energy Agency	
GHG(s) affected (if applicable):		19.8
Quantified objective /Indicators used to monitor and evaluate progress over time:	Final energy savings (ktoe) in 2030:	12.0
	Primary energy savings (ktoe) in 2030:	14.3
Actions to support the implementation of the objective:	• Financial support for construction of new buildings at municipality level • Law on Energy Efficiency adopted • National Building Renovation Strategy to be developed and adopted • Establishment of an Energy Efficiency Fund	
Finance:	Budget:	282.7 M€
	Source of finance:	Private, donors through commercial EE loans, EE fund
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	Energy strategy up to 2040, NECP; 3rd BUR	
Assumptions/ General comments:	Construction of new residential buildings, while meeting the standard for at least C class (90 kWh/m2)	

A-M-19: Construction of passive buildings	
Main objective: After 31.12.2020 all new building should be nearly zero-energy buildings	
Description: The measure considers construction of new passive residential buildings in compliance with the EU Directive 2010/31/EU. This measure will provide issuing of certificates for energy performance of buildings, as a prerequisite for putting the building into operation	
Implementation period:	2020 – 2040
Type of policy instrument:	Technical, regulatory
Link to the EU policies (where applicable):	Energy efficiency directive 2010/31/EC, Directive of energy performance of buildings 2010/31/EC
Relevant national planning documents, legal and regulatory acts:	• Strategy for Energy Development of RN Macedonia up to 2040 • Law on energy efficiency
Implementing entity:	• Ministry of Economy, Energy Agency • Donors and financial institutions

	• Investors (households)	
Monitoring entity:	Ministry of Economy, Energy Agency	
GHG(s) affected (if applicable):		17.0
Quantified objective /Indicators used to monitor and evaluate progress over time:	Final energy savings (ktoe) in 2030:	8.5
	Primary energy savings (ktoe) in 2030:	10.5
Actions to support the implementation of the objective:	• Law on Energy Efficiency adopted • National Building Renovation Strategy to be developed and adopted • Establishment of an Energy Efficiency Fund	
Finance:	Budget:	1068 M€
	Source of finance:	Private, donors through commercial EE loans, EE fund, financial support at municipality level
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	Energy strategy up to 2040, NECP; 3rd BUR	
Assumptions/ General comments:	Construction of new passive buildings, while meeting the standard for at least A+ class (15 kWh/m2) starting from 2020 and continuously increasing their number so that in 2040, 85% of new buildings are assumed to be passive	

A-M-20: Phasing out of incandescent lights		
Main objective: Improve the efficiency of lighting following the EU policies		
Description: Governments around the world have passed measures to phase out incandescent light bulbs for general lighting in favour of more energy-efficient lighting alternatives. The goal is to improve energy efficiency, rather than forbid the use of incandescent technology. This measure includes replacing conventional incandescent light bulbs with halogen ones (at the beginning) and later with compact fluorescent (CFL) and LED		
Implementation period:	2020 – 2040	
Type of policy instrument:	Regulatory, policy	
Link to the EU policies (where applicable):	Commission Regulation(EC) No 244/2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to eco-design requirements for non-directional household lamps	
Relevant national planning documents, legal and regulatory acts:	• Strategy for Energy Development of RN Macedonia up to 2040 • Law on Energy Efficiency • Commission Regulation(EC) No 244/2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to eco-design requirements for non-directional household lamps	
Implementing entity:	• Government of the Republic of North Macedonia • Ministry of Economy, Energy Agency • End-users	
Monitoring entity:	Ministry of Economy, Energy Agency	
GHG(s) affected (if applicable):		401.8
	Final energy savings (ktoe) in 2030:	66.0

Quantified objective /Indicators used to monitor and evaluate progress over time:	Primary energy savings (ktoe) in 2030:	118.4
Actions to support the implementation of the objective:	Adoption of a Regulation that will prohibit sales of incandescent light bulbs	
Finance:	Budget:	558.0 M€
	Source of finance:	Central government budget, private
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	Energy strategy up to 2040, NECP; 3rd BUR	
Assumptions/ General comments:	It is assumed that a Regulation will be adopted on prohibiting sales of incandescent light bulbs, its implementation will start in 2020, and it is assumed that there will be 2-3 years of transition period	

A-M-21: Improvement of the street lighting in the municipalities		
Main objective: Reduce the costs and increase the quality of street lighting		
Description: The cost of street lighting, including electricity and maintenance, can have a huge impact on the budget of the municipalities. In addition, having in mind that a lot of manufactories work on daily bases on the improvement of the light bulbs, new opportunities are being opened for the municipalities. The inefficient light bulbs should be replaced, purchasing new ones that comply with the criteria of belonging to the highest EE class possible (CFL and LED lamps)		
Implementation period:	2020 – 2040	
Type of policy instrument:	Technical	
Link to the EU policies (where applicable):	Energy efficiency directive 2010/31/EC	
Relevant national planning documents, legal and regulatory acts:	• Strategy for Energy Development of RN Macedonia up to 2040 • Law on Energy Efficiency	
Implementing entity:	• Government of the Republic of North Macedonia • Energy Regulatory Commission • Ministry of Environment and Physical Planning • Ministry of Economy, Energy Agency • Local self-government	
Monitoring entity:	Ministry of Economy, Energy Agency	
GHG(s) affected (if applicable):		37.9
Quantified objective /Indicators used to monitor and evaluate progress over time:	Final energy savings (ktoe) in 2030:	7.8
	Primary energy savings (ktoe) in 2030:	14.2
Actions to support the implementation of the objective:	• Street lighting at some location replaced • Promotional activities for the implementation of public-private partnership (PPP) taken • Continuing the promotional activities for the implementation of public-private partnership	

Finance:	Budget:	25.3 M€
	Source of finance:	Central and local government budget, ESCO
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	Energy strategy up to 2040, NECP; 3rd BUR	
Assumptions/ General comments:	Improvement rate of 100% of street lighting by 2040	

A-M-22: Green procurements		
Main objective: Application of energy efficiency criteria ("greening") in public procurement procedures		
Description: According to Article 6 from the EE Directive, central governments can purchase only products, services and buildings with high energy-efficiency performance. Intensified activities should take place to ensure legal and technical knowledge and skills of public sector entities for inclusion and evaluation of requirements for energy efficiency in public procurement procedures by applying the criteria of most economically advantageous tender		
Implementation period:	2020 – 2040	
Type of policy instrument:	Regulatory	
Link to the EU policies (where applicable):	Energy efficiency directive 2010/31/EC	
Relevant national planning documents, legal and regulatory acts:	• Strategy for Energy Development of RN Macedonia up to 2040 • Law on Energy Efficiency	
Implementing entity:	• Ministry of Economy, Energy Agency • Public Procurement Bureau • Local self-government	
Monitoring entity:	Ministry of Economy, Energy Agency	
GHG(s) affected (if applicable):		9.4
Quantified objective /Indicators used to monitor and evaluate progress over time:	Final energy savings (ktoe) in 2030:	2.5
	Primary energy savings (ktoe) in 2030:	2.4
Actions to support the implementation of the objective:	• Law on Energy Efficiency adopted • Law on Public procurements • By-laws from the Law on Energy efficiency to be developed	
Finance:	Budget:	24 M€
	Source of finance:	Central and local government budget
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	Energy strategy up to 2040, NECP; 3rd BUR	
Assumptions/ General comments:	Increased rate of advanced energy efficiency technology due to public procurement by 7%	

A-M-23: Increased use of central heating systems		
Main objective: Reduction of local air pollution, as household heating is one of the main sources for local pollution		
Description: Increased use of the existing central heating systems through the implementation of information campaigns for connecting new consumers, including those who have been disconnected from the system in the past		
Implementation period:	2020 – 2040	
Type of policy instrument:	Technical, information	
Link to the EU policies (where applicable):	Energy efficiency directive 2010/31/EC	
Relevant national planning documents, legal and regulatory acts:	• Strategy for Energy Development of RN Macedonia up to 2040 • Law on Energy Efficiency • Study for determining the techno-economic optimal and environmentally sustainable structure of heating and implementation of the central supply of sanitary hot water in the City of Skopje	
Implementing entity:	• Ministry of Economy, Energy Agency • Balkan energy Dooel Skopje • JSC Skopje Sever • "Energetika" –Skopje, subsidiary to JSC Macedonian Power Plants (ESM AD) • Private investors	
Monitoring entity:	• Energy Regulatory Commission • Ministry of Economy, Energy Agency	
GHG(s) affected (if applicable):		9.3
Quantified objective /Indicators used to monitor and evaluate progress over time:	Final energy savings (ktoe) in 2030:	1.3
	Primary energy savings (ktoe) in 2030:	2.1
Actions to support the implementation of the objective:	• Studies for analysis of the central heating system and implementation of central supply of sanitary hot water developed • Information campaigns for re-connection of the previously disconnected consumers and attraction of new consumers implemented • Reduced the VAT from 18% to 5% • Continuing the implementation of the information campaigns	
Finance:	Budget:	
	Source of finance:	
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	Energy strategy up to 2040, NECP; 3rd BUR	
Assumptions/ General comments:	Information campaigns will contribute to maximize the utilization of the existing network as well as to enable construction of new network, which will increase the heat consumption for at least 40%	

A-M-24: Energy management in manufacturing industries

Main objective: Efficient management of manufacturing processes in industry aiming to increase production using the same energy consumption		
Description: This measure considers implementation of obligatory energy audits of large companies and implementation of ISO 50001 standard, as well as advanced measurement and introduction of new IT technologies. This will enable prevention of defects, better process control and quicker response times in manufacturing using advanced data analysis and predictive technologies		
Implementation period:	2020 – 2040	
Type of policy instrument:	Technical, regulatory	
Link to the EU policies (where applicable):	Energy efficiency directive 2010/31/EC	
Relevant national planning documents, legal and regulatory acts:	• Strategy for Energy Development of the RN Macedonia up to 2040 • Law on energy efficiency	
Implementing entity:	• Ministry of Economy, Energy Agency • Private companies	
Monitoring entity:	• Energy Regulatory Commission • Ministry of Economy, Energy Agency	
GHG(s) affected (if applicable):		67.8
Quantified objective /Indicators used to monitor and evaluate progress over time:	Final energy savings (ktoe) in 2030:	15.7
	Primary energy savings (ktoe) in 2030:	18.8
Actions to support the implementation of the objective:		
Finance:	Budget:	
	Source of finance:	
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	• Promotion of ISO 50001 standards completed • Training on implementation of energy management in industry organized • Certificates for energy auditors issued • USAID project for energy management in industry realized in 17 companies • UNIDO/GEF Project in which one of the activities is Program for energy management in industrial companies according to ISO 50001 standard and the UNIDO Methodology. Initial results achieved in 12 companies and additionally Program for replications of the energy management systems realized in 5 companies • Continuation of the implementation of ISO 50001 standard in more industrial companies (manufacturing industries) • Implementation of obligatory energy audits	
Assumptions/ General comments:	Improvement of the systems efficiency in manufacturing industries at annual rate of 0.15%	

A-M-25: Introduction of efficient electric motors

Main objective: Increase the competitiveness of the industrial products through improvement of the efficiency in the production process and reducing the resources		
Description: Electric motors are responsible for a high share of the total electricity consumption in industries. This measure considers replacement of the obsolete machines currently in use, with new more efficient motors		
Implementation period:	2020 – 2040	
Type of policy instrument:	Technical	
Link to the EU policies (where applicable):	Energy efficiency directive 2010/31/EC	
Relevant national planning documents, legal and regulatory acts:	• Strategy for Energy Development of the RN Macedonia up to 2040 • Law on energy efficiency	
Implementing entity:	• Ministry of Economy, Energy Agency • Private companies	
Monitoring entity:	• Energy Regulatory Commission • Ministry of Economy, Energy Agency	
GHG(s) affected (if applicable):		28.8
Quantified objective /Indicators used to monitor and evaluate progress over time:	Final energy savings (ktoe) in 2030:	5.0
	Primary energy savings (ktoe) in 2030:	7.8
Actions to support the implementation of the objective:	• New efficient electric motors installed in a number of companies • Replacement of the existing electric motors from the production processes in the industry facilities in RN Macedonia with more efficient ones	
Finance:	Budget:	5.0
	Source of finance:	7.8
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	Energy Strategy up to 2040, NECP, 3rd BUR. Study of the Industry Sector - Analysis of Mitigation Policies and Measures	
Assumptions/ General comments:	It is envisaged that the share of efficient electric motors by 2040 will be 60%	

A-M-26: Introduction of more advanced technologies		
Main objective: Introduction of more advanced technologies in the industrial processes that will also enable use of more environmentally friendly fuels		
Description: Advanced industrial technologies present major opportunities for further reduction of the energy consumption and potentially lower costs as well as environmental benefits. In addition, they can help various industries to progress at a much faster rate		
Implementation period:	2020 – 2040	
Type of policy instrument:	Technical	
Link to the EU policies (where applicable):	Energy efficiency directive 2010/31/EC	

Relevant national planning documents, legal and regulatory acts:	• Strategy for Energy Development of the RN Macedonia up to 2040 • Law on energy efficiency	
Implementing entity:	• Government of the Republic of North Macedonia • Ministry of Environment and Physical Planning • Ministry of Economy, Energy Agency • Private investors	
Monitoring entity:	Ministry of Economy, Energy Agency	
GHG(s) affected (if applicable):		206.0
Quantified objective /Indicators used to monitor and evaluate progress over time:	Final energy savings (ktoe) in 2030:	59.4
	Primary energy savings (ktoe) in 2030:	62.5
Actions to support the implementation of the objective:	• Construction of gas network in RN Macedonia • Klechovce-Valve station 5 (Stip), finished in 2016 • Valve station 5(Stip)-Negotino, finished in 2019 • Finishing the construction of gas network in RN Macedonia • Negotino (Kavadarci)-Bitola, 76.36% realized November 2019 • Skopje-Tetovo-Gostivar, 53.1% realized November 2019 • Gostivar-Kicevo, in a process of obtaining building permit (by 2022) • Kicevo-Ohrid (to be finished by 2025) • Valve station 5 (Stip)-Radovis-Strumica	
Finance:	Budget:	438.6 M€
	Source of finance:	Private, donors through commercial EE loans, EE fund
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	Energy Strategy up to 2040, NECP, 3rd BUR. Study of the Industry Sector - Analysis of Mitigation Policies and Measure	
Assumptions/ General comments:	The share of more advanced technologies by 2040 is 60% from all technologies	

A-M-27: Increased use of the railway	
Main objective: Improve the energy efficiency in the transport sector using cheap and efficient railway transport	
Description: Although the rail transport is cheap, official statistical data show that in the last three years there is a downward trend. Using this mode of transport as one of the most efficient can also improve the competitiveness of the companies. Therefore, at least several listed measures should be implemented, aiming to return the utilization level of this transport as of three years ago, and further increase it. The measure includes: • implement raising awareness campaigns • invest in stations and improve the “access to the stations” • increase the network security and expand the network coverage	
Implementation period:	2020 – 2040
Type of policy instrument:	Technical

Link to the EU policies (where applicable):	Directive on the Promotion of Clean and Energy Efficient Road Transport Vehicles 2009/33/EC, Regulation on CO2 from cars and vans (2009/443/EC Regulation on CO2 from cars and vans 2009/443/EC	
Relevant national planning documents, legal and regulatory acts:	• National Transport Strategy • Strategy for Energy Development of the RN Macedonia up to 2040	
Implementing entity:	• Government of the Republic of North Macedonia • Ministry of Transport and Communications • Ministry of Economy, Energy Agency • JSC Macedonian Railway Transport • End-users • Private companies	
Monitoring entity:	Ministry of Economy, Energy Agency	
GHG(s) affected (if applicable):		37.2
Quantified objective /Indicators used to monitor and evaluate progress over time:	Final energy savings (ktoe) in 2030:	14.8
	Primary energy savings (ktoe) in 2030:	12.3
Actions to support the implementation of the objective:	• 150 freight cars and six compositions consisting of a locomotive and passenger cars ordered by the Government as part of a project with the European Bank for Reconstruction and Development (EBRD). Some of these have already been received and put into use • Campaigns for cheaper/free driving of certain categories of passengers (young people, pensioners, etc.) carried out • Implement promotional campaigns for raising public awareness • Continuing the campaigns for cheaper/free driving • Enabling additional conditions for companies	
Finance:	Budget:	180.6 M€
	Source of finance:	Central government budget
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	Energy Strategy up to 2040, NECP, 3rd BUR	
Assumptions/ General comments:	By 2040, 3% of the passenger kilometres of cars, 1% of passenger kilometres of busses and 6.6% of tonnes kilometres of heavy-duty vehicles will be realized by railway transport	

A-M-28: Renewing of the national car fleet	
Main objective: Use of more advanced technologies in order to slow down the growing energy consumption in the transport sector, which is complex and with limited capabilities of energy use reduction	
Description: The measures recommended in the Study on the transport sector analysis of policies and measures should be implemented: Reduction of VAT from 18% to 5% for hybrid and electric vehicles; Direct subsidizing of hybrid vehicles, Excise duties of diesel fuel and petrol need to be gradually equalled. Obligations of public institutions to purchase vehicles with low CO2 emissions (up to 90 gCO2/km by 2020 and 50 gCO2/km by 2025).	
Implementation period:	2020 – 2040

Type of policy instrument:	Regulatory, policy, information	
Link to the EU policies (where applicable):	Directive on the Promotion of Clean and Energy Efficient Road Transport Vehicles 2009/33/EC, Regulation on CO2 from cars and vans (2009/443/EC Regulation on CO2 from cars and vans 2009/443/EC	
Relevant national planning documents, legal and regulatory acts:	• National Transport Strategy • Strategy for Energy Development of the RN Macedonia up to 2040 • Law on vehicles • Law on vehicle tax	
Implementing entity:	• Government of the Republic of North Macedonia • Ministry of Transport and Communications • Ministry of Economy, Energy Agency • End-users	
Monitoring entity:	• Ministry of Economy, Energy Agency • Ministry of interior	
GHG(s) affected (if applicable):		43.1
Quantified objective /Indicators used to monitor and evaluate progress over time:	Final energy savings (ktoe) in 2030:	13.9
	Primary energy savings (ktoe) in 2030:	13.9
Actions to support the implementation of the objective:	• Law on vehicles adopted (August 2019) • Law on vehicle tax by-laws to be adopted • Implementation of the program for subsidizing for purchasing vehicles stipulated in the Law on vehicles • Revision of the Law on excise duty to be prepared (excise duties of diesel fuel and petrol need to be gradually equalled)	
Finance:	Budget:	2167.7 M€
	Source of finance:	Private, EE fund, incentives from the central government budget
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	Energy Strategy up to 2040, NECP, 3rd BUR	
Assumptions/ General comments:	It is assumed that only new vehicles and vehicles not older than eight years will be sold, i.e. vehicles that meet EU standards such as CO2 emissions in 2020 of 95 g CO2/km, and 70 g CO2/km by 2025. In addition, advanced technologies such as diesel and gasoline HEV will be used with a share of 35% in the total passenger km from cars by 2040.	

