EUROPE AND
CENTRAL ASIA

WESTERN BALKANS 6

North Macedonia Country Compendium

World Bank Group

COUNTRY CLIMATE AND DEVELOPMENT REPORT

September 2024

1818 H Street NW, Washington, DC 20433
Telephone: 202-473-1000; Internet: www.worldbank.org

Table of Contents

LIST OF BOXES

LIST OF TABLES

LIST OF FIGURES

Acknowledgments

The Western Balkans Six Countries Climate and Development Report (CCDR), including the North Macedonia Country Compendium, is a collaborative effort of the World Bank, the International Finance Corporation (IFC), and the Multilateral Investment Guarantee Agency (MIGA), produced by a core team led by Katharina Gassner, Megha Mukim, and Christos Kostopoulos. Pablo Andres Salas Bravo led the IFC work and Gabisile Ndlovu and Seonyeong Son led the MIGA inputs. The climate adaptation work was coordinated by Solene Dengler, Luc Marius Jacques Bonnafous, Giuseppe Rossitti, and Pavlina Zdraveva. The mitigation work was coordinated by Claudio Protano, Elena Merle-Beral, Luiz Gabriel Sucrmont Rodrigues Simoes and Talis Mabito Tebecis. The macroeconomic aspects of the report were coordinated by Priscilla Kandoole with significant input from the macro modeling team and the country economists mentioned below. The core team also included Celestinah Temilade Odebunmi, Enock Seth Nyamador, Joni Baboci, Mustafa Copelj, Nerali Patel, Tianyu Zhang, and Varnitha Kurli.

This CCDR is underpinned by substantial modelling work that involved coordination among multiple teams. Energy modelling was conducted by Amit Kanudia, George Giannakidis and Rocco De Miglio from MRC Consultants, with support from Szilvia Doczi. Claire Nicolas, Maelle Baronnet and Thomas Nikolakakis conducted power sector modelling. Important contributions were received from Luis Blancas, Eduardo Espitia Echeverria and Raimund Mair on transport. New data and modelling was commissioned to gain insights on climate-related hazards, including from JBA Risk Management for floods, the Global Earthquake Model (GEM) Foundation for earthquakes, the International Center for Environmental Monitoring (CIMA) Research Foundation for wildfires, VITO NV for extreme heat, and the International Institute for Applied Systems Analysis (IIASA) for droughts. Macroeconomic modelling work was led by Charl Jooste and Thi Thanh Thanh Bui; they used the results from the energy and transport modeling and the modeling on climate-related hazards as an input into the macroeconomic structural models. The Western Balkan countries' economists Besart Myderrizi, Hilda Shijaku, Isolina Rossi, Joana Madjoska, Lazar Sestovic, Milan Lakicevic, Natasha Rovo, Sandra Hlivnjak, Sanja Madzarevic-Sujster, and Tihomir Stucka contributed to long term growth modelling and other macroeconomic aspects of the study. Distributional impact of the decarbonization was led by Victor Mylonas using the Climate Policy Assessment Tool (CPAT). Assessment of the co-benefits of the decarbonization was undertaken by Paulina Estela Schulz Antipa, Faustyna Gawryluk, Ira Dorband with support from Weronika Celniak also using the CPAT. Penelope Ann Mealy and Esther G. Naikal led the work using the Green Transition Navigator; Euijin Jung, Aleksandar Stojanov and Pranidhi Sawhney prepared a background note on trade and climate.

In addition, essential analytical work was conducted by the following sectoral teams. Important contributions were received from Raimund Mair, Natalia Limones Rodriguez, Regassa Ensermu Namara, Fan Zhang, Vera Kehayova and Trandelina Baraku for water; from Augusto Garcia, Irina I. Klytchnikova, Sergiy Zorya, Teklu Tesfaye, Fang Zhang and Xueling Li for agriculture; Neeta Hooda, Sameer Akbar, and Sasa Eichberger for environment, biodiversity, and forestry; Valerie Morrica, Sangeeta Kumari, Dianna Pizzaro, and Luiza Nora for social sustainability and inclusion; Henrike Brecht, Guillermo Siercke, Axel Baumler, Yondela Silimela, Paul Scott Prettitore, and Caleb Travis Johnson for urban, resilience and land. Private and financial sector assessments were contributed by Alper Ahmet Oguz, Marc Schiffbauer, Ana Goicoechea, Stefka Slavova, Charis Lypiridis, Magdalena Soljakova, Gianfilippo Carboni, Bodin Bulatovic, Levent Karadayi, Gabisile Ndlovu, Susan Josefina Vasquez Plasencia, Bexi Francina Jimenez Mota, Seonyeong Son, Tatiana Skalon, Ehab Adel Samir Tawfik, Maja Andjelkovic, Vladimir Hrle, Milos Milivojevic, Thea Louise Jung and Vahe Vardanyan and Milica Nikolic. On poverty, the report was supported by Zurab Sajaia, Leonardo Lucchetti, Alexandru Cojocaru, and Anna Fruttero. Stefan Apfalter, supported by Francis Ralambotsiferana Ratsimbazafy, Dusko Vasiljevic, Mariem Malouche, and Antoine Coste, provided input on state-owned enterprises using the Businesses of State database. The report benefitted from six rapid Climate Change Institutional Assessments led by Kai Kaiser and contributed by Zoran Kapor.

The human development (HD) work was coordinated by Indhira Santos and led by Tigran Shmis (Education), Predrag Djukic (Health), and Sarah Coll-Black, Alicia Marguerie, and Daniel Garrote Sanchez (Social Protection and Jobs). The HD team benefitted from input provided by Catherine Fitzgibbon, Renata Gukovas (Social Protection and Jobs), Domagoj Racic, Bojana Naceva (Education), Muloongo Simuzingili, Akiko Kitamura, Sven Neelsen and Ali Hamandi (Health). The CCDR team also benefitted greatly from strategic inputs provided by Ede Ijjasz-Vasquez.

Detailed feedback and suggestions were received from peer reviewers Ani Balabanyan, Daniel Navia Simon, Ivana Fernandez Duarte, Jas Singh (with contributions from Raimund Malischek), Nancy Lozano Garcia, Wolfhart Pohl and Yue Man Lee. Helpful comments at various stages were also received from teams represented by Ahmadou Moustapha Ndiaye, Alberto Rodriguez, Carolina Monsalve, Craig Meisner, Damian Brett, Dena Ringold, Elizabeth Ruppert Bulmer, Fan Zhang, Kevin Carey, Luiza Nora, Michael Stanley, Pablo Fajnzylber, Paulo De Sa, Rhedon Begolli, Sebastian Molineus, Stephane Hallegatte, Tamara Babayan, Ulrike Lehr, Yuriy Myroshnychenko, Armin Ridzalovic, Laureta Qorlazja, Visar Perani, and many others.

The CCDR benefitted from the feedback received from the governments, private sector stakeholders, academia, and civil society organizations during the consultation events organized in each of the six countries in January-May 2024. Filip Kochan and communication teams in WB6 country offices coordinated consultation, communication, and dissemination activities.

The CCDR was prepared under the leadership of Antonella Bassani, Xiaoqing Yu, Sameh Naguib Wahba, Charles Cormier, Asad Alam, Fadia Saadah, Lalita M. Moorty, Ary Naim, Nicolas Marquier and Rana Karadsheh. Managerial guidance was provided by Christopher Sheldon, Emanuel Salina, Massimiliano Paolucci, Nicola Pontara, Jasmin Chakeri, Sudeshna Ghosh Banerjee, Stephanie Gil, Christoph Pusch, with inputs from Ramon Munoz-Raskin, Simon Ellis, Richard Record, Indhira Santos and Nathalie Lahire. The team is particularly grateful to Thomas Farole who provided outstanding guidance and support throughout the CCDR process.

The team is grateful for excellent research support from Daniel Mayr, Eda Belgin Abedin and Senjuty Bhowmik, as well as administrative support received from Bisera Nurkovic, Dragana Varezic, Luan Aliu, Nejme Kotere, Mjellma Rrecaj, Odeta Bulo, Paula Blanco, Sanja Tanic and Valentina Aleksic. Mary Fisk and the GCSTI English Team edited the report, and Vladimir Mirzoyev provided the graphic design.

Abbreviations

A&R	Adaptation and Resilience
AAL	Average Annual Losses
ALMP	Active Labor Market Policies
BAU	Business as Usual
BCR	Benefit Cost Ratio
BOS	Businesses of The State
CAPEX	Capital Expenditure
CBAM	Carbon Border Adjustment Mechanism
CCA	Climate Change Adaptation
CCDR	Country Climate and Development Reports
CCIA	Climate Change Institutional Assessment
CCS	Carbon Capture and Storage
CEP	Clean Energy Package
CMC	Crisis Management Center
C-MFMod	Macro-Structural Model with Climate Module
CPAT	Carbon Price Assessment Tool
CPS	Carbon Pricing Scenario
CRPS	Climate Policy Relevant Sectors
DNA	Designated National Authority
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
ECA	Europe and Central Asia
EP&R	Emergency Preparedness and Response
ESM	Power Plants of Macedonia
ETS	Emissions Trading System
EU	European Union
EUR	Euro
EU-27	Refers to the 27 Countries of the EU
EV	Electric Vehicle
EWS	Early Warning Systems
FDI	Foreign Direct Investment
FLR	Forest Landscape Restoration
GCF	Green Climate Fund
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GMA	Guaranteed Minimum Assistance
GPP	Green Public Procurement
GW	Gigawatt
ICE	Internal Combustion Engine
IFIs	Independent Financial Institutions
IMF	International Monetary Fund
IPPU	Industrial Processes and Product Use
KINESYS-WB6	Knowledge-Based Investigation of Energy System Scenarios for the WB6
LCA	Law on Climate Action
LCOE	Levelized Costs of Electricity
LSG	Local Self-Government
LTS	Long-Term Strategy on Climate Action
LULUCF	Land Use, Land-Use Change, and Forestry
MKD	Macedonian Denars
MoEPP	Ministry of Environment and Physical Planning
MRV	Monitoring, Reporting and Verification (of GHG Emissions)
$MtCO_2eq$	Million Tons of Co_2 Equivalent
NBS	Nature-Based Solutions
NCASPD	National Climate Actions Strategies and Policies Database
NCASPD	National Climate Actions Strategies and Policies Database
NCCCA	National Coordination Council on Climate Action
NDC	Nationally Determined Contribution
ND-GAIN	Notre Dame Global Adaptation Initiative Climate Vulnerability Index
NDS	National Development Strategy
NECP	National Energy and Climate Plan
NGO	Nongovernmental Organization
NPV	Net Present Value
NZE	Net Zero Emissions Scenario
NZE-HG	Net Zero Emissions Scenario with Higher Growth
OECD	Organization for Economic Co-Operation and Development
OFA	One-Off Financial Assistance
OPEX	Operational Expenditure
OOP	Out of Pocket

PFM	Public Finance Management
PIM	Public Investment Management
PISA	Program for International Student Assessment
PPCA	Powering Past Coal Alliance
PPP	Public-Private Partnership
PPP	Purchasing Power Parity
PRD	Protection and Rescue Directorate
PV	Photovoltaic
R2R	Ready2respond
RCP	Representative Concentration Pathway
RE	Renewable Energy
RS	Reference Scenario
SNG	Subnational Governments
SMEs	Small and Medium Enterprises
SOE	State-Owned Enterprise
STEM	Science Technology Engineering Mathematics
TVET	Vocational Education and Training
UHI	Urban Heat Island
UMICs	Upper-Middle-Income Countries
UNFCCC	United Nations Framework Convention on Climate Change
US	United States
US$	United States Dollar
WAM	With Additional Measures
WB	World Bank
WB6	Six Western Balkan Countries (Albania, Bosnia And Herzegovina, Kosovo, Montenegro, North Macedonia, And Serbia)
WEM	With Existing Measures

Executive Summary

North Macedonia is an upper-middle-income country that aspires to join the European Union (EU), but its sustained growth has been achieved at high environmental and health costs. North Macedonia has been converging with the EU in terms of gross domestic product (GDP) per capita (from 34 percent of the EU-27 average at purchasing power parity (PPP) in 2009 to 41.5 percent in 2021) and poverty has decreased. However, the country's energy and carbon intensities remain higher than the EU-27 average; air pollution is a major issue, especially in the capital Skopje and other urban areas, including those in proximity to thermal power plants. North Macedonia is a hotspot for both slow-onset and sudden climate and natural hazards, including floods, heat-related stressors, and intensified wildfire risks.

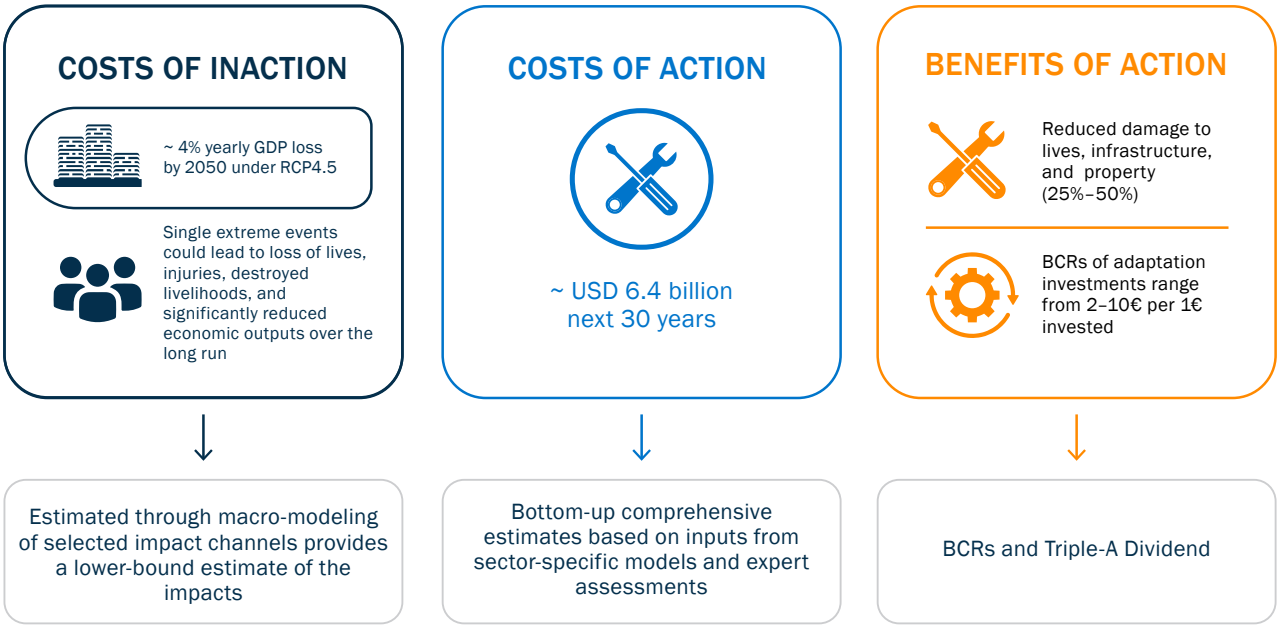
External drivers and international commitments shape North Macedonia's climate change policies, but further progress is needed to step up the country's climate ambition level, as well as implementation capacity. The country is a party to the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement. Despite recent progress (for example, the draft Law on Climate Action), North Macedonia still lacks a comprehensive legislative framework for climate adaptation and resilience. As a contracting party to the Energy Community Treaty, North Macedonia has committed to harmonizing its energy and climate legislation with the EU acquis.[1] The country has expressed its intention to act to achieve a carbon-neutral continent together with the EU by 2050, but it has not set a net zero target yet. The World Bank's Climate Change Institutional Assessment (CCIA) highlights the fact that North Macedonia's institutional maturity for climate action is improving, but efforts are needed to strengthen institutional capacity and coordination mechanisms across the relevant ministries and agencies. Additionally, human capital in North Macedonia will be critical to enable climate action, such as by ensuring that the labor force is able to respond to the changing demand for skills brought about by the green transition. Human capital needs significant investments, given declining learning outcomes, as well as high rates of unemployment and persistent inequalities.

North Macedonia is exposed to several natural and climate-related hazards, and the potential costs of inaction are high. The country has a long history of devastating floods, and the future will bring more unpredictable, high-intensity extreme weather events (for example, in the form of torrential rains and heat waves). Recent decades have been characterized by a surge in heat-related stressors—heightened temperatures, droughts, and intensified wildfire risks—all of which threaten to undermine the nation's stability and productivity. Climate change also worsens access to fresh water, which, in turn, increases water-borne diseases. Extreme temperatures in North Macedonia increase morbidity and mortality. Losses from disasters and extreme climate events have totaled an estimated US$667 million over the past 20 years. Moreover, the effects of natural hazards compound and cascade, increasing overall risk for already vulnerable sectors, especially agriculture. Small family farms dominate the sector and are especially vulnerable to droughts and hail because they are seldom covered by national irrigation systems or hail protection, do not use drip irrigation or ultraviolet nets, and lack agriculture insurance. Thus, extreme weather adversely affects yields and associated family incomes. The effects of climate-related shocks tend to be localized and worsen existing socioeconomic vulnerabilities, as rural, municipalities with declining populations and newly expanding urban areas are more exposed to floods and other climate risks. North Macedonia could suffer important economic damages from climate change under all the representative greenhouse gases concentration pathways (RCPs). In the absence of any investments to adapt to a changing climate, lower-bound estimates of the potential impact amount to close to 4 percent of GDP in 2050 under RCPs 2.6, 4.5, and 8.5. It should be emphasized that modeling the effects of natural hazards and climate change on GDP is not straightforward; reasoning in expected average impact can hide how dramatic certain events will be. For instance, the 2015 floods in North Macedonia caused 7 fatalities; affected more than 100,000 citizens; and resulted in economic losses of US$107.4 million.

[1] The *European Union acquis communautaire*, or "EU acquis"—French for that which has been acquired, received, or obtained—refers to the accumulation of common rights, legislation, court decisions, policy objectives, directives, principles, treaty provisions, resolutions, regulations, and obligations that constitute the body of European Union law. It is currently made up of 31 chapters.

The costs of action, that is, of investing in adaptation, are high—but then, the benefits of action can be even higher. North Macedonia would need to invest in US$6.4 billion (in 2020 dollars, undiscounted) over the next decade to protect people and property from the damaging and escalating impacts of climate change (Figure ES.1). This initial comprehensive adaptation investment package would cost equivalent to around 0.8-1.2 percent of GDP per year until 2050. Investments in adaptation will yield the "Triple-A Dividend," which includes three types of benefits: (1) avoided losses, (2) accelerated economic potential, and (3) amplified social and environmental co-benefits. Implementing adaptation climate actions at the national level greatly reduces human and economic losses from disasters and climate events, and it facilitates human capital development.

FIGURE ES.1. Summary of adaptation investment narrative



Source: World Bank analysis
Note: GDP = gross domestic product, RCP = representative concentration pathway, BCR = benefit-cost ratio.

Adaptation investments can be a precursor to employment growth; skills improvement and increased trade opportunities often follow in the wake of these adaptation projects, further bolstering the case for a proactive approach to climate resilience. For instance, a 14-fold benefit was found for the implementation of the national heat health action plan and associated heat-health adaptation measures.[2] Relatedly, while investments in education serve as economic drivers, they also inform pro-climate behaviors.[3] Enhancing climate resilience in urban and transportation sectors unlocks economic and trading opportunities and supports employment. Accordingly, the integration of risk information into the planning, design, and maintenance stages of all infrastructure investments should be encouraged. Moreover, investing in nature-based solutions (NBS) promotes adaptation while yielding substantial co-benefits for the ecosystem and local communities, especially those who are vulnerable and those in the mountainous and downstream areas. NBS for flood prevention can yield high net benefits, with benefit-cost ratios that are generally greater than 2 and that can be up to 12 for peatland restoration and up to 18 for floodplain restoration. Finally, investing in human capital helps systems to adapt through improved education and productive skills, earlier identification of health issues, and protection of vulnerable populations from impoverishment.

[2] Climate-Adapt. 2021. *"Implementation of the Heat-Health Action Plan of North Macedonia."* https://climate-adapt.eea.europa.eu/en/metadata/case-studies/implementation-of-the-heat-health-action-plan-of-the-former-yugoslav-republic-of-macedonia/#cost_benefit_anchor.

[3] Angrist, N. W., K. Winseck. H. A. Patrinos, and J. S. Graff Zivin. 2023. *"Human Capital and Climate Change."* NBER Working Paper Mo. 31000, National Bureau of Economic research, Cambridge, MA. https://www.nber.org/papers/w31000.

Accelerating the energy transition to achieve economy-wide net zero emissions in North Macedonia by 2050 is feasible, but it would require radical transformations and decisive action. An energy system modeling analysis was conducted as part of the six Western Balkan countries (WB6) CCDR to assess sectoral decarbonization pathways for the countries. Until 2030, North Macedonia could meet the 2030 target (82 percent emissions reduction compared to the 1990 levels) for the scenario with additional measures (WAM) of its National Energy and Climate Plan (NECP) by decommissioning coal-fired generation and aggressively scaling up solar photovoltaic (PV) and wind capacities. Beyond 2030, all of the incremental electricity demand would be met by solar PV and wind; hydro and natural gas would balance the fluctuations of intermittent renewable generation. Achieving net zero by 2050 would also require significant energy efficiency improvements and the large-scale use of electricity and zero-carbon energy carriers (for example, biofuels, biomass) in end-use sectors, especially transport, heating, and industry. The aggregate employment impacts of the green transition may be manageable, but shifts are likely to occur among sectors, firms, occupations, and regions. Low-educated workers and men, on average, are expected to be disproportionately affected by the change associated with the green transition in North Macedonia. These expectations will entail implementing a Just Transition Plan in coal regions and workforce reskilling.

In terms of macro-fiscal impact, the net zero target by 2050 can be achieved with a negligible impact on the current potential growth of the economy. Overall, compared to a Reference Scenario (RS)[4], North Macedonia would need to invest an additional US$1.7 billion by 2030 and US$5.6 billion by 2050 (expressed at present values and in 2020 US$) in the energy system to achieve economy-wide net zero, equivalent to about 2.6 percent of GDP per year, on average. The lion's share of the incremental investment until 2050 would go to the power sector and would be mostly directed to the scale-up of renewable generation capacities. However, the higher investment required would be at least partially compensated by lower operating costs, estimated at -1.3 percent of GDP per year, on average. The impact of decarbonization investments on domestic output would be modest relative to the significant emissions reduction; GDP per capita would be only 0.3 percent lower in 2050, compared to the RS.

More than 80 percent of additional capital investments needed to meet the decarbonization target could be undertaken by the private sector. Raising capital to finance climate change-induced investments requires creating an enabling regulatory environment. Mobilizing financing for the green transition entails issuing green bonds, accessing public-private partnerships (PPPs), and tapping into EU pre-accession and guarantee funds.

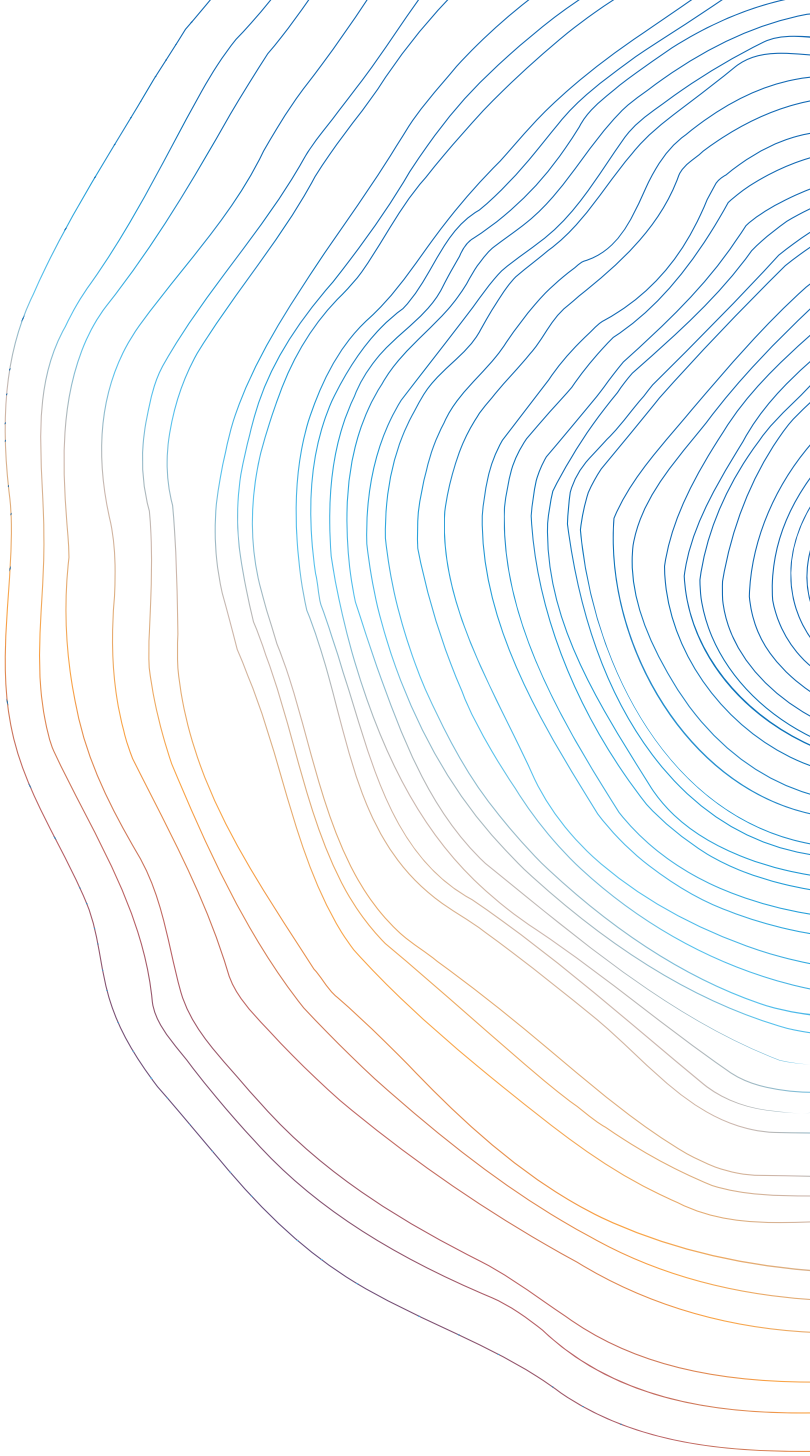
The green transition will have to be designed and implemented in a just manner. In general, the net zero transition will have a distributional impact on household consumption due to variations on generation and supply costs, potentially leading to changes in the prices of energy and non-energy products. The government should focus on targeted support to households, incorporating revenue recycling, to soften potential effects on those who are less well-off. At the same time, specific attention should be paid to the impact of the green transition on the two coal-dependent regions, Pelagonija and the Southwest region. The Just Transition roadmap calls for an integrated approach to green transition. Such integration regards the mitigation of impacts on people and communities as a core concern; plans for environmental remediation and land reclamation; and engages in strategic coordination across multiple actors, including stakeholders to be consulted (Three Pillars approach).[5] Strategic planning also entails supporting the economic diversification of those two regions to increase employment opportunities outside of the coal sector. The phaseout of coal provides an example of the importance of human capital investments, both prior to and during the transition, for the broader economic transition. Short-term investments include upskilling/reskilling packages with subsidizing schemes for the job transition of workers affected by the coal phaseout; longer-term investments include the improvement of vocational education and non-formal education—and both will be key. The green transition also requires

[4] This modeling scenario represents an unconstrained least-cost evolution of the energy system. No specific assumptions are made on the introduction of new policies supporting decarbonization, and the evolution of the energy system is purely driven by economic considerations. This scenario is incompatible with the WB6 countries' aspirations of EU integration and their existing climate change commitments, but it provides a comparable baseline across the six countries for the other decarbonization scenarios.

[5] World Bank Group *"Managing Coal Mine Closure: Achieving a Just Transition for All"* (English). World Bank Group, Washington, DC.

stronger support for mental and other health conditions to the affected population. Overall, with the green transition, about 66,000 workers in North Macedonia will be at the highest risk of losing their jobs and will need to change their occupations. Therefore, the country will need to adapt the education system and social protection mechanisms to respond to these emerging demands, retrain people, and build up a health system to support the green transition, increase resilience to climate shocks, and adjust to changing disease patterns.

The note concludes with a summary of detailed recommendations for policy reforms and investments, along with the associated complexities and timelines for implementation. The recommendations focus on what could and should be done in the short term (until 2030), with an eye to laying the groundwork for the scale-up of climate action in subsequent decades. The recommendations span four areas: (1) resilience and adaptation, (2) decarbonization and mitigation, (3) macroeconomy and financing, and (4) regulatory/institutional framework and education and labor.



Chapter 1

Introduction: setting the scene

1.1. Climate and development context

North Macedonia is a small, landlocked, upper-middle-income country that aspires to join the European union (EU). Agricultural land covers almost 50 percent of the surface area of the country, and forests cover approximately one-third.[6] The total resident population is 1.8 million; around 40 percent lives in rural areas. The country has achieved considerable progress in terms of reducing poverty; based on the upper-middle-income poverty line of US$6.85 at 2017 purchasing power parity (PPP) per day, poverty has been reduced from 40.8 percent in 2009 to 19.1 percent in 2019. The country has been converging with the EU in terms of GDP per capita, from 34 percent in 2009 to 41.5 percent in PPP for EU27 in 2021, which has helped to establish its upper-middle-income status.

EU accession, coupled with changes in the regulatory and trade environments, can offer opportunities to revive growth in a sustainable manner. Accession to the EU can be an anchor for future growth and development. In the context of limited fiscal space and ability to attract investment, North Macedonian firms can seek EU funds for research, development, and innovation in green and digital technology. The EU Growth Plan for the Western Balkans incentivizes the region's preparations for EU membership and accelerates reforms via the €6 billion Reform and Growth Facility in 2024-2027, with €750 million tentatively allocated to North Macedonia, subject to the achievement of the payment conditions.

The current income status has been achieved at high environmental and health costs. North Macedonia's energy and carbon intensity remain higher than the EU-27 average, despite being lower than in most WB6 neighbors (refer to Figure 1.1).[7] This relatively high level is a result of multiple factors: partial dependence on coal for electricity generation, industrial growth based on iron and steel production, continued ore extraction and cement production, poorly insulated buildings, and inefficient electrical appliances in households. Air pollution is exacerbated by household heating and remains a serious problem, especially in the capital city of Skopje. More than 3,800 people are estimated to die prematurely from air pollution every year in the country.[8] Climate change, including changing wind patterns and strength, can influence the air quality. The estimated welfare loss associated with air pollution in North Macedonia was equivalent to 17.5 percent of GDP in 2019.[9] While the effects of air pollution are felt in the short term, the composition of North Macedonia's economy has longer-term environmental implications.

The Western Balkan region is a hotspot for climate and natural hazards, and North Macedonia is no exception. The country is exposed to both onset hazards (such as increases in temperature and changes in rainfall) and sudden hazards (such as more extreme weather events). These onset hazards can reduce the productivity of capital (human, physical, natural, and social); they can also reduce fiscal revenues or increase public spending to rebuild after a climate-related event. North Macedonia is already exposed to the high risks of river floods, urban floods, landslides, and wildfires, as well as to the medium risks of earthquakes, water scarcity, and extreme heat.[10] In 2020, more than 18 percent of the total population was exposed to floods,[11] and the mean temperature increased by close to 9 percent from 1991–2020, compared to 1951–1980.[12]

---

6 UNDP, GEF (Global Environment Facility) and Republic of North Macedonia, Ministry of Environment and Physical Planning of the. 2022. NDC Implementation Roadmap for North Macedonia 2020–30. https://api.klimatskipromeni.mk/data/rest/file/download/c86929c13f43f00f201b38ef166822904cf3568a881e997bc608433de987eb8f.pdf.

7 OECD. 2022. "*Indicators for CO_2 Emissions.*" https://www.oecd-ilibrary.org/energy/data/iea-co2-emissions-from-fuel-combustion-statistics/indicators-for-co2-emissions_data-00433-en.

8 Institute of Public Health of the Republic of North Macedonia. 2023. Report on health and healthcare protection of the population in republic of North Macedonia in the year 2022. https://www.iph.mk/Upload/Documents/Izvestaj%20za%20zdravje%202022.pdf.

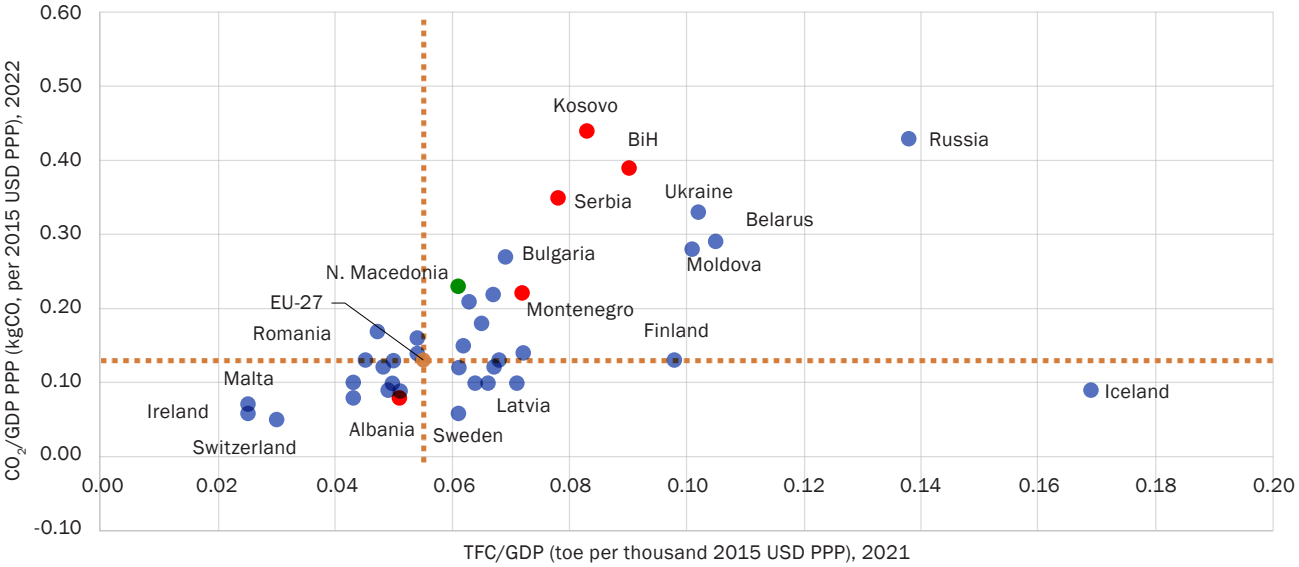
9 OECD. 2024. OECD Data Explorer. https://stats.oecd.org/Index.aspx?DataSetCode=EXP_MORSC#.

10 GFDRR. 2023. "*Think Hazard: FYR of Macedonia.*" https://thinkhazard.org/en/report/241-fyr-of-macedonia.

11 CCDR Database, World Bank DataBank. 2024.

12 Climate Knowledge Portal, World Bank.

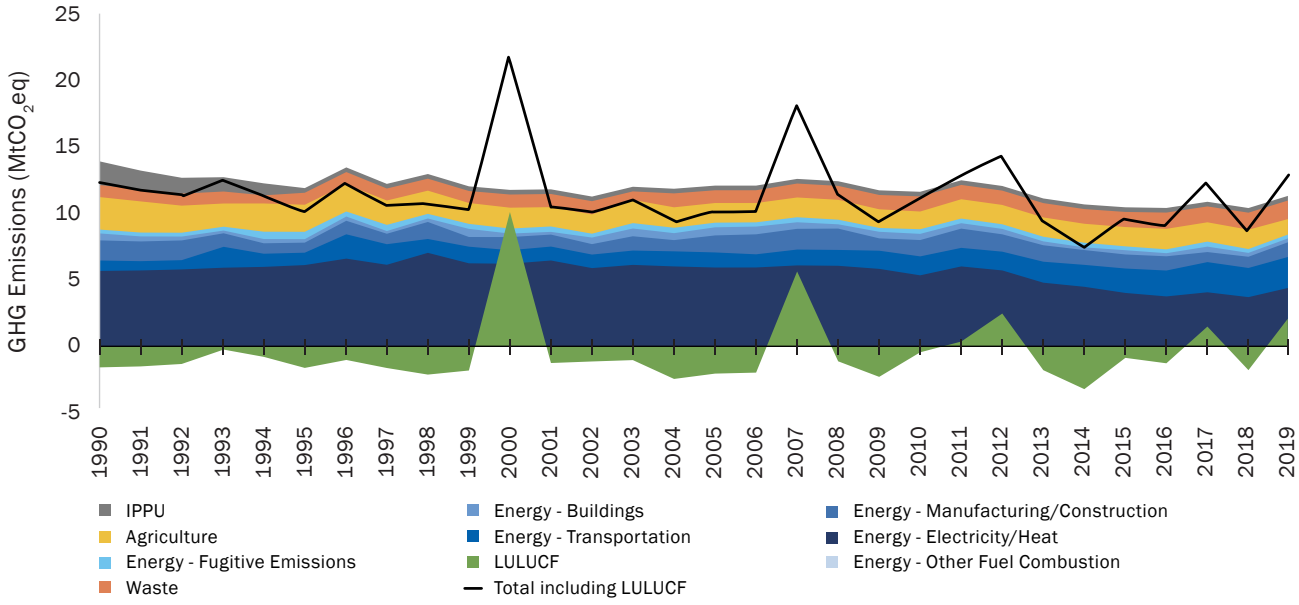
FIGURE 1.1. Energy intensity versus carbon intensity of European countries



Source: IEA (2021). World Indicators; IEA 2022 Indicators for CO2 emissions.

