



Republic of North Macedonia
**Ministry of Environment
and Physical Planning**



RAPID SOCIO-ECONOMIC ASSESSMENT OF THE MACEDONIAN ENHANCED NDC TARGETS/MEASURES

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Climate Change (enhanced NDC)



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This report has been prepared by the team of DS Institute led by Dr. Gaston GOHOU. The team members are Dr. Lea Salmon MARCHAT, Mrs. Claude LEBLANC, Mrs. Aimée USANASE et Mrs. Putri KUSUMASTUTI.

Contact: Dr Gaston GOHOU | ggohou@dsinstitute.org
Phone: +1 418 914 5444

3155 chemin Ste Foy, Quebec City, G1X 1R3, Qc,Canada |
www.dsinstitute.org

NORTH MACEDONIA MAP



ACRONYMS

AFOLU	Agriculture, Forestry and Other Land Use
C&D	Construction and demolition
CE	Circular Economy
CHP	Combined Heat and Power Plants
CO2-eq	Carbon Dioxide equivalents
e-WAM	Extended mitigation scenario WEO World Energy Outlook
EC	European Commission
ELVs	End of Life Vehicles
EPR	Extended producer responsibility EU European Union
EU	European Union
FBUR	First Biennial Update Report
GAP	Good agricultural practice
GDP	Gross Domestic Product
GHG	Greenhouse Gases
GWP	Global Warming Potential
HEV	Hybrid Electric Vehicle
HPP	Hydropower Plant
ICA	International consultation and analysis
IND4.0	Fourth industrial Revolution
INDC	Intended Nationally Determined Contributions
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial Processes and Product Use
LCI	Life cycle inventory
LNG	Liquefied natural gas
LPG	Liquefied petroleum gas
MARKAL	(MARKet ALlocation)
MBT	Mechanical and biological treatment MS Member states
MEMO	National Electricity Market Operator
NCSP	National Communication Supporting Program

NDCs	Nationally Determined Contributions
NMWP	National Waste Management Plan SRF Solid Recovered Fuel
OECD	Organization for Economic Co-operation and Development
PHEV	Plug-in Hybrid Electric Vehicle
RES	Renewable energy sources
SBUR	Second Biennial Update Report SDG Sustainable Development Goals
SOM	Soil Organic Matter
STUGRES	Study on the Heating in the City of Skopje Analysis of Policies and Measures
TMR	Total Mix Ration
TNC	Third National Communication
UN	United Nations
UNDP	United Nations Development Program
UNFCCC	United Nations Framework Convention on Climate Change
WAM	With additional measures
WEM	With existing measures
WFD	Waste Framework Directive
WOM	Without measures
WtE	Waste to Energy
TPP	Thermal Power Plant

Chemical symbols

CH ₄	Methane
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
CO ₂ -eq	Carbon Dioxide equivalents
N ₂ O	Nitrous Oxide

Units and Metric Symbols

Unit	Name	Unit for
g	gram	mass
W	watt	power
J	joule	energy
m	meter	length
Wh	watt-hour	energy
toe	ton of oil equivalent	energy

Mass Unit Conversion

1g		
1kg	= 1 000 g	
1t	= 1 000 kg	= 1 Mg
1kt	= 1 000 t	= 1 Gg
1Mt	= 1 000 000 t	= 1 Tg

Metric Symbol	Prefix	Factor
P	peta	10 ¹⁵
T	tera	10 ¹²
G	giga	10 ⁹
M	mega	10 ⁶
k	kilo	10 ³
h	hecto	10 ²
da	deca	10 ¹
d	deci	01-Oct
c	centi	02-Oct
m	milli	03-Oct
μ	micro	06-Oct
n	nano	09-Oct
p	pico	12-Oct





Vulnerable groups

Social vulnerability In North Macedonia. North Macedonia defines vulnerability as the presence of special characteristics, specialties and circumstances of the individual, community, system or objects that are making them susceptible to negative influences and damaging factors of a given hazard. As energy is the main sector of the eNDC, the following sections are assessing the use of energy by the vulnerable groups.

Climate change. The Republic of North Macedonia identifies 14 vulnerable groups. two main groups as being at high risk based on their economic and social conditions: women and vulnerable groups in the Skopje City.

Covid-19 in Macedonia

In North Macedonia, from January 3rd to February 16th, 2021, there have been 97,456 confirmed cases of COVID-19 with 3,003 deaths. To combat the spread of the virus and reduce the health impact, governments quickly implemented, at the end of March 2020, health measures focused on containment and physical distancing.

Socio-economic impacts of the Covid-19. The GDP contracted in 2020 by 5.4% because of the Covid-19 pandemic. The fiscal position of the government has also deteriorated due to the snowball effect of the constraints taken by all countries. The government revenue is now expected to reduce by 11.5% (about 415 million EUR). The industry sector is the one that is the more hit by the pandemic. The recession of the economy in early 2020 has a direct impact on unemployment. Since the beginning of the pandemic, 45,543 jobs have been lost and overall, at the country level, unemployment increase by almost 43%.

North Macedonia after the Covid-19 plan. The country has thus adopted a series of economic and legislative measures (69 protocols) aimed at limiting the spread of the virus and preserving as many jobs as possible. Since the beginning of the crisis, the Macedonian government has deployed four packages of economic

measures. In total, the overall investment plan for the new Macedonian economy will cost about 1.02 billion euros.

Enhanced National Determined Contributions (eNDC)

Overview. Five specific sectors largely contribute to the GHG emissions including (i) the energy sector (80% of emission); (ii) the metal industry; (iii) the cement production sector; (iv) the crop production sector; and (v) the waste sector.

Sectors and contribution to enhanced NDC through pollution reduction. North Macedonia's GHG emissions as a ratio to GDP are five times higher than the EU average and will require incremental investments if they are to be moderated by 2040. In 2025, the largest reduction should come from the "Increased use of heat pumps" while in 2030, the largest reduction of GHG will come from hydropower plants built. The PAM 2 related to the construction of Large hydropower plants contributes to the use of renewable energy source from watermills and can improve the quality of the air and the reduction of the negative effects of GHG production. The second measure that will highly contribute to the reduction of GHG production is the reduction of losses in electricity and heat networks.

Actions to strengthen the NDC applications. The 16 additional policies and measures enablers of mitigation actions contribute significantly to sustainable development and the SDG 7 aims to respond to the RES. In North Macedonia, several measures would enhance the achievement of the SDG 9 including (i) Building resilient infrastructure; (ii) promoting inclusive and sustainable industrialization; and (iii) fostering innovation.

Socio-economic impact of eNDC

Gender and the benefits of enhanced NDC. eNDC policies and measures meet three social objectives that impact the well-being of the population and the most vulnerable.

as well as their ability to cope with them. The elderly, especially women who face the challenge of providing a proper home heating, are exposed to the negative effects of burning firewood that has a long-term impact on their health. Finally, 68% of the citizens perceive the connection and the differences between climate change and air pollution.

Green jobs creation resulted from actions of the ENDC that contribute to the well-being of the population, especially the vulnerable groups. The positive impact of the effort of reducing the CO₂ and GHG emissions is the social and suitable development due to the job creations.

By 2030, the Existing Measures (WEM), the Scenario with Additional Measures (WAM) and the Scenario with Extended Measures (e-WAM) shows an exponential increase of the green jobs' creations, with the contribution of energy efficiency. The most ambitious scenario also known as the climate champion scenario has the most potential of job creation, doubling the survival scenario in 2035

The impact of enhanced NDC on vulnerable groups. Vulnerable groups here include poor households, poor women headed households, elders, unskilled workforce and minorities. To present an objective qualitative and analytical manner the wide information available, the 63 proposed policies and measures (PAM) identified have been classified into 12 categories presented below. The latter are grouped per type of policy (energy incentives encompasses PAMS such as *incentives feed-in premium, incentives feed-in tariff, introduction of CO₂ tax and RES without incentives*) and not exclusively by sectors of applicability.

Each policy in this **"Disposal of unwelcome components and waste"** area should have beneficial effect on the general population and firms due to its contribution to cleaner environment. Overall, it is estimated that such measures would have either a positive impact on vulnerable groups (on at least 50% of them). **Regarding the Energy Incentive**, it is related to financial measures aimed at making upcoming changes in the energy mix more attractive from an economic perspective. Incentive *feed-in tariffs* and *RES* should have a beneficial impact

on health over time and thus affect positively vulnerable groups, generating savings and health benefits for them.

Overall, the **"Energy production and distribution"** measures should have a positive impact on households and firms (80% of proposed PAMs), provided job opportunities are offered (20% of PAMs). For **"Improving social effects of transition to a low carbon economy"** measures, transversal and economy-wide program can be used to smooth out the change in energy systems. In this respect, of the four PAMs in this category should all have a positive impact on vulnerable groups provided appropriate mitigation and inclusion measures are implemented.

While around 60% of PAMs proposed in the **Land and forest use** category should be neutral with respect to vulnerable groups, still some positive and negative impact are to be expected. "Greening" of procurement rules should have an obvious positive impact on all kinds of social groups and none negative impact on vulnerable groups. **The measures in "R&D and education"** should have a broad positive impact on the economy due to the induced productivity increase as well as increased energy efficiency and lowered pollution. **Developing regional integration of energy markets** with a view to lowering costs and increase generation should be neutral for vulnerable groups (100% of PAMs) and should prove beneficial for the economy in the long run.

"Change in energy use in manufacturing and transportation" measures have a broad range of impact for its PAMs, from negative impacts (44.4% of PAMs) to conditionally positive effects (55.6). **Economywide change in energy use** may positively affect vulnerable groups (30%) or negatively affect them (70%) if none mitigation measures are implemented. **The PAM "Reduction of emissions from agriculture and agro-industry"** will lower emissions but will all require investments (equipment, training, upgrade of facilities...) that necessitate incentives/support, otherwise they may harm poor/women farmers, older farmers and minority rural households.

Finally, developing energy efficiency of (public and private) buildings (by making new up-to-date buildings or retrofitting/renovating existing ones) and photovoltaic irrigation for agriculture will be very important for environmental purposes.

Economic Impacts. In the energy sector (32 measures), 50% of the measures (i.e. 16) would have a positive impact on job creation, main green jobs. In addition, 56.3% of the measure in the energy section would positively impact economic growth. Finally, the energy measure would improve the standard of living of the poor by creating more opportunities for them and by improving their health status (less pollution for instance). The agriculture measures (11) would have no impact of job creation and low impact (36% of them) on poverty reduction. Indeed, in the agriculture sector, the improvement of technology would result in a reduction of labor in the sector. However, the improvement production and intercorrelation with the EU will create an important value chain to “forward industry” that could easily absorb the free labor from agriculture. The measures in the agriculture sector will have a high impact in economic growth as 81.8% of these measures will impact it positively. The economy overall will benefit more of the eNDC agricultural measures.

Economic Implications of the eNDC scenarios. For the realization of the measures proposed under the WEM scenario €13.3 billion are needed, of which about 99% are investment in the energy sector. WAM scenario requires an additional 38%, while for the realization of e-WAM almost 60% more compared to WEM. The average yearly investment in WEM is approximately 4.8% of the total average annual GDP, while in the e-WAM is 7.7%. If all of the measures are implemented in parallel and the “Energy efficiency first” principle is applied, then the total investment can be reduced in the range from 7% to 19%.

Impact of Covid-19 on the GHG. The reduction in GHG emissions in the world is mainly caused by the reduction of land transport (teleworking) and air transport, the increase in local shopping and in online shopping. However, this

reduction has no effect on climate change since it is a one-time impact located around the sources of emissions. This positive effect could not be observed in the long term unless it is followed by strong climate policy action.

Low carbon transition plan

Impact of the Covid-19 on the low-carbon transition plan. The main elements likely to undermine energy transition efforts are (i) Health crisis and rising unemployment; (ii) Transition plan investment at risk; (iii) Drop of oil price; (iv) Investment in innovation technology at risk; and Renewal energy projects at risk.

Covid-19 as an engine for low-carbon transition. The policies put forward to revive the post-COVID economy should support this energy transition in a win-win approach because it is possible to revive the economy while reducing GHG emissions. Moreover, it is possible to link some of the measures taken for the Covid-19 pandemic and the post-Covid-19 economic plan with a number of measures of the enhanced NDCs. The table below presents the link between the government Covid-19 response plan and the eNDC measures. At least 12 measures of the eNDC are directly link with the Government post-Covid-19 economic plan. The energy sector represents about 70% of these measures with also one measure in transport and 8 in the energy production sector. One eNDC measure from the agriculture and another one from the waste management are contributing directly to the Government post-Covid-19 economic plan.

Recommendations

Recommendation 1: The North Macedoni government should continue its strong support to the implementation of the eNDC measures. Doing so, the other economic agents (private sector, household,...) of the country will follow.

Recommendation 2. The government should use the Malus-Bonus policy to bring the private sector on board for the implementation of the eNDC as an important partner. The Malus-Bonus policy would drive the private

sector to do business sustainably and to drive innovation, competitiveness, risk management and growth.

Recommendation 3. Household should be educated to implement sustainable behavior in their daily live (heating method, waste management,...). This should be done through the PAM13: Public awareness campaigns and network of EE info centers. Increase the number of campaigns in response to the lack of knowledge about the benefits of the EE through the promotion of an efficient use of energy by small energy customers, including domestic customer, and train the employees in the public institutions at the central and local level.

Recommendation 4. In terms of most targeted groups, it is recommended that support go to single women aged 65+ in the first place. This support can be designed in form of awareness campaign (climate change literacy) and financial support. In terms of heating coverage, it is recommended to accelerate the effort of generalization of the use of central district heating as the main preference of the population specially in the city of Skopje. The next groups to be supported include the single mothers, fathers of minors and household below the poverty line

Recommendation 5. Considering the importance of the issues related to water resources for the Macedonian population, it is recommended to update knowledge on the impacts of climate change on water resources.

Recommendation 6. As part of the eNDC measures to provide awareness campaign or training, special efforts should be made to promote the inclusion of women in informal jobs among the target clientele.

Recommendation 7. As part of the gradual implementation of eNDC measures for households, priority should be given to households with 3 or more children as these are among the most vulnerable groups.

Recommendation 8. Mitigation responses must be more gender responsive. To do so, the analysis of the needs, priorities, roles and experiences of women and men must be done. Also, one needs

to integrate specific actions to address any gender inequalities that may have emerged from that analysis.

Recommendation 9. During this period of health crisis, it is crucial to continue efforts to raise awareness among the population about the importance of environmental issues in general and the fight against climate change, in particular.

Recommendation 10. The promotion of the North Macedonia CCM Plan to be implemented must be done, as it is a powerful tool for its participation in the achievement of European energy transition objectives.

Recommendation 11. In order to have a clearer and more complete understanding of the COVID-19 crisis on the energy transition plan of North Macedonia, it is recommended to carry out an analysis of the impacts of the crisis on the sectors targeted by the CCM Plan.

Recommendation 12. In the context of the country's economic recovery, efforts should be made to prioritize, and finance projects needed for the enhanced NDCs. Thus, these investments would promote the achievement of two major objectives of the country, namely a strong economic recovery and a significant contribution to GHG reduction efforts, which are essential in the context of the accession process to the European Union.

Recommendation 13. In order to optimize the various public policies put forward by the North Macedonian government and to promote compliance with the commitments it has made in the energy transition process, it is recommended to broaden the scope of the analysis of the impact of the COVID-19 crisis to environmental issues, paying particular attention to issues related to water resources (quality and quantity), biodiversity, air quality as well as agricultural and forest environments.

Recommendation 14. In implementing actions to revive the economy, it is important to adopt targeted measures for vulnerable groups, adapting them in particular to their education level and ensuring that citizens engaged in informal employment are also included, especially women in the agricultural sector





TABLE OF CONTENT



ACRONYMS	4
EXECUTIVE SUMMARY AND POLICY BRIEF	12
I. INTRODUCTION	20
1.1. Context	20
1.2. Objectives	20
1.3. Methodology of the study	21
II. VULNERABLE GROUPS	24
2.1. Definition	24
2.2. Social vulnerability In North Macedonia	25
2.3. Climate change	31
III. COVID-19 IN NORTH MACEDONIA	34
3.1. Overview	34
3.2. Socio-economic impacts of the Covid-19	35
3.3. North Macedonia after the Covid-19 plan	42
IV. ENHANCED NATIONAL DETERMINED CONTRIBUTIONS (ENDC)	44
4.1. Definition of eNDC and context	44
4.2. Overview	45
4.3. Sectors and contribution to enhanced NDC through pollution reduction	49
V. SOCIO-ECONOMIC IMPACT OF ENDC	54
5.1. Gender and the benefits of enhanced NDC	54
5.2. The impact of enhanced NDC on vulnerable groups	62
5.3. Economic Impacts	67
5.4. Economic Implications of the NDC scenarios	69
5.5 Impact of Covid-19 on the GHG	70

VI. LOW CARBON TRANSITION PLAN	74
6.1. The low-carbon transition plan of North Macedonia	74
6.2. Impact of the Covid-19 on the low-carbon transition plan	75
6.3. Covid-19 as an engine for low-carbon transition	77
RECOMMENDATIONS	80
REFERENCES	82

List of tables

Table 1: Vulnerability criteria in North Macedonia	25
Table 2: Vulnerable groups in North Macedonia	26
Table 3: Main source of GHG in North Macedonia	45
Table 4: Enhancement components of the enhanced NDC 2020 vs initial NDC 2005	46
Table 5: The 16 Additional Policies and Measures Enablers of Mitigation Action	53
Table 6: Gender roles in Energy and Transport linked to Climate Change	54
Table 7: Gender roles in Agriculture and Science/Technical Skills linked to Climate Change	56
Table 8: Links between the European GAWB and North Macedonia Climate Change Mitigation Plan.	74
Table 9: Links between Covid-19 response measures and enhanced NDCs measure	79

List of figures

Figure 1: Organigram of methodology	21
Figure 2: Primary fuel used for heating women 65+ living alone	28
Figure 3: Heating system preference by gender	29
Figure 4: Heating system preference by ethnic group	29
Figure 5: Heating system preference by household monthly income (MDK)	30
Figure 6: Heating system preference by education level	30
Figure 7: Heating system preference by marital status	31
Figure 8: Daily compilation of confirmed cases of Covid-19 in North Macedonia	34
Figure 9: Real GDP growth 1990-2025 (Annual percent change)	35
Figure 10: Actual and forecasted quarterly real GDP growth	35
Figure 11: Government revenues 2019-2020	36
Figure 12: Government expenditure 2019-2020	36
Figure 13: Overnight stays in tourism sector	37
Figure 14: Production and number of employees by industry sector	37
Figure 15: Number of registered unemployed	38
Figure 16: Number of newly unemployed by gender, January 2019-September 2020	40
Figure 17: Women unemployment by age groups, 2006Q1 – 2020Q1	40
Figure 18: Poverty incidence and people at risk of poverty, 2010-2020	41
Figure 19: Impact on child poverty	41
Figure 20: Mitigation Measure, Emission Reduction in Energy Sector.	50
Figure 21: Mitigation Measure, Emissions reduction in AFOLU	51
Figure 22: Number of green jobs per scenario	58
Figure 23: Number of specific green jobs created using the E-WAM best scenario in 2030	59
Figure 24: Plausible impact on vulnerable populations of key eNDC policies (L.Pct of PMAs impact)	66
Figure 25: Percentage of eNDC measure with positive impact by sector	67



List of annexes

Annex 1: Legal and regulatory context of North Macedonia with regard to NDC	86
Annex 2: Summary of measures for the Extended mitigation scenario (e-WAM)	89
Annex 3: Classification of policies	98

The global pandemic has swiftly altered the world's focus and enlarged the definition of vulnerable groups. The best way forward is to have a robust national coping strategy in dealing with the pandemic impact that encompasses the security and safety of the vulnerable groups and environment.





I. INTRODUCTION



1.1. Context

North Macedonia is one of the smallest countries in the Southeastern Europe region, with around 2.075 million inhabitants living in about 600 000 households. Its gross domestic product (GDP) equals to €8.5 billion and the GDP per capita is €4,086.5.

The Ministry of Environment and Physical Planning (MoEPP) revises and enhances the Macedonian Nationally Determined Contributions to Climate Change (NDC). The Macedonian Initial NDC had rather limited scope as it took into consideration the mitigation of potential only from Energy Supply, Buildings and Transport sectors. The enhanced NDC has more ambitious mitigation targets which are based on the mitigation potential both energy and non-energy sectors, and are considered crosscutting areas: gender, various co-benefits; private sector engagement and Sustainable Development Goals (SDG) linkages.

Moreover, the Macedonian enhanced mitigation targets is a step forward towards the alignment with the EU ambitious Green Deal for making Europe the first climate neutral continent by 2050. Macedonian enhanced NDC is built upon both energy and non-energy climate actions and can reach -82% potential net reduction of GHG emission by 2040, in comparison with 1990. The Macedonian mitigation potential has been analyzed using MARKAL model. The economic and environmental effectiveness of the proposed policies and measures within the Macedonian enhanced NDC were analyzed through a Marginal Abatement Cost Curve. In addition, the newly created green jobs from implementation of the mitigation measures have also been analyzed.

To achieve the ambitious national climate targets, the country needs to ensure adequate interventions to de-risk major systemic legal, institutional and financial barriers for renewable energy investments and to contribute significantly to sustainable development by

creating socio-economic, environmental and institutional co-benefits.

1.2. Objectives

The aim of this report is to conduct a rapid assessment to capture the socio-economic impacts and co-benefits of the Macedonian enhanced NDC targets/actions and propose recommendations for balancing social, economic and environmental considerations.

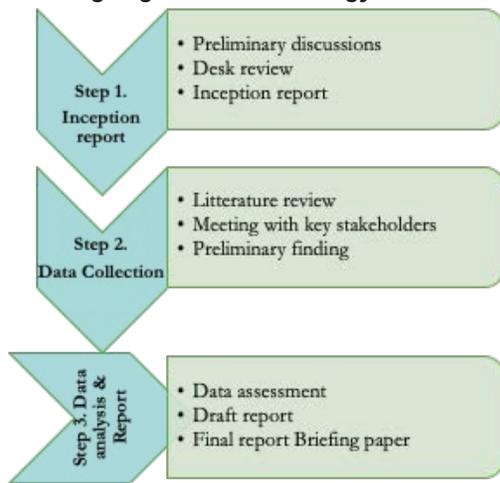
The specific objectives include:

- Review of relevant national legal and strategic document (3rd BUR, draft Climate Action Strategy, draft National Energy and Climate Plan, Energy Strategy);
- Identification of the socio-economic aspects and co-benefits of the actions stipulated in the Macedonian enhanced NDC (such as employment, education, skills, social impacts, health, etc.)
- Analysis of the impact of COVID – 19 to the low-carbon transition in the country and proposition of the way how it can become an integral part of the wider recovery agenda to achieve social, economic and environmental objectives;
- Identification of potentially the most affected segments of the society by the proposed measures in the NDC and development of a framework to quantify the impact on each group separately;
- Elaboration of a comprehensive package of policy instruments, incentives and clear recommendations on possible ways to mitigate the impact of the Macedonian enhanced NDC on the most vulnerable segments of the society (including women), as well as the resources available to support those efforts, taking into consideration the just transition aspects;
- Estimation of the likely impact of the Macedonian NDC on the GDP, rate of inflation, poverty rate, unemployment rate, some categories of general government budget revenue, and social transfers (to the extent possible);
- Presentation of the findings on-line to a selected group of Macedonian policy-makers and preparation of a briefing paper on socio-economic impacts of the Macedonian enhanced NDC targets/measures.

1.3. Methodology of the study

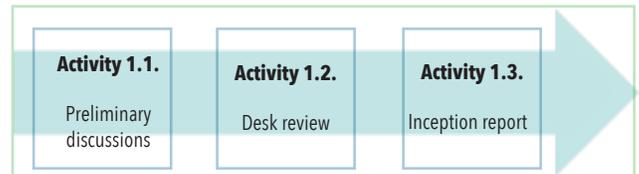
This section presents the methodology used to achieve for this report. The main stages to achieve the aims of the assignment are displayed below.