A-M-29: Renewing of other national road fleet	
Main objective: Reduction of the local air pollution	
Description: This measure anticipates introduction of a regulation that will enable renewal of the vehicle fleet of light duty and heavy goods vehicles and buses	
Implementation period:	2020 – 2040
Type of policy instrument:	Technical, regulatory

Link to the EU policies (where applicable):	Directive on the Promotion of Clean and Energy Efficient Road Transport Vehicles 2009/33/EC	
Relevant national planning documents, legal and regulatory acts:	• National Transport Strategy • Strategy for Energy Development of the RN Macedonia up to 2040 • Law on vehicles • Law on vehicle tax	
Implementing entity:	• Government of the Republic of North Macedonia • Ministry of Transport and Communications • Ministry of Economy, Energy Agency • Private companies	
Monitoring entity:	• Ministry of Transport and Communications • Ministry of Economy, Energy Agency	
GHG(s) affected (if applicable):		66.4
Quantified objective /Indicators used to monitor and evaluate progress over time:	Final energy savings (ktoe) in 2030:	20.8
	Primary energy savings (ktoe) in 2030:	20.8
Actions to support the implementation of the objective:	• Law on vehicles adopted (August 2019) • Law on vehicle tax by-laws to be adopted • Successive implementation of EURO standards (EU new standard is a EURO 6, while in RN Macedonia is EURO 4) for import of new EE vehicles	
Finance:	Budget:	2.300 M€
	Source of finance:	Private
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	Energy Strategy up to 2040, NECP, 3rd BUR	
Assumptions/ General comments:	It is assumed that only new advanced vehicles such as HEVs that meet EU standards for exhaust fumes will be sold	

A-M-30: Advanced mobility	
Main objective: Reduction of the local air pollution	
Description: The measure includes conducting campaigns/providing subsidies and systems for use of new or rented bicycles, electric scooters, promoting walking, and introduction of parking policies that would reduce the use of cars in the city area. People, especially in smaller towns where a lot of them use cars for short distances, would increase the use of bicycles/electric scooters or walking	
Implementation period:	2020 – 2040
Type of policy instrument:	Technical, regulatory
Link to the EU policies (where applicable):	
Relevant national planning documents, legal and regulatory acts:	• National Transport Strategy • Strategy for Energy Development of the RN Macedonia up to 2040 • Decisions made by municipalities to subsidize buying of new bicycles
Implementing entity:	• Ministry of Economy, Energy Agency

	• Local self-government • End-users	
Monitoring entity:	• Ministry of Economy, Energy Agency • Local self-government	
GHG(s) affected (if applicable):		3.6
Quantified objective /Indicators used to monitor and evaluate progress over time:	Final energy savings (ktoe) in 2030:	1.2
	Primary energy savings (ktoe) in 2030:	1.2
Actions to support the implementation of the objective:	• Subsidies and campaigns for buying new bicycles/electric scooters implemented • Systems for bicycles renting implemented • Bicycles tracks constructed • Zonal parking implemented • New multi-level car parks constructed • Continue the implementation of the campaigns and subsidies for buying new bicycles and renting bicycles • Continue the construction of new bicycles tracks	
Finance:	Budget:	
	Source of finance:	Private, EE fund, incentives from the central and local government budget, donors
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	Energy Strategy up to 2040, NECP, 3rd BUR	
Assumptions/ General comments:	By 2040, 3% of short distance passenger kilometres will be replaced by walking, using bicycles or electric scooters	

A-M-31: Construction of the railway to Republic of Bulgaria	
Main objective: Connecting the RN Macedonia with the Republic of Bulgaria and extending the export to external markets, not just in the neighbouring countries but in the Southeast Europe and Turkey region, using the railway transport	
Description: Construction of the railway to Republic of Bulgaria	
Implementation period:	2023 – 2040
Type of policy instrument:	Technical, policy
Link to the EU policies (where applicable):	
Relevant national planning documents, legal and regulatory acts:	• Work Program of the Government of the Republic of North Macedonia • National Transport Strategy
Implementing entity:	• Government of the Republic of North Macedonia • Ministry of Transport and Communications • Ministry of Economy, Energy Agency
Monitoring entity:	• Ministry of Transport and Communications

	• Ministry of Economy, Energy Agency	
GHG(s) affected (if applicable):		24.6
Quantified objective /Indicators used to monitor and evaluate progress over time:	Final energy savings (ktoe) in 2030:	10.2
	Primary energy savings (ktoe) in 2030:	8.2
Actions to support the implementation of the objective:	• First phase (Kumanovo - Beljakovce) is under construction, 67% constructed at the end of 2019 • Tender for the second phase is announced • First phase (Kumanovo - Beljakovce) to be finished by the end of 2020 • Tender for the third phase to be announced	
Finance:	Budget:	720 M€ (infrastructure + trains)
	Source of finance:	Central government budget
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	Energy strategy up to 2040, NECP; 3rd BUR	
Assumptions/ General comments:	By 2040 up to 5% of the tonne kilometres (to the Republic of Bulgaria) of the heavy goods vehicles will be replaced by the railroad transport	

A-M-32: Electrification of the transport		
Main objective: Transition from society based on fossil fuels to low carbon society, where the renewable energy and electrification of the transport will play the most important role		
Description: At least the following measures recommended in the "Study on the transport sector, analysis of policies and measures" should be implemented: • Direct subsidizing of electric vehicles, 5000 EUR in the period 2020-2023 • Obligation to place fast chargers at all gas stations on motorways (at every 100 km by 2020)		
Implementation period:	2020 – 2040	
Type of policy instrument:	Regulatory, policy, information	
Link to the EU policies (where applicable):	Directive on the Promotion of Clean and Energy Efficient Road Transport Vehicles 2009/33/EC	
Relevant national planning documents, legal and regulatory acts:	• National Transport Strategy • Strategy for Energy Development of the RN Macedonia up to 2040 • Law on vehicles • Law on vehicle tax	
Implementing entity:	• Government of the Republic of North Macedonia • Ministry of Transport and Communications • Ministry of Economy, Energy Agency	
Monitoring entity:	• Ministry of Economy, Energy Agency • Ministry of interior	
GHG(s) affected (if applicable):		61.6

Quantified objective /Indicators used to monitor and evaluate progress over time:	Final energy savings (ktoe) in 2030:	30.5
	Primary energy savings (ktoe) in 2030:	20.9
Actions to support the implementation of the objective:	• Chargers installed at specific locations in the City of Skopje • Law on vehicles adopted (August 2019) • Law on vehicle tax and by-laws adopted • Exemption from paying excise duty for electric vehicles • Development of studies for determining the best locations for installation of electric vehicles chargers from the aspect of the power grid. • Money from the budget should be allocated for the realization of the Program for subsidizing new vehicles	
Finance:	Budget:	5058.5 M€
	Source of finance:	Private, EE fund, incentives from the central government budget
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	Energy strategy up to 2040, NECP; 3rd BUR	
Assumptions/ General comments:	It is envisaged that by 2040 the share of electric vehicles and "plug-in" hybrid electric vehicles in the total passenger km from cars will be 45%	

A-M-33: Reduction of CH_4 emissions from enteric fermentation in dairy cows by 3%		
Main objective: Decrease level of CH_4 emission from enteric fermentation in highly productive dairy cows		
Description: By modification of the feed composition and nutrition practice in dairy cows, the emission of CH4 due to enteric fermentation can be reduced by 20%. It is foreseen that the number of dairy cows under intensive farming system will be increased form present 1% to 30% in 2040. Because of highly productive cows involved the CH4 emission will also increase. But, with modification of feed content (adding carbohydrates, high quality forages and tannins) into TMR, the CH4 emission will be decreased by 20%. The mitigation measure can be easily applied on dairy farms, by nutrition management. It is also cost effective; do not require additional subsidies or incentives. Practical training and demonstration for farmers will be sufficient		
Implementation period:	2020 – 2040	
Type of policy instrument:	Education, Technical	
Link to the EU policies (where applicable):	CAP Reform 2014-2020: Regulation 1305/2013; Regulation 1306/2013; Regulation 1307/2013 and Regulation 1308/2013	
Relevant national planning documents, legal and regulatory acts:	• Strategy for Agriculture Development • IPARD program	
Implementing entity:	• Ministry of Agriculture Forestry and Water Economy	
Monitoring entity:	• Ministry of Agriculture Forestry and Water Economy	
GHG(s) affected (if applicable):		35.0
Quantified objective /Indicators used to monitor and evaluate progress over time:	Number of farms (dairy cows as a percentage of the total population) used TMR modified feed and nutrition management on biannual base in 2030	

Actions to support the implementation of the objective:	• TMR with partly modified feed composition in already used on two intensive farms that account about 1% of the dairy cow population • Development advisory package for TMR modified feed and nutrition management for the intensive dairy farms with more than 50 cows • Incentives for dissemination of the advisory package to target farmers • Monitoring of the effect of TMR modified feed and nutrition management, and further improvements	
Finance:	Budget:	0.2 mil. EUR
	Source of finance:	Private sector, IPARD programme
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	NECP; 3rd BUR	
Assumptions/ General comments:	• Increased number of highly productive dairy cows under intensive farming • Introduced modified TMR and nutrition management • Expected to be on organized in farms with more than 50 heads	

A-M-34: Reduction of N_2O emissions from manure management in dairy cows by 20%		
Main objective: Decrease level of N_2O emission from manure management in highly productive dairy cows		
Description: By modification of the manure management in dairy cows, the emission of N2O can be reduced up to 20%. It is foreseen that the number of dairy cows under intensive farming system with more than 50 heads will be increased form present 1% to 30% in 2040. All those farms will need to apply improved manure management in order to reduce N loss, and NxO emissions. Therefore, on farm manure management system needs to modify. The mitigation measure considers on farm adaption on existing farms and moderate investments on newly established farms. It will require subsidies for adapting and incentives in farm design and construction		
Implementation period:	2020 – 2040	
Type of policy instrument:	Education, Technical	
Link to the EU policies (where applicable):	EU Enlargement (IPA/IPARD) Agro-ecology measures in national program	
Relevant national planning documents, legal and regulatory acts:	• Law for Nature Protection • IPARD program • Agro-ecology measures in national program	
Implementing entity:	Ministry of Agriculture Forestry and Water Economy	
Monitoring entity:	Ministry of Agriculture Forestry and Water Economy	
GHG(s) affected (if applicable):		2.1
Quantified objective /Indicators used to monitor and evaluate progress over time:	Number of farms (dairy cows as a percentage of the total population) used modified manure management on 2-5 years base in 2030	
Actions to support the implementation of the objective:	• None • Adaption in manure management on intensive dairy farms with more than 50 cows • Design and construction of intensive dairy farms with more than 50 cows	

	• Monitoring of the effect modified manure management in the intensive dairy farms with more than 50 cows	
Finance:	Budget:	1 mil. EUR
	Source of finance:	Private sector, IPARD programme
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	NECP; 3rd BUR	
Assumptions/ General comments:	• Target group are the farms with more than 50 heads. The manure management practice is expected to be change from solid fraction (N loss factor 40), to below animal (N loss factor 28). It can be applied to 10% of the population and shift toward practice is expected to be done in 15% of the farms by 2025. The proportion of the high productive dairy cows is expected to reach 25% in 2040. In such action the reduction of the N2O emissions in manure management on dairy cows will be up to 25% by 2040 • Increased number of highly productive dairy cows under intensive farming • On farm modified manure management	

A-M-35: Reduction of N_2O emissions from manure management in swine farms by 13%		
Main objective: Decrease level of NO_2 emission from manure management in highly productive swine farms		
Description: By modification of the manure management in swine farms, the emission of N_2O can be reduced up to 50%. It is foreseen that number of fatteners and number of fatteners per sow will increase, while the total number of sows will remain stable over period. Number of swine farms with more than 1000 fatteners and/or 350 sows will also increase, and they need to adapt improved manure management system, in order to reduce N loss. In 2040 is expected that 90% of fatteners will be produced on those farms, accounting for 75% of sow in the country. The mitigation measure consider on farm adaption on existing farms and moderate investments on newly established farms. It will require subsidies for adapting and incentives in farm design and construction		
Implementation period:	2020 – 2040	
Type of policy instrument:	Education, Technical	
Link to the EU policies (where applicable):	EU Enlargement (IPA/IPARD)	
Relevant national planning documents, legal and regulatory acts:	• Law for Nature Protection • IPARD program • Agro-ecology measures in national program	
Implementing entity:	Ministry of Agriculture Forestry and Water Economy	
Monitoring entity:	Ministry of Agriculture Forestry and Water Economy	
GHG(s) affected (if applicable):	N_2O	0.4
Quantified objective /Indicators used to monitor and evaluate progress over time:	Number of farms (fatteners and sows as a percentage of the total population) used modified manure management on 2-5 years base in 2030	
Actions to support the implementation of the objective:	• Existing swine farms with more than 1000 fatteners and/or 350 sows are working on modification in manure management system • Adaption in manure management on intensive swine farms with more than 1000 fatteners and/or 350 sows • Design and construction of intensive swine farms with more than 1000 fatteners and/or 350 sows	

	• Monitoring of the effect modified manure management in the intensive swine farms with more than 1000 fatteners and/or 350 sows	
Finance:	Budget:	1 mil. EUR
	Source of finance:	Private sector, IPARD programme
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	NECP; 3rd BUR	
Assumptions/ General comments:	• Swine production system is expected to shift towards intensification that will bring modification of the swine farms. The management practice is supposed to shift form solid manure towards below animal (practice that already exists on large swine farms). Then the fraction of N loss will be reduced by 50%. The implementation of shift will be slightly over years in category sows and finishing pigs (e.g. sows from 55% in 2020 to 75% in 2040; finishing pigs from 70% in 2020 to 92% in 2040) • Increased number of highly productive swine farms with more than 1000 fatteners and/or 350 sows • On farm modified manure management	

A-M-36: Reduction of N_2O emissions from manure in dairy cows by 20% for farms below 50 Livestock Units		
Main objective: Decrease level of N_2O emission from manure management in dairy cows on farm farms below 50 Livestock Units		
Description: By modification of the manure management in dairy cows, the emission of N2O can be reduced up to 30%. In discussion with farmers, the most common system is dry manure management, where manure together with bedding (mostly wheat or barley straw) are taken out of the barn daily or within week. The manure than is composting on pile near the farm. Farmers do not use any cover of manure nor tanks for collecting liquid drainage of the pile. Fermentation is usually mixed where in bottom parts is anaerobic, but on the surface, due to aeration it is aerobic. Manure is used as fertilizer mostly within 2-3 months (depending on storage capacity on the farm and field availability). Depending on manure fermentation the loss of N can be up to 60%. The N loss and reduction of the N2O emissions can be reached by prolonging fermentation period up to 6 months and covering the pile. Hence the measure is to support farmers with less than 50 cows to provide proper manure storage places for longer period		
Implementation period:	2020 – 2040	
Type of policy instrument:	Education, Technical	
Link to the EU policies (where applicable):		
Relevant national planning documents, legal and regulatory acts:	• IPARD program • Agro-ecology measures in national program	
Implementing entity:	Ministry of Agriculture Forestry and Water Economy	
Monitoring entity:	Ministry of Agriculture Forestry and Water Economy	
GHG(s) affected (if applicable):	N2O	0.7
Quantified objective /Indicators used to monitor and evaluate progress over time:	Number of farms (dairy cows as a percentage of the total population) used modified manure management in 7 years	

Actions to support the implementation of the objective:	• Provide incentives to build on farm manure storage place • Train farmers for BAT in manure management • Monitoring of the effect modified manure management	
Finance:	Budget:	1 mil. EUR
	Source of finance:	Private sector, IPARD programme
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	NECP; 3rd BUR	
Assumptions/ General comments:	• Replaced low productive with high productive dairy cows • On farm modified manure management for farms with 10 to 50 cows • Dairy cow produce manure about 7% of the life weight per day. Milking cows are weighted between 500 and 650 kg, depending on breed and conditions. Heifers 1-2 year, calves 3-12 months and young calves 0-3 months are transformed into adult cow by coefficient 2, 4 and 10, respectively. For simplicity, animal units (AU) should be used as a base (1 AU = 500 kg). Based on usual feed consumption, bedding material (annual average use of 8% wheat/barley straw) it can be expected about 0.04 m3 manure per AU/day • The manure has about 40% moisture and during the storage reduce volume for 40%. For the period of 6 months total volume of 5 m3 per AU should be expected. For pile composting, a trench with clay or concreate floor with inclination of 4% is required. The pile needs to be protected from rainfall (either by roof or covered by plastic foil. Aeration is occurring when fresh manure is adding, taking care that old and already fermented one should be always on top. By prolonging manure storage and covering period the reduction of N2O emission will be for 30% is expected	

A-M-37: Establishing integrated management of forest fires		
Main objective: Reducing the average annual burned area for 6000 ha		
Description: Forest fires are already detected as a very significant problem of forest loss and source of GHG emissions. In the period from 1999 to 2019 year the average annual number of forest fires is 229 fires, average annual burned area is 10,985 ha and average annual damage is estimated on 6,9 million Euro. The total burned forest area in the same period is around 219,163 ha with the total damage of around 138 million. This measure includes the protection of the forest area by preventing the forest fires and the damages resulting from forest fires		
Implementation period:	2020 – 2040	
Type of policy instrument:	Technical	
Link to the EU policies (where applicable):		
Relevant national planning documents, legal and regulatory acts:	• Law on forest • Special rule book for forest fire protection • Strategy for development of the forest fire protection, diseases and insects with action plan for realization of the projects and procurements for the needs of PE "Makedonski sumi"	
Implementing entity:	Ministry of Agriculture Forestry and Water Economy, through PE "National forests"	
Monitoring entity:	Ministry of Agriculture Forestry and Water Economy, through PE "National forests"	
GHG(s) affected (if applicable):	CO2, CH4, N2O	345.0

Quantified objective /Indicators used to monitor and evaluate progress over time:	Forest area (ha) in 2030	n/e
Actions to support the implementation of the objective:	• The location for building and establishment of a forest fire training centre in the frame of the PE "National forests" is already chosen, the plan prepared and 8 vehicles are purchased • Phase I - Procurement of vehicles for initial attack, had tools and personal protective equipment (PPE) • Duration: one year • Vehicles' procurement: 25 specialized vehicles for initial attack • 25 vehicles x 40,000 € = 1,000,000 € • 50 sets of hand tools and PPE for 50 crews of five fire fighters (two per vehicle) • 1 set of hand tools and PPE = 4,000 € • 50 sets x 5,000 € = 250,000 € • Phase II - Specialized training for fire fighters (six days) • 50 craws x 5 persons = 250 fire fighters • 250 fire fighters x 800 € = 200,000 €	
Finance:	Budget:	1.45 mil. EUR
	Source of finance:	PE "National forests", other forest enterprises
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	NECP; 3rd BUR	
Assumptions/ General comments:	Up to 3000 ha will be burned annually on average	

A-M-38: Afforestation		
Main objective: Afforestation of 5000 ha of barren land with Oak (Quercus spp.)		
Description: Afforestation and reforestation may change landscapes and may have an impact on the provision of landscape-related goods and services. The supply with goods and services benefiting people and societies and the conservation of traditional cultural landscapes, as well as landscape ecology, need to be taken into account. According to the many strategic documents there are about 1,500,000 ha barren land aimed for afforestation or reforestation		
Implementation period:	2020 – 2040	
Type of policy instrument:	Technical	
Link to the EU policies (where applicable):		
Relevant national planning documents, legal and regulatory acts:	Law on forest	
Implementing entity:	Ministry of Agriculture Forestry and Water Economy	
Monitoring entity:	Ministry of Agriculture Forestry and Water Economy	
GHG(s) affected (if applicable):	CO2	312.5
	Forest area (ha) in 2030	

Quantified objective /Indicators used to monitor and evaluate progress over time:	Forest planted/covered with new seedlings (ha) in 2030	
Actions to support the implementation of the objective:	• There are already existed nurseries for production of more than 8.000.000 seedlings annually • Area for afforestation should be chosen, around 7.5 million Oak seedlings should be produced, afforestation to be done with proper care in the next 5 years • Phase I – seedling production • Duration: 3 years • Number of seedlings: 2,500 seedlings/ha x 5,000 ha = 12,500,000 seedlings • Costs for seedling production: 12,500,000 seedlings x 20 den. = 250,000,000 = 4,100,000 € • Phase II – soil preparation and afforestation • Sub phase - soil preparation • Duration: four months • Costs: 5,000 ha x 15,000 den = 75,000,000 den = 1,250.000 € • Sub phase - afforestation • Duration: six months • Costs: 5,000 ha x 20,000 den = 100,000,000 den = 1,650,000 € • Phase III – maintenance and protection • Duration: five years • Costs: 5.000 ha x 10.000 den = 50.000.000 den = 800.000 €	
Finance:	Budget:	7.8 mil. EUR
	Source of finance:	PE “National forests”, other forest enterprises
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	NECP, 3rd BUR	
Assumptions/ General comments:	• The oak is species resistant on high air temperature and small amount of precipitations-dry conditions (conditions that are expected in agreement with the official national scenarios on climate change for Macedonia) and lees sensitive to forest fires, as well. Besides, the economic and technical value of the timber mass is high. The afforestation could be done on one location (all 5,000 ha) or distributed but not to more than five location • Minimum 80 % of the seedlings have to be alive after third year of the afforestation and with good health and morphological condition should be maintained	

A-M-39: Conversion of land use of field crops above 15% inclination
Main objective: To reduce the intensity of soil erosion and loss of soil organic matter
Description: Cultivation of land on inclined terrain causes intensive processes of soil erosion and mineralization of sol organic matter. These processes lead to intensive decomposition of soil organic matter and emission of soil carbon into atmosphere. Conversion of such areas into perennial grassland (pastures, meadows) will significantly decrease intensity of soil organic matter depletion and emission of soil carbon and will lead to carbon sink. Areas above 15% inclination by law should not be cultivated and are not considered as agricultural land. This conversion supposes land use change and change of the production system, which might influence the net annual income of primary producers. Due to this, its

implementation should be supported with incentives, especially in the first years of conversion, in order to bridge possible loss of incomes in farm holds		
Implementation period:	2020 – 2040	
Type of policy instrument:	Education, Technical	
Link to the EU policies (where applicable):		
Relevant national planning documents, legal and regulatory acts:	• Law on agricultural land • Rulebook on GAP • Rulebook on cross compliance for minimum requirements of GAP and environmental protection	
Implementing entity:	Ministry of Agriculture Forestry and Water Economy	
Monitoring entity:	Ministry of Agriculture Forestry and Water Economy	
GHG(s) affected (if applicable):		3.7
Quantified objective /Indicators used to monitor and evaluate progress over time:	Area converted on yearly base (ha/year)	n/e
Actions to support the implementation of the objective:	• The effects of conversion of crop land to grass land has been monitored on two experimental fields in the past four years • Land Parcel Identification System has been established and will serve as a tool for control of the process of conversion • Establishment of system for systematic control of land use and land use change on national level • Institutional support to primary producers with subsiding the process of conversion of crop fields into grassland	
Finance:	Budget:	1.5 mil. EUR
	Source of finance:	Private sector, IPARD programme
Progress monitoring:	Objective achieved Activities implemented	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	NECP, 3rd BUR	
Assumptions/ General comments:	• The total area of almost 3000ha is intensively cultivated which leads to decreasing of SOM as a result of its intensive decomposition and intensive soil erosion processes. If conversion to grass land is implemented, the estimated SOM increase is for more than 2% which for the total converted area of 2975 ha. • The conversion of land use, should: o Stop the intensive process of erosion of the top soil layer which leads to loss of soil organic matter and its intensive ex-city mineralization, o Stop on site mineralization of soil organic matter due to intensive processes of cultivation, o Intensify carbon sink through accumulation of soil organic matter.	