North Macedonia has been decoupling its growth from emissions since 1990, but much more needs to be done to fully decarbonize the economy. Total greenhouse gas (GHG) emissions have declined since 1990 (refer to Figure 1.2), while GDP per capita has increased, demonstrating the decarbonization of the economy to some degree. Total emissions remain at approximately 11 $MtCO_2eq$, making up 9 percent of the total emissions for the WB6 region. Energy-related emissions represent three-quarters of total emissions, which includes fuel combustion for electricity and heat production, transportation, and manufacturing. In 2019, the biggest emissions sectors were electricity and heating (33 percent of total emissions), transportation (18 percent), waste (10 percent), and agriculture (9 percent). Land Use, Land-Use Change and Forestry (LULUCF) emissions have been volatile over time, with the LULUCF sector switching between being a carbon sink and a carbon source, due to recurrent wildfires. Emissions from Industrial Processes and Product Use (IPPU) were reduced significantly due to North Macedonia's deindustrialization after gaining independence in 1991.

FIGURE 1.2. GHG emissions by sector in North Macedonia



Source: CAIT 2023.

Transforming the energy system will allow North Macedonia to achieve two goals: ensure energy security and decarbonize the economy. The country has a high degree of import dependence; historically, about 40 percent of the electricity supply comes via electricity and natural gas imports). It also has significant import source vulnerability; gas is solely supplied from Russia through Bulgaria. This level of dependence leaves the country highly vulnerable to energy price and supply shocks. Further, its reliance on oil and petroleum products for energy supply and coal for electricity generation (about 35 percent of production comes from coal and 5 percent from oil) means that North Macedonia's energy system is not future-fit and remains vulnerable to environmental impacts. Transforming the energy system requires both integrating it with its neighbors and transitioning energy production to clean technologies. Several steps have been made toward this transition: the adoption of the Electricity Integration Package by the Energy Community in December 2022[13] means that North Macedonia has a legal obligation to align its legal, regulatory, and institutional framework with the EU market. The new electricity interconnection planned with Albania further diversifies the supply options, similar to new gas connections planned with Greece, Kosovo, and Serbia; and the plan to couple its day-ahead market with Bulgaria will enhance short-term flexibility. Energy sector transformation would also help minimize the country's exposure to the EU's Carbon Border Adjustment Mechanism (CBAM). CBAM covers close to 10 percent of national exports, of which electricity is a significant component. Furthermore, integration into the EU electricity market is a core policy condition for the exemption of the electricity sector from CBAM payments until 2030.[14] A range of multisectoral policies and investments, detailed in the following sections, will be critical to enabling this transition in a manner that protects the gains the country has made in poverty reduction and economic growth.

1.2. Climate change commitments and strategies

External drivers and international commitments are key for shaping North Macedonia's climate change goals and actions. The United Nations Framework Convention on Climate Change (UNFCCC) and the country's aspiration to join the EU have served to articulate North Macedonia's major commitments to date. As a contracting party to the Energy Community Treaty, North Macedonia must harmonize its energy and climate legislation with the EU law and adopt a National Energy and Climate Plan (NECP), reflecting the country's efforts to achieve energy and climate objectives. The regulatory framework for climate change mitigation and adaptation is emerging with the draft Law on Climate Action (LCA) under adoption procedure (as of December 2023) and the Law on Environment providing the legal basis for the mitigation planning and establishment of the national GHG inventory system. The National Development Strategy 2024–44 has been drafted and is expected to become an overarching policy document for the country, including for the climate change agenda. Table 1.1 sets out the status of key national laws and strategies for climate action.

TABLE 1.1. Key national laws and strategies, as of December 2023

	Paris Agreement			Strategies				Laws			
	Entry into force	NDC last update	LT-LEDS	NECP	Climate change /Low-carbon Development Strategy	National Adaptation Plan	Energy Strategy	Law on Climate Action	Law on Air Quality	Law on Energy Efficiency	Law on Renewable Energy
Status	Nov 2017	Apr 2021	✓ Nov 2021	✓ Until 2040	✓ Until 2050	»	✓ Until 2040	»	✓	✓	»

Source: World Bank National Climate Actions Strategies & Policies Database (NCASPD).
Note: Green= document approved and valid. Blue = draft document exists but has not yet been approved. Red = document does not exist or has expired. LT-LEDS = Long-term, low-emissions development strategy in accordance with Article 4 of the Paris Agreement; NDC = Nationally Determined Contribution.

[13] The Energy Community Ministerial Council adopted Decision 2022/03/MC-EnC on the incorporation of the European Union's electricity market acquis in the Energy Community. https://www.energy-community.org/implementation/package/EL.html#:~:text=On%2015%20December%202022%2C%20the,integration%20in%20the%20Energy%20Community.

[14] Regulation (EU) 2023/956 of the European Parliament and of the Council of 10 May 2023 establishing a carbon border adjustment mechanism. https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32023R0956.

1.2.1. Adaptation

The planning framework for climate change adaptation is based on the Long-term Strategy on Climate Action (LTS) and Action Plan. The LTS defines priority sectors for adaptation, such as agriculture, water resources, tourism, and human health.[15] It also contains specific adaptation and resilience (A&R) objectives derived from the vulnerability and adaptation assessment done in the framework of the preparation of the national communications on climate change. The adaptation measures contained in this strategy are limited and mainly aimed at addressing the key barriers and gaps identified in the Third National Communication (2014) and creating an enabling regulatory environment for climate adaptation. Signaling further efforts, the process of the preparation of a comprehensive National Adaptation Plan has been announced to start in 2024. Regarding disaster risk preparedness, the overall emergency preparedness and response (EP&R) management system lacks a strategic framework for disaster risk reduction (DRR), for example, a National Strategy for Disaster Risk Reduction. Learning from the COVID-19 pandemic, North Macedonia modified its social protection legislation so that its poverty-targeted social assistance program (the Guaranteed Minimum Assistance program) can expand to reach new people when a national emergency occurs, including emergencies caused by climate disasters.

Despite the recent progress, such as the drafting of the Law on Climate Action, North Macedonia still lacks a comprehensive legislative framework for climate adaptation and resilience. This lack hinders the mainstreaming of climate change adaptation (CCA) in national decision-making. LTS is not fully implemented due to resource constraints—both fiscal and institutional. There is also a lack of adaptation actions at the local and community levels. The situation is aggravated by inadequate and fragmented data collection and information management, due to limited institutional capacity and expertise on adaptation.[16] These deficits serve as barriers for climate impact and vulnerability assessment and identification of potential adaptation measures, which are crucial for CCA decision-making.

Adaptation at the sectoral level is proceeding but in a lopsided fashion. North Macedonia has developed legislation to enhance climate resilience and adaptation in key sectors such as agriculture, water, and human health. However, the legal framework for adaptation in other crucial sectors, such as transportation and urban planning, remains lacking. Existing policy documents include the National Climate Change Health Adaptation Strategy and Action Plan (2012), the National Strategy for Adaptation of the Agriculture Sector to Climate Change (2018), the National Strategy for Adaptation of the Water Sector to Climate Change (2018), and the National Strategy for Agriculture and Rural Development (2021). Nevertheless, such regulations are not well implemented at the local levels due to the low levels of coordination and the lack of expertise. At the sectoral level, there is very limited regulation integrating climate change adaptation actions into the specific articles. For instance, there is limited legal ground for the introduction of climate adaptation in spatial planning. For critical infrastructures, the Law on Construction does not include climate resilience as a basic requirement for construction.[17] Importantly, the existing sector-specific regulations lack integration. Crucially, the impacts of climate hazards compound and cascade—across sectors and space. Therefore, it is crucial to consider multihazard risks, as well as synergies and trade-offs with other sectors, when making policy decisions related to adaptation.

1.2.2. Mitigation

NDC, LTS, and NECP provide a consistent planning framework for climate change mitigation and set the most ambitious targets in WB6. Enhanced Nationally Determined Contribution (NDC) sets the target to reduce net GHG emissions in 2030 by 82 percent, compared to 1990 levels, consistent with the targets in the NECP and the Clean Energy Package adopted by the Energy Community in 2022 (refer to table 1.2). The LTS includes an assessment of GHG emissions, trends, scenarios, and targets to 2050 that are aligned

[15] Republic of North Macedonia, Ministry of Environmental and Physical Planning. 2023. *"Long-Term Strategy on Climate Action and Action Plan."* https://api.klimatskipromeni.mk/data/rest/file/download/61ae4e7b2a98595427e5ab19a736414084e75ba743df2165f80dba996a82eb62.pdf.

[16] Republic of North Macedonia, Ministry of Environmental and Physical Planning. 2023. *"Long-Term Strategy on Climate Action and Action Plan."* https://api.klimatskipromeni.mk/data/rest/file/download/61ae4e7b2a98595427e5ab19a736414084e75ba743df2165f80dba996a82eb62.pdf.

[17] UNDP. 2022. *"Study on the Climate-Resilient Infrastructure in the Republic of North Macedonia."* https://api.klimatskipromeni.mk/data/rest/file/download/b8600f4a08a5020202a2deb79ef7b893eecb7173c1f001c5c96d9c1c791e5f0d.pdf.

with the enhanced NDC. Both NECP and the National Strategy for Energy Sector Development set targets to 2030 and mitigation scenarios to 2030 and 2040 and outline policies and measures to reach the targets. The GHG emissions reduction commitment—the most ambitious among the WB6 countries—is supported by 63 mitigation policies and measures in the NDC that are focused primarily on the energy sector, agriculture, forestry and other land use sectors, and the waste sector.[18] The draft LCA foresees the introduction of a carbon tax for stationary installations and aviation operators. The Energy Community discusses the possibility and benefits of a coordinated approach to introducing an Emissions Trading System (ETS) in the WB6 region, but the modalities of such an approach remain to be defined.

North Macedonia aspires to contribute to the EU target of making Europe a carbon-neutral continent by 2050, but it has not adopted a net zero target yet. The ambition for accession to the EU means North Macedonia aims to align with the European Green Deal and thereby contribute to the net zero objective by mid-century. This goal was affirmed when the country became a signatory to the Sofia Declaration on the Green Agenda for the Western Balkans in 2020. However, the country's strategic policy documents do not set a net zero target date. North Macedonia seeks to phase out coal-fired power generation by 2030.[19] The country has joined the Powering Past Coal Alliance (PPCA) and is committed to participating in the Coal Region in Transition initiative for the Western Balkans. The country has also adopted the Just Transition Roadmap (refer to Chapter 4). In July 2023, the country joined the EU LIFE program for environment and climate action, with the objective of committing to climate action, clean energy transition, biodiversity protection, and circular economic development under the support of the EU.[20]

TABLE 1.2. North Macedonia's key mitigation targets

Nationally Determined Contribution (NDC)	Clean Energy Package (CEP) and NECP 2030 targets				
GHG emission reduction target for 2030 compared to 1990 levels	**Net GHG emissions reduction compared to 1990 level** (CEP and NECP)	**Emissions level, $MtCO_2eq$** (CEP)	**Share of energy from RES in gross final consumption** (CEP and NECP)	**Final Energy Consumption, Mtoe** (CEP)	**Energy savings relative to BAU scenario** (NECP)
-51% (without LULUCF) or -82% net GHG emission reduction (with LULUCF)	-82% (with LULUCF)	2.2	38% from 17% in 2021*	2 from 1.83 in 2020	20.8% savings of final energy consumption or 34.5% of primary energy

Sources: Enhanced Nationally Determined Contribution and National Energy and Climate Plan of the Republic of North Macedonia; Energy Community Clean Energy Package.
Note: * = Eurostat for the actual share of renewable energy in gross final energy consumption in 2021.

The establishment of a monitoring, reporting, and verification (MRV) system aligned with EU Acquis communautaire is ongoing. The MRV system, including an inventory of GHG emissions and sinks per sectors, is expected to be regulated under the draft LCA. Institutional capacities are not yet available, and the climate agenda is strongly dependent on international donor support.

1.3. Institutions, policies, and capacities

North Macedonia features an emerging institutional maturity for addressing climate change, according to the World Bank's Climate Change Institutional Assessment (CCIA); the assessment examines countries' capacity to plan, implement, and sustain climate change policies over multiple political cycles by analyzing 74

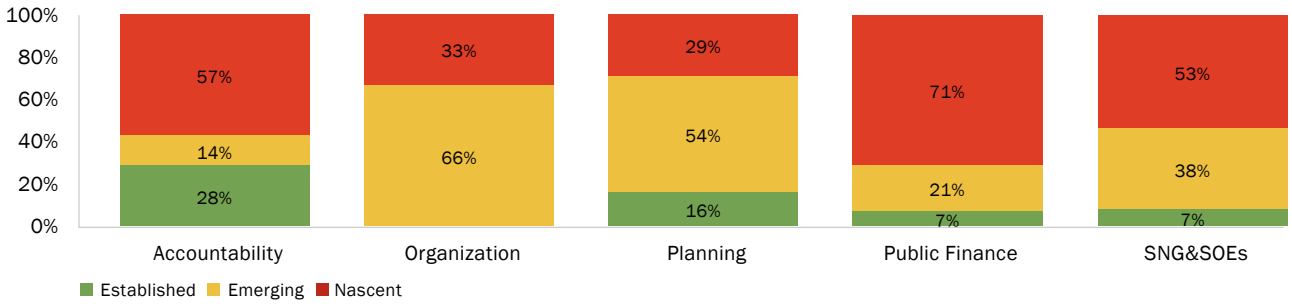
[18] North Macedonia. 2021. *"Enhanced Nationally Determined Contributions."* https://unfccc.int/sites/default/files/NDC/2022-06/Macedonian%20enhanced%20NDC%20%28002%29.pdf.

[19] NECP states the phaseout in 2027, but adjustments are under discussion to postpone it to 2030.

[20] European Commission. 2023. *"North Macedonia Joins the LIFE Program for Environment and Climate Action."* https://neighbourhood-enlargement.ec.europa.eu/news/north-macedonia-joins-life-programme-environment-and-climate-action-2023-07-04_en.

indicators across 5 pillars. The indicators measure different aspects of a country's institutional maturity for climate action—as nascent, emerging, or established—with further breakdowns within each category. Given the fact that the CCIA is a point-in-time analysis, the findings may not capture recent developments due to the rapid pace of regulatory and institutional development across the region. Nevertheless, it serves as a useful empirical baseline to highlight achievements and gaps across the region, helping to inform peer learning and innovation in climate action. Annex A outlines the CCIA methodology and summarizes the CCIA results that demonstrate that North Macedonian institutional maturity is slightly more advanced than the Western Balkans average, except for the Organization pillar. However, the level of ability and action varies among the five pillars, as demonstrated in Figure 1.3.

FIGURE 1.3. Climate Change Institutional Assessment summary for North Macedonia



Sources: Country Institutional Capabilities for Climate Change Action: Western Balkans Climate Change Institutional Change (CCIA); D4C National Climate Actions Strategies and Policies Database (NCASPD).
Note: SNGs = subnational governments; SOEs = state-owned enterprises.

The organizational structures for climate change in the relevant ministries are only partially established and have insufficient capacities. The leadership role for climate change is assigned to the Ministry of Environment and Physical Planning (MoEPP) as a national designated entity for coordination of the climate action in the country. The MoEPP has a state councilor on climate change and a Unit for Climate Policies that is understaffed. The Cabinet of the Deputy President of the Government in Charge of Economic Affairs and Coordination of Economic Sectors and Investments—which acts as the Designated National Authority (DNA) to the Green Climate Fund (GCF)—coordinates climate change adaptation, including the development of the yet to be approved National Adaptation Plan. The Ministry of Economy (MoE), in cooperation with MoEPP, is responsible for the development and implementation of the NECP. Other ministries do not have dedicated staff for climate action. The LTS Action Plan includes measures to strengthen institutional capacity; however, its implementation can start only after the adoption of the Law on Climate Action.

Coordination mechanisms for climate action are being developed. The Draft LCA foresees the establishment of a National Coordination Council on Climate Action (NCCCA) that will have an advisory role in the government and the mandate to coordinate the national response to climate change. The NCCCA is expected to include permanent representatives of relevant ministries, local governments, relevant national institutions, nongovernmental organizations (NGOs), academia, and the economic chambers. The Designated National Authority to the Green Climate Fund has coordination, outreach, and strategic oversight responsibilities for GCF-funded projects.[21] The law on National Development Strategy (NDS) 2024—44 envisages the establishment of a National Council for Development, which is expected to play some coordination role for key national policy agendas, including climate change.

Lack of clarity and coordination on emergency preparedness and response (EP&R), as well as insufficient budgets, hinder an effective and efficient disaster response. Although the EP&R in North Macedonia is functional, there is clearly room for improvements to ensure that the country can respond to its main risks:

[21] Republic of North Macedonia. *"National Designated Authority (NDA)."* http://www.greendevelopment.mk/en/NDA.aspx.

floods and wildfires. According to the World Bank's Ready2Respond (R2R) diagnostic,[22] North Macedonia has an overall score of 3 out of 5 for the legal and institutional accountability component, with 3.25 for legal accountability and 2.75 for financial preparedness.[23] There is a duplication of responsibilities and a severe lack of coordination between two main institutions responsible for disaster risk management and emergency responses at national level—the Crisis Management Center (CMC) and the Protection and Rescue Directorate (PRD).[24] Implementation is carried out by local authorities, but their actions are hindered by the lack of consistent budgetary planning for climate adaptation at the central and municipal levels, as well as the lack of sufficient budget for emergency response.[25] The country does not have a systematic disaster and climate risk insurance system, and there is scope to further strengthen the ability of its social protection system for climate and disaster risks.

The functional responsibilities of local self-governments and state-owned enterprises (SOEs) for mitigation and adaptation are emerging with the draft LCA. Local strategic plans for climate action are not obligatory, but the draft LCA law encourages LSGs to develop sectoral planning documents for adaptation to climate change. The draft law obliges LSGs to harmonize their policies and measures with the objectives of the LTS and the NECP and to regularly report their policies and measures. Also, the Law on Energy Efficiency requires LSGs to prepare Energy Efficiency Action Plans. Several municipalities and the city of Skopje, supported by donors, have developed GHG inventories and Sustainable Energy and Climate Action Plans. With respect to SOEs, ESM is the largest energy company in the country and the largest GHG emitter. The introduction of a carbon tax envisaged in the draft LCA will provide stronger incentives for ESM to decarbonize its generation fleet.

The Government of North Macedonia intervenes in markets relevant to the low-carbon transition as a regulator, as well as an economic agent, by directly managing SOEs beyond power generation.[26] With 27 businesses of the state (BOS),[27] that is, businesses where the state holds more than 10 percent of the shares,[28] North Macedonia has the third highest presence of BOS in high-emitting sectors across the Western Balkans, after Serbia and Bosnia Herzegovina.[29] This status is important for North Macedonia's mitigation agenda, because a large state footprint was found to be associated with lower business dynamism, which discourages new firms from entering markets, curbs private investment, and potentially slows the transition to a greener, more sustainable economy.[30] Moreover, since BOS are not profit-maximizing, they are known to reduce the effectiveness of market-based policies (for example, carbon pricing) or distort the playing field and hinder the needed private investments (for example, in renewable energy).

---

[22] To support disaster risk management in Western Balkan countries, an assessment was undertaken by the World Bank and Prepared International (PPI) in 2020 to examine the countries' emergency preparedness and response (EP&R) current capacities. The assessment uses the Ready2Respond (R2R) diagnostic methodology, designed by the World Bank and executed by PPI. The methodology covers five core components of EP&R (legal and institutional frameworks, information, facilities, equipment, and personnel), which are further divided into 18 criteria, 72 indicators, and 360 attributes that represent necessary elements for fully developed EP&R system.

[23] World Bank. 2021. *"North Macedonia Emergency Preparedness and Response Assessment Diagnostic Report."* https://documents1.worldbank.org/curated/en/340711620280963213/pdf/North-Macedonia-Emergency-Preparedness-and-Response-Assessment-Diagnostic-Report.pdf.

[24] European Commission. 2019. *"European Civil Protection and Humanitarian Aid Operations: Overview."* https://civil-protection-humanitarian-aid.ec.europa.eu/what/civil-protection/national-disaster-management-system/north-macedonia_en.

[25] World Bank and GFDRR *(Global Facility for Disaster Reduction and Recovery). 2021. Scaling Up And Mainstreaming Resilience In A World Of Compound Risks.* https://documents1.worldbank.org/curated/en/955811620194170587/pdf/GFDRR-Strategy-2021-2025-Scaling-Up-and-Mainstreaming-Resilience-in-a-World-of-Compound-Risks.pdf.

[26] When the state acts as a regulator, it supervises and controls economic agents that supply products and services. The state does that through the exercise of legal powers—control regulation—but without directly interfering in the market. When the state acts as an economic agent, it assumes a direct participation in the market by supplying goods and services through an SOE.

[27] WB Global Businesses of the State (BOS) database. 2019. Employment data coverage for North Macedonia: 98 percent, revenue data coverage: 99 percent, profit/loss data coverage: 99 percent.

[28] The term *"Businesses of the State"* (BOS) refers to all businesses owned by the state with a holding >10 percent, both directly or indirectly, for example, owned through subsidiary holdings, differentiating BOSs from SOEs, which are often companies where the state has a controlling stake.

[29] Compared to 121 in Serbia, 62 in Bosnia Herzegovina, 19 in Albania, 14 in Montenegro, and 13 in Kosovo.

[30] World Bank. 2023. The Business of the State. Washington, DC: World Bank. doi:10.1596/978-1- 4648-1998-8.

The presence of BOS is also important for North Macedonia's climate adaptation agenda. In North Macedonia, 124 BOS (or 65 percent of all BOS) operate in climate-vulnerable sectors, that is, sectors that will experience the negative effects of climate change; this is only slightly above the WB6 average of 63 percent, but it is significantly above the global average of 44 percent. At the same time, North Macedonia scores higher on the ND-GAIN climate vulnerability index, with a score of 0.38[31] compared to several of its peers.[32] This finding suggests that North Macedonia has relatively higher adaptation needs; the country is more vulnerable to climate change because it also has BOS in vulnerable sectors. The fact that many of these BOS are frequently owned by subnational governments (for example, municipalities) and that some BOS are performing poorly has implications for financing and coordinating the climate agenda (refer to Chapter 4).

The extent of climate action integration in public finance management (PFM) is limited, and sustainable climate finance sources are yet to be developed. Attempts have been made to introduce the tracking of climate responsive capital expenditures. Guidelines for climate budget tagging in public finance have been developed but not implemented and enforced. Green and climate change considerations in the public procurement processes are regulated under the Law on Public Procurement; however, these are not applied systematically. The draft LCA does not explicitly request that climate change be addressed in the public investment cycle. There are no sustainable multiyear financing mechanisms for climate actions. However, the draft LCA foresees the introduction of a carbon tax for GHG-emitting stationary installations and aviation operators; such a tax will provide financing for the MRV system and the implementation of the climate actions stipulated in the adopted policy documents.

Public participation in climate policy development is emerging, but the government's accountability for climate action could be further strengthened. Climate-related legal, policy, strategic, and technical documents and GHG inventories are available on a climate change focused website.[33] The draft LCA envisages a mechanism for public participation in the development of climate policy, and public consultations are already taking place. The Parliament Subcommittee on Transport, Energy, Regional Development and Environment provides oversight and opinions on new legal and strategic documents related to climate. The court jurisdiction for climate action is only emerging: the draft LCA and the consequent bylaws will give court authorities a mandate to issue penalties in cases of noncompliance with the forthcoming requirements related to carbon pricing and GHG emissions from stationary installations and aircrafts. The State Audit Office is engaged in the review of climate change policy. Its audit conducted in 2022 concluded that the country's legal and institutional framework "does not provide all necessary conditions for efficient and effective implementation and monitoring of adopted measures and policies for climate change mitigation."

Human capital in North Macedonia will be critical for climate action, yet it will need significant investments. The Human Capital Index score is 0.56,[34] meaning that almost one-half of the human potential in the country is not utilized. Recently released PISA 2022 assessment results for North Macedonia showed significant impacts of the COVID-19 pandemic and declining learning outcomes. Moreover, inequalities in human capital outcomes persist in North Macedonia. For example, less than 10 percent of children from households in the poorest quintile attend preschool, compared to more than one-half of children from wealthier households. The health system offers a reasonably comprehensive benefits package, and approximately 90 percent of the population is enrolled in the social health insurance scheme. Primary health

[31] ND-GAIN Index measures the vulnerability to climate change and other challenges for more than 180 countries. It consists of two scores: (1) the Vulnerability score, and (2) the Readiness score. The Vulnerability score summarizes a country's level of exposure, sensitivity, and capacity to adjust to the adverse effects of climate change. Lower scores indicate low vulnerability, and higher score indicate higher vulnerability. https://gain.nd.edu/our-work/country-index/rankings/.

[32] With a ND-GAIN vulnerability score of 0.38, North Macedonia is considered more vulnerable to climate change than Montenegro (0.37), Bosnia and Herzegovina (0.35), Bulgaria (0.34), Hungary (0.35), Estonia (0.34), and Poland (0.31); it is less vulnerable than Serbia (0.41) and Albania (0.40).

[33] https://klimatskipromeni.mk.

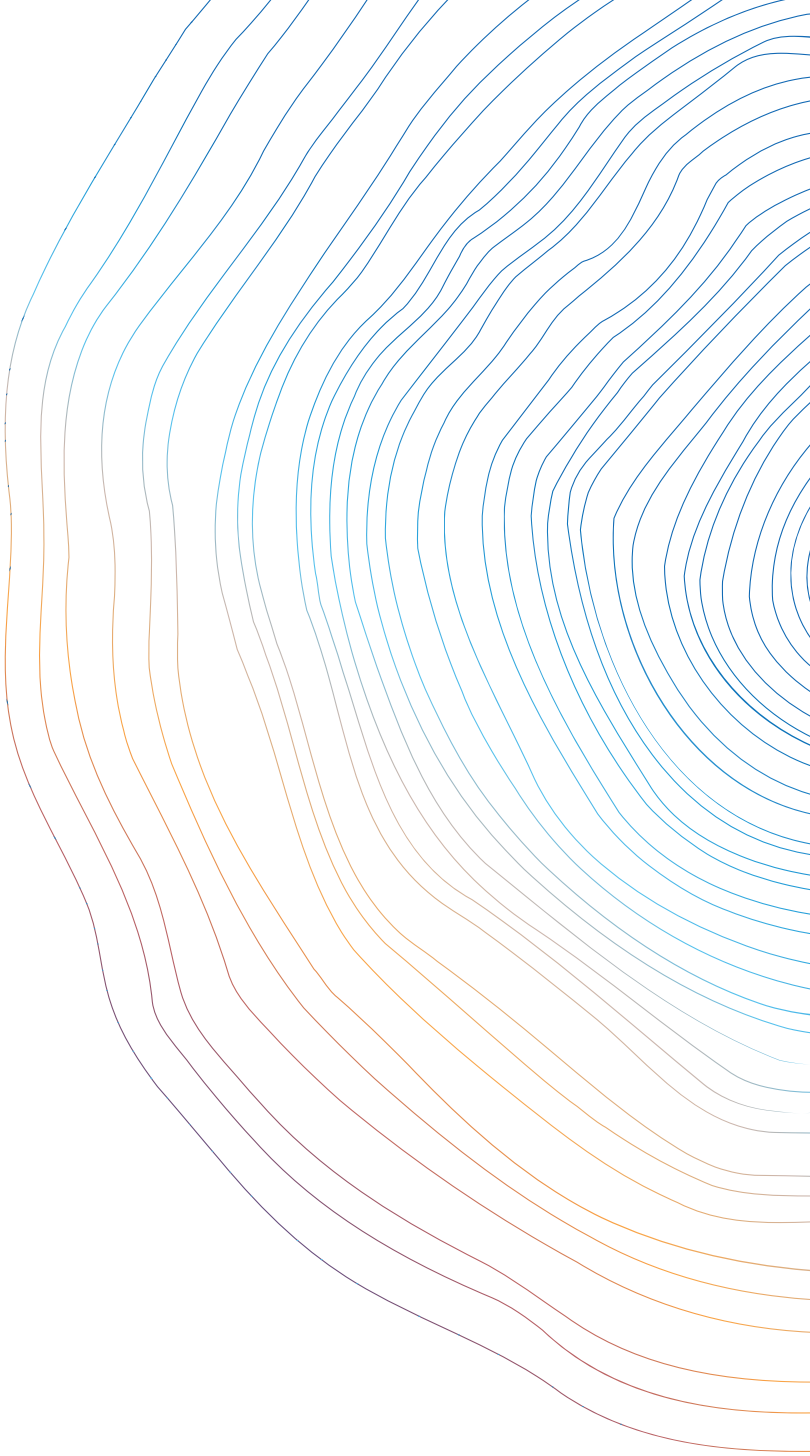
[34] The index is a summary measure of the amount of human capital that a child born today can expect to acquire by age 18, given the risks of poor health and poor education that prevail in the country where the child lives. Neda Milevska Kostova, Chichevalieva Snezhana, Ninez A. Ponce, Ewout van Ginneken, and Juliane Winkelmann. 2017. "The Former Yugolslav Republic of Macedonia: health System Review." Health Systems in Transition 19:3. https://www.researchgate.net/publication/321059136_The_former_Yugoslav_Republic_of_Macedonia_Health_System_Review.

care access is well distributed, but quality care remains a challenge at all levels, and a notable gap exists in the availability and quality of services between rural and urban areas.[35] North Macedonia has the highest out-of-pocket health expenditure (OOP) share among Western Balkan countries at 42 percent in 2022.[36] Despite improvements over the past decade, the unemployment rate and inactivity rate in North Macedonia are high at 13.1 percent and 48 percent, respectively, indicating a major loss of potential productivity. Many of the unemployed persons have been jobless for a long time. A limited supply of high-quality childcare negatively affects women's participation in the labor force.[37] Against a backdrop of rising emigration rates, investments in human capital are critical to ensure that the labor force is able to respond to the changing demand for skills brought about by the green transition.

[35] The European Observatory on Health Systems and Policies. 2017. https://iris.who.int/bitstream/handle/10665/330210/HiT-19-3-2017-eng.pdf?sequence=7.

[36] World Health Organization. 2024. Global Health Expenditure Database. https://apps.who.int/nha/database.

[37] World Bank. 2023. *"Systematic Country Diagnostic."* https://www.worldbank.org/en/country/northmacedonia/brief/consultations-scd-update-2023#:~:text=The%202023%20SCD%20Update%20proposes,and%20improve%20resilience%20to%20climate.



Chapter 2

Adaptation risks and opportunities

2.1.How is a changing climate affecting risks and opportunities?

Located in southeastern Europe on the Balkan Peninsula, the Republic of North Macedonia is prone to several natural hazards, including floods, wildfires, extreme heat, earthquakes, and landslides. The incidence of these risks and their associated impacts vary depending on the hazard, the geography, the level of exposure, the underlying vulnerabilities of the local communities, and their capacity to respond. North Macedonia is highly exposed to flooding, with areas in the north, south, southeast, and center particularly vulnerable. During the summer months, all parts of the country are vulnerable to wildfires and to heat waves. The west and southeast parts of the country are exposed to the highest risks of landslides.[38] Table 2.1 presents the country's main hazards and the corresponding risk levels.

TABLE 2.1. Main hazards in North Macedonia and associated risk levels

Hazard	Risk level
Flood	High
Wildfire	High
Landslide	High
Earthquake	Medium
Water scarcity	Medium
Extreme heat	Medium

Source: World Bank and GFDRR 2023[39] and Popovski 2022.[40]

Over the past 20 years, losses[41] from disasters and extreme climate events in North Macedonia have been significant, totaling more than US$667 million and affecting diverse sectors such as agriculture, forestry, and tourism.[42] Table 2.2 presents an overview of major natural disasters in North Macedonia and the associated deaths, population affected, and damages. The greatest losses resulted from floods and wildfires.

TABLE 2.2. Overview of major hazards and losses in North Macedonia

Year	Disaster type	Total deaths	Population affected	Total damages, adjusted ('000 US$)
1993	**Drought**	×	10,000	×
1995	**Flood**	×	1,500	470,527
2000	**Wildfire**	×	×	23,050
2001	**Extreme temperature**	15	×	×
2002	**Flood**	×	1,500	×
2003	**Flood**	2	4,000	×
2003	**Flood**	×	750	×
2004	**Flood**	×	100,000	5,578
2004	**Extreme temperature**	15	×	×
2005	**Storm**	1	×	×
2005	**Flood**	×	2,000	×

[38] Popovski, V. 2022. *"Disaster Risk Reduction Report for the 4th National Communication on Climate Change."* https://api.klimatskipromeni.mk/data/rest/file/download/c6dc3a754d4b3fcad7f2366744d3c3c09db26e621e47ed8cc99391478e597b5f.pdf.

[39] World Bank and GFDRR. 2023. ThinkHazard—FYR of Macedonia. https://thinkhazard.org/en/report/241-fyr-of-macedonia. Accessed September 2023.

[40] Popovski, V. 2022. "Disaster Risk Reduction Report for the 4th National Communication on Climate Change." https://api.klimatskipromeni.mk/data/rest/file/download/c6dc3a754d4b3fcad7f2366744d3c3c09db26e621e47ed8cc99391478e597b5f.pdf.

[41] Losses include human loss, displacement of people from their homes, infrastructure damage, economic loss, and environmental loss.

[42] The Emergency Events Database (EM-DAT). 2024. https://public.emdat.be/data. Data accessed February 2024.

TABLE 2.2. Overview of Major Hazards and Losses in North Macedonia

Year	Disaster type	Total deaths	Population affected	Total damages, adjusted ('000 US$)
2006	**Flood**	×	1,500	×
2007	**Extreme temperature**	×	202	×
2007	**Wildfire**	1	1,000.000	×
2012	**Extreme temperature**	1	5,100	×
2013	**Flood**	1	4,911	×
2014	**Extreme temperature**	×	8,800	×
2015	**Flood**	7	5,000	107,423
2015	**Flood**	×	100,000	×
2016	**Flood**	22	33,522	60,968
2017	**Extreme temperature**	3	2,220	×
2021	**Wildfire**	1	80,000	×

Source: The Emergency Events Database (EM-DAT). 2024. https://public.emdat.be/data.
Note: × = data unavailable.

Floods in North Macedonia have been devastating in terms of frequency and intensity. The country has experienced several severe floods within the past two decades that resulted in loss of life, infrastructural damage, and displacement of communities. The 2015 floods in the Pelagonija and Strumica regions caused 7 fatalities, affected more than 100,000 people, and caused damages that totaled US$107.42 million.[43] In the summer of 2016, devastating floods occurred in the western and northwestern parts of the country; they killed 22 people and caused US$61 million in damages and losses.[44] On average, every year, floods affect around 70,000 people and lead to annual losses exceeding US$500 million.[45]

The country is also prone to wildfires and extreme heat events, whose intensity and impacts have been rising in the past decade. Escalating heat waves, along with prolonged warm spells,[46] have become an increasingly common occurrence in North Macedonia. For instance, in Skopje, a significant urban heat island (UHI) effect is prominent; nighttime temperatures in the city center are 4.7°C higher than in the surrounding rural areas, primarily due to the lack of vegetation and the extensive impervious surfaces in the city.[47] In Gevgelija, a town located in the southeast of North Macedonia, the duration of extreme heat waves has increased 6-fold, from 196 days from 1951–80 to 1,164 days from 1991–2020.[48] Poorer neighborhoods tend to experience elevated heat exposure. Tropical nights[49] and summer days[50] have also set shocking records, catapulting fivefold and 2.3 times, respectively, and culminating in a remarkable 564 tropical nights and 3,064 summer days in Gevgelija. In addition, wildfires in the past two decades have caused substantial economic losses, totaling €180 million and destroying more than 18 percent of the entire forested area, while contributing to annual GHG emissions of 11.774 $GgCO_2$-eq (average yearly emissions for Macedonia).[51] Almost one-half of North Macedonia's population was affected by the 2007 wildfire.[52]

[43] Emergency Events Database (EM-DAT). 2024. https://public.emdat.be/data.