Figure 1. Organigram of methodology

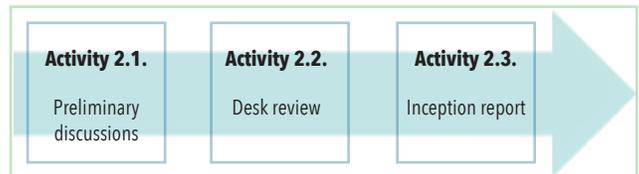


Step 1. Inception report.

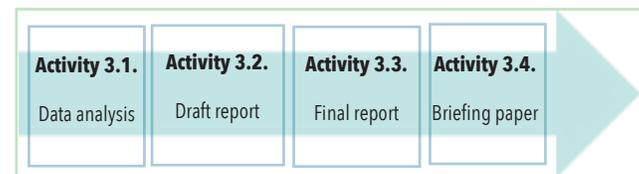
The first step focuses on the initial discussion and the finalization of the methodology.



Step 2. Data Collection



Step 3. Analysis and report writing







II. VULNERABLE GROUPS



2.1. Definition

The definition of the vulnerability has been a discussion in the literature for a while and it is difficult to find a consensual one. The paragraphs below summarize the literature regarding the definition of vulnerability.

Social vulnerability. Social vulnerability is the characteristics of the population that influence the capacity to prepare for, respond to, and recover from hazards and disasters. Social vulnerability interacts with natural processes and the built environment to redistribute the risks and impacts of natural hazards and in this way creates the social burdens of hazards (Cutter et al. 2003). Social vulnerability helps to explain why some communities experience the hazard differently, even though they experience the same level of flooding or storm surge inundation.

Understanding the differential impact of hazards as a product of the social vulnerability of a place, rather than exposure, is a critical element in formulating comprehensive mitigation plans (Morrow 2008). Unlike biophysical vulnerability or other exposure indicators, social vulnerability is present, independent of the hazard type or threat source. In other words, social vulnerability is a pre-existing condition or an inherent property of existing communities, irrespective of the natural hazard of interest (Cutter et al. 2009).

Social vulnerability analysis is a way of describing who is likely to be especially at risk to the effects of hazards (climate change for instance), both spatially and temporarily, and enables the special needs of so-called 'vulnerable groups' to be taken into account as part of the risk management planning process (Dunning, 2009).

Vulnerability indicators. A vulnerability indicator for hazards of natural origin can be defined as a variable which is an operational representation of a characteristic or quality of a system able to provide information regarding the susceptibility, coping capacity and resilience of a

system to an impact of an albeit ill-defined event linked with a hazard of natural origin.

Research focuses on those social factors that increase or decrease the impact of specific natural hazard events on the local population. Some broad indicators appear repeatedly in social vulnerability analyses, although it is possible to choose different proxies or variables to represent them. Those characteristics most often found in the literature include socioeconomic status (wealth or poverty); age; special needs populations; gender; and finally, race and ethnicity

Socioeconomic status influences the ability of individuals and communities to absorb the losses from hazards (Peacock et al. 2000; Masozera et al. 2007). In general, people living in poverty are more vulnerable than the wealthy to hazard impacts. Poor people have less money to spend on preventative measures, emergency supplies, and recovery efforts.

The confluence of race and class (socioeconomic status) has a long history of producing social inequalities (Füssell 2007). Discrimination also plays a major role in increasing the vulnerability of racial and ethnic minorities (Fothergill et al. 1999; Bolin 2006). In particular, real estate discrimination may confine minorities to certain hazard-prone areas or hinder minorities in obtaining policies with more reliable insurance companies

Gender also affects social vulnerability. Women are more vulnerable than men are to disasters, mainly because women— especially single mothers – are more likely to live in poverty (Bianchi and Spain 1996). Women often suffer the impacts of a disaster disproportionately. For example, women are more likely than men are to hold low-status jobs in the service industry, which often disappear after a disaster strike (Morrow 2008). Women are also more vulnerable to disasters because of their roles as mothers and caregivers: when disaster is about to strike, their ability to seek safety becomes restricted by their responsibilities to the very young and the very old, both of whom require help and supervision.

Both the **young and the elderly** may be unable to respond to disasters without outside support. Children who lack adequate family support are at a major disadvantage for disaster response (Phillips and Hewett 2005; Fothergill 2004). Disruptions created by a disaster can have significant psychological and physical impacts on children (Kar 2009). Generally, the elderly are more likely to lack the necessary physical and economic resources to respond effectively to a disaster. They are more likely to suffer health problems and experience a slower recovery (Ngo 2001). The elderly also tend to be more reluctant to evacuate their homes during a disaster. In addition to the physical difficulties imposed by evacuation, the elderly become distressed at the prospect of leaving their own homes and living even on a temporary basis, in a group setting (Gladwin and Peacock 1997).

People living with mental or physical disabilities are less able to respond effectively to disasters and require additional assistance in preparing for and recovering from disasters (McGuire et al. 2007). Emergency managers need to target areas with high concentrations of disabled people, particularly in group-living quarters, for early evacuation and other preparatory measures (Morrow 2008).

Economic vulnerability. This is the level of vulnerability that is highly dependent upon the economic status of individuals, communities and nations. Economic factors exert a profound influence upon social vulnerability, to the extent that the two can be difficult to untangle and thus we may see references to 'socioeconomic vulnerability'. It is not the lack of wealth directly that makes an individual or community socially vulnerable; it is the provision and access to resources that 'money can buy' which is of interest. The economic vitality of an area in general has been shown to influence quality of life: conditions prior to a hazard event (e.g. out-migration, economic recession) are likely to continue post-hazard event (Cutter and Emrich, 2006).

Social vulnerability. This is the characteristics of the

at-risk individual or community which alter the degree of susceptibility and sensitivity to hazard impact. These may include demographic characteristics such as age, gender, family structure, health and disability, occupation and employment, as well as access to political power. With the exception of the latter, these characteristics typically reflect those employed in taxonomic classifications of social vulnerability.

2.2. Social vulnerability In Macedonia

Macedonia defines vulnerability as the presence of special characteristics, specialties and circumstances of the individual, community, system or objects that are making them susceptible to negative influences and damaging factors of a given hazard. (Decree 2011 - Regulation on the methodology for making assessment, Official Gazette, br.03/11).

It has to be noted that climate change poses disproportionate risks to human and natural systems due to differences in vulnerability and exposure. In addition, it is difficult to define the vulnerability of people affected by climate change and how they respond to these severe conditions. To solve these issues, the Least Developed Countries Expert Group (UNFCCC, 2018) has developed 4 new assessment criteria to identify vulnerable groups as shown in the table below.

Table 1: Vulnerability criteria in Macedonia using the UNFCCC category

Criteria	Definition
Targeting based on climate change impacts	This considers groups and communities that have adversely been affected by climate hazards and having limited ability to recover by themselves. This would include vulnerable groups and communities that have severely been affected by droughts, floods, coastal inundation, and extreme temperatures.

Categorical targeting	by gender, age, income, education, ability, ethnicity and social caste. A set of indicators for analyzing and defining vulnerable communities are basically demographics, housing security, mobility, health services, environmental hazards, business/jobs, available public and private utilities, social services, governance, community, fiscal health and culture.
Geographical targeting	Under this criterion, the government or responsible authority identifies priority regions or boundaries whose groups and communities should be prioritized, based on specific criteria. Such criteria may include arid or semi-arid lands, mountain regions, or remote areas;
Using locally derived assessment tools	such as community-based targeting or community participatory methods. Community-based targeting is administered by local governing authorities, recognized community groups, non-governmental organizations or religious to decide on which groups and communities are most vulnerable.

Source: Aderito Santana, Considerations regarding vulnerable groups, communities and ecosystems in the context of national adaptations plans, UNFCCC, Dec. 2018, p.12-13.

Some characteristics of vulnerable people are such as people with the low income, minority and marginalized ethnic groups, young children and old people, people with physical and mental disabilities, are crucial in determining vulnerable groups. Social factors are related to the non-economic factors such as the welfare of individuals, population groups and communities, the level of education, security, access to basic human rights and good governance (Daskalova, 2013).

As energy is the main sector of the NDC, the following sections are assessing the use of energy by the vulnerable groups. Chapter 5 will then discuss the impact of the NDC on these vulnerable groups.

Based on the discussion above ¹, the Republic of Macedonia identifies vulnerable groups as follows:

¹ Daskalova K. (2013). Socio-economic assessment of population, Risk of catastrophes and climate change (South Eastern region in North Macedonia), Third National Report to the UN Framework convention for climate change, Macedonia.

i. Roma	viii. Drug addicts
ii. Minorities	ix. Homeless people
iii. Unemployed	x. Young people
iv. Disabled	xi. Single parents
v. Senior citizen	xii. Chronically ill
vi. Children at risk	xiii. People with cancer
vii. Women	xiv. Victims of trafficking and prostitution.

Those groups faced several disadvantages that hamper their coping mechanism to adapt with adverse environmental situation. Some recent studies are more focus on two main groups as being at high risk based on their economic and social conditions: women and vulnerable groups in the Skopje City. They are mostly recommended as key analysis for the Macedonian enhanced NDC

In Skopje, a study on climate change impacts and air pollution (Dzambaska, 2019) used categorical targeting criteria to assess household heating choices. The study identified a set of indicators for analyzing and defining vulnerable groups based on sex, age, whether they live in urban or rural areas in a house or apartment building, residence, education and monthly income. The main criteria to identify vulnerable groups are the economic disadvantage/advantage and the cost of heating. A stratification by category of vulnerable groups shows seven most vulnerable groups with specific characteristics below. They represent 9.2% of the total household surveyed (5044).

Table 2: Vulnerable groups in Macedonia

Vulnerable groups	Definition
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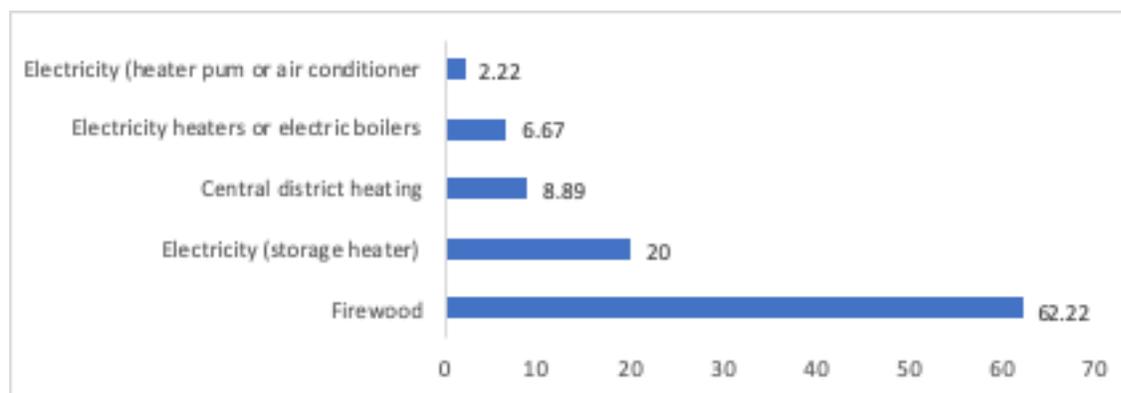
1	Single mothers living in houses with children under the age of 18, using firewood.	They are mostly poor with low income and the parental burden added to their marital status of being single, divorced or widowed increased their vulnerability. Due to traditional beliefs, these women have to take care of their children alone. They have no choice but to use firewood as the method of heating their home because of its low cost.
2	Single fathers living in houses with children under the age of 18, using firewood.	This category of people is less poor than women and being in charge of children makes them vulnerable because they are not used to doing so in a society with strong traditional beliefs that women are in charge of the children. The low cost of firewood is the main factor on their decision to use it as the heating system for their house.
3	Women 65+ age, with monthly income beyond 12.000 denars single, divorced or widower and live alone.	In addition to low income (using family pensions), marital status and age are factors of vulnerability. This is the case for this category of elderly persons living alone with fragile health conditions. They are more exposed to the dangers of using firewood.
4	Men 65+ age, with monthly income beyond 12.000 denars, single, divorced or widower and live alone	This category is more vulnerable because of its advanced age and low health condition. They use firewood as it is cheap.
5	Households living in a rural area in a house with monthly income of up to 12.000 denars.	This is the category that uses firewood the most and are mostly reluctant to change the heating method due to their low monthly income level.

6	Households living in an urban area in the Skopje Valley, in buildings built before 1963 or whose last renovation was at the latest until that year, have thermal insulated roof and insulation of a façade of up to 2 cm.	This group is mainly living in old buildings with few insulations that contribute to the loss of energy and increase the cost of heating (mostly electricity, central city heating). They are vulnerable to climate change, exposed to high temperatures in the summer time.
7	Households living in houses in urban areas, are highly educated and use firewood as a way of heating their homes	This group, although highly educated, use electricity, central heating and firewood. Since they are more informed about the harmful effects of the firewood on the health of their family members, and its contribution to air pollution in the environment where they live.

In terms of numbers of vulnerable groups identified, category #6 has the highest percentage with 33%, followed by the category # 5 with 29% and category 7 counts for 19%. Although category # 3 is poorly represented in the distribution with only 8% of households, it is the category with the highest potential of vulnerability and should be at the center of the country concerns.

Women 65+ age, with monthly income beyond 12.000 denars single, divorced or widower and live alone (older women suffer greater impact of climate change) are at the center of the vulnerability groups. These women need attention from the government because they face several simultaneous hurdles, including economic, social, sanitary and loneliness. Because of their age, they have also reduced mobility and wood heating – their dominant heating system – can be unhealthy. This category of the vulnerable groups should be part of the country emergency relief interventions, especially during the winter when temperatures become fairly cold.

Figure 2. Primary fuel used for heating women 65+ living alone



Source: <https://www.skopjesezagreva.mk/all-data-on-fire/>

To affect change, there is, however, a need to assess the state of demand, or what are households' preferences. This is done below using available survey data in Skopje.

Households heating preferences: key points.

Other things being equal and in a best-case scenario, households in Skopje were asked to report their preference for a specific heating system. As such, their response is the result of an underlying rational choice between pros and cons of each heating system proposed in the survey.

Gender. Based on the survey, in Skopje, the majority of households (47.7 per cent overall, with no gender difference) would choose central district heating over firewood if they had the opportunity, followed by gas boilers (slightly more for men than women). However, some households 12% express no preference – i.e. do not know which system to choose - regardless of the cost of installing the equipment and the related monthly operating cost.

Ethnicity. According to the last census in 2002², the largest ethnic group is Macedonians (64% of the population) followed by Albanians (25%) who are concentrated in the northwestern part of the nation. Most of the ethnic groups (Macedonians, Romas, Serbs, Turks) prefer a central district heating system. However, Albanians and the other groups mostly did not express any preference.

Income. Households with low-income tend to have a preference for wood boilers. It is the dominant preference for households earning less than 12,000 MKD per month (39.3 to 56.1 percent of them, depending on the income class), while the households who have a higher income level prefer central heating (37.2 to 67.4 percent of them).

Education. The level of education seems to influence the preferred choice of a heating system. Central district heating seems to be the preferred choice of the household with a higher level of education (University, vocational) while households with primary education tend to prefer *wood boilers*. Education and income being generally correlated. Indeed, wood is mostly used by households with lower education levels (and thus lower income). Another effect may be at play, households with higher education may also be more environmentally conscious and this may appear in their choices.

Marital status. Expressed preferences have a clear distribution by marital status: all household groups (divorced, married, singles and widowed) express a preference for *central district heating*, while vulnerable groups, identified above, are using firewood as a main heating system.

More broadly, households' preferences provide opportunities to better help households to change their habits of using firewood as a heating system.

² (<https://worldpopulationreview.com/countries/macedonia-population>)

Indeed, households, irrespective of their differentiating characteristics clearly express a preference for central district heating systems. Wood and pellet boilers (as well as other systems), are preferred by smaller numbers of households even if the cost of installing the heating equipment and the related monthly operating cost was taking care of.

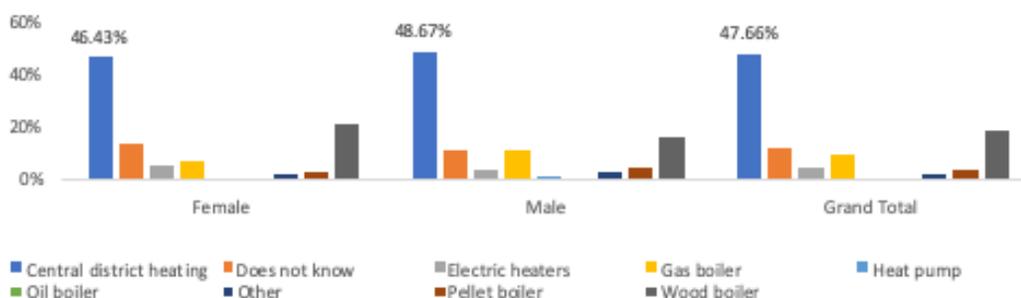
This expression of “consumer” demand for Central district heating systems is a clear opportunity for reducing air pollution but it also has obvious costs. Indeed, Central district heating systems using appropriate technology can help lower emission for a majority of households. However,

for this to be effective, such system needs to be deployed broadly, quickly, and be accessible using the appropriate technology. This is likely to have significant fiscal and financial implications that need to be carefully assessed³.

For categories of households having expressed different preferences (wood, pellet, oil, gas boiler, electric heaters, heat pump), targeted awareness campaigns and support (subsidies, cash transfers...) would go a long way in helping them transition to the new systems⁴.

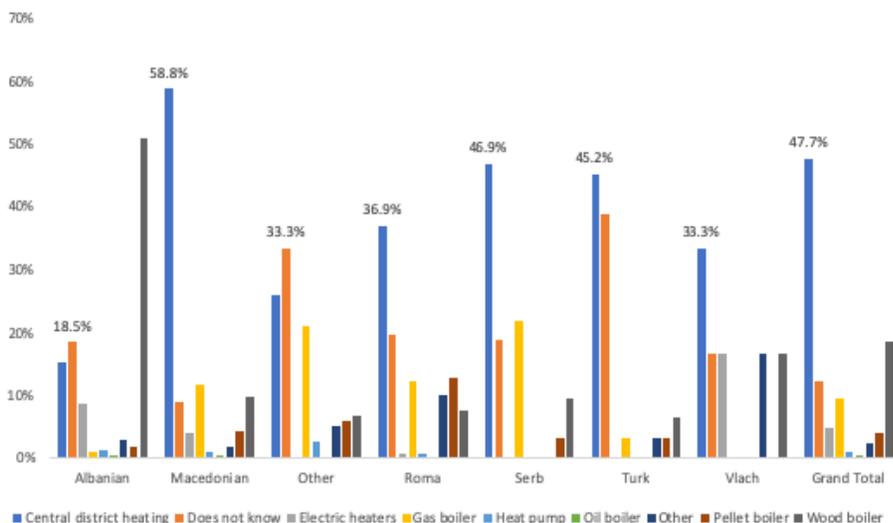
³ We will show in chapter 3 that the policy and measure # 23 of the e-NDC is reaching this goal of increasing the use of central system through information campaigns to encourage the use of existing and new central heating network.
⁴ We will show in chapter 3 that this is taking into account by the policy and measure # 13 of the NDC regarding the public awareness campaigns and network of energy efficiency info centers aiming at responding to the lack of knowledge of the benefit of the EE.

Figure 3. Heating system preference by gender



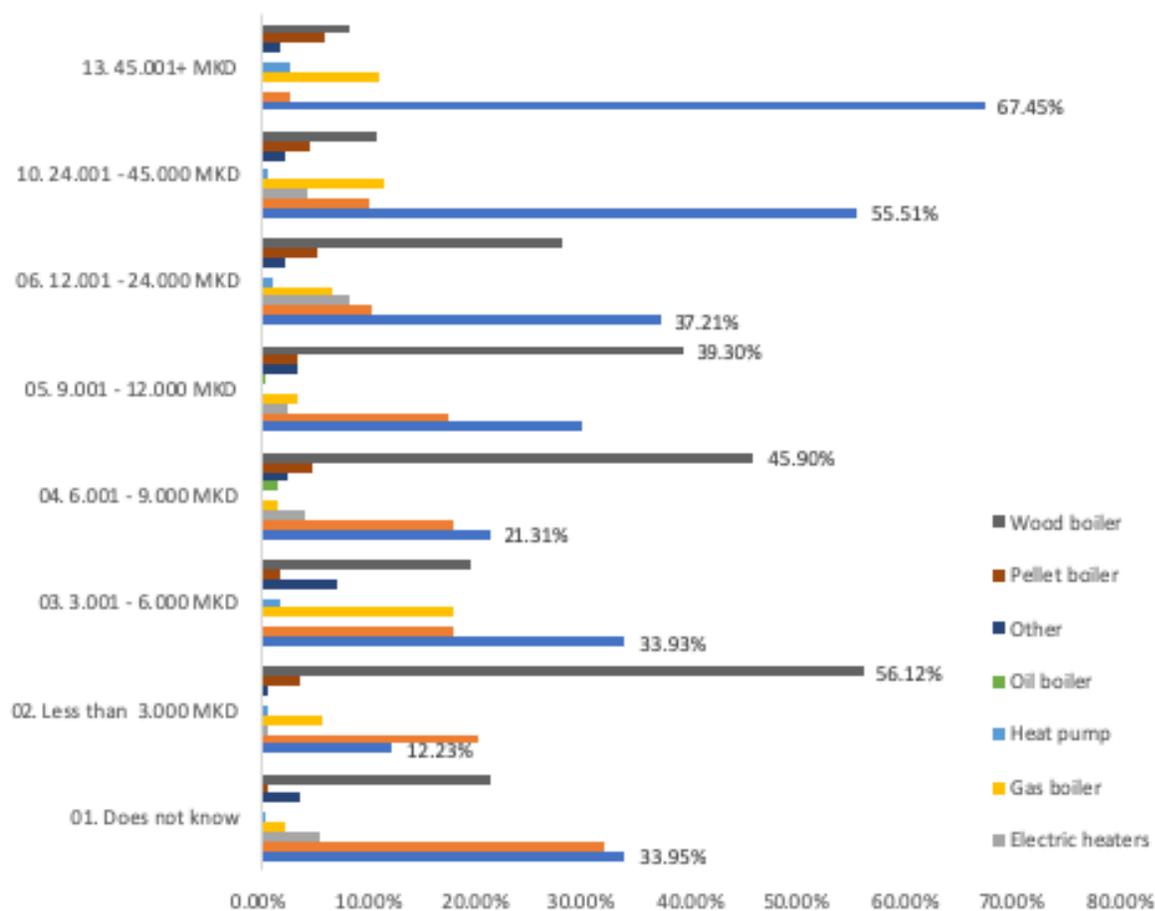
Source: Author’s calculation based on 2017 household data from Skopje.

Figure 4. Heating system preference by ethnic group



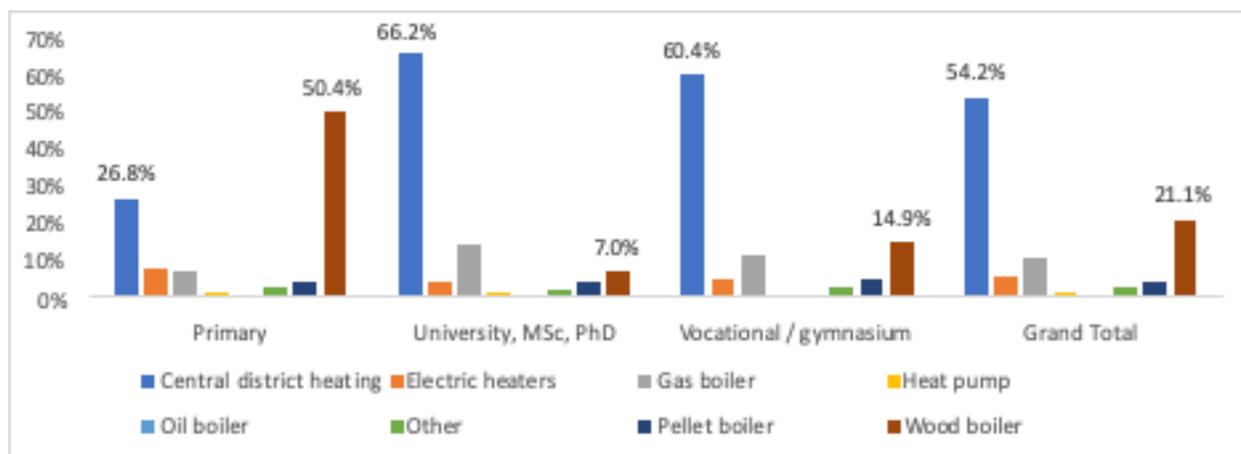
Source: Author’s calculation based on 2017 household data from Skopje.