A-M-40: Contour cultivation on areas under field crops on inclined terrains (5-15%)
Main objective: To reduce erosion of topsoil and conservation of soil organic matter
Description: Regular cultivation in crop production means a massive disturbance of topsoil layer, which cause intensive mineralization of soil organic matter (SOM) and CO2 emissions. Downslope cultivation of cropland usually causes

intensive processes of soil erosion. Field experiments showed that the quantity of eroded sediment is multiply higher if compared to contour cultivation. This eroded sediment is reach with SOM which in such circumstances is rapidly mineralized, due to what significant quantity of soil carbon is released into atmosphere. Contour cultivation means that all agro-technical operations should be across the slope. This measure is easy to be implemented, since it does not require a special technical capacities and know-how. In practice, farmers usually are not aware of its importance and influence of the overall soil fertility. With a systematic campaign for increasing the awareness of the farmers this measure can be widely adopted.		
Implementation period:	2020 – 2040	
Type of policy instrument:	Education, Technical	
Link to the EU policies (where applicable):	Common Agricultural Policy, Areas with natural constraints	
Relevant national planning documents, legal and regulatory acts:	• Law on agricultural land • Law on water • Rulebook on Good Agricultural Practices • Rulebook on cross compliance for minimum requirements of GAP and environmental protection	
Implementing entity:	Ministry of Agriculture Forestry and Water Economy	
Monitoring entity:	Ministry of Agriculture Forestry and Water Economy	
GHG(s) affected (if applicable):	CO2	28.0
Quantified objective /Indicators used to monitor and evaluate progress over time:	Area in ha with contour cultivation in 2030	
Actions to support the implementation of the objective:	• Contour cultivation tested in practice of two experimental sites • Contour cultivation promoted among farmers within several national and international Projects • Incorporation of contour cultivation as an agro-ecological measure into strategic documents • Promotion of contour cultivation among farmers • Institutional support to primary producers with subsiding the process of adoption of the system of contour cultivation	
Finance:	Budget:	
	Source of finance:	
Progress monitoring:	Objective achieved: Activities implemented	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	NECP, 3rd BUR	
Assumptions/ General comments:	• 14,000 ha (30%) of the total 47,090 ha of no-irrigated land on inclined terrines (above 5%) are planned for this measure • Decreasing of soil erosion processes of the topsoil layer and SOM loss with contour ploughing of inclined cropland • Increasing of soil carbon with preservation of SOM in the topsoil layer	

A-M-41: Perennial grass in orchard and vineyards on inclined terrains (>5%)
Main objective: Reducing of soil erosion and increasing of SOM in vineyards and orchards on inclined terrains (5-15% slope)

Description: In vineyards and orchard on locations where rows are oriented downslope, as a result of intensive classical system of cultivation, an intensive processes of soil erosion and depletion of SOM occurs, which lead to intensive emissions of soil carbon. Simple change of cultivation system with establishment of perennial grass can significantly mitigate the process of SOM loss and emissions of soil carbon. The measure is easy to be implemented with low initial cost		
Implementation period:	2020 – 2040	
Type of policy instrument:	Education, Technical	
Link to the EU policies (where applicable):		
Relevant national planning documents, legal and regulatory acts:	• Law on agricultural land • Law on water • Rulebook on GAP • Rulebook on cross compliance for minimum requirements of GAP and environmental protection	
Implementing entity:	Ministry of Agriculture Forestry and Water Economy	
Monitoring entity:	Ministry of Agriculture Forestry and Water Economy	
GHG(s) affected (if applicable):	CO2	8.9
Quantified objective /Indicators used to monitor and evaluate progress over time:	Area of vineyards and orchards under perennial grass (ha) in 2030	
Actions to support the implementation of the objective:	• Perennial grass in vineyards and orchards as a cover crop tested in practice in two regions • Perennial grass in vineyards and orchards as an agro-ecological measure promoted among farmers within several national and international Projects • To foresee cover crops in perennial plantations (vineyards and orchards) as an agro-ecological measure into strategic documents • To promote the effects of cover crops among vine and fruit growers • Institutional support to primary producers with subsiding the process of implementing the measure	
Finance:	Budget:	1 mil. EUR
	Source of finance:	Private sector, IPARD programme
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	NECP, 3rd BUR	
Assumptions/ General comments:	• Decreasing of soil erosion processes of the topsoil layer and SOM loss when classical type of cultivation system with deep ploughing is replaced with perennial grass and no-tillage system • Increasing of soil carbon with accumulation of SOM in the topsoil layer due to mulching of moved biomass and accumulation of biomaterial in the root zone of the perennial grass	

A-M-42: Use of biochar for carbon sink on agricultural land
Main objective: Carbon sink by negative emission technology

Description: The agricultural soils in the country are characterized as soils with relatively low carbon content and with average to low fertility. The application of biochar can improve soil water holding capacity, nutrients storage into the soil, and increase yield. Biochar can capture even 3 times more CO2 compared to its weight, because of its high carbon concentration. Biochar was included for the first time as a promising negative emission technology in the new IPCC special report "An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty" published in 2018. The process of application of biochar should go through several steps: i) research, ii) development the suitable technology for various soil/crop combination iii) experimental/demonstrative sites iv) development the measure for support from national programs for support of agriculture v) promotion of measure. This is new measure, need some research, therefore, in period 2017 – 2040 we predict only 15 years of active use of the measure		
Implementation period:	2020 – 2040	
Type of policy instrument:	Research, Education, Technical	
Link to the EU policies (where applicable):		
Relevant national planning documents, legal and regulatory acts:	Biochar is not present in any strategic document in the country	
Implementing entity:	Ministry of Agriculture Forestry and Water Economy	
Monitoring entity:	Ministry of Agriculture Forestry and Water Economy	
GHG(s) affected (if applicable):	CO2	110.0
Quantified objective /Indicators used to monitor and evaluate progress over time:	Area of vineyards and orchards under perennial grass (ha) in 2030	
Actions to support the implementation of the objective:	• To conduct experimental research and to determine optimal biochar application rates for different soil/crop combinations • To foresee application of biochar on arable land as an agro-ecological measure into strategic documents • To promote the effects of biochar on soil health, yield and environment • Institutional support to primary producers with subsiding the process of implementing the measure	
Finance:	Budget:	30 mil. EUR
	Source of finance:	Private sector, IPARD programme
Progress monitoring:	Objective achieved:	Yes/No
	Activities implemented:	Yes/No
Reference to assessments and underpinning technical reports:	NECP, 3rd BUR	
Assumptions/ General comments:	• Sinking the amount of 330.3 Gg-eq CO2-eq and removing that amount from the atmosphere • Increasing of soil carbon content with adding of biochar as persistent carbon source. Most of the biochar will remain in the in the topsoil layer due to available application technology incorporation biochar by plough on the ploughing depth • The positive effects on the soil fertility and soil health • Local production of the biochar by using residual biomass that is usually burnt in open fires	

A-M-43: Photovoltaic Irrigation		
Main objective: Mitigation by replacing the non-renewable energy sources for water pumping with renewable, thus reducing the CO_2 emission		
Description: Installation of photovoltaic system for irrigation purposes with 2.4 kW installed capacity, capable to run 1.1 kW 3 phase pump. The two cases are considered as mitigation practice, replacing the petrol pump with consumption of 0,3l petrol per hour (one of the most popular pumps in the country) with 3 phase AC pump and adding photovoltaic and replacing 1.1 kW electricity pump with 3 phase AC pump and adding the photovoltaic. The measure is suitable for already established on farm irrigation systems, but also for new establishing of the irrigation systems with on-farm water source. The measure is compatible with IPARD 2 measure "Production of energy from renewable resources for self-consumption, through processing of plant and animal products from primary and secondary biomass (except biomass from fishery products) for production of biogas and/or biofuels, use of solar energy, windmills, geo-thermal energy etc.)		
Implementation period:	2021 – 2040	
Type of policy instrument:	Research, Education, Technical	
Link to the EU policies (where applicable):	NECP, 3rd BUR	
Relevant national planning documents, legal and regulatory acts:	• Law on Agriculture and Rural Development • National strategy on Agriculture and Rural Development • IPARD2	
Implementing entity:	Ministry of Agriculture Forestry and Water Economy	
Monitoring entity:	Ministry of Economy, Energy Agency	
GHG(s) affected (if applicable):	CO2	93.3
Quantified objective /Indicators used to monitor and evaluate progress over time:	Increase in installed capacity (MW) in 2030	
Actions to support the implementation of the objective:	• There is possibility for getting support from IPARD2 funds. The measure provides up to 65% of co-financing and promoting of photovoltaic irrigation if the frame of this measure is feasible • To promote the photovoltaic irrigation as mitigation measure • To include the measure in agri-environmental scheme • To investigate possibilities for diversification of farm incomes trough distributing the excess of electricity produced into the network	
Finance:	Budget:	47 mil. EUR
	Source of finance:	Private sector, IPARD programme
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	NECP, 3rd BUR	
Assumptions/ General comments:	About 1000 installations annually in the period of 20 years, reaching about than 20 000 hectares irrigated by photovoltaic as energy source	

A-M-44: Landfill gas flaring
Main objective: Environmental protection and meeting the highest European standards

Description: Rehabilitation of the existing landfills and illegal ("wild") dumpsites with very high, high and medium risk in each of the eight waste management regions, as well as opening of regional landfills. The rehabilitation includes covering on the existing non-compliant landfills, supplemented by gas extraction and flaring		
Implementation period:	2020 – 2040	
Type of policy instrument:	Technical	
Link to the EU policies (where applicable):	Landfill Directive 1999/31/EC, amended by Directive 2018/850; Waste Management Framework Directive 2008/98/EC, amended by Directive 2018/851	
Relevant national planning documents, legal and regulatory acts:	• National Waste Management Plan 2020-2030 • Strategy for Waste Management in the RN Macedonia • Regional Waste Management Plans (Northeast, East, Southeast, Southwest, Pelagonia, Polog, Vardar and Skopje region)	
Implementing entity:	• Ministry of Environment and Physical Planning • Municipalities (Public municipal enterprises for waste management) • Regional waste management companies / Inter-Municipal Waste Management Board	
Monitoring entity:	• Ministry of Environment and Physical Planning • State Environmental Inspectorate • Authorized Inspectors of Environment (Municipalities)	
GHG(s) affected (if applicable):	CO2, CH4	489.7
Quantified objective /Indicators used to monitor and evaluate progress over time:	Amount of CH4 burned (kt) in 2030	22.0
Actions to support the implementation of the objective:	• Regional waste management plans developed and adopted • EU funds provided for construction of a regional landfill for the East and Northeast planning region provided, construction of six transfer stations and closing of all non-compliant landfills • Discussions started with EBRD for involvement in financing regional waste management projects • Obtaining funds for the other regions • Starting the construction of the new regional landfill for the East and Northeast planning region • Covering on the existing non-compliant landfills and installation of gas flaring systems where it is feasible	
Finance:	Budget:	10.5 mil. EUR
	Source of finance:	Local self-government through Public Utilities, Public Private Partnership, EU funds, IFIs
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	NECP, 3rd BUR	
Assumptions/ General comments:	Closing of existing and opening of new landfills by waste management regions in the following order: • Skopje – 2023 • East and Northeast – 2025	

	• Polog – 2026 • Southeast – 2029 • Pelagonia and Southeast – 2029 • Vardar 2029

A-M-45: Mechanical and biological treatment (MBT) in new landfills with composting		
Main objective: Environmental protection and meeting the highest European standards		
Description: Opening of new regional landfills in all waste management regions with installed system for mechanical and biological treatment and composting		
Implementation period:	2020 – 2040	
Type of policy instrument:	Technical	
Link to the EU policies (where applicable):	Landfill Directive 1999/31/EC, amended by Directive 2018/850; Waste Directive 2006/12/EC; Waste Management Framework Directive 2008/98/EC, amended by Directive 2018/851	
Relevant national planning documents, legal and regulatory acts:	• National Waste Management Plan 2020-2030 • Strategy for Waste Management in the RN Macedonia • Regional Waste Management Plans (Northeast, East, Southeast, Southwest, Pelagonia, Polog, Vardar and Skopje region) – final and draft versions	
Implementing entity:	• Ministry of Environment and Physical Planning • Municipalities / Public municipal enterprises for waste management • Regional waste mgmt companies / Inter-Municipal Waste Management Board	
Monitoring entity:	Ministry of Environment and Physical Planning State Environmental Inspectorate Authorized Inspectors of Environment (Municipalities)	
GHG(s) affected (if applicable):	CO2, CH4, N2O	
Quantified objective /Indicators used to monitor and evaluate progress over time:	Amount of compost (kt) in 2030	78
Actions to support the implementation of the objective:	• Regional waste management plans developed and developed • EU funds provided for construction of a regional landfill for the East and Northeast planning region provided, construction of six transfer stations and closing of all non-compliant landfills • Obtaining funds for the other regions • Starting the construction of the new regional landfill for the East and Northeast planning region	
Finance:	Budget:	36.1 mil. EUR
	Source of finance:	Local self-government through Public Utilities, Public Private Partnership, EU funds
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	NECP, 3rd BUR	

Assumptions/ General comments:	Opening of the regional landfills in the following order: • Skopje – 2023 • East and Northeast – 2025 • Polog – 2026 • Southeast – 2029 • Pelagonia and Southeast – 2029 • Vardar 2029

A-M-46: Selection of waste - paper		
Main objective: Environmental protection and meeting the highest European standards		
Description: Installation of containers for collection of selected waste, mainly paper		
Implementation period:	2020 – 2040	
Type of policy instrument:	Technical	
Link to the EU policies (where applicable):	Landfill Directive 1999/31/EC, amended by Directive 2018/850; Waste Directive 2006/12/EC; Waste Management Framework Directive 2008/98/EC, amended by Directive 2018/851	
Relevant national planning documents, legal and regulatory acts:	• National Waste Management Plan 2020-2030 • Strategy for Waste Management in the RN Macedonia • Regional Waste Management Plans (Northeast, East, Southeast, Southwest, Pelagonia, Polog, Vardar and Skopje region)	
Implementing entity:	• Ministry of Environment and Physical Planning • Public municipal enterprises for waste management • State Environmental Inspectorate • Inter-Municipal Waste Management Board • Authorized Inspectors of Environment (Municipalities)	
Monitoring entity:	Ministry of Environment and Physical Planning	
GHG(s) affected (if applicable):	CO2, CH4, N2O	10.1
Quantified objective /Indicators used to monitor and evaluate progress over time:	Amount of paper waste (kt) in 2030	2030
Actions to support the implementation of the objective:	• Regional waste management plans developed • Containers for waste selection installed in several cities in RN Macedonia, mostly in Skopje • Private companies – digitalization of information (bills) realized • Installation of containers for waste selection in all cities in RN Macedonia. • Promoting the reduction of paper consumption and dematerialization of the information using ICT (Information and Communication Technologies)	
Finance:	Budget:	2 mil. EUR
	Source of finance:	Local self-government through Public Utilities, Public Private Partnership, EU funds
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No

Reference to assessments and underpinning technical reports:	NECP, 3rd BUR
Assumptions/ General comments:	Gradual increase of paper selection compared to WOM, starting from 2% up to 50% in 2040

A-M-47: Improved waste and materials management at industrial facilities		
Main objective: Set targets for reduction of generation, selection, reuse, recycling and treatment of waste at industrial installations		
Description: On an individual assessment, each IPPC installation operator shall submit proposals for 1) waste generation, 2) waste selection, 3) waste reuse, 4) waste recycling, 5) waste treatment. Goals are set in integrated environmental permits. Goals are set for a 5-year framework (progressive goals for each year) that will be updated as appropriate after the deadline. Two levels of goals: mandatory and higher incentives (through tax or financial incentives).		
Implementation period:	2020 – 2040	
Type of policy instrument:	Regulation, Technical	
Link to the EU policies (where applicable):		
Relevant national planning documents, legal and regulatory acts:	• National Waste Management Plan 202-2030 • Strategy for Waste Management in the RN Macedonia • Law on Waste Management and by-laws • Law on Finance and by-laws • Regional Waste Management Plans (Northeast, East, Southeast, Southwest, Pelagonia, Polog, Vardar and Skopje region)	
Implementing entity:	• Ministry of Environment and Physical Planning • Public municipal enterprises for waste management • State Environmental Inspectorate • Inter-Municipal Waste Management Board • Authorized Inspectors of Environment (Municipalities)	
Monitoring entity:	Ministry of Environment and Physical Planning	
GHG(s) affected (if applicable):	CO2, CH4	3.3
Quantified objective /Indicators used to monitor and evaluate progress over time:	Industrial waste collected (kt) in 2030	302
Actions to support the implementation of the objective:	• Analysis of possible tax and financial options to encourage the achievement of higher goals • Analysis done; opportunities/mechanisms identified • Modified and issued environmental permits • Regular annual implementation oversight • Regular annual reporting by IPPC operators	
Finance:	Budget:	
	Source of finance:	Ministry of Environment and Physical Planning, Municipalities and city of Skopje, Industrial facilities, EU funds

Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:	NECP, 3rd BUR	
Assumptions/ General comments:	Conducted substantive analysis, international experiences analysed. The percentage of industrial waste treatment will increase from 5% in 2024 up to 30% in 2040	

A-M-48: Introduction of CO_2 tax		
Main objective: Incentivize lowering CO2 emissions		
Description: Introduction of CO2 tax in order to stimulate the investments in RES and to increase the penetration of energy efficiency measures		
Implementation period:	2020 – 2040	
Type of policy instrument:	Regulatory	
Link to the EU policies (where applicable):	EU ETS Directive	
Relevant national planning documents, legal and regulatory acts:	• Strategy for Energy Development of the RN Macedonia up to 2040 • Law on Energy • By-laws for renewable energy • Law on Climate Action	
Implementing entity:	• Government of the Republic of North Macedonia • Ministry of Environment and Physical Planning • Ministry of Economy, Energy Agency • Ministry of Finance	
Monitoring entity:	Ministry of environment and physical planning	
GHG(s) affected (if applicable):		3223
Quantified objective /Indicators used to monitor and evaluate progress over time:	kt CO2 emissions paid under carbon tax in 2030	3223
Actions to support the implementation of the objective:	• Draft version of the Law on Climate Action • Strategy for Energy Development of the RN Macedonia up to 2040 • Adoption of the Law on Climate Action • Adoption of the Strategy on Climate Action • Adoption of the National Energy and Climate Plan	
Finance:	Budget:	
	Source of finance:	
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:		
Assumptions/ General comments:	Gradual introduction of CO2 tax (2023 in WAM) based on the projected prices from WEO 2017	

A-M-49: Program for just transition		
Main objective: Developing programs for socially responsible and just transition		
Description: Depending on selected level of transition from conventional energy, it is important to develop programs for socially responsible and just transition to mitigate negative effects of associated job losses. Such programs should provide an answer how to redeploy employees to other jobs and stimulate new job opportunities by investing in low carbon technologies and services		
Implementation period:	2020 – 2030	
Type of policy instrument:	Regulatory	
Link to the EU policies (where applicable):		
Relevant national planning documents, legal and regulatory acts:	• Strategy for Energy Development of the RN Macedonia up to 2040 • Law on Energy • Documents from project which are working in this area	
Implementing entity:	• Government of the Republic of North Macedonia • Ministry of Economy • JSC Macedonian Power Plants (ESM AD) • Ministry of labour and social policy	
Monitoring entity:	Ministry of Economy	
GHG(s) affected (if applicable):		
Quantified objective /Indicators used to monitor and evaluate progress over time:	Program adopted in 2030	yes
Actions to support the implementation of the objective:	• EBRD project of just transition in Oslomej region • NGO project of just transition in Oslomej region • 100 MW PV power plant in Oslomej • 20 MW PV power plant in Bitola • 20 MW PV power plant in Bitola	
Finance:	Budget:	
	Source of finance:	JSC ESM, state budget, donors
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:		
Assumptions/ General comments:	• Oslomej is decommissioned in 2021 • Bitola is decommissioned in the period 2025-2027	

A-M-50: Identification of the proper location for solar and wind power plants
Main objective: Development of methodology for selection of the most appropriate location foe solar and wind power plants
Description: Avoid excessive damage to nature, Government, energy companies and NGOs can prioritize land areas that have already been disturbed by industrial activity such as mines or quarries. In territories that have been historically dependent on coal production, depleted coal and other mines can be used for this purpose. In addition, for the wind warms it is important to find appropriate locations, not environmentally sensitive (e.g., habitats of birds and bats)

Implementation period:	2020 – 2023	
Type of policy instrument:	Technical	
Link to the EU policies (where applicable):		
Relevant national planning documents, legal and regulatory acts:	• Strategy for Energy Development of the RN Macedonia up to 2040 • Law on Energy • Law on environmental protection • Documents from project which are working in this area	
Implementing entity:	• Government of the Republic of North Macedonia • Ministry of Economy • JSC Macedonian Power Plants (ESM AD) • Ministry of labour and social policy • Donors	
Monitoring entity:	Ministry of Economy	
GHG(s) affected (if applicable):		
Quantified objective /Indicators used to monitor and evaluate progress over time:	Methodology developed in 2023	yes
Actions to support the implementation of the objective:	• 100 MW PV power plant in Oslomej • 20 MW PV power plant in Oslomej • 20 MW PV power plant in Bitola	
Finance:	Budget:	
	Source of finance:	State budget, donors
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:		
Assumptions/ General comments:	• Oslomej is decommissioned in 2021 • Bitola is decommissioned in the period 2025-2027	

A-M-51: Smart communities	
Main objective: Develop pilots for smart communities	
Description: Smart academic campuses could have an exemplary role where all advanced concepts and principles from smart energy systems can be tested with the goal for roll-out on larger scale	
Implementation period:	2020 – 2030
Type of policy instrument:	Education, Technical
Link to the EU policies (where applicable):	
Relevant national planning documents, legal and regulatory acts:	
Implementing entity:	Universities (or high schools)