[44] Emergency Events Database (EM-DAT). 2024. https://public.emdat.be/data.

[45] World Bank. 2017. *"Disaster Risk Profile: North Macedonia."* https://www.gfdrr.org/en/publication/disaster-risk-profile-macedonia.

[46] Warm spell duration index: count of days in a span of at least 6 days where TX > 90th percentile, comparing two 20-year periods: 2001–20 with 1951–70.

[47] VITO UrbClimb analysis for World Bank. 2023.

[48] Calculated based on Macedonian Hydrometeorological Service for Macedonia's Fourth National Communication on Climate Change.

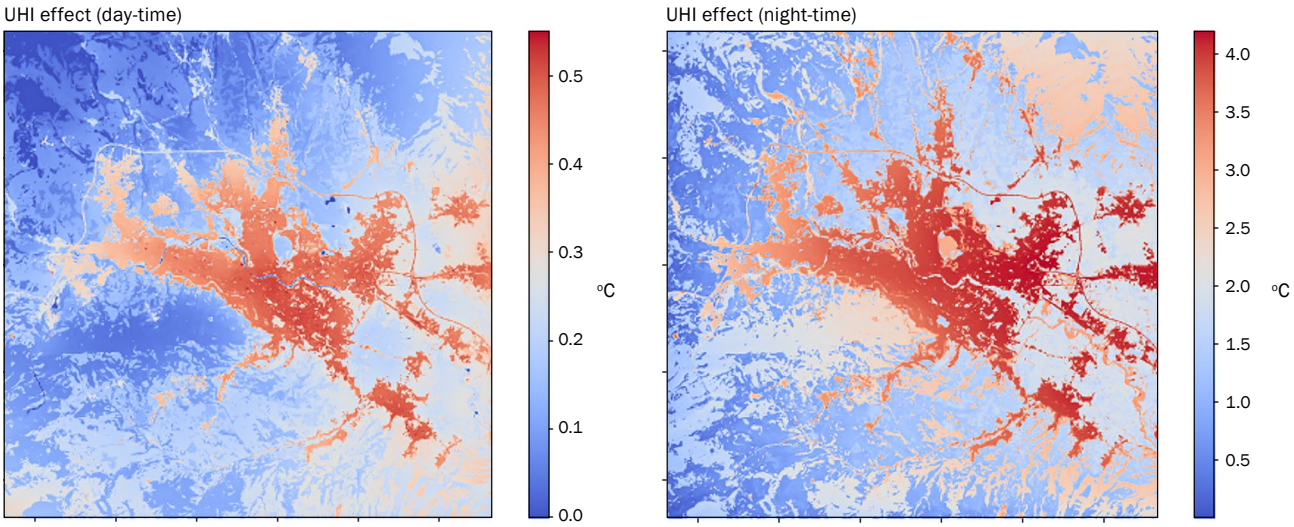
[49] Tropical nights: count of days where TN (daily minimum temperature) > 20 °C.

[50] Summer days: count of days where TX (daily maximum temperature) > 25°C.

[51] Based on data from the Hans Em faculty of Forest Sciences, Landscape Architecture and Environmental Engineering, for the Macedonia's Fourth National Communication on Climate Change.

[52] Republic of North Macedonia, Ministry of Health. 2018. *"Plan for Readiness and Response of the Health System in Dealing with Urgent Crisis Situations and Disasters."*

FIGURE 2.1. Skopje urban heat island effect



Source: World Bank, VITO UrbClimb analysis.
Note: The UHI effect is modeled based on historical climate data for 2001–20.

Moreover, the intensity of some natural hazards—and their impacts—is expected to worsen with the changing climate. The country is expected to face a warmer and drier climate in the future, with less precipitation and increased occurrence of wildfires and extreme weather events.[53] The country will still be highly susceptible to floods, and its exposure to droughts and high temperatures during the summer months will increase. In the 20-year period from 1996–2016, the number of flood events increased by 28.6 percent.[54] The probability of annual severe drought could be between 0.23 and 0.37 by 2060.[55] In addition, average annual temperatures increased from 0.2 to 0.5°C from 1981–2010 and are projected to increase by 1.0–3.3°C by 2050. 18 Increasing temperatures, combined with falling precipitation, are leading to more wildfires: from 2015–21, wildfires increased from 386 to 1,141.[56] At the same time, the country will be increasingly exposed to more unpredictable hazards as well, such as flash floods. In 2015, disastrous flash floods and landslides affected Tetovo and neighboring villages and caused a total loss of US$21.5 million.[57]

The effects of climate also compound and cascade, making resilience far more difficult—the agricultural sector is a case in point. Agriculture in North Macedonia faces several risks, including increasing temperatures, droughts, and floods. Droughts lead to agricultural loss: the average annual losses (AAL)[58] to maize and wheat yield from droughts in the region is 4.2 percent and 3.5 percent, respectively Droughts and rising temperatures also increase the frequency and intensity of wildfires that burn away cropland and damage crops. In North Macedonia, 19.5 percent of the crop area is projected to be under very high wildfire risk. A consequence of wildfire is soil degradation, because the fires burn the vegetation cover and expose the soil to erosion agents, such as water and wind. Thus, degraded soil is at a higher risk of flash floods and landslides. Within North Macedonia, 48.2 percent of the crop area in Aračinovo municipality is under very high wildfire risk; 11 percent of the very high-risk wildfire crop area is exposed to very high-risk landslides. Meanwhile, evidence shows

[53] Gjurgjevik, Vladimir. 2020. *"Climate Projection Report Changes and for Changes in the Extreme Climate Events in the Republic of North Macedonia."* UNDP. https://api.klimatskipromeni.mk/data/rest/file/download/5e8046fa4761fb1b91d41c7fa0a0f34b621b19acc537ff9f45b79af5b623255e.pdf.

[54] Climate Change Knowledge portal. 2022. https://climateknowledgeportal.worldbank.org/country/north-macedonia/vulnerability.

[55] USAID. 2018. Climate Risk Profile, North Macedonia fact sheet. https://www.climatelinks.org/sites/default/files/asset/document/2019_USAID_Macedonia_CRP.pdf.

[56] Forest fires in Europe, Middle East, and North Africa; 2015 and 2021.

[57] United Nations Country Team. 2016. *"Partnership for Sustainable Development: United Nations Strategy for 2016–2020."* Skopje. https://unece.org/DAM/operact/Technical_Cooperation/Delivering_as_One/UNDAF_country_files/UNDAF_files_2015-2020/Macedonia-UNDAF-2016-2020.pdf.

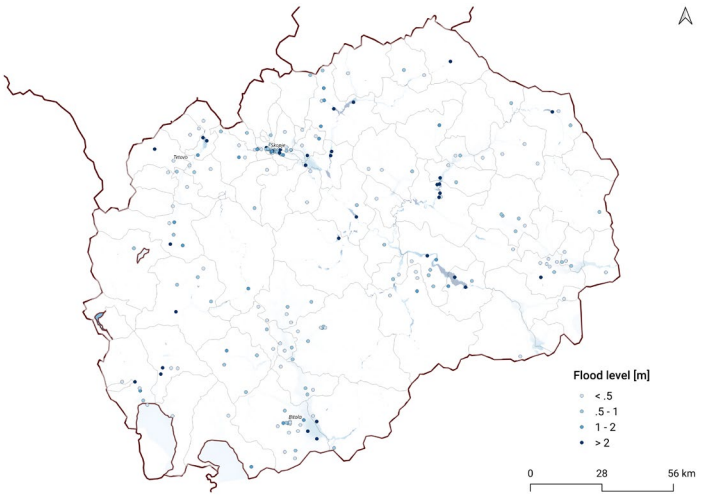
[58] AAL represents the expected average loss based on probabilistic analysis (sum of losses for a variety of possible scenarios with associated probabilities per year).

that agricultural production loss accounted for 91.3 percent of the economic loss due to flash floods in 2004; most of the agricultural production loss was in the southeastern part of the country. Successive shocks from wildfires, post-fire landslides, and degraded soils have resulted in precipitous falls in wheat production—for instance, from 1,451 tons to 1,089 tons from 2014–21 in Aračinovo municipality.

In addition, North Macedonia's critical infrastructures—such as transportation networks and public buildings—are also exposed to great climate risks because they lack adequate climate-proofing. Road infrastructure is particularly vulnerable to climate and disaster risks. For land transport infrastructure, such as road and rail networks, extreme temperature and weather events including heavy rainfall and flooding lead to structural damage and road surface deterioration. The fact that not all damage is evident immediately after an event is particularly problematic.[59] Landslides, triggered by floods or heavy rainfalls, can cause damage or even destroy infrastructure components, leading to disruptions of road traffic and economic activities.[60] The 2017 landslide on the Pretor-Markova Noga road section caused road deformations and traffic disruption for almost a year, leading to a cost of €2.7 million for landslide remediation.[61] Landslides could also negatively affect critical infrastructure for water management by damaging the water adduction and distribution infrastructure and irrigation systems, breaking the underground pipelines and increasing the risks of dam collapse.[62] Meanwhile, wildfires and extreme temperatures could lead to structural damage of infrastructures.

Essential services, such as schools, are also exposed to climate hazards and require interventions to limit disruptions for local communities. A substantial number of schools in North Macedonia is exposed to climate hazards. Using the geolocation of educational facilities matched with their localized exposure to hazards[63] suggests that around 13 percent of schools are highly exposed to floods.[64] Similarly, 28 percent of schools have medium or higher exposure to landslides; 9 percent of those are highly exposed. Exposure to wildfires is lower, possibly due to the location of most schools in central parts of urban areas away from the forests where the wildfire risk is higher. Only 1.7 percent of schools are highly exposed to wildfires, while 3.2 percent display medium or higher exposure. Flood exposure is uncorrelated with the other hazards. Hence, there is only one institution in the sample that faces at least medium severity of exposure to all three hazards. However, because exposure to wildfires and landslides often overlaps, 1.7 percent of schools could potentially face compounding climate hazards. School closures caused by disaster events significantly impact student outcomes, as international studies recently confirmed[65]; this outcome, in turn, negatively affects human capital development.

FIGURE 2.2. Exposure to floods of educational facilities in North Macedonia



Source: World Bank, JBA 2023.

[59] This is usually the case after long-term flooding, when road surfaces appear undamaged after water subsides; however, water can seep through porosities in the pavement surface and eroded the base and sub-base of the road, a condition that is further aggravated by continued use of the road. This leads to surface damage and subsidence that leads to increased vehicle operating costs, as well as being a road safety hazard.

[60] Gajšak, M., L. Ilieva, T. Trumbić, and D. Blažev. 2022. *"Study on the Climate-Resilient Infrastructure in North Macedonia."* https://api.klimatskipromeni.mk/data/rest/file/download/b8600f4a08a5020202a2deb79ef7b893eecb7173c1f001c5c96d9c1c791e5f0d.pdf

[61] Jovanovski, M., and I. Peshevski. 2019. *"Study on Landslides Mapping as a Result of Floods in the Pelagonia Region."* GAUSS Institute. https://www.ipa-cbc-programme.eu/gallery/Files/EN-Study-for-landslides.pdf.

[62] Gajšak, M., L. Ilieva, T. Trumbić, and D. Blažev. 2022. *"Study on the Climate-Resilient Infrastructure in North Macedonia.* https://api.klimatskipromeni.mk/data/rest/file/download/b8600f4a08a5020202a2deb79ef7b893eecb7173c1f001c5c96d9c1c791e5f0d.pdf.

[63] Similar analysis will be performed in other country notes using similar geolocalized information on educational and health facilities.

[64] High exposure is defined as a 1 percent yearly probability of a flood, either fluvial or surface water, with depth more than half a meter.

[65] Jakubowski, M., T. Gajderowicz, and H.A. Patrinos. 2024. *"Covid-19, School Closures, and Student Learning Outcomes: New Global Evidence from PISA."* IZA Discussion Paper No. 16731, SSRN. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4696073.

Climate change and related hazards have a strong impact on human health in the country. Climate change exacerbates the lack of access to fresh water in rural areas,[66] which can increase waterborne diseases. Evidence also suggests a linear increase in Salmonella with a 1oC increase in weekly temperature;[67] projections show that food poisoning from Salmonella will increase due to rising average monthly temperature.[68] Extreme temperatures in North Macedonia have further implications for morbidity and mortality. Extreme heat affected 5,100 people in 2012; 8,800 in 201;4 and 2,700 in 2017.[69] During a heat wave in 2007, there were over 1,000 excess deaths.[70] Projections show that an increase in average monthly temperature of 1oC will influence the total mortality.[71] Individuals with cardiovascular and respiratory diseases are at a greater risk of mortality during heat waves;[72] the elderly, in particular, face heightened stress-related mortality during the summer months.[73] From 2009-10 in Skopje, there was a positive association with increases in air temperature and allergens that caused respiratory infections.[74] Pollen seasonality was also observed from 1996–2009.[75] Other climate-health links are the floods in the country associated with mental health disorders, including anxiety and depression, which can last for months after a flood event. Additionally, climate change is likely to change the distribution of vectors and lead to the re-emergence of vector-borne diseases.

Exposure to natural hazards is linked with and aggravates existing socioeconomic vulnerabilities. North Macedonia is divided into 80 municipalities (opštini) that are facing different levels of socioeconomic stresses that interact with and are compounded by climate shocks. Population decline represents a significant challenge. The 2021 census recorded a population decrease of more than 9 percent since 2002; 45 percent of all municipalities have shrunk in the past two decades. Of the municipalities that are facing demographic decline, 64 percent are rural and among the most isolated, as well as more exposed to hazards. The average declining municipality has a 19 percent higher exposure to floods, compared to an average growing municipality, and 2 percent higher exposure to wildfires.[76] The incidence of landslides is higher in border areas with Albania that have witnessed some population growth, mainly due to illegal lodging by residents.

Yet, all urban areas in North Macedonia have been expanding despite the absence of a pressing need to accommodate population. In doing so, they have become significantly more exposed to floods. The regional report identifies 36 urban areas with populations above 5,000 in North Macedonia.[77] Only 52 percent of these have been growing in terms of population in the past two decades, but nearly all of them have increased their urban footprints. This finding suggests that cities in North Macedonia have been expanding inefficiently, although, on average, the extent of their urban sprawl is lower than in other WB6 countries. The new urban expansion in the past two decades has occurred on city parcels whose average exposure to floods is 120 percent higher than preexisting urban built-up area, which translated into an average increase in flood exposure of around 23 percent. The same does not apply for exposure to landslides, which is virtually

---

66 USAID. *"Climate Risk Profile: North Macedonia."* Fact Sheet. https://www.climatelinks.org/sites/default/files/asset/document/2019_USAID_Macedonia_CRP.pdf.

67 Kendrovski V., Spasenovska M. and Menne B. 2014. *„The Public Health Impacts of Climate Change in the former Yugoslav Republic of Macedonia".* https://www.mdpi.com/1660-4601/11/6/5975.

68 World health Organization, 2017, *Protecting health in Europe from climate change:* 2017 update. https://iris.who.int/bitstream/handle/10665/329522/9789289052832-eng.pdf.

69 World Bank. 2021. *"Climate Change Knowledge Portal: Historical Hazards North Macedonia".* https://climateknowledgeportal.worldbank.org/country/north-macedonia/vulnerability.

70 Kendrovski V., Spasenovska M. and Menne B. 2014. *„The Public Health Impacts of Climate Change in the former Yugoslav Republic of Macedonia".* https://www.mdpi.com/1660-4601/11/6/5975.

71 Ibid.

72 Ibid.

73 Ibid.

74 Karadzinska-Bislimovska, J. , Minov, J. , Kendrovski, V. , Milkovska, S. , Stoleski, S. and Mijakoski, D. 2012. *"Prevalence of the Respiratory Allergies among Adult Population in the City of Skopje in Relation to Climatic Change and Change in Pollen Micro Flora".* Journal of Environmental Protection, 3, 1364-1372. doi: 10.4236/jep.2012.310155.

75 Kendrovski V., Spasenovska M. and Menne B. 2014. *„The Public Health Impacts of Climate Change in the former Yugoslav Republic of Macedonia".* https://www.mdpi.com/1660-4601/11/6/5975.

76 World Bank analysis (CIMA data); European Land Susceptibility (ELSUSV2); State Statistical Office.

77 See Chapter 3 of the WB6 regional CCDR for further details on identification of urban areas.

unchanged. However, cities with higher landslide exposure in 2000 have been growing faster in this timeframe, a development that points to the possibility that while average area exposure is unchanged, risk may be higher because a larger share of the population is concentrated in risky locations.

The business of modeling the effects of climate change—whether shocks or slower-moving stressors—on GDP is tricky, even with the best that economics has to offer. The channels via which impacts take place are difficult to account for in an exhaustive way. This challenge is further compounded by the uncertainties in climate and exposure data, especially when projected, and the difficulty of calibrating vulnerabilities. For instance, while overall flooding risks are expected to fall, the incidence of flash floods is expected to rise. More generally, modeling fails to capture the impacts of certain extreme events. Wildfires are a case in point. Historical data quickly become sparse as one goes back in time, impact channels are multifaceted and seldom understood, and projection of the hazard is yet to be tested. Modeling the impacts at a yearly level is next to impossible for highly nonlinear climate shifts (such as hydrological cycles), whose dynamics are not yet fully captured in climate models and yield large uncertainties that are once again expensive to propagate. Finally, as discussed, climate hazards interact and compound. Yet, models can best capture the dynamics critical to a given climate hazard, missing the complexity of the links. Nevertheless, Chapter 4 provides the very best assessment of the potential lower-bound magnitudes of damages and their impacts on GDP. These estimates should be supplemented with an understanding of the uncertain and extreme nature of climate shocks and stressors, as described in this section.

To counter the growing risks linked to a changing climate, North Macedonia will need to consider large investments in adaptation—investments that will come with large benefits (refer to section 2.2). The total cost of proposed policy actions and investments for adaptation in North Macedonia is approximately US$6.4 billion (refer to section 5.1), including sectoral estimates of US$2.04 billion (DRM), US$851.5 million (urban), US$1.4 billion (water), US$32.21 million (forestry and biodiversity), US$143 million (agriculture), US$1.74 billion (transport), US$47.84 million (education, skills, labor markets), US$123 million (social protection systems), and US$26.72 million (health system). Multiple sources of information were used to estimate the needs. These included extracting identified needs and costs from the country's national strategic documents (for example, the Third and Fourth National Communication on Climate Change, Long-term strategy on climate action, and action plans). These sources were supplemented by input from local and international sectoral experts and validated with costs from previous projects, including those previously financed by the World Bank Group. A technical annex (Annex B) provides a detailed assessment of the methodology used. The proposed measures cover a range of adaptation needs, such as policies, and hard and soft infrastructures, with varying timelines and complexities, depending on the area of focus. These are further elaborated on in Chapter 5.

BOX 2.1. Climate change impact and the financial sector

The exposure to physical and transition risks of the bank-dominated financial system in North Macedonia is high. More than 50 percent of the total bank portfolio is exposed to climate change shocks, in particular, in terms of the buildings, transport, and energy-intensive sectors.[78] The direct exposure of banks to fossil fuels and utilities is, on average, limited, although transition risk exposures could differ strongly among individual banks, depending on their specialization. Exposure to physical risks is most pronounced in real estate loans. However, the exposure extends to all other commercial and household loans that use real estate as collateral, due to a potential reduction in its value; half of the household and corporate portfolio is being placed in the Skopje region that is under high risk of floods and landslides. Agricultural loans, although representing a small share of all commercial loans (1.93 percent[79]), are also at risk due to increases in air temperature, droughts,

[78] The identification of CPRS is based on a classification of economic activities developed to assess climate transition risk. The classification was first developed in the article by Battiston et al. (2017) published in Nature Climate Change. The CPRS classification, which has been refined over the years, has been widely used by practitioners and policy makers to assess investors' exposure to climate transition risk.

[79] Quarterly report of the National Bank of North Macedonia on risks to the banking system (Q3 2023).

hail, and lack of irrigation that can significantly reduce yields. Therefore, the Central Bank has undertaken a proactive role to help banks start reporting on the exposure to climate risks and to incentivize changes in the management of their portfolios. To increase awareness and active management of the impact of climate change, the Central Bank introduced the obligation for commercial banks to publicly disclose data and information about the exposure to climate risks and the management of such risks as of 2026.

FIGURE 2.3. Share of banks' exposure to Climate Policy Relevant Sectors (CRPS) and other sectors

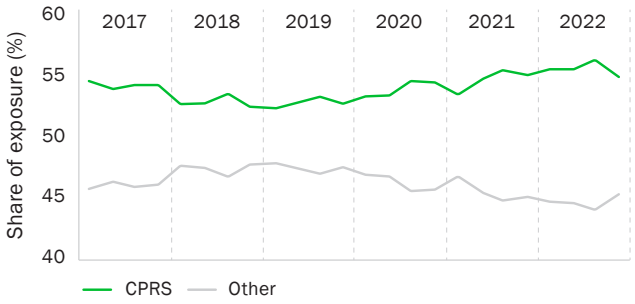
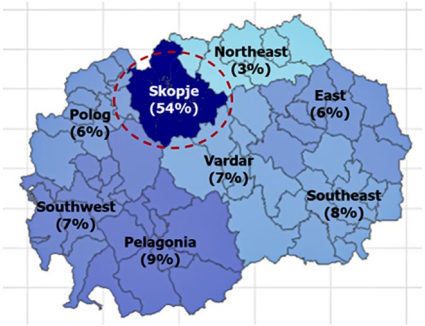


FIGURE 2.4. Distribution of bank loans by region



Source: Data from Central Bank and World Bank calculations.

2.2. A changing climate comes with greater risks–but also greater opportunities

Investing in adaptation can yield substantial social, economic, and environmental benefits. Such benefits could be expressed through the Triple-A Dividend. The Triple-A Dividend framework reconciles perspectives from the humanitarian, environmental, and economic fields (refer to Figure 2.5. **Triple-A Dividend of Resilience framework**).[80] It identifies three types of benefits: (1) ***avoided*** losses and lives saved during a disaster or climate event; (2) ***accelerated*** economic potential as a result of stimulated investments and bolstered economic activities due to the reduction in background climate and disaster risks; and, finally, (3) ***amplified*** social and environmental co-benefits of adaptation investments.

Avoided losses: Investing in adaptation and financial preparedness to climate risk is associated with significant human, physical, and financial losses avoided. Global reports found that investing in adaptation globally could generate a total net benefit of US$7.1 trillion and an average BCR of 4 (BCRs typical range from 2.5 to 5.5, but some could go beyond 10).[81] In North Macedonia, integrating climate risk and information into policy making and mainstreaming CCA and DRR at the national and regional levels could greatly reduce climate damages and losses.[82] The implementation of adaptation actions at the national level could also greatly reduce fatalities and avoid losses. For instance, according to the team's analysis, significant investment in Early Warning Systems (EWS) along with reasonable investments in NBS traditional flood protection could

[80] Original term is "Triple Dividend of Resilience," modified here to "Triple-A Dividend of Resilience" to hint at potential financial dividends from these economic and other co-benefits. The Triple Dividend framework was developed and described in Tanner, T., S. Surminski, E. Wilkinson, et al., 2015. *"The Triple Dividend of Resilience: Realizing Development Goals through the Multiple Benefits of Disaster Risk Management."* Overseas Development Institute and World Bank, London and Washington, DC.

[81] Global Commission on Adaptation. 2019. *"Adapt Now: A Global Call for Leadership on Climate Resilience."* https://gca.org/wp-content/uploads/2019/09/GlobalCommission_Report_FINAL.pdf?_gl=1*1gronxf*_ga*MTYwMzUzMjU2My4xNjk2NTgwOTA3*_up*MQ.

[82] Popovski, V. 2022. *"Policy Brief on Climate Change Loss and Damage in the Context of North Macedonia."* https://api.klimatskipromeni.mk/data/rest/file/download/88b808f906eff5a92c6c34a3807f57380360a14cc054bab48a1eff187e135d00.pdf.

cap AAL at its current level, despite increases in the building stock value by 2050.[83] Health climate actions that focus on enhancing public preparedness and response to health risks have an annualized cost of 12 million Macedonian denars (MKD) and a health cost avoided (in terms of reduced heat-induced fatalities and diseases) of 170 million MKD per year—a 14-fold benefit. In addition, investing in financial preparedness for disasters and climate events also avoids losses by reducing the level of government liabilities. A high-liability scenario in France shows that DRF instruments, such as catastrophe insurance, can lead to a €3.6 billion reduction in government liabilities for a 1-in-100-year disaster event, albeit it is not clear how the numbers would translate for North Macedonia.[84] Meanwhile, an EU-level funding gap assessment suggests that incentivizing disaster risk insurance programs has the potential to decrease government liabilities to €10 billion for small disaster events and halve them to €50 billion for very extreme scenarios.[85]

FIGURE 2.5. Triple-A Dividend of Resilience framework

1st Dividend: **Avoided** Losses & Lives Saved	**Damages and losses avoided from disasters and climate impacts:** ▪ Reduced fatalities, injuries, and people affected ▪ Reduced damages to infrastructures and other assets ▪ Reduced losses to financial flows and government liabilities ▪ Reduced days of school closures ▪ Reduced skills mismatch on the labor market inherent to the green transition
2nd Dividend: **Accelerated** Economic Potential	**Economic activities stimulated from adaptation and reduced climate risk:** ▪ Business and capital investments ▪ Job creation and enhanced labor productivity ▪ Land value increased ▪ Sustainable and circular economic growth
3rd Dividend: **Amplified** Social & Environment Co-benefits	**Social and environmental co-benefits of adaptation investments:** ▪ Positive human health effect and better learning outcomes ▪ Enhanced biodiversity and ecosystem services ▪ Recreational value and tourism gains ▪ Agriculture productivity gains

Source: Adapted from Tanner et al., 2015.[86]

Accelerated economic potential: Climate change also provides opportunities for green and sustainable economic development, especially in sectors such as transportation and urban development. According to the Economic and Investment Plan for the Western Balkans developed by the European Commission, taking actions in climate adaptation and mitigation promotes circular economic growth and provides new business opportunities related to sustainability and energy efficiency.[87] In North Macedonia, measures were implemented to improve bridge and road resilience to flood risks in the border areas of Kosovo; these included both *structural measures* (such as the construction of retention structures and small check dam and the reconstruction and maintenance of existing riverbeds) and *non-structural measures* (such as afforestation and early warning). A World Bank assessment shows that the measures not only reduce flood damage but also have

[83] Based on a tool provided by JBA and enabling the quantification of flood risk reduction using a mix of measures.

[84] European Commission, 2021. *"Economics for Disaster Prevention and Preparedness: Financial Risk and Opportunities to Build Resilience in Europe."* https://civil-protection-knowledge-network.europa.eu/system/files/2024-04/Financial%20Risk%20and%20Opportunities%20to%20Build%20Resilience%20in%20Europe%20-%20Report.pdf.

[85] European Commission, 2021. *"Economics for Disaster Prevention and Preparedness: Financial Risk and Opportunities to Build Resilience in Europe."* https://civil-protection-knowledge-network.europa.eu/system/files/2024-04/Financial%20Risk%20and%20Opportunities%20to%20Build%20Resilience%20in%20Europe%20-%20Report.pdf.

[86] Tanner, T. et al., 2015."*The Triple Dividend of Resilience: Realizing Development Goals through the Multiple Beneffts of Disaster Risk Management".* Overseas Development Institute and World Bank, London and Washington, DC. https://documents1.worldbank.org/curated/en/993161515193991394/pdf/P151463-01-05-2018-1515193988640.pdf.

[87] European Commission. 2020. *"Economic and Investment Plan for the Western Balkans."* https://www.wbif.eu/storage/app/media/Library/economic-and-investment-plan-brochure.pdf.

positive effect on the economic activity and labor market.[88] As a result, the investment yields positive returns in the long run (until 2041), with NPV of MKD 21.77 million and IRR of 16 percent. Investing in adaptation also supports employment as well as sustainable and climate-resilient urban development, although education and training systems will need to adapt to teach the skills required by these investments to meet this labor demand.[89] In the process, some jobs will be lost, but the net effect is expected to be positive. Moreover, many jobs will change significantly to require additional (green and other) skills.[90] Increased retraining and overall improvement in education may also benefit country economy. According to a recent study, a year of education increases pro-climate beliefs, behaviors, most policy preferences, and green voting, with voting gains equivalent to a substantial 35 percent increase.[91] A few projects have already been implemented at the city level. For instance, a wastewater management project was signed for the capital city of Skopje in 2019; this project helps North Macedonia to align with EU environmental and water laws and standards, and it helps Skopje to transit into a green and climate-resilient metropolis. The project is expected to bring significant environmental and public health benefits, and its implementation is expected to create new job opportunities.[92]

Amplified social and environmental co-benefits: Climate actions also yield substantial social and environmental co-benefits, safeguarding the health and welfare of citizens and the ecosystem. In the Western Balkans, local-level, low-cost, nature-based measures promote adaptation through the sustainable use of natural resources, which benefits the ecosystem and local communities, especially those in the mountainous and downstream areas.[93] Evidence from European countries shows high net benefits for such nature-based measures due to the various co-benefits; BCRs generally are greater than 2 and can be up to 12 for peatland restoration and up to 18 for floodplain restoration.[94] Over the past two decades, North Macedonia lost 5.5 percent of its total tree cover. An ongoing nature-based solutions adaptation project, funded with €2.48 million, aims to utilize 40 hectares of degraded forest land in Bukovikj, North Macedonia, for forest landscape restoration (FLR).[95] The project is expected to yield multiple co-benefits in terms of improving social awareness and cohesion and enhancing biodiversity and ecosystem functions. Meanwhile, actions to improve the regional waste management system, such as the closure of noncompliant landfills and the enhanced management of waste in cross-border areas, can yield substantial environmental and health benefits.[96]

2.3. Enabling adaptation through improved human capital

Human capital is a cornerstone of adaptation efforts. Adaptation politics and investments require reforms and adjustments to which people will need to respond, by changing their consumption; investments, including in education and possibly employment. Accordingly, people-focused interventions are required in education, health, and social protection to enable people to take advantage of these opportunities, and to

---

88 World Bank. 2019. *"Technical Assistance Preparation of Climate Resilience Design Guidelines for the Public Enterprise for State Roads in North Macedonia: Part B Climate Resilience Design Guidelines."* https://roads.org.mk/wp-content/uploads/2023/03/PartB-CLIMATE-RESILIENCE-DESIGN-Guidelines.pdf.

89 Gajšak, M., L. Ilieva, and M. Grujić. 2022. *"Study on the Climate-Resilient Infrastructure in North Macedonia."* https://api.klimatskipromeni.mk/data/rest/file/download/b8600f4a08a5020202a2deb79ef7b893eecb7173c1f001c5c96d9c1c791e5f0d.pdf.

90 Sanchez-Reaza, Javier, Diego Ambasz, Predrag Djukic, and Karla McEvoy. 2022. *Making the European Green Deal Work for People: The Role of Human Development in the Green Transition.* Washington DC: World Bank.

91 Angrist, N., W., K. Winseck, H. A. Patrinos, and J.S. Graff Zivin. 2023. *"Human Capital and Climate Change."* NBER Working Paper No. 31000, National Bureau of Economic Research, Cambridge, Massachusetts. https://www.nber.org/papers/w31000.

92 WBIF. 2023. *"Progress Made on North Macedonia's largest environmental project."* https://www.wbif.eu/news-details/progress-made-north-macedonias-largest-environmental-project.

93 Alfthan, B., E. Krilasevic, S. Venturini, S. Bajrovic, M. Jurek, T. Schoolmeester, P. C. Sandei, H. Egerer, and T. Kurvits. 2015. *"Outlook on Climate Change Adaptation in the Western Balkan Mountains."* United Nations Environment Programme, GRIDArendal, and Environmental Innovations Association. Vienna, Arendal, and Sarajevo. https://weadapt.org/wp-content/uploads/2023/05/balkanmountains_smd.pdf.

94 World Bank. 2021. *"Economics for Disaster Prevention and Preparedness: Investment in Disaster Risk Management in Europe Makes Economic Sense."* https://documents1.worldbank.org/curated/en/873811622437677342/pdf/Summary-Report.pdf; Climate Change Committee. 2021. *"Independent Assessment of UK Climate Risk: Advice to Government For the UK's third Climate Change Risk Assessment (CCRA3)."* https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1047003/climate-change-risk-assessment-2022.pdf.

95 IUCN. 2023. *"ADAPT: Nature-Based Solutions in the Western Balkans."* https://www.iucn.org/our-work/region/eastern-europe-and-central-asia/our-work/adapt-nature-based-solutions-western.

96 European Commission. 2020. *"Economic and Investment Plan for the Western Balkans."* https://www.wbif.eu/storage/app/media/Library/economic-and-investment-plan-brochure.pdf.

possibly protect them from changing access to resources and higher food and fuel process. Without such investments, there is a risk that people will be left behind, a situation that will threaten the political support for such transformations.

Education and science play important roles in adaptation to climate change, but more attention is required at the country level. Key education system issues to be tackled in North Macedonia include the quality of teaching,[97] digitalization and digital skills, quality and relevance of vocational education and training, curricula modernization, access and equity, financing, governance, and early childhood education.[98] The new results of OECD PISA 2022[99] showed that significant work should be implemented in North Macedonia to reverse the negative trends in learning outcomes and mitigate consequences of the pandemic. Education improvement will require preparing all teachers in North Macedonia for green education and may cost from €2.8 to €8.6 million. Higher education and science would also play significant roles in advancing mitigation in the Western Balkans. Given the many common challenges and the limited resources, more collaboration projects among Western Balkan countries should be promoted and supported. The role of higher education in providing skills and undertaking research and innovation to support climate change adaptation can be strengthened. As part of the adaptation, the country will need to consider greening schools and health facilities.[100]

The health system in North Macedonia has a good foundation to support the adaptation to climate change, but it also has its weaknesses. The current lack of accessible and high-quality health services significantly hampers the capacity to address climate-related health risks effectively. The limited health workforce capacity in North Macedonia presents a significant challenge in effectively addressing climate-health risks. This situation is compounded by the migration of health workers to other countries.[101] Notably, the nurse-population ratio is below the European average.[102] This limitation in personnel becomes particularly critical during health emergencies, such as those arising from climate-related hazards. Noteworthy examples from the handling of the COVID-19 pandemic underscore the importance of a robust health workforce. Despite disruptions in delivering essential health service during the COVID-19 pandemic, health professionals were rewarded for their dedication to patient care,[103] and innovative electronic health interventions played a pivotal role in the emergency response.[104] The strategies during the pandemic show the urgent need to strengthen the health system's ability to deal with the specific challenges of climate-related health risks and disasters through a thorough and strategic approach. Furthermore, the country's eHealth system, MojTermin, does not yet incorporate climate hazard-related functionalities for patients and providers; the analytical capacity to process climate and health-related data remains low, limiting the country's ability to provide early detection and respond effectively to climate emergencies. At 4.6 percent in 2022, public health spending as a share of gross domestic product (GDP) is among the lowest in the Western Balkans region, and, despite a substantial increase over the past years, remains relatively low in absolute terms, at US$305 per person (2022).[105] Consequently, limited resources are available to support climate resilience measures in the health sector, while high out-of-pocket (OOP) expenditures limit access to health care during climate-health emergencies, particularly for poorer households.

---

97 World Bank. 2013. *"Beyond the Learning Drop: Why Countries in Eastern Europe and Central Asia Should Act Now to Avoid a Teacher Crisis."* https://blogs.worldbank.org/education/beyond-learning-drop-why-countries-eastern-europe-and-central-asia-should-act-now-avoid.

98 OECD. 2022. *Multi-dimensional Review of the Western Balkans: From Analysis to Action.* Paris: OECD. https://doi.org/10.1787/8824c5db-en

99 OECD. 2022. PISA 2022. https://www.oecd.org/publication/pisa-2022-results/country-notes/north-macedonia-bfdbb774/.

100 Dozol, A., D. Ambasz, and T. Shmis. 2023. *"Greening Public Human Development Buildings in Croatia: Support for the Implementation of the European Green Deal in the Croatian Health and Education Sectors."* World Bank, Washington, DC. http://hdl.handle.net/10986/39825.