Figure 5. Heating system preference by household monthly income



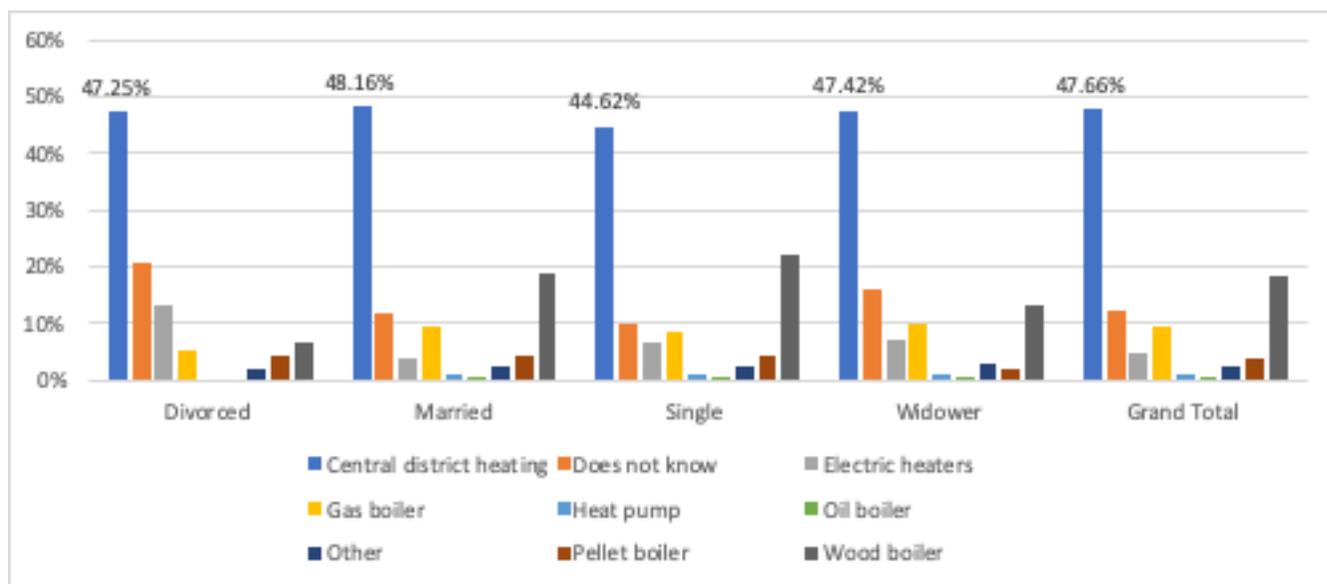
Source: Author's calculation based on 2017 household data from Skopje.

Figure 6. Heating system preference by education level



Source: Author's calculation based on 2017 household data from Skopje.

Figure 7. Heating system preference by marital status



Source: Author's calculation based on 2017 household data from Skopje.

2.3. Climate change

The effect of climate change on different vulnerable sectors in North Macedonia has been assessed as part of the implementation of the United Nations Framework Convention on Climate Change (UNFCCC). The vulnerable sectors studied are as follows::

Biodiversity	Protection of cultural heritage
Health	Forestry
Water resources	Tourism
Agriculture	

The impact of climate change on biodiversity in North Macedonia was analyzed in the Second National Report (SNC) to United Nations Framework Convention on Climate Change (UNFCCC) and in the Third National Communication to UNFCC (*Ljupčo et al, 2013*). This assessment focused mainly on the potential impacts of climate change on flora, fauna, protected areas, wetlands and various ecosystems present in North Macedonia. The

social issues of the effects of climate change on biodiversity are not documented there, except for the references to the introduction of exotic and invasive species, which generate impacts on biodiversity and on the Macedonian economy.

Regarding the health aspect, the south-eastern sector of North Macedonia is subject to the most significant heat waves and the most important droughts and floods. In particular, older people are particularly vulnerable to the effects of heat waves, including those caused by forest fires, and cold waves. Climate change is likely to influence the quality of water as well as the presence of pathogens in food as well as the presence of biting insects. Finally, 10% of the Macedonian population does not have access to drinking water of sufficient quality and quantity (Gjorgjević, D (2013)).

Among the issues relating to water resources are the irrigation regimes of agricultural land, the lack of tools to regulate the use of surface water and groundwater, the lack of data on the quantities of water used for irrigation, an increase in precipitation in the form of rain in winter generating water management



issues for agriculture, drinking water supply systems and flood protection (Popovska, C. (2013)).

Climate change also generates impacts on the cultural heritage of North Macedonia. In fact, sudden changes in temperature as well as the increase in freezing and thawing cycles as well as the increase in the frequency of floods and erosion phenomena have the effect of altering infrastructures such as the aqueduct of Skopje and the archeological site of Stobi. In the future, impacts are also anticipated on the archeological site of Plaosnik, currently protected from climatic hazards due to its geographical location on a plateau, with a significant increase in water runoff to be expected.

The impacts of climate change on forestry are poorly documented although this sector is susceptible to the effects of increasing temperature, decreasing precipitation, increasing forest fires and changes in climatic parameters of seasons. Climate change is in turn likely to lengthen the logging season, affect infrastructure and people living in or near forest environments, increase GHG emissions and reduce carbon sequestration, reduce the amount of wood available, modify the timber market and impact the recreational value of the forest (Nikolov, N. (2014)).

The tourism sector is also vulnerable to the impacts of climate change. Thus, tourist activities related to winter sports which require predictable access to sufficient quantities of snow are at risk. Cultural tourism would also be at risk, given the impacts of climate change on historic monuments and archeological sites and the intense heat waves that may discourage visitors (Burns, P. (2013)).

Also, within the framework of the Third National Communication to UNFCC, **what is the potential impact of climate change on agriculture**, particularly on agricultural production and food security, in the South-East region of the country. Food security can be reduced when food systems are under stress and that these stresses can be induced by climate or other environmental changes, by urbanization and globalization. Also,

agricultural productions generating low incomes are considered more vulnerable and their adaptive capacity is more limited. Also, the risks associated with the multiplication of pathogenic microorganisms and the subsequent choice of more resistant varieties which can, in the long term, alter agro diversity. The study concludes that climate change will affect the four dimensions of food security: availability of food, access to it, stability of food supply and use of food (Mukaetov et al (2013)).



III. COVID-19 IN NORTH MACEDONIA



3.1. Overview

The Coronavirus pandemic, which began in Wuhan, China in November 2019, quickly spread across the world, becoming one of the worst pandemics in recent history. Since the start of data dissemination by the World Health Organization (WHO) on January 3, 2020, until January, 2021, the WHO has identified 107,770,013 confirmed cases of contamination worldwide, 2,368,520 confirmed death cases and 223 countries, areas or territories affected by the pandemic. On the same date, 20 478 718 confirmed cases were recorded in Europe (WHO, 2021).

North Macedonia has been hit very hard by the pandemic. From January 3, 2020 to February 16th, 2021, the WHO reports 97,456 confirmed cases and 3,003 deaths. Since the start of the pandemic, the curve of confirmed cases in North Macedonia has also shown a sharp rise in cases of contamination during the second wave of the pandemic, that is, during the months of October and November 2020. The figure below presents the cumulative number of cases of Covid-19 and the cumulative number of deaths since January 3rd 2020. In North Macedonia, from January 3rd to February 16th, 2021, there have been 97,456 confirmed cases of COVID-19 with 3,003 deaths.

To combat the spread of the virus and reduce the health impact, governments quickly implemented, at the end of March 2020, health measures focused on containment and physical distancing. These measures forced the shutdown of many businesses and industries. As a result, the economies experienced major disruptions in supply chains resulting in an unprecedented global economic crisis.

At the macroeconomic level, the pandemic of Covid-19 had severely affected the economy. As a consequence of border closure and general confinement measure taken by governments around the world, the economy of North Macedonia is expected to contract more than previously forecast by 5.4% in 2020. This contraction of the economy will create intense pressure on unemployment and poverty rates and will reverse the pre-crisis development results. If the measures taken by the government (Health containment measures, fiscal stimulus, ...) bears results, the economy is expected to reach its pre-Covid-19 level at early by the end-2023^{5 6}.

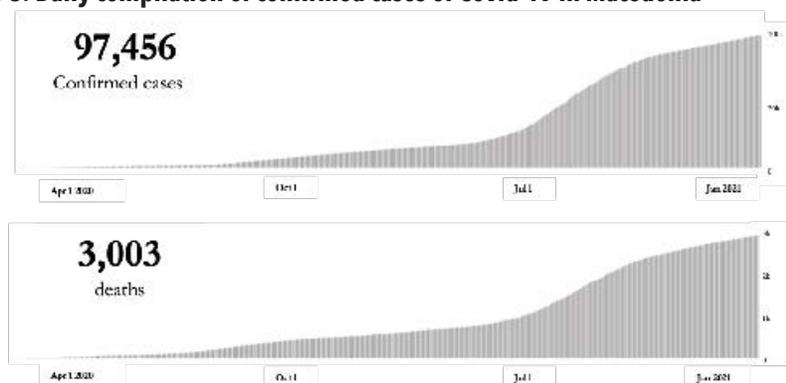
The main consequence of the pandemic in the economy are basically:

- A contraction of the GDP by 5.4%,
- Increase in unemployment to reach 20.4 % in 2020 from 16.8% in 2019,
- Increase of the poverty to reach 21%,

⁵ This value is taken from the following UNDP site: <https://www.impact-covid19.mk/macro-economic-outlook/>, as viewed on December 3, 2020 as well as January 18, 2021

⁶ These values are taken from the following UNDP site: <https://www.impact-covid19.mk/macro-economic-outlook/>, as consulted on December 3, 2020 as well as January 18, 2021.

Figure 8: Daily compilation of confirmed cases of Covid-19 in Macedonia



3.2. Socio-economic impacts of the Covid-19

3.2.1. Macroeconomic

Growth. The figure below presents the real GDP growth rate between 1990 and 2025. The GDP contracted in 2020 by 5.4% because of the Covid-19 pandemic. The economy is expected to experience cumulative losses of 2.3 billion US\$ in 2020 and 2021. The economy is expected to recover of the growth lost by the end of 2023. The country experienced a rapid decline in real GDP in the second quarter of 2020 by -12.7%. The decline continues during the third and fourth quarter 2020 by -7% and -3.5%. The country is to recover a positive growth in the first quarter of 2021 (figures 9 and 10).

Figure 9: Real GDP growth 1990-2025 (Annual percent change)

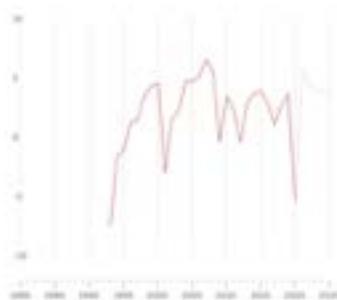
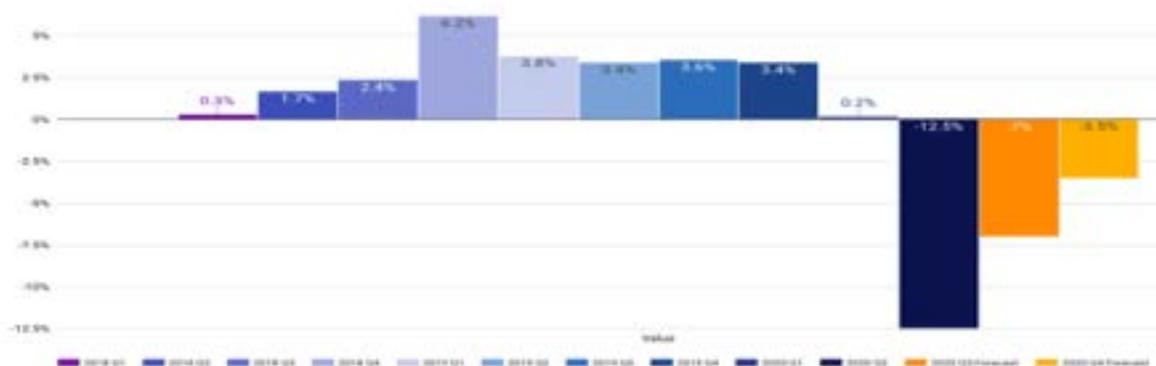


Figure 10: Actual and forecasted quarterly real GDP growth

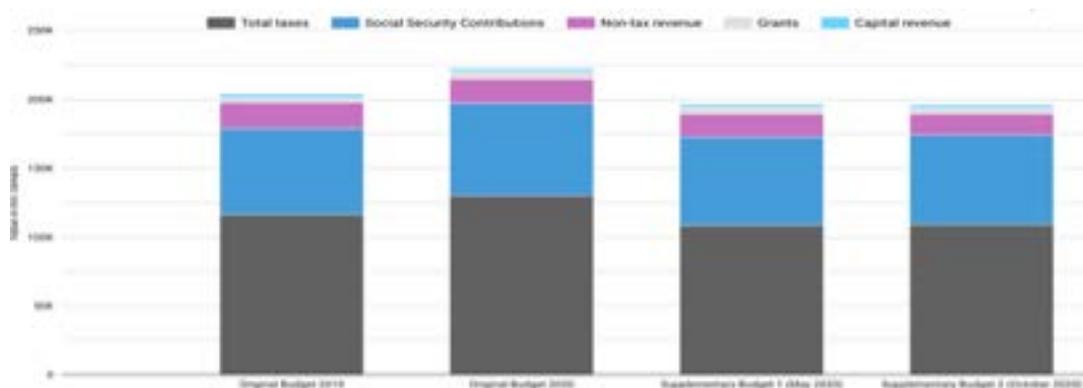


Source: Socio-Economic Impact Assessment for Macedonia (October 2020)

Fiscal position. The fiscal position of the government has also deteriorated due to the snowball effect of the constraints taken by all countries. The government revenue is now expected to reduce by 11.5% (about 415 million EUR). The largest revenue shortfall is expected in VAT (net of refunds) revenue (125 million EUR), revenue from excise (90 million EUR), and revenues from corporate income tax (88 million EUR). The 2nd supplementary budget 2020 foresees increase of 2.5% in Social Services Contributions (figure 11). The pandemic is likely to lead to increased debt and deficits beyond those recorded in the Global Financial Crisis of 2009. In relative terms, the corporate income tax revenue is likely to fall by a staggering 33.8%, indicating a stark deterioration of profitability. This is aligned with the high unemployment discussed above.

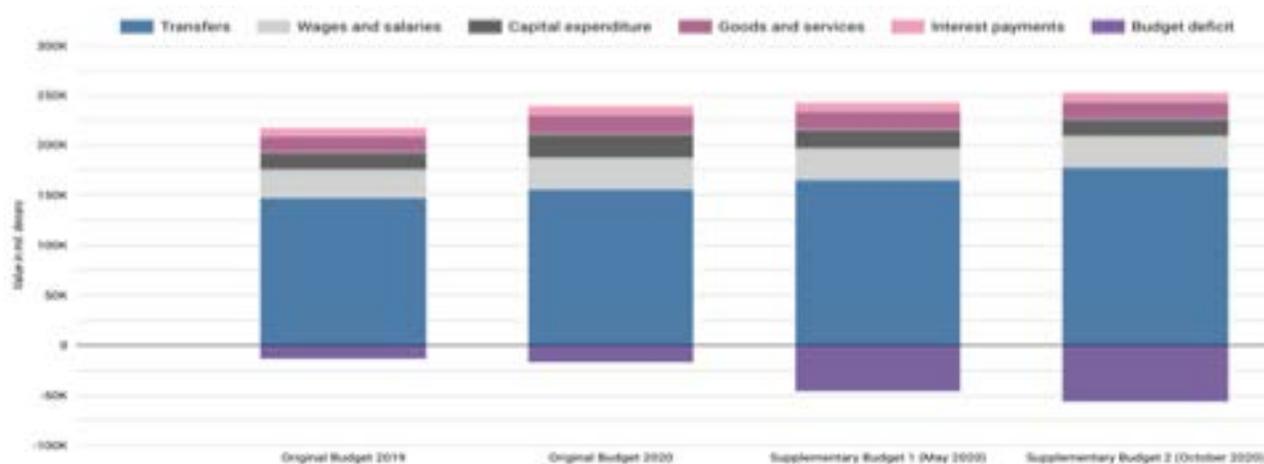
With a recession and reduced revenue, the government reduced its expenditure, especially the capital expenditure has dropped by 22.5% from the original 2020 budget. The decline was done mostly in non-essential and non-priority expenditures. The budget deficit went from -13.3 bill. denars in 2019 to -56.6 bill of denars in the current 2020 budget (figure 12). With the economic package put in place to support the economy and the population, the government increases its transfer by 13.9% in 2020.

Figure 11: Government revenues 2019-2020



Source: Socio-Economic Impact Assessment for Macedonia (October 2020)

Figure 12: Government expenditure 2019-2020



Source: Socio-Economic Impact Assessment for Macedonia (October 2020)

3.2.2. Economic sectors

The industry sector is the one that is the more hit by the pandemic. Indeed, the industrial production declined by -14.6%, the wholesale trade turnover by -33.3% and the retail trade by - 8.9%. As a direct consequence of the borders closing, the tourism and hospitality sector were the hardest-hit industries were the overnight stays fell by 80% and 25%, respectively for foreign and domestic tourists in the first five months of 2020 (figure 13).

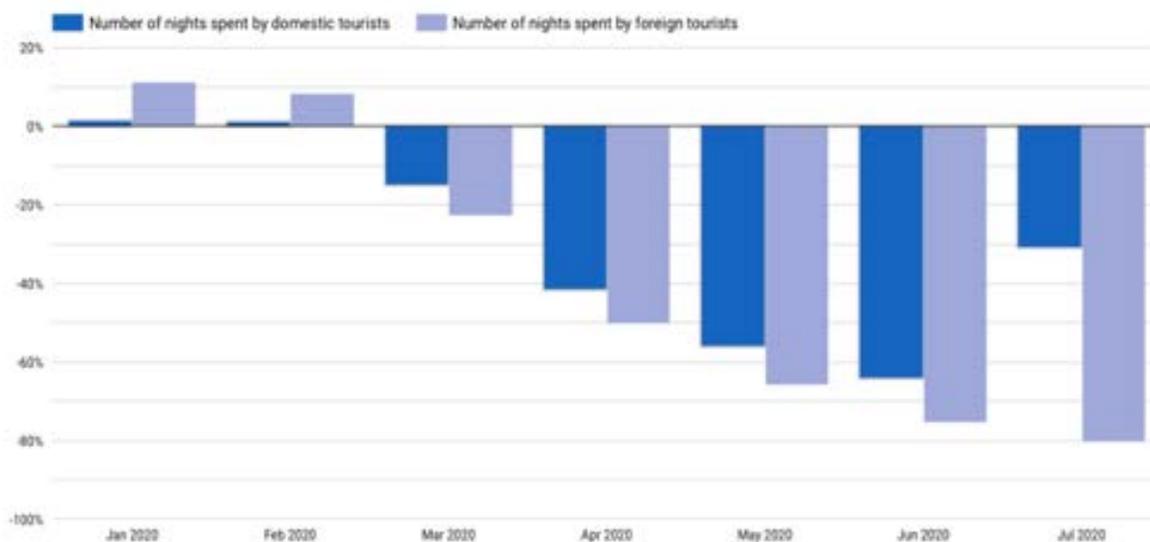
Few sectors of the industry have proven resilient to the crisis and achieved growth (pharmaceuticals, computers, and electronics, construction...) but the rest of the industrial branches that make up 86% of the industrial production was negatively affected by the COVID-19 pandemic. This represents about 21 branches of the industrial production. For instance, manufacture of leather, machinery, equipment and motor vehicles are the hardest hit with a decline of 21-43%.

While the overall industrial production is down by 13.2% for the first seven months, it went down by 9% in August 2020. May, June and July were the 3 months with the highest drop of the industrial production with respectively 14.4%, 14.6% and 13.8%.

This reduction of the industry sector has not impacted proportionally employment. Indeed, the during the month were industrial production dropped significantly,

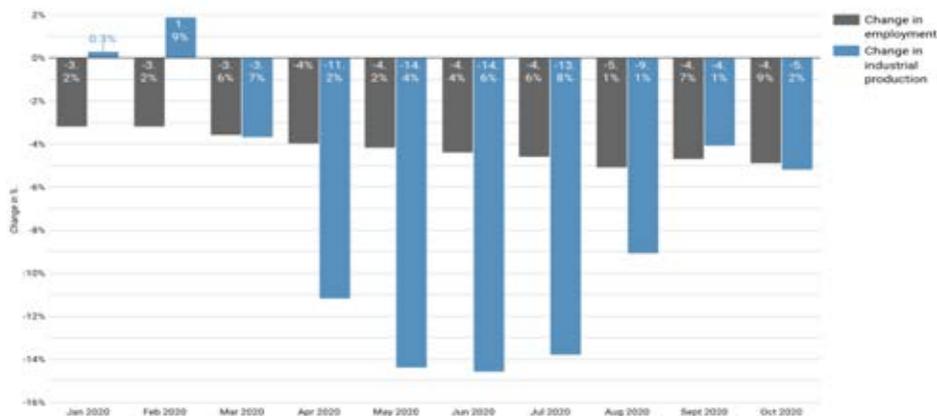
the employment rate decrease by about 4.4% only (figure 13 below). The employment rate before the Covid-19 crisis shows that the increase of unemployment is very small. In fact, the employment rate decline by 3.2% in January and February 2020. When the crisis hit, the employment decline was about 4% on average. The less pronounced impact on employment is a result of the government economic measures (figure 14).

Figure 13: Overnight stays in the tourism sector



Source: State Statistical Office (October 2020)

Figure 14: Production and number of employees by industry sector



Source: State Statistical Office (October 2020)

3.2.3. Employment

Employment. The recession of the economy in early 2020 has a direct impact on unemployment. The figure 15 displays the number of newly unemployed people. Between March and April 2020, the number of newly unemployed went from 1916 people to 7030 persons in April 2020. The peak of the newly unemployed was reached in June 2020 with 12,268 new employed. Since the beginning of the pandemic, the cities of Gevgelija and Valandovo are the most hit with about 80% increase in unemployment. In total, since the beginning of the pandemic, 45,543 jobs have been lost and overall, at the country level, unemployment increase by almost 43%.

Both formal and informal MSMEs are hit hard as they tend to have low cash-to-asset ratios. About three in five employees have lost their jobs in the micro-and small businesses. Those businesses have seen a fall of 95% in average monthly revenue.