Monitoring entity:	• Ministry of Education and Science • Ministry of Economy	
GHG(s) affected (if applicable):		
Quantified objective /Indicators used to monitor and evaluate progress over time:	Number of smart communities in 2030	
Actions to support the implementation of the objective:	PV power plants are installed at the Faculty of Electrical Engineering and Information Technologies	
Finance:	Budget:	
	Source of finance:	
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:		
Assumptions/ General comments:		

A-M-52: Construction of 400 kV electricity transmission interconnection Macedonia-Albania (Bitola-Elbasan)		
Main objective: Improve the interconnectivity level		
Description: this project is the last segment of the Corridor 8 for transmission of electricity between Bulgaria, Macedonia, Albania and Italy. The project is included in the List of Projects of Energy Community Interest (PECI)		
Implementation period:	2020 – 2023	
Type of policy instrument:	Technical	
Link to the EU policies (where applicable):		
Relevant national planning documents, legal and regulatory acts:	• PECI list • Plan for development of the transmission system, 2020-2029, MEPSO • Infrastructure Capacity Project, Technical Assistance Window (IPA) Western Balkans	
Implementing entity:	MEPSO	
Monitoring entity:	Ministry of economy	
GHG(s) affected (if applicable):		
Quantified objective /Indicators used to monitor and evaluate progress over time:	Interconnectivity level in 2030	
Actions to support the implementation of the objective:	An agreement for construction signed	
Finance:	Budget:	34 Mil. €
	Source of finance:	EBRD (17.2 Mil. €),

		Grand from Western Balkan Investment Fund (16.9 Mil. €)
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:		
Assumptions/ General comments:	Interconnectivity level will be increased for at least 7%	

A-M-53: Develop natural gas cross-border infrastructure to diversify supply routes and increase market competitiveness		
Main objective: Develop natural gas cross-border infrastructure to diversify supply routes and increase market competitiveness		
Description: On 10 July 2015 the Republic of North Macedonia became a signatory to the Memorandum of understanding on a common approach to address the natural gas diversification and the challenges of security of supply within the Central and Southeastern Europe Gas Connectivity Initiative (CESEC). NER JSC Skopje has started implementing the obligations under this Initiative aimed at promoting the diversification of natural gas supply and ensuring security in the supply of the region, which should take place by improving the regional infrastructure and integration of markets through the joint engagement of all EU Member States and Contracting Parties of the Energy Community. This initiative should provide the supply of the necessary quantities of natural gas to all consumers in the region of Central and South-Eastern Europe (CESEC), including the Republic of North Macedonia. In addition, there are two other initiatives - pipelines to Kosovo* and Serbia. The pipeline to Serbia could provide additional alternative source and transit opportunity to the Macedonian system, while the connection with Kosovo* could provide transit opportunity. Both can increase the utilization rate of the system, thus have the potential to decrease tariffs and help the gasification efforts in RN Macedonia. The projects for gas pipelines to Kosovo* and Serbia are on the preliminary PECI 2020 list that should be adopted by the Ministerial council at the end on 2020, while the gas project to Greece is already included on the PMI list, verified on 14 October 2016 by the Ministerial council of the Energy Community. Furthermore, Macedonia and Albania have signed a Memorandum of understanding and a working group is established and it is expected that by the end of 2020 more concrete activities will start.		
Implementation period:	2020 – 2025	
Type of policy instrument:	Technical, Regulatory	
Link to the EU policies (where applicable):		
Relevant national planning documents, legal and regulatory acts:	• List of Projects of Mutual Interest • List of Project of Energy Community Interest	
Implementing entity:	National Energy Resources of RN Macedonia	
Monitoring entity:	Ministry of Economy	
GHG(s) affected (if applicable):		
Quantified objective /Indicators used to monitor and evaluate progress over time:	Natural gas interconnection capacity (Mill. Nm3) in 2030	3300
Actions to support the implementation of the objective:	Macedonia – Greece pipeline • Project application after the fourth open call for co-financing of infrastructure projects within the IPA instrument Investment Framework of the Western Balkans,	

	November 2018 and update of the same in April 2019. The investment grant application has a positive screening status and the final decision was made in December 2019 • A letter was submitted with a request for expression of interest for financing the Project submitted to the European Investment Bank (EIB), October 2018. The EIB submitted a positive response to this request in November 2018. Intensive negotiations have started for the financing procedure • Mutual Feasibility Study is prepared by DESFA and NER in January 2019 and it is submitted and accepted by EIB • A request for technical assistance (100% grant) has been submitted for the preparation of an Environmental Impact Assessment Study and a general design project to Connect (Technical Assistance for Connectivity in the Western Balkans). The application was approved in January 2019. The study and the general design project are being prepared by Konnekta. According to the plans, the Study (EIA) has already been prepared and submitted to the EIB for comments, while the project documentation should be completed by the middle of 2020 • A request for technical assistance (100% grant) for preparation of tender documentation for construction and construction supervision has been submitted. The same has been approved, but due to the coronavirus situation it is postponed Macedonia – Kosovo* pipeline • Memorandum of Understanding is signed, February 2019 • A letter with a request for expression of interest for financing the Project was submitted to the EBRD. At the beginning of 2019, the EBRD submitted a positive response to this request and the bank supported the implementation of this project • A project application was submitted after the 21st open call for technical assistance for preparation of a Feasibility Study and Environmental Impact Assessment Study within the IPA Instrument Investment Framework of the Western Balkans, November 2018 and update of the same in April 2019. The technical assistance application was approved in July 2019; The TOR (Terms of Reference) has been developed. A Feasibility Study and an Environmental Impact Assessment Study are expected to be completed by the middle of 2020 Macedonia – Serbia pipeline • Activities for signing a Memorandum of Understanding • Start with the construction of RN Macedonia-Greece pipeline	
Finance:	Budget:	
	Source of finance:	Grant – 10 Mil. €, Central government budget
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:		
Assumptions/ General comments:		

A-M-54: Develop gas transmission network
Main objective: Increase the access to the transmission network
Description: Macedonia has an ambitious gasification plan and a detailed list of planned infrastructure project of the gas network in RN Macedonia with timeline is given in Chapter 4, Energy transmission infrastructure. The increased level of transmission network access is especially aimed at the industrial consumers (which are most affected by the green

scenario), as natural gas is one of the fuels that will significantly contribute to the energy transition in the industry sector. In addition, with the implementation of this measure the air quality will be significantly improved		
Implementation period:	2020 – 2025	
Type of policy instrument:	Technical	
Link to the EU policies (where applicable):		
Relevant national planning documents, legal and regulatory acts:	Gasification plan of RN Macedonia	
Implementing entity:	National Energy Resources of RN Macedonia	
Monitoring entity:	Ministry of Economy	
GHG(s) affected (if applicable):		
Quantified objective /Indicators used to monitor and evaluate progress over time:	Final energy consumption of natural gas in Industry (ktoe) in 2030	216
Actions to support the implementation of the objective:	• Klechovce-Valve station 5(Stip), with length of 61 km and diameter of 500mm, finished in 2016 • Valve station 5(Stip)-Negotino, with length of 38 km and diameter of 500mm, finished in 2019 • Negotino (Kavadarci)-Bitola, with length of 92 km and diameter of 500mm, 90% realized up to June 2020 • Skopje-Tetovo-Gostivar, with length of 76 km and diameter of 500mm, and additional branch to Tetovo with length of 10 km and diameter of 150 mm, 53.1% realized at the beginning of November 2019 • Gostivar-Kicevo, with length of 34 km, in a process of obtaining building permit (to be finished by 2022) • Sveti Nikole – Veles, with length of 32 km, in a process of preparing project documentation (to be finished by 2023) • Kicevo-Ohrid (to be finished by 2025) • Bitola – Ohrid (to be finished by 2025) • Valve station 5 (Stip)-Radovis-Strumica, with length of 60 km	
Finance:	Budget:	~200 Mil. €
	Source of finance:	State budget
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:		
Assumptions/ General comments:		

A-M-55: Develop a gas distribution network
Main objective: Diversification of the energy resources
Description: Macedonia has an ambitious gasification plan and natural gas is one of the fuels that will significantly contribute to the energy transition up to 2040. In addition, with the implementation of this measure the air quality will be significantly improved

Implementation period:	2020 – 2025	
Type of policy instrument:	Technical	
Link to the EU policies (where applicable):		
Relevant national planning documents, legal and regulatory acts:	• Gasification plan of RN Macedonia • Feasibility study about gasification (revised version in 2020)	
Implementing entity:	• Ministry of economy • National Energy Resources of RN Macedonia • Local self-government	
Monitoring entity:	Ministry of Economy	
GHG(s) affected (if applicable):	CO2, CH4, N2O	n/e
Quantified objective /Indicators used to monitor and evaluate progress over time:	Final energy consumption of natural gas except Industry (ktoe) in 2030	38
Actions to support the implementation of the objective:	• Tender announced • EBRD support for procurement and installation of household equipment (50 mill. EUR) • Tender for technical and legal support for preparation and implementation of a tender procedure is announced in June 2020 by EBRD	
Finance:	Budget:	n/e
	Source of finance:	Grant, Central governmental budget, Local self-government budgets
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:		
Assumptions/ General comments:	Development of a cost benefit analyses for each city	

A-M-56: Pursue regional electricity market integration	
Main objective: Increase the electricity price competitiveness and affordability	
Description: It is anticipated that day ahead market coupling, and development of power exchange is playing an important role in the future for RN Macedonia and EnC market integration initiatives (WB6). Future potential domestic capacities for electricity generation are considered in the context of integrated regional and European market. In addition, a well-integrated regional market will serve as a control indicator for price competitiveness and steer future capital investment decisions. In order to have competitive natural gas market in RN Macedonia, the interconnection agreement between Macedonian and Bulgarian TSOs is of crucial importance	
Implementation period:	2020 – 2023
Type of policy instrument:	Regulatory
Link to the EU policies (where applicable):	

Relevant national planning documents, legal and regulatory acts:	Energy Law and by-laws	
Implementing entity:	• National electricity market operator (MEMO) • GAMA	
Monitoring entity:	Energy Regulatory Commission	
GHG(s) affected (if applicable):	CO2, CH4, N2O	
Quantified objective /Indicators used to monitor and evaluate progress over time:	Coupled with Bulgaria	Yes
	Macedonian and Bulgarian gas TSOs agreement signed	Yes
Actions to support the implementation of the objective:	The decree for the operation of the organized electricity market and the necessary technical, staff and financial conditions that should be fulfilled, is adopted by the Government	
Finance:	Budget:	
	Source of finance:	
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:		
Assumptions/ General comments:		

A-M-57: Develop further distribution system network to integrate more RES, including prosumers and more electric vehicles (EVs), as well as continuously improve network reliability	
Main objective: Develop further distribution system network to integrate more RES, as well as continuously improve network reliability	
Description: The RES policies and measures envisage a huge number of solar PVs up to 1,400 MW, out of which 250 – 400 MW being rooftop PVs. Such trend indicates an important role of the distribution network system to service growing decentralised systems. In addition, European practice shows that regulators are imposing additional pressure and incentive to improve the operational performance and results of distribution system operators. The key changes that should be considered in the future are related in introducing new quality indicators in the tariff methodology (voltage quality, quality of supply, customer relationship quality etc.), as well as additional revisions on investment decisions (CAPEX and regulated asset base), operating efficiency and expected returns for distribution system operators. These changes in the regulatory framework will indirectly contribute to improvements in asset management, workforce management, automation and roll out of "behind the meter" services in the future	
Implementation period:	2020 – 2040
Type of policy instrument:	Regulatory, technical
Link to the EU policies (where applicable):	
Relevant national planning documents, legal and regulatory acts:	• Energy Law and by-laws • Plan for development of the distribution network
Implementing entity:	• EVN • Energy Regulatory Commission
Monitoring entity:	Energy Regulatory Commission

GHG(s) affected (if applicable):	CO2, CH4, N2O	
Quantified objective /Indicators used to monitor and evaluate progress over time:	Number of prosumers Capacity of distributed PV Number of electric vehicles	
Actions to support the implementation of the objective:	• Chargers for Electric vehicles are being installed • Old meters are being replaced with smart meters	
Finance:	Budget:	
	Source of finance:	EVN, consumers through their electricity bills
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:		
Assumptions/ General comments:	The potential for distributed RES, prosumers and electric vehicles will be increased	

A-M-58: Price signal demand response		
Main objective: Introduce price signals to consumers in order to implement demand response		
Description: Demand response is one of the main methods that are used in order to reduce the maximum electricity consumption in the system, and thus reduce its peak load and integrate higher level of RES in the system. Price signalling provided by the electricity suppliers can significantly contribute towards achieving these goals. By implementing the new Energy Law, and by the liberalized market it is envisioned that the role of the universal supplier will be reduced, and that the concurrency of the suppliers will be increased. Therefore, each of them may introduce different pricing signals for different type of consumers		
Implementation period:	2020 – 2040	
Type of policy instrument:	Regulatory	
Link to the EU policies (where applicable):		
Relevant national planning documents, legal and regulatory acts:	• Energy Law and by-laws • Study on automated demand response, MEPSO	
Implementing entity:	• Electricity suppliers/traders • Consumers	
Monitoring entity:	Energy Regulatory Commission	
GHG(s) affected (if applicable):	CO2, CH4, N2O	
Quantified objective /Indicators used to monitor and evaluate progress over time:	Number of suppliers on the market with price signals	

Actions to support the implementation of the objective:		
Finance:	Budget:	
	Source of finance:	Electricity suppliers/traders, Consumers
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:		
Assumptions/ General comments:	Price signal demand response will reduce the peak load and enable higher integration of RES	

A-M-59: Adoption of annual program for vulnerable consumers		
Main objective: Protect vulnerable customers		
Description: The Implementation of the GHG and RES targets will increase the price of electricity as it is described in Chapter 4 Internal energy market. Having this in mind a program for vulnerable costumers is needed that will protect them from the price shocks		
Implementation period:	2020 – 2040	
Type of policy instrument:	Regulatory	
Link to the EU policies (where applicable):		
Relevant national planning documents, legal and regulatory acts:	• Energy law • Separate rules for electricity, gas and heat supply • Program for vulnerable consumers for 2020	
Implementing entity:	• Ministry of economy • Suppliers of electricity, gas and heat	
Monitoring entity:	Energy Regulatory Commission	
GHG(s) affected (if applicable):	CO_2, CH_4, N_2O	
Quantified objective /Indicators used to monitor and evaluate progress over time:	Program adopted:	Yes/No
Actions to support the implementation of the objective:		
Finance:	Budget:	Different for each year
	Source of finance:	Budget and potential donors
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:		

Assumptions/ General comments:	This early program should define the categories of vulnerable costumers and associated measures, including financial supports and responsible institutions for realization of the program

A-M-60: Participation in development of energy transition technologies and measures		
Main objective: Streamline energy transition technologies and measures into national R&I priorities		
Description: The development of sectoral strategies and plans for science and R&I should be realized in cooperation between Ministry of Education and Science and relevant energy stakeholders, in order to prioritize energy transition technologies and measures. Same is needed for the programmes in the Fund for Innovation and Technology Development		
Implementation period:	2020 – 2040	
Type of policy instrument:	Research	
Link to the EU policies (where applicable):		
Relevant national planning documents, legal and regulatory acts:	• Innovation Strategy, 2012-2020 • Law on Innovation Activity • Annual programs of the Fund for Innovation and Technology Development	
Implementing entity:	• Ministry of Education and Science • Fund for Innovation and Technology Development • Chamber of Commerce	
Monitoring entity:	Ministry of Education and Science	
GHG(s) affected (if applicable):	CO2, CH4, N2O	
Quantified objective /Indicators used to monitor and evaluate progress over time:	Number of research projects development of energy transition technologies and measures	
Actions to support the implementation of the objective:		
Finance:	Budget:	
	Source of finance:	• Fund for Innovation and Technology Development • Horizon 2020 • Donors
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:		
Assumptions/ General comments:		

A-M-61: Increased level of education of sustainable energy needs
Main objective: Adjust energy related curricula at all educational levels to make them responsive to energy transition trends

Description: The development of consciousness for sustainable energy needs to be addressed from the earliest education levels and incorporated in the curricula of all primary, secondary and tertiary educational levels. Moreover, stimulating science and education in energy transition will help mobilization of the existing and building of new research capacities, as well as better integration into European Research Area (ERA) in energy themes		
Implementation period:	2020 – 2040	
Type of policy instrument:	Education, Regulatory	
Link to the EU policies (where applicable):		
Relevant national planning documents, legal and regulatory acts:	• Law on primary education • Law on secondary education • Law on higher education	
Implementing entity:	Universities, High and Primary schools	
Monitoring entity:	Ministry of Education and Science	
GHG(s) affected (if applicable):		
Quantified objective /Indicators used to monitor and evaluate progress over time:	Number of curricula for sustainable energy needs	
Actions to support the implementation of the objective:		
Finance:	Budget:	
	Source of finance:	
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:		
Assumptions/ General comments:		

A-M-62: Inter-sectoral and geographical mobility of researchers	
Main objective: Encourage inter-sectoral and geographical mobility of researchers	
Description: Knowledge and experience transfer among researchers from industry and academia, as well as incoming and outgoing mobility is needed to build internal capacities. For example, at highest educational level, industrial doctorates can be promoted as a tool to support industry driven science	
Implementation period:	2020 – 2040
Type of policy instrument:	Education, Regulatory
Link to the EU policies (where applicable):	
Relevant national planning documents, legal and regulatory acts:	
Implementing entity:	
Monitoring entity:	

GHG(s) affected (if applicable):		
Quantified objective /Indicators used to monitor and evaluate progress over time:	Number of industrial doctorates	
Actions to support the implementation of the objective:	INNOFEIT	
Finance:	Budget:	
	Source of finance:	• Industry companies • Donors
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:		
Assumptions/ General comments:		

A-M-63: Increase the role of SME sector in energy transition		
Main objective: Encourage SME sector to diversify their portfolio of services and products in RES and EE		
Description: To support greater involvement of local SME in energy transition, it is necessary to promote further expansion of RES projects and EE measures overall, especially via financial mechanisms, as well as green public procurement for innovative products. Private investments in RES and EE will be encouraged by structuring financing instruments with grant components to lower the risk of private investments in untested but promising clean energy technologies or business models. In addition, provision of technical assistance for SMEs in order to facilitate the access of enterprises to external services is needed. This covers the areas of external research and development, testing, design, instruction and training, market research, business consulting, etc.		
Implementation period:	2020 – 2040	
Type of policy instrument:	Research, Technical, Voluntary	
Link to the EU policies (where applicable):		
Relevant national planning documents, legal and regulatory acts:		
Implementing entity:	SMEs	
Monitoring entity:	Ministry of Economy	
GHG(s) affected (if applicable):		
Quantified objective /Indicators used to monitor and evaluate progress over time:	Number of innovations/patents in the field of clean energy	
Actions to support the implementation of the objective:		
Finance:	Budget:	

	Source of finance:	• Grants • Private investments
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:		
Assumptions/ General comments:		

2.2 Actions that support the implementation of the adaptation objectives of the Strategy

2.2.1 Measures aimed at addressing specific objective 6: To build solid systems for the regular and periodic collection data for the production and dissemination of scientific and technical knowledge

<table>
<tr><th colspan="3">A-A-1 (Water Resources): Pilot project for the collection of data on water use in rural context for the purpose of ensuring effective adaptation to climate change</th></tr>
<tr><td colspan="3">Main objective: This measure specifically aims at addressing the following needs and gaps identified in the Third National Communication:
Lack of knowledge about the extent of groundwater irrigation, and there is an urgent need for mapping/inventory of existing irrigation wells
There are no reliable data on water consumed for irrigation. Most irrigation schemes do not have measuring devices at the level of intakes, river diversions or canal outlets</td></tr>
<tr><td colspan="3">Description: Pilot project for the collection of data on water use in rural context for the purpose of ensuring effective adaptation to climate change. The project would aim at addressing specific needs and gaps identified in the Third National Communication</td></tr>
<tr><td>Implementation period:</td><td colspan="2">2021-2023</td></tr>
<tr><td>Type of policy instrument:</td><td colspan="2">Technological/Technical</td></tr>
<tr><td>Link to the EU policies (where applicable):</td><td colspan="2"></td></tr>
<tr><td>Relevant national planning documents, legal and regulatory acts:</td><td colspan="2"></td></tr>
<tr><td>Implementing entity:</td><td colspan="2">Ministry of Environment and Physical Planning; Ministry of Agriculture, Forestry and Water Economy; Water Utilities, Farmers Associations</td></tr>
<tr><td>Monitoring entity:</td><td colspan="2">Ministry of Environment and Physical Planning</td></tr>
<tr><td>GHG(s) affected (if applicable):</td><td></td><td></td></tr>
<tr><td rowspan="2">Quantified objective /Indicators used to monitor and evaluate progress over time:</td><td>Description:</td><td>Number of monitored wells</td></tr>
<tr><td>Values in 2030:</td><td></td></tr>
<tr><td>Actions to support the implementation of the objective:</td><td colspan="2">Define the boundaries of the pilot, in particular in terms of geographic coverage
Inventory and map wells, including the identification of its main use (irrigation or other). For this, good practices shall be considered, such as:
digital field mapping, where the relevant features are observed, analysed, and recorded in the field, producing spatially referenced maps
field work aided by and to complement / validate the results of the digital field mapping, with a view to collecting/validating, for example, data on: well location, status (operational / non-operational), depth to groundwater, groundwater quality
Identify needs and determine measures for the improvement of the monitoring of irrigation water use in order to:</td></tr>
</table>