101 European Observatory on Health Systems and Policies. 2017. *"The former Yugoslav Republic of Macedonia: Health system review".* https://iris.who.int/bitstream/handle/10665/330210/HiT-19-3-2017-eng.pdf?sequence=7.

102 European Observatory on Health Systems and Policies. 2017. *"The former Yugoslav Republic of Macedonia: Health system review".* https://iris.who.int/bitstream/handle/10665/330210/HiT-19-3-2017-eng.pdf?sequence=7.

103 European Observatory on Health Systems and Policies. *"COVID-19 Health System Response Monitor (HSRM)"* https://eurohealthobservatory.who.int/monitors/hsrm/hsrm-countries/hsrm/north-macedonia/measures-in-other-sectors/measures-in-other-sectors/.

104 European Observatory on Health Systems and Policies. 2022. *"Health systems in action: North Macedonia".* https://eurohealthobservatory.who.int/publications/i/health-systems-in-action-north-macedonia-2022.

105 WHO. 2023. *"Global Health Expenditure Database".* https://apps.who.int/nha/database.

Strengthening the resilience of the health care system to manage and respond to climate change and hazards requires a multifaceted approach. First, there is an imperative need to implement both preventive and responsive plans to manage extreme temperatures[106] and other severe weather events, as well as other climate-related exposures—such as increased air pollution, changes in disease vector ecology, increases in the concentration and types of allergens—that endanger the water quality and the food supply. Health systems need to be able to adequately respond to the effects of these exposures; they need to be prepared to respond both to immediate and sudden events (like floods, heat waves or epidemics), as well as to changing disease burdens in the medium term. Strengthening surveillance and monitoring mechanisms for climate-related diseases and providing continuous capacity-building opportunities for health care professionals, are important measures to ensure the health care system's readiness to address the evolving challenges posed by climate change.[107] The continued use of electronic health systems for emergencies should be promoted.[108] Health systems have a role in supporting the green transition and the people who migrate because of climate change.[109, 110] Similarly, as the green transition progresses, the need for mental health support will increase because to support the population going through it. Lastly, as people who migrate due to climate change may have limited access to health services and insurance, the health system needs to be sufficiently agile and ready to adapt to climate change and green transition-related migrations to provide adequate health care support when and where necessary. The capacity to do this would include enhancing the provision of health services in new settlement areas and optimizing the service provision in old ones. Special attention should be given to the needs of the most vulnerable populations to ensure equitable access and the use of various health services because these populations are most at risk.

Increased coverage and adequacy of social protection systems is required to reduce the risks and uncertainty of climate change on people's income, consumption, and human capital investments. North Macedonia's social protection system is comprehensive, offering income protection to formal sector workers through its social insurance scheme, as well as multiple social assistance programs to vulnerable groups backed by digital information systems.[111] Recent reforms have improved the efficiency and effectiveness of this system, including by extending some social assistance benefits to working poor households (that is, the child and education grants). Yet, remaining gaps within the system may limit its ability to support workers as they transition between jobs, and they may leave critical gaps in coverage for those employed in the informal sectors. For example, as is the case in all Western Balkan countries, North Macedonia has an unemployment insurance system, which, by design, only cover formal sector workers. However, only between 4 percent and 6 percent of all registered jobseekers receive unemployment benefits. At the same time, while steps have been taken to extend the coverage of social assistance benefits, the ability of these programs to provide any temporary income support to poor households that experience job loss or income-shocks remains limited. North Macedonia's program for energy-vulnerable consumers provides some protection against rising energy prices. However, as currently designed, this program extends financial support to existing beneficiaries of the guaranteed minimum assistance (GMA) and social pension. The government has introduced temporary programs that aim to expand support to other poor households, such as in 2022 and 2023, although implementation challenges limited their effectiveness, as discussed in the next section under the Just Transition.

Although North Macedonia's social protection system is well established, further investments are needed to increase its flexibility to protect households from climate shocks. Figure 2.6 presents an assessment of the capacity of the social protection system in North Macedonia to respond to climate shocks along

[106] https://www.climatechangepost.com/north-macedonia/health.

[107] https://www.mdpi.com/1660-4601/11/6/5975.

[108] CDC. 2023. *"Occupation Safety and Health and Climate."* https://www.cdc.gov/niosh/topics/climate/default.html.

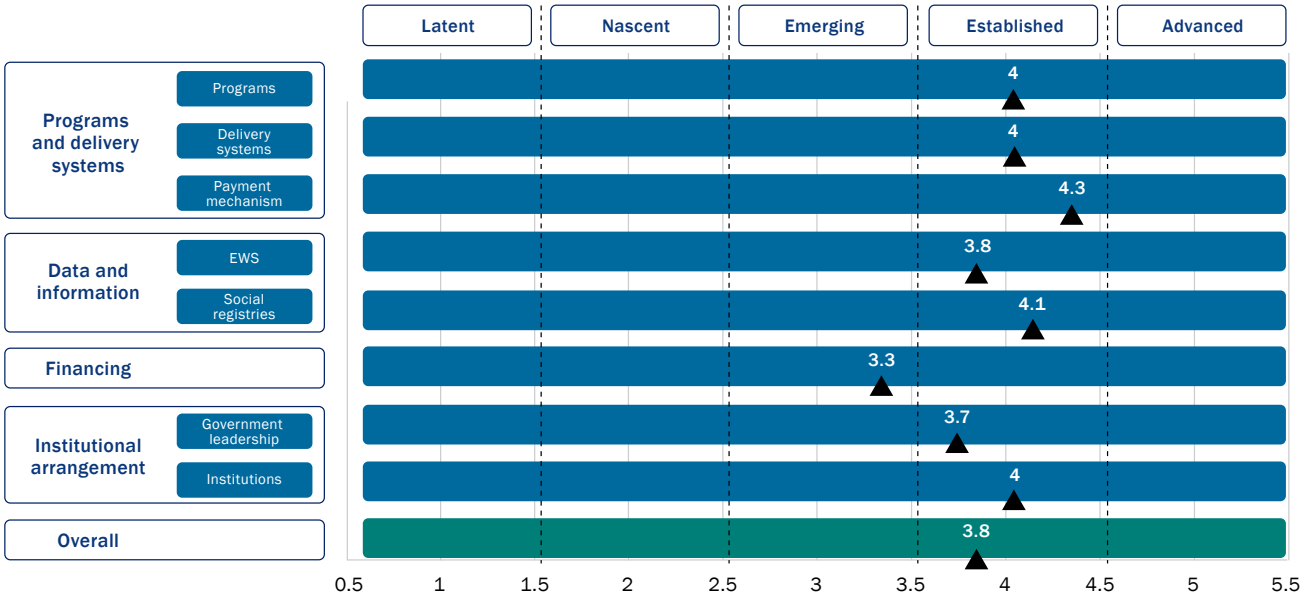
[109] Schulte, P.A., A. Bhattacharya, C. R. Butler, H. K. Chun, B. Jacklitsch, T. Jacobs, M. Kiefer, J. Lincoln, S. Pendergrass, J. Shire, J. Watson, and G. R. Wagner. 2016. *"Advancing the Framework for Considering the Effects of Climate Change on Worker Safety and Health."* Journal of Occupational and Environmental Hygiene 13 (11): 847–65. doi: 10.1080/15459624.2016.1179388. PMID: 27115294; PMCID: PMC5017900.

[110] Lebano, A., S. Hamed, H. Bradby, et al.2020. *"Migrants' and Refugees' Health Status and Healthcare in Europe: A Scoping Literature Review."* BMC Public Health 20: 1039. https://doi.org/10.1186/s12889-020-08749-8.

[111] See World Bank. 2022. *"North Macedonia Social Protection Situational Analysis."* https://openknowledge.worldbank.org/server/api/core/bitstreams/f8097cd2-ac22-58b9-944b-bcaf3f623141/content.

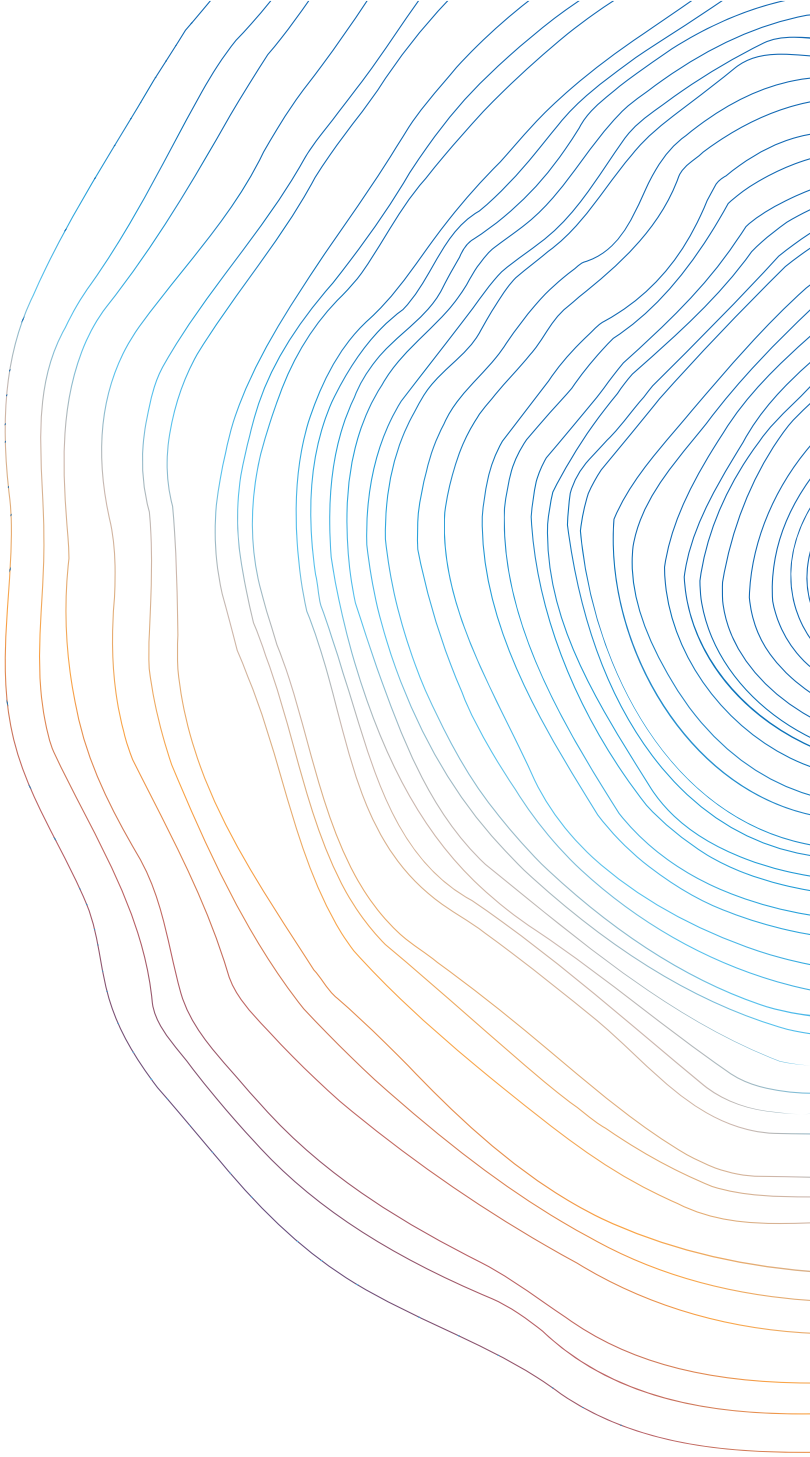
four pillars: (1) programs and delivery systems, (2) data and information, (3) financing, and (4) institutional arrangements.[112] The results indicate that the social protection system in North Macedonia is mature and protects people from a range of vulnerabilities and risks across their lifecycles. The social protection system also stands out as the only country that has put in place the mechanisms to expand the coverage of its poverty-targeted program (GMA) to new households when disasters occur and that has a mechanism to respond to localized events (One-Off Financial Assistance or OFA). However, these fall short when it comes to providing a rapid, adequate response to climate impacts, because the system is not informed by early warning systems to trigger an expansion in coverage or backed by dedicated contingency financing resources—both are key aspects for enabling a much faster response. Additionally, the capacity that exists in the social protection system to directly support poor households is not recognized within DRM legislation; this omission misses an opportunity for the DRM system to leverage this on-the-ground capacity. Alignment of social protection, disaster risk management, and climate change adaptation legislation is still required to permit greater flexibility in the targeting and duration of social assistance. The allocation of adequate financing in climate change adaptation budgets to enable such investments in the social protection system and, importantly, to rapidly fund system scalability, is also required. Social services, which are historically underdeveloped, are envisioned in national disaster risk management (DRM) legislation as providing lifesaving support to disaster-affected households, such as shelter for displaced populations. Ongoing reforms aim to improve access and quality of social services; these reforms offer the potential to strengthen the response function, as well as provide an avenue for protecting vulnerable groups from extreme heat, an objective of the national heat health action plan.

FIGURE 2.6. North Macedonia's social protection system could be better harnessed to protect households from climate-induced shocks, whilst also promoting their resilience



Source: Fizgibon, C., and S. Coll-Black. 2023. "Findings of the World Bank Stress Test in the Western Balkans: Draft." World Bank, Washington, DC.

[112] The World Bank's Social Protection Stress Test Tool rapidly assesses the readiness and ability of national social protection systems to adapt or scale-up in response to shock, thereby pinpointing areas for greater investment. https://documents1.worldbank.org/curated/en/559321634917529231/pdf/Stress-Testing-Social-Protection-A-Rapid-Appraisal-of-the-Adaptability-of-Social-Protection-Systems-and-Their-Readiness-to-Scale-Up-A-Guide-for-Practitioners.pdf.



Chapter 3

Mitigation risks and opportunities

An energy system modeling analysis was conducted as part of the WB6 CCDR to assess sectoral decarbonization pathways for the economies of North Macedonia and the other WB6 countries. The analysis aimed to develop possible decarbonization scenarios and compare them to a reference scenario to highlight the extent to which the energy systems will have to transform to reach net zero GHG emissions by 2050 and provide policy makers with recommendations on how this can be achieved, with a focus on short-term actions.

The analysis relied on the Knowledge-based Investigation of Energy System Scenarios for the WB6 (KINESYS-WB6) model, a global energy system model based on TIMES (The Integrated MARKAL-EFOM1 System) and applied to the WB6 countries. KINESYS-WB6 explicitly covers GHG emissions from fuel combustion in all sectors and fugitive emissions from fossil fuel extraction and transportation. To set economy-wide GHG emissions targets to model quantity-constrained scenarios, projections from official government strategies (especially the NECPs) were used for the sectors not included in the KINESYS-WB6 model to set targets for the energy-related sectors. The main scenarios modeled included the following: (1) the Reference scenario (RS), an unconstrained least-cost development scenario - this scenario is incompatible with the WB6 countries' aspirations of EU integration and their existing climate change commitments, but it provides a comparable baseline across the six countries for the decarbonization scenarios described below; (2) the net zero emissions scenario (NZE), in which GHG emission constraints are imposed to achieve economy-wide net zero by 2050; (3) the net zero emissions scenario with higher growth (NZE-HG), which is similar to the NZE but assumes higher GDP growth rates for the WB6, countries; and (4) the carbon pricing scenario (CPS), a price-constrained scenario in which the WB6 countries are assumed to adopt an emissions trading scheme (ETS) that covers all sectors of the economy with an allowance price in line with the European Commission's projections for the EU ETS price in a net zero by 2050 scenario. Further details on the modeling approach and assumptions are presented in the main report and the Mitigation Background Note accompanying the CCDR.

3.1. Reference Scenario (RS) achieves limited progress on climate change mitigation

In the RS, economy-wide GHG emissions (including sectors outside the model scope) for North Macedonia would reach 6.7 $MtCO_2eq$ in 2050, which is about 55 percent of 1990 emissions (refer to row 1 in Figure 3.1). Under the unconstrained RS, North Macedonia would achieve only limited progress in climate change mitigation. North Macedonia's energy mix would remain relatively unchanged over the next decades, with a limited level of penetration of renewable energy (RE) sources. The primary energy supply mix would continue to be dominated by fossil fuels (refer to row 2 in Figure 3.1). In 2050, coal would still account for almost 35 percent of the total primary energy supply, compared to about 30 percent in 2019. Bioenergy (biomass and biofuels) and renewables (mostly solar and wind) would show relatively modest growth, increasing from 12 percent of the total primary energy supply in 2019 to 19 percent in 2050.

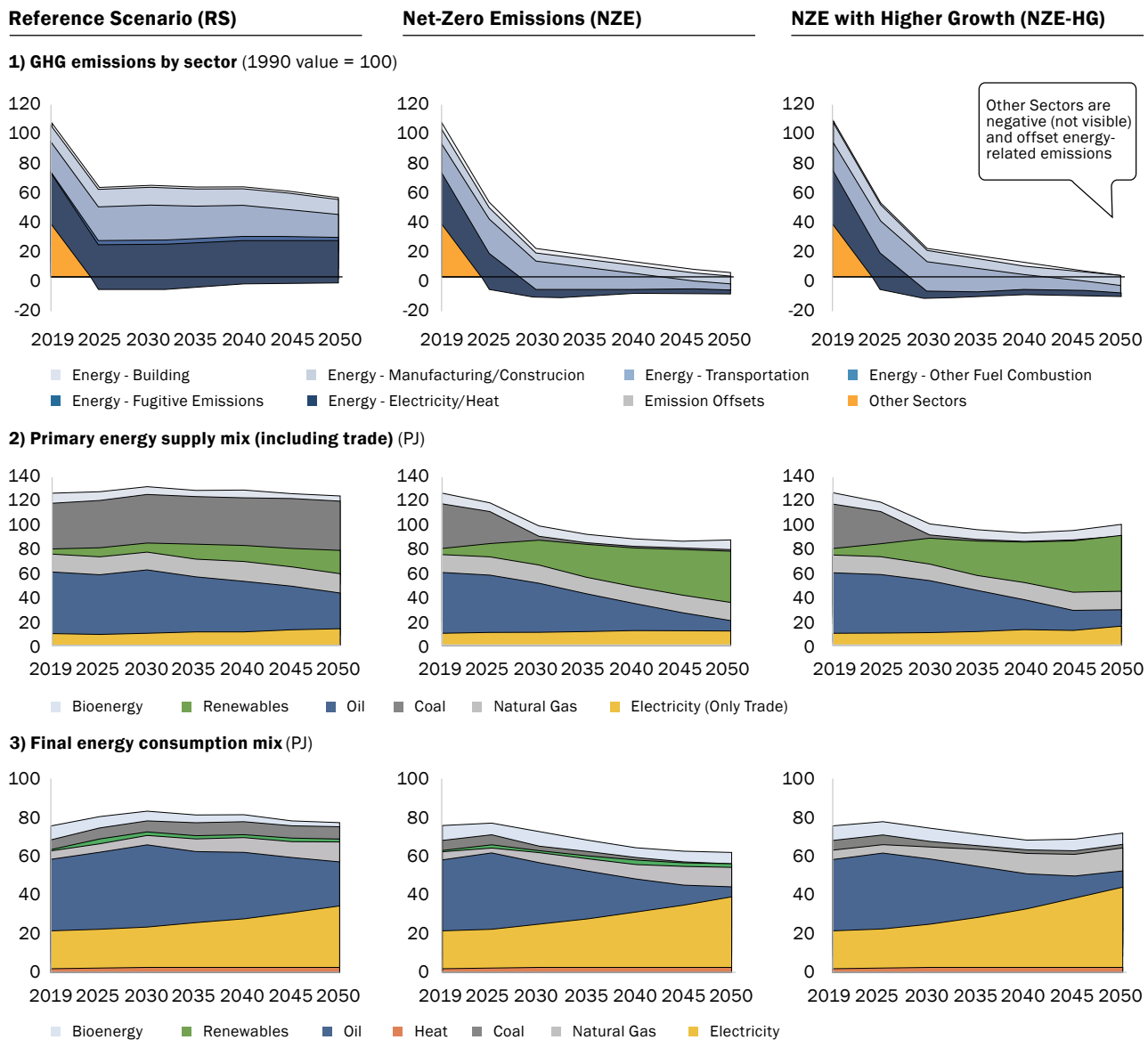
In the power sector, coal generation would remain essentially stable throughout the model period; after 2030, most of the incremental demand would be met by solar power. In 2030, coal would still account for about one-half of total generation (refer to Figure 3.2), followed by hydro (25 percent), natural gas (20 percent), and non-traditional renewables (5 percent). However, beyond 2030, solar PV would become the most economical source and would start picking up, reaching 40 percent of total generation in 2050. Coal and hydro generation would remain stable in absolute terms; in 2050, their shares would decrease to 37 and 17 percent of the total, respectively. Given that North Macedonia has limited lignite reserves, such a prolonged reliance on coal would likely require an increase in coal imports; this, in turn, would pose a potential risk to the country's energy security, increase the average electricity generation cost due to additional transport costs, and impose a financial burden on the economy.[113] In the RS, natural gas generation would be phased out and would only account for 5 percent of the total in 2050.

Although it represents the least-cost development pathway under no external constraints, the RS is not a viable scenario for a sustainable development of North Macedonia's energy sectors, as it would

[113] The financial impact of potential additional coal imports was not quantified in this study, but it is expected to be significant.

not eliminate the existing negative externalities and it would be incompatible with their aspirations of EU integration and their existing climate change commitments. The results of the RS are driven by the fact that lignite-fired generation remains relatively competitive overtime with its mostly fully depreciated generation fleet. However, significant negative financial and non-financial impacts that were not quantified in the model would arise from delaying the transition. First, prolonged reliance on coal would continue causing severe air pollution challenges and exacerbate the environmental and health impacts of coal mining and generation. Second, it would have energy security implications, especially in light of the recent episodes of coal supply disruptions and the increasing difficulty procuring financing for investments in coal mining and power plants. Third, it would hamper the competitiveness of the economy in terms of job creation and attractiveness for foreign direct investment and financing from international financial institutions. Lastly, the lack of progress on coal phase-out would be incompatible with EU integration and the commitments the country has made with the Sofia Declaration.

FIGURE 3.1. System-wide indicators across the RS, NZE, and NZE-HG scenarios* for North Macedonia.



Source: World Bank analysis.

Note: NZE = net zero emissions scenario; NZE-HG = net zero emissions scenario with higher growth; RS= reference scenario.

1 Includes sectors not covered by KYNESIS-WB6, that is, agriculture, waste, LULUCF (land use, land use change, and forestry), and IPPU (industrial processes and product use). After 2025, total emissions from the "Other Sectors" becomes negative thanks to negative emissions from LULUCF and are offset by positive emissions in energy-related sectors.

2 "Electricity" refers to the consumption of electricity in end-use sectors, and "renewables" refers to the direct use of RE in end-use sectors.

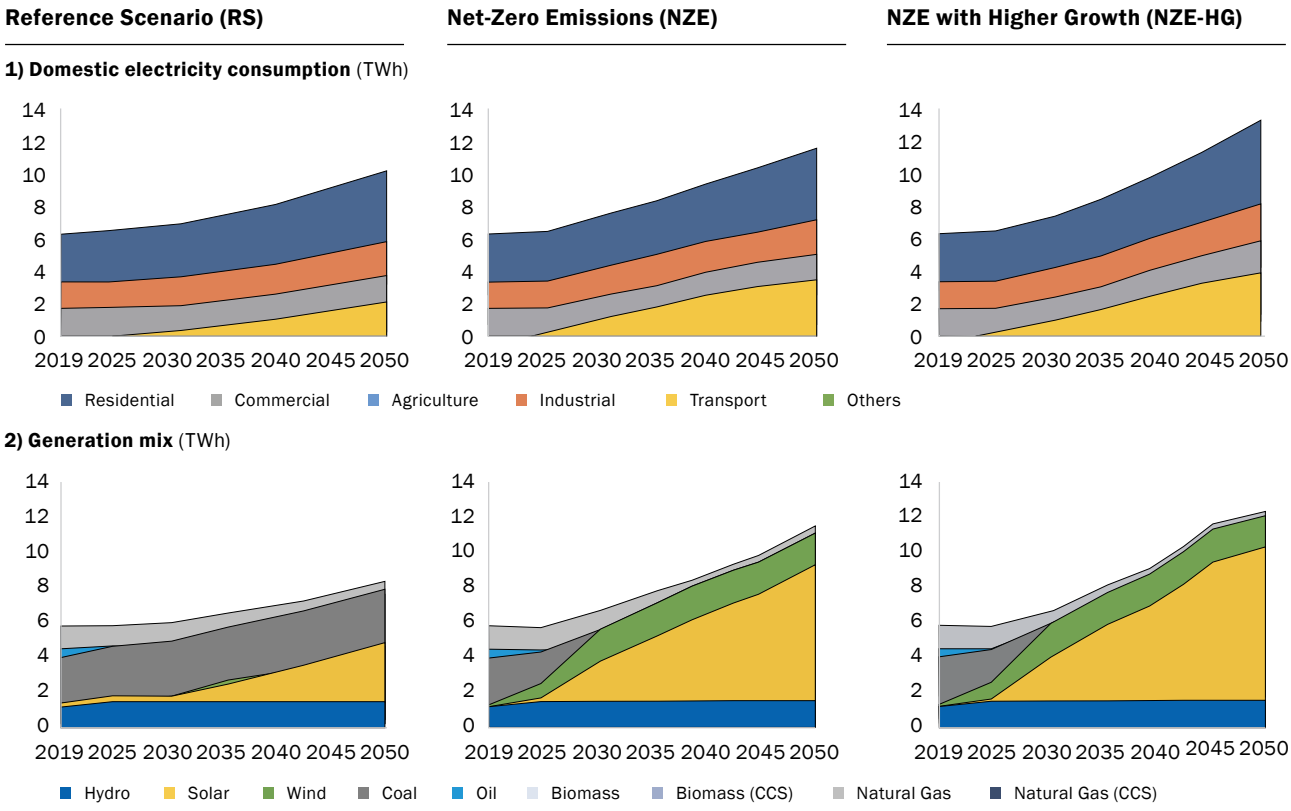
3 PJ = Petajoule

The comparison of the unconstrained evolution of GHG emissions in the RS with the projections of the scenario with existing measures (WEM) defined in North Macedonia's NECP highlights a certain lack of ambition in the definition of the WEM targets. North Macedonia's energy-related GHG emissions resulting from the unconstrained least-cost energy sector development defined in the RS would be 8.2 $MtCO_2eq$ in 2040, while the WEM target from the NECP is higher at 8.6 $MtCO_2eq$ for the same year. This discrepancy suggests that the definition of the WEM scenario in the country's NECP is not particularly ambitious and does not represent an actual constraint on the development of North Macedonia's energy sector.

3.2. Radical energy system transformation is required to achieve net zero by 2050

Meeting the country's 2030 targets for the scenario with additional measures (WAM) of the NECP would require large-scale investments in the deep decarbonization of the power sector. In a least-cost net zero scenario, the Bitola and Oslomej lignite power plants would be decommissioned by 2030, because North Macedonia's ambitious GHG targets (from the WAM scenario of the NECP) make it impossible for coal plants to continue generating. Coal would be essentially replaced by solar PV and wind generation, due to the large and economically cost-attractive renewable energy resources; natural gas and hydro would provide energy to balance intermittent generation. To achieve economy-wide net zero by 2050, power sector emissions would need to decrease from about 4.2 $MtCO_2eq$ in 2019 to 0.5 $MtCO_2eq$ in 2030 and then nearly zero in 2040. In the NZE scenario, the share of renewable energy in total electricity generation would increase from about 25 percent in 2019 (mostly hydro) to 97 percent in 2050, compared to 59 percent in the RS for the same year (refer to row 2 in Figure 3.2). North Macedonia would have to install about 1.7 GW of solar and 0.7 GW of wind by 2030, and 5.8 GW of solar and 0.8 GW of wind by 2050. Based on the modeling assumptions, wind power beyond 2030 would be less competitive than solar. However, its deployment could still be economically viable in specific areas that provide competitive levelized costs of electricity (LCOEs).

FIGURE 3.2. Power sector indicators across the RS, NZE, and NZE-HG scenarios for North Macedonia



Source: World Bank analysis.

As a result of the accelerated deployment of renewable capacity, in the NZE, electricity generation and supply costs would be 30-40 percent higher than in the RS in the medium term; the increase would be only about 20 percent in the longer term. Assuming that these costs are fully passed onto customers, the increase in retail tariffs would be of a similar magnitude. While these tariff increases could be mitigated by the shift to liberalized wholesale markets and increased regional integration, the country would need to manage them carefully, by assessing their impacts on the population and businesses and implementing social security measures targeting lower-income and vulnerable consumers.

The least-cost pathway to achieving net zero by 2050 would require significant energy efficiency improvements and the large-scale use of electricity and zero-carbon energy carriers in end-use sectors. As shown in row 3 of Figure 3.1 (final energy consumption mix), in 2050 final energy demand in the NZE would need to be about 20 percent lower than the demand in the RS in the same year, or about 18 percent lower than in 2019. Achieving this goal would require ambitious policies to support energy efficiency improvements across all sectors. At the same time, the final energy mix would be significantly different in the NZE compared to the RS: in 2050, almost 60 percent of final energy demand would be met by electricity, especially in the transport and heating sectors, compared to about 40 percent in the RS; oil and oil products would account for about 10 percent of final energy demand, compared to 30 percent in the RS. Zero-carbon energy carriers (that is, biofuels, biomass, and biogas) would support the decarbonization of hard-to-abate sectors (for example, specific transport segments) and would account for about 10 percent of final energy demand in 2050 in the NZE, compared to 3 percent in the RS.

In the NZE, GHG emissions from the transport sector could be abated by more than 80 percent by adopting a three-pronged strategy consisting of demand reductions (Avoid), the shift of demand to more sustainable modes (Shift), and the adoption of more energy-efficient vehicles running on cleaner fuels (Improve). The relatively limited reduction in GHG emissions in the transport sector in the NZE, compared to the power sector is justified by the fact that emissions from the transport sector have a higher average abatement cost than other sectors and that North Macedonia would benefit from having sizeable carbon sinks that lower the overall decarbonization effort required to achieve net zero. Avoid strategies (for example, integrated land use planning to reduce travel distances, digital accessibility, and remote working when possible) could help reduce total passenger transport demand in 2050 by 5 percent in the NZE compared to the RS, with most of the reduction accounting for urban transport. Additional policies and incentives could support the shift of the residual demand for transport services from more polluting means of transportation to less carbon-intensive ones. In 2050, private road transport would account for 65 percent of motorized passenger transport activity in the NZE, compared with 80 percent in the RS, while public road transport and rail would account for 35 percent of motorized passenger transport activity (compared to 20 percent in the RS).[114] Rail would account for 5 percent of freight transport activity in 2050 (compared with 2 percent in the RS). However, the bulk of GHG emission reductions in the transport sector would have to come from Improve strategies (that is, the adoption of more efficient vehicles and the transition to cleaner fuels). The specific energy consumption (i.e., the amount of energy required per vehicle-km) would have to improve substantially for both passenger and freight transport and be 45-65 percent lower in 2050 than in 2019, depending on the transport segment. This would be achieved by both fuel-efficiency improvements in internal combustion engine (ICE) vehicles and, by 2050, a great increase in the penetration of electricity and biofuels in the fuel mix. In 2050, passenger cars would be mostly electrified (90 percent of the total stock). In the freight transport segment, by 2050 about 90 percent of trucks would be electric or hybrid. In addition, a more efficient use of trucks by increasing the average payload (up to 15 percent more by 2050 in the NZE compared to the RS), would significantly reduce the specific energy consumption by ton-km, by means of allowing for the use of high-capacity vehicles and leveraging logistics digitalization for asset sharing and optimization of operations.

[114] Excluding the share of active mobility (walking and cycling), which is assumed to capture up to 4 percent of the passenger car demand by 2050 in the NZE.

The decarbonization of the buildings sector would require energy efficiency improvements on top of the RS, combined with higher levels of electrification of heating demand and the switch to cleaner heating sources. The implementation of energy efficiency measures could reduce primary energy demand for space heating in the buildings sector by more than 30 percent in 2050 in the NZE, compared to the RS. Oil products used for space heating would be completely phased out by 2040–45; the share of biomass in total energy demand for space heating would drop from about 60 percent in 2019 to less than 20 percent in 2050. At the same time, natural gas could become economically viable, especially in densely populated urban areas, but it would only account for about 20 percent of the total energy demand for space heating in 2050. The use of district heating and electricity would also increase. These sources would account for about 40 and 20 percent, respectively, of the energy demand for space heating in 2050. Considering that heat pumps have efficiency rates several times higher than traditional gas and biomass boilers and stoves, this level of penetration of electricity in the primary heating energy mix would correspond to more than 40 percent of households and businesses relying on heat pumps for heating in 2050.

Decarbonization options for the industrial and energy transformation sectors would include energy efficiency, the replacement of coal and oil with natural gas for heat production, carbon pricing, the electrification of low-temperature industrial processes, and the adoption of CCS. The implementation of energy-efficiency measures could reduce energy demand in these sectors by more than 5 percent in 2050 in the NZE, compared to the RS. In the NZE, coal and oil products would have to be replaced by natural gas and electricity; after 2030–35, CCS would become economically viable, unlike in the RS, and would be implemented to capture industrial GHG emissions. By 2050, CCS could remove about 1 $MtCO_2eq$/year of industrial process emissions. A carbon price (for instance, through a carbon fee under Article 40 of the draft Law on Climate) could complement other decarbonization options for the industrial sector. Revenues generated from this fee could also help meet decarbonization investment needs and support Just Transition policies for communities and sectors—although more work is needed on the optimal revenue recycling options. Expanding the scope to CBAM sectors would also reduce exposure to CBAM, because importers can deduct the effective domestic carbon price from their CBAM compliance obligations. The CPS modeling scenario in the CCDR (results are presented in the regional report) demonstrates how carbon pricing can help speed up the decarbonization trajectories for WB6 countries, including a faster coal phaseout. Recent modeling carried out by the Energy Community also highlights how a carbon price can help drive renewable energy expansion, particularly across a common regional electricity market.[115]

Significant decarbonization efforts in the non-energy sectors (e.g., waste, agriculture – not included in the modeling exercise described above) would be crucial to achieve economy-wide net zero GHG emissions in a cost-effective manner. Stepping up GHG emissions reduction efforts in these sectors can reduce the need to resort to decarbonization solutions with a higher abatement cost in energy-related sectors. North Macedonia should focus on reducing direct methane emissions from the waste and agriculture sectors and further improving the carbon sink potential of forests. Methane is a potent GHG, with a global warming potential (i.e., the capacity to absorb infrared thermal radiation and warm up the atmosphere) that is about 30 times the one of CO_2. It also contributes to the formation of ground-level ozone, a dangerous air pollutant.[116]

The establishment of a well-performing waste management system would be essential to curb methane emissions, and to make the waste sector more resilient to climate-related shocks. In the absence of action, these emissions would continue to increase. To reduce emissions from the waste sector, priority should be given to increasing waste collection, minimizing open dumping and uncontrolled landfilling, managing landfill gas, and diverting organic waste from landfills. This should be accompanied with measures to integrate sector development, minimize, and separate waste, increase, and improve treatment, and improve sector governance, especially regarding the availability and predictability of operational financing. Waste management also

[115] Kantor E3M. 2021. *"A Carbon Pricing Design for the Energy Community Final Report."* https://www.energy-community.org/dam/jcr:82a4fc8b-c0b7-44e8-b699-0fd06ca9c74d/Kantor_carbon_012021.pdf.

[116] CCAC and UNEP, 2021. *Global Methane Assessment.* https://www.ccacoalition.org/resources/global-methane-assessment-full-report.

brings other positive environmental and health outcomes, such as the reduction in soil and marine pollution (including from plastics) and better local health and environmental outcomes. Better waste management also accelerates economic development by improving access to public services, helping to create jobs, and improving livability.

Methane emissions from agriculture would also have to be actively monitored and reduced. The main sources of agriculture emissions emanate from livestock production, including cattle and small ruminant, and relate to enteric fermentation, manure left on pasture, and poor manure management. In the agriculture sector, methane emission reduction measures can include improving the genetic makeup of the animals (through breeding), optimizing animal feeding, establishing a system of safe disposal of animal byproducts, and improving manure and pasture management systems.

In an optimistic growth scenario, North Macedonia would have to make additional efforts to achieve economy-wide, net zero targets. In 2050, North Macedonia's GDP is assumed to be about 30 percent higher in the NZE-HG than in the NZE and RS, which would correspond to a similar increase in the demand for services. However, efforts to further improve energy efficiency could lead to an increase in final energy demand of about 17 percent, compared to the NZE. In addition, in the NZE-HG meeting the decarbonization targets would require resorting to higher levels of penetration of cleaner technologies across all sectors. For example, in the NZE-HG North Macedonia would have to install about 6.5 GW of solar capacity in 2050, compared to 5.8 GW in the NZE. In the NZE-HG, electricity generation and supply costs are expected to be 35 percent higher than in the NZE by 2050, mainly due to the need to resort lower-quality renewable energy resources to meet the higher demand.