The impact on employment differs by the nature of contract. Permanent workers face either pay cuts or an unpaid hiatus, backed by strong employment laws that discourage layoffs. Seasonal and informal workers in both the formal and informal sectors face job cuts and losses. Temporary workers, internal migrants, and day workers were among the most vulnerable based on income, and their ability to sustain themselves through the slowdown. An inability to find an alternative source of income is

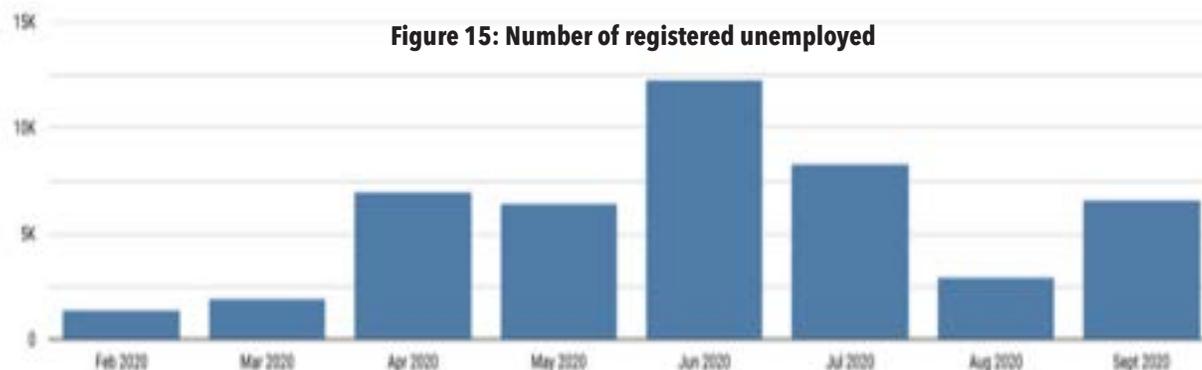
judged to be the main impact of the crisis on those already vulnerable or otherwise engaged in precarious work.

The crisis has affected women, especially from lower income groups, differently than men. Women typically work in industries that are less tele-commutable, such as hospitality, wholesale and retail, keeping them out of work and lowering the overall female participation in the employment force.

3.2.4. Social impact of the Covid-19 on vulnerable groups

The COVID-19 pandemic is unique it spread in almost all countries and forced several borders to be closed. This disrupted the current way of living and especially the economy. In these conditions, the most vulnerable groups are paying the highest price. Industrial production went down in North Macedonia as in most of the countries. Tens of thousands of jobs have been affected so far most of which are at the bottom of the wage spectrum and the disproportionate impact on the vulnerable groups will most likely increase poverty and inequalities at a national as well as at a global scale. Being aware of the impacts of the COVID-19 on the vulnerable groups is fundamental to inform and tailor the responses of governments and partners to recover from the crisis and ensure that no one is left behind.

Gender. Gender disparity increased since the pandemic. Since March 2020 (except in May 2020),



Source: Employment Service Agency (October 2020)

the number of newly unemployed women is higher than the men. In addition, this number has more than double since the beginning of the pandemic. In June 2020, the worst month, the number of newly unemployed women was 6291 and 5971 for the men. The gender disparities are, hence increasing (figure 17).

In March and April 2020, women were more affected by unemployment than men, with 1,019 new unemployed women in March and 3,829 in April compared to 897 newly unemployed men in March and 3,201 in April. In May 2020, the number of newly unemployed men was higher than that of women, but as of this date, it is still the most numerous women in this situation, the women of Skopje, Kumanovo, Bitola and Tetovo being the most affected.

When we analyze the women unemployment by age groups (15-29; 30-39; 40-49 and 50-59), the structure of Women unemployment has been (on average) in constant decline in the last 15 years across all age groups. In addition, the unemployment rate has been always higher among the group age of 15-29. The first half of 2020 shows various degrees of increase in all age groups from 30-59 years, likely due to COVID-19. The 50-59-year age group was hit the hardest with increase in unemployment of nearly 24% or 3.4 points for the first 6 months of 2020 (figure 14).

The informal economy in North Macedonia is important generating output equivalent to 17.4% of GDP. Women aged 65 and over are particularly numerous in informal jobs, accounting for 86.2% of all jobs held by this age group. Overall, 15 out of 100 women are working in the informal sector, and they are often found in the lowest-paying jobs, such as housekeeping or selling farm produce.

Poverty. The impact of the Covid-19 crisis accentuates poverty and inequalities within the population, particularly affecting children and women. The poverty incidence for the last 10 years has been decreasing. It went from 27% in 2010 to 21.9% in 2020. With the Covid-19, it is expected to rise in 2020 to 23.3%. The number of people at risk of poverty and social exclusion was decreasing from 555,600

persons in 2010 to 455,600 in 2019. The projection for 2020 shows that about one citizen out of four in North Macedonia are at risk of poverty and social exclusion.

Children poverty. The impact of the Covid-19 on children poverty is greater with younger children. While the poverty incidence among children between 15-17 years is almost constant before and after the pandemic, the poverty incidence for children 0-5 years old increase from 39.2% before the crisis to 42.5% during the pandemic. Hence, an additional 16,000 children will most likely fall below the poverty threshold as a result of COVID-19 crisis. The relative child poverty rate will increase to an estimated 33.3%. In terms of household, the ones with three children or more children are most at risk of COVID-19 induced poverty.

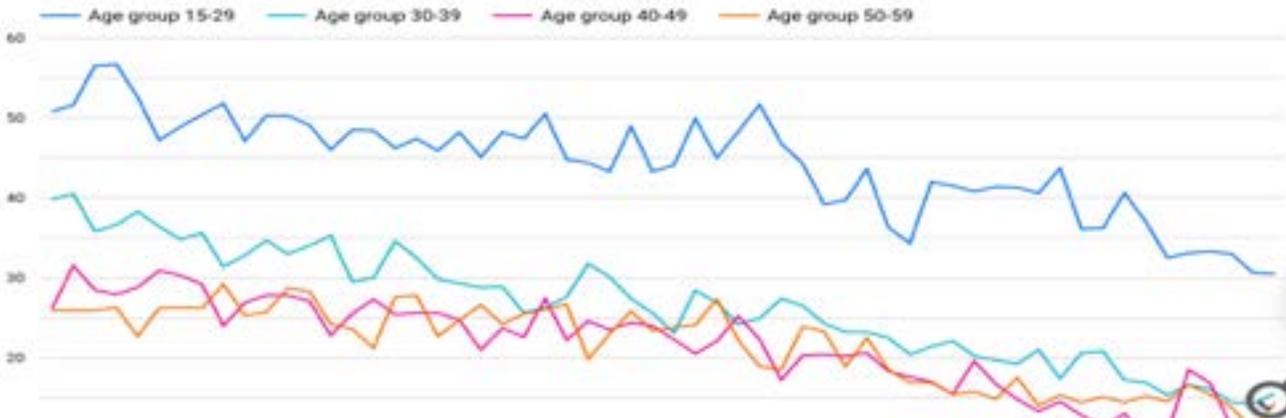
If we assume that the spread of the virus will be contained during the winter and spring of 2021, that there will be no further episodes of confinement and that a vaccine will be available at the beginning of 2021, a gradual recovery of growth to 3.6 percent is projected for 2021. However, with this pandemic crisis, the government quickly put in place measures to mitigate its impact on poverty; an overview of these measures is presented in the section below.

Figure 16: Number of newly unemployed by gender, Jan 2019-Sept 2020



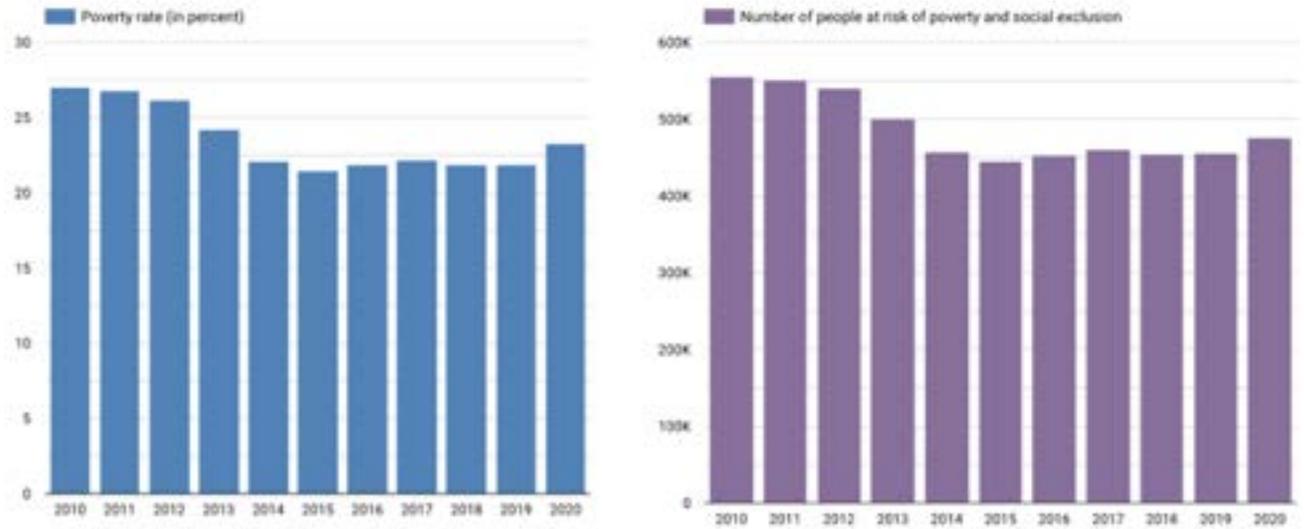
Source: Employment Service Agency (October 2020)

Figure 17: Women unemployment by age groups, 2006Q1 - 2020Q1



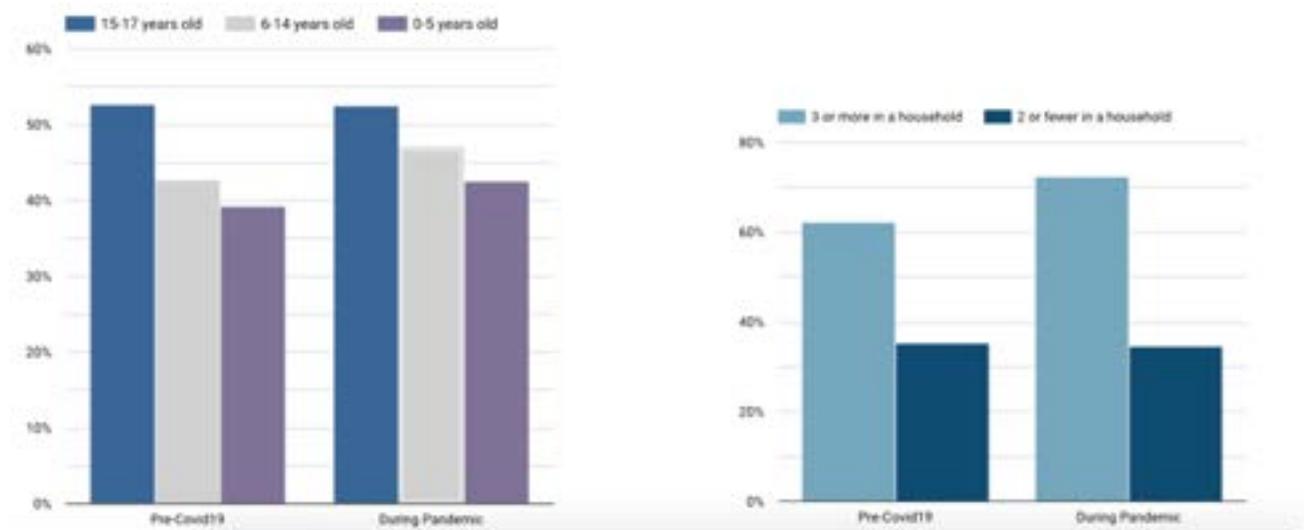
Source: Employment Service Agency (October 2020)

Figure 18: Poverty incidence and people at risk of poverty, 2010-2020



Source: Employment Service Agency (October 2020)

Figure 19: Impact on child poverty



Source: Employment Service Agency (October 2020)

3.3. North Macedonia after the Covid-19 plan

To deal with the pandemic, the government of the Republic of North Macedonia set up, in March 2020, a crisis unit to ensure the coordination of State bodies, legal entities established by the state and local self-government units. Coordinated by the Prime Minister, this crisis unit includes 10 key government members ⁷.

The country has thus adopted a series of economic and legislative measures aimed at limiting the spread of the virus and preserving as many jobs as possible. Among these measures, no less than 69 protocols have been adopted, ranging from preventive measures in the workplace, to the organization of events, to educational and childcare settings, to internships in work environment, leisure and sports activities, land and air transport of passengers as well as hotels and restaurants.

Since the beginning of the crisis, the Macedonian government has deployed four packages of economic measures (Government North Macedonia, 2020). The first and second packages of measures aimed to provide a rapid response to the economic crisis and cost between 200 and 250 million euros, or 2% of GDP. The third package of measures specifically targets citizens, the unemployed, students, low-income households and medical personnel, as well as sectors affected by the crisis, national companies, export companies, services, agriculture and tourism. The cost of these measures is about 355 million euros and reaches 730,000 beneficiaries. The Macedonian government estimate that these three packages prevented the collapse of the health system, the economy and social security.

76. The fourth package of measures, costing 470 million euros, has several objectives, including to:

- ensure the sustainability of national economic activ-

ities and jobs;

- recover some key activities;
- ensure the stability of social transfers;
- propose policies that will help to implement a rapid exit strategy once the crisis is over.

In total, the overall investment plan for the new Macedonian economy will cost about 1.02 billion euros. The measures taken by the Macedonian government range from cash support for citizens, to support for businesses and farmers, direct aid to the unemployed, athletes, artists and tourist guides and, finally, tax and debt relief. The economic measures are likely to support the implementation of the country's energy transition plan.

Section 6.3.2 of this report presents the measures put forward by the Macedonian government to reduce the economic impacts of the crisis that could also support the low-carbon transition plan and the implementation of the enhanced NDCs.

⁷) the Deputy Prime Minister of the Republic of North Macedonia in charge of economic affairs; (ii) the Deputy Prime Minister and Minister of the Political System and Inter-Community Relations; (iii) the Deputy Prime Minister in charge of European Affairs; (iv) the Minister of Foreign Affairs; (v) the Minister of the Interior; (vi) the Minister of Health; (vii) the Minister of Transport and Communications; (viii) the Minister of Finance; (ix) the Minister of Education and Science; (x) the director of the Crisis Management Center; and (xi) the director of the protection and rescue department.



IV. ENHANCED NATIONAL DETERMINED CONTRIBUTIONS (eNDC)



4.1. Definition of eNDC and context

NDCs are national climate plans highlighting climate actions governments aim to implement in response to climate change and as a contribution to global climate action. Intended Nationally Determined Contributions (INDC) are (intended) reductions in greenhouse gas emissions under the United Nations Framework Convention on Climate Change (UNFCCC). The intended contributions were determined without prejudice to the legal nature of the contributions. Under the Paris Agreement, adopted in December 2015, the INDC became the first Nationally Determined Contribution (NDC) when a country ratifies the agreement. Once the Paris Agreement was ratified, the NDC became the first greenhouse gas targets under the UNFCCC that applied equally to both developed and developing countries.

On August 4th 2015, North Macedonia submitted its INDC that covered the period 2015 to 2020. The country is now revising and enhancing its NDC to Climate Change. This enhanced NDC has more ambitious mitigation targets which are based on the mitigation potential both energy and non-energy sectors, and are considered crosscutting areas: gender, various co-benefits; private sector engagement and Sustainable Development Goals (SDG) linkages. It is built upon both energy and non-energy climate actions and can reach -82% potential net reduction of GHG emission by 2040, in comparison with 1990.

Within the framework of the reinstatement of GHG reduction measures and policies, North Macedonia has developed a set of 63 measures. This set includes 47 mitigation measures presented in detail in the Macedonian Third Biennial Update Report on Climate Change (TBUR), i.e. 32 measures in the energy sector, 11 measures in the sector of agriculture, forestry and other territorial uses (AFOLU) and 4 measures in the waste management sector. It also includes 16 additional measures to facilitate the implementation of mitigation measures, such as carrying out pilot projects or adopting new programs.

The Republic of North Macedonia is an EU candidate country and is willing to follow the European energy policy. The country is hence obliged to transpose and implement the EU energy directives and regulations. North Macedonia was granted the candidate status for entering the European Union in 2005. Since 2009, the Commission has recommended to the Council to open accession negotiations with North Macedonia. Furthermore, in 2018, the Commission has also recommended that the accession negotiation will be open with North Macedonia in 2019. In March 2020, the General Affairs Council of the EU decided to open accession negotiations with North Macedonia and the members of the council endorsed the decision.

North Macedonia has the second-highest unemployment rate in the region, but it is showing a positive trend over the years. Besides, employment is characterized with unfavorable gender structure, which has remained unchanged over a longer period due to unstable economic and social conditions, as well as the imbalance between the available and required profiles on the labor market. The employment rate in women population in 2019 was 48.4% (315 thousand women), significantly lower than the man employment rate) of the active population aged from 20 to 64 years.

GDP growth till 2040 is projected to position North Macedonia closer to today's CEE region economies. GDP shows that today North Macedonia lags behind the SEE average, as well as the CEE region. According to the Ministry of Finance, it is projected that until 2040, the Macedonian real GDP growth rate will be at an average rate of 3.3%. Such GDP growth rate could be expected for a developing country and should lead to convergence towards levels of GDP per capita for developed CEE countries today.

North Macedonia has a positive business environment to provide opportunities for small and medium enterprises in RES and energy efficiency. According to The World Bank Doing Business 2020 report, North Macedonia has the highest cumulative index for business

environment compared to countries in the region, and in particular stands out in the fields of protecting minority investors and dealing with construction permits. Still, there is room for improvement in the other categories, especially in trading across borders as their ranking is lagging behind the countries in the region. It is expected that future investments, including the investments in the energy sector (especially RES and energy efficiency), could have a positive impact on the economic growth.

4.2. Overview

The Ministry of Environment and Physical Planning (MoEPP) is the main institution responsible to revise the Macedonian Nationally Determined Contributions (NDCs) under the Paris Agreement of the United Nations Framework Convention on Climate Change (UNFCCC), supported by the United Nations Framework Convention on Climate Change (UNDP) Climate Promise Initiative.

There is a consensus that climate change is a result of human activity and has a social, economic and environmental impact on the population at local, national and global level (IPCC, UNECCC). In North Macedonia, five specific sectors largely contribute to the GHG emissions including **(i) the energy sector; (ii) the metal industry; (iii) the cement production sector; (iv) the crop production sector; and (v) the waste sector.**

According to the GHG inventory, the energy sector is the first contributor to GHG emissions in North Macedonia, using coal as 80 percent of the demand. The energy sector also depends heavily on domestic lignite, which constitutes 50 percent of the primary energy supply, but lignite is responsible for about 70 percent of all carbon dioxide equivalent (CO₂-eq) emissions (TBUR, 2020). However, the use of imported electricity and renewable energy explains the decline of the fossil fuel in 2017. The second sector is the **metal industry** with a dominant level of emissions from the production of ferroalloys. Then comes the **cement production**

which largely contribute to GHG emissions. In the AFOLU category, GHG emissions from **crop production** are caused by the inadequate and excessive fertilization with mineral fertilizers, which in the long-term causes a serious reduction in organic matter in soils and significant CO₂ emissions. Finally, **waste**, the emissions in the waste sector are increased by 50 percent between 1990 and 2016, making this sector the fastest growing. The table below summarizes the main sector responsible for GHG.

Table 3: Main source of GHG in Macedonia

Sector	Source of GHG
Energy	<ul style="list-style-type: none"> • Largest share in the GHG emissions • Based on fossil fuels, primarily coal (over 80% of the total energy demand) • Country with high gross inland consumption and high final energy consumption per unit of GDP despite the low energy consumption per capita
Industrial Processes and Product Use (IPPU)	<ul style="list-style-type: none"> • Production from industries and use of ozone-depleting substances for air conditioning • Metal industry (production of ferroalloys) and Cement production are the main contributors to the GHG emissions of this sector • The rest of the emissions from the use of substituents of ozone-depleting substances
Agriculture, Forestry and Other Land Use	<ul style="list-style-type: none"> • Forests and forest lands are the main CO₂ sinks in North Macedonia, • Total area in 2017 of forest is 1.001.489 ha, forest land is 109.126 ha and barren land is 11.643 ha, • From 2009 to 2017, about 43.252 ha of other wood land were changed to forest, • Around 90% of the forests are state-owned and the rest are private forests, • Livestock production emit GHG mainly as a result of enteric fermentation and management of manure, • GHG emissions from crop production are a consequence of several major sources, such as inadequate and excessive fertilization with mineral fertilizers, rare and inadequate application of manure, conversion to land use from extensive to an intensive plant production system, inadequate management of arable land and improper management when fertilizing.
Waste	<ul style="list-style-type: none"> • GHG emissions increased by 50% between 1990 and 2016 (fastest growing), • Most of the emissions are from Solid Waste Disposal, Biological Treatment of Solid Waste, Incineration and Open Burning of Waste, and Wastewater Treatment and Discharge, • Solid waste disposal is the category with the highest share of GHG emissions in this sector.

The SBUR and the TBUR exceed the requirements of the UNFCCC Guidelines for Non-Annex I Countries since, besides economic and environmental evaluation, it addresses social aspect estimating co-benefits from the implementation of mitigation policies and measures

(PAMs). The main components of enhanced NDC enhancement are realized in the following areas: Mitigation ambition, Implementation and Communication. The table below displays the main improvement between the enhanced NDC 2020 and the initial NDC 2005.

Table 4: Enhancement components of the enhanced NDC 2020 vs initial NDC 2005

	Enhanced NDC (2020)	Initial NDC (2015)
Mitigation ambition		
Strengthen the GHG target	<ul style="list-style-type: none"> • End-year type of targets (2030 emissions level compared to 1990 emissions level) • Compatibility and comparability with EU targets • Absolute emission reduction in 2030 compared to BAU: 7,603 Gg CO₂-eq 	<ul style="list-style-type: none"> • Deviation from BAU type of target in 2030 • Absolute emission reduction in 2030 compared to BAU: 5,228 Gg CO₂-eq
Strengthen or add a sectoral non GHG target	<ul style="list-style-type: none"> • The enhanced NDC is coherent with the following • sectoral non-GHG targets in 2030 stipulated in the draft National Energy and Climate Plan (NECP): • Renewable Energy Sources (RES) • 38% share in gross final energy consumption • 66% share in gross electricity production • 45% share in gross final energy consumption for heating and cooling • 10% in final energy consumption in transport • Energy Efficiency (EE) • 20.8% savings of final energy consumption relative to BAU scenario • 34.5% savings of primary energy consumption relative to BAU scenario 	
Align implementation of the existing eNDC with long-term goals	<ul style="list-style-type: none"> • The enhanced NDC echoes the Green scenario from the National Strategy for Energy Development up to 2040 and is fully aligned with the draft National Energy and Climate Plan (NECP). It is consistent with the following long-term (2040) goals: • % reduction of GHG emissions vs. 2005: 61.5 • % of RES in gross final energy consumption: 45 • % reduction of primary and final energy consumption vs. BAU: 51.8 primary, 27.5 final 	<ul style="list-style-type: none"> • No relation to long-term goals.

	<ul style="list-style-type: none"> The enhanced NDC is strongly linked to the EU-funded "Law and Strategy on Climate Change" project, which will deliver the Long-Term Climate Action Strategy and the Law on Climate Action. 	
Implementation		
<ul style="list-style-type: none"> Add actions or measures to Strengthen implementation 	<ul style="list-style-type: none"> The enhanced NDC encompasses mitigation action enabling PAMs like carbon pricing, pursuing regional energy markets integration, strengthening the role of SME, PAMs in the area of research and innovation and other measures. For each PAM, the finance needed is specified, as well as the potential sources of finance. For each PAM, the implementing and the monitoring entities/institutions are identified. For each PAM, progress indicators to monitor implementation with reference values (in the reporting year and in the target year) are clearly stated. For each PAM, information of the direct and indirect contributions on the Sustainable Development Goals (SDGs) is included. 	<ul style="list-style-type: none"> PAMs are presented in less detail
Communication		
<ul style="list-style-type: none"> Provide basic information to enhance clarity, transparency & understanding 	<ul style="list-style-type: none"> PAMs are presented in a tabular format with sufficient level of detail. The conducted analyses and PAMs tables are included in the enhanced NDC background document which is an integral part of the enhanced NDC submission. 	<ul style="list-style-type: none"> PAMs are presented in tabular format. The conducted analyses and PAMs tables are included in the eNDC Background document which is an integral part of the eNDC submission.