	○ Determine the area under irrigation with surface and groundwater ○ Enhance the coverage of measuring devices at the level of intakes, river diversions or canal outlets ○ Set up a system / methodological approach to estimate irrigation water losses through leakage and evaporation • Define and implement a methodological approach for the monitoring of groundwater aquifers within the boundaries of the pilot project	
Finance:	Budget:	
	Source of finance:	State budget
Progress monitoring:	Objective achieved:	Yes/No
Reference to assessments and underpinning technical reports:	Third National Communication	
Assumptions/ General comments:	Financial support for the acquisition and maintenance of the monitoring devices, required from international partners, including EU programmes such as IPA and IPARD	

A-A-2 (Agriculture): Promote Cooperation Among Scientific Institutions and Enhance the Science-Policy-Implementers Link		
Main objective: To promote cooperation among scientific institutions and enhance the science-policy-implementers link		
Description: This measure specifically aims at addressing the following needs and gaps identified in the Third National Communication: Weak networking and an insufficient level of cooperation between scientific institutions		
Implementation period:	2021-2022	
Type of policy instrument:	Informational/Educational; Organizational/Managerial/Institutional	
Link to the EU policies (where applicable):		
Relevant national planning documents, legal and regulatory acts:		
Implementing entity:	Ministry of Agriculture, Forestry and Water Economy; Universities and research institutions, farmers association	
Monitoring entity:	Ministry of Agriculture, Forestry and Water Economy	
GHG(s) affected (if applicable):		
Quantified objective /Indicators used to monitor and evaluate progress over time:	Description:	Mechanism established and functioning
	Values in 2030:	1 (Yes/No)
Actions to support the implementation of the objective:	• Identify the institutions performing research on agriculture and climate change • Define and establish a coordination, communication and knowledge management mechanism, including web-based, that promotes synergies among research institutions and enhances the link and communication among research institutions, policy makers, extension services and farmers, including civil society organizations	
Finance:	Budget:	1 million euro (for set up)
	Source of finance:	State Budget, International cooperation

Progress monitoring:	Objective achieved:	Yes/No
Reference to assessments and underpinning technical reports:	Third National Communication	
Assumptions/ General comments:	Financial resources are available, in particular post-set up financing (sustainability) The mechanism foreseen in this measure could be set up as a regional mechanism, as the research it is to perform can be of interest to the different countries in South East Europe International cooperation partners can include: IPA; USAID and other bilateral and multilateral cooperation (such as FAO)	

A-A-3 (Biodiversity): Define and develop an indicator system to monitor the impacts of climate change on biodiversity		
Main objective: To define and develop an indicator system to monitor the impacts of climate change on biodiversity		
Description: This measure specifically aims at addressing the following needs and gaps identified in the Third National Communication: • Lack of data for precise distribution of different species, population density and abundance; Vegetation map - communities and habitats; Insufficient definition of biogeographical characteristics of Macedonian territory • Lack of data on vulnerable biodiversity components to climate change • A monitoring system of climate change impacts on biodiversity does not exist • Lack of good intersectoral cooperation (partially) • Insufficient capacities (human and knowledge) (partially)		
Implementation period:	2021-2022	
Type of policy instrument:	Technological/Technical	
Link to the EU policies (where applicable):		
Relevant national planning documents, legal and regulatory acts:		
Implementing entity:	MoEPP – Department of Nature Protection; Hydrometeorological Service; Protected areas; Universities and Research Institutes; NGOs	
Monitoring entity:	MoEPP – Department of Nature Protection	
GHG(s) affected (if applicable):		
Quantified objective /Indicators used to monitor and evaluate progress over time:	Description:	Indicator System Established
	Values in 2030:	Yes/No
Actions to support the implementation of the objective:	• Define policy relevant key indicators for evaluation of impacts of climate change on biodiversity o Assess data needs and data availability and gaps, including accessibility to climate data by relevant stakeholders including research institutions • Design and establish monitoring system for the impacts of climate change on biodiversity, including institutional responsibilities (for example, through signing of memorandum of understanding among the relevant entities)	

Finance:	Budget:	The costs associated with designing and establishing are close to zero. In addition, this biodiversity/climate change indicator system is to build upon the monitoring that should already be done by the protected areas. As such, the additional costs should be minimized. (Approximate cost for monitoring of 1 area/3 species/1year is estimated at 3,000 euros.)
	Source of finance:	State Budget and International cooperation
Progress monitoring:	Objective achieved:	Yes/No
Reference to assessments and underpinning technical reports:	Third National Communication	
Assumptions/ General comments:	Availability of resources (financial and human) For some taxonomic groups there are no national experts. Some training and technical assistance is required in addition to financial support Potential cooperation partners/programmes include: GCF, IPA, GEF. Swedish, Austrian and Swiss cooperation	

A-A-4 (Biodiversity): Define a national research plan for biodiversity (including agrobiodiversity) and climate change		
Main objective: To define a national research plan for biodiversity and climate change		
Description: This measure specifically aims at addressing the following needs and gaps identified in the Third National Communication16: • Lack of data for precise distribution of different species, population density and abundance; Vegetation map - communities and habitats; Insufficient definition of biogeographical characteristics of Macedonian territory; • Lack of good intersectoral cooperation (partially) • Insufficient capacities (human and knowledge); (partially)		
Implementation period:	2021-2022	
Type of policy instrument:	Informational/Educational; Organizational/Managerial/Institutional	
Link to the EU policies (where applicable):		
Relevant national planning documents, legal and regulatory acts:		
Implementing entity:	MoEPP; Hydrobiology Institute; Universities and Research Centres	
Monitoring entity:	MoEPP	
GHG(s) affected (if applicable):		
	Description:	Plan prepared

16 The needs and gaps addressed by these measures are partially the same as those addressed by the previous measure.

Quantified objective /Indicators used to monitor and evaluate progress over time:	Values in 2030:	Yes/No
Actions to support the implementation of the objective:	Elaborate a research plan for biodiversity, including agrobiodiversity, and climate change	
Finance:	Budget:	Near to zero (costs associated with implementation of the plan cannot be pre-determined)
	Source of finance:	
Progress monitoring:	Objective achieved:	Yes/No
Reference to assessments and underpinning technical reports:	Third National Communication	
Assumptions/ General comments:		

A-A-5 (Human Health): Restore and improve the system for the collection of air-climate-health, including the platform for sharing it with the public (integrated system for weather extremes, air quality and human morbidity and mortality) data		
Main objective: To restore and improve the system for the collection of air-climate-health		
Description: This measure specifically aims at addressing a need identified during the elaboration of this strategy, related to the unsustainability of the solution previously implemented for assuring a real time communication among the key health-meteorology organizations		
Implementation period:	Restoration of current system: 2021 Improvement (roll out in accordance with plan foreseen in activities): 2022-2023	
Type of policy instrument:	Technological/Technical; Informational/Educational	
Link to the EU policies (where applicable):		
Relevant national planning documents, legal and regulatory acts:		
Implementing entity:	Institute of Public Health; Hydrometeorological Service and the Medical Emergency Service	
Monitoring entity:	Institute of Public Health	
GHG(s) affected (if applicable):		
Quantified objective /Indicators used to monitor and evaluate progress over time:	Description:	System Restored System Maintained
	Values in 2030:	Yes/No Yes/No

Actions to support the implementation of the objective:	• Define technical specifications for the server required to restore the existing automated platform
	• Define the technical specifications for improving the platform, including:
	  o Selection of meteorological, air quality and public health parameters
	  o Identify data needs and gaps
	  o Identify needs to strengthen the system for data collection, analysis and dissemination (including weather and air quality stations and procedures for the reporting and morbidity and mortality associated with weather events)
	• Prepare a roll out plan, including, if relevant, the definition of a phased approach for implementation
	• Prepare the Terms of Reference for the acquisition of hardware and software	

Finance:	Budget:	
	Source of finance:	State Budget International Cooperation
Progress monitoring:	Objective achieved:	Yes/No
Reference to assessments and underpinning technical reports:	Third National Communication	
Assumptions/ General comments:	Potential International partners include: WHO / European Centre for Environment and Health; GCF	

A-A-6 (Socio Economic Vulnerability): Define and develop a system to monitor socio-economic vulnerability to climate change	
Main objective: To define and develop a system to monitor socio-economic vulnerability to climate change	
Description: This measure specifically aims at addressing the following needs and gaps identified in the Third National Communication: • Inaccurate statistical data for some statistical units, particularly at the settlement level, because the Census of Population, Households and Dwellings was not conducted in 2011 • Certain data in the field of health, social care, employment, etc., are not available at the municipal level due to the method of processing and disclosure of relevant institutions. The above information is processed and disseminated at the level of 30 centres. The official statistical data on incomes and expenditures of households, poverty, socially excluded groups and related indicators are available only as totals for the Republic of North Macedonia as a whole and are not disaggregated • Comparability of data over time is not possible due to changes in applied methodology and changes in the administrative divisions in which the census data are published • Limiting factors meant that the composite socio-economic index could not include indicators on the economic situation of the population, such as the unemployment rate and the level of household income	
Implementation period:	2021-2022
Type of policy instrument:	Technological/Technical
Link to the EU policies (where applicable):	
Relevant national planning documents, legal and regulatory acts:	

Implementing entity:	MoEPP; Office of the Vice-Prime Minister for Economic Affairs; Statistical office; Ministry of Local Self-government; Local Self-governments; Ministry of Information Society and Administration; Universities; NGOs; Ministry of Finance; Ministry of Agriculture, Forestry and Water Economy; Ministry of Health; Ministry of Labour and Social Policy	
Monitoring entity:	MoEPP	
GHG(s) affected (if applicable):		
Quantified objective /Indicators used to monitor and evaluate progress over time:	Description:	System established
	Values in 2030:	Yes/No
Actions to support the implementation of the objective:	• Define policy relevant key indicators for evaluation of the socio-economic vulnerability to the impacts of climate change • Define parameters and rules for the establishment of community-specific indexes • Determine data needs and gaps for the accurate socio-economic characterization of the impacts of climate change • Identify data providers • Establish a system for the periodic, systematic and consistent collection of data (for example, through signing of memorandum of understanding among the relevant entities)	
Finance:	Budget:	
	Source of finance:	State budget
Progress monitoring:	Objective achieved:	Yes/No
Reference to assessments and underpinning technical reports:	Third National Communication	
Assumptions/ General comments:	• Human, financial and institutional constraints are present and cannot be expected to be fully removed in the near future. As such, the system needs to be built taking such constraints into consideration. A careful selection of key indicators and the definition of priorities should contribute to overcoming these constraints. In addition, the system should be built in such a way that its benefits are clear to all involved • This system should be set up in a way to build upon and reinforce existing systems • International financial and capacity building (training and technical assistance) support required.	

2.2.2 Measure aimed at addressing specific objective 7: To increase the resilience of climate change impacts of key socio-economic sectors and ecosystems

A-A-7 (Cross-cutting): Prepare the National Adaptation Plan (NAP)	
Main objective: Endow RN Macedonia with the required tools to implement key adaptation measures to reduce vulnerability and increase resilience to climate change across all sectors	
Description: Prepare the National Adaptation Plan	
Implementation period:	2021-2025

Type of policy instrument:	Organizational/Managerial/Institutional	
Link to the EU policies (where applicable):		
Relevant national planning documents, legal and regulatory acts:		
Implementing entity:	Office of the Vice-Prime Minister for Economic Affairs; Ministry for Environment and Physical Planning; Ministry of Economy; Ministry of Finance; Ministry of Agriculture, Forestry and Water Economy; Ministry of Health; Ministry of Labour and Social Policy; Ministry of Local Self-government; Ministry of Culture; Ministry of Education and Science; Ministry of Information Society and Administration; Local Self-governments; Universities; Crisis Management Centre, NGOs.	
Monitoring entity:	Office of the Vice-Prime Minister for Economic Affairs	
GHG(s) affected (if applicable):		
Quantified objective /Indicators used to monitor and evaluate progress over time:	Description:	Plan adopted
	Values in 2030:	Yes/No
Actions to support the implementation of the objective:	Prepare the National Adaptation Plan	
Finance:	Budget:	
	Source of finance:	State budget and international support (GCF)
Progress monitoring:	Objective achieved:	Yes/No
Reference to assessments and underpinning technical reports:		
Assumptions/ General comments:	Approval of the financing by the Green Climate Fund	

2.3 Actions that support the cross-sectoral coordination objectives of the Strategy

A-C-1: Mainstream climate change related aspects into the future national strategic planning documents related to education, research, and development, innovation, social inclusion and equal opportunities on women and men	
Main objective: Mainstream climate change related aspects into the forthcoming National Strategy for Education	
Description: Mainstream climate change related aspects into the forthcoming National Strategy for Education	
Implementation period:	2021- 2030
Type of policy instrument:	Educational
Link to the EU policies (where applicable):	
Relevant national planning documents, legal and regulatory acts:	National Strategy for Education

Implementing entity:	Ministry of Education and Science	
Monitoring entity:	MoEPP	
GHG(s) affected (if applicable):		
Quantified objective /Indicators used to monitor and evaluate progress over time:	National Strategy for Education considers climate aspects	
	National Innovation Strategy considers climate aspects	
Actions to support the implementation of the objective:	• Mainstream climate change related aspects into the forthcoming National Strategy for Education • Develop an action plan for the introduction of climate related education into the curricula of all education levels and in lifelong learning, teacher education and in-service training • Establish a coordination mechanism on climate change education among all relevant stakeholders • Allocate resources for the implementation of climate change education activities on all educational levels • Provide guidance and support for the development and implementation of skill building programmes related to sustainable technologies (professional upgrading, vocational training, lifelong learning) in order to unlock potential for the creation of green jobs and a low-carbon economy • Establish research exchange programmes and networks between national and international academic institutions dealing with climate related issues • Assure regular financial allocations for climate change projects through the Fund for Innovations and Technology Development • Provide support to national experts to be involved in global climate related reviews and relevant scientific activities, for example the IPCC Assessment Reports	
Finance:	Budget:	
	Source of finance:	National budget, donor community
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:		
Assumptions/ General comments:		

A-C-2: To promote the green transition through capacity building, training for new skills and awareness rising
Main objective: Promotion of the role of the public sector, awareness raising and supporting the green transition through capacity building, training for new skills and awareness rising

Description: Promotion of the role of the public sector, awareness raising and supporting the green transition through capacity building, training for new skills and awareness rising		
Relevant national planning documents, legal and regulatory acts:	• Long Term Strategy on Climate Action • National Strategy for Gender Equality	
Implementing entity:	MoEPP, MoES, MSP	
Monitoring entity:	MoEPP	
Actions to support the implementation of the objective:	• Develop a national programme for climate awareness raising including behavioural measures, such as sustainable food production, vegan diet and lifestyle, environment and climate friendly consumer practices, primary waste selection, local waste composting, promotion of local and low carbon products, etc. • Provision of strategic guidance to the donor community to support projects related to climate action and climate awareness rising in the country • Allocate resources for the implementation of climate change awareness raising activities • Promote the Long-term Strategy on Climate Action and facilitate the participation of the general public and the NGO sector in its implementation • Develop a programme for strengthening climate action capacity of national and local institutions • Implement campaigns to raise climate awareness • Support the development of a legal framework and funding to protect climate vulnerable groups, including women, children, elderly and people with disabilities • Mainstream climate change related aspects into the forthcoming National Strategy for Gender Equality • Facilitate active participation of affected communities in climate change decision-making and equal participation of women and men • Provide training on climate relates aspects for journalists and media representatives • Produce promotional materials such as publications, atlases, audio-visuals and graphics that might be widely disseminated among the general public and civil society • Involve the private sector and the economic chambers in the elaboration and implementation of programmes for climate awareness raising (e.g., electricity distribution companies, waste collection utilities, etc.) • Support the development of an enabling legal framework and incentive mechanisms for domestic producers of sustainable technological solutions and climate friendly technologies, which will support the implementation of the Strategy (as solar panels, solar boilers, EE appliances and construction items, batteries, etc.) • Provide coaching and capacity building on Industrial Energy Management aspects and on the introduction of climate friendly technologies in the Industry sector • Support the development of an enabling legal framework and incentive mechanisms for business dealing with sustainable waste management and climate friendly agricultural practices • Provide guidance to banks and other financial institutions to offer financial products for enhanced investments in climate friendly technologies	
Finance:	Budget:	

	Source of finance:	
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:		
Assumptions/ General comments:		

A-C-3: Implementation of the priority mitigation actions under Long-term Strategy on Climate Action and further transposition of climate legislation		
Main objective: To contribute to the transposition of the EU climate action legislation, and to the creation of an enabling environment for the successful implementation of the priority mitigation actions developed under the Long-term Strategy on Climate Action		
Description: Implementation of priority mitigation actions identified in the Long-term Strategy on Climate Action		
Implementation period:	2022 – 2025	
Type of policy instrument:	Legal,Technical	
Link to the EU policies (where applicable):		
Relevant national planning documents, legal and regulatory acts:	• Law on Climate Action • Secondary legislation on climate action • Long-term Strategy on Climate Action	
Implementing entity:	MoEPP	
Monitoring entity:	MoEPP	
GHG(s) affected (if applicable):	CO2, CH4, N2O	
Quantified objective /Indicators used to monitor and evaluate progress over time:	Number of new legal acts for further alignment of the national climate legislation developed	
	Priority mitigation measures identified and timeline for implementation drafted	
Actions to support the implementation of the objective:	• Assessment of the existing national legal and strategic frameworks v. the EU policies and measures for climate action • Further alignment of the national legislation with the EU climate legislation • Establishment of national climate action coordination mechanism • Identification of priority mitigation measures and drafting of a timeline for implementation of priority mitigation measures • Strengthening of institutional capacities for coordination and implementation of climate action • Public awareness rising	
Finance:	Budget:	2 milion euro
	Source of finance:	EU IPA or other donor funds
Progress monitoring:	Objective achieved:	Yes/No

	Activities implemented:	Yes/No
Reference to assessments and underpinning technical reports:		
Assumptions/ General comments:		

A-C-4: Cross –sectoral coordination and capacity development for monitoring and reporting policies and measures in the Republic of North Macedonia		
Main objective: Development of strong and sustainable capacities in the Republic of North Macedonia, to successfully implement the system for policies, measures and projection for the county's climate actions		
Description: Capacity development for monitoring and reporting policies and measures		
Implementation period:	2022 – 2025	
Type of policy instrument:	Capacity building	
Link to the EU policies (where applicable):	• MMR Directive • Energy Governance Regulation	
Relevant national planning documents, legal and regulatory acts:	• Law on Climate Action • Law on Water • Secondary legislation on climate action • Long-term Strategy on Climate Action	
Implementing entity:	MoEPP	
Monitoring entity:	MoEPP	
GHG(s) affected (if applicable):		
Quantified objective /Indicators used to monitor and evaluate progress over time:	Number of capacity development events held	
	Number of reporting guidelines and supporting legal instruments elaborated	
Actions to support the implementation of the objective:	• Assessment and identification • Planning for capacity development and coordination on reporting of policies and measures • Strengthening the administrative capacity at central and local level for implementation of the System of policies, measures and projections • Development of reporting guidelines and digital tools for enhanced understanding of the system • Development of legal instruments that will support the use of IT tools for reporting of policies and measuresMaintsreem climate related aspects into the sectoral legal and strategic frameworks, especially when it comes to river basin management planning •	
Finance:	Budget:	0.5 Milion EUR
	Source of finance:	EU IPA or other donor funds

Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:		
Assumptions/ General comments:		

A-C-5: Enabling climate mitigation through circular economy policies and legislation in the waste sector		
Main objective: Reduction of GHG emissions in the waste sector through introduction of circular economy policies and legislation		
Description: Assessment And development of circular economy policies and legislation on the waste sector		
Implementation period:	2022 - 2030	
Type of policy instrument:	Policy	
Link to the EU policies (where applicable):	EU Circular Economy Action Plan	
Relevant national planning documents, legal and regulatory acts:	• Long Term Strategy on Climate Action • National Waste Strategy	
Implementing entity:	MoEPP	
Monitoring entity:	MoEPP	
GHG(s) affected (if applicable):	CO2, CH4, N2O	
Quantified objective /Indicators used to monitor and evaluate progress over time:	Number of circular economy policies elaborated over time	NA
	Number of adopted legal acts related to implementation of circular economy policies	NA
Actions to support the implementation of the objective:	• Assessments of existing policies, strategic documents and legislation in the Republic of North Macedonia relevant to circular economy in the waste sector and analyse gaps with regard to the relevant EU acquis • Development of an action plan to establish and implement circular economy in the waste sector • Align the relevant national strategic documents • Draft legislative amendments or new legislation to close gaps and to transpose the relevant EU acquis • Prepare communication plan on circular economy in waste management and carry out communication actions with stakeholders	
Finance:	Budget:	1 milion EUR
	Source of finance:	EU IPA or other donor funds
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No

Reference to assessments and underpinning technical reports:	
Assumptions/ General comments:	

A-C-6: Strengthening capacity for monitoring socio-economic vulnerability to climate change		
Main objective: Identify and increase the resilience of those communities and sections of the population which are most vulnerable to climate change impacts		
Description: Strengthening capacity for monitoring socio-economic vulnerability to climate change		
Implementation period:	2022 - 2024	
Type of policy instrument:	Capacity building	
Link to the EU policies (where applicable):		
Relevant national planning documents, legal and regulatory acts:		
Implementing entity:	MoEPP; Office of the Vice-Prime Minister for Economic Affairs; Statistical office; Ministry of Local Self-government; Local Self-governments; Ministry of Information Society and Administration; Universities; NGOs; Ministry of Finance; Ministry of Agriculture, Forestry and Water Economy; Ministry of Health; Ministry of Labour and Social Policy	
Monitoring entity:	MoEPP	
GHG(s) affected (if applicable):		
Quantified objective /Indicators used to monitor and evaluate progress over time:	Number of indicators identified	
	Data collection plan elaborated and endorsed	Yes/No
Finance:	Budget:	1 million EUR
	Source of finance:	State budget
Progress monitoring:	Objective achieved:	Yes/No
Actions to support the implementation of the objective:	• Identify indicators, data requirements and data owners • Develop a data collection plan • Raise Awareness and the capacity of key stakeholders • Implementation of pilot studies for the definition of community specific indexes	
Reference to assessments and underpinning technical reports:	Third National Communication	
Assumptions/ General comments:	• Human, financial and institutional constraints are present and cannot be expected to be fully removed in the near future. As such, the system needs to be built taking such constraints into consideration. A careful selection of key indicators and the definition of priorities should contribute to overcoming these constraints. In addition, the system should be built in such a way that its benefits are clear to all involved	

	• This system should be set up in a way to build upon and reinforce existing systems • International financial and capacity building (training and technical assistance) support required

2.4 Actions that support the implementation of the legal framework for climate action and the strengthening of institutional capacity

The actions to implement the Law differentiate between those actions which directly flow from the LCA and partly require implementation immediately after its adoption (below, section 2.4.1, referring to the *Road Map for the Implementation of the Law* developed by the Project) and those actions which can be classified as medium-term and longer-term, following the immediate actions. The latter actions (below, section 2.4.2 and 2.4.3), still within the first phase of implementation, relate to organisational arrangements and capacity-strengthening and are based on the *Action Plan for Administrative Strengthening* which has been prepared by the Project.