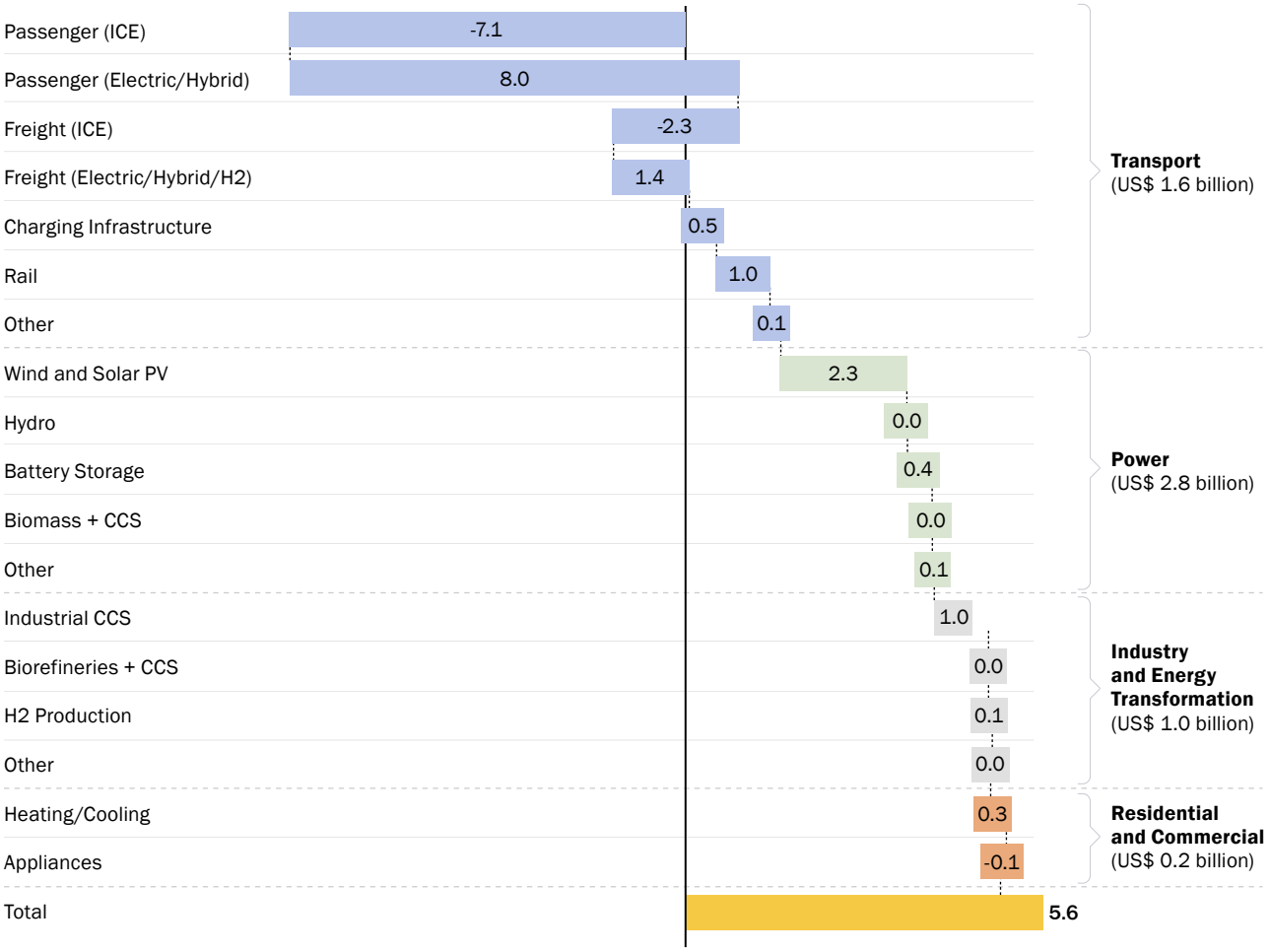
3.3. Incremental investments needed for decarbonization

Overall, compared to the RS, in the NZE North Macedonia would need to invest in the energy system an additional US$1.7 billion until 2030 and US$5.6 billion until 2050 (expressed at present values in 2020 US dollars) to achieve economy-wide net zero. This investment is incremental to the discounted investments required in the RS, which amount to US$22.1 billion until 2030 and US$48.0 billion until 2050 (in 2020 US dollars). The incremental investment is equivalent to about 2.5 percent of GDP until 2030 and 2.6 percent until 2050, on average. Approximately 82 percent of the investments could come from the private sector, including households. However, the higher investment required would be at least partially compensated by lower operating costs, estimated at -1.3 percent of GDP per year on average through 2050.

The lion's share of the incremental investment until 2050 would go to the power sector. The incremental investment by 2050 (US$5.6 billion) is composed of investments in the power sector (US$2.8 billion), the transport sector (US$1.6 billion), the industry and energy transformation sector (US$1.0 billion), and the residential and commercial sectors (US$0.2 billion) all in 2020 US dollars. Figure 3.3 shows the breakdown by subsector. In the power sector, the incremental investment would ramp up after 2030, and most of it would be directed to the scale-up of RE generation capacities. In the transport sector, as a result of the Avoid strategies to reduce transport demand and the Shift strategies to shift demand from road vehicles to rail, the investments in electric and hydrogen vehicles would be comparable to the absolute reduction in investment in ICE vehicles. However, significant incremental investments would still be required to modernize and expand the rail network and deploy charging infrastructure for electric vehicles. In the industrial sector, most of the incremental investment would be directed to the implementation of CCS systems.

The energy transition would be even costlier in absolute terms in the NZE-HG (as a larger economy corresponds to higher levels of energy demand), but the required investments would be similar to those in the NZE in terms of share of GDP. In the NZE-HG, to achieve economy-wide net zero, North Macedonia would need to invest in the energy system US$56.8 billion until 2050, compared to US$53.6 billion in the NZE, all expressed at present values in 2020 US dollars. However, in the NZE-HG, the incremental investments (calculated compared to a different RS in which GDP growth is the same as in the NZE-HG) would correspond to about 3.0 percent of GDP, on average, until 2050, in line with the value for the NZE.

FIGURE 3.3. Discounted investment gap (difference between NZE and RS) until 2050 by subsector, US$ billion



Source: World Bank analysis.

3.4. Human capital and labor markets transformations

The green transition will require significant retraining of the labor force in North Macedonia, beyond the high-polluting sectors. Transitioning to greener forms of production, distribution, and consumption can affect the labor market positively or negatively. The effects go beyond the most polluting industries (for example, coal mining) because significant transformations will be seen in other occupations (for example, mechanical engineering). This turnaround requires investment in retraining and upskilling to help workers remain productive in a given occupation or to move to another occupation with similar skill requirements. The extent of this reskilling depends on the gap between the current skills and the future skills required. Reskilling and upskilling can be considered short-term investments; however, shifting the demand for labor requires longer-term investments to enhance the human capital needed for North Macedonia to reach net zero by 2050.

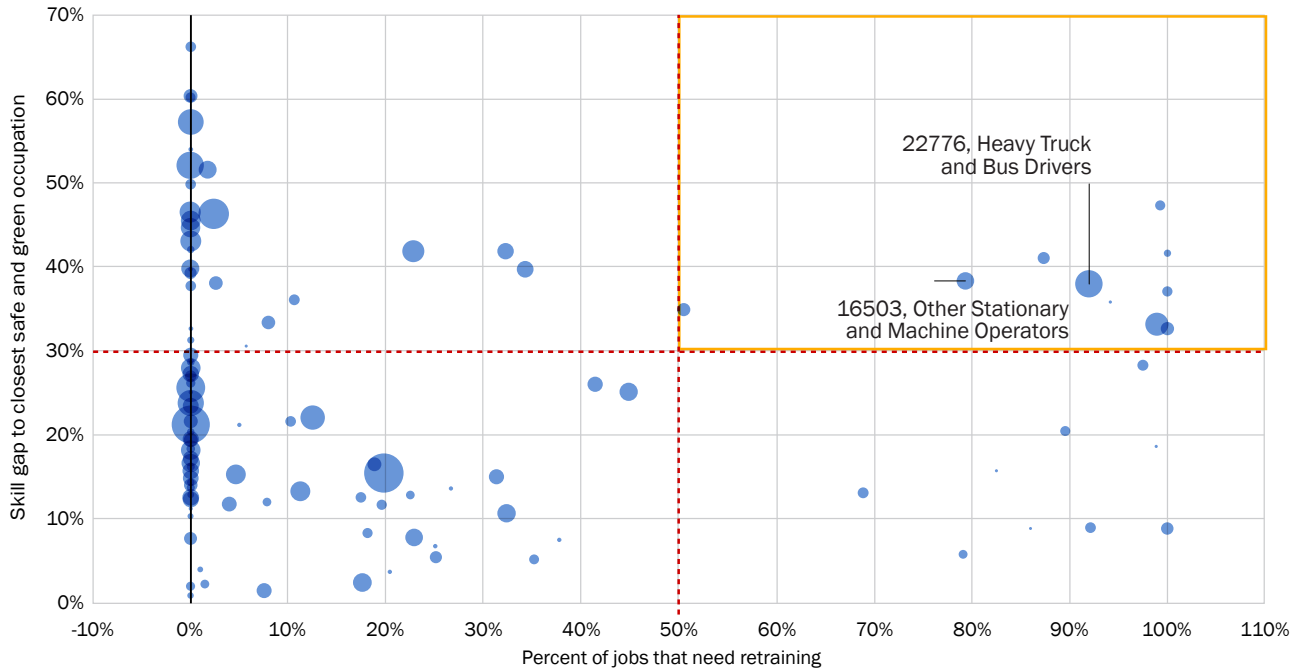
A green transition requires a comprehensive reform of the education and training systems. Taking advantage of green growth opportunities could lead to significant changes in occupational standards and skills needs. Education must provide students with the skills and competencies needed in the current and future labor market; it should be supported by active labor market policies to reskill and upskill persons affected by the green transition. Given the sizeable proportion of the labor force at risk and with significant needs for retraining, it becomes critical for North Macedonia to start adapting its education system from early learning to the technical and vocational education and training (TVET) and higher education levels so that the education systems produce green skills ready for new economy.

The skills impact on the North Macedonian economy will go beyond just brown industries, as 16.9 percent of the workforce requires upskilling or retraining in the medium term. Approximately 6.5 percent of jobs are in the brown industry, but the green transition will affect approximately one out of six workers in the entire labor force due to changes in technology or business models. Currently, 66,000 workers are employed in occupations for which a high percentage of jobs will need retraining and for which the skills gap is large and therefore at risk.[117] Missing the required investments in retraining and upskilling will put individuals at risk of unemployment; it will also put firms at risk of missing growth opportunities due to a lack of adequate workforce (Figure 3.4).

The skill gaps for workers in occupations at risk will require large investments. The transition costs in each occupation that is at risk depend on the size of the skills gap, that is, how similar the skills are to the ones required in the closest occupation. On average, workers in affected occupations will need to acquire about one-fourth of the total skills required to transition to a green occupation. At the same time, they may transition to safe occupations that are not green but will remain relevant for the economy.

The most necessary skills needed for the transition surround cognitive abilities and knowledge in STEM—science, technology, engineering, and mathematics. Developing these skills requires long periods of time, as opposed to physical, psychomotor, or sensory abilities. Other skills such as complex problem solving, critical thinking, or equipment maintenance are also needed, while gaps in social skills are of the second order. To facilitate this change, active labor market policies (ALMPs) to support on-the-job training or upskilling for unemployed people will not be sufficient; they need to be complemented by long-term education and training reforms. Facilitating the change also requires adjustments on the supply side of training provision, including training for adult workers, with an increasing role for the private sector. Our estimates show that the cost of retraining and reskilling the most at-risk workers for North Macedonia may reach €57 million for safe occupations, and up to €197 million for green occupations.

FIGURE 3.4. Occupations and number of workers that need retraining



Source: Garrote, Gukovas and Makovec. 2024. "Jobs, Skills and the Green Transition in ECA." [forthcoming] Data from Labor Force Survey of North Macedonia. 2021.
Note: The yellow area shows the most affected.

[117] These occupations are classified in the O*Net model and include: 1. Wood Treaters, Cabinet-makers and Related Trades Workers; 2. Other Craft and Related Workers; 3. Metal Processing and Finishing Plant Operators; 3. Rubber, Plastic and Paper Products Machine Operators; 4. Food and Related Products Machine Operators; 5. Wood Processing and Papermaking Plant Operators; 6. Other Stationary Plant and Machine Operators; 7. Heavy Truck and Bus Drivers; 8. Manufacturing Labourers; and 9. Other Elementary Workers.

For climate change mitigation, green technologies must be absorbed, adapted, and developed to the local needs and circumstances. Catching-up economies do not operate at the technology frontier, but their economic growth rates depend on institutional and technological advancements that bring them closer to more developed economies.[118] Technology absorption refers to the acquisition, development, assimilation, and utilization of technological knowledge and capability by firms and other entities from external sources. Successful technology absorption entails mastering specific technologies, adjusting them to local needs, and creating rich knowledge spillovers that can lead to further innovations. Development and deployment of green technologies requires skills acquisition to be complemented by other relevant resources and cross-sectoral partnerships. Collaboration between public and private sectors in research, development, and innovation should be promoted and co-financed.

[118] Lee, Jeong-Dong, Keun Lee, Dirk Meissner, Slavo Radosevic, and Nicholas S. Vonortas. 2021. *"Technology Upgrading and Economic Catch-Up Context, Overview, and Conclusions."* In The Challenges of Technology and Economic Catch-up in Emerging Economies, edited by Jeong-Dong Lee, Keun Lee, Dirk Meissner, Slavo Radosevic, and Nicholas S. Vonortas. Oxford: Oxford University Press, 1–34.

Chapter 4

Economic risks and opportunities

4.1. Macroeconomic impact

4.1.1. Introduction

North Macedonia is an upper-middle-income country that has demonstrated macroeconomic stability and resilience over the recent period. Macroeconomic stability has been largely facilitated by three anchors: the de facto currency peg (which ties narrowly the MKD denar to the euro), relatively low public debt prior to the recent crisis, and the EU accession negotiations opened in 2022.

While macroeconomic indicators appear favorable, absolute poverty and the unemployment and inactivity rates are high despite recent progress. North Macedonia has been converging with the EU in terms of gross domestic product (GDP) per capita (from 34 percent of the EU-27 average at purchasing power parity (PPP) in 2009 to 41.5 percent in 2021) and poverty has decreased. However, this has been slower than expected by the younger population that is among the largest emigration cohort. The country's energy and carbon intensities remain higher than the EU-27 average, however, North Macedonia has been decoupling its growth from emissions since 1990, but much more needs to be done to fully decarbonize the economy. Total greenhouse gas (GHG) emissions have declined since 1990, while GDP per capita has increased, demonstrating the decarbonization of the economy to some degree.

Real GDP growth has rebounded after pandemic by mid-2022, before inflation has started accelerating to the several decades high. While inflation declined toward a single-digit level in late 2023, at 4.5 percent in May 2024 it remains elevated, while growth remains subdued as personal consumption, investments, and exports remained mute. Post-crises fiscal deficit remained high, and consolidation process got delayed until 2023. As a result, public debt surpassed 62 percent of GDP by end-2023 above the recently introduced fiscal rule. A slowdown in growth to 1 percent in 2023 also led to a decelerated employment growth from mid-2023. The employment rate stagnates at around 45 percent since early 2023, while the unemployment rate (according to the Labor Force Survey) declined to 12.9 percent in the first quarter of 2024 as labor force participation declined to 52 percent. This means that almost half of the working-age population does not participate in the labor market.

Economic impact analysis was conducted as part of the WB6 CCDR to assess the economic and distributional impacts of pathways presented in the earlier sections for North Macedonia. The analysis assessed the economic impact of climate-intensified damages and the economic and poverty impacts of decarbonization pathways, using the Macro-Structural Model with climate module (CC-MFMod) developed by the World Bank, as well as the Carbon Price Assessment Tool (CPAT) developed jointly by the World Bank and International Monetary Fund.

4.1.2. Baseline and optimistic growth scenario

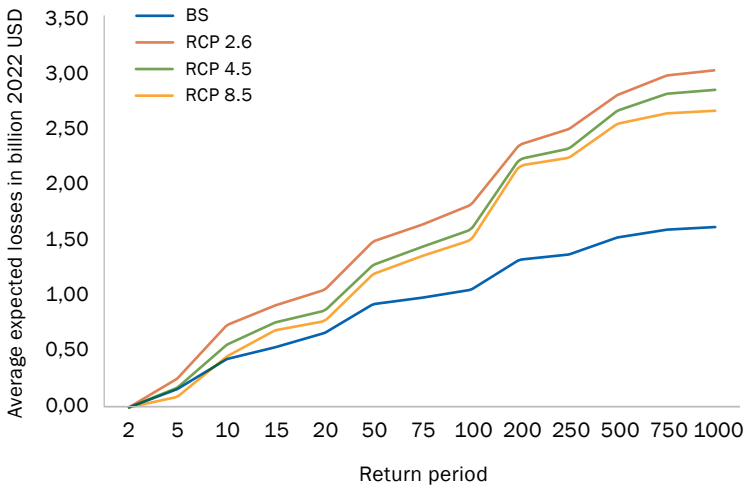
Over the long term, North Macedonia's real GDP trend growth rate under the baseline is projected to significantly decelerate by 2050 to around 1.2 percent. This is expected to be driven by the continuing decline in population and a stagnant total factor productivity growth. Specifically, in this scenario, private consumption that currently explains around 74 percent of growth consistently reduces its share in real GDP over the next three decades. In parallel, green capital projects to support decarbonization keep government capital spending at above 6.4 percent of GDP. The fiscal deficit is expected to decline in the longer term at a level of between 1.7 and 2 percent of GDP, with revenues and total spending declining in tandem to 31 and 33 percent of GDP, respectively. Such developments are expected to keep the public debt within the fiscal rule threshold of 60 percent of GDP by 2050. The external current account deficit would hover around 1 percent of GDP as the integration into the European energy network takes place and the country reduces the risks of its exports to the CBAM exposure. The extent of the external deficit increase will depend on the debt and non-debt (FDI) financing, which, together with the currency peg, may place constraints on the level of the external shortfall. That all said, there is a high degree of uncertainty surrounding these projections as it is difficult to assess, for example, the full impact of CBAM on the economy as well as the potentially positive impact of the EU's accession negotiations and the Growth Plan for the Western Balkans.

In the high-growth scenario, economic and energy reforms as well as a private investment push in the decarbonization context elevate North Macedonia's trend growth rate to 2.3 percent by 2050. While the country still loses its population dividend, productivity increases faster under the more ambitious reform scenario. To raise growth in TFP, the authorities are assumed to have initiated the transition to a market economy by reducing the SOE footprint, boosting competition and lowering informality through digitalization, enforcement, and reduced administrative barriers for businesses, as well as lowering the rigidity of the labor market. These reforms, coupled with the accelerated EU accession process, would boost firms' efficiency, and increase investment confidence. Ensuring compliance with EU standards and infrastructure upgrade would lead to increased labor force participation rate. Finally, energy policy reforms were undertaken to navigate potential adverse impacts of the CBAM. A major aspect of these reforms has been the diversification of electricity production, with an increasing share from renewable sources, and energy market coupling with the EU. Under such circumstances, the share of private investment in GDP increases to above 26.5 percent of GDP over the next three decades. This investment-driven growth widens somewhat the negative net exports over time, although the external current account deficit remains low at 1.4 percent of GDP by 2050. Fiscal outcomes are far less severe under optimistic growth rates and fully adhere to the country's fiscal rules throughout the entire projection horizon, lowering the public debt to 50 percent of GDP by 2050.

4.1.3. Impact of adaptation risks on the economy

North Macedonia is expected to suffer significant economic damages from climate change under all RCPs. The country is exposed to important risks of earthquakes and floods that have been historically associated with the largest climate-related losses and that pose the most significant risk to the economy (refer to Chapter 2). North Macedonia's most significant economic damages will likely come from flooding, and to some degree from labor heat stress,[119] although the average flooding impact diminishes in scenarios with higher concentration of greenhouse gases, due to the overall drying of the region (refer to Figure 4.1). This is not the case for flashfloods, a hazard that is more likely to take place with higher rainfall variability and whose average damages are likely to increase. The modeling exercise shows that a once-in-50-year flood can lead up to US$0.9 billion of losses, increasing up to US$1.5 billion for a flood occurring once every 500 years (refer to Figure 4.1).

FIGURE 4.1. Average expected losses from floods



Source: World Bank estimates.
Note: Return period refers to the probability of damage occurrence; 50 means a once-in-50-years event occurs.

North Macedonia also suffers from exposure to earthquakes. With medium-risk exposure to earthquakes, output is expected to be reduced by at least 1.5 percent in 2050. In 2050, for a once-in-30-years earthquake, estimated economic losses would amount to US$0.6 billion and would rise to US$1.5 billion for an earthquake occurring once every 100 years. However, these are examples where summarized risk metrics cannot fully capture actual extreme events, such as the 1963 Skopje earthquake, which caused a very significant output loss; it destroyed or damaged over 80 percent of the built-up area and resulted in the loss of more than 1,000 lives.[120]

[119] For North Macedonia, the expected losses from floods for the next 50 years are much higher than they have been historically (the Exceedance Probability curves are very steep for all RCPs).

[120] UNESCO. 1964. *"The Skopje Earthquake of 26 July 1963 and the Seismicity of Macedonia."* https://unesdoc.unesco.org/ark:/48223/pf0000014189.locale=en

Climate-related disasters will come at significant economic costs and are expected to worsen with time. Damages under RCP4.5 are expected to reach 4 percent of GDP in 2050 under RCP4.5;[121] and this estimate is a lower bound based on the modeling of heat, drought (wheat and maize), and floods.[122] Floods damages cause most significant output losses, reducing GDP by about 3.6 percent relative to the baseline under RCP 2.6 by 2050 (refer to Table 4.1). Damages induced by increased heat go up to 1.4 percent of GDP loss in 2050 under RCP 8.5. The modeled impact of droughts is moderate, largely due to the partial coverage of the analysis.

Adaptation investments can reduce output losses. Modeling suggests that investing around US$90 million[123] annually (or about 0.6 percent of GDP) in adaptation to address heat, drought, and flood impacts—such as tree plantings, infrastructure protection, early warning systems, and shifting work hours—can bring a reduction in GDP losses in 2050 under RCP 8.5 closer to 2.75 percent by 2050,[124] compared to 3.86 percent of GDP losses without the adaptation investments. These impacts are reflected in Table 4.1. Alternative estimates of investment needs from a more comprehensive investment program tackling almost all sectors[125] would cost about US$260 million annually, or US$6.4 billion, around 0.8-1.2 percent of GDP through 2050 (depending on the investment distribution through time). Such an investment package could yield a reduction of from 25 to 75 percent in damages, depending on the sector and hazard,[126] and could bring BCRs between 2 and 10, based on estimates from the literature.

TABLE 4.1. Projected damages and economic impacts under trend growth

Real GDP *% deviation from baseline*	**RCP 2.6**			**RCP 4.5**			**RCP 8.5**		
Without adaptation investments									
	2030	**2040**	**2050**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**
Heat	-0.25	-0.45	-0.65	-0.41	-0.73	-1.06	-0.55	-0.97	-1.40
Drought (wheat and maize)	-0.03	-0.02	-0.02	-0.05	-0.06	-0.05	-0.02	-0.04	-0.02
Floods	-1.62	-2.85	-3.62	-1.31	-2.29	-2.90	-1.12	-1.97	-2.49
Combined	*-1.89*	*-3.30*	*-4.25*	*-1.76*	*-3.06*	*-3.97*	*-1.68*	*-2.95*	*-3.86*
With adaptation investments									
Heat	-0.14	-0.26	-0.41	-0.23	-0.46	-0.73	-0.32	-0.64	-1.03
Drought (wheat and maize)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Floods	-1.30	-2.27	-2.88	-0.88	-1.55	-1.96	-0.79	-1.38	-1.75
Combined	*-1.43*	*-2.53*	*-3.28*	*-1.11*	*-2.00*	*-2.67*	*-1.10*	*-2.01*	*-2.75*

Source: World Bank estimates.

[121] As modeled by MFMod.

[122] The impacts of extreme events and the way they propagate through the economy changes over time (in particular for nonlinear climate shifts) and compound, and science is not yet able to model the economic impacts of certain extreme events such as wildfires.

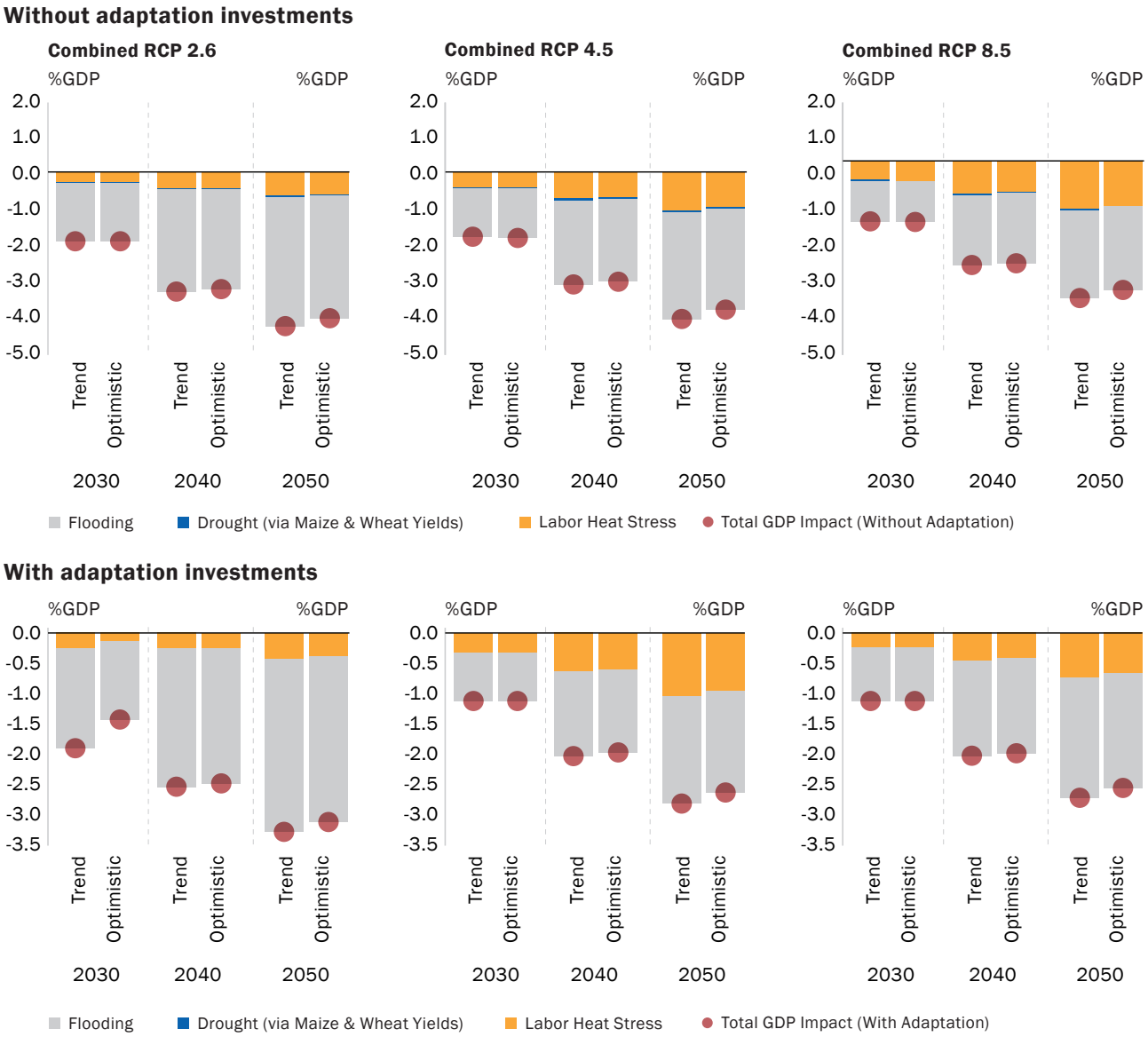
[123] As modeled by providers, numbers that were used as inputs to MFMod.

[124] As modeled by MFMod. The numbers presented here are conservative in terms of the benefits of investments: they consist in a lower bound for impacts of climate change and natural hazards without adaptation on GDP, a comprehensive investment program that is still less costly than these impacts, and a lower bound in terms of benefits (as the positive impacts of investments on the growth and associated co-benefits are not fully captured).

[125] This bottom-up exercise was undertaken based on expert knowledge and national policy documents from the region. However, sufficient detail is not available to model the investment costs and the benefits to the economy in a macroeconomic structural model (MfMod).

[126] These reductions in damages would then translate into reductions in GDP losses, growth opportunities, and co-benefits that have not been modeled here.

FIGURE 4.2. Combined damages and economic impacts under trend and optimistic growth



Source: World Bank estimates with inputs from JBA, IIASA and CIMA.

Adaptation investments are expected to affect the fiscal balance, due to the higher frequency and intensity of natural hazards, and result in rising debt levels. The US$90 million a year adaptation investment package (refer to Table 4.1 and Figure 4.2), under trend growth adjusted for the impact of climate damages, results in a wider deficit of at least 1 percentage points across all RCPs in the projection horizon, and for public debt levels to rise by more than 10 percentage points and to stand above 70 percent of GDP by 2050. Under optimistic growth, fiscal outcomes are far less severe and fully adhere to the country's fiscal rules throughout the entire projection horizon. Financing adaptation investments will be costly; this is based on the assumption that the government covers all the costs. In practice, however, some of the costs can be taken on by households, firms, and financial institutions, but they will offset the expected economic losses.

Government has options to mitigate the fiscal impact of climate change and the cost of adaptation. First, it can create fiscal space as the economy recovers after recent crises. Doing this can unlock the support needed to lessen the large impact of damages by funding adaptation investments. Second, it can share some of the investment costs with the private sector and households if the policies and regulatory frameworks be in place. Finally, the government can take on adaptation investments and meet any deficit impacts through public debt. Such fiscal costs would be in addition to the social assistance costs that come with natural

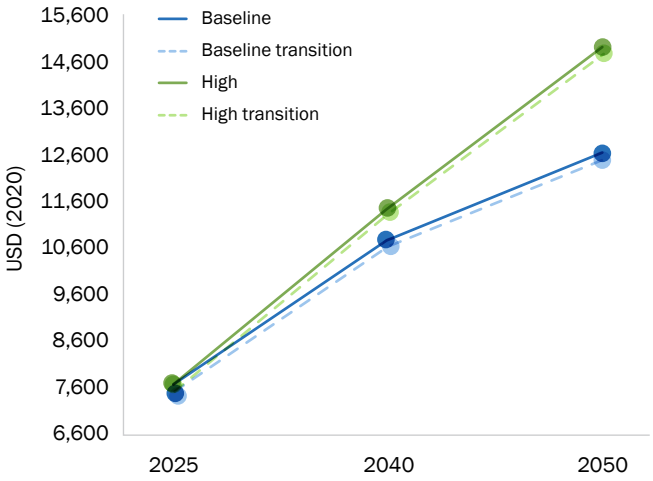
disasters. Modelling suggests that a 1 percentage point increase in public spending as a share of GDP leads to a reduction in real output losses by 1.3 percentage points on average, with all damages combined by 2050 under RCP 4.5. Another way of looking at the role of public spending is the following: an increase of 20 percentage points in public debt by 2050 can lead to a reduction in cumulative GDP growth losses by more than 25 percentage points; however, this comes at a cost, as additional public debt drives up interest rates, raises interest costs, and crowds out private investment.

At the same time, external imbalances are expected to narrow over time across all scenarios modelled, albeit somewhat slower with optimistic growth. In the trend growth scenario, the current account balance is expected to improve by 0.7 percentage points of GDP in RCP 2.6, 0.5 percentage points in RCP 4.5, and 0.4 percentage points of GDP in RCP 8.5 by 2050. External account estimates under the optimistic growth scenario are relatively similar, and adaptation investments do not affect them under any of the two growth trajectories. These outcomes predominantly result from stronger exports of goods and non-factor services and a reduction in imports as energy demand narrows in both RS and NZE.

4.1.4. Impact of mitigation risks on the economy

Reaching the net zero target by 2050 can be achieved with the current potential growth of the economy. After an initial acceleration largely by 2030, driven by the highway construction project and energy investments, under the trend scenario, projected growth rates start to decelerate toward 1 percent in 2050 as aging cuts into potential growth. Notwithstanding this, GDP per capita (in US$ 2020 terms) in 2050 is expected to be more than 30 percent higher than in 2030 in the NZE scenario with trend growth projections (refer to Figure 4.3). The decarbonization impact on domestic output is modest relative to the significant emissions reduction, because GDP per capita is only 0.6 percent lower in 2050 compared to the BAU scenario. However, under the high growth scenario (an increase of 0.4 percent a year on average over the forecast horizon compared to the baseline), GDP per capita (in US$ 2020 terms) would increase by more than 50 percent in 2050 relative to 2030, even during the transition.

FIGURE 4.3. GDP per capita, 2025–2050, USD 2020 terms



Source: World Bank estimates.

Meeting the net zero target would require large scale investments for the whole economy. Most of the incremental capital investments in the NZE relative to the RS increase after 2030. The total incremental investment costs (capital and operational) of the NZE are 1.5 percent of GDP in the trend scenario and 1.9 percent of GDP in the optimistic growth scenario on average for 2023-2050, mostly directed to the transport, industry, and power utilities sectors. Incremental CAPEX for the net zero target under both the trend and optimistic growth scenarios starts picking up after the decommissioning of coal power plants and the build-up of RE generation capacities, and peak at 4.1 and 4.6 percent of GDP in 2036, respectively. Additional capex costs in the NZE then ease to 1.9 and 1.7 percent of GDP in 2050 under the trend and optimistic growth scenario, respectively, as power utilities investments scale down (refer to Figure 4.4).

At the same time, decarbonization brings lower operational expenditures in the economy, in particular, for transport, extraction, and trade (mostly energy). OPEX in the NZE relative to the RS reduces, on average, by 1.3 percent of GDP for 2023–50 under the trend scenario, driven by such factors as lower transport costs with the adoption of more efficient vehicles, lower imports of energy products, and lower residential costs due to energy efficiency improvements of buildings and the switch to cleaner heating sources. The optimistic growth scenario foresees a similar reduction in OPEX, despite a more intensive decline in operational expenditures after 2045 (refer to Figure 4.5).

FIGURE 4.4. Incremental CAPEX and OPEX of the energy system including transport under trend growth, percent of GDP

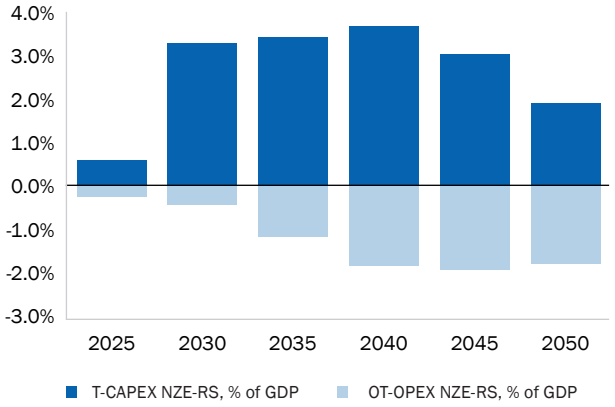
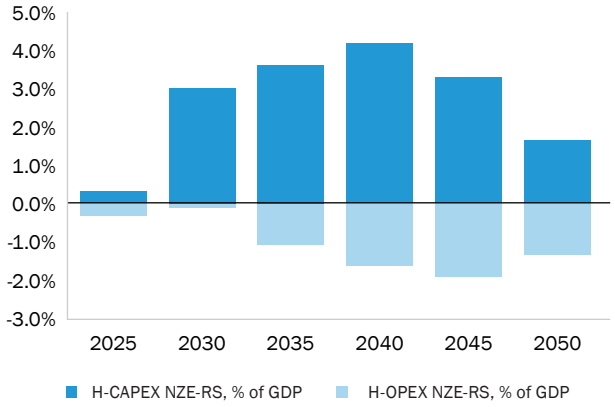


FIGURE 4.5. Incremental CAPEX and OPEX of the energy system including transport under optimistic growth, percent of GDP



Source: WDI and World Bank estimates based on the TIMES model, transport model, and CPAT.
Note: Charts show public and private investment.