Recommendation 1: The Macedonia government should continue its strong support to the implementation of the eNDC. Doing so, the other economic agents (private sector, household,...) of the country will follow.

The main objective of the following sections is to identify the socio-economic aspects and co-benefits of the actions stipulated in the Macedonian enhanced NDC (such as employment, education, skills, social impacts, health etc.). This will be done by:

- Discussing the benefits for the sectors that need intensive actions and mitigation measures to reduce their impact on the climate change;
- Presenting how the population will benefit from those actions, especially the most vulnerable groups.
- Draw some recommendations to enhance the implementation of the eNDC.

eNDC Policies and measures met three social objectives that impact the well-being of the population and the most vulnerable ones: i) the reduction of the pollution that has a positive effect on people's health; ii) the creation of green jobs through green economy projects. These jobs have a positive effect on economic growth and the reduction of poverty; and iii) Enhancing green education and information. This has a long-term effect on people's behaviors by making them aware of changes beneficial to their health and well-being.

4.3. Sectors and contribution to enhanced NDC through pollution reduction

North Macedonia's GHG emissions as a ratio to GDP are five times higher than the EU average and will require incremental investments if they are to be moderated by 2040 (TBUR). In order to reduce the CO₂ emissions in the next 20 years, North Macedonia enhanced its NDC actions by adopting 63 climate change mitigation measures/policies that will impact each individual life in the sectors of energy, AFOLU, Transport and Waste.

Energy sector. Figure 20 below presents the GHG emission reduction for the energy sector. In 2025, the

largest reduction should come from the "Increased use of heat pumps" while in 2030, the largest reduction of GHG will come from hydropower plants built.

Although energy-intensive industries, heating and poorly insulated buildings, and transport all contribute to emissions, energy generation remains the main culprit. Through the national Policies and Measures (PAM), the energy sector will contribute to the gas reduction in terms of energy supply to the main users (households, central and local government, commercial, transport, and industry). Also, actions in the AFOLU will have an impact in livestock, land and agriculture sector. The solid waste disposal will also contribute to the reduction of CO₂.

The PAM 2 related to the construction of Large hydropower plants contributes to the use of renewable energy source from watermills and can improve the quality of the air and the reduction of the negative effects of GHG production. This energy economy plays an important role, especially in the health sector. The construction of new plants in several valleys (Vardar valley – 2025-2030 | Chebren – 2029 | Unnel Vardar – Kozjak, Veles and Gradec | Globochica II – 2035) will greatly contribute to the CO₂, CH₄ and N₂O reduction by 2035. This reduction of GHG will have a positive impact in the health sector by improving the quality of air.

The second measure that will highly contribute to the reduction of GHG production is the reduction of losses in electricity and heat networks. Through this measure, the electricity transmission and distribution losses will decrease from 12% to 8%, while the district heating system losses will be reduced from 12% to at least 7% contributing to the emission reduction of 323.4 Gg CO₂-eq in 2030. The increased use of heat pumps in compliance with EU Climate and Energy Policy will also contribute to a reduction of 369.5 Gg CO₂-eq in 2030 with 55% of the reduction of heat demand in 2040.

The energy mitigation measures are in compliance with the SDG 7⁹. This is the reason why certain

⁹ "ensure access to affordable, reliable, sustainable and modern energy for all"

regulations are put in place to encourage the use of renewable energies, for example, in the field of construction.

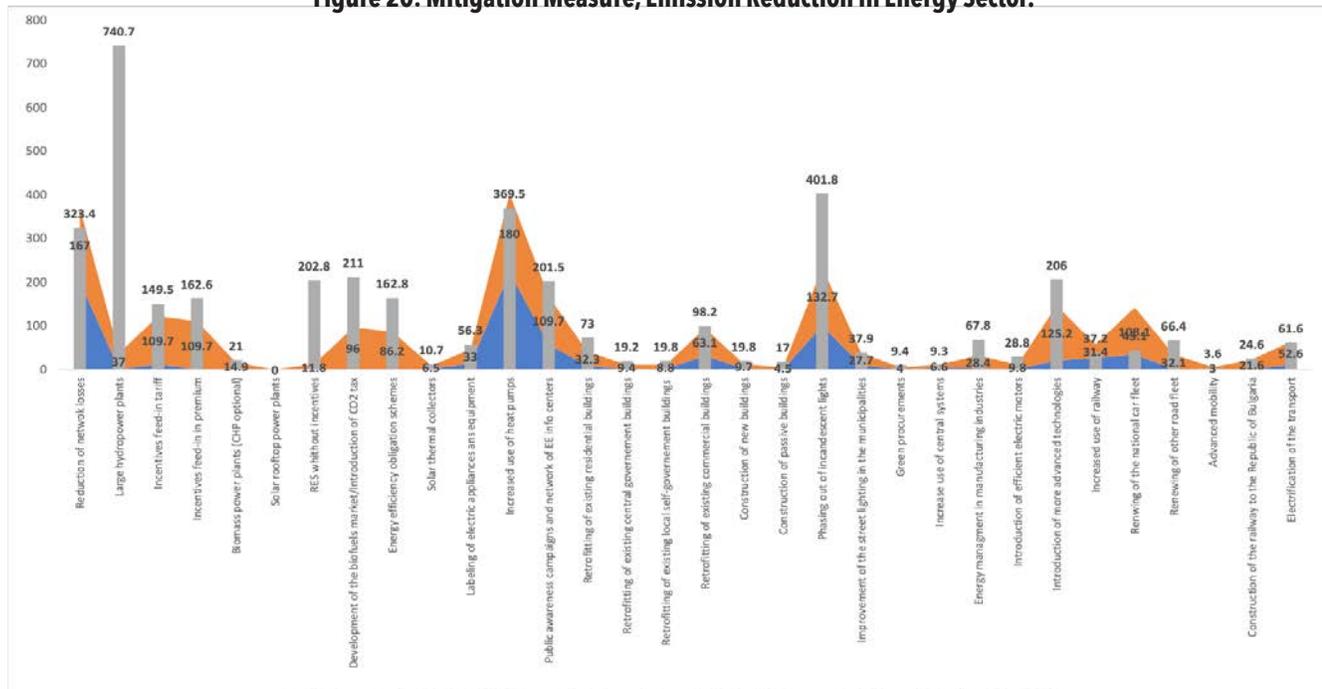
Some regulations also enhanced the incentives of new energy supply with the construction of small plants by 2040. The incentives in feed-in tariffs will add value with the building of wind power plants (86 MW), biogas power plants (13 MW), small hydro power plants (92.5 MW), and biomass power plants with the capacity of 15 MW. In the other hand, the incentives in feed-in premium will speed up the construction of solar power plants 200 MW and additional wind power 64 MW. Also, agreements will be awarding to use premium for electric power produced from photovoltaic power. Construction of solar rooftop power plants, on private as well as public

buildings, will contribute to a better use of electricity.

Recommendation 2. The government should use the Malus-Bonus policy to bring the private sector on board for the implementation of the eNDC as an important partner. The Malus-Bonus policy would drive the private sector to do business sustainably and to drive innovation, competitiveness, risk management and growth.

With regard to AFOLU, deforestation and forest fire management are an important problem as it is the source of high CO₂ production. In 10 years, there has been an annual average of 229 forest fires. To solve this issue, North Macedonia has established an integrated

Figure 20: Mitigation Measure, Emission Reduction in Energy Sector.



Source: MASA (2020). Macedonian enhanced nationally determined contribution, Skopje, Macedonia.

management of forest fires plan to fight against forest fires. To reach the objective of reducing the average annual burned area for 6000 ha, special training centers for firefighters will be created, as well as the purchase of vehicles to monitor and report fires. This measure contributes to the SDG 15¹⁰. It will also contribute to the reduction of emission of 345 Gg CO₂-eq in 2030.

To balance the ecosystem and the forest loss, a project of afforestation of 7.5 million Oak in 5000 ha of barren land (*Quercus* spp.) will be put in place in one location. The choice of the Oak comes from its resistance to fire and high temperatures. This measure will have a beneficial effect on the health of the population and will contribute to achieve

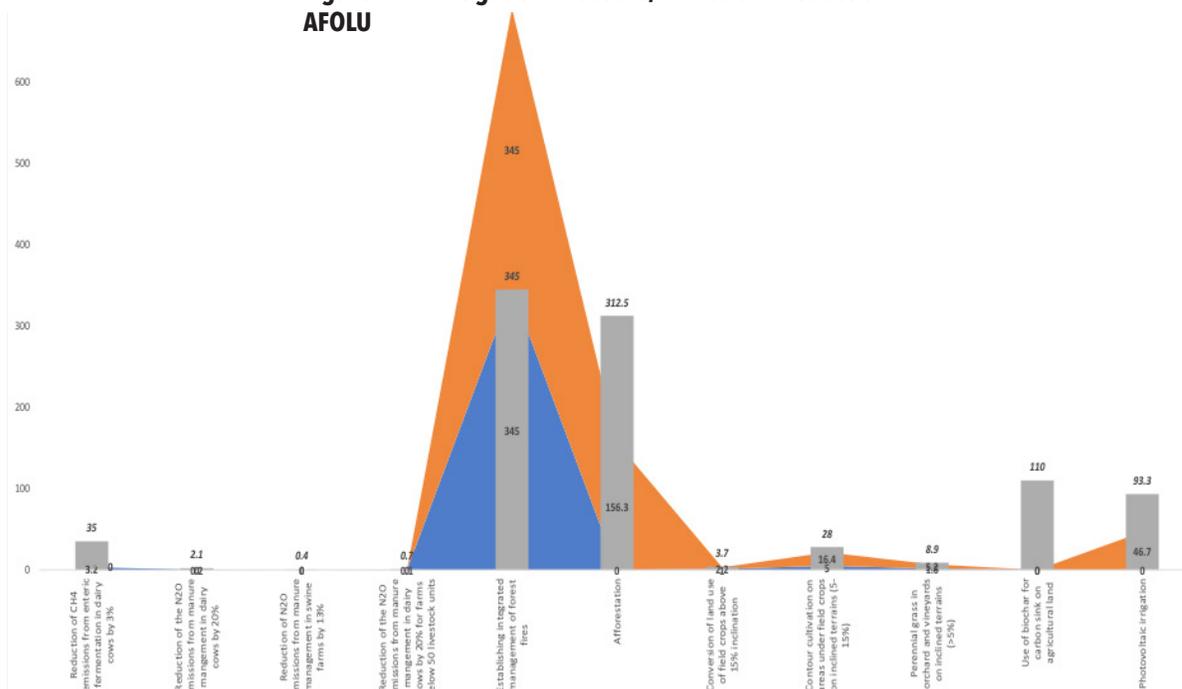
¹⁰ Protecting, restoring and promoting sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation and halt biodiversity loss

the SDG 15 and the reduction of 312.5 Gg CO₂-eq in 2030.

Solid waste management measures. Landfill gas flaring measure will contribute to environmental protection and meeting the highest European standards. The objective is to reach the indicator target value of 489.7 emissions reduction (Gg CO₂-eq) in 2030. From 2023 to 2029, many existing landfills and illegal dumpsites with very high, high and medium risk will be closed or covered, new ones will be opened by the waste management regions.

Recommendation 3. Household members should be educated to implement sustainable behavior in their daily life (heating method, waste management,...)

Figure 21: Mitigation Measure, Emissions reduction in AFOLU



Source: MASA(2020). Macedonian enhanced nationally determined contribution, Skopje, Macedonia.

Actions to strengthen the NDC applications. The 16 additional policies and measures enablers of mitigation actions (table 5) contribute significantly to sustainable development and the SDG 7 aims to respond to the RES. The Macedonian government has implemented several incentives to accelerate the transition to an affordable, reliable and sustainable energy system. The adoption of the Climate Action Strategy, the National Energy and Climate Plan, as well as the introduction of the CO2 tax, are helping to stimulate investment in renewable energy resources and prioritize energy-efficient practices. The transition to low-carbon technologies and services must be accompanied by socially responsible and just-in-response programs to address the job loss of employees in traditional industries with high greenhouse gas emissions.

Identifying the appropriate location for solar and wind power plants is also part of this process, using land-based areas that have already been disrupted by industrial activities such as mines or quarries. Access to affordable, reliable, sustainable and modern energy for all also requires experimentation to test innovative concepts for smart energy systems. Developing smart communities and campuses are part of this initiative. The photovoltaic plant installed at the Faculty of Electrical Engineering and Information Technology in 2018 serves as a pilot project and could become widespread to meet the objectives of SDG 7.

The SDG9¹¹ encompasses three important aspects of sustainable development: infrastructure, industrialization and innovation. Sustainable development requires better management of natural and energy resources. However, the industrialization, as the transition from agricultural to industrial society, has largely contributed to increasing industries with high consumption of fossil energy. Achieving sustainable development would require a change in strategy and new standards and measures to invest in advance and clean infrastructure and technologies. These innovative technologies must include and cover all private or public services and

structures and must be implemented in a practical way to have an impact on the population.

In North Macedonia, several measures would enhance the achievement of the SDG 9 including (i) Building resilient infrastructure; (ii) promoting inclusive and sustainable industrialization; and (iii) fostering innovation. These would require: a) Participating in development of energy transition technologies and measures through streamlining energy transition technologies and measures into national R&I priorities, b) Increasing level of education of sustainable energy needs and adjusting energy related curricula at all educational levels to make them responsive to energy transition trends; c) Encouraging the inter-sectoral and geographical mobility of researchers; and (iv) Increasing the role of SME sector in energy transition by diversifying their portfolio of services and products in RES and EE.

¹¹ Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

Table 5: The 16 Additional Policies and Measures Enablers of Mitigation Action

PAM	Additional PAM enablers of mitigation action	Description
48	Introduction of CO2 tax	Incentivize lowering CO2 emissions
49	Program for just transition	Developing programs for socially responsible and just transition
50	Identification of the proper location for solar and wind power plants	Development of methodology for selection of the most appropriate location for solar and wind power plants
52	Construction of 400 kV electricity transmission interconnection North Macedonia-Albania (Bitola-Elbasan)	Improve the interconnectivity level
53	Develop natural gas cross-border infrastructure to diversify supply routes and increase market competitiveness	Develop natural gas cross-border infrastructure to diversify supply routes and increase market competitiveness.
54	Develop gas transmission network	Increase the access to the transmission network
55	Develop a gas distribution network	Diversification of the energy resources
56	Pursue regional electricity market integration	Increase the electricity price competitiveness and affordability.
57	Develop further distribution system network to integrate more RES, including prosumers and more electric vehicles (EVs), as well as continuously improve network reliability	Develop further distribution system network to integrate more RES, as well as continuously improve network reliability.
58	Price signal demand response	Introduce price signals to consumers in order to implement demand response
59	Adoption of annual program for vulnerable consumers	Protect vulnerable customers.
60	Participation in development of energy transition technologies and measures	Streamline energy transition technologies and measures into national R&I priorities
61	Increased level of education of sustainable energy needs	Adjust energy related curricula at all educational levels to make them responsive to energy transition trends
62	Inter-sectoral and geographical mobility of researchers	Encourage inter-sectoral and geographical mobility of researchers
63	Increase the role of SME sector in energy transition	Encourage SME sector to diversify their portfolio of services and products in RES and EE

Source: MASA (2020). Macedonian enhanced nationally determined contribution, Skopje, North Macedonia.



5.1. Gender and the benefits of enhanced NDC

eNDC Policies and measures met three social objectives that impact the well-being of the population and the most vulnerable. First, the reduction of the pollution has a positive effect on people's health. Second, the green jobs creation through green economy projects has an effect on economic growth and the reduction of the people's poverty. And, third Enhancing green education and information has a long term effect on people's behaviors by making them aware of changes beneficial to their health and well-being. All of these measures must take gender difference into account with a focus on women as they can positively influence their community and thus society.

Pollution reduction and the impact on gender.

When it comes to climate change, we are all at risk - no one is immune. But when it comes to impact, differences arise on how men and women experience the effects of climate change, as well as their ability to cope with them¹².

In addition, air pollution has been recognized as one of

the most serious environmental challenges in the urban areas of the country. The elderly, especially women who face the challenge of providing a proper home heating, are exposed to the negative effects of burning firewood that has a long-term impact on their health¹³. Finally, 68% of the citizens perceive the connection and the differences between climate change and air pollution¹⁴. The main motivation for the protection of the environment is the desire to live in healthy and clean environment. Indeed, a lot of research convey that the reduction of the pollution has a positive effect on people's health.

Gender differences and roles in Energy, Transport, Agriculture and Sciences linked to Climate Change

Despite tremendous efforts made to reduce the gender gap and climate change, there are still a lot of disparity between women and men to be addressed in different sectors as shown in the table 6 and 7 below¹⁵.

¹³ Djambaska E. (2019)

¹⁴ UNDP survey (2019) on climate change perception and awareness level: an online survey of the citizens of the Republic of North Macedonia,

¹⁵ Refer to Apotolova O. (2020). Gender Equality and Climate Change: 2020, Published under project TBUR on Climate Change with UNDP and GEF support.

Table 6: Gender roles in Energy and Transport linked to Climate Change

Gender	Energy	Transport
Men	<ul style="list-style-type: none"> Men are better informed and more proactive than women about such measures, while women are more interested in the savings achieved with these measures. Gender differences are also evident in the approach to energy reform, with men being more informed than women about energy reforms 	<ul style="list-style-type: none"> Both men and women use transport in order to access economic opportunities. Men mostly use the car as a means of transportation, and women use the public transport. Men often own property and have better paid jobs that gives them access to loans for buying new or used car. By using the car as a means of transport, men save time while women who use public transport cannot save time. The economic and social status and life of women and men affect their different transport needs and their use of transport services.



Women	<ul style="list-style-type: none">• There are fewer women (than men) in the energy sector: engineers, employees and managerial positions.• Women have fewer financial resources to invest in new technologies.• Women are usually poorer and more at risk of energy poverty.• In countries with traditional gender character, most often men decide when and what type of appliances will be purchased (or used), or what type of energy will be used to heat the home.• men and women alike believe that energy efficiency measures are a good way to address energy poverty.• The poverty rate is higher among single mothers' families, which is reflected in their energy poverty. They should be particularly targeted in national mitigation efforts and in the subsidy's programs.• Energy poverty is most pronounced among women living alone, age of 65 + with a fixed income.• Women have interest in energy reform and energy efficiency but they do not have sufficient knowledge to implement it.• Communication and information systems on energy reform should target women in particular.	<ul style="list-style-type: none">• In addition to accessing the labor market, women also use transport as a way of taking care of their home and family.• Women use the public transport. Therefore, public transport should respond to women's needs and priorities. Women often work in lower paid jobs and sectors and are have limited access to finance and credits so they cannot buy their own car.• Women are much more accepting to environmental mobility models (walking, cycling).• Women more often make transportation decisions based on its safety, while men choose based on speed.• By using the car as a means of transport, men save time while women who use public transport cannot save time.• The economic and social status and life of women and men affect their different transport needs and their use of transport services.• Transport infrastructure and services should not be seen as "gender neutral".• Gender-responsive budgeting should be used when developing budgetary policies and programs in the transport sector.• The lack of gender disaggregated data in the transport sector prevents the development of detailed analyzes that will show what is the situation with gender equality in this area.
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Source: Apostolva, O. (2020). Gender Equality and Climate Change: 2020, Published under project TBUR on Climate Change with UNDP and GEF support., p. 32, 34

Table 7: Gender differences and roles in Agriculture and Science/Technical Skills linked to Climate Change

Gender	Agriculture	Tehcnical Science
Women	<ul style="list-style-type: none"> • In agriculture women are often unpaid workers on family farms and / or underpaid workers on other farms and agricultural enterprises. They are often involved in growing crops and nurturing livestock for their own and commercial needs. They produce food and are often involved in mixed farming operations. • Climate change and its adverse effects affect access to drinking water and irrigation water on agricultural land. This is directly related to female labor in the family - hygiene, home cooking or irrigation for the cultivation of certain types of crops mostly near the home. • Ownership of property/lands is one of the most significant problems in agriculture. Women traditionally do not inherit the property/agricultural area which leads to their inability to manage finances. • Women own 11% of agricultural holdings. It prevents them from accessing banking credits, loans and access to funds for the purpose of mitigation or adaptation. • In the agricultural sector, women generally have less control over land and livestock (ownership), much less use improved seeds, quality fertilizers and banking services such as credits and loans, which means they have a smaller share in the use of extension services / measures. • Caring for dependent family members prevents women from being more present in the labor market, but the infrastructural (in)accessibility and remoteness of social, health, and educational services make their work at home 	<ul style="list-style-type: none"> • Social and cultural norms associated with the traditional role of women in the society constitute an obstacle for greater achievement of women in science. • Girls show more interest in science and mathematics, but boys show more confidence. • There is a gender imbalance in the workforce in the field of technical sciences and the ICT sector, especially in managerial positions. • Girls who study science, mathematics IT often choose to pursue their careers in the education sector, while boys in the IT industry. • Although women are increasingly involved in entrepreneurship, the percentage of women-led companies in the IT sector is still low

Gender	Agriculture	Technical Science
	<p>even more difficult, since it takes a lot of time to reach these services</p> <ul style="list-style-type: none"> • Women have traditionally been the guardians of cultural heritage and knowledge on the use of natural resources in health treatment / healing, cooking, etc. • They are increasingly involved in vegetable production but are also involved in the production of dairy products, i.e., processing of dairy products, fruits and vegetables. • They are less represented in natural resource utilization activities such as forestry, hunting, fishing. • Women are less represented in decision-making processes at local level (and less informed about local policies). • The educational structure and access to education for rural women are an important factor in strengthening the role of women in agriculture. • Women rarely use improved seeds and / or fertilizers, machines and tools. • Women have less access to information on new technologies in both mitigation and adaptation. • Agriculture. Women traditionally do not inherit the property / agricultural area which leads to their inability to manage finances. 	

Source: Apostolva, O. (2020). Gender Equality and Climate Change: 2020, Published under project TBUR on Climate Change with UNDP and GEF support, p.33, 35.

Green jobs creation resulted from actions of the ENDC that contribute to the well-being of the population, especially the vulnerable groups. In the agriculture and the waste management sector, it is not sure that the net creation of job will be positive. However, the main results of the eNDC in these sectors is, for agriculture, the increase of productivity, and the improvement of health for both sectors

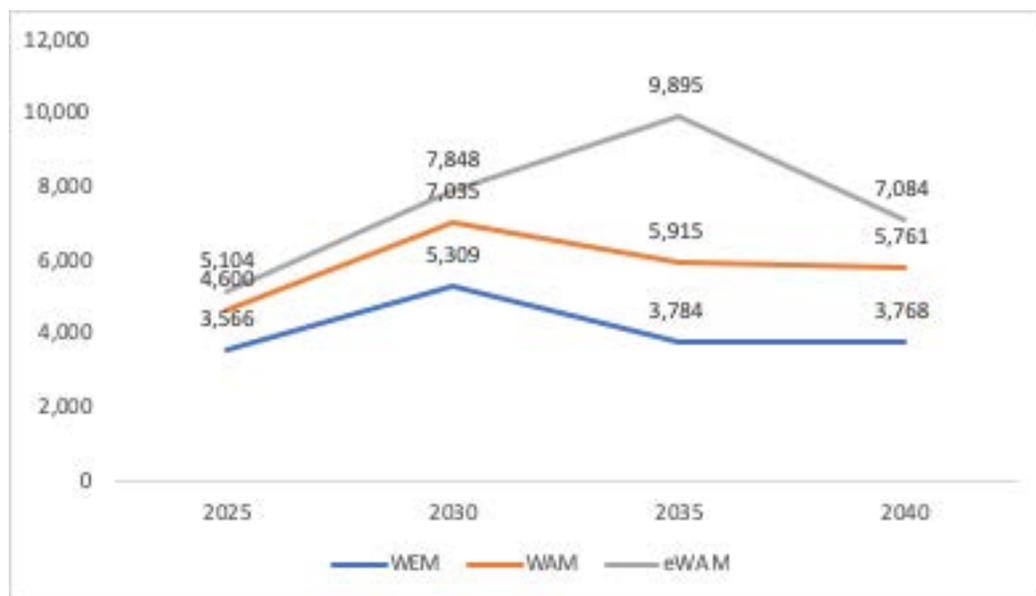
The positive impact of the effort of reducing the CO2 and GHG emissions is the social and suitable development due to the job creations. The climate change mitigation plan uses 3 mitigation scenarios to predict the number of green jobs creations for the period from 2025 to 2040.