A particular set of actions will be needed to update the legal framework of the country in the light of new EU legislation in the coming years, and these must be reflected in this Action Plan as well (below, section 2.4.2.2). Currently, EU legislation concerning climate action is under deep revision, within the context of the EU Green Deal launched in December 2019 which led to the proposal of an EU "climate law" in March 2020, the stepping up of the EU GHG reduction target for 2030, and the proclaimed intention to review and revise relevant EU legislation in the sectors in the years to come. All areas of EU climate legislation will be affected, and the legislation of RN Macedonia may require adjustments and amendments in the LCA, sectoral legislation, and by-laws. These developments must be followed for eventual needs of updating. Updates will further be required with the progress of the accession process and the eventual membership of RN Macedonia in the EU. Certain obligations—also in the area of climate action—are linked to membership, and legislative amendments may be required to be in line with the accession agreement (below, section 2.4.2.1).

2.4.1 Actions to implement the Law on Climate Action – immediate actions after adoption of the Law

The project has prepared a *Road Map for the implementation of the Law* to which reference is made here for full details. The main features of the Road Map are:

The Road Map lists the actions which are needed immediately after the adoption and the entry into force of the Law. The actions cover, first of all, the preparation and adoption of secondary legislation foreseen in the LCA as well as institutional and administrative arrangements. The actions are classified according to the chapters of the LCA: general provisions, planning for climate action, climate action mechanism, system of monitoring and reporting, inspection and misdemeanours, and transitional and final provisions.

The Road Map also indicates the responsibility for taking the actions, and in most cases the responsibility for preparing the secondary legislation needed is with the MoEPP as the main authority in the area of climate action. The secondary legislation comprises both, decrees to be enacted by the Government, and Rulebooks to be enacted by the Ministry, in some cases in cooperation with other Ministries, as clearly provided for in the LCA.

The institutional and administrative actions consist in creating the necessary organizational structures in the authorities to create the institutional basis to implement the LCA and to provide the necessary human and technical resources.

The Road Map also proposes a scheduling of the actions. It recognizes that it depends on and the date of the adoption of the LCA. However, as a general rule, the actions should be taken in the first two years after the adoption of the Law.

A-L-1: Establishment of National Council on Climate Change (NCCC) – Option 1 (representative body)

Main objective: Establishment of the NCCC as the advisory body as foreseen in the Law		
Enabling measures: • nominate members (governmental, non-governmental stakeholders) • appoint members • propose, decide on remuneration • decide on establishing technical support and provide support staff • establish rules of procedure in Council, including rules on presidency/ chair		
Implementation period:	2021-2022	
Type of policy instrument:	Decisions of Government (appointments, remuneration, technical support) Administrative decision on organizing technical support Council internal rules of procedure	
Link to the EU policies (where applicable):	As defined in EU legislation, LCA	
Relevant national planning documents, legal and regulatory acts:	• Law on Climate Action as adopted • Government rules and regulations • Ministry rules and regulations	
Implementing entity:	• MoEPP for practical arrangements during preparation; • Technical support after establishment (if so decided) • Government for appointment of members, remuneration, support	
Monitoring entity:	• MoEPP for technical matters • Government for decisions	
GHG(s) affected (if applicable):		
Quantified objective /Indicators used to monitor and evaluate progress over time:	Description:	Members proposed and appointed; NCCC in place; technical support decided and functional; regular meetings held
	Values in 2030:	
Finance:	Budget: See below action 14 for institutional administrative costs	1 staff for technical support
	Source of finance:	MoEPP budget
Progress monitoring:	Objective achieved:	Yes/No
Reference to assessments and underpinning technical reports:	Road Map for the Implementation of the Law	
Assumptions/ General comments:	• Option of representative body chosen • The LCA with basic rules covering membership, functions, and appointment procedures adopted and in force • Decision on technical support (by MoEPP) taken • Resources for technical support staff available	

A-L-1: Establishment of National Council on Climate Change (NCCC) – Alternative Option (governmental body)	
Main objective: Establishment of the NCCC as advisory body as foreseen in the Law	
Enabling measures: • decide on governmental members • decide on presidency/ chair • decide on establishing technical support and provide support staff • establish rules of procedure	
Implementation period:	2021-2022
Type of policy instrument:	• Decisions of Government (members, technical support and staff) • Government rules and regulations for functioning

Link to the EU policies (where applicable):	As defined in EU legislation, LCA	
Relevant national planning documents, legal and regulatory acts:	• Law on Climate Action as adopted • Government rules and regulations	
Implementing entity:	• Government • Governmental entity chosen for technical support	
Monitoring entity:	Government	
GHG(s) affected (if applicable):		
Quantified objective /Indicators used to monitor and evaluate progress over time:	Description:	Members of Council decided on; NCCC in place; rules and procedures for functioning in place; presidency/ chair decided; technical support decided and functional; regular meetings held
	Values in 2030:	
Finance:	Budget: See below action 14 for institutional administrative costs	1 staff for technical support
	Source of finance:	Budget of entity serving as technical support
Progress monitoring:	Objective achieved:	Yes/No
Reference to assessments and underpinning technical reports:	Road Map for the Implementation of the Law	
Assumptions/ General comments:	• Option of governmental body chosen • The LCA with basic rules covering membership, functions, and appointment procedures adopted and in force • Decision on technical support taken • Resources for technical support staff available	

A-L-2: Preparation and adoption of the Long-term Strategy on Climate Action	
Main objective: Establishment of the Strategy according to requirements in the LCA	
Enabling measures: • Prepare Strategy by the MoEPP • Submit to Government • Submit draft Strategy to National Assembly for adoption • Adopt Strategy • Coordinate alignment of sectoral planning instruments with Strategy according to LCA • Monitor implementation of Strategy continuously • Prepare updates when necessary • Submit updates to Government • Submit updates to Assembly for adoption • Adopt updates	
Implementation period:	• Adoption 2021-2022 • Monitoring and review from 2023 onwards • Alignment of sectoral planning instruments after adoption, by the latest at the time of revision of planning instruments
Type of policy instrument:	• Strategy instrument. • Decision by National Assembly.
Link to the EU policies (where applicable):	Regulation (EU) 2018/1999 (Governance Regulation)

Relevant national planning documents, legal and regulatory acts:	• LCA • NECP • other relevant planning instruments	
Implementing entity:	• MoEPP for preparation and monitoring of implementation, coordination of alignment of sectoral planning instruments, preparation of updates, submission to the Government • sectoral Ministries and other state bodies for aligning sectoral and other planning instruments • Government for proposal to National Assembly • National Assembly for adoption	
Monitoring entity:	• MoEPP • Sectoral Ministries • Other relevant state bodies competent for planning instruments	
GHG(s) affected (if applicable):	As defined in EU legislation	
Quantified objective /Indicators used to monitor and evaluate progress over time:	Description:	• Strategy document • Monitoring documents, reports • NECP aligned • Sectoral, other plans aligned
	Values in 2030:	
Finance:	Budget: See below action 14 for institutional administrative costs	Administrative costs
	Source of finance:	• MoEPP budget • Sectoral Ministries budgets
Progress monitoring:	Objective achieved:	Yes/No
Reference to assessments and underpinning technical reports:	Road Map for the Implementation of the Law	
Assumptions/ General comments:	• LCA adopted and in force • Cooperation between MoEPP and other Ministries and state bodies for aligning the relevant planning instruments • Human and financial resources available for preparation and monitoring in MoEPP and other Ministries and state bodies available	

A-L-3: Preparation and adoption of Action Plan to implement the Strategy	
Main objective: Action plan adopted to ensure the implementation of the actions foreseen in the Strategy	
Enabling measures: • Prepare Action Plan according to contents in LCA • Propose Action Plan to Government for adoption • Adopt Action Plan • Monitor implementation continuously • Update and take corrective action where necessary, • Propose updates and corrections to Government for adoption • Adopt updates and corrections	
Implementation period:	• 2021-2022 • Monitoring 2023 onwards, based on policies and measures reports • Updates and corrective measures as necessary
Type of policy instrument:	• Plan instrument • Assembly decisions

	• Government decisions	
Link to the EU policies (where applicable):		
Relevant national planning documents, legal and regulatory acts:	LCA	
Implementing entity:	• MoEPP for preparation and monitoring implementation • Government for adoption of Action Plan and possible updates	
Monitoring entity:	• MoEPP • Government	
GHG(s) affected (if applicable):	As defined in EU legislation	
Quantified objective /Indicators used to monitor and evaluate progress over time:	Description:	• Action Plan document adopted • Updates of Action Plan adopted
	Values in 2030:	
Finance:	Budget: See below action 14 for institutional administrative costs	administrative costs
	Source of finance:	MoEPP budget
Progress monitoring:	Objective achieved:	Yes/No
Reference to assessments and underpinning technical reports:	• Road Map for the Implementation of the Law • Monitoring and possible updates of Action Plan to be based on the regular reports on policies and measures as provided for in the LCA	
Assumptions/ General comments:	• LCA adopted and in force. • Human and financial resources available at MoEPP	

A-L-4: Establishment of the mechanism for GHG emissions from industry and aviation activities
Main objective: Establishment and operation of the mechanism.
Enabling measures: • Adopt decree on activities requiring GHG emission permit • Adopt decree on aviation activities requiring approved monitoring plan • Identify and develop a list/registry of installations that will be subject to GHG emission permitting • Prepare and adopt decree on GHG emission cap • Prepare and adopt rulebook on form and contents of applications for permit • Prepare and adopt rulebook on permitting procedure and contents of permit • Establish registry of permits

<table>
<tr><td colspan="3">
• Allocate competences in authority (MoEPP) for issuing permit, approving monitoring plans
• Prepare and adopt decree on contents of monitoring plan
• Train the staff of the operators of stationary installations to prepare monitoring plans
• Train the relevant staff of the MoEPP and the State Environmental Inspectorate regarding the permitting, approving monitoring plans and inspection procedure
• Prepare and adopt rulebook on low emission installations
• Prepare and adopt rulebook on significant changes of monitoring plan
• Prepare and adopt rulebook on methodology of monitoring in stationary installations
• Prepare and adopt rulebook on methodology of monitoring of aviation activities
• Prepare and adopt rulebook on assessment of technical feasibility and unreasonable costs
• Prepare and adopt rulebook of data keeping by operators
• Prepare and adopt rulebook on annual emission report contents
• Prepare and adopt rulebook on reporting improvements of monitoring methodology
• Prepare and adopt rulebook on verifiers and verification processes
• Prepare and adopt rulebook on accreditation of verifiers
• Prepare and adopt rulebook on information and documents for accreditation
• Prepare and adopt rulebook on assessment teams in accreditation process
• Establish supervision programme for verifiers
• Prepare and adopt rulebook on implementation of supervision programme
• Prepare and adopt rulebook on electronic templates for emission reports and verification reports
• Allocate competences and staff for accreditation in Institute for Accreditation
</td></tr>
<tr><td>Implementation period:</td><td colspan="2">2021 - 2022</td></tr>
<tr><td>Type of policy instrument:</td><td colspan="2">• Decrees adopted by Government
• Rulebooks adopted by MoEPP
• Rulebooks adopted by MoEPP and MoTC (aviation)
• Rulebooks by MoEPP and MoE (accreditation of verifiers)
• Organisational decisions of MoEPP
• Organisational acts by Institute for Accreditation</td></tr>
<tr><td>Link to the EU policies (where applicable):</td><td colspan="2">• Directive 2003/87/EC (ETS Directive as amended)
• Regulation 600/2012
• Regulation 601/2012
• Regulation 2018/2066</td></tr>
<tr><td>Relevant national planning documents, legal and regulatory acts:</td><td colspan="2">LCA</td></tr>
<tr><td>Implementing entity:</td><td colspan="2">• MoEPP for preparation of draft decrees
• Government for adoption of decrees
• MoEPP for rulebooks (in cooperation with MoTC for aviation activities, and with MoE for secondary legislation on verification and accreditation of verifiers)</td></tr>
<tr><td>Monitoring entity:</td><td colspan="2">MoEPP</td></tr>
<tr><td>GHG(s) affected (if applicable):</td><td>As defined in LCA</td><td></td></tr>
<tr><td rowspan="2">Quantified objective /Indicators used to monitor and evaluate progress over time:</td><td>Description:</td><td>• Decrees adopted (as listed above)
• Rulebooks adopted (as listed above)
• Administrative decisions taken (as listed above)</td></tr>
<tr><td>Values in 2030:</td><td></td></tr>
<tr><td>Finance:</td><td>Budget: See below action 14 for institutional administrative costs</td><td>• Administrative costs
• Compliance costs TBD (RIA based)</td></tr>
</table>

	Source of finance:	• MoEPP budget • MoTC budget • MoE budget
Progress monitoring:	Objective achieved	Yes/No
Reference to assessments and underpinning technical reports:	Road Map for the Implementation of the Law	
Assumptions/ General comments:	• LCA adopted and in force • MoEPP has necessary human and financial resources • Cooperation between MoEPP and MoTC and MoE as well as with Institute for accreditation established and functioning • Businesses are informed and are cooperative	

A-L-5: Establishment of a system of monitoring and reporting of GHG emissions
Main objective: Establishment of the national system of monitoring and reporting as provided for in the LCA
Enabling measures: • Adopt decree on GHG inventory • Adopt rulebook on monitoring and reporting • Establish single national entity • Establish national coordination committee • Allocate competences for data delivery • Appoint staff for data delivery • Notify nominated staff to MoEPP • Prepare document on QC/QA • Prepare document on planning, preparation and management of GHG inventory • Update systematization of MoEPP • Prepare protocols, procedures for GHG data documentation • Adopt decree on reporting on policies and measures • Allocate responsibilities for report on policies and measures • Establish data base for GHG data • Manage and operate GHG inventory • Coordinate and improve system of policies and measures reporting • Submit data for GHG inventory • Determine GHG inventory • Prepare GHG inventory report • Submit GHG inventory report to Convention • Determine approximated GHG inventory • Complete CRF tables • Perform QC/QA • Submit information on policies and measures • Prepare projections • Prepare report on policies and measures • Prepare report on projections • Prepare report on adaptation measures • Prepare Biannual Reports • Prepare National communications • Grant public authorizations • Include system of monitoring and reporting in Environmental Information System

Implementation period:	• 2021-2022 for adopting decrees, rulebooks and administrative decisions on creating staff units, systematisation, creating capacity • 2022 onwards and according to schedule foreseen in the LCA for preparation of reports on National GHG Inventory and Policy and Measures • Submission of reports and communications to Convention as required under the international reporting obligations	
Type of policy instrument:	• Decrees and rulebooks • Administrative decisions concerning tasks and responsibilities in the MoEPP and other relevant institutions • Systematisation acts of ministries and institutions • Decision about establishment of single national entity for GHG inventory and Coordination Committee	
Link to the EU policies (where applicable):	Regulation (EU) 525/2013; Regulation (EU) 749/2014; Regulation (EU) 666/2014	
Relevant national planning documents, legal and regulatory acts:	LCA	
Implementing entity:	• MoEPP with main responsibility for the system of data collection, establishment and operation of databases for the GHG inventory , the information on policies and measures, the determination of GHG inventories, included the approximated GHG inventory, and the preparation and submission of all reports • MoEPP with Coordination Committee for guidance documents • All institutions contributing data as foreseen in LCA and by-laws, for appointment of necessary staff on data submission, QC/QA, with updated systematisation regulations, and for submission of data and information to MoEPP • Government for adopting decrees and decisions on single national entity and coordination committee • MoEPP for adopting rulebooks	
Monitoring entity:	• MoEPP • Government	
GHG(s) affected (if applicable):	As defined in the LCA	
Quantified objective /Indicators used to monitor and evaluate progress over time:	Description:	• Enabling decrees adopted • Enabling rulebooks adopted • Administrative decisions on tasks and responsibilities allocated in the MoEPP and other institutions • Systemisation acts updated • Guidance documents produced • Data bases established and functioning • Reports on National GHG Inventory, Policies and Measures, Projections, • Reports, communications submitted to Convention
	Values in 2030:	
Finance:	Budget: See below action 14 for institutional administrative costs	Administrative costs of institutions
	Source of finance:	Budgets of MoEPP and other relevant institutions
Progress monitoring:	Objective achieved:	Yes/No

Reference to assessments and underpinning technical reports:	Road Map for the Implementation of the Law
Assumptions/ General comments:	• LCA adopted and in force • Secondary legislation (decrees and rulebooks) adopted and in force. • Single national entity established • Coordination Committee with MoEPP and all relevant institutions established • Human and financial resources available in MoEPP and other relevant institutions • All institutions are informed about the system and committed to cooperate for the system and with the MoEPP

A-L-6: Establishment of system of supervision		
Main objective: Establishment of a system of supervision of compliance with obligations under the LCA		
Enabling measure: Appoint the competent environmental inspectors		
Implementation period:		
Type of policy instrument:	• Organisational decisions • Ministry systematisation act	
Link to the EU policies (where applicable):		
Relevant national planning documents, legal and regulatory acts:	LCA	
Implementing entity:	MoEPP	
Monitoring entity:	MoEPP	
GHG(s) affected (if applicable):	As defined in LCA	
Quantified objective /Indicators used to monitor and evaluate progress over time:	Description:	Environmental inspectors in place
	Values in 2030:	
Finance:	Budget: See below action 14 for institutional administrative costs	Administrative costs
	Source of finance:	Inspection budget
Progress monitoring:	Objective achieved:	Yes/No
Reference to assessments and underpinning technical reports:	Road Map for the Implementation of the Law	
Assumptions/ General comments:	• LCA adopted and in force • Human and financial resources available	

A-L-7: Establishment of a system of misdemeanors		
Main objective: Creating the rules for a functioning system of misdemeanors		
Enabling measure: Adopt rulebook on form and contents of misdemeanor payment orders		
Implementation period:	2021-2022	
Type of policy instrument:	Rulebook	
Link to the EU policies (where applicable):		
Relevant national planning documents, legal and regulatory acts:	LCA	
Implementing entity:	MoEPP	
Monitoring entity:	MoEPP	
GHG(s) affected (if applicable):	As defined in LCA	

Quantified objective /Indicators used to monitor and evaluate progress over time:	Description:	Rulebook adopted
	Values in 2030:	
Finance	Budget: See below action 14 for institutional administrative costs	Administrative costs
	Source of finance:	MoEPP budget
Progress monitoring:	Objective achieved:	Yes/No
Reference to assessments and underpinning technical reports:	Road Map for the Implementation of the Law	
Assumptions/ General comments:	• LCA adopted and in force • Resources available at MoEPP	

2.4.2 Actions for further development of the legal framework for climate action

Current legal developments with regard to climate action both, at the European and international levels, as well as the progress of accession of RN Macedonia towards accession to the EU will necessitate the adjustment of the legal framework established with the Law. Therefore, the LCA must be understood as initiating a legislative process to build up the full and continuously adjusted legal framework.

Three factors will determine the needs of continuous legislative adjustments in the coming decade:

- membership of the Republic of North Macedonia in the EU;

- new EU legislation on climate action leading to new requirements in the EU Acquis Communautaire; and

- evaluation of experiences under the currently established legal framework.

2.4.2.1 Adjustments for the date of EU accession

The LCA provides the legal framework for climate action as it can be laid down at the moment when RN Macedonia is a candidate country for EU accession. The LCA can prepare for complying with the obligations of a member state of the EU; it cannot anticipate the obligations of the country as a member state and require application before the date of accession. The actions needed at the time of accession will depend on the outcome of the accession negotiations between RN Macedonia and the agreement reached in the accession treaty.

The main adjustments will be needed for the full compliance with the mechanisms to reduce GHG from industry and aviation, i.e., for the **full participation in the EU Emission Trading System** (ETS). The LCA currently foresees actions to prepare for participation through the requirements of GHG emission permits – for industrial installations - and monitoring and reporting obligations according to an approved monitoring plan which applies to both, industry activities and aviation. This will help identify the GHG emissions in the country from these sectors. What the law does not yet establish is the regime for allocating the allowances for GHG emissions and the participation in the trade of allowances at the EU level. These rules must be established in a process which ensures that they are in place and operational at the date of accession.