More than 80 percent of additional energy and transport-related capital investments needed to meet the decarbonization target are to be undertaken by the private sector. This eases pressure on government spending that stabilizes at 35 percent of GDP after 2030, with the budget deficit staying below 3 percent until 2050. Financing options for government investments would include issuing green bonds (the inaugural was issued in October 2023) or introducing a carbon tax that would bring in new revenues as well as accelerate the climate transition[127] and reduce the needed investments.[128] The external imbalance is projected to improve significantly with the coal plants decommissioning after 2030, due to a lower reliance on fossil fuels and energy imports (refer to Figure 4.6). The improvement is even more sizeable in the optimistic scenario in 2040, in the order of at least 0.5 percentage points of GDP relative to the reference scenario; however, the higher growth effect on the CAB diminishes by 2050.

FIGURE 4.6. Current account balance, incremental impact of NZE relative to RS, change in percentage points of GDP as deviation from BAU

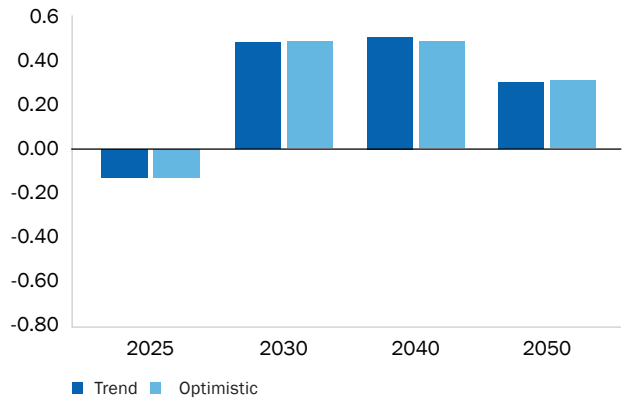
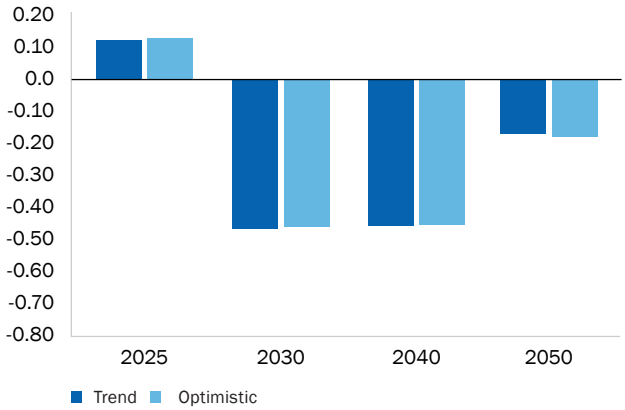


FIGURE 4.7. Fiscal deficit, incremental impact of NZE relative to RS, change in percentage points of GDP as deviation from BAU

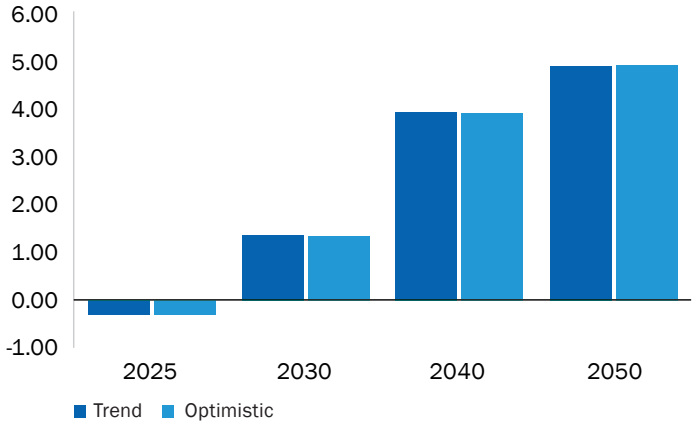


Source: World Bank estimates.

[127] A discussion on the carbon tax is elaborated in the World Bank. 2021. *"North Macedonia: Environmental and Tax Reform Options and Outcomes."* World Bank, Washington, DC. https://documents1.worldbank.org/curated/en/333331623933161040/pdf/North-Macedonia-Environmental-Tax-Reform-Options-and-Outcomes.pdf?_gl=1*1uwp34s*_gcl_au*MTYxNzMzNDEyMS4xNzI1OTYxMzE0

[128] Recycling these revenues through reducing payroll taxation, increasing support for energy vulnerable citizens (Just Transition), providing state aid to the private sector to ease the climate transition, or simply funding the deficit are options to consider for carbon tax revenues allocation. Each option has a different growth and distributional impact as discussed in World Bank. 2021. *"North Macedonia Environmental and Tax Reform Options and Outcomes."*

FIGURE 4.8. Public debt, incremental impact of NZE relative to RS, change in percentage points of GDP as deviation from BAU



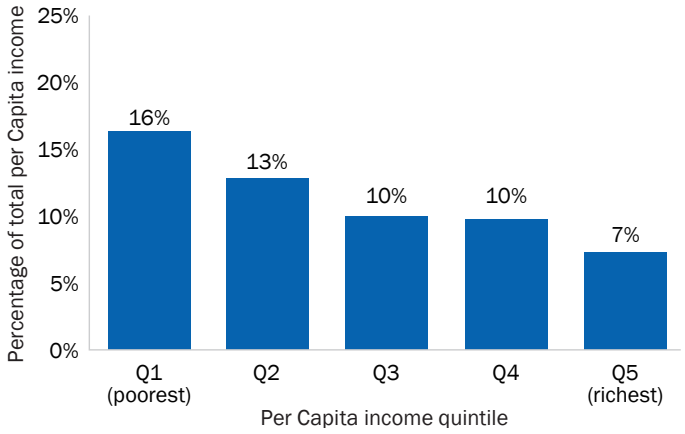
Source: World Bank estimates.

Under the optimistic growth scenario, the fiscal deficit would deepen as activity and decarbonization-related investments pick up. On average, the fiscal deficit is higher by 0.28 percentage points of GDP in NZE than in RS by 2040, before it narrows as large investments end (refer to Figure 4.7), given that more than one-half of the government's share of the incremental investment comes before 2033. In the short- to medium-terms, fuel taxation and then carbon taxation may help finance decarbonization investments, but carbon tax revenues decline over time as decarbonization takes hold. Public debt to GDP falls below 60 percent in 2050 as revenues rise faster than expenditures and the financing remains manageable because the sovereign risk premium is unaffected by contained fiscal imbalances (refer to Figure 4.8).

4.2. Poverty and distributional impact of a net zero transition–Just Transition

The transition to a low-carbon economy can bring additional co-benefits arising from lower air pollution, fewer road accidents, and decreased road damage. Reducing reliance on fossil fuels can reduce air pollution levels despite the rise in biomass and biofuels to balance the transition to renewables in the near term. This would lead to 23 percent lower mortality due to air pollution, identified as one of the top 10 health risks[129] for the population of North Macedonia, cumulatively by 2050. Savings of health spending and gains due to lower working hours lost are estimated at 1,281 million constant 2021 US$. Decarbonizing the transport sector also leads to reduced mortality from road accidents and lower costs for road maintenance, amounting to close to 92 million constant 2021 US$ in savings. In total, cumulative GDP savings that are the result of positive externalities from decarbonization amount to 1,373 million constant 2021 US$.

FIGURE 4.9. Share of energy consumption per capita, per quintile



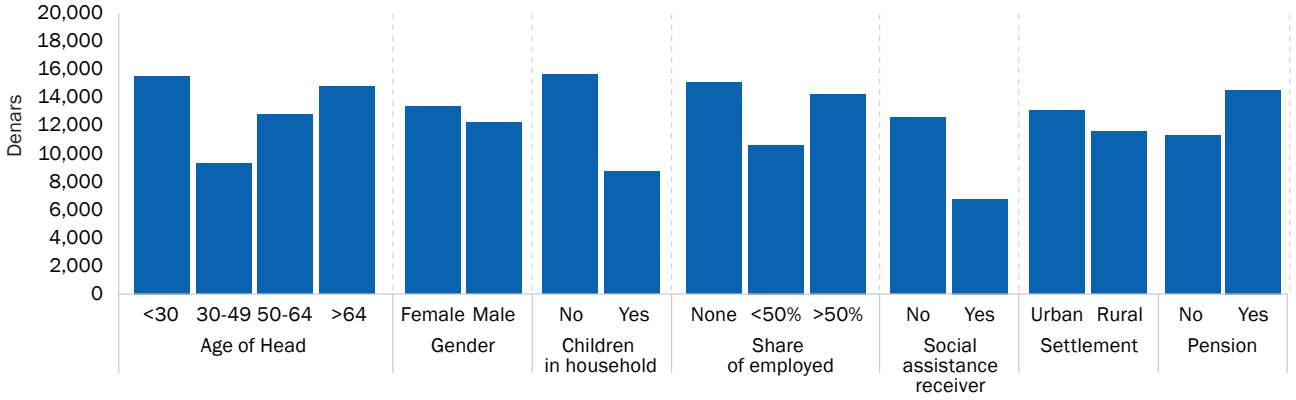
Source: SSO and World Bank calculations.

Decarbonization is expected to involve an increase in electricity prices, and North Macedonia already has a high energy poverty rate. Households in the lowest income quintile spend more than 16 percent of their per capita income on energy (refer to Figure 4.9). Younger households, female-headed households, urban households, and pension recipients tend to spend more on energy (refer to Figure 4.10). More than 75 percent of total energy consumption of households in the poorest income decile is spent on electricity; the share rises to 80 percent in the case of rural households.[130] Social assistance recipients rely even more on electricity in their energy consumption. Thus, low-income households are particularly vulnerable to energy price increases, with an even larger share of the population at risk of falling into poverty due to an energy price shock.

[129] IHME (Institute for Health Metrics and Evaluation). 2021. *"North Macedonia."* https://www.healthdata.org/research-analysis/health-by-location/profiles/macedonia.

[130] World Bank calculation.

FIGURE 4.10. Energy consumption by household characteristics, 2019



Source: SSO and World Bank calculations.

The government should focus on targeted support, given the expected disproportionate impact of the decarbonization on those who are less well-off. Social assistance recipients rely even more on electricity in their energy consumption. Accordingly, low-income households are particularly vulnerable to energy price increases, with an even larger share of the population at risk of falling into poverty due to an energy price shock. Welfare simulations indicate that with a 10-percent increase in energy prices and without changes to the coverage of energy poor, the poverty rate can rise to 20.8 percent, 1.4 percentage points higher than the baseline rate.[131] Currently, support for energy-poor consumers is channeled to GMA and social pension beneficiaries, and, on an ad hoc basis, to annual programs for additional low-income households[132] in the form of a subsidy for energy bills (electricity, gas, and district heating). Fully compensating the bottom 20 percent (about equivalent to the share of the poor) for an assumed energy price increase of 10 percent could cost an additional 0.10 percent of GDP, compared to the current energy poor budget that targets only means-tested social assistance beneficiaries.

Estimates of household consumption incidence of the net zero scenario using the CPAT tool point to decreasing consumption losses over time, despite the energy price hikes. On average, annual household losses for the period 2025–50 amount to 2.91 percent of consumption in North Macedonia; this is the second highest loss observed in the Western Balkans after Kosovo. Although household consumption losses are expected across both urban and rural households, rural households are likely to be relatively more affected by the rise in the cost of both final energy and non-energy products under the decarbonization scenario. Notably, North Macedonia is the only country in the region where consumption inequality is expected to decrease, and household consumption losses would be progressively distributed under the NZE scenario.

To realize the energy affordability agenda, the authorities need to strengthen current policies and adopt a comprehensive approach by doing the following: (1) defining the criteria for energy vulnerability—the current system allocates support to beneficiaries of selected social protection programs rather than to energy-poor households; (2) choosing a model to determine the minimum amount of energy required to sustain socially acceptable living conditions; (3) identifying delivery mechanisms through the current energy poverty program under targeted social assistance rather than increasing administrative costs by setting up various independent programs; and (4) supporting energy efficiency interventions to reduce energy spending (building insulation, space and water heating systems, windows, doors, and lighting can unlock energy savings and enable the long-term sustainability of decarbonization efforts).[133]

[131] In the baseline case, the poverty line is fixed at 60 percent of median per capita disposable income.

[132] The Program for Support of Energy Vulnerable Consumers for 2023 defines low-income households as those that have monthly net income less than: (1) 19,000 MKD for a one-person household; (2) 25,000 MKD for a two-person household; (3) 30,000 MKD for a three-income household; (4) 36,000 MKD for a four-person household; and (5) 43,000 MKD for a household with five or more people.

[133] Such measures can reduce energy consumption by 40–50 percent predicted by technical analysis and energy audits. However, a "rebound effect" can lead to lower savings by 10–40 percent; namely, when energy operating costs are lowered due to energy efficiency measures, households tend to increase their consumption of energy. This effect is expected to be larger in low-income households, which otherwise often cannot afford to adequately heat their homes.

To enable a Just Transition, the Government of North Macedonia in June 2023 adopted the Just Transition Roadmap, tackling development pathways during the transition, with a special focus on the two coal-dependent regions, Pelagonija and the southwest region. Given that coal-dependent regions face structural labor market challenges—including the coal-income trap, low activity, and high unemployment—the roadmap calls for an integrated approach to the transition. Such an approach would include vocational education, improvement of non-formal education, early retirement options, new economic/job opportunities, and upskilling/reskilling packages with subsidizing schemes for the transition of workers affected by the coal phaseout. The total cost of the proposed Just Transition Roadmap actions ranges from €29.4 and €44.6 million annually, depending on a mix of technology and policy drivers for emissions reduction, including carbon prices/taxes, and sector-specific and cross-sectoral price- and non-price-related policies and measures. The Just Transition Roadmap also provided socioeconomic inputs for the Accelerating Coal Transition Investment Program developed by the Government of North Macedonia in December 2023, targeting US$676.3 million sourced from multilateral development banks, as well as public and private investment.

TABLE 4.2. Just Transition roadmap for North Macedonia

Clean energy	Private investments and startup economy	Green and smart infrastructure	Skills development
▪ Converting existing lignite-fired thermal power plants ▪ Increasing participation of storage units in electricity markets and energy systems by prioritizing the coal-dependent regions ▪ Increasing the share of renewables in gross final energy consumption through large scale industrial development ▪ Promoting prosumers as one of the key actors of the just energy transition	▪ Improving the attractiveness of coal-dependent regions for investment ▪ Connecting local business with large enterprises ▪ Setting up a startup ecosystem to boost local innovation ▪ Promoting networking and creating a critical mass of start ups ▪ Removing infrastructure barriers ▪ Upgrading the industrial zones ▪ Greening production processes	▪ Energy efficiency ▪ Smart and sustainable local mobility ▪ Waste management ▪ Water supply and management ▪ Digital innovation	▪ Systemic interventions ▪ Continuing vocational training ▪ Integrated actions for ALMPS ▪ Work-based learning ▪ Youth guarantee initiative ▪ Active labor market measures ▪ Smooth transition on the labor market

Source: Just Transition Roadmap for North Macedonia, May 2023.

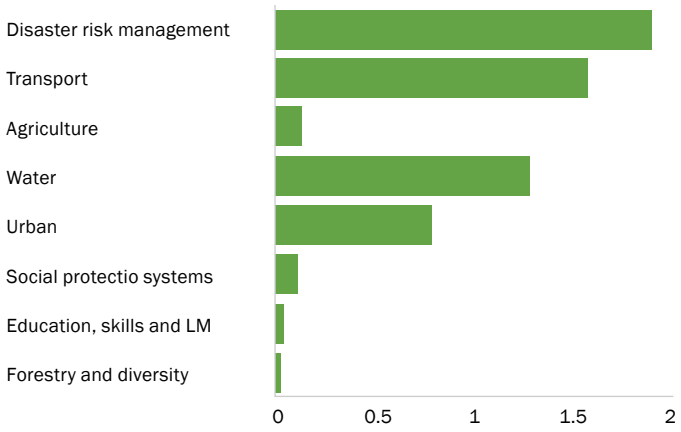
4.3. Financing of investments

4.3.1. Investment needs for adaptation and mitigation

The previous sections provided an assessment of the macroeconomic impact of climate change, the cost and impact of adaptation needs, and investment needs for a net zero transition by 2050. Although the previous sections presented investment needs in terms of differences from baseline scenarios, this section presents absolute amounts because doing this allows better gauging of the financing needs and the investment opportunities.

For adaptation, the bottom-up approach to estimating adaptation investments came to about US$6.4 billion through 2050, or US$260 million annually. Figure 4.11 shows the sectoral breakdown of total adaptation investment. The

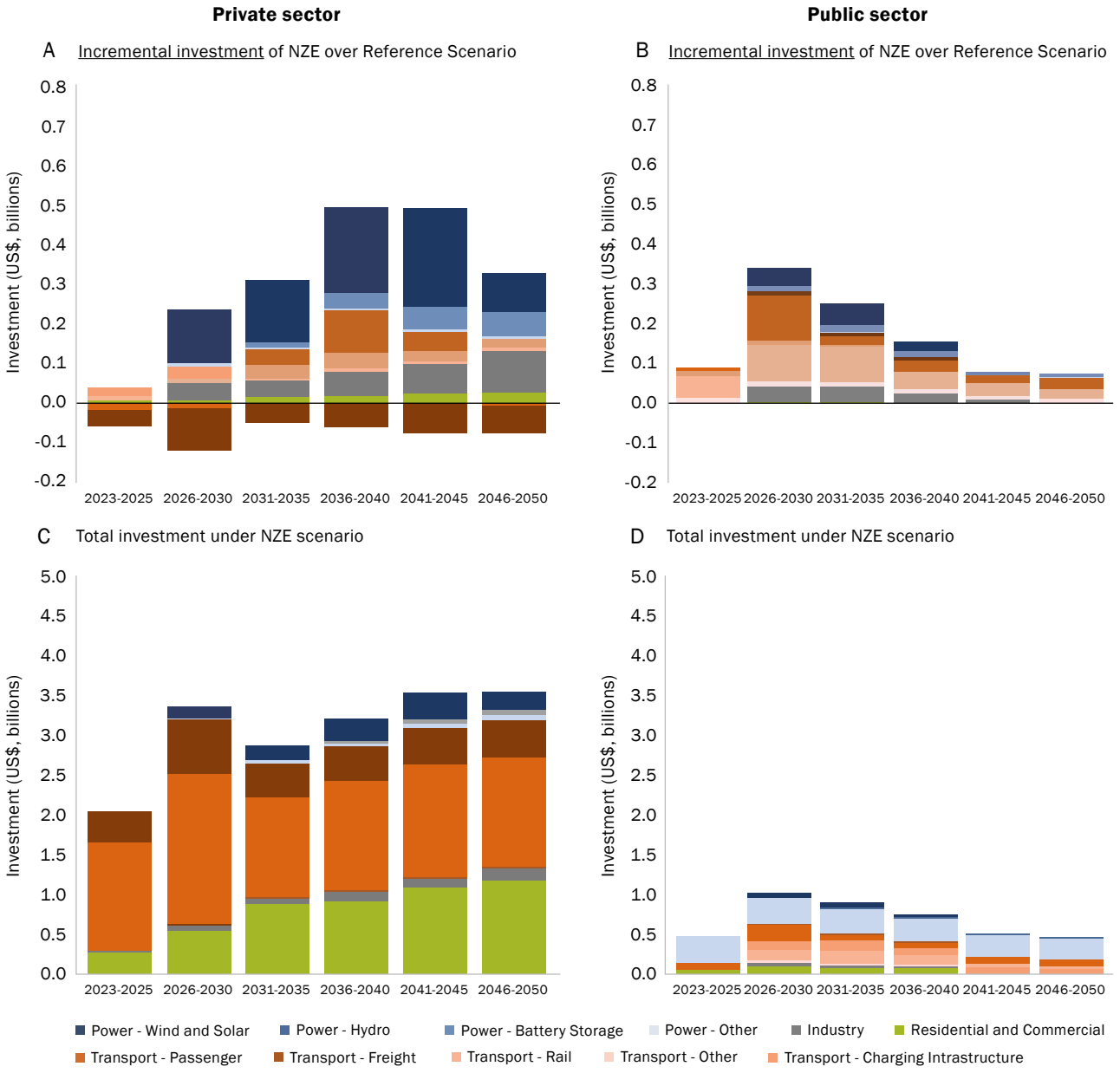
FIGURE 4.11. Adaptation investments 2025–50



Source: Annex table B.1.
Note: LM-labor market.

largest needs are in DRM, transport, water, and urban. Average annual investment needs, as a percent of GDP, come close to 1 percent of GDP annually. As previously noted, policy makers face some choices over whether the public or the private sector covers the cost. The said adaptation investments are incremental, additional to any planned investments.

FIGURE 4.12. Absolute (NZE scenario) and incremental (NZE versus RS scenario) investments, in US$ billion. The numbers represent undiscounted annual investment, averaged over the period



For mitigation, the total public and private investment required under the NZE scenario with trend growth between 2026–50 is US$100.70 billion (not discounted). Chapter 3 (refer to Figure 3.3) showed the discounted investment gap, the difference between NZE and RS investments at the sector level through 2050 in discounted US$. A breakdown of this Figure shows two things. First, Figures 4.12 A and B show a different time profile for the incremental investment between government and the private sector: the incremental government investment is front-loaded and largely on transport, while the incremental private investment is backloaded and largely on wind and solar, although transport and industry become more important after 2036. The sectors for incremental investment can be viewed as sectors to which the economy needs to pivot. Looking at total investment under the NZE scenario, Figures 4.12 C and D show that the private sector is

expected to do most of the investment (US$84.26 billion, 83.7 percent); the public sector investment accounts for 16.3 percent (US$16.44 billion) (refer to Figure 4.11, left and right bottom panels, respectively). The major investment tickets by sector from 2026–50 include transport (US$57.09, 56.7 percent of the total, 89.2 percent private, and 10.8 percent public); for residential and commercial buildings (US$24.57 billion, 24.4 percent of the total, 94.2 percent private, and 5.8 percent public); and power (US$15.89 billion, 15.8 percent of the total, 47.9 percent private, and 52.1 percent public). Importantly, the areas for investment between the public and private sector are expected to differ. The private sector is expected to focus on freight transport and residential and commercial buildings, while the public sector is expected to focus on transmission lines, charging infrastructure, and rail.

4.3.2. Green finance

North Macedonia has several options to finance adaptation investments, but these require strengthening its capacity to access EU and international donors, private borrowers and to build better capacity in the public sector to assess risks and develop financing instruments. Analysis suggests that national authorities currently lack the tools to assess their financial needs for adaptation and to access the resources required.[134] Thus, North Macedonia will need to step up its capacity to access international donors and private investment, and the public sector will have to play its role. In particular:

- **At the international level, financial support from the EU and other international donors for climate actions could be further utilized to promote adaptation and sustainable economic development.** The Sofia Declaration on the Green Agenda for the Western Balkans, the new Growth Plan and the EU Adaptation Strategy all aim to increase international climate finance for adaptation.[135] EU countries such as Switzerland have also financed adaptation projects at national and municipal levels. In addition, bilateral organizations (SECO, GIZ are most visible in North Macedonia) as well as multilaterals as well as other funds such as the Adaptation Fund, the Green Climate Fund, and the Special Climate Change Fund, have also deployed billions of dollars in adaptation and could be leveraged further.

- **At the private sector level, commercial banks and firms have much to contribute.** To promote private adaptation activities and climate finance, a higher level of collaboration between the public and private sectors is needed. Already, a number of laws have been published to encourage the private sector to finance adaptation,[136] and several funding schemes such as the Fund for Innovation and Technological Development are available.[137] North Macedonia could adopt EU market guidelines and join international platforms. For instance, the Coalition of Finance Ministers for Climate Action has “mobilizing climate finance” as one of its principles and provides member countries guidelines in “mobilizing private sources of finance toward climate action in their capacity as Finance Ministers, and by complementing Central Banks and market regulators.”[138] Research shows that there is a growing market for climate adaptation that could be worth US$2 trillion annually within the next five years.[139]

- **At the national level, public financing schemes and budgetary planning for adaptation need to be enhanced.** The government should allocate adequate financial sources to support adaptation, identify the responsibilities of relevant institutions, and mainstream climate into budgetary planning at national

[134] Alfthan, B.; Krilasevic, E.; Venturini, S.; Bajrovic, S.; Jurek, M.; Schoolmeester, T., Sandei, P.C., Egerer, H, and Kurvits, T. 2015. *Outlook on climate change adaptation in the Western Balkan mountains. United Nations Environment Programme, GRIDArendal and Environmental Innovations Association. Vienna, Arendal and Sarajevo.* https://www.weadapt.org/sites/weadapt.org/files/balkanmountains_smd.pdf.

[135] European Commission. 2021. *Communication From The Commission To The European Parliament, The Council, The European Economic And Social Committee And The Committee Of The Regions Empty - Forging a climate-resilient Europe - the new EU Strategy on Adaptation to Climate Change.* COM(2021) 82 final. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2021:82:FIN.

[136] Including Law on financial support of investment, Energy Strategy, Law on energy efficiency, Industrial Policy, and Smart Specialization Strategy

[137] Food and Agriculture Organization of the United Nations. 2021. *Private sector engagement in climate action in the Republic of North Macedonia.* https://www.fao.org/3/cb3251en/cb3251en.pdf.

[138] The Coalition of Finance Ministers for Climate Action. 2021. *About the Coalition*. https://www.financeministersforclimate.org/.

[139] Randall, T. et al. 2023. *Private investment for climate change adaptation – difficult to finance or difficult to see the finance?* UNDRR - PreventionWeb. https://www.preventionweb.net/news/private-investment-climate-change-adaptation-difficult-finance-or-difficult-see-finance.

and municipal levels. A good example from Albania can be used, which mainstreams climate change into national development planning and budgeting as well as fiscal policy options through the implementation of the NAP.[140] Disaster risk financing (DRF) also needs to be enhanced to strengthen the country's financial resilience to climate disasters and yield substantial benefits in terms of reducing the level of government liabilities.

Raising capital to finance climate change-related investments precipitates the creation of an enabling regulatory environment. Enabling and fostering the development of a green finance ecosystem includes the development of a green taxonomy,[141] along with the adoption of disclosure and reporting standards, and the development of green bonds' framework and markets. The green taxonomy, yet to be adopted by North Macedonia, should be aligned with the climate-related national strategies, laws, and action plans, and be compatible with the EU green taxonomy. According to the World Bank Enterprise Survey, about 20.4 percent of North Macedonian firms monitored their own CO_2 emissions over the past three years. While this figure is above the ECA average of 12.6 percent, the country still needs to adopt reporting and disclosure practices to align with EU standards.

North Macedonia is already attracting private sector investment via auctions and PPPs to fund and implement renewable energy projects. The GoNM has launched several auctions and leveraged PPPs to fund and implement renewable energy projects. The first large-scale solar power plant in North Macedonia, built on the site of the spent Oslomej lignite coal mine with the support of EBRD, combined investment from the SOE power utility (Elektrani na Severna Makedonika) and private investors via PPP. Since then, the government has awarded several renewable energy auctions, and there are a series of site-specific auctions for solar power investments in the pipeline to ensure more solar PV capacity in the country.

PPPs can be further used for attracting private capital into municipal district heating and cooling. There is potential in North Macedonia for constructing new and improving existing district heating systems by introducing more renewable energy sources which would help to increase energy independence, efficiency and reduce emissions. In this context, private investment can be promoted by developing a pipeline of pilot projects for PPP in municipal services and seeking international technical assistance for structuring these projects. The use of government-backed guarantees could help to decrease the cost of capital and increase the financial viability of the projects, incentivizing private investment.

The financial sector can support the expansion of the EV market. Banks can play a big role on the uptake of EVs by creating tailored packages to incentivize investment from individuals as well as companies. Commercial banks in North Macedonia already have access to credit lines from IFIs, which can be used in combination with other funding sources to create favorable financing conditions for EVs, as well as for investment in charging infrastructure. Leasing companies and microfinance organizations could also be supported to provide lower interest rates and specialized operational leasing packages for individuals, companies and public institutions.

Issuance of green debt instruments can help mobilize financing for low carbon infrastructure. Green bonds can help the country scale up public and private investment to boost green growth and facilitate the realization of mitigation and adaptation priorities. North Macedonia issued the first green bond in October 2023, with a two-year repayment period and an interest rate of 4.75 percent in the amount of 10 million EUR, that is expected to finance investments via the Energy Efficiency Fund. The latter is established as a revolving fund for energy-efficiency investments in the public sector with a funding size of million (of which 10 million come from green bonds and 5 million come from the World Bank-financed Public Sector Energy Efficiency Project), but the Government can also tap into additional funds (Green Climate Fund and EU IPA).

[140] Republic of Albania. 2021. *National Adaptation Planning (NAP) to Climate Change in Albania Framework for the Country Process*. https://unfccc.int/sites/default/files/resource/National_Adaptation_Plan_Albania.pdf.

[141] A green taxonomy is a classification system that defines and categorizes economic activities and assets based on their environmental sustainability, helping drive capital more efficiently toward environmentally sustainable projects.

Commercial banks in North Macedonia have already scaled up efforts in response to demand for green financial products. Most of the commercial banks in the country (10 out of 12 banks) have already introduced green loans[142] in their portfolio to respond to the increased demand of households and companies to invest in better insulation and roof-top photovoltaics in order to mitigate increased energy costs, in particular for heating and cooling of facilities. However, their participation in the credit portfolio is still low (4.4%).[143] Green loans are often provided by IFI credit lines (such as EIB, EBRD, French Development Agency) channeled through the Development Bank or directly through commercial banks. Some of them also include advisory support and a performance-based grant component to encourage uptake of early adopters of green solutions. International banks operating in North Macedonia are also using capital optimization instruments from guarantee agencies to reduce the regulatory risk-weighting applied to mandatory reserves and free up capital for climate financing. The freed-up capital is being used to support green lending in areas such as renewable energy, energy efficiency and green buildings.[144] Additionally, credit enhancement solutions can also be accessed to improve private sector financing terms and conditions for the sovereign, sub sovereign, SOEs and PPP's climate mitigation and adaptation projects.

North Macedonia can also tap into EU pre-accession and guarantee funds to leverage additional financing. In 2020, the European Commission adopted a comprehensive *Economic and Investment Plan for the Western Balkans 2021-2027* including up to €9 billion in EU funds, which aims to support the green transition and fostering regional integration and convergence with the EU, with a focus on transport, energy, buildings, waste management, digital infrastructure, competitiveness, skill-building and quality employment for the youth. In November 2023, the EU introduced the new Growth Plan for the Western Balkans[145], designed to enhance the region's socio-economic alignment with the EU and hasten EU reform efforts. This initiative seeks to deepen economic ties with the EU's Single Market and within the Western Balkans via the Common Regional Market, expedite crucial reforms, and augment financial support. Implementation will occur through the newly established Reform and Growth Facility for the Western Balkans, allocating up to €6 billion from 2024 to 2027. This funding comprises €2 billion in grants, contingent on revising the Multi-annual Financial Framework, and €4 billion in concessional loans. Notably, a significant portion, at least €3 billion (€2 billion in grants and €1 billion in loans), is earmarked for the Western Balkans Investment Framework (WBIF) to finance investments on sustainable transport, clean energy, environment and climate, digital future, competitiveness of the business sector, and human capital development. Additionally, North Macedonia can make use of the EU Western Balkan Guarantee Facility, that provides guarantees to help reduce the cost of financing for both public and private investments, and to reduce the risk for investors. Through the facility, the EU is expecting to mobilize up to €20 billion of investments.

4.4. Structural and regulatory framework issues

4.4.1. Private investment and financial sector structural issues

North Macedonia needs to address deficiencies in the business environment to attract private investment for mitigation and adaptation at scale.[146] Private investment is hampered by limited access to finance, particularly affecting micro, small and medium enterprises (MSMEs). The use of financial instruments, such as factoring and leasing, is limited by lack of awareness and only recently adopted regulation.[147] In addition, the country faces obstacles to competition between private firms and state-owned enterprises (SOEs) driven by

[142] The National Bank defines green loans as those with significant environmental benefit and climate change mitigation effect, such as those for improving household and corporate energy efficiency, for investments in green technologies, materials and solutions, investments in renewable energy sources, control and prevention of pollution, environment protection and mitigation of climate change risks.

[143] Quarterly report of the National Bank of North Macedonia on risks to the banking system (Q3 2023).

[144] This is, for instance, what Nova Ljubljanska Banka (NLB) is doing to support its Climate Framework Action Plan, the first of its kind in the North Macedonian banking industry. With the help of capital optimization guarantees from MIGA, NLB has set green loan targets as a milestone, which is helping the wider industry to set up a comprehensive climate financing standard.

[145] Directorate-General for Neighbourhood and Enlargement Negotiations, 2023, *Factsheet*. https://neighbourhood-enlargement.ec.europa.eu/document/download/75354ed6-6f5a-426e-9f29-f1c77ce8ce18_en?filename=factsheet_GP_February2024.pdf.

[146] World Bank. 2023. *North Macedonia Systematic Country Diagnostic (Update of 2023).* https://openknowledge.worldbank.org/handle/10986/40596.

[147] The amendments to the Law on financial companies were enacted in 2023 to encourage the use of factoring.

the lack of competitive neutrality enforcement, entry barriers in network sectors, and restrictions in regulated professions. Boosting green private investment will require regulatory reforms promoting competition, strengthening financial intermediation, and improving access to finance for MSMEs, complemented with the adoption of a sustainable finance framework in alignment with the EU regulation.

MSMEs are responsible for more than 80 percent of the output of North Macedonia but they continue to face structural barriers for access to finance. While ample green financing is channeled from IFIs through commercial banks, the SMEs still meet obstacles in accessing it, such as high interest rates (exacerbated by the recent monetary policy tightening due to a surge in inflation), and collateral and viability requirements. The banking system continues to be risk averse, fusing its services mostly on existing, large and well-established clients. Many of the family-owned business that dominate the economy of North Macedonia lack professional management, know-how for available and applicable technologies and accurate accounting to meet the bank's viability thresholds. The Government has been providing matching grants to companies through the Law for Financial Support of Investments, the Competitiveness program of Ministry of Economy and the Fund for Innovations and Technological Development to stimulate investments, technological upgrades and adoption of standards, but these measures have a lot of room for improvement, in particular when it comes to targeting, transparent and predictable implementation, value-added and impact.

North Macedonia needs to build on success in innovation capabilities if it is to capitalize on the energy transition. North Macedonia's global ranking is 66th out of 132 countries in the Global Innovation Index. The country ranks better than 66th in market sophistication, infrastructure, knowledge and technology, and business sophistication. But it ranks worse than 66th, inter alia, in human capital and research (mostly tertiary education and R&D) and in institutions (mostly the business environment). North Macedonia ranks 17th out of 36 UMICs but ranks 36th out of 39 countries in Europe. The Global Innovation Index covers the whole economy and is therefore indicative of challenges in the broad set of investment areas that are needed for adaptation and innovation. Importantly, innovation includes capacity to adapt and disseminate new technologies.

4.4.2. Public investment management

North Macedonia needs to address governance bottlenecks at the planning, appraisal, and costing stages of the public infrastructure project cycle. North Macedonia has a decentralized and fragmented public investment system, without a legal framework and overarching standards for the appraisal of investment projects, including those implemented through PPPs. Integrating planning and monitoring systems, operationalizing a central public investment management unit, and linking priorities with investment strategies will enable more informed decision making and more efficient implementation monitoring. Fostering the adoption of transparent and robust project appraisal standards, ensuring fair competition, and incentivizing the efficient provision of services by adopting clearly defined and measurable performance indicators is critical.

Climate-focused PPPs can be used to leverage private investment on low-carbon infrastructure, but North Macedonia's regulatory framework needs to be strengthened. Climate-focused PPPs allow for risk-sharing between public and private partners in critical sectors, such as power, transport and building sectors. However, PPPs can also add on to fiscal risks and costs without a strong institutional and legal framework. The current PPP legislation in North Macedonia (2012 Law on Concessions and Public-Private Partnerships) lacks clarity regarding the rules and procedures of PPPs and is not fully harmonized with EU directives. Aiming to align with the EU acquis, the new draft Law on Public-Private Partnerships that addresses the issue of fragmented terms and conditions and lack of central oversight of fiscal risks related to PPPs is yet to be enacted by Parliament. Additional efforts need to be made to integrate PPPs within the overall PIM framework, ensure consistency between strategic priorities and capital spending, strengthen the institutional system for oversight, and further improve management and reporting of fiscal costs and risks associated with PPPs.