By 2030, the Existing Measures (WEM), the Scenario with Additional Measures (WAM) and the Scenario with Extended Measures (e-WAM) shows an exponential increase of the green jobs' creations, with the contribution

of energy efficiency. The most ambitious scenario also known as the climate champion scenario has the most potential of job creation, doubling the survival scenario in 2035. This is mostly due to the job creation in using new technology to reduce emissions home energy retrofits (50%), passive houses building that results in ultra-low energy using (23%), a photovoltaic or power system designed to supply usable solar power (10%) and solar thermal collectors (8%). These results are very optimistic and should take into account the distribution of the green jobs creation by gender. This assessment of mitigation policies and measures predicts in the ambitious scenario that 2,718 jobs will be created for women in 2035, with 43% in the retrofitting of existing commercial buildings sector.

Building retrofitting by creating more jobs in the construction sector will co-benefit from the energy measures. The replacement by new technology and improved construction code are part of the

Figure 22: Number of green jobs per scenario



Source: Third Biennial update Report on Climate Change of the Republic of Macedonia, 2020

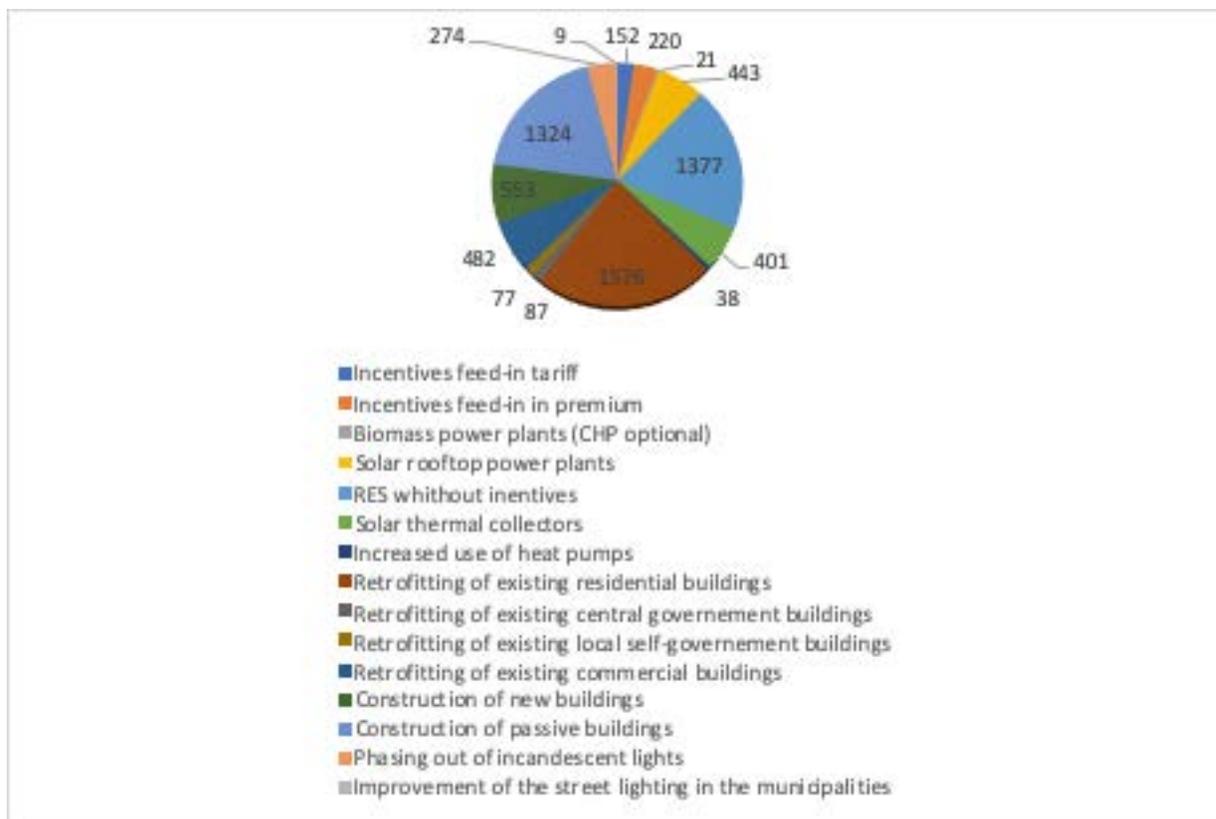
retrofitting of building and will contribute to save more energy. Retrofitting of existing residential, central government local self-government buildings and commercial buildings would create over 10,700 jobs. Overall, in the Republic of North Macedonia, new buildings construction according to a new standard for energy efficiency would create over 1,580 jobs.

The other jobs that will be created as co-benefit of the energy measures are: Biomass power plants, solar roof power plants, solar thermal collectors,

street lighting improvement, RES without incentives.

Lighting improvement refers to buildings, but also to public lighting. The transition to LED lighting, which has a much higher added value, will create jobs, because new sales channels and innovative installations will be formed. By applying this measure, a total of 650 new jobs might be created by 2040. The renewable energy sector measures including feed-in tariffs, feed in premiums, solar rooftops, thermal collectors and RES without incentives would lead to 1,870 jobs. Jobs related to "more efficient transport"

Figure 23: Number of specific green jobs created using the E-WAM best scenario in 2030



Source: Summary of measures for the Extended mitigation scenario (e-WAM)

The Mitigation Policies and Measures (PAMS) from sectors such as Transport, Industry, Agriculture, Forestry and Other Land Use (AFOLU) and Waste sector didn't incorporate gender in their scenarios. This indicator could help to monitor development progress.

Climate change has also a social impact on vulnerable groups who are exposed to pollution and air quality; this has a health burden and high economic cost in North Macedonia. The World Bank¹⁶ estimated that about 1,600 people die prematurely every year as a result of exposure to AAP (PM2.5). About 21 percent of this burden is carried by the capital city, Skopje. It is the city with high level of air pollution due to extensive consumption of firewood used as household heating. Improving the insulation in the housing facilities, the change of fuel and the manner of heating, the increased acceptance of central heating should (i) reduce the consumption of energy obtained from GHG high emission energy sources, (ii) ensure the replacement with low-carbon fuels, (iii) promote the use of technologies to minimize the effect on local pollution (STUGRES 2017).

The characteristics of air pollution in the City of Skopje¹⁷ are mainly:

- Firewood is the household heating contributing to 90% of total PM10 particles
- Poor thermal insulation of buildings contributes to greater energy demand for heating on the one hand
- Inefficient stoves and boilers used to heat homes contribute to increase local pollution.
- Inefficient use of energy is one of the main causes of increased greenhouse gas emissions.

The Skopje breathing scenario was planned for the period 2017-2025 and consist at taking 3 actions aiming at reducing energy consumption from sources whose GHG emissions are high and their replacement with low-carbon sources with minimal effect on local pollution:

- Fuel change and heating (use of more efficient tech-

nologies) - complete shutdown of coal as a source of warming in homes; - changing the way homes are heated by replacing fossil fuels primarily with firewood with alternative environmentally friendly sources of energy, - replacement of firewood stoves with newer and more energy-efficient ones; - possibility to connect to a central heating system.

- Energy-efficient buildings (improvement of insulation in residential buildings) - renovation and replacement of insulated or slightly insulated facades lower than prescribed standards with a thermally efficient facade of housing structures; - renovation and replacement of insulated roofs with thermally insulated roofs with the possibility of installing appropriate solutions for the use of solar energy;
- Increased acceptance of central heating (existing or small central systems). The most desirable scenario is to include all proposed groups through appropriate measures and activities that will enable the realization of the goals set in STUGRES and Skopje breath. The planned activities, as well as the number of households to be covered by the proposed STUGRES measures.

Mitigations. Major actions to enhance the NDC should be based on gender response to climate change, mainly because women are the most vulnerable in North Macedonia. Women's labor participation rate, 48.4%, is also 14 percentage points lower than the EU average (World Bank 2019).

Mitigation assessment has to be made more gender responsive. This requires a contextual analysis of the needs, priorities, roles and experiences of women and men, as well as the integration of specific actions to address any gender inequalities that may have emerged from that analysis. In addition, mitigation measures and policies have to be developed considering the gender perspective. Some gender indicators need to be developed during the planning phase in order to secure that the progress and results will be properly monitored and evaluated during and after the implementation of the projects (TBUR 2020). It has to be noted that in 2020, trainings on gender and climate change have been provided and there is a plan to continue in the coming years these trainings

¹⁶ Environment: AQM Report in North Macedonia, November 2019

¹⁷ study of city of Skopje, 2019

Education-Skills-Information Actions are supported with ENDC Policies and Measure. The green education and information enhance long-term effects on people's behaviors by making them aware of changes beneficial to their health and well-being. Indeed, in the CC perception

survey, most of the respondents think that an individual change of behavior can greatly influence climate change.

Education-Skills-Information Actions supporting ENDC Policies and Measures/PAM
PAM13: Public awareness campaigns and network of EE info centers. Increase the number of campaigns in response to the lack of knowledge about the benefits of the EE through the promotion of an efficient use of energy by small energy customers, including domestic customer, and train the employees in the public institutions at the central and local level.
PAM 22. Green Procurements. Increase the 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.
PAM 23. Increase use of central systems. Through information campaigns encourage the use of existing and new central heating network.
PAM 26. Introduction of more advanced technologies industries. Increase the knowledge in more advanced technologies can help various industries to grow faster.
PAM 27. Increase use of railways. Implement raising awareness campaigns for the use of railways.
PAM 30. Advanced mobility. Conduct a vast campaign for the use of new or rented bicycles, electric scooters, and the promotion of walking.
PAM 33. Reduction of CH4 emissions from enteric fermentation in dairy cow by 3%. The nutrition management training and demonstration for farmers will be sufficient to reach the goal.
PAM 34. Reduction of N2O emissions from manure management in dairy cow by 20%. The modification of the manure management in dairy cows requires farmers' training.
PAM 40. Contour cultivation on areas under field crops on inclined terrains (5-15%). With a systematic campaign for increasing the awareness of the farmers this measure can be widely adopted.
PAM 41. Perennial grass in orchard and vineyards on inclined terrains (>5%). The measure is easy to be implemented with training and low initial cost.
PAM 42. Use of biochar for carbon sink on agricultural land. 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.
PAM 46. Selection of wastepaper. Promote the reduction of paper consumption at school, offices and dematerialize the information using ICT (Information and Communication Technologies).
PAM 49. Program for just transition. Build the capacity of people who are losing their jobs and needs to transition to new job that requires knowledge in low carbon technologies and services.
PAM 51. Smart communities. Smart academic campuses are experimental places to test pilot advanced energy systems with the goal for roll-out on larger scale. PV power plants are installed at the Faculty of Electrical Engineering and Information Technologies.

PAM 60. Participation in development of energy transition technologies and measures. Prioritize energy transition technologies and measures into national R&I priorities in cooperation with the Ministry of Education, the Science, technology development sector and relevant energy stakeholders.

PAM 61. Increased level of education of sustainable energy needs. There is a need to i) include energy efficiency in schools' programs starting at an early age, ii) enhance science energy transition and new research capacities, iii) better integrate European Research Area (ERA) in energy themes.

PAM 62. Inter-sectoral and geographical mobility of researchers. The knowledge and experience sharing among researchers increases their capacities in terms of energy efficiency and innovation. The Faculty of Electrical Engineering and Information Technologies has established INNOFEIT, which is a place where the faculty staff, students and company representatives can interact, network and transfer technologies and innovations.

PAM 63. Increase the role of SME sector in energy transition. There is a need to provide technical assistance for SMEs in order to facilitate the access of enterprises to external services. This covers the areas of external research and development, testing, design, instruction and training, market research, and business consulting.

5.2. The impact of enhanced NDC on vulnerable groups

The assessment of the socio-economic impact of the eNDC is a difficult task to do in a quantitative manner because mainly of lack of data. To go around this constraint and in order to present an objective qualitative and analytical manner the wide information available, the 63 proposed policies and measures (PAM) identified have been classified into 12 categories presented below. The latter are grouped per type of policy (energy incentives encompasses PAMS such as incentives feed-in premium, incentives feed-in tariff, introduction of CO2 tax and RES without incentives) and not exclusively by sectors of applicability.

Due to a lack of disaggregated data, vulnerable groups here include poor households, poor women headed households, elders, unskilled workforce and minorities - all subgroups that could be significantly impacted by the proposed measures (in a positive or negative way). Then, for each PAM, an expert assessment of their impact on such vulnerable groups has been performed. A grade of zero (no impact) and 1 (possible impact) are done for each PAM. This rating also uses the available assessments

already done by Macedonian experts for select PAMs.

The figure below presents, by category of policy, the distribution of expected impact on vulnerable groups. Key findings are as follows for each category.

Disposal of unwelcome components and waste.

Each policy in this area should have beneficial effect on the general population and firms due to its contribution to cleaner environment. Overall, it is estimated that such measures would have either a positive impact on vulnerable groups (on at least 50% of them). Specifically:

i) improved waste and materials management at industrial facilities would benefit firms in terms of employee's health and may ultimately reduce costs,

ii) landfill gas flaring and the mechanical and biological treatment in new landfills would have a positive impact on populations and vulnerable groups closer to landfills in terms of health benefits, this being especially important for the latter as they typically are a group that has difficulties in accessing/financing healthcare;

iii) the selection of waste – paper should reduce waste, improve hygiene and promote selective waste management. Further, the current wave of ICT

developments (for example industry 4.0) should also reduce the need for paper, compounding the effect.

Energy Incentive. This category is related to financial measures aimed at making upcoming changes in the energy mix more attractive from an economic perspective. Incentive feed-in tariffs and RES should have a beneficial impact on health over time and thus affect positively vulnerable groups, generating savings and health benefits for them. This is important as they are the group the least able to protect itself from detrimental health effects of any measure. It has to be noted is the fact that at least in the short run, CO2 taxation may negatively affect household's disposable income as well as firm profits levels and thus, despite its rationale, may have a short-term negative impact.

Energy production and distribution. Overall, measures in this category should have a positive impact on households and firms (80% of proposed PAMs), provided job opportunities are offered (20% of PAMs). It should contribute to increase the flexibility of the electricity system, eventually reduce costs in the medium term and support new "green job" creation. Biomass power plants and large hydropower plants should benefit the entire population, firms and vulnerable groups though health effects, increased generation and (hopefully) lower production costs in the medium term. To enhance the positive impact, it would be useful to ensure that vulnerable groups can access – maybe in a preferential manner – the related job opportunities offered. The development of improved and expanded production/transmission/distribution networks, of cross-border infrastructure and solar related plants will be positive in terms of health benefits and costs.

Improving social effects of transition to a low carbon economy. Transversal and economy-wide program can be used to smooth out the change in energy systems. In such a transition, vulnerable groups can face significant hardship due to the difficulties they may have to adjust to the new situation (low income

does not help acquiring new appropriate appliances, vehicles or equipment while it is an obstacle to better health care, lack of skills and of retraining opportunities may lead to a lack of employability or an inability to join so-called smart communities operating under the new rules...). In this respect, of the four PAMs (program for just transition, identification of locations for solar/wind power plants, programs for vulnerable consumers and smart communities) in this category should all have a positive impact on vulnerable groups provided appropriate mitigation and inclusion measures are implemented. For example, land values may negatively be affected by solar/wind power plants, leading to net wealth reduction for vulnerable groups. Such effects should be mitigated either by setting up appropriate land prices or providing compensatory transfers.

Land and forest use. While around 60% of PAMs proposed in this category should be neutral with respect to vulnerable groups, still some positive and negative impact are to be expected. Perennial grass on orchards, contour cultivation and afforestation should not have any direct detrimental impact on vulnerable groups while proper integration of management of forest fires should have an obvious impact in terms of preservation of natural resources and capital, as well as a positive health effect on local populations. However, it should be kept in mind that while conversion of land use should be environmentally sound, this may entail income losses for landowners and may call for proper mitigation to avoid a negative impact.

"Greening" of procurement rules should have an obvious positive impact on all kinds of social groups and none negative impact on vulnerable groups. However, for this to happen, follow-up measures have to be implemented. First, procurement laws and regulations have to be adapted to take into account the consequences of such a change on call for tenders, the way bids are structured and the choice of procurement methods. An obvious example would be a contradiction happening between the choice of a lower-cost bidder against a more expensive competitor but

R&D and education. Such measures should have a broad positive impact on the economy due to the induced productivity increase as well as increased energy efficiency and lowered pollution. Participation by researchers to new technological research as well as their increased mobility should have none detrimental impact on vulnerable groups (66% of PAMs). Increased education on these matters should also be positive provide that vulnerable groups have access to such an education—whether in school for children or during retraining for new jobs for adults.

Developing regional integration of energy markets with a view to lowering costs and increase generation should be neutral for vulnerable groups (100% of PAMs) and should prove beneficial for the economy in the long run.

Change in energy use in manufacturing and transportation. This category has a broad range of impact for its PAMs, from negative impacts (44.4% of PAMs) to conditionally positive effects (55.6). Renewal of vehicle fleets (for individuals, firms) and development of advanced mobility means may improve energy efficiency, logistics but will be done at a cost for firms (costly investment required) and for vulnerable groups (who may force to change of transportation means, who will face a diminution of the second-hand market which is mostly composed of thermal engine vehicles when only electric ones will be allowed, who may not have the money to get the new means of transportation...). Therefore, unless mitigation measures are implemented, the impact would likely be negative for vulnerable groups. This can only be compensated for by the development of rail transportation and provided that vulnerable groups can have access to some of the jobs newly created. Similarly, while promising from an environmental point of view, better energy management, use of more advanced technologies and more efficient electric engines in manufacturing will create challenges for vulnerable groups. The key here will be to retrain as much as possible the current workforce and provide financial support to individuals who cannot be retrained or create their own job.

Economywide change in energy use. This category includes a broad range of PAMs that may positively affect vulnerable groups (30%) or negatively affect them (70%) if none mitigation measures are implemented. Improvement in street lighting, increased use of central systems and awareness campaigns should all lead in the medium term to better energy use, better health outcomes as well as increased security for the population and vulnerable groups. The impact is likely positive. The other PAMs proposed, while highly rational, will likely induce extra costs that vulnerable groups may have difficulties addressing on their own. Phasing out incandescent lights, increasing the use of heat pumps, labeling “green” appliances, developing biofuels... are all likely to induce price increases that may hurt such groups. Mitigation measures, mostly under the form of cash transfers or subsidies, should be implemented.

Reduction of emissions from agriculture and agro-industry. These PAMs will lower emissions (reduction in CH₄ and NO₂ emissions from livestock, use of biochar as carbon sink) but will all (100%) require investments (equipment, training, upgrade of facilities...) that necessitate incentives/support, otherwise they may harm poor/women farmers, older farmers and minority rural households. There is a strong case here for public support to the sector.

Finally, developing energy efficiency of (public and private) buildings (by making new up-to-date buildings or retrofitting/renovating existing ones) and photovoltaic irrigation for agriculture will be very important for environmental purposes. While these PAMs will benefit to general population, for equity purposes and as a way of compensation for other costs underlined above, one should target poor people and vulnerable groups (such as elders, poor women and minorities). This concerns 85% of PAMs in the category. On the positive side, such measures should have a large positive impact in terms of job creations and may provide some relief to vulnerable workers.



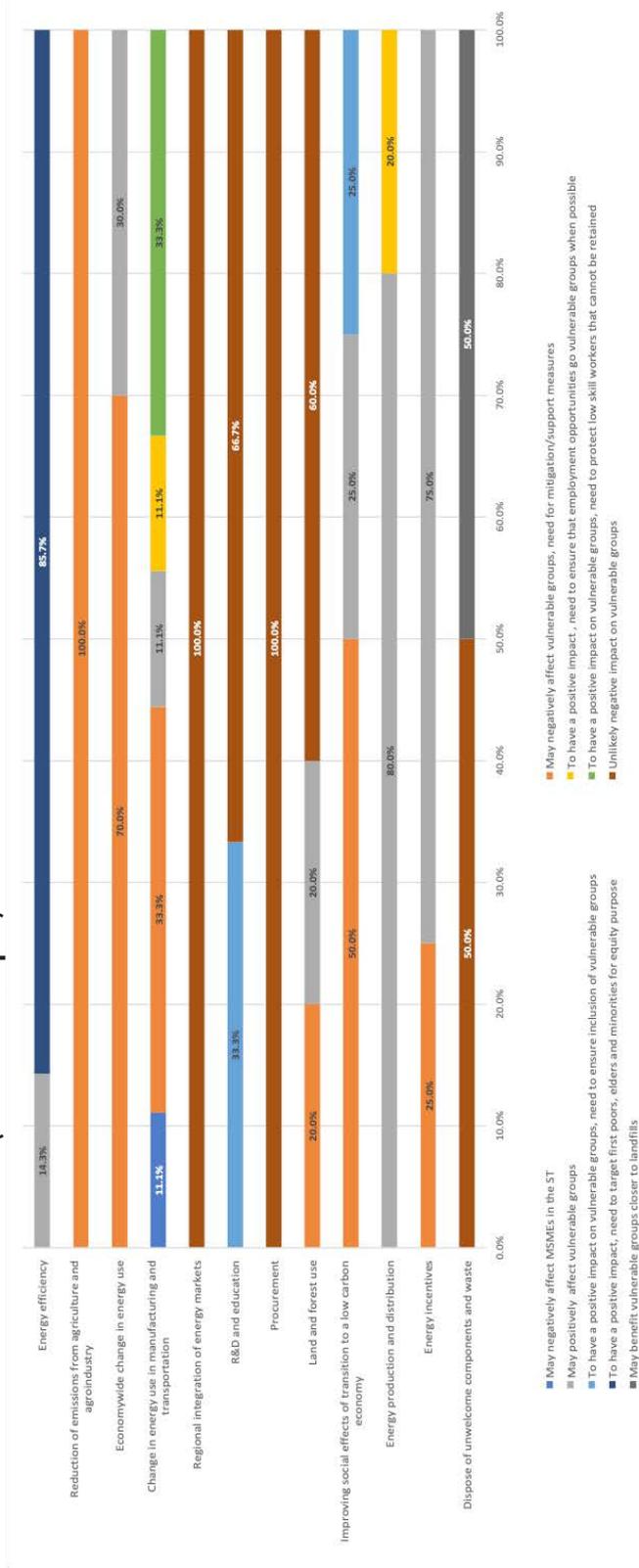
Recommendation 4. In terms of most targeted groups, it is recommended that support go to single women aged 65+ in the first place. This support can be designed in form of awareness campaign (climate change literacy) and financial support. In terms of heating coverage, it is recommended to accelerate the effort of generalization of the use of central district heating as the main preference of the population specially in the city of Skopje. The next groups to be supported include the single mothers, fathers of minors and household below the poverty line.

Recommendation 5. Considering the importance of the issues related to water resources for the Macedonian population, it is recommended to update knowledge on the impacts of climate change on water resources.

Recommendation 6. As part of the NDC measures providing for awareness campaign or training, special efforts should be made to promote the inclusion of women in informal jobs among the target clientele.

Recommendation 7. As part of the gradual implementation of NDC measures for households, priority should be given to households with 3 or more children as these are among the most vulnerable groups.