The legislative actions will include amendments to the LCA to introduce the legal required legal obligations, specified in additional pieces of secondary legislation for which enabling provisions will be needed. Main responsibility will be with the MoEPP to drive this process, with additional institutional capacity and resources. Close cooperation, information and consultation with stakeholders will be necessary.

The timing of the actions will depend on the date of accession; as soon as the date is fixed preparation for the actions can start. For the contents of the legislative actions, the treaty of accession will need to be taken into account, especially for possible transition period rules.

Further development of the legal framework will also be needed in the sectors not covered by the ETS; these are the sectors under the **Effort-sharing regime**, particularly: energy use in buildings, transport, agriculture, wastes, and F-Gases. With accession – and as the EU legislation stands at the moment – RN Macedonia will be required to comply with targets for the sectors covered which will be prescribed in the accession treaty. The regime, however, will come under review and revision in the near future, and any further development of the national legislation will have to take the developments into account.

While the MoEPP will again have an overall and coordinating role, the relevant sectoral authorities will be implied. The preparation of the actions which are needed will be done in cooperation. It may be necessary to add basic rules to the LCA; this will be decided if appropriate. However, amendments to sectoral legislation, including its secondary legislation, can be expected to fully comply with the EU effort-sharing regime as it will be at the time of accession. There may be implications for the administrative capacity of the sectoral institutions, too. Concerning the possible timing, the same what has been said about the ETS above, applies here too.

A-L-8: Establishment of rules to participate in the EU Emission Trading System (ETS)		
Main objective: Enabling RN Macedonia to participate as EU member in the EU ETS as agreed in accession treaty		
Enabling measures: • Follow the development of EU legislation on ETS • Prepare and establish the legal provisions necessary for the participation of RN Macedonia as EU member in the EU ETS • Regulate the allocation of tradable allowances • Provide for institutional responsibilities and procedures • Prepare and adopt amendments to the LCA as necessary • Prepare and adopt decrees and rulebooks as necessary		
Implementation period:	Depending on date of accession. - When date is fixed, preparations of drafting the legal rules should start so that the rules are determined, enacted and ready for application	
Type of policy instrument:	• Amendments to the LCA • Secondary legislation (decrees and rulebooks) under the LCA	
Link to the EU policies (where applicable):	Directive 2003/87/EC (ETS Directive as amended)	
Relevant national planning documents, legal and regulatory acts:	LCA	
Implementing entity:	• MoEPP for preparation of drafts, in cooperation with other relevant Ministries, e.g. MoE (industry, energy matters), MoTC (aviation) • National Assembly for adopting amendments to LCA • Government for adopting decrees • MoEPP for adopting rulebooks	
Monitoring entity:	MoEPP	
GHG(s) affected (if applicable):	As defined in EU legislation and LCA	
Quantified objective /Indicators used to monitor and evaluate progress over time:	Description:	• Draft legal acts • Adopted legal acts
	Values in 2030:	
Finance:	Budget: See below action 14 for institutional administrative costs	• Administrative costs • Compliance costs TBD (RIA based)

	Source of finance:	• Budget of MoEPP for administrative costs • Private sector finances for compliance costs
Progress monitoring:	Objective achieved:	Yes/No
Reference to assessments and underpinning technical reports:	• Relevant EU documentation • Documents on accession • Accession treaty	
Assumptions/ General comments:	• Date of accession fixed • Accession negotiations completed, accession treaty concluded • Awareness of all stakeholders achieved • Human and financial resources in MoEPP available	

A-L-9: Establishment of legal rules to comply with EU effort-sharing regime		
Main objective: Enabling RN Macedonia to participate in EU effort-sharing at the time of accession and as agreed in accession treaty to comply with the then existing EU acquis		
Enabling measures: • Follow the development of the EU acquis on effort-sharing • Prepare legal rules for participation of RN Macedonia as EU member in the EU effort-sharing regime • Prepare and adopt amendments to LCA as necessary • Prepare and adopt amendments to sectoral legislation governing the relevant sectors. The contents of the legal rules will depend on (a) the further development of the EU legislation and (b) the accession treaty agreements reached for effort-sharing		
Implementation period:	Depending on date of accession. - When date is fixed, preparations of drafting the legal rules should start so that the rules are determined, enacted and ready for application	
Type of policy instrument:	• LCA amendments • Amendments to relevant sectoral legislation	
Link to the EU policies (where applicable):	Regulation (EU) 2018/842 (as amended)	
Relevant national planning documents, legal and regulatory acts:	• LCA • Sectoral legislation on sectors covered by effort-sharing	
Implementing entity:	• MoEPP for LCA and secondary legislation • Sectoral Ministries for relevant sectors for preparation of sectoral legislation adjustments • Government for adoption of decrees • Ministries for adoption of rulebooks • National Assembly (for law amendments)	
Monitoring entity:	• MoEPP • Sectoral Ministries	
GHG(s) affected (if applicable):	As defined in EU legislation	
Quantified objective /Indicators used to monitor and evaluate progress over time:	Description:	• Draft amendments for LCA • Draft amendments for sectoral legislation, as necessary • Adopted legal acts
	Values in 2030:	
Finance:	Budget: See below action 14 for institutional administrative costs	• Administrative costs • Compliance costs TBD (RIA based)

	Source of finance:	• MoEPP and relevant Ministries budgets for administrative costs • Private sector finance if applicable
Progress monitoring:	Objective achieved	Yes/No
Reference to assessments and underpinning technical reports:	• Relevant EU documentation • Documents on accession • Accession treaty	
Assumptions/ General comments:	• Date of accession fixed • Accession negotiations completed, accession treaty concluded • Awareness of all stakeholders achieved • Human and financial resources in MoEPP and sectoral Ministries available	

2.4.2.2 Adjustments to transpose new EU legislation in climate action

EU legislation is currently under fundamental review which will lead to changes in the EU Acquis. RN Macedonia as a candidate country preparing for EU accession will need to consider these developments for transposition and implementation. The EU "Green Deal" launched in December 2019 covers also climate action and has already led to milestones the EU process for new legislation, most prominently to the presentation of a proposed Regulation to establish an EU "climate law" in March 2020, and, as part of it, a proposal for a new GHG reduction target for 2030. The process is currently ongoing as negotiations are being held between the EU institutions to reach final agreement on the elements of the legislative package. However, it is clear that there will be changes in EU legislation, and these changes will affect all areas of climate action and all relevant sectors. Eventually, changes in the national framework will be needed. The country will have to follow closely the process and, where necessary, will have to initiate legislative amendments at various levels. Possible actions are reflected in the table below.

The main responsibility to follow the legal developments at EU level will be with the MoEPP and its climate action unit and staff. New legislative developments at the EU level may necessitate amendments of the legal framework in RN Macedonia, even before the date of accession. Certain EU requirements may relate to the existing framework and may need transposition to adjust the legal rules. The adjustments may relate to all parts of the legal framework, i.e., the LCA, its secondary legislation and the relevant sectoral legislation. The timing will depend on the legislative processes at the EU level and the precise frameworks agreed in the possible new community acts.

A-L-10: Adjustment of legal framework to new EU legislation on climate action	
Main objective: Creating the legal rules to comply with new EU legislation in the area of climate action currently under significant changes	
Enabling measures: • Follow the further development of the EU climate action legislation • Prepare national legislation to further develop the national legal framework accordingly • Prepare and adopt amendments to LCA and related by-laws • Prepare and adopt amendments to sectoral legislation as necessary by new EU legislation	
Implementation period:	2021 - 2030
Type of policy instrument:	• LCA amendments • Amendments to secondary legislation under LCA • Amendments to relevant sectoral legislation and by-laws
Link to the EU policies (where applicable):	All EU legislation in climate action
Relevant national planning documents, legal and regulatory acts:	• LCA and by-laws • Relevant sectoral legislation and by-laws

Implementing entity:	• MoEPP for LCA and by-laws • Relevant sectoral Ministries for sectoral laws and by-laws • Government for adopting new and additional decrees • National Assembly for adopting law amendments • MoEPP and other Ministries for adopting rulebooks	
Monitoring entity:	• MoEPP • Sectoral Ministries	
GHG(s) affected (if applicable):	As defined in EU legislation, LCA	
Quantified objective /Indicators used to monitor and evaluate progress over time:	Description:	• Draft legal acts (primary, secondary) • Adopted legal acts (primary, secondary)
	Values in 2030:	
Finance:	Budget: See below action 14 for institutional administrative costs	• Administrative costs • Compliance costs TBD (RIA based)
	Source of finance:	• Budgets of MoEPP and sectoral Ministries (administrative costs) • Private sector finances (compliance costs)
Progress monitoring:	Objective achieved:	Yes/No
Reference to assessments and underpinning technical reports:	Relevant EU documentation on climate policy and legislation	
Assumptions/ General comments:	• "EU climate law" adopted (expected for mid-2021) • EU climate action acquis subsequently reviewed and revised • EU accession process for RN Macedonia progressed • Accession negotiations started, completed • Accession treaty containing relevant agreements on climate action • MoEPP and other relevant Ministries with human and financial resources	

2.4.2.3 Adjustments to respond to experience under the legal framework

Adjustments due to new planning and institutional developments

Climate action as a cross-cutting task requires the interaction of environmental and sectoral policies, planning and legislation; to succeed, climate action essentially needs coordination and cooperation of all areas. Policies, planning and legislation in the sectors change over time making coordination and cooperation a continuous undertaking. New arrangements and achievements in both, the environmental and the sectoral areas, may have legal implications and may necessitate adjustments of the current legal framework for climate action.

A major pillar of climate action is planning. The LCA provides for the preparation of a Long-term Strategy on Climate Action following the requirements of the EU Regulation 2018/1999 on climate and energy governance which prescribes the contents of climate actions. The requirements for the Strategy also cover climate action in the areas for which efforts are shared between the member states as well as action for adaptation to the negative impacts of climate change. The Strategy must be implemented through a shorter-term planning instrument. In the concept of the EU Regulation 2018/1999, this is the National Energy and Climate Plan (NECP).

In RN Macedonia, the LCA had to take note of the NECP being prepared and being in the process of adoption, based on the relevant legislation and prepared by the institutions competent for energy and climate; the outcome had to be awaited. The current LCA reflects

this situation in a way that it recognizes energy and climate action planning, and requires – following the EU Regulation 2018/1999 – that the NECP shall be consistent with the long-term Strategy. However, in order to make sure that the Long-term Strategy is being implemented in its entirety and in all the areas covered, the LCA provides for a separate planning instrument, namely an Action Plan, and makes detailed prescriptions for its functions and contents. In this way, the current LCA is to ensure that adequate implementation of the long-term strategy in all its dimension is taking place.

If the development of planning tools progresses further and if the NECP when adopted covers all areas of the long-term strategy, including adaptation and the actions in the sectors under the EU effort-sharing regime, there may no longer be a need for a separate planning tool like the currently foreseen Action Plan to implement the long-term strategy. The NECP may serve this purpose.

The essential prerequisite, however, is that the NECP covers all areas and actions in the Long-term Strategy and has the objective and the measures which the LCA has provided for the Action Plan.

It must be a cross-sectoral plan which implements the Strategy in its entirety, not only in parts or in one sector, is updated as need be, and also provides the corrective actions necessary over time. Only then, the Action Plan as foreseen in the LCA can be replaced and the necessary amendments to the LCA can be made. The amendments would relate to the contents of the NECP, its objectives, and the need to harmonize sectoral planning with the NECP. If need be or appropriate, new institutional arrangements for coordination and cooperation for the harmonisation of the planning tools will be made.

The MoEPP and the MoE would be in charge to follow these developments and provide the adjustments. Both Ministries would cooperate with the relevant sectoral Ministries and institutions. The timing would depend on the further progress of the adoption of the NECP. The basic assumption is that the NECP is as comprehensive and functional as the Action Plan in the current LCA.

A-L-11: Adjustment of legal framework to respond to new planning and institutional developments		
Main objective: Creating of legal rules to adjust the planning for climate action to new planning tools and new arrangements for coordination and cooperation between environmental and sectoral planning		
Enabling measures: • Monitor the development and contents of the NECP • Verify if all areas of the long-term strategy are covered and implemented by the NECP • If so, prepare and adopt amendments to the LCA making NECP the planning tool to implement the long-term strategy, providing the objectives, functions and contents of the plan necessary for implementation, making new provisions on the harmonisation of all relevant planning tools, and where necessary or appropriate provide for institutional task and responsibilities.		
Implementation period:	2021- 2022, following adoption of the LCA and the adoption of the NECP	
Type of policy instrument:	• Legal amendments to LCA	
Link to the EU policies (where applicable):	All parts of the climate acquis, especially EU Regulation 2018/1999 (governance)	
Relevant national planning documents, legal and regulatory acts:	• LCA • Long-term Strategy • Law on Energy	
Implementing entity:	• MoEPP for LCA and Strategy • MoE • Sectoral Ministries to coordinate and cooperate • Assembly for adopting law amendments	
Monitoring entity:	MoEPP in cooperation with MoE and sectoral Ministries	
GHG(s) affected (if applicable):	As defined in the EU climate action acquis	

Quantified objective /Indicators used to monitor and evaluate progress over time:	Description:	• NECP as adopted • Draft legislative amendments • Adopted legislative amendments
	Values in 2030:	
Finance	Budget: See below action 14 for institutional administrative costs	• Administrative costs • Compliance costs TBD (RIA based)
	Source of finance:	• MoEPP and other Ministries budgets for administrative costs • Private sector finances for compliance costs, as applicable
Progress monitoring:	Objective achieved	Yes/No
Reference to assessments and underpinning technical reports:		
Assumptions/ General comments:	• LCA adopted and in force • Energy legislation as amended in force • NECP adopted and covers all climate action areas • MoEPP and MoE equipped with human and financial resources to implement the Long-term Strategy and the NECP • Cooperation between MoEPP, MoE and other relevant Ministries established and functioning for ensuring the harmonisation of all plans and the implementation of all plans in line with the long-term Strategy and the NECP • Political commitment, will and support continues for effective climate action	

Climate action is a challenging task for governments, and so is legislation to support climate action. Legislation is not only complex and multi-sectoral; it is also technically and politically complicated and sensitive and requires continuous monitoring with regard to completeness and effectiveness, and where evaluation identifies gaps in this regard, adjustment in legislation will be needed.

Monitoring of experiences under current legislation needs to look at the legal framework in its entirety, i.e. the Law on Climate Action, the secondary legislation enacted to implement it and the relevant sectoral legislation and its respective lye-laws. Monitoring will have to evaluate if the legislative objectives are achieved, where constraints appear in practice, if capacities in all respects – administrative, human resources, financial – are sufficient or need to be improved. It will also be necessary to verify how legislation is implemented in practice and throughout business and civil society in order to find out if the level of education, training and public awareness at large necessary for effective climate action is reached. To the extent that this is not the case, complementary legislative action may need to be considered.

The main responsibility will be with the MoEPP. For those areas where competences are shared, especially with regard to effort-sharing, cooperation and coordination with other, sectoral authorities is needed. The lead will, however, be with the MoEPP. The monitoring of the implementation in practice, its acceptance by society, businesses and citizens, should start with the implementation of the LCA. The monitoring may result in the need of more rules in the LCA in order to strengthen implementation, and these rules may also refer to issues such as awareness-raising, education, and capacity-building. The rules may also cover financial matters for which, however, rules in the LCA would not be sufficient. Specific financial instruments would need to be worked out to be included in the relevant sectoral (financial) legislation. Here, cooperation with the finance authorities will be essential.

A-L-12: Adjustment of legal framework to respond to experience under current legislation

<table>
<tr><td colspan="3">Main objective: Creating of legal rules to enable RN Macedonia to strengthen legal framework for climate action over time</td></tr>
<tr><td colspan="3">Enabling measures:
• Monitor regularly the implementation or the LCA and by-laws and the implementation of the relevant sectoral legislation and by-laws
• Report regularly on the implementation of climate action legislation, using for this purpose regular reports which are prepared
• Suggest in the reports measures for further development of the legal framework as necessary
• Prepare and adopt amendments to the LCA and by-laws and sectoral legislation and by-laws as necessary</td></tr>
<tr><td>Implementation period:</td><td colspan="2">2021, following adoption of the LCA, continuously up to 2030.</td></tr>
<tr><td>Type of policy instrument:</td><td colspan="2">• Reports on implementation of the legal framework
• Legal amendments to LCA and relevant sectoral legislation (primary and secondary), as necessary</td></tr>
<tr><td>Link to the EU policies (where applicable):</td><td colspan="2">All parts of the climate acquis</td></tr>
<tr><td>Relevant national planning documents, legal and regulatory acts:</td><td colspan="2">• LCA (primary and secondary)
• Sectoral legislation (primary and secondary)</td></tr>
<tr><td>Implementing entity:</td><td colspan="2">• MoEPP for reporting and proposing LCA amendments and amendments to by-laws
• Sectoral Ministries to cooperate in reporting and proposing amendments as needed in their respective sectoral legislation
• Government for adopting decrees
• Ministries for adopting rulebooks
• Assembly for adopting law amendments</td></tr>
<tr><td>Monitoring entity:</td><td colspan="2">MoEPP in cooperation with sectoral Ministries</td></tr>
<tr><td>GHG(s) affected (if applicable):</td><td>As defined in the EU climate action acquis</td><td></td></tr>
<tr><td rowspan="2">Quantified objective /Indicators used to monitor and evaluate progress over time:</td><td>Description:</td><td>• Regular reports on the implementation of existing legal framework
• Draft legislative amendments
• Adopted legislative amendments</td></tr>
<tr><td>Values in 2030:</td><td></td></tr>
<tr><td rowspan="2">Finance</td><td>Budget: See below action 14 for institutional administrative costs</td><td>• Administrative costs
• Compliance costs TBD (RIA based)</td></tr>
<tr><td>Source of finance:</td><td>• MoEPP and other Ministries budgets for administrative costs
• Private sector finances for compliance costs, as applicable</td></tr>
<tr><td>Progress monitoring:</td><td>Objective achieved</td><td>Yes/No</td></tr>
<tr><td>Reference to assessments and underpinning technical reports:</td><td colspan="2">• Reports and documents related to climate action and prepared, adopted and submitted in implementing the LCA
• Assessments and analyses of climate action in RN Macedonia</td></tr>
<tr><td>Assumptions/ General comments:</td><td colspan="2">• LCA adopted and in force
• MoEPP has human and financial resources to report and to propose and develop legal changes
• Cooperation between MoEPP and other relevant Ministries established and functioning for reporting and preparing legislative changes in the relevant areas of climate action
• Political commitment, will and support continues to be available for effective climate action</td></tr>
</table>

2.4.3 Actions for the strengthening of the institutional capacity

The following actions are based on the Action Plan for Administrative Capacity Strengthening for Climate Action. For details reference is being made to this Action Plan.[17] The Action Plan distinguishes between actions of organisational and structural strengthening and actions of administrative capacity strengthening.

The Action Plan recommends actions concerning the **organisation and structure** of the relevant national institutions involved in climate action. The proposed actions cover internal reorganisations and inter-institutional relations to ensure the necessary cooperation and coordination of authorities and governmental institutions. Cooperation and coordination in government will be ensured through the National Council on Climate Change foreseen in the LCA and to be established immediately after the adoption of the Law; it is, therefore included in the immediate actions above presented in section 3.1.

The actions for institutional arrangements cover:

- Provide institutions with responsibilities in climate action with necessary, qualified staff and, to the extent possible, a distinguished structure for climate action, be it a department or a unit.
- Provide each of these structures for climate action with a clear mandate and comprehensive, consistent description of tasks and responsibilities, avoiding overlaps and conflicts of competences with other structures within the same institution or with other institutions.
- Ensure that each of these structures for climate action be staffed and equipped with the necessary human, financial, and technical resources covering all relevant subject matters falling within their competences and functions (policy, regulatory, monitoring, reporting, legal, and financial).
- Provide institutions with responsibilities in climate action with legal and financial support, through resources either within their departments or units, or through mechanisms of cooperation with central governmental structures.
- Where tasks in climate action are shared within a particular institution, ensure that communication, coordination, and cooperation mechanisms are established.
- Ensure that competent authorities have access to scientific expertise, as needed.

A-L-13: Establishment of organizational capacity in institutions relevant for climate action	
Main objective: Enabling competent governmental institutions to establish the organizational capacity necessary to implement climate action	
Enabling measures: • Reorganize, restructure institution for climate action and implementing LCA • Create staff units for climate action • Allocate tasks of climate action to sufficient and qualified staff • Update systematization regulations • Mobilize human, financial and technical resources • Establish cooperation and coordination arrangements between units • Establish cooperation and coordination between institutions in Government	
Implementation period:	2021 – 2025 (with subsequent adjustments, as needed)
Type of policy instrument:	• Organizational decisions of Ministries

[17] Action Plan for Administrative Capacity Strengthening for Climate Action, dated 30 12 2020 (Project Document)

	• Government decisions for inter-institutional cooperation (as needed)	
Link to the EU policies (where applicable):	All EU climate change acquis	
Relevant national planning documents, legal and regulatory acts:	• LCA and secondary legislation • Sectoral legislation relating to climate action (primary and secondary)	
Implementing entity:	• MoEPP • Sectoral Ministries	
Monitoring entity:	• MoEPP • Relevant sectoral Ministries • Other state bodies	
GHG(s) affected (if applicable):	As defined in EU climate action acquis and LCA	
Quantified objective /Indicators used to monitor and evaluate progress over time:	Description:	• Organizational decisions taken • Units created • Staff employed • Systematisation updated • Budgets for climate action allocated • Technical resources available, especially IT hardware, software • Dataflow organized • Reports delivered • Coordination meetings held
	Values in 2030:	
Finance	Budget: See below action 14 for institutional administrative costs	Administrative costs
	Source of finance:	• Budgets of MoEPP • Budgets of sectoral Ministries and relevant state actors (for administrative costs)
Progress monitoring:	Objective achieved:	Yes/No
Reference to assessments and underpinning technical reports:	Action Plan for Administrative Capacity Strengthening for Climate Action	
Assumptions/ General comments:	• Law on Climate Action adopted and in force • Political will to implement climate action • Human and financial resources available • Cooperation and coordination in Ministries and state bodies between relevant units functioning • Cooperation and coordination between all relevant institutions in Government functioning	

The actions proposed to strengthen **administrative capacity through adequate staffing** for climate action in the various institutions responsible in the area are also based on the Action Plan for Administrative Capacity Strengthening mentioned before. That Action Plan identified all measures to reach the capacity needed to carry out the **climate action tasks** in the relevant institutions in RN Macedonia. In a second step the capacity strengthening measures needed in **each institution** were identified and proposed over time, with a projection period up to 10 year, i.e. up to 2030. This second part of the Action Plan is referred to here.