4.4.3. Managing the role of the state and its implications for financing the green transition

In North Macedonia, state-owned businesses play a significant role in sectors that are responsible for high levels of GHG emissions. Electricity production generates about 60 percent of GHG emissions, by far the largest share, followed by the transport sector, heating sector and agricultural sector with around 10

percent each.[148] Also, network losses (15 percent in 2022) are high by international standards as a result of both technical and commercial losses in the distribution system.[149,150] Yet, many companies in these sectors are state-owned businesses (BOS, enterprises with more than 10 percent direct or indirect state ownership), especially, in particular in the power sector and transport but also agriculture (Figure 4.13).

FIGURE 4.13. Distribution of BOS in high-emitting sectors in North Macedonia, based on number of enterprises

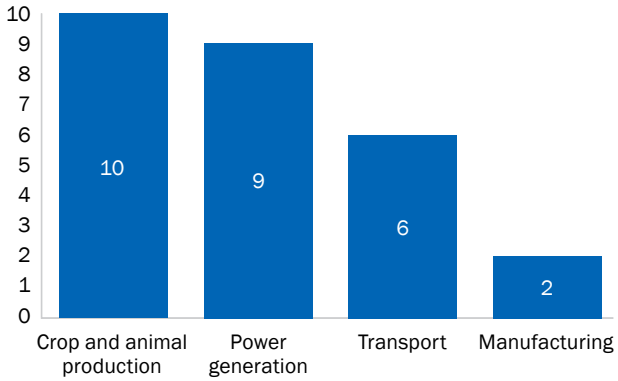
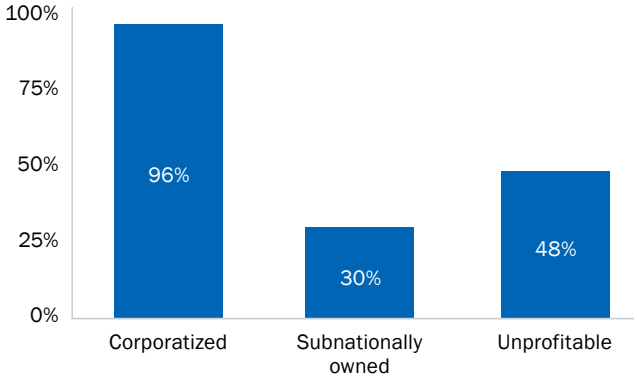


FIGURE 4.14. Distribution of BOS in high-emitting sectors by ownership level, corporatization, and financial performance



Source: WB Global BOS database.

About half the BOS are not generating profits, and this poses a challenge to financing mitigation investments. A significant share of the BOS in high-emitting sectors are not generating profits (48 percent). This coupled with the fact that some BOS are subordinated entities of municipalities (30 percent), may entail challenges for North Macedonia's mitigation agenda, in terms of coordination and finance (Figure 4.14). With a partly decentralized ownership structure, mandating BOS to implement climate mitigation objectives may be difficult as a few BOS do not report to a centralized agency. Second, it is unlikely that these BOS will have the cash-flows for the required mitigation investments.

For a successful adaptation and mitigation strategy, the GoNM will need to ensure that high emission sectors can respond to the emerging investment needs by adopting necessary reforms. Reform efforts should continue towards right-sizing the state presence across the economy, in particular in competitive markets where private operators are better suited to deliver services, thus avoiding that the country spends public funds on climate action where, in fact, the private sector should step in.

To attract private investments, business environment must be conducive from a legal, regulatory, and competition point of view. Markets, in particular energy markets, must offer a level playing field between BOS and private actors which requires careful market liberalization and regulation. Enabling a shift toward increased investment in RE implies allowing third parties to access the transmission and distribution networks owned and controlled by the state-owned utility. Such access needs to be granted at regulated tariffs so that private investors in renewables can sell directly to eligible customers without discrimination.[151]

[148] The electric power production system in North Macedonia consists of two coal power plants with a total installed capacity of 825 megawatts (MW), several hydro power plants with a total installed capacity of 695 MW, one combined generation power plant, a heavy oil plant, a few solar power plants, a few biogas plants, and one wind power farm.

[149] IMF (2024) *Republic of North Macedonia: Selected Issues.* https://www.elibrary.imf.org/view/journals/002/2024/027/article-A001-en.xml.

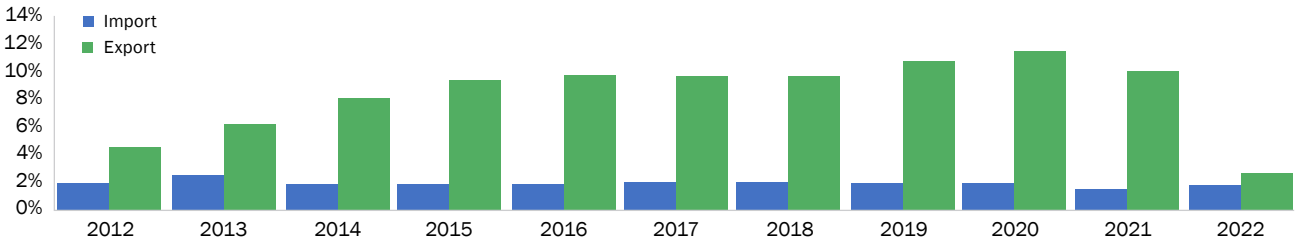
[150] OECD (2022), *Multi-dimensional Review of the Western Balkans: From Analysis to Action, OECD Development Pathways, OECD Publishing, Paris,* https://doi.org/10.1787/8824c5db-en. https://www.oecd-ilibrary.org/sites/4223758a-en/index.html?itemId=/content/component/4223758a-en.

[151] All Western Balkan countries demonstrated their commitment to adopting EU legislation on energy and climate, including carbon pricing. But as BOS are not profit-maximizing, they may not fully engage in ETS.

4.5. Growth opportunities with export development and EU accession

North Macedonia can rely on existing and potential comparative advantages in trade to foster greener growth. In the past decade, export of environmental goods[152] was on average 8.4 percent of total merchandise exports, including renewable energy plant and air pollution control products (Figure 4.15). However, reaching net zero emissions by 2050 will accelerate the deployment of renewables and electric vehicles (EVs), allowing North Macedonia to further benefit from the comparative advantages in the wind, solar and EV value chains. The country can capture the rising global demand for ferro-nickel used in the wind value chain, but also enhance the export of raw materials such as zinc and copper needed in the solar value chain. Compared to the rest of the countries in the Western Balkans, North Macedonia is uniquely competitive in exporting end-products in the EV value chain, including non-diesel-powered buses and lead-acid electric accumulators. This is important given that the adoption of more efficient vehicles can drive most of the GHG reductions in the transport sector, along with the transition to cleaner fuels (see Section 3.2).

FIGURE 4.15. EG import and export (as % of total)



Source: WITS mirror data.

The country can benefit from further financial and trade integration with the EU during the green transition. Close to 80 percent of exports from North Macedonia go to the EU and more than 60 percent of foreign direct investment (FDI) comes from the EU. Not only does the EU offer access to a large market for goods and services,[153] and access to funding but it can also offer access to technology and know-how, critical for greening the product and export mix of the country. Reaping the benefits from the EU accession agenda can be further exploited if the remaining barriers to trade in goods and services are addressed, thereby allowing entrepreneurs, investors, and firms to scale up innovation and financing needed to reach the net zero target by 2050.

At the same time, the export structure of North Macedonia to the EU reveals that the iron and steel sector would be initially most affected by recently introduced EU CBAM, followed by aluminum, cement and fertilizer production.[154] During the transitional phase that started in October 2023 and is going through December 2025, companies in these sectors would need to introduce proper carbon measurement, have collected data verified by an independent body and report on the carbon emissions of their imports. In the second phase, starting from January 2026, companies will need to obtain import licenses through the system of carbon certificates of the EU. The value of CBAM products exported from North Macedonia is estimated between US$350 million to US$700 million over the last four years, or around 5-8 percent of the total value of exported products[155]. Estimates from the World Bank suggest the CBAM compliance costs could reach around US$120 million per year, with iron, steel and electricity products absorbing the lion's share of the costs in North Macedonia. Going forward, the scope of CBAM, both in terms of type of emissions and products affected, is also expected to expand, and domestic companies will have to adjust to maintain their competitiveness. Reducing the cost of CBAM can only be achieved by reducing emissions intensity of production or by paying for the existing emissions intensity of production through a domestic carbon price.

[152] Environmental goods in this section are based on the APEC list of 54 environmental goods. https://www.apec.org/meeting-papers/leaders-declarations/2012/2012_aelm/2012_aelm_annexc.

[153] More than 500 million consumers. World Bank, 2023. *The Economic Effects of Market Integration in the Western Balkans.*

[154] Implications of EU CBAM on North Macedonia https://idscs.org.mk/wp-content/uploads/2022/11/CARBON-WEB-FINAL-Nov2022.pdf.

[155] World Bank. 2024. *North Macedonia Climate - Public Finance Review: Integrating Climate Change Perspectives into Fiscal Policy (English).* http://documents.worldbank.org/curated/en/099060724174031856/P17926410e12380611804e15fc4ec12793b.

FIGURE 4.16. Competitive strengths

Products with export competitiveness (RCA≥1)

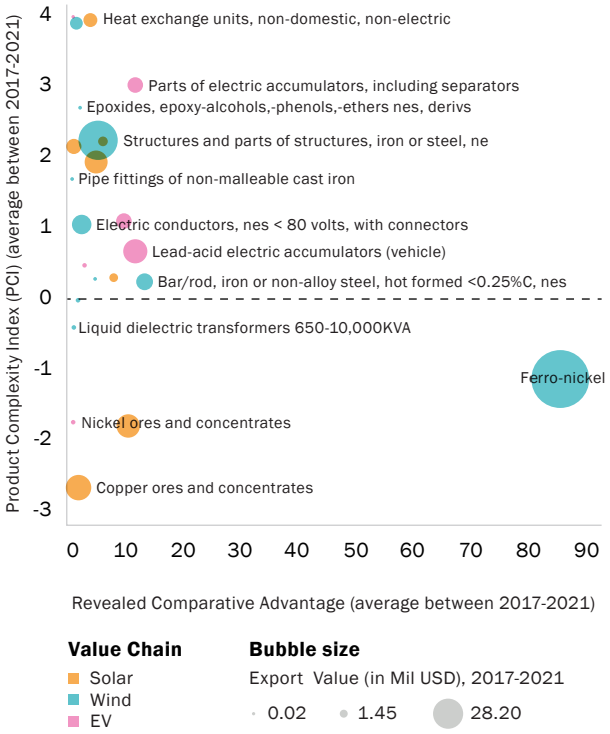
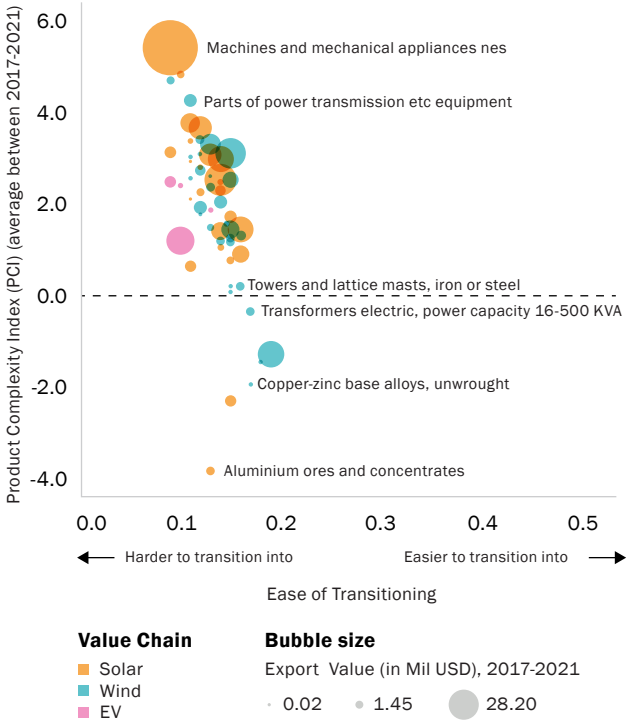


FIGURE 4.17. Potential opportunities

Products without export competitiveness (0.1<RCA<1)

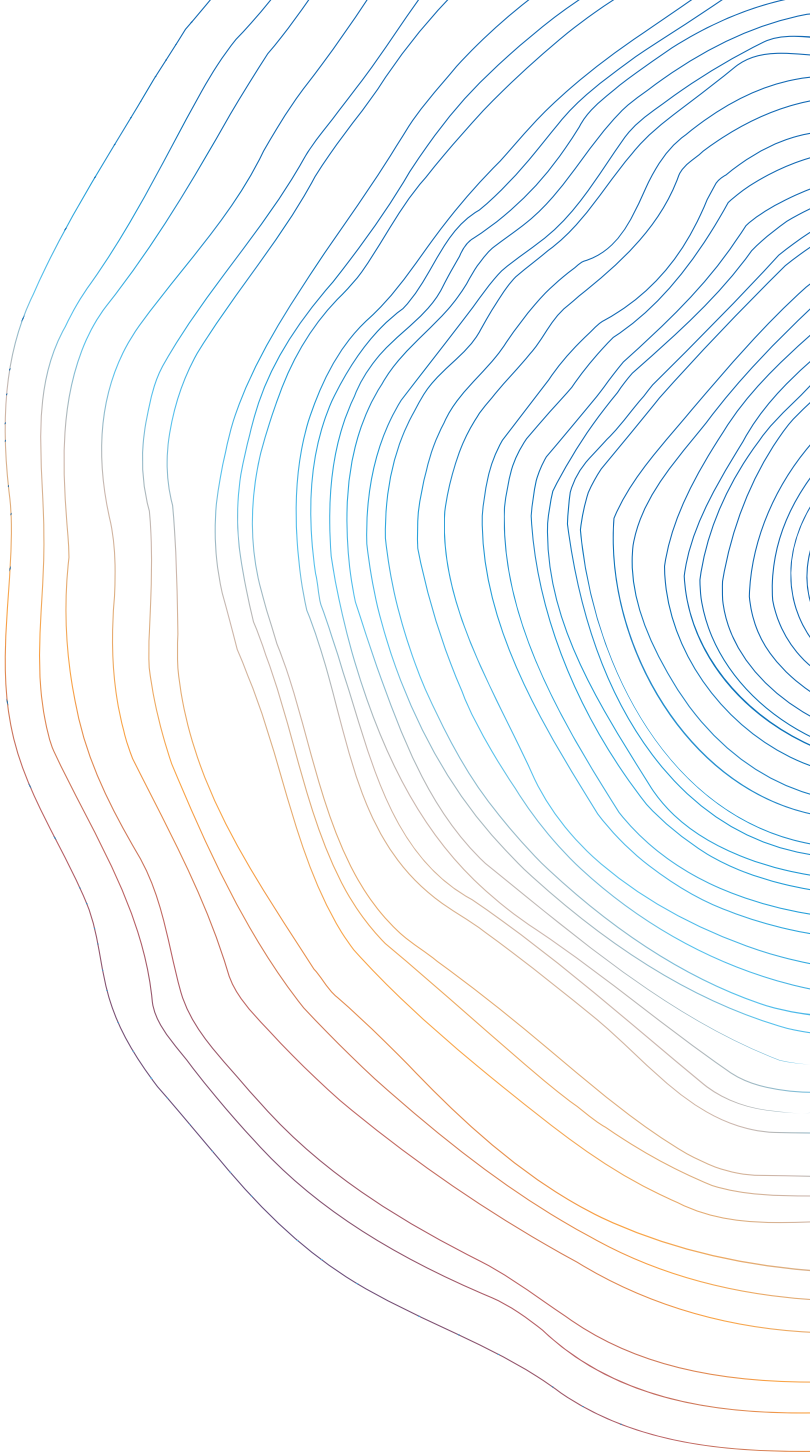


Source: Green Value Chain Explorer (GVCE).

The agricultural sector needs transformation in order to support green growth in the country.[156] Despite significant budget support (at 1.2 percent of GDP between 2017 and 2020), which is double that of other Western Balkan countries and almost 60 percent higher than the European Union (EU) average, most of the subsidies benefited low-value production. Organic farming in North Macedonia has been evolving very slowly with only 0.48 percent of the farms in the country certified as organic, or in transition. The use of mineral fertilizers and pesticides in the country has been low (compared to the EU) and is decreasing, but inefficient application seems to be the main problem. A further reduction of fertilizer and pesticide use and a convergence toward EGD targets seems feasible, especially if there are improvements in application efficiency, triggered by an upgrade of farm advisory services, use of soil maps and digital technology, and contract farming (which promotes traceability). Increased financial support and improvement of knowledge transfer and advisory services are needed to facilitate efficiency gains associated with greener practices, especially when using fertilizers, pesticides and organic farming. Agricultural policy support should shift toward productivity-enhancing innovations, which also generate lower negative environmental impacts, facilitate more sustainable practices and improve the sector's economic performance.

Further green growth opportunities lie in better waste management and fostering a circular economy. There are already some recycling facilities for glass, metal, paper and plastics, but they mostly produce semi-products and have not moved to final production stages yet. However, large amounts of organic, textile and construction and demolition waste are deposited in land fields and are not reintegrated in the economy. Unfortunately, the current legal framework, including national regulations, strategic documents and action plans, do not provide a solid basis for the circular economy transition. Furthermore, SMEs are rarely aware of the circular business models applicable to their sectors, presenting an untapped opportunity for green growth.

[156] *Green Growth in North Macedonia's Agriculture Sector,* June 2022, World Bank https://openknowledge.worldbank.org/server/api/core/bitstreams/68656c4b-15a1-4cd7-92ed-7dff1b297b58/content.



Chapter 5

Conclusions and recommendations

The following table highlights recommended policy actions and investments, with an associated prioritization, split by policy area. The urgency and ease of implementation of actions have been marked as high (●●●), medium (●●○), or low (●○○). The EU tag highlights actions that are aligned with the legal obligations already undertaken by North Macedonia within the EU accession process or based on their membership to the Energy Community.

Policy Actions	Investments	Prioritization
Policy area: Resilience and adaptation		
RA1: Disaster risk management[157]		
▪ Establish a comprehensive legislative framework for climate adaptation, including (1) adopting the draft Law on Climate Action and the draft Law on Critical Infrastructure, (2) develop a National Adaptation Plan, (3) update the building code and regulations with climate-resilient design and construction standards [with a focus on critical infrastructure], (4) update environmental regulation / environmental assessment acts for EIAs (Environmental Impact Assessments) and SEAs (Strategic Environmental Assessments) to include requirements to assess climate vulnerability and align with the EU Green Deal, and v) define the roles and competencies of the institutions/agencies responsible for managing emergencies and disasters. EU ▪ Develop a comprehensive disaster risk finance strategy supporting diversified financial mechanisms for climate adaptation and resilience. EU ▪ Build capacity and support institutional actors at national and local levels to implement the disaster risk finance strategy, including sustainable financial models for budgetary planning. EU ▪ Increase preparedness at national and local levels through designing and implementing (1) multi-hazard EWS, including mobile phone alerts, (2) public awareness campaigns, (3) programs to strengthen and train communities, with a focus on the most vulnerable, (4) modernize and increase capacity and resources of emergency response departments at local level. EU		Urgency ●●○ Ease of implementation ●●○
	▪ Expand the existing public building retrofit investment program to enhance the resilience of critical infrastructure assets against multi-hazard risks, based on detailed vulnerability analytics of these assets. EU ▪ Implementation of heat adaptation measures, such as shading and air circulation systems. EU	

[157] Disaster risk management and urban climate adaptation measures are mostly linked to the following EU legislation and strategies:

Legislation: European Climate Law (https://climate.ec.europa.eu/eu-action/european-climate-law_en), Directive on the resilience of critical entities (https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32022L2557)), Eurocode building codes (https://eurocodes.jrc.ec.europa.eu/policies-standards/en-eurocodes-and-related-standards#the-european-standardisation-system). and other relevant construction laws (such as the revised Energy Performance of Buildings Directive EU/2024/1275 and the revised Energy Efficiency Directive EU/2023/1791), Floods directive (https://www.eea.europa.eu/themes/water/interactive/by-category/floods-directive) UCPM legislation (https://civil-protection-humanitarian-aid.ec.europa.eu/what/civil-protection/eu-civil-protection-mechanism_en).

Strategies, frameworks, programs and best practice networks: EU Adaptation Strategy (https://climate.ec.europa.eu/eu-action/adaptation-climate-change/eu-adaptation-strategy_en), EU Disaster Resilience Goals (https://civil-protection-humanitarian-aid.ec.europa.eu/what/civil-protection/european-disaster-risk-management/european-disaster-resilience-goals_en), EU Mission Adaptation to Climate Change (https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe/adaptation-climate-change_en), EU level technical guidance for adaptation of buildings (https://susproc.jrc.ec.europa.eu/product-bureau/sites/default/files/2023-04/Technical%20Guidance%20adapting%20buildings.pdf). The measures particularly support progress on areas presented in Chapter 27 Environment of the acquis (https://neighbourhood-enlargement.ec.europa.eu/enlargement-policy/glossary/chapters-acquis-negotiating-chapters_en).

The EU tag indicates that these measures are directly or indirectly linked or go beyond requirements included in EU legislation or strategies.

Policy Actions	Investments	Prioritization
	▪ Develop and implement financial mechanisms proposed in the DRF strategy, including (1) a dedicated national climate finance mechanism/fund that would source funds for instance from domestic revenue, carbon taxes, or environmental levies, (2) microfinance programs and community-based funds that empower local communities to implement small-scale adaptation projects, (3) issuing climate bonds to attract investments from the capital market for specific adaptation projects, (4) design and operationalize Disaster-Linked Contingent Credits as a mechanism to provide a financial safety net. EU	Urgency ●○○ Ease of implementation ●○○
RA2: Urban		
▪ Strengthen legislation to encourage the inclusion of climate adaptation in spatial planning. ▪ Update zoning, building codes, and construction requirements to limit development in high-risk areas.	▪ Invest in nature-based solutions for adapting urban areas to climate change. EU ▪ Invest in climate-resilient cities and UHI reduction through (1) retrofitting of buildings and public infrastructures, (2) implementing green and cool roofs, (3) creating green spaces, such as urban parks, forests, and gardens. EU	Urgency ●●○ Ease of implementation ●●○
RA3: Water		
▪ Detailed assessment of the institutional, regulatory, and financing framework for water management in the country, and development of recommendations for institutional reform of the water sector at all scales of governance. ▪ Enhance assessment and management of flood risk toward alignment with the EU Floods Directive 2007/60/EC, including flood hazard and risk mapping and the development of comprehensive flood risk management actions.	▪ Invest in national hydro-meteorological data and information collection systems for water management, and enhancement of regional cooperation and data sharing with neighboring countries and the European Union at large. ▪ Invest in effective water resources management across sectors, including the regulation of groundwater abstraction for agricultural purposes and improved coordination with other water-using sectors. ▪ Develop and implement strategies and action plans to reduce the high levels of non-revenue water to increase the efficiency and resilience of water supply systems.	Urgency ●●● Ease of implementation ●●○
RA4: Forestry and Biodiversity		
▪ Develop policies that promote adaptive forest management. ▪ Increase the coverage of and connectivity between the protected areas to support ecosystem protection and recovery.	▪ Promote afforestation with native and climate-resilient species. ▪ Establish a surveillance system for forest and biodiversity monitoring purpose. ▪ Invest in design and construction of green (biodiversity) corridors to allow the free movement of animals, facilitate seed dispersal, and expand vegetation cover.	Urgency ●●● Ease of implementation ●●○
RA5: Agriculture		
▪ Improve access to financial assets for farmers and small agricultural enterprises. ▪ Increase farmers' (including women and informal farmers") participation in policy development and decision-making processes. ▪ Reduce the direct payments envelope in favor of rural development (for example, advisory, farm extension services, and R&D). ▪ Support a policy shift to increase the use of decoupled farm support combined with cross-compliance (where farmers are encouraged and supported to comply with high EU standards) to promote the adoption of sustainable and climate resilient farming practices. ▪ Improve the targeting of rural development policies, and provide incentives for technical change and innovation.	▪ Improve the maintenance of irrigation systems. ▪ Invest in sustainable management of natural resources, and green and resilient agricultural diversification, including the promotion of investments in climate-resilient agrifood value chains, organic farming, and farm and agrifood processing innovations. Support investments to mitigate the impact of GHG emissions from farms and livestock. ▪ Support farmers to make production decisions based on competitive advantage; increase farm investment, production specialization, and adoption of climate-resilient farm innovations; and shift land use to high-value production. ▪ Develop the Agriculture Knowledge and Information Innovation System (AKIS), and promote climate smart agriculture investments. Aligning the knowledge agenda with climate resilience and improving the access of farmers to agroclimatic information will further improve the sustainability of investment.	Urgency ●●○ Ease of implementation ●○○

Policy Actions	Investments	Prioritization
RA6: Transport		
▪ Promote and update safety standards and technical transport design guidelines for public and private sector stakeholders. ▪ Strengthen regulations and assets design standards to ensure that risk information and data are used adequately and consistently in assets design and construction. ▪ Incentivize climate-resilient transport projects and innovative adaptation solutions by transferring best international practices.	▪ Improve the resilience of key transportation corridors and networks, including roads and railways, involving development of robust technical documentation, and implementing infrastructure measures that prioritize climate resilience in design, construction, and public procurement processes. Invest in resilient design and construction of integrated freight corridors on roads and railways. ▪ Invest in charging infrastructure and non-motorized transport to support the transition to lower-carbon and more resilient transportation.	Urgency ●●○ Ease of implementation ●○○
RA7: Education, skills, and labor markets		
▪ Reform education and training systems to prepare the flow and the stock of workers with skills needed for new jobs, by increasing the links between the education and training system and the labor market, including through greater involvement of the private sector. ▪ Develop national plans for fostering green values, attitudes, and behaviors from an early age and throughout the education and training system. ▪ Decarbonize education delivery, adapt school infrastructure to climate change, and create modern learning environments. ▪ Promote science and R&D to facilitate the adaptation to climate change. ▪ Reform the financing and design of upskilling and reskilling programs to expand the opportunities for lifelong learning, including on the job. ▪ Assess the fit of current labor regulations and tax and benefit systems to balance the need for flexibility of firms to adapt to economic changes with the protection of workers' rights and standards.	▪ Invest in the conditions needed for more labor-market-responsive and larger-scale training (curricula, teachers/instructors, infrastructure, and equipment) ▪ Invest in green school infrastructure: energy-efficient buildings, compact structures; embed energy-efficient technology in the curriculum to foster climate education [as part of DRM and Urban Policies]. ▪ Invest in R&D and innovation to facilitate the adaptation to the green economy. ▪ Establish mechanisms (for example, skills development funds) co-led by the private sector to support reskilling and upskilling on a larger scale. ▪ Develop tools for labor market observatory to identify on a regular basis the changes in skills demand associated with the greening of the labor market. ▪ Invest in labor mobility schemes to support the geographical reallocation of jobs and workers.	Urgency ●●● Ease of implementation ●○○
RA8: Social protection systems		
▪ Modify legislation to strengthen one-off financial assistance to respond to localized shocks rapidly through the social protection system in a transparent manner. ▪ Align social protection, disaster risk management, and climate change legislation to (1) recognize the role of social protection in supporting adaptation; (2) strengthen the use of early warning systems to inform a scaling-up of social protection programs; and (3) enable disaster risk financing to be channeled through these programs to directly reach affected people. ▪ Strengthen labor income protection systems, including for informal workers, to respond to a likely increase in job-related shocks.	▪ Support dedicated outreach by the social protection systems to poor and vulnerable communities to ensure their understanding of the benefits that are available to support climate adaptation. ▪ Invest in social protection delivery systems to enable a quick identification of people in need of support, their enrollment and payment, supported by robust complaints and grievance mechanisms. This includes (1) investments in the interoperability of social protection information systems with other government databases to allow for rapid identification of eligibility; and (2) establishment of standard operating procedures to ensure system capacity during disasters, supported by capacity building and staff training. ▪ Establish and finance a contingency budget that will fund the expansion of social protection systems when shocks occur.[158] ▪ Invest in efforts to better understand the individual- and household-level impacts of disasters and climate impacts, including through the tracking of damage and losses.	Urgency ●●● Ease of implementation ●●○

[158] For budgeting purposes, the maximum amount per year would be allocated, with the assumption that it is issued every year, although in practice, disbursements would be needs based.

Policy Actions	Investments	Prioritization
RA9: Health system		
▪ Improve data sharing with other sectors on surveillance and monitoring of emerging new diseases and climate-related health emergencies. ▪ Create plans for health system responses to health emergencies, including climate-related ones. ▪ Continue structural reforms in the health sector (organizational, financial, Human resources) to strengthen the availability of health services to respond better to climate-related health events. Specifically, expand the scope of primary health care providers to diagnose and manage cardiovascular and respiratory illnesses, and improve integration and information sharing with higher-level health services. EU	▪ Establish legislative and technical prerogatives for robust connections with other sectors for disease surveillance and monitoring. ▪ Raise capacities of health sector administrative and clinical professionals on the climate change effects on health and awareness of the population on climate-resilient practices. ▪ Make strategic investments for strengthening response to climate-related hazards and other health emergencies to enable a more effective response by healthcare providers. Such investments should include equipment and training of primary health care providers in line with an extended scope of care and developing climate-hazard related functionalities for both patients and healthcare providers in North Macedonia's eHealth system, MojTermin.	Urgency ●●● Ease of implementation ●●○
Policy area: Decarbonization and mitigation		
DM1: Energy pricing		
▪ Complete the liberalization of the electricity market and strengthen regulatory institutions. EU ▪ Converge to cost-reflective electricity tariffs to ensure the financial viability of the power sector. EU ▪ Increase fuel levies and other environmental taxes to EU levels. EU ▪ Strengthen targeted social protection measures in parallel with price reforms, in combination with broader strengthening of the social protection system. EU ▪ Deploy instruments for carbon pricing, with revenue recycling to help vulnerable and low-income groups.		Urgency ●●● Ease of implementation ●●○
DM2: Power sector		
▪ Develop spatial plans for identifying priority zones for RE development, including depleted mines to support the Just Transition in coal-mining regions. EU ▪ Prepare a pipeline of RE projects with clear timelines and support schemes. EU ▪ Strengthen planning capacity for grid integration of RE at both the transmission and distribution levels. EU ▪ Develop the legal and regulatory frameworks for battery storage. EU	▪ Develop and implement national transmission grid modernization programs to enable the grid to integrate renewable electricity. EU ▪ Support investments in hydropower rehabilitation. ▪ Support investments in battery storage with the help of EU funds and private sector participation using PPPs, bonds, and commercial loans. ▪ An additional ~330 MW of pumped storage hydropower (Chebren) is economically viable. Given that the construction phase can be long for hydro projects, it would be advisable to launch these projects in this decade. ▪ Support investments led by the private sector based on competitive selection processes (for example, RE auctions) in solar and wind capacities.	Urgency ●●● Ease of implementation ●●○
DM3: Transition away from coal		
▪ Develop a framework for the repurposing of the Suvodol mine, including labor and social mitigation measures and land rehabilitation and take into account local communities indirectly affected by the closure.	▪ Provide continued support to projects for the rehabilitation of abandoned coal pits in Oslomej (especially solar PV projects) and reskilling of workers. ▪ Launch the repurposing or decommissioning of the Oslomej TPP.	Urgency ●●● Ease of implementation ●○○
▪ Adopt a Just Transition strategy for coal mine closures, including labor and social mitigation measures and land rehabilitation and take into account local communities indirectly affected by the closure.	▪ Launch the plan for the repurposing of the Suvodol coal mine, accompanied by the repurposing or decommissioning of the Bitola TPP. ▪ Strengthen public employment services, increase the offer of upskilling/retraining for occupations in demand, and invest in ALMPs in coal-affected areas.	Urgency ●●○ Ease of implementation ●○○

Policy Actions	Investments	Prioritization
DM4: Transport sector		
▪ Transition to concession-based models for public transport where providers are paid based on indicators of service delivered (performance-based contracts), aiming at improving service and accelerating the transition to e-buses. Increase the bankability of bus concessions through standardization at national and regional levels. ▪ Improve coordination of international rail freight traffic at the corridor level. EU ▪ Introduce fuel efficiency standards for vehicles and tighten second-hand import regulations. EU ▪ Improve governance and enforcement of emission testing in roadworthiness inspections. EU ▪ Introduce regulatory requirements for early electrification of highly utilized fleets, for example, buses, taxis, car-sharing, and public fleets. ▪ Establish a clear policy framework for the deployment of charging infrastructure, facilitating private sector participation. ▪ Prioritize collective and active mobility over private motorized transport in urban and metropolitan areas.	▪ Finance pilot projects to start developing EV charging infrastructure along main corridors. ▪ Support low-interest finance for the early e-mobility transition of highly utilized fleets. ▪ Introduce dedicated infrastructure for exclusive circulation of public transport vehicles along key urban corridors. ▪ Invest in continuous, integrated, and safe non-motorized transport infrastructure (cycling). ▪ Leverage EU funding and guarantees to generate incentives for private investment in the electrification of passenger and freight transport.	Urgency ●●● Ease of implementation ●●○
▪ Introduce minimum regulatory requirements for the rollout of publicly accessible EV charging points, gradually converging with those of the EU AFIR for both light- and heavy-duty vehicles. EU ▪ Introduce low-emission zones with gradual and growing levels of restriction over time. ▪ Implement parking management strategies to discourage private car use and recover public space, including controlled parking zones and parking charges. ▪ Explore alternative financing schemes for urban mobility, such as land value capture for transformative projects. ▪ Expand private sector participation in infrastructure, services, and emerging transport modes (for example, Mobility as a Service (MaaS) and urban logistics) through PPPs. ▪ Improve the market orientation of transport operators and encourage private participation. ▪ Reform transport state-owned enterprises, enable their access to finance, appoint professional boards of directors, and divest state-owned enterprises of non-core business activities. EU	▪ Invest in improved public transport and pedestrian and cycling accessibility to low-emission zones. ▪ Support, with decreasing participation over time, the rollout of publicly available charging infrastructure for electric mobility. ▪ Upgrade and expand infrastructure at border-crossing points on critical transport corridors within WB6 to achieve fully functioning one-stop-shops, and between WB6 and EU neighbors. EU	Urgency ●●○ Ease of implementation ●●○
▪ Introduce the gradual phaseout of ICE vehicles among new registrations.	▪ Revitalize and expand rail infrastructure through investment, improving service quality and competitiveness for both passenger and freight transport. Make core rail network compliant with TEN-T standards by 2035 (per the Western Balkans Sustainable and Smart Mobility Strategy) (for example, new railway infrastructure in the eastern part of Corridor VIII, and rehabilitation project on Corridor X) would enable a gradual shift from private road transport to rail for both passenger and freight.	Urgency ●●○ Ease of implementation ●○○

Policy Actions	Investments	Prioritization
DM5: Residential and commercial sector		
▪ Enhance EE standards for buildings and reinforce compliance. EU ▪ Develop a roadmap for sustainable heating.	▪ Set up national programs for public building EE. ▪ Provide incentives for EE and distributed RE in private buildings, including electrification of heating through heat pumps and installation of rooftop solar PV systems.	Urgency ●●● Ease of implementation ●●●
DM6: Industry		
▪ Enhance EE standards for industry and reinforce compliance. EU ▪ Facilitate use of rooftop photovoltaics on industrial/commercial facilities. ▪ Stimulate replacement of old and inefficient production technology.	▪ Provide favorable green credit lines with a performance-based grant component.	Urgency ●●● Ease of implementation ●●●
	▪ Provide incentives for selected pilot investments for industrial CCS and green hydrogen production.	Urgency ●●○ Ease of implementation ●○○
DM7: Education, training, and skills		
▪ Retrain current workers to adapt to the transition. ▪ Support the mitigation studies and research activities, including scientific research on decarbonization, absorption (forestry and nature preservation). ▪ Implement the measures listed in RA7: many of them will facilitate not only adaptation but also mitigation and decarbonization.	▪ Invest in upskilling and reskilling to improve the employability of the labor force and mitigate climate change in key sectors of the economy, and retrain the most vulnerable occupations to safe or green occupations. ▪ Invest in research and development in the area of mitigation. ▪ Implement the investments listed in RA7: many of them will facilitate not only adaptation but also mitigation and decarbonization.	Urgency ●●○ Ease of implementation ●○○
Policy area: Macroeconomy and financing		
MF1: Macroeconomic stability		
▪ Enforce fiscal rules and maintain debt at sustainable levels. EU ▪ Create fiscal buffers to better manage uncertainty while balancing support for priority policies and investments. ▪ Improve the quality of the MT macro framework through strengthened macro-fiscal and climate modeling capacity.		Urgency ●●● Ease of implementation ●●○
MF2: Public finance management		
▪ Introduce climate budgeting. ▪ Strengthen the energy-vulnerable consumer program and expand the coverage while reducing universal electricity subsidies. EU ▪ Implement the actions and reforms proposed in the Just Transition Roadmap. ▪ Strengthen debt and fiscal risks management. ▪ Increase fuel taxation and the motor vehicle carbon tax. ▪ Introduce carbon pricing. ▪ Introduce climate proofing for planning of all capital investments. ▪ Introduce GPP standards as obligatory for the public sector.	▪ Allocate funding for a Just Transition. ▪ Phase out fossil-fuel energy subsidies.	Urgency ●●● Ease of implementation ●●○