Figure 24: Plausible impact on vulnerable populations of key eNDC policies (L.Pct of PMAs impact)



5.3. Economic Impacts

5.3.1. Employment, economic growth and poverty reduction

Qualitative impacts of each of the 47 policies are assessed on three main economic aspects: employment, economic growth and poverty. For each of these 47 policies/actions, a rating of 0 (no impact) and 1 (possible impact) is done for the three aspects. The figure 25 below present the number of measures (out of the 47 measures) that would have a positive impact on employment, economic growth and poverty reduction of the vulnerable groups.

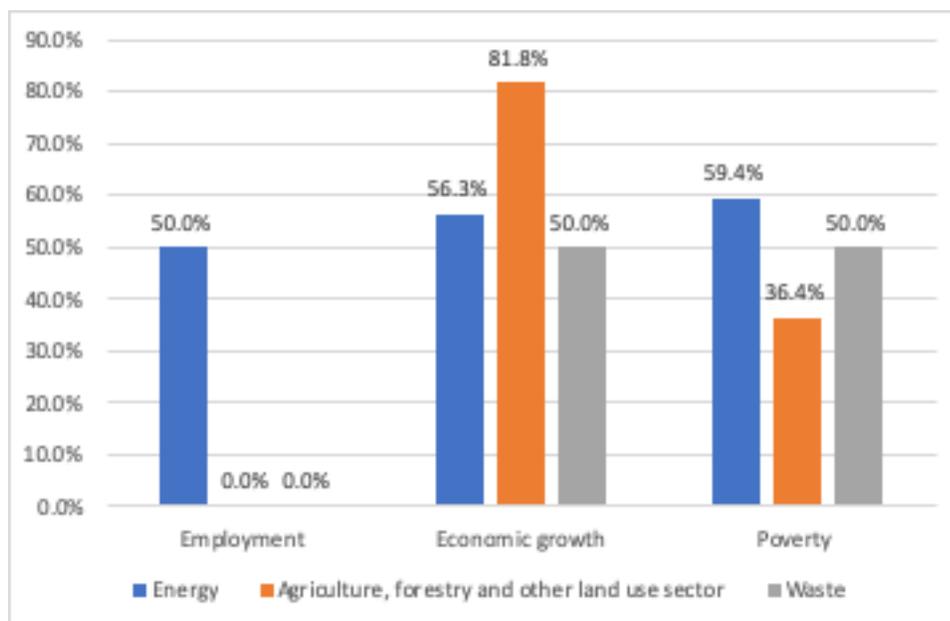
In the energy sector (32 measures), 50% of the measures (i.e. 16) would have a positive impact on job creation, main green jobs. This is an important milestone, especially since the country wants to focus more its development toward sustainable and inclusive growth. However, it has to be noted that it is difficult to estimate to jobs that would be destructed with the new technology. Nevertheless, experience of more advanced economies in the EU shows that the balance job creation -job destruction is positive. In addition, 56.3% of the measure in the energy section would positively impact economic growth. Finally,

the energy measure would improve the standard of living of the poor by creating more opportunities for them and by improving their health status (less pollution for instance).

The agriculture measures (11) would have no impact of job creation and low impact (36.5 of them) on poverty reduction. Indeed, in the agriculture sector, the improvement of technology would result in a reduction of labor in the sector. However, the improvement production and intercorrelation with the EU will create an important value chain to "forward industry" that could easily absorb the free labor from agriculture. Hence, even if in the short term, we will not see any impact in employment, in the medium and long term, more jobs will be created along the line of the agricultural value chain. This reduction of labor in the agriculture would have a low impact on poverty reduction.

The measures in the agriculture sector will have a high impact in economic growth as 81.8% of these measures will impact it positively. The economic overall will benefit more of the agricultural sector measures in the NDC. Indeed, improve technology in this sector will result in a higher productivity and then a higher contribution to the GDP.

Figure 25: Percentage of eNDC measure with positive impact by sectors



5.3.2. Economic aspects.

The Economic effectiveness or specific cost indicator is used to assess the economic aspect of the climate change mitigation policies and measures. This indicator shows the number of investments required in order to reduce 1 t CO₂-eq by applying the specific policy/measure and it is expressed in €/t CO₂-eq. It is also used to calculate the Marginal Abatement Cost Curve (MAC curve). The MAC curve is a tool for determining priorities in the implementation of mitigation policies and measures.

The MAC curve is created for the WAM scenario for 2030 (as target year) and it shows that the total reduction from the proposed measures is estimated to around 5.6 Tg CO₂-eq. 70% of the reduction can be achieved with a “win-win” policies and measures, which means that these measures are reducing the emissions by a negative specific cost (total cost of the proposed measure are lower compared to the costs of the WOM scenario). Furthermore, additional 20% of the reduction is realized by measures with specific costs in range from 0-5 €/t CO₂-eq. It is very important so underline that this is not the total amount of GHG emission reduction, because there is one more measure which is very important, but its independent contribution cannot be estimated. This measure is the introduction of CO₂ tax, which depends to a high extent on the other measures (such as the measures for RES, energy efficiency, fuel switch, etc.) which are needed to replace the CO₂ emitters (TBUR 2020).

Social aspect- Job. In this study the social aspect is analyzed through the number of newly created green jobs. The methodology that was developed for the Intended Nationally Determined Contributions and also used in the FBUR and SBUR is implemented in TBUR too. In addition, in TBUR the number of green jobs is calculated for the policies and measures of each of the scenarios.

One of the main co-benefits of the enhanced NDC is the creation of green jobs. As discussed above, the enhanced NDC would bring new jobs, almost 8,000 in 2030 and 10,000 in 2035, with dominant contribution

of energy efficiency PAMs of 77%. PAMs with the highest share in the number of new domestic green jobs are:

- Retrofit of existing residential buildings (42%),
- Construction of passive houses (21%),
- RES without incentives (6%) and
- Solar thermal collectors (8%).

The number of green jobs in each year depends on the time (year) of implementation of the policies and measures in each scenario. In general, in all scenarios the share of green jobs the field of Energy efficiency green jobs is higher compared to RES green jobs (Figure 45). The maximal number in the WEM scenario is in 2030 with 5,309 green jobs, from which 61% are from the energy efficiency and the remaining are from RES. In the WAM scenarios, the maximal number is achieved in 2030 (7,035), while in the e-WAM scenario in 2035 (9,895). Moreover, the number of green jobs in 2035 in the e-WAM scenario is almost doubled compared to the WEM scenario.

Furthermore, the technology which contribute most to the creation of new domestic green jobs is retrofitting with almost 50% in 2035 in e-WAM scenario, followed by building of new houses, including passive houses (23%), PV (10%) and solar thermal collectors (8%). After 2036 there is a decrease in the creation of domestic green jobs mainly because of the reduced number of PV installations, as well as retrofit of existing buildings

Gender: Based on the types of the newly created jobs, it seems that at least 27% of the jobs in 2035 can be assigned to women. In addition, the PAMs were analyzed in light of their gender responsiveness. It was found that there are number of PAMs where gender disaggregated approach would improve the implementation, particularly the PAMs related to subsidizing mitigation technologies and awareness rising. Subsequently, with an aim to make the enhanced NDC gender-responsive, the respective PAMs were redesigned and gender indicators included. Most prominent example is redesigning of the “first come, first served” subsidy model to a gender-

informed model that supported 10,000 most vulnerable households in most affected cities in the country to replace their heating technology with more efficient one.

Youth: To ensure that the voices of young people are included in the enhanced NDC, consultations with them took place. Three pressures point vital to ensuring the quality and impact of youth engagement in the Climate Promise have been recognized and weaved into the design of the Youth for Climate platform. They include:

- Establishing a comparison with the use of interactive tools.
- Broadening the conversation beyond the “climate niche” by introducing content related to social, economic and technological trends impacting the development of the country.
- Recognizing informality in youth-led climate action

Three key action points on the strategic level have been identified and incorporated into the NDC:

- Designing a systemic, long-term approach to youth engagement in consultations and decision-making regarding national and local climate policies and actions, including new mechanisms, new roles and new tools.
- Incorporating feedback loops into the existing system, allowing for two-way communication and monitoring of climate-related activities designed and implemented by the youth and/or public administration.
- Revising educational and mainstreaming approaches and tools used to inform young people and broader public about the causes and consequences of climate crisis, including the topic of individual impact.

Recommendation 8. Mitigation responses must be more gender responsive. To do so, the analysis of the needs, priorities, roles and experiences of women and men must be done. Also, one needs to integrate specific actions to address any gender inequalities that may have emerged from that analysis.

5.4. Economic Implications of the NDC scenarios

For the realization of the measures proposed under the WEM scenario €13.3 billion are needed, of which about 99% are investment in the energy sector. WAM scenario requires an additional 38%, while for the realization of e-WAM almost 60% more compared to WEM. The average yearly investment in WEM is approximately 4.8% of the total average annual GDP, while in the e-WAM is 7.7%. If all of the measures are implemented in parallel and the “Energy efficiency first” principle is applied, then the total investment can be reduced in the range from 7% to 19%.

Economic Analysis of the WAM Scenario.

For the realization of WAM scenario €18.4 billion is needed, of which about 99% is investment in the energy sector. The investment in the other sectors is the same as in the WEM scenario. The average yearly investment in WAM is approximately 6.6% of the total average annual GDP of the same period.

For the implementation of the mitigation measures in the Energy sector, investments of €18.3 billion are needed, for the period from 2020 to 2040. If the investments from the private sector are exempted, the remaining investments amount to around €3,3 billion or an average of €165 million annually (referring to the budget of the country, the local self-governments, the City of Skopje, JSC ESM). It is important to emphasize that these investments contribute to reducing the total system costs (€36,8 billion discounted in 2012) compared to the reference scenario costs (€39.8 billion), which is a reduction of 7.5%. If all of the measures are implemented in parallel and the “Energy efficiency first” principle is applied, then the total investment can be reduced by about 12%. Measures with the most significant potential for greenhouse gas emissions reduction are the Large hydro power plants, RES without incentives and phasing out of incandescent lights.

Economic Analysis of the e-WAM Scenario.

For the realization of e-WAM scenario €21.3 billion is needed, of which about 99% is investment in the energy sector. The investment in the other sectors is the same as in the WEM scenario. The average yearly investment in e-WAM is approximately 7.7% of the total average annual GDP of the same period.

For the implementation of the mitigation measures in the Energy sector, investments of €21.2 billion are needed, for the period from 2020 to 2040. If the investments from the private sector are exempted, the remaining investments amount to around €3.6 billion or an average of €170 million annually (referring to the budget of the country, the local self-governments, the City of Skopje, JSC ESM). It is important to emphasize that these investments contribute to reducing the total system costs (€ 35.9 billion discounted in 2012) compared to the reference scenario costs (€ 39.8 billion), which is a reduction of 9.6%. If all of the measures are implemented in parallel and the "Energy efficiency first" principle is applied, then the total investment can be reduced by about 7%. Measures with the most significant potential for greenhouse gas emissions reduction are the RES without incentives, large hydropower plants and phasing out of incandescent lights.

5.5 Impact of Covid-19 on the GHG

Beside the immediate impact on the health of populations, the COVID-19 pandemic is having major effects on global economies, energy demand and GHG emissions.

The reduction in GHG emissions in the world is mainly caused by the reduction of land transport (teleworking) and air transport, the increase in local shopping and in online shopping. However, this reduction has no effect on climate change since it is a one-time impact located around the sources of emissions. This positive effect could not be observed in the long

term unless it is followed by strong climate policy action.

Indeed, what impact climate change is not the one-time reduction of the quantity of GHG emission but rather the quantity and composition of gases in the atmosphere (OECD, 2020). For example, the decline in GHG emissions during the 2008 financial crisis was followed by an increase in emissions above their levels of before the crisis (OECD, 2020). Thus, the positive environmental impact of COVID-19 on air quality remains one-time even and of very limited scope, while the impact on global economies is huge.

Recommendation 9. During this period of health crisis, it is crucial to continue efforts to raise awareness among the population about the importance of environmental issues in general and the fight against climate change, in particular.



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VI. LOW CARBON TRANSITION PLAN



6.1. The low-carbon transition plan of Macedonia

It is considered that the North Macedonia low-carbon transition plan is based on the TBUR as well as on the guidelines of the European Commission (EC) for the implementation of the Green Agenda for the Western Balkans (GAWB), to which the country adhered, on November 10, 2020.

Recently, North Macedonia signed up to the Green Agenda for the Western Balkans, under the European Green Deal. Indeed, Western Balkans committed to the target of making the Europe carbon-neutral by 2050, as Western Balkans signed the Sofia Declaration on the Green Agenda for Western Balkans, the 10th of November 2020 (Balkan green energy news, 2020)¹⁸.

¹⁸ «German Chancellor Angela Merkel offered congratulations on the progress in the transition to a CO2-free economy in light of the COVID-19 pandemic challenges.» Extrait de: Balkangreenergynews.com (Consulted on November 18, 2020)

In this context, the European Commission (EC) issued, on October 10, 2020, the expected guidelines for the implementation of the GAWB (European Commission, 2020). This Agenda is based on five pillars: (i) the decarbonization; (ii) the circular economy; (iii) the protection and restoration of biodiversity; (iv) the cleaning of air, water and soil; and (v) the sustainable agriculture. Table 8 below displays the links between the guidelines set out in the GAWB and the measures put forward by North Macedonia in its CCM Plan.

The analysis of the guidelines proposed by the European Union as well as the measures envisaged by North Macedonia within the framework of its CCM Plan, indicates that each of the measures proposed by North Macedonia meets one or other of the guidelines of the European Commission. In this sense, the Climate Change Mitigation Plan of North Macedonia is proving to be a powerful tool to help

Table 8: Links between the European GAWB and Macedonia Climate Change Mitigation Plan

Green Agenda for the Western Balkans (pillars/measures)	TBUR (number of the measure)
Decarbonization	
Integrate measures for Energy efficiency	1, 9, 22
Strengthen the efforts for climate proofing, resilience building, prevention and preparedness	14, 15, 16, 17, 18, 19, 20, 21, 23
Consider adoption of Emission trading Scheme	8
Increase the awareness and buy-in from civil society and individual citizens	13, 23, 27, 30, 32
Develop renewable energy sources	2, 3, 4, 5, 6, 7, 10, 11, 12
Develop new technology to lower energy consumption in industries	24, 25, 26
Revitalize rail network	27, 31
Develop more environmentally friendly transport modes	28, 29, 30, 32
Circular economy	
Implement effective separate collection schemes	46
Depollution	
Implement better risk prevention to face increase of dramatic forest fires	37
Improve sustainable forest management, increase absorption of CO2 and promote the bioeconomy by effective afforestation and forest restoration in Europe	38
Sustainable food systems and rural areas	
Promote environmentally friendly and organic farming	33, 34, 35, 36, 39, 40, 41, 42, 43

Source: Authors

achieve the European energy transition objectives.

Recommendation 10. The promotion of the North Macedonia CCM Plan to be implemented must be done, as it is a powerful tool for its participation in the achievement of European energy transition objectives.

6.2. Impact of the Covid-19 on the low-carbon transition plan

6.2.1. General impacts

Many economists and energy experts consider that the COVID-19 crisis poses a risk to the implementation of energy transition plans adopted by countries to reduce their GHG emissions and migrate to a greener economy. The main elements likely to undermine energy transition efforts are as follows¹⁹:

- **Health crisis and rising unemployment:** Governments have as a huge primary challenge to respond to the health crisis while minimizing unemployment; this crisis is different from the financial crisis of 2008 in the sense that there is a social and health crisis in a context of lower income;
- **Transition plan investment at risk.** As public finance is shaken by the crisis, governments are less about stimulating the economy than trying to keep the economy afloat. The COVID crisis puts the investments planned for the transition at risk;
- **Drop of oil price.** The fall in the price of oil, which is detrimental to investments in low-carbon technologies;
- **Investment in innovation technology at risk.** In times of economic uncertainty, firms tend to reduce or postpone their investments in innovation sectors; this is particularly true for the energy sector which has a long-term horizon. "Achieving the targets of the Paris Agreement requires innovation. However, the impact of the COVID crisis is much stronger for small innovative companies than for large companies for

which it is easier to absorb shocks;

- **Renewal energy projects at risk.** The COVID crisis has created disruptions in supply chains, and therefore those necessary for the implementation of renewable energy projects.

Another element likely to harm the energy transition efforts is the population's perception of the improvement in the quality of the environment observed since the implementation of confinement measure during the pandemic. For example, many cities around the world have observed an improvement in the quality of ambient air. This drop-in air pollutants are explained by a drastic drop in industrial activities and in the transport of people, which are due to the containment measures put in place, reductions in the number of hours of industrial activities and teleworking. However, this one-time improvement in the quality of the environment has no impact on climate change.

However, the implementation of certain measures of the energy transition plans rests, at least in part, on the involvement of the population. Also, the "false" perception of improving the quality of the environment can, in some cases, influence the motivation of people to take steps that would require changes in behavior and efforts, sometimes financial, not negligible.

Finally, it has been observed that the COVID-19 crisis is pushing the industrial lobby for a reduction in environmental requirements or a postponement of climate policies. However, it is important to stay the course in order to reduce uncertainties, thus promoting long-term stability for low-carbon industries. This is particularly true for the energy sector which requires long-term business planning.

Countries must avoid weakening climate policies because, for the following reasons:

- Past experience tends to show that the relaxation of environmental standards, initially intended to be temporary (example: tax exemption or free allocations of carbon credits), are extremely difficult to bring back;

¹⁹ OECD, 2020, World Bank Group, 2020, IEA, 2020; (Dechezleprêtre (undated) and Dewar et al (2020))

- This reduces incentives for innovation, investment and employment in low-carbon industries;
- This could increase air pollution but notwithstanding the already known health risks, preliminary research tends to show a link between exposure to high air pollution and a higher death rate from COVID-19.

Maintaining the investments planned for the low-carbon transition in this period of unprecedented pandemic is a major challenge for the entire planet. According to the OECD, the COVID-19 crisis is an enormous challenge to economies years societies across the world, but it must not derail global efforts to limit warming to well-below 2 degrees Celsius (OECD (2020)).

The health and economic impacts of the COVID-19 crisis are huge. However, the climate crisis remains and generates major impacts on individuals, societies, the environment and the economy. In 2017 alone, economic losses from climate disasters amounted to USD 337 trillion (OECD (2020)). Finally, the COVID crisis is testing resilience to respond to climatic hazards; it makes us aware of the vulnerability of our societies to cope with crises and the importance of GHG reduction policies.

6.2.2. Main challenges of North Macedonia?

As presented in the sections above of this report, the socio-economic impacts of COVID-19 include:

- Increase in the unemployment rate, especially in the service, manufacturing and energy sectors;
- Increased jobs in the information, information technology, construction and finance sectors;
- Increase in poverty;
- Drastic drop in international and domestic tourism;
- Decrease in economic activity of 4.1% in 2020;
- Mobilization of one billion and 20 million euros by the Government to counter the effects of the COVID-19 crisis.

In addition, it should be noted the lack of

information in connection with the possible budgetary readjustments made to the CCM Plan following the Covid-19 crisis as well as those made in the timetables for carrying out the various measures. It should also be noted the lack of specific information on the economic impact of COVID-19 on the different sectors of activity targeted by the Plan, namely the sectors of energy, agriculture, forestry and others, land uses, waste management and carbon market mechanisms envisaged.

Recommendation 11. In order to have a clearer and more complete understanding of the COVID-19 crisis on the energy transition plan of North Macedonia, it is recommended to carry out an analysis of the impacts of the crisis on the sectors targeted by the CCM Plan.

Furthermore, the government intends to go ahead with large-scale infrastructure projects, whether in rail transport or the construction of wind farms and photovoltaic power plants. The same is true for the irrigation program of North Macedonia as well as the agricultural modernization project. The Macedonian government also plans to continue the project of building new solid waste landfills and waste management stations, which will also act as sorting and composting centers as well as the closure of landfills in all regions. These projects all have good potential to contribute to the country's energy transition efforts and several of them can echo the measures proposed in the enhanced NDCs.

Recommendation 12. In the context of the country's economic recovery, efforts should be made to prioritize, and finance projects needed for the enhanced NDCs. Thus, these investments would promote the achievement of two major objectives of the country, namely a strong economic recovery and a significant contribution to GHG reduction efforts, which are essential in the context of the accession process to the Euro-

pean Union.

The COVID-19 crisis is also likely to generate effects in other sectors of activity and to modulate the behavior of the population in such a way that impacts, indirect this time, could also be observed. Also, with the objective of optimizing the various policies put forward by the country and in order to promote the commitments made within the framework of international agreements, in particular the GAWB, it would be appropriate to broaden the scope of the analysis of the impact of the COVID-19 crisis on the environmental aspects of these impacts. As examples, this study could attempt to answer the following questions:

- How has the COVID-19 crisis influenced the trajectory of the country's development model?
- Has the COVID-19 crisis had an impact on health and energy infrastructure? On waste management?
- What are the effects of the sanitary measures put in place on the quality of the water? On the amount of water available? On the management of biomedical waste?

Recommendation 13. In order to optimize the various public policies put forward by the North Macedonian government and to promote compliance with the commitments it has made in the energy transition process, it is recommended to broaden the scope of the analysis of the impact of the COVID-19 crisis to environmental issues, paying particular attention to issues related to water resources (quality and quantity), biodiversity, air quality as well as agricultural and forest environments.

6.3. Covid-19 as an engine for low-carbon transition

6.3.1. The Covid-19: a green opportunity?

The COVID-19 crisis, which has forced governments to release large amount of money to keep the economies of countries affected by the pandemic afloat, may represent an unprecedented opportunity to support energy transition efforts around the world.

Indeed, the policies put forward to revive the post-COVID economy should support this energy transition in a win-win approach because it is possible to revive the economy while reducing GHG emissions²⁰.

To build this win-win relationship, the policies put forward as part of the post-COVID economic recovery should aim in particular at:

- the creation of so-called "green" jobs;
- investments in small innovation companies;
- investments in renewable energy infrastructure (wind, solar, hydroelectricity, residual biomass, etc.);
- reliable power supply;
- investing in smart digital technologies;
- renovating buildings to increase energy efficiency;
- support for the adoption of energy-efficient practices such as teleworking, public and active transport and the purchase of local products;
- improving communication networks, in particular through universal access to high-speed internet, in support of teleworking, access to financial and other services;
- support for the development of public transport;
- support for the electrification of transport;
- the implementation of measures related to the carbon market.

²⁰ (OECD (2020), Biró (2020), Hammer and Hallegatte (2020 and 2), Figueres (2020), Dechezleprêtre (undated) and Dewar et al (2020))

Notwithstanding the objectives stated above, it is recognized that policies related to post-COVID recovery can have a major positive overall impact on the resilience capacity of communities in the face of health crises as well as in the face of environmental and climate crises, and this, insofar as the investments are oriented in the direction of sustainable practices, including energy transition.

6.2. Specificities in North Macedonia

Like many countries around the world, North Macedonia wants to steer economic recovery in order to increase the country's resilience capacity. In its Socio-economic assessment of Covid-19's impact in North Macedonia, the UNDP recommends a series of measures to support North Macedonia's economic recovery. Among the measures proposed relating to the "new normal", environmental protection and the promotion of a carbon neutral economy occupy an important place. It is proposed to transform environmental costs into environmental investments and to invest significantly in the environment, green energy being likely to generate jobs, technological upgrading, human capital development and industrial restructuring.

A review of the measures put forward by the Macedonian government to reduce the economic impacts of the crisis, makes it possible to draw up a list of measures likely to also support the low-carbon transition plan.

- **Measures to support citizens.** These measures provide a financial aid to young people of 6,000 denars and a payment card of 3,000 denars for the purchase of Macedonian products and services. The measure includes vouchers of up to 6,000 denars to cover university tuition fees as well as accommodation in dormitories and registered accommodation for students and high school students from low-income families. It also includes the co-financing of training and courses in computer and digital skills for young people aged 16 to 29 years old.
- **Support to the Macedonian economy for innovation and development.** For the preservation of existing and new jobs, interest-free loans for busi-

nesses - support for women, young people and the digitalization of businesses, is planned. This measure is available to all MSME. Some subsidies are also available for SME in innovation and digitalization of their operations.