A-L-14: Establishment of necessary staff capacity in institutions for climate action
Main objective: Providing of adequate staff resources in the institutions with tasks in climate action.
Enabling measures:

<table>
<tr><td colspan="6">

- Identify existing staff in climate action
- Identify needs for additional staff
- Increase staff in steps over time
- Allocate the necessary work time to climate action required by EU, international commitments
- Identify sources of budget and request necessary budget
- Provide training for existing and new staff
- Provide information and incentives to motivate staff for climate action

</td></tr>
<tr><td>Implementation period:</td><td colspan="5">2021-2025, following the adoption and entry-into-force of the LCA</td></tr>
<tr><td>Type of policy instrument:</td><td colspan="5">Administrative decisions of Ministries and state bodies to request and allocate financial resources and employ additional staff for climate action tasks</td></tr>
<tr><td>Link to the EU policies (where applicable):</td><td colspan="5">All EU climate action acquis</td></tr>
<tr><td>Relevant national planning documents, legal and regulatory acts:</td><td colspan="5">• LCA and secondary legislation
• Relevant sectoral legislation (primary and secondary)</td></tr>
<tr><td>Implementing entity:</td><td colspan="5">• MoEPP
• MoE
• MLSG
• Energy and Water Regulatory Commission
• Deputy Prime Minister Cabinet
• MoF
• MoH
• Hydro-meteorological Service
• MoAFWE
• MoTC
• MoI
• State Market Inspectorate
• State Statistical Office
• MANU</td></tr>
<tr><td>Monitoring entity:</td><td colspan="5">All institutions, as above</td></tr>
<tr><td>GHG(s) affected (if applicable):</td><td>As defined in relevant EU legislation and LCA</td><td colspan="4"></td></tr>
<tr><td rowspan="2">Quantified objective /Indicators used to monitor and evaluate progress over time:</td><td>Description:</td><td colspan="4">• Administrative decision taken to employ additional staff
• Staff employed and increased over time
• Systematisation acts updated
• Budgets allocated to relevant institutions for additional staff and increased over time as necessary</td></tr>
<tr><td>Values in 2030:</td><td colspan="4"></td></tr>
<tr><td>Finance</td><td>Budget:
MKD per year
per institution
short-term/ medium-term/ long-term
(based on Action Plan Administrative Capacity Strengthening for Climate Action 2020)</td><td>MoEPP</td><td>14.034.350</td><td>4.040.850</td><td>0</td></tr>
<tr><td></td><td></td><td>MoE</td><td>3.977.300</td><td>513.200</td><td>0</td></tr>
<tr><td></td><td></td><td>MLSG</td><td>804.00</td><td>0</td><td>0</td></tr>
<tr><td></td><td></td><td>ERC</td><td>328.400</td><td>0</td><td>0</td></tr>
<tr><td></td><td></td><td>DPM</td><td>5.367.900</td><td>0</td><td>0</td></tr>
<tr><td></td><td></td><td>MoF</td><td>1.156.500</td><td>0</td><td>0</td></tr>
<tr><td></td><td></td><td>SSO</td><td>0</td><td>734.00</td><td>0</td></tr>
<tr><td></td><td></td><td>MAFWE</td><td>1.140.300</td><td>450.900</td><td>0</td></tr>
<tr><td></td><td></td><td>MoTC</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td></td><td></td><td>MoH</td><td>0</td><td>3.740.000</td><td>0</td></tr>
<tr><td></td><td></td><td>Hydro-M</td><td>1.979.500</td><td>0</td><td>0</td></tr>
</table>

		MANU	1.787.000	0	0
		Market I	545.00	0	0
		MoI	837.000	0	0
		MoF Cust	813.000	0	0
	Source of finance:	Budgets allocated to relevant governmental institutions, Ministries and state bodies			
Progress monitoring:	Objective achieved:	Yes/No			
Reference to assessments and underpinning technical reports:	Action Plan for Administrative Capacity Strengthening for Climate Action				
Assumptions/ General comments:	• LCA adopted and in force • Political commitment and will to implement climate action • Relevant institutions and state bodies committed to strengthen their staff capacity. • Financial resources made available for additional staff in all relevant institutions and increased over time				

A-L-15: Strengthening Capacities for Implementation of Environmental and Climate Change Legislation		
Main objective: To strengthen capacities at all levels of the public administration to promote, monitor, and enforce environmental and climate change legislation in the Republic of North Macedonia		
Description: Strengthening Capacities for Implementation of Environmental and Climate Change Legislation		
Implementation period:	2022 – 2025	
Type of policy instrument:	Legal	
Link to the EU policies (where applicable):		
Relevant national planning documents, legal and regulatory acts:	• Law on Climate Action • Secondary legislation on climate action • Law on Environment • Secondary legislation on environment	
Implementing entity:	MoEPP	
Monitoring entity:	MoEPP	
GHG(s) affected (if applicable):	CO2, CH4, N2O	
Quantified objective /Indicators used to monitor and evaluate progress over time:	Gaps in environmental and climate legislation identified	
	Number of new legal acts developed for Further alignment of the national legislation with the EU climate legislation	
Actions to support the implementation of the objective:	• Assessment of the environmental and climate legal and policy framework • Assessment of the existing national legal and strategic frameworks vs. the most recent EU policies and measures for climate action • Further alignment of the national legislation with the EU climate legislation • Strengthening of the administrative capacity at the MoEPP • Strengthening of the capacity for environmental and climate inspection and enforcement	

	• Environmental and climate awareness raising and enhanced exchange of information	
Finance:	Budget:	2 milion EUR
	Source of finance:	EU IPA or other donor funds
Progress monitoring:	Objective achieved: Activities implemented:	Yes/No Yes/No
Reference to assessments and underpinning technical reports:		
Assumptions/ General comments:		

3. IMPACT ASSESSMENT

3.1 For the Implementation of the Strategy

3.1.1 Environmental impact assessment

According to the Law on Environment ("Official Gazette of the RN Macedonia" no. 53/2005; 81/2005; 24/2007; 159/2008; 83/2009; 48/2010; 124/2010; 51/2011; 123/2012; 93/2013; 187/2013; 42/2014; 44/2015; 129/2015; 192/2015; 39/2016 and 99/2018), the holder of the planning document is obliged to conduct a procedure for assessment of the impact of the planning document on the environment, as well as on human life and health.

The MoEPP and the Project have initiated the process of development of Strategic Environmental Assessment (SEA) and the draft assessment was prepared in accordance with the Decree on the form and the content of the report on strategic environmental assessment (Official Gazette of the RN Macedonia no. 153/2007).

The SEA of the draft Long-term Strategy on Climate Action made a detailed assessment of the environmental impacts of the policies and measures foreseen under the Strategy, which provides confidence that the environmental consequences of the measures foreseen under the Strategy are identified already at the stage of its preparation and appropriate measures to prevent, control and/or compensate the possible adverse impacts are considered already in the development phase. The procedure also provides a framework for public debate on the consequences, options and obligations, consideration of comments and their involvement in decision-making.

Both scenarios envisage a 23% reduction in greenhouse gas emissions by 2050 in the WEM scenario and a 72% reduction in the WAM scenario compared to 1990 levels. The largest percentage of emissions come from the energy sector, a 72% reduction could occur if in this sector achieve a reduction of 64% in 2050, compared to 1990. These projections do not propose measures to reduce greenhouse gas emissions in the IPPU sector, so the forecasts are taken according to the basic regression model, which by 2050 compared to 1990 is expected to increase of greenhouse gases by 153%.

Measures to reduce greenhouse gas emissions from the energy sector (energy production, industry, private and public buildings) will contribute to reducing greenhouse gas emissions. In addition to reducing greenhouse gases, the implementation of these measures and activities will contribute to improving the media and the state of the environment and the health of the population.

Additionally, the measures of the Strategy aim at stability in the energy sector, increased participation of renewable energy sources in the energy sector for electricity and heat production, diversification in the use of energy and improved services in the production and supply of electricity and heat.

In addition to the benefits in terms of reducing greenhouse gases and improving the environmental situation at national level, some of the individual activities envisaged, such as the construction of hydropower plants or biogas plants and RES, may cause adverse environmental effects and may have negative health effects on the local population. The construction of hydropower plants can have an impact on surface water, change in river flow, destruction of nature sites, disturbance of soils, landscape, etc.

The measures envisaged in the sector transport will greatly contribute to improvement of the air quality through increased use of rail, electric vehicles, encouraging less use of vehicles and promoting sustainable mobility (use of bicycles, walking, etc.). Negative impacts may occur during the implementation of the project for construction of the railway to the Republic

of Bulgaria, such as destruction of nature sites, disturbance of soils and landscapes, increased noise, destruction of natural goods, etc.

The activities envisaged for the sector agriculture are mainly related to improved manure management which has positive impacts on the environment. However, the Strategy also foreseen measures for land use change which may cause negative impacts on the state of the environment. The land use change activities can affect biodiversity and certain species and they can also cause a change in the soil quality.

The forestry sector is significant affected from climate change as a result of the rising temperatures, reduced rainfalls and changes in seasons resulting in more frequent forest fires and changes in forest productivity. Without adaptation measures, the forestry losses will continue to grow. The Strategy does not foresee adaptation measures related to the sector forestry, since a comprehensive National Adaptation Plan is expected to be developed soon. In addition, implementation of some of the planned policies and measures foreseen under the energy sector can cause negative impacts to the sector forestry.

The need for proper waste management in order to protect the environment, and thus mitigate the impacts of climate change is inevitable. Reducing the amount of waste as well as recycling and reuse of some types will give a positive contribution in that direction. The waste related measures proposed in the Strategy aim to reduce air and soil emissions from the waste treatment and incineration. Thus, the impacts of the implementation of the waste related measures will be mainly positive.

3.1.2 Socio-economic impact

The Strategy foresees implementation of 64 policies and measures related to mitigation and seven policies and measures related to adaptation. It is worth underlining that the investment in the adaptation measures are limited because the policies and measures foreseen under the Strategy are related to enabling activities for establishment of more comprehensive and overarching set of adaptation policies and measures, as foreseen in the forthcoming National Adaptation Plan. In addition, This Action Plan contains additional policies and measures related to enabling activities, cross sectoral coordination processes and support of the implementation of the legal framework and strengthening of the institutional capacities. However, most of the investments are foreseen under the mitigation policies and measures.

The realization of a transition towards low-carbon society in RN Macedonia would require approximately 19 Bill. EUR of cumulative capital investments in the period 2020-2050 (WEM scenario), while for an enhanced transition (WAM scenario) around 35 Bill. EUR are needed. The energy sector (supply and demand side + infrastructure) accounts for about 99% of the total investments in both WEM and WAM scenarios. The total cumulative investments in the AFOLU sector are about 115 mil. EUR, while the total investments in the waste sector are about 67 mil. EUR in both scenarios. It can be noted that the total investments in the WAM scenario are almost doubled compared to the WEM scenario. The focus in both scenarios is on the capital investments in energy efficiency, followed by investments in RES generation. To accept the increased use of RES in the WAM scenario capital investments would be also needed in the energy system infrastructure.

For a sustainable transition, besides the economic and environmental, the social aspect is also very important. According to the years in which the proposed measures and policies are implemented, for some of them, the number of domestic green jobs is calculated at yearly level for the WAM scenario. The highest number of around 10,000 green jobs is achieved in 2035, which represents 2.7 times more jobs than the current number of employees in the coal power plants in RN Macedonia. Retrofitting contributes to the most for the opening of new jobs (around 58%), followed by construction of new houses, including passive houses (with around 19% share). Because of the gradual increase of the standard for renovation and construction of new buildings up to 2035, the number of the new green jobs from these measures is

increasing in that period. Additionally, the measures with the highest share are (1) Retrofitting of existing residential buildings (50% in 2035), (2) Construction of passive buildings (18% in 2035), (3) RES without incentives, (4) Solar thermal collectors, (5) Retrofitting of existing commercial buildings, and (6) Solar rooftop. Furthermore, it is shown that more than 27% of the new domestic green jobs in 2050 can be assigned to women.

Regarding the socio-economic situation of the population, the following impacts are generally expected from the implementation of the Long-term Strategy on Climate Action:

- Increased economic pressure as a result of the introduction of new taxes;
- Possibility to introduce the concept “prosumers” and to reduce the;
- Reduction of product prices as a result of the introduction of energy efficient industrial processes;
- Better information of the citizens and energy savings by marking the electrical devices;
- Greater profitability and development of the private sector through the introduction of EE principles in commercial buildings and the work process;
- Increasing agricultural yield through improved land management;
- Improving the quality of life and living facilities;
- Reducing gender inequality and improving the situation of young people; and
- Opportunity for urban-rural migration and mitigation of differences in the development of the regions.

In more details, the implementation of the Strategy will mean the closure or modernization of coal-fired power plants, investment in renewable sources and environmentally friendly technologies, energy efficiency, reduction of grid losses and provision of a favorable environment and affordable renewable energy prices.

The two existing thermal power plants that produce electricity are owned by AD Power Plants of Northern Macedonia (ESM) and are located in the Polog region. Their closure will mean loss of jobs, which will cause a negative impact on local employment and significant socio-economic effects. According to the Annual Report of AD ESM for 2019, TPP Oslomej and TPP Bitola with their mines employ 3588 employees. Some workers will be able to transfer to new activities in ESM linked to new energy sources – be it renewables or linked to gas.

The implementation of climate-related policies and measures will accelerate the recovery of investments and activities in key economic sectors such as services, tourism, construction and energy, and at the same time create new jobs. The strategy will indirectly contribute to the recovery of the economy and the state from the consequences of COVID-19.

The implementation of the envisaged measures will also generate green jobs and create training opportunities in areas including renewable energy, energy efficiency, access to energy, improving household resilience, providing the infrastructure needed to support active transport and infrastructure, sustainable and resilient sectors, such as forestry, agriculture, etc.

In addition, it is essential to take proactive steps to build climate resilience and to invest in adaptation measures, especially for the poorest or most marginalized in society, as well as for the sectors most affected by the pandemic. Finally, investing in resilience and capacity building is crucial instrument to tackle the adverse effects of climate change and to provide an enabling and sustainable environment for economic investment and development.

3.2 For the Implementation of the Law

The impacts of the draft Law on Climate Action (LCA) were assessment in the Regulatory Impact Assessment (RIA) undertaken by the project.[18] The main findings on the costs and benefits of the LCA can be summarized as follows:

Economic and social impacts of climate action

Climate change will have pervasive socio-economic consequences that will not only affect major economic sectors such as agriculture, energy or healthcare, but will also result in changes to the supply and demand for goods and services of all sectors of the economy, albeit with varying levels of intensity. Higher temperatures, sea level rise, and other climatic changes (changes in regional precipitation patterns, the water cycle, frequency and intensity of extreme weather events), will also impact aspects of life that are not primarily based on or related to economic activity, as for example human security, health and well-being, culture, people's capabilities, and environmental quality.

Mitigation measures reduces the expected level of climate damages (the likely uncertainty range reduces damages from 2-10% to 1-3% by 2100 for the selected climate impacts, according to the simulations). Furthermore, less ambitious mitigation policies in the first decades will have lower short-term costs but lead to higher long-term risks (in quantitative terms, this result is heavily influenced by the choice of discount rate).

Mitigation policies will reduce the negative impacts of climate change on all economic sectors, yet the costs of these policies will not be borne by all sectors proportionally to their expected benefits. Both damages and the mitigation policy lead to a shift in the structure of the economy towards more services. The detailed economic modelling analysis is used to shed further light on this, again with a horizon to 2060.

- Agriculture, will experience substantial direct and indirect impacts from climate damages; its high emissions could imply substantial costs from stringent economy-wide mitigation policies;
- For energy production and the industrial sectors the climate damages are smaller than the potential effects from stringent economy-wide mitigation policies. Renewable power generation can substantially increase production activities if an ambitious mitigation policy is implemented, but on balance the negative effects on fossil fuel producers outweigh those on renewables; and
- Services are projected to benefit from the mitigation policy as they are relatively clean, but they are negatively affected by climate damages. However, given the large size of services compared to the other sectors, the relative share of the services sectors in total GDP can increase, i.e. they are relatively less affected than other sectors.

Fiscal and administrative costs

Fiscal Implications - Law on Climate Action (amounts in MKD)							
	Art	Cost description	Calculations - cost structure	Total Annual Amount First Year	Total annual amount second year	Total annual amount third year	Budget line
1	10	Remuneration for members of the Council *)	(15 members x 50.000 MKD+10% Personal Tax)	834,000.00	834,000.00	834,000.00	425

[18] Report on Regulatory Impact Assessment on the Law on Climate Action, draft, 20 08 2020.

2	62 and 63	Additional employments in the State inspectorate for Environment with two state environmental inspectors /1 Senior and 1 Independent	Net salary of senior inspector 29.000 MKD; Net salary of Independent Inspector 26.000 MKD	990,000.00	990,000.00	990,000.00	40
3	62 and 63	Other costs for new employment (furniture, PC, phone, other overhead)	#First Year: PC 25.000 MKD; Furniture 15.000 MKD, Phone 5.000 MKD, Overhead 35.000 MKD per employee. From first year on only overhead.	160,000.00	70,000.00	70,000.00	421; 423
4	62 and 63	Training for conducting inspections related to the Law on climate action	Training home and abroad incl accommodation, transport, fee for participation if appl (2 new inspectors)	250,000.00	200,000.00	150,000.00	420; 425
5	Law all	Training on expertise for implementation of the law	Training home and abroad incl accommodation, transport, fee for participation if appl (20 people in MoEPP and line ministries)	1,000,000.00	500,000.00	300,000.00	420; 425
6	Costs with access to EU	Establish and keep an electronic registry of the greenhouse gas emission permits issued and make it available to the public.	First year: Software purchase 1.000.000 MKD; Hardware upgrade 600.000 MKD; From first year on: Licenses and maintenance 200.000 MKD	1,600,000	200,000	200,000	480
Total amount without position 6				3,234,000.00	2,594,000.00	2,344,000.00	
Total amount with position 6				4,834,000.00	2,794,000.00	2,544,000.00	

(*) Depending on option chosen for NCCC.

Compliance costs

The RIA also assessed the compliance costs for operators in industries whose activities fall under the GHG emission permit and monitoring and reporting system (aviation activities were left aside for the time being as not applicable). Compliance with the requirements in the LCA will lead to administrative activities and to information obligations.

The LCA provides at this stage for requirements for operators of industrial installations and aviation activities to apply for GHG permits (industry) and for approvals of monitoring plans (aviation). The LCA also provides for monitoring and reporting obligations of operators in industry and aviation. The LCA does not yet foresee the participation in the EU Emission Trading System as RN Macedonia is a candidate country and will participate only when a member of the EU. The compliance costs therefore cover the costs for the permitting and approval procedures and the costs for monitoring and reporting.

The compliance costs of applying for GHG emission permits for all industrial operators falling under the system were estimated at MKD 68.141.140,40.

The compliance costs of monitoring and reporting for all industrial operators under the system were estimated at MKD 2.882.102,40 per monitoring and reporting cycle.

4. MONITORING AND EVALUATION FRAMEWORK

The overall objective in the implementation of the Strategy and Law is to support RN Macedonia in achieving the long-term goals of climate action, i.e., full transposition and implementation of the EU climate acquis, achieving low carbon emissions and climate resilient development.

The monitoring and the evaluation framework of the Action Plan for the first phase of implementation of the Strategy and the Law is supported and enabled by the legal acts prepared by the Project, the Law on Climate Action and the Decree on the national inventory system. Moreover, Annex II of the Decree on the national inventory system defines the format for reporting on the information on implementation of the policies and measures and that format has been used as a template for description and elaboration of the Actions foreseen under this Action Plan.

The CBIT Project implemented by UNDP has recently started to implement an activity for development of a digital MRV tool that will support the monitoring and the reporting of the climate action in the country, including aspects of policies, measures and projections, climate finance and status of achievements of specific objectives. This tool will be designed in a manner to support the monitoring of the implementation of the enhanced NDC, as well as the implementation of this specific Action Plan as a primary tool for climate action in the country. As defined in Article 57 of the LCA, starting from the year 2025, the country will be obliged to report on the implementation of the mitigation policies and measures on a biennial basis, and on the implementation of adaptation actins on 4 years.

The actions defined in this Action Plan contain indicators and quantified objectives for the targeted years, so there is no need of defining separate monitoring framework that should support the evaluation of the implementation of the Action Plan.

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Republic of North Macedonia

Ministry of Environment and Physical Planning