Policy Actions	Investments	Prioritization
MF3: Climate-resilient financing		
▪ Promote green financing by creating incentives for both private and public investments in green projects, sustainable technologies, and climate-resilient businesses. ▪ Implement carbon pricing mechanisms, such as carbon taxes or cap-and-trade systems, to internalize the costs of emissions and drive businesses to reduce their carbon footprint. (EU) ▪ Support the Central Bank in managing climate risks as outlined in the risk assessment, surveys, data collection, regulation, or guideline preparation; incorporate climate risks in supervision, stress testing, and setting capital requirements for climate risks. ▪ Adopt and enact the PPP law and strengthen the PPP and concession policy framework to facilitate and streamline investments in green and climate-resilient projects; undertake a robust public awareness campaign to better inform the population of the benefits and challenges of PPPs, and build the capacity of local institutions to design, negotiate, and manage PPPs.	▪ Invest in green bonds issued by governments, municipalities, and corporations as a means to finance environmentally friendly projects. ▪ Invest in measures to mitigate climate change impacts on the financial sector to increase resilience and reduce risk premiums associated with climate related events. ▪ Develop and deepen local capital markets to support the issuance and trading of GSS bonds.	Urgency ●●● Ease of implementation ●●○
MF4: Regulatory and supervision framework		
▪ Employ event or scenario-based stress tests to evaluate climate-related risks comprehensively to assess their potential impacts on financial institutions and the broader financial system. ▪ Develop guidelines for integrating climate risk into risk management, governance structures, disclosure practices, and supervisory scoring models and approaches to ensure consistent and thorough assessments. ▪ Establish a comprehensive national strategy and roadmap for green finance. ▪ Adopt a national green taxonomy.	▪ Invest in the development and deployment of advanced risk assessment and compliance monitoring tools that can identify potential violations and emerging climate-related risks in financial institutions.	Urgency ●●● Ease of implementation ●○○
MF5: Resilient and sustainable growth		
▪ Strengthen state aid policies for supporting EV supply chain, including skills, regulations, and SME capabilities via horizontal state aid.	▪ Increase state aid for skills development, greening, and SME capabilities. ▪ Consider government support, or counterbalance the high upfront costs of e-mobility investments.	Urgency ●●○ Ease of implementation ●●○
▪ Develop the innovation framework, and attract R&D capacity investments. ▪ Develop R&D and commercialization and technology transfer efforts specific to climate change. ▪ Eliminate regulatory uncertainty to the development and adoption of green technologies (critical areas: lack of open data on grid capacity and demand, but especially price uncertainty). ▪ Strengthen energy and transport SOEs governance in responding to climate needs and improve SOEs balance sheets. (EU)	▪ Build the innovation ecosystem, including funds for R&D, university-industry collaboration, technology transfers, and centers of excellence to stimulate knowledge transfer.	Urgency ●●● Ease of implementation ●●○
MF6: Leverage on competitiveness		
▪ Diversify the export base to include green products to mitigate the impact on economic output and protect employment. ▪ Stimulate shift to less-polluting and less energy-intensive industries and knowledge-based services. ▪ Leverage areas where North Macedonia has a comparative advantage in green product manufacturing.		Urgency ●●○ Ease of implementation ●●○

Policy Actions	Investments	Prioritization
Policy area: Regulatory / Institutional Framework		
RI1: Institutional framework		
▪ Continue the development of climate-related legislation and adopt the Draft Law on Climate Action and its bylaws. ▪ Facilitate multi-level governance in climate action.	▪ Allocate sufficient financing to ensure that the MoEPP and other line ministries, subnational governments, and other relevant institutions have adequate staff to deal with climate change and continue increasing their technical capacities. EU ▪ Set up a capacity building/training plan, and introduce climate change training modules for the public administrations.	Urgency ●●● Ease of implementation ●●○
RI2: Planning		
▪ Set a net zero target in strategic policy documents. ▪ Align sectoral and local planning documents with the national climate action priorities and needs. ▪ Establish GHG emissions-related monitoring, reporting, verification and accreditation (MRVA) rules aligned with EU Acquis communautaire, as proposed in the draft Law on Climate Action. EU ▪ Prepare progress reports for the implementation of the LTS. ▪ Strengthen the regulatory environment to support green investment. ▪ Explore strategies for incorporating climate risk into existing regulations and ensuring alignment with international standards.		Urgency ●●● Ease of implementation ●●○
RI3: Accountability and citizen engagement		
▪ Ensure legislature oversight through regular meetings of and opinions on climate action from the Parliamentary Subcommittee for Transport, Environment, Energy, and Regional Development. ▪ Establish regular practice for the State Audit Office for the review of the implementation of climate policy. ▪ Continue to improve public consultation processes, and facilitate citizen engagement and participation in the development of climate-related policy and legislation.	▪ Continue to improve the climate change portal and other instruments to enable public access to reliable information on climate change. ▪ Establish a publicly accessible and inclusive geographic information systems (GIS) portal, which maps all the climate risks, vulnerabilities, significant emitters, critical infrastructure, and adaptation needs.	Urgency ●●○ Ease of implementation ●●○

Annexes

Annex A. Climate Change Institutional Assessment: Key findings

BOX A.1. Climate Change Institutional Assessment methodology

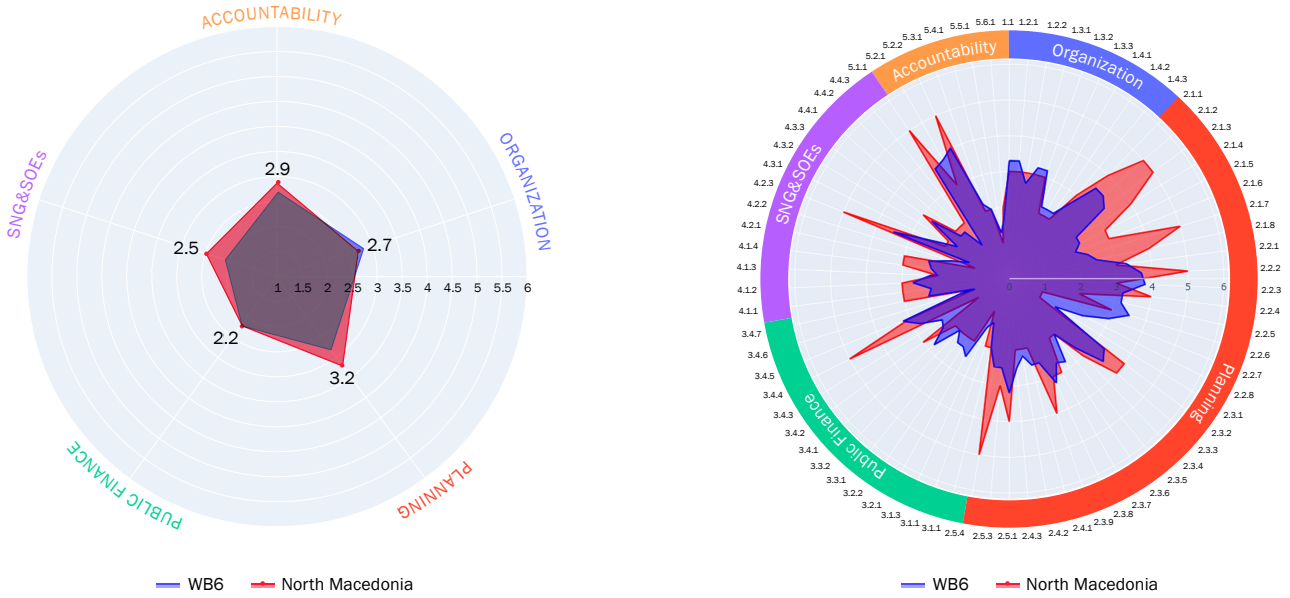
Country institutional capabilities are critical for reaching medium- and long-term climate action results. A Climate Change Institutional Assessment (CCIA) helps prioritize and sequence measures to enable countries to meet their climate change mitigation/de-carbonization and Adaptation and Resilience (A&R) objectives. The institutional performance is assessed by examining the suitability of the institutional framework to plan, implement, and sustain a credible and long-term commitment to increasing ambitious climate change policies over multiple political cycles. The assessment covers the functional pillars for organization, planning, public finance, subnational governments (SNG)/state-owned enterprises (SOE), and accountability.

The Climate Change institutional capabilities of the Western Balkans have been assessed by applying a maturity benchmarking framework. The quantitative benchmarking covers 74 indicators across the five CCIA pillars. The indicators can be read in both level terms, as well as relative to comparator countries (including EU-27 illustrations, such as Austria). The indicators are measured in overview terms of nascent, emerging, and established); and they are further detailed within the bands of innocent/aware, developing/competent, and optimizing/excellent. These maturity scores should not be read as objectives in their own right but rather in terms of how they contribute to climate change action outcomes.

The level of ambition in terms of climate mitigation or A&R is subject to a range of results metrics, including institutional abilities and actions. In the planning pillar, the CCIA captures the priorities and sequencing for climate action for both mitigation and adaptation. Climate change mitigation ambitions may be reflected in key climate action strategies and policy documents. These include objectives for GHG emissions reductions/net zero by 2030 and 2050, as well as shifts away from fossil fuels to low-carbon energy sources. The expectations for green transition trajectories— and consequently the institutional demands required for these whole-of-economy structure transformations—will depend on current baselines. A&R outcomes are subject to more diverse metrics, including expected changes in adverse climate exposure. In many cases, it still should be considered in terms of prospective loss and damage risks mitigated due to a range of proactive measures over time (including information, insurance and social protection measures, building standards, and land use planning).

The CCIA Country Reports explore in more depth the institutional measures likely to enhance and sustain climate action ambitions, ability, and actions. The CCIA dialogues identify relative strengths and possible binding constraints to deliver climate change action across the medium (2030) and longer terms (2050). These include ambitions—both for mitigation as well as for an articulation of climate A&R risks— and revealed abilities and actions to address these credibly across regional, national, and local levels. The CCIA recommendations also note the sectoral diversity that current mitigation and A&R challenges represent across the countries' socioeconomic structures. Institutional development recommendations are consequently organized by highlights across the five CCIA pillars. Figure A.1 depicts the country institutional capacities for climate change action compared to the WB6, split by the five CCIA pillars. Table A.1 provides highlights of achievements and gaps by pillar.

FIGURE A.1. CCIA Country Benchmarking: summary and indicators by pillar



Sources: Country Institutional Capabilities for Climate Change Action: Western Balkans Climate Change Institutional Change (CCIA); D4C National Climate Actions Strategies and Policies Database (NCASPD).

TABLE A.1. CCIA pillar highlights as of December 2023

	Achievements	Gaps
Organization	▪ MoEPP has a state councilor on climate change and Unit for Climate Policies. ▪ Draft Law on Climate Action (LCA) anticipates the establishment of the National Coordination Council on Climate Action (NCCCA) and an Advisory Scientific Board. ▪ Action Plan for the implementation of the Long-Term Strategy on Climate Action includes institutional measures.	▪ The planned five full-time positions in the MoEPP Unit for Climate Policies have not been occupied. ▪ The NCCCA has not been not established. ▪ The action plan for institutional strengthening will start implemen-tation only after the LCA is enacted.
Planning	▪ Long-term strategy on Climate Action has been adopted. ▪ NECP with the highest ambition in WB6. ▪ Coal phase out date: 2030. The just transition strategy adopted. ▪ The national agriculture development strategy considers climate change scenarios and impacts and foresees adaptation measures.	▪ Law on Climate Action has not been enacted. ▪ Net zero target is missing.
Public finance	▪ Guidelines for climate budget tagging in the public financed has been developed. ▪ Draft LCA foresees the introduction of a carbon tax for GHG-emitting installations and aviation operators that will provide financing for the MRV system.	▪ Public finance management does not integrate climate change. ▪ Climate-informed public investment mana-gement (PIM) not existing. ▪ No green public procurement (GPP) is in practice.
SNG/SOEs	▪ Draft LCA obliges local self-governments (LSGs) to adopt policies and measures in accordance with the law, the LTS, and the NECP. The EE Law requires LSGs to prepare EE action plans. ▪ The formation of the NCCCA will support vertical coordination. ▪ The draft LCA foresees the establishment of a carbon tax covering state-owned thermal power plants.	▪ Capacities at the local level for climate action are insufficient. ▪ There is a lack of sustainable finance for climate action at the local level.
Accountability	▪ Climate information is available online. ▪ The Subcommittee on Transport, Energy, Regional Development and Environment in the Parliament provides opinions regarding new legal and strategic documents in the field of climate action.	▪ Designated stakeholder exchange mechanisms will be introduced after the adoption of the LCA.

Annex B. Assessment of adaptation needs

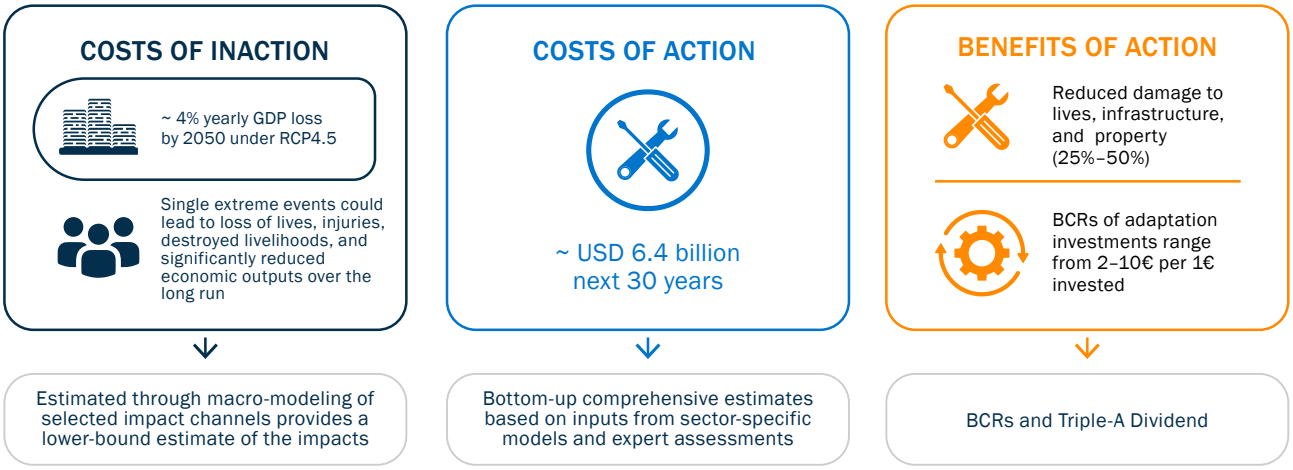
Table B.1 provides brief costing details of the measures prioritized in the policy table. It includes the narrative by sector; both the policy and investment measures are denoted with an alphanumeric code corresponding to each measure in the policy table. Below the table is a description of the challenges and methodological approach.

TABLE B.1. Estimate of adaptation needs

Policy Area	Total cost (2020 US$)	Total Cost (€)	Estimate
RA1: DRM	2.04 billion	1.92 billion	RA1.1 ~ €1.96 million 1. No cost, already in adoption procedure and the draft Law on Critical Infrastructure (US$10.000 for a national consultant to revise the Law), ~ €9,128 2. US$2,000,000, project proposal prepared, ~ €1.83 million 3. US$30,000 to engage company, ~ €27,387 4. US$100,000 to engage company, ~ €91,293 5. US$100,000 to engage company, ~ €91,293
			RA1.2 US$10,000 to engage company, ~ €91, 300
			RA1.3 US$1,000,000, as the cost of previous project on capacity building ~ €913,000
			RA1.4 ~ €38.6 million 1. Mobile phone alerts were piloted in Prespa within UNDP project, this activity costed app. US$50,000 ~ €45,681 2. Public Awareness campaigns, approximately US$30000 annually *6 years to 2030, US$210,000 ~ €191,879 3. Programmes to strengthen and train communities = conceptualizing training plan (US$15,000) + community forums + mentorship +training (US$55,000 per year) *6 years= US$345,000 (based on expert's experience) ~ €315,280 4. From Serbia World Bank R2R Investment Plan, capacity building + emergency response equipment/resource upgrading costs, ~ €38 million
			RA1.5 ~ €1,7 billion (1708.2 M€ by 2030 from the NDC)
			RA1.6: ~ €94 million from Macro' estimates
			RA1.7: ~ €80 million (Cat DDO for Serbia was €66 million and then there is a buffer of €14 million for the rest.)
RA2: Urban	851.5 million	801 million	RA2.1 €1 million based on expert's experience
			RA2.2 €2 million based on expert's experience
			RA2.3 €5 million (assessment based on previous activities with City of Skopje)
			RA2.4 €792.8 million (Calculation based on extrapolation from Albania.)
RA3: Water	1.4 billion	1.3 billion	Non-revenue water (NRW) in North Macedonia is estimated around 60 percent (according to IBNET data). Investment needs to reduce losses in North Macedonia to around 25 percent (EU average) are estimated around €1.3 billion. Estimate is deducted from a detailed technical assistance project on NRW which was recently finalized for Croatia (population of 3.9 million, NRW values of 49 percent, investment needs of €1.7 billion to reach EU average NRW values of 25 percent) from [Water GP assessments: Investment needs of €1.3 billion to reduce NRW levels from current 60 percent to EU average of 25 percent
RA4: Forestry and diversity	32.21 million	30.3 million	RA4.1 "Develop a program for adapting forestry to global climate change (policy/capacity building); €150,000" in North Macedonia 4th National Communication on Climate Change
			RA4.2 €2 million for increase and sustainable management practices afterwards, this is the cost of the latest similar project
			RA4.3 "Afforestation of 5000 ha of barren land with Oak (Quercus spp.): €7.8 million" in the Long-Term Strategy on Climate Action
			RA4.4 "Monitoring of the status of alien (and invasive) species of plants (€100,000 – 300,000)". Considering the highest of the range ~ €300,000 in the 3rd National Communication on Climate Change.
			RA4.5 7 green corridors (mostly bridges) are identified as necessity in Macedonia, with specific locations selected, one bridge as bio-corridor is from €2–€3 million; for 7 of them, the estimate is €20 million
RA5: Agriculture	143 million	135 million	RA5.1 From the 3rd National Communication on Climate Change: Subsidies for implementing adaptation measures for professional farmers), €2 million
			RA5.7 from World Bank Irrigation North Macedonia Country overview, €132.5 million

Policy Area	Total cost (2020 US$)	Total Cost (€)	Estimate
RA6: Transport	1.74 billion	1,64 billion	~€135.3 million to strengthen the most vulnerable sections of the existing national road network + €1.5 billion (US$1.6 billion total over 2024–30 over 7-year period) to invest in new resilient multimodal transport infrastructure and maintenance). Total aggregate cost of ~1.7 percent of 2024–30 GDP
RA7: Education, skills, and labor markets	47.84 million	45 million	RA7.7 [€2.8 million to €8.5 million] range provided by other global practice colleagues, ~ €8.5 million
			RA7.9 [€1.2 million to €2.5 million] range provided by other global practice colleagues, ~ €2.5 million
			RA7.10 [€3 million to €21 million] range provided by other global practice colleagues, ~ €21 million
			RA7.11 [€2.5 million to €5 million] range provided by other global practice colleagues, ~ €5 million
			RA7.12 [€3.8 million to €8 million] range provided by other global practice colleagues, ~ €8 million
RA8: Social protection systems	123 million	116 million	RA8.4 Estimated by Social Protection Global Practice colleagues, €500,000
			RA8.5 Estimated by Social Protection Global Practice colleagues, €2 million
			RA8.6 Estimated by Social Protection Global Practice colleagues, €113 million
			RA8.7 Estimated by Social Protection Global Practice colleagues, €500,000
RA9: Health system	26.72 million	25.13 million	RA.9.1 Estimated by Health, Nutrition, and Population Global Practice colleagues, US$50,000 ~ €44,634
			RA9.2 Estimated by Health, Nutrition, and Population Global Practice colleagues, US$200,000 ~ €178,540
			RA9.3 Estimated by Health, Nutrition, and Population Global Practice colleagues, US$1 million~ €892,700
			RA9.4 Estimated by Health, Nutrition, and Population Global Practice colleagues, US$2.7 million ~ €2.41 million
			RA.9.5 Estimated by Health, Nutrition, and Population Global Practice colleagues, US$3.5 million ~ €3.124 million
			RA9.6 Estimated by Health, Nutrition, and Population Global Practice colleagues, based also on country's Economic Reform Program 2024—26 of investments to upgrade PHC facilities, US$20.7 million ~ €14.48 million

FIGURE B.1. Summary of adaptation investment narrative



Source: World Bank analysis

Note: GDP = gross domestic product, RCP = representative concentration pathway, BCR = benefit-cost ratio.

The business of modeling the effects of climate change—whether shocks or slower-moving stressors—on GDP is tricky. Thus, the estimates provided are grossly undervalued. Why? The channels via which the impacts take place are difficult to account for in an exhaustive way. Further, EP curves carry large uncertainties that stem from uncertainties in climate and exposure data, especially when projected, and the difficulty of

calibrating vulnerabilities. Accordingly, propagating these through macro-modeling exercises is prohibitive for this CCDR. For instance, while overall flooding risks are expected to fall in the Western Balkans, the incidence of flash floods is expected to rise; even though this is understood, propagating the joint uncertainty in impacts is already too expensive.

More generally, modeling fails to capture the impacts of certain extreme events. Wildfires are a case in point. Historical data quickly become sparse as one goes back in time, impact channels are multi-faceted and seldom understood, and the projection of the hazard is yet to be tested. Modeling the impacts at a yearly level is next to impossible for nonlinear climate shifts (such as the hydrological cycle) whose dynamics are not yet fully captured in climate models and yield large uncertainties, once again expensive to propagate. Finally, this CCDR demonstrates how climate hazards interact and compound. Yet, models can best capture the dynamics critical to a given climate hazard, missing the complexity of the links. Modeling an example of future with compound shocks is possible, but capturing the breadth of uncertainty accounting for correlated risk is next to impossible at this stage. With examples from the region and literature review that provide some information on the direction and magnitude of the uncertainties and the way certain hazards may interact, the CCDR will provide some avenues to think through the enormity of the costs of inaction, as well as hints of solutions to deal with the matter of uncertainty, including better data collection.

This estimate is based on a comprehensive bottom-up approach, with a clear and verifiable methodology that brings huge value to clients grappling with similar issues. Approximately 80 percent of these investments are in hard infrastructure; this cost could be reduced by developing more detailed feasibility studies, combining investments (EE and seismic), and improving building codes for higher standards to avoid retrofitting, which is generally more costly. Also, some of these investments are development investments that are essential in any case for the development of sectors, the economy, and society (for example, water systems efficiency, irrigation schemes, and social protection schemes).

Benefits of action: The Triple Dividend

Investing in adaptation can yield substantial social, economic, and environmental benefits. Such benefits could be expressed through the Triple-A Dividend. The Triple-A Dividend framework reconciles perspectives from the humanitarian, environmental, and economic fields (refer to Figure 2.2). It identifies three types of benefits:

- **avoided** losses and lives saved during a disaster or climate event
- **accelerated** economic potential as a result of stimulated investments and bolstered economic activities due to the reduction in background climate and disaster risks
- **amplified** social and environmental co-benefits of adaptation investments.

The urgency of the action framework could also be applied for specific sectors, for which the costs of inaction (that is, damages) numbers are available linked to specific hazards. This exercise could be useful for sector-specific or ministry-level dialogue.

The estimates are for 2050 only, except for costs of action that are between now and 2050 and for RCP 4.5 only.

Floods

Costs of Inaction	Costs of Action	Benefits of Action
US$144.86 million AAL	US$267.19 million	US$46.56 million reduction in AAL

Droughts

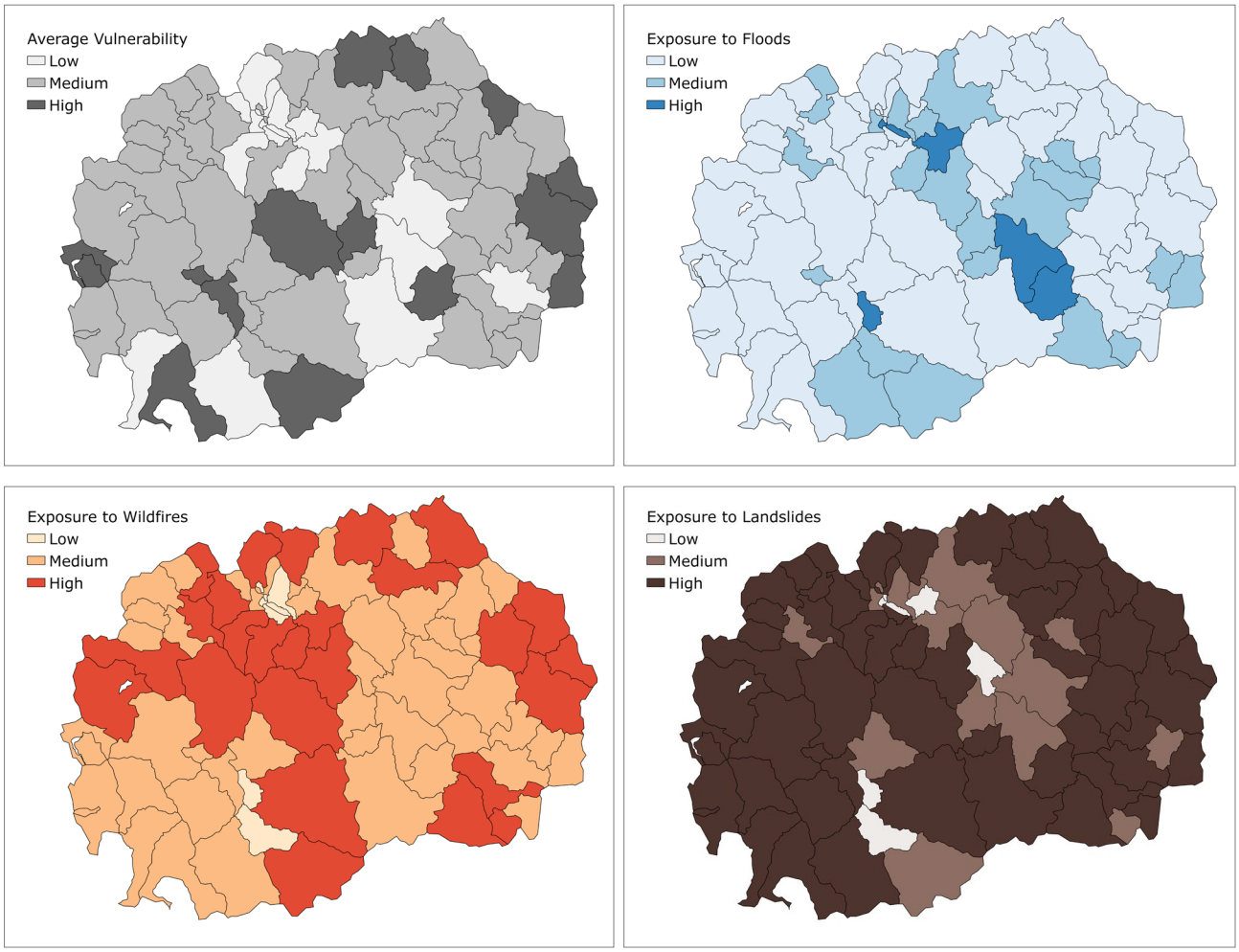
Costs of Inaction	Costs of Action	Benefits of Action
10 percent reduction in yield by 2050	US$ 1.3 billion	Given as increased revenue from adaptation for maize and wheat (~ 30k per hectare)

Heat

Costs of Inaction	Costs of Action	Benefits of Action
5 percent reduction in labor productivity by 2050	US$2.17 billion	30 percent reduction of impact

Annex C. Exposure to hazards and socioeconomic vulnerability on the municipal level

FIGURE C.1. Overlapping vulnerabilities in North Macedonian municipalities



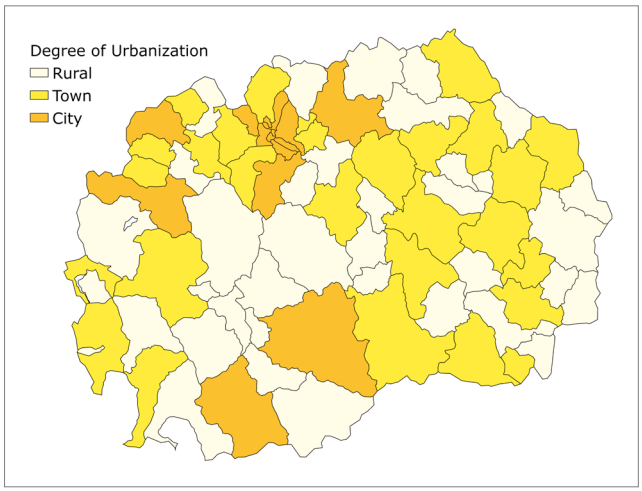
Sources: World Bank, MAKSTAT Census 2021, GHS-POP R2023A, OpenStreetMap, JBA, CIMA, ELSUS v2.
Note: Average vulnerability is measured as the arithmetic mean of 1-4 scores assigned to each municipality based on the quartiles of the distributions of: 1. population growth/decline from 2000 to 2020, 2. access to markets, 3. unemployment rate deviation from urban/rural country average, 4. share of population with secondary education. High flood exposure indicates a municipality average raw depth of half a meter or higher for a flood event (fluvial or pluvial), with a 1% yearly probability of occurrence. Low flood exposure indicates a depth of less than 20 cm for a similar event. High wildfire risk represents an average municipality score of 3 or higher based on CIMA's wildfire hazard grid assigning to each 100x100 m cell a score from 1 (very low) to 6 (very high). High landslide risk is similarly defined as an average municipality score of 3 or higher based on the ELSUS v2 landslide hazard grid, which assigns to each 200x200 m cell a score from 1 (very low) to 5 (very high). For both wildfires and landslides, low risk is defined as an average below 2.

TABLE C.1. The most highly exposed municipalities ranked from highest to lowest exposure, by hazard type

Vulnerability	Rankovce, Novaci, Staro Nagorichane, Pehchevo, Novo Selo, Plasnica, Debar, Gradsko, Berovo, Resen
Floods	Aerodrom, Petrovec, Centar, Demir Kapija, Krivogashtani, Negotino, Jegunovce, Ilinden, Bitola, Gazi Baba
Wildfires	Makedonski Brod, Chashka, Zelenikovo, Zhelino, Prilep, Sopishte, Saraj, Berovo, Lipkovo, Valandovo
Landslides	Centar Zhupa, Mavrovo i Rostushe, Debar, Tetovo, Makedonski Brod, Zelenikovo, Chucher - Sandevo, Kavadarci, Saraj, Gostivar

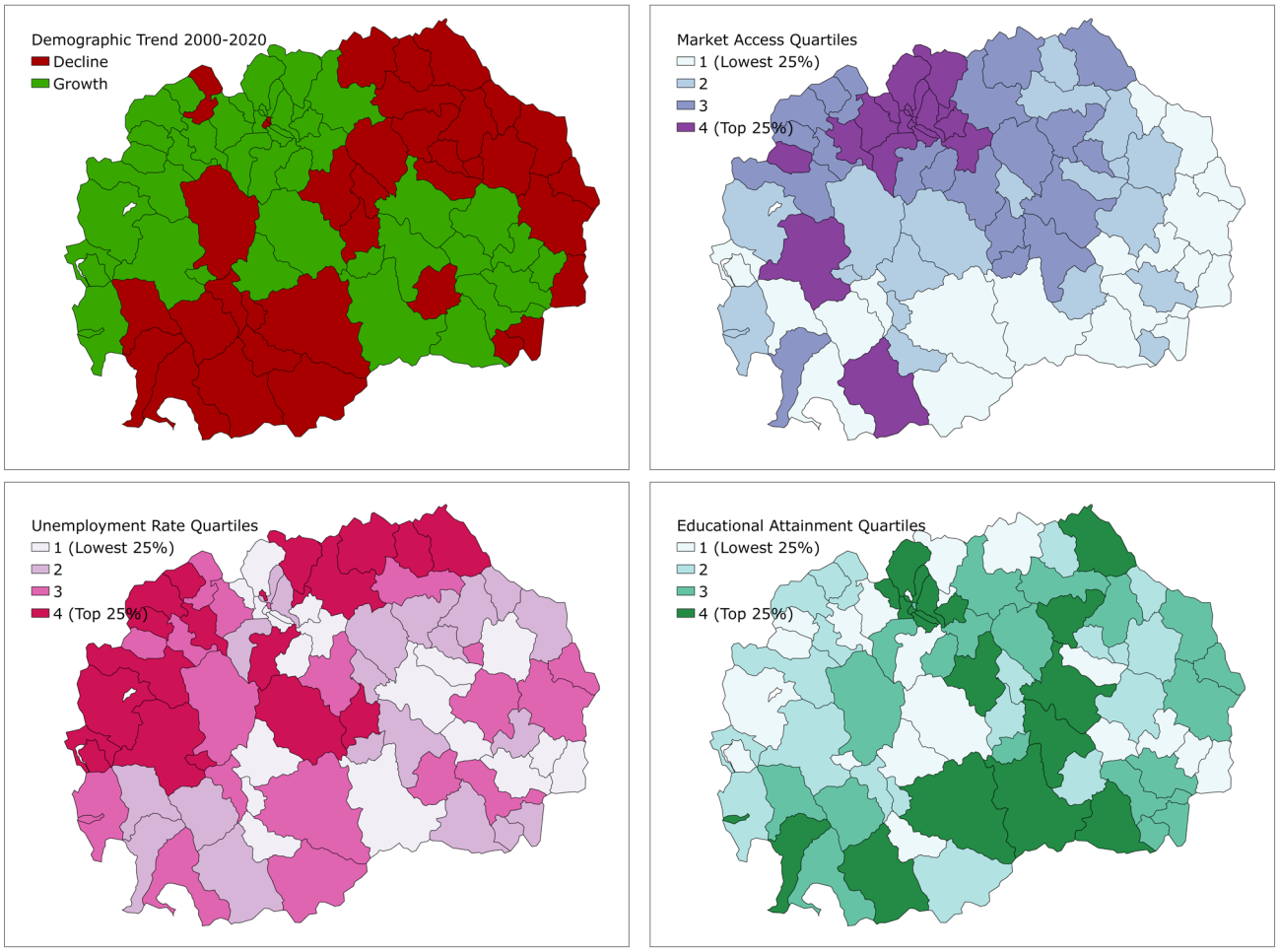
Sources: World Bank, MAKSTAT Census 2021, GHS-POP R2023A, OpenStreetMap, JBA, CIMA, ELSUS v2.
Note: Includes socioeconomic vulnerability

FIGURE C.2. Degree of urbanization of North Macedonian municipalities



Sources: World Bank, GHS-POP R2023A.
Note: Classification based on the European Commission's Degree of Urbanization methodology applied to the GHS 1 km² population grid. Cities are areas where more than 50 percent of the population lives in an urban center (contiguous areas with a minimum density of 1,500 inhabitants per km² and a minimum population of 50,000 inhabitants). Towns are areas that do not meet the city classification thresholds where more than 50 percent of the population lives in urban clusters (contiguous areas with a minimum density of 300 inhabitants per km² and a minimum population of 5,000 inhabitants).

FIGURE C.3. Determinants of socioeconomic vulnerability



Sources: World Bank, MAKSTAT Census 2021, GHS-POP R2023A, OpenStreetMap.
Note: The Figure shows the distribution of individual determinants of the average vulnerability measure in table C.1. Market access is measured as the population potential using the routing distance in km from the centroid of the municipality to all urban areas (identified using the European Commission's definition of urban clusters) in 2020, restricted to only markets in the same country. The distribution of unemployment is based on the difference between the local unemployment rate and the average country level unemployment rate, computed separately for rural and urban areas to account for underlying differentials in unemployment due to rural-urban migration. Educational attainment refers to the share of population with secondary education.