- **Support for the development of national start-up products and services.** New 1.6 million euros for the development of innovative products and services.
- **Co-financing of events and conferences.** This measure, which aims to support tourism, will also contribute to capacity building by supporting the participation of candidates in various trainings, seminars and conferences by financing not more than 30,000 denars per candidate.
- **Support for farmers.** Domestic production will be favored by the commissioning of all agricultural land. The income generated will improve the competitiveness of Macedonian agriculture, which in turn will improve food security and production predictability.
- **Support for the development of human capital.** A series of tax exemption measures will be put in place starting January 1st 2021 to promote people training and team building, upgrading of qualifications and obtaining new licenses.

These measures, although put in place to deal with the COVID-19 crisis, can contribute to the implementation of the low-carbon transition plan, by supporting the educational process of young people, particularly in the field of skills IT. They will also support innovation and development, especially at the level of micro-enterprises and start-ups, by supporting capacity building of people, improvement of the quality of the workforce and, finally, support to farmers

Moreover, it is possible to link some of the measures taken for the Covid-19 pandemic and the post-Covid-19 economic plan with a number of measures of the enhanced NDCs. The table below presents the link between the government Covid-19 response plan and the eNDC measures.

Table 9: Links between Covid-19 response measures and enhanced NDCs measures

Opportunities and measures taken in response to the COVID-19 pandemic	Enhanced NDCs
Opportunity of human capacity development, reduction of air pollution for a better resistance to pathogens	<ul style="list-style-type: none"> • Large hydropower plants
Opportunity for innovation, development and human capacity	<ul style="list-style-type: none"> • Incentives feed-in tariff • Incentives feed-in in premium • Biomass power plants (CHP optional) • Solar rooftop power plants • RES without incentives • Solar thermal collectors
Construction of a Photovoltaic plant Oslomej	RES without incentives
Construction and rehabilitation of railway – section 8 toward Bulgaria	Construction of the railway to the Republic of Bulgaria
Agriculture irrigation network and modernization	Photovoltaic irrigation
New solid waste sites in the following regions: south-west, Vardar, Pelagonija, South-east and Skopje and the ones planed in the NDC	Mechanical and biological treatment (MBT) in new landfills with composting
Providing support to national star-up	Increase the role of SME sector in energy transition

At least 12 measures of the eNDC are directly link with the Government post-Covid-19 economic plan. The energy sector represents about 70% of these measures with also one measure in transport and 8 in the energy production sector. One eNDC measure from the agriculture and another one from the waste management are contributing directly to the Government post-Covid-19 economic plan.

Recommendation 14. In implementing actions to revive the economy, it is important to adopt targeted measures for vulnerable groups, adapting them in particular to their level of ed-

ucation and ensuring that citizens engaged in informal employment are also included, especially women in the agricultural sector.

RECOMMENDATIONS



To soften the implementation of the enhanced NDC, the report is making the following recommendations:

Recommendation 1: The North Macedonia government should continue its strong support to the implementation of the eNDC. Doing so, the other economic agents (private sector, household,...) of the country will follow.

Recommendation 2. The government should use the Malus-Bonus policy to bring the private sector on board for the implementation of the eNDC as an important partner. The Malus-Bonus policy would drive the private sector to do business sustainably and to drive innovation, competitiveness, risk management and growth.

Recommendation 3. Household should be educated to implement sustainable behavior in their daily live (heating method, waste management,...). This should be done through the PAM13: Public awareness campaigns and network of EE info centers. Increase the number of campaigns in response to the lack of knowledge about the benefits of the EE through the promotion of an efficient use of energy by small energy customers, including domestic customer, and train the employees in the public institutions at the central and local level.

Recommendation 4. In terms of most targeted groups, it is recommended that support go to all vulnerable groups and single women aged 65+ in the first place. This support can be designed in form of awareness campaign (climate change literacy) and financial support. In terms of heating coverage, it is recommended to accelerate the effort of generalization of the use of central district heating as the main preference of the population specially in the city of Skopje. The next groups to be supported include the single mothers, fathers of minors and household below the poverty line

Recommendation 5. Considering the importance of the issues related to water resources for the Macedonian population, it is recommended to update knowledge on the impacts of climate change on water resources.

Recommendation 6. As part of the NDC measures to provide awareness campaign or training, special efforts should be made to promote the inclusion of women in informal jobs among the target clientele.

Recommendation 7. As part of the gradual implementation of NDC measures for households, priority should be given to households with 3 or more children as these are among the most vulnerable groups.

Recommendation 8. Mitigation responses must be more gender responsive. To do so, the analysis of the needs, priorities, roles and experiences of women and men must be done. Also, one needs



to integrate specific actions to address any gender inequalities that may have emerged from that analysis.

Recommendation 9. During this period of health crisis, it is crucial to continue efforts to raise awareness among the population about the importance of environmental issues in general and the fight against climate change, in particular.

Recommendation 10. The promotion of the North Macedonia CCM Plan to be implemented must be done, as it is a powerful tool for its participation in the achievement of European energy transition objectives.

Recommendation 11. In order to have a clearer and more complete understanding of the COVID-19 crisis on the energy transition plan of North Macedonia, it is recommended to carry out an analysis of the impacts of the crisis on the sectors targeted by the CCM Plan.

Recommendation 12. In the context of the country's economic recovery, efforts should be made to prioritize, and finance projects needed for the enhanced NDCs. Thus, these investments would promote the achievement of two major objectives of the country, namely a strong economic recovery and a significant contribution to GHG reduction efforts, which are essential in the context of the accession process to the European Union.

Recommendation 13. In order to optimize the various public policies put forward by the North Macedonian government and to promote compliance with the commitments it has made in the energy transition process, it is recommended to broaden the scope of the analysis of the impact of the COVID-19 crisis to environmental issues, paying particular attention to issues related to water resources (quality and quantity), biodiversity, air quality as well as agricultural and forest environments.

Recommendation 14. In implementing actions to revive the economy, it is important to adopt targeted measures for vulnerable groups, adapting them in particular to their education level and ensuring that citizens engaged in informal employment are also included, especially women in the agricultural sector.

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Annex 1: Legal and regulatory context of North Macedonia with regard to NDC

As a candidate for EU membership the transposition of EU regulations on accurate monitoring, reporting and regular evaluation of greenhouse gas emissions are currently the main objectives of the project Preparation of a long-term strategy and Law for climate action funded by the EU within the IPA 2014-2020. The relevant EU legislations includes the following regulations:

- Regulation 525/2013 of the European Parliament and of the Council defines the establishment of accurate monitoring, reporting and regular evaluation of greenhouse gas emissions.
- Regulation 666/2014 which establishes the key requirements for the Union's inventory system, taking into account changes in global warming potential and internationally agreed inventory guidelines.
- Commission Implementing Regulation (EU) No 749/2014 of 30 June 2014 on structure, format, submission processes and review of information reported by Member States pursuant to Regulation (EU) No 525/2013 of the European Parliament and of the Council.

In regard to the national context, The Law On

Environment¹⁷ currently regulates the issue of monitoring of anthropogenic emissions by sources and sinks of greenhouse gases. According to the Law on Environment, The Ministry of Environment and Physical Planning is obligated to collect data and to cooperate with several bodies of the state administration, namely, the State Statistical Office, Ministry of Economy, Ministry of Agriculture, Forestry and Water Economy and Ministry of Interior. Strengthening the institutional cooperation for data exchange relevant for the preparation of the inventory is considered a key issue that would enable easy and successful preparation of the national reports.

According to the Law on Environment, the Ministry of Environment and Physical Planning (MOEPP) should establish, develop, manage and coordinate a national system for inventory of greenhouse gas emissions. This system will provide the necessary data for the preparation of the Greenhouse Gas Inventory, as well as for the monitoring of the implementation of the National Climate Change Plan. However, the Law does not regulate in detail the issue of monitoring, reporting and verification of policies and measures. Sectoral laws and strategies provide some guidance on monitoring and reporting on policies and in several key areas :

Sector	Law
Energy Sector	<ul style="list-style-type: none"> • In the energy sector, the Law on Energy regulates, albeit incompletely, the issues of monitoring, reporting and verification of the implementation of strategic documents, including institutional competence. • The National Strategy for Energy Development up to 2040 (Energy Strategy) (Article 10, Law on Energy) which is adopted every five years and refers to the next 20 years was adopted in December 2019 and is currently in force. There is a chapter of this Strategy, "The manner of monitoring the realization of the Program," that prescribes the structure of the annual report and the requirements for information in it. Annex 1 of the document also establishes indicators for evaluating the use and the effects of its implementation, as well as the competence to monitor each individual indicator. • The Strategy for the Use of Renewable Energy Sources and Strategy for Energy Efficiency provide a legal basis for regulating these energy sub-sectors, as well as energy markets and energy balance preparation as outlined in the Action Plan for Renewable Energy Sources and the National Energy Efficiency Action Plan (NEEAP). However, the content, manner and deadline for submitting the data

	<ul style="list-style-type: none"> required for the preparation of the two-year report for the implementation of the Action Plans is not prescribed by law . instead, it takes place on the basis of a long-standing mutual cooperation between institutions or memoranda of cooperation. Furthermore, as a response to the obligation of the Republic of North Macedonia to the Energy Community Treaty, the report is prepared according to a template recommended by the European Commission in accordance with Article 22 of Directive 2009/28/E.
IPPU sector	<ul style="list-style-type: none"> According to the Law on the Environment industrial plants/installations may operate with previously obtained environmental permits. It states that A-integrated environmental permit is issued by the body of the state administration responsible for environmental affairs or B-integrated environmental permit issued by the municipality or the city of Skopje or the body of the state administration responsible for the affairs in the field of environment when it comes to installation located in a protected area, which is regulated by Article (123) of the same law. The notification to the State Statistical Office comes from legal obligation, defined by the Law on State Statistics.²¹ Theoretically, while report creators should have easy and detailed access to the information needed to create those GHG emissions reports, the practical implementation of these laws and regulations is not always monitored, so contact with the industrial installations usually has to be made. An additional obligation to report on ambient air emissions from stationary sources is defined by a rulebook. The Rulebook was adopted on the basis of Article 45 paragraph (4) of the Law on Ambient Air Quality
Transport sector	<ul style="list-style-type: none"> The Law on Vehicles²⁰ regulates the issues of market release and start of operation of vehicles, registration and roadworthiness, as well as the data registry for vehicles, which is run by the Ministry of Interior. Unfortunately, although the law has been in force for almost a decade, the by-law that should prescribe the form, the content and the manner of keeping the registry, and the manner of input and release of data, has not yet been enacted. The new Energy Law ("Official Gazette of the Republic of North Macedonia", No. 96 of 28.5.2018) complements the requirements for national standards for fuel quality in Article 150. This Article obliges the Government, upon the proposal of the Ministry of Environment, to adopt a Regulation on the quality of liquid fuels. The decree was passed to a public hearing but has not been adopted yet. In the context of light vehicle emissions, it is important to mention Regulation 443/2009 / EC. Given the fact that the country will have to report to the EU on the structure of imported (new) vehicles, the establishment of a database of the vehicle fleet and its fuel economy will be a good basis for this reporting to the EU in the future. Rail transport is regulated by the Law on the Railway System. From the viewpoint of the measures envisaged in INDC, it is important to establish that they originate from the National Transport Strategy for the period 2007 - 2017 and the National Program for Railway Infrastructure for the period 2014-2016⁷ (Article 26, Law on Railway System). A three-year National Program is adopted by the Parliament, and the public enterprise Macedonian Railways - Infrastructure (PE MZ-I) prepares an annual program for railway infrastructure financing that is adopted by the Government. In the context of monitoring and reporting, the law stipulates a responsibility for PE MZ-I to report to the Macedonian Government on the implementation of its annual program during the first quarter of the year. However, it should be noted that the Law does not stipulate any methodology for preparing the annual report or for establishing a system for monitoring and reporting on implementation of the annual program for financing the railway infrastructure.

Sector	Law
Agriculture, Forestry and Other Land Uses	<ul style="list-style-type: none"> • In the Agriculture and Land use sectors data is collected from the field from legal and individual entities who have obtained a license for performing agricultural activities. Information from the field is submitted in the form of an LPIS format. Other legal bodies that collect information from which GHG emissions are reported include the Agency for Financial Support of Agriculture and Rural Development, the Food and Veterinary Agency and the customs administration through the State Statistical Office. • Forests can be privately or state-owned, which is registered in the state real estate cadastre, which is regulated by a rulebook, from which the information about the situation with the forest territory is drawn. The law defines the conditions for forest management, defining national inventory according to which data on forest condition will be collected. Forest operations are controlled under several legal articles and defined rules, including are required to carry out special plans and programs, to conduct an inventory of forests and forest land and report it. State owned forests have a legal obligation with the statistical law to submit information to the State Statistical Office (SSO).
Waste Sector	<ul style="list-style-type: none"> • While there is no law or governing by-law that stipulates any methodology for preparing reports or for establishing a system for monitoring and reporting on waste measurement for GHG emissions, a new Draft Law on Waste Management is currently being drafted. Waste data is collected from a number of sources. The Ministry of Environment and Physical Planning is the competent authority to collect waste sector data on: Waste sector Solid Waste Disposal, Biological Treatment of Solid Waste, Incineration and Open Burning of Waste and Wastewater Treatment and Discharge.

Annex 2: Summary of 47 measures for the Extended mitigation scenario (e-WAM)

		Type	Status	Source of finance	Indicative emissions reductions (Gr CO2e q) 2030	Specific costs : (€/t CO2-eq) 2030	Budget (mil. €)	Green jobs			Potential socio-economic effects for the population		
								2030	2035	2040	Potential effects	Target groups	
Energy sector													
1	Reduction of network losses	Technical	Ongoing	Distribution and transmission companies	323.4	-31	170						
2	Large hydropower plants	Technical	Planned	JSC ESM, Public Private Partnership, Independent power producers	740.7	9.5	1716.2				Users of the territory targeted by the projects		
3	Incentives feed-in tariff	Technical, Regulatory	Ongoing	Independent power producers, consumers of electricity through their bills	149.5	-6.1	356.9	152	163	181	Users of the territory targeted by the projects	Jobs in the industrial and construction sector	
4	Incentives feed-in in premium	Technical, Regulatory	Ongoing	Independent power producers, incentives from the central government budget	162.6	-3.7	240.6	220	20	220	Users of the territory targeted by the projects	Jobs in the industrial and construction sector	
5	Biomass power plants (CHP optional)	Technical, Regulatory	Ongoing	Independent power producers, incentives through consumers bills	21	5	24.3	21	28	23	Users of the territory targeted by the projects	Jobs in the renewable energy sector	

6	Solar rooftop power plants	Technical, Regulatory	Planned	Independent power producers, subsidies from national and local budget, EE fund	164.3	-33	263.4	443	209	167	Jobs in the renewable energy sector	Users of the territory targeted by the projects
7	RES without incentives	Technical, Regulatory	Ongoing	JSC ESM, Public Partnership, Independent power producers	202.8	-6	1325.4	1377	693	669	Jobs in the renewable energy sector	
8	Introduction of CO2 tax	Regulatory	Planned	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Increase in state revenues	
9	Energy efficiency obligation schemes	Technical, Regulatory	Planned	Consumers through their bills	162.8	-88.7	182				Decrease in energy consumption generating, Increase in atmospheric pollution generating positive impacts on public health	
10	Solar thermal collectors	Technical	Ongoing	Private, EE fund, incentives from the central government budget, donors	21.5	-60	70	401	495	633	Jobs in the renewable energy sector – Reduction of the cost of hot water for households and the commercial sector, once the initial investment has paid off	
11	Labeling of electric appliances and equipment	Regulatory	Ongoing	Private, EE fund	56.3	-85.9	71				Reduction of the cost of hot water for households and the commercial sector, once the initial investment has paid off	
12	Increased use of heat pumps	Regulatory, policy	Ongoing	Private, EE fund, incentives from the	584.6	-79.9	474.4	38	73	88	Jobs in the industrial sector	

18	Construction of new buildings	Technical, Regulatory	Ongoing	Private, donors through commercial EE loans, EE fund	19.8	64.6	282.7	553	167	117	<ul style="list-style-type: none"> - Jobs in the construction sector - Decline in maintenance costs of houses and public services - Enhancement of household's wellbeing
19	Construction of passive buildings	Technical, Regulatory	Ongoing	Private, donors through commercial EE loans, EE fund	17	231.2	1068	1324	2084	1468	<ul style="list-style-type: none"> - Jobs in the construction sector - ↑ technical knowledge and skills in the sector of passive buildings construction - Can stimulate innovation and R&D
20	Phasing out of incandescent lights	Technical, Regulatory, policy	Ongoing	Central government budget, private	401.8	61.5	558	274	425	657	<ul style="list-style-type: none"> - Can increase the cost for consumer
21	Improvement of the street lighting in the municipalities	Technical	Ongoing	Central and local government budget, ESCO	401.8	-73.2	558	9	12	15	<ul style="list-style-type: none"> - Jobs in the maintenance sector of local state. - Can reduce the energy costs in local states)
22	Green procurements	Regulatory	Ongoing	Central and local government budget	9.4	-61.2	24				<ul style="list-style-type: none"> - ↑ technical knowledge and skills of public sector entities

23	Increase use of central systems	Technical, Information	Ongoing	Private, EE fund, incentives from the central and local government budget	9.3	-105.6	3.2					<ul style="list-style-type: none"> - Enhancement of households' health and of the population as a whole in general by the improvement of the quality of air. -
24	Energy management in manufacturing industries	Regulatory, Technical	Ongoing	Private, donors through commercial EE loans	67.8	-45.7	n/a					
25	Introduction of efficient electric motors	Technical	Ongoing	Private, donors through commercial EE funds	28.8	-21.7	113					
26	Introduction of more advanced technologies	Technical	Ongoing	Private, donors through commercial EE loans, EE funds	206	-42.1	438.6					
27	Increased use of railway	Technical, Information	Planned	Central government budget	37.2	-286.2	180.6					<ul style="list-style-type: none"> - Decline in transport costs for users - Enhancement of access to train stations - Improvement of security - Increase of the population's awareness - Sensitize the population to climate change effect in general

34	Reduction of the N2O emissions from manure management in dairy cows by 20%	Livestock, manure management in dairy cow	Planned	Private sector	2.1	13	1						Need of private sector investments	– Farms of more than 50 heads
35	Reduction of N2O emissions from manure management in swine farms by 13%	Livestock, manure management in swine farms	Ongoing	Private sector	0.4	77.4	1						Need of private sector investments	Farms of more than 1000 heads fatteners and/or 350 SOWS
36	Reduction of the N2O emissions from manure management in dairy cows by 20% for farms below 50 livestock units	Livestock, manure management in dairy cow	Planned	Private sector	0.7	44.2	1						Training of farmers to change management practices of manure.	– Farms of 10 to 50 cows
37	Establishing integrated management of forest fires	Forest fires reduction	Ongoing	PE «National forests», other forest enterprises	345	-9.3	1.5						– ↓ Damage caused by forest fire (example: health of elderly vulnerable to heat waves, damage of infrastructure)	–
38	Afforestation		Ongoing		312.5	1.3	7.8						– Economic losses of foresters.	

39	Conversion of land use of field crops above 15% inclination	Afforestation of Barren Land	PE « National forests », other forest enterprises	Ongoing	Private sector	3.7	21	1.5	Improvement of goods and services delivered by natural areas.- Conversion of traditional natural landscape.	<ul style="list-style-type: none"> Loss of income of agricultural producers which need to be compensated by incentive measures
40	Contour cultivation on areas under field crops on inclined terrains (5-15%)	Land management and land use change in the category of cropland	Private sector	Ongoing	Private sector	28	2	1	<ul style="list-style-type: none"> Training of farmers on this type of crop more durable/sustainable agriculture Awareness of farmers on more resilient agriculture 	
41	Perennial grass in orchard and vineyards on inclined terrains (>5%)	Land management and land use change in the category of cropland	Private sector	Ongoing	Private sector	8.9	5.9	1	Improvement of practices of producers of fruits and vegetables	
42	Use of biochar for carbon sink on agricultural land	Land management of the category of cropland	Private sector	Planned	Private sector	110	30.5	47	<ul style="list-style-type: none"> Can reduce costs linked to use of fertilizers Can increase productivity of land 	
43	Photovoltaic irrigation	Agriculture – irrigation replacing fossil energy with renewables	Private sector	Ongoing	Private sector	93.3	36	47		

Waste sector											
44	Landfill gas flaring	Technical	Ongoing	Local self-government through Public Facilities, Public Partnership, Grants from the EU	489.7	1.4	20.5				
45	Mechanical and biological treatment (MBT) in new landfills with composting	Technical	Ongoing	Local self-government through Public Facilities, Public Partnership, Grants from the EU	108	12.8	36.1				This measure aims at favoring composting of waste in sanitary landfills
46	Selection of waste - paper	Technical	Ongoing	Local self-government through Public Facilities, Public Partnership, Grants from the EU	62.5	2.1	2				
47	Improved waste and materials management at industrial facilities	Regulation, Technical	Planned	Ministry of Environment and Physical Planning, Municipalities and city of Skopje, Industrial facilities	3.3	0	0				- Awareness of workers in industry sector to better manage waste

Annex 3: Classification of policies

Dispose of unwelcome components and waste	Improved waste and materials management at industrial facilities Landfill gas flaring Mechanical and biological treatment in new landfills with composting Selection of waste - paper
Energy incentives	Incentives feed-in premium Incentives feed-in tariff Introduction of CO2 tax RES without incentives
Energy production and distribution	Biomass power plants (CHP optional) Construction of 400 kV electricity transmission interconnection Macedonia-Albania (Bitola-Elbasan) Develop a gas distribution network Develop further distribution system network to integrate more RES, including prosumers and more electric vehicles (EVs), as well as continuously improve network reliability Develop gas transmission network Develop natural gas cross-border infrastructure to diversify supply routes and increase market competitiveness Large hydropower plants Reduction of network losses Solar rooftop power plants Solar thermal collectors
Improving social effects of transition to a low carbon economy	Adoption of annual program for vulnerable consumers Identification of the proper location for solar and wind power plants Program for just transition Smart communities
Land and forest use	Afforestation Contour cultivation on areas under field crops on inclined terrains (5-15%) Conversion of land use of field crops above 15% inclination Establishing integrated management of forest fires Perennial grass in orchard and vineyards on inclined terrains (>5%)
Procurement	Green procurements
R&D and education	Increased level of education of sustainable energy needs Inter-sectoral and geographical mobility of researchers Participation in development of energy transition technologies and measures
Regional integration	Pursue regional electricity market integration
Change in energy use in manufacturing and transportation	Advanced mobility Construction of the railway to the Republic of Bulgaria Electrification of the transport Energy management in manufacturing industries Increased use of railway Introduction of efficient electric motors Introduction of more advanced technologies Renewal of national car fleet Renewing of other road fleet
Economywide change in energy use	Energy efficiency obligation schemes Improvement of the street lighting in the municipalities Increase the role of MSME sector in energy transition Increase use of central systems Increased use of heat pumps Phasing out of incandescent lights Price signal demand response Public awareness campaigns and network of EE info centers Develop the biofuel market Labeling of electric appliances and equipment
Reduction of emissions from agriculture and agroindustry	Reduction of CH4 emissions from enteric fermentation in dairy cows by 3% Reduction of N2O emissions from manure management in swine farms by 13% Reduction of the N2O emissions from manure management in dairy cows by 20% Reduction of the N2O emissions from manure management in dairy cows by 20% for farms below 50 livestock units Use of biochar for carbon sink on agricultural land
Energy efficiency	Construction of new buildings Construction of passive buildings Photovoltaic irrigation Retrofitting of existing central government buildings Retrofitting of existing commercial buildings Retrofitting of existing local self-government buildings Retrofitting of existing residential buildings